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Dynamic Coast – Scotland's National Coastal Change Assessment

Site Summary

Morrich More / RAF Tain (Site 38)

Disclaimer

The evidence presented within the National Coastal Change Assessment (NCCA) must not be used for property level of scale investigations. Given the precision of the underlying data (including house location and roads etc.) the NCCA cannot be used to infer precise extents or timings of future erosion.

The likelihood of erosion occurring is difficult to predict given the probabilistic nature of storm events and their impact. The average erosion rates used in NCCA contain very slow periods of limited change followed by large adjustments during storms. Together with other local uncertainties, not captured by the national level data used in NCCA, detailed local assessments are unreliable unless supported by supplementary detailed investigations.

The NCCA has used broad patterns to infer indicative regional and national level assessments to inform policy and guide follow-up investigations. Use of these data beyond national or regional levels is not advised and the Scottish Government cannot be held responsible for misuse of the data.

Morrich More / RAF Tain (Site 38)

Historic Change: Morrich More is an extensive sand dune and salt marsh system stretching over 2,900 hectares into the southern side of the Dornoch Firth. The interior of Morrich More is composed of gravel ridges capped with sand dunes running parallel with the open North Sea coast. The oldest gravel ridge is located east (and inland) from Tain, lies around 9m above mean sea level and was deposited on an open coast some 7,000 years ago (Firth et al., 1995, Hansom, 2003). Over the intervening period subsequent sets of ridges have been laid down as relative sea levels have fallen. Over millennia whilst this has occurred the western-facing shore has experienced erosion, fuelling accretion on the eastern-facing shore. This has resulted in the near shore at Inver becoming increasingly chocked with sediment. Spanish galleons were once reputed to dock at Inver and now you can walk out from the harbour at low tide.

The southern facing shore of Morrich More (closest to Inver) has seen the smallest changes up to 1940, with very modest erosion occurring since. The western and eastern facing shores of Morrich More have seen very significant changes and will be discussed in turn.

The western flank of Morrich More extends 7 km from Tain to the Island of Innes Mhor. Between 1904 and 1977 almost all of it has experienced substantial erosion, resulting in the loss of approximately 14 ha of mainly high dunes (Figure 3.1). In places this reached over 100 m (1.3 m/yr) but most sections lost closer to 60 to 70 m. These losses are substantiated by the presence of former terrestrial peat deposits becoming exposed on the foreshore. Changes on the easterly facing shore are equally dramatic where substantial accretion has occurred. Behind Innes Mhor, in the 73 years after 1904, MHWS has advanced seawards some 460 m and 78 ha of new habitat above MHWS has been formed. Paterson Island (the southerly barrier island) has also formed in this period, resulting in 54 ha of new land. Taken together the 132 ha equates to 1.8 ha/yr (or one and a half football pitches every year).

Figure 3.1: MHWS position in 1890, 1970s, and Modern datasets at Morrich More. Getmapping are our current providers of Scotland-wide digital aerial imagery© Getmapping plc.

The 1977 OS maps have seen little update, as a result our analysis relies on the Scottish Government's LiDAR survey in 2011. The erosion on the westerly facing coast produced up to 42 m of erosion in 34 years (1.2 m/yr) and this continued to infill and join the former island of Innes Mhor and Patterson Island to the remainder of the site. The 700 m gap to the south of Innes Mhor has been in-filled by up to 148 ha of new land, mainly salt marsh. The former island of Paterson Island has seen 28 ha gained, although there are losses adjacent to Inver where MHWS has retreated several hundred meters into the interior which has lost 67 ha. The net gain is 106 ha in 34 years equating to 3.1 ha/yr (two football pitches every year).

Morrich More lies within part of the Tarbat Ness Potentially Vulnerable Area and it also contributes towards the Dornoch Firth and Loch Fleet Special Protection Area and Morrich More Site of Special Scientific Interest.

Future Vulnerability: The vulnerability assessment projects the past rate of change into the future for a 2050 and 2100-year shoreline, which is then compared with assets. The initial section of shore from Tain is protected with rock armour then a series of near-shore breakwaters. The methodology excludes these defended areas from the projections for the future coast. However, to the northern limit of the breakwater a 25 m deep erosional bight already exists and by 2050 this is expected to retreat a further 50 m, exacerbating the losses to the forestry plantation (Figure 3.2). The remainder of the western-facing flank of Morrich More is expected to continue to erode as it has for the last 7,000 years. This will result in the loss of some forestry plantation, something Forestry Commission Scotland anticipates within their harvesting schedule. Alongside the trees, nature conservation designated sites will be eroded. The analysis here suggests in area terms at least, the gains are more than compensating for the losses, however the scientific quality and ecosystem services are defined by more than a measure of extent.

Figure 3.2: Possible future coastline position in 2050 based on rates between 1970 and Modern MHWS data at Morrich More. Getmapping are our current providers of Scotland-wide digital aerial imagery© Getmapping plc.

References

This is an extract from:

Fitton, J.M., Rennie, A.F., and Hansom, J.D. (2017) Dynamic Coast - National Coastal Change Assessment: Cell 2 - Fife Ness to Cairnbulg Point, CRW2014/2.

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