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# Dynamic Coast

## National Coastal Erosion Risk Assessment

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F.M.E Muir, M.D. Hurst, A.F. Rennie & J.D. Hansom

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**Authors:** F.M.E Muir, M.D. Hurst, A.F. Rennie & J.D. Hansom

**Project Managers:** Emily Hastings (2017), Nikki Dodd (2018), Sophie Beier (2019-2021). Centre of Expertise for Waters/James Hutton Institute.

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The cover image shows: (Top) Storm waves reflecting and undermining artificial defences at Golspie, Highland. Copyright: A. MacDonald (2020). (Bottom left) coastal erosion of the beach crest adjacent to the World Heritage Site at Skara Brae, Bay of Skaill in Orkney. Copyright: A Rennie / NatureScot (2019). (Bottom right) an oblique aerial image of the Splash play park at Montrose looking north. In the 1980s the play park was set-back within the dune, due to the subsequent coastal erosion, now it is in a more exposed position relying on artificial coastal defences. Copyright: F. McCaw (2021).

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Statement of notation: Throughout this document the abbreviation ‘M’ denotes ‘million’ and ‘B’ denotes ‘billion’ (e.g. £1B = one billion pounds sterling). Lower case ‘m’ denotes the unit of distance metres.

## Overview

A wide range of society's assets are at risk from coastal erosion in Scotland, with all coastal cells and asset types exposed to increasing risk associated with climate change. Scotland has around £20B of roads, rail and residential properties within 50m of MHWS; with £14.5B (74%) on soft shores (protected by natural defences) compared with £5B (26%) on artificial shores (protected by artificial defences). Under a high emissions scenario and assuming a 'do nothing' coastal management scenario £1.2B of buildings, roads and railways are at risk as well as extensive sections of water network infrastructure, alongside the cultural and natural heritage affected. Current artificial coastal defence structures protect around £5B of assets, alongside around £15B of assets protected by natural defences. Tideline positions, updated from Dynamic Coast research published in 2017, suggest that across the majority of Scotland's soft coast (i.e. all soft coast excluding salt marsh) around 46% are experiencing coastal erosion, with an average rate of 0.43m/yr. This is an increase above the 38% which were erosional from resampled 2017 Dynamic Coast research results. Whilst erosion rates are expected to quicken with rising relative sea level rise, our enhanced analysis here shows that the first decades where erosion is most commonly anticipated is the 2020-2030s. Thus, whilst our natural coastal defences still retain some capacity to cope, left unchecked accelerating coastal erosion and associated enhanced coastal flood risk, is expected to have an increasingly disruptive influence on society's coastal assets. It follows that society should start resilience and adaptation planning now. Fortunately, a large proportion of the assets identified at risk are clustered within a few Local Authority areas, and our improved mapping and analysis allows follow-up investigations and resources to be targeted on these key areas.

## WS2 National Coastal Erosion Risk Assessment 2 (Technical Annex)

### Context

Dynamic Coast modelling has modelled the shoreline changes anticipated under High Emissions, Medium and Low Emissions Scenarios, allowing these positions to be compared with the mapped location of society's assets. We have used data comparable to SEPA's National Flood Risk Assessment, to ensure a consistent approach across the Scottish Public Sector. It should be stressed that such an approach aims to be indicative at a national scale and, although we assume simplified management scenarios, such as 'do nothing' or 'maintain existing defences', we acknowledge that real-world decision making is complex and depends on uncertain future political, financial and environmental contexts. Nevertheless, such national assessments provide a valuable evidence base in support of more detailed planning.

Dynamic Coast (2017) undertook a Whole Coast Assessment (link) which was summarised within the National Overview (link). Using 2017 costs £13B of road, rail and residential property was identified within 50m of MHWS. This valuation is updated here, using improved residential property data (properties mapped by detailed polygons, rather than an imperfect dataset of the central location of properties which was used in 2017). An updated valuation for residential property has also been used. Table 1 updates the Whole Coast Assessment Valuations from 2017, for key asset types. Note residential property valuation reflects average property value and excludes adjacent assets (services etc). Road and Rail valuations were taken from 2017 Dynamic Coast research.

*Table 1 Whole Coast Assessment update for numbers and value of assets within 50m of MHWS in Scotland.*

| Asset Type | Source | Amount (# or km) | £ per unit | Total direct values (£) |
|---|---|---|---|---|
| Residential Property (Hard coast) | DC2 | 10,474 | | |
| Residential Property (Soft coast) | DC2 | 15,893 | 161,510 | 2.6B |
| Residential Property (Artificial coast) | DC2 | 10,444 | | 1.7B |
| Roads (Hard) | DC1 | 733 km | | |
| Roads (Soft) | DC1 | 497 km | 6.5M/km | 3.2B |
| Roads (Artificial) | DC1 | 107 km | | 0.7B |
| Rail (Hard) | DC1 | 27 km | | |
| Rail (Soft) | DC1 | 58 km | 150M/km | 8.7B |
| Rail (Artificial) | DC1 | 18 km | | 2.7B |
| **Total Road, Rail & Residential Property (£)** | | | | **19.6B** |
| **Total (Soft) (£)** | | | | **14.5B (74%)** |
| **Total (Artificial) (£)** | | | | **5B (26%)** |

### Methods

Anticipated coastal erosion has been modelled (using a modified Bruun method) where recent coastal changes are considered alongside recent relative sea level rise and projected forward using anticipated future relative sea level rise to influence future rates of change. An open coast and inner inlet approach was deployed (reflecting differing coastal gradients in such contexts) under the High, Medium and Low Emissions Scenarios (UKCP18 RCP 8.5 95$^{th}$ percentile, RCP4.6 50$^{th}$ percentile and RCP2.6 50$^{th}$ percentile). Anticipated coastal erosion areas were created by forming a polygon between the known modern (2020) shoreline and the anticipated 2050 and 2100 shorelines, respectively. This is the 'Erosion Area' (EA in Table 2) landward of MHWS today but expected to be seaward of MHWS

by 2050 or 2100. Similar to Dynamic Coast 1, a 10 m buffer was added to this area, termed Erosion Influence (EI in Table 2), to identify those adjacent areas that might be directly impacted by erosion events. Both of these Erosion Area and Erosion Influence areas are highly likely to be affected or damaged by erosion or wave thrown debris during storm events. A further buffer was also created a further 50m in land, termed here the Erosion Vicinity (EV, not presented in Table 2 for clarity but visible via the web-maps), to allow the identification of adjacent assets, which may be indirectly impacted by events, and flagged for further consideration by Local Authorities and asset managers etc. The net output of this process are time-series maps of the anticipated future shorelines positions each decade however, for simplicity, only the 2050 and 2100 results are presented here.

Positions of coastal assets were derived from OS and partner datasets (as points, lines and polygons) which were then 'selected by location (intersect)' with the EA, EI & EV areas generated above for 2050 and 2100. Where an asset straddled more than one of these erosion areas, we report only the greatest risk (most-seaward) asset or asset group. Although we present detail on the Erosion Area, Erosion Influence and Erosion Vicinity in the WS2 reports, the National Overview summary tables below only report the combined Erosion Area and Erosion Influence area results.

For the avoidance of doubt, these report the anticipated effect of future erosion under a 'do-nothing' coastal management scenario, where artificial and natural defences are not maintained. An example of the resulting output is shown in Figure 1 at a location where residential property, a roadway and a network water connection are all affected by anticipated erosion.


*Figure 1 Exemplar location with buildings, road and associated infrastructure at risk from anticipated erosion. Grey line represents 2020 MHWS, pink lines are decadal anticipated MHWS positions from 2030 inland (right to left) with 2050 and 2100 marked in bold red. Anticipated retreat is under a high emission scenario and a 'do nothing' coastal management scenario. Indicative Results.*

## National Coastal Erosion Risk Assessment

The National Coastal Erosion Risk Assessment summarises the assets which are identified at risk by 2050, it is the coastal erosion equivalent to the National Flood Risk Assessment. It presents an intentionally conservative baseline where existing artificial and natural defences are not maintained. This then can be considered against alternative approaches where increasing levels of management are maintained / invested in. It should be noted that our analysis has been undertaken on soft shores and those where a beach lies in front of an artificial defence. Those shores where no natural landform exists and MHWS lies along the defence structure have not been included in our assessment. As such, the risk posed to heavily engineered shores are excluded from these assessments.

Under the 'do nothing' coastal management strategy and High Emission Scenario and where artificial and natural defences are not maintained coastal erosion is expected to affect at least £1.2B of assets in the next 30 years (Table 2). This includes up to 647 residential properties (£104M at 2020 prices), 4.95 km of railway (£743M) across 45 locations, and 55.6 km of road (£361M) across 1,022 locations.

If artificial defences are maintained but natural defences erode then £800M of assets are expected to be affected by erosion by 2050 (Table 2). This includes 269 residential properties at risk by 2050, 3.40 km of rail and 44.6 km of roads, all located behind natural shores. As such the maintenance (and enhancement) of natural coastal defences is critical in the coming decades. Together these figures reflect an increase over the number and value of the assets identified in the (2017) Dynamic Coast assessment (£340M of assets anticipated to be impacted). The increase reflects updated shoreline data (erosion is affecting more shores than in 2017) and improved modelling reflecting influence of rising relative sea level on beach retreat rates. Nevertheless, this Risk Assessment may underrepresent the wider risks (erosion can occur on defended and rocky shores, not included here) and the costs may be higher due to the associated impacts, beyond the individual asset costs.

*Table 2 National Coastal Erosion Risk Assessment headline figures for the assets at risk by 2050 under a high emission scenario and a 'do nothing' coastal management strategy. Any associated minimum replacement costs where known are indicated. Erosion Area (EA) is the eroded land seaward of the 2050 MHWS position, Erosion Influence (EI) is a 10m buffer landward of the anticipate position of MHWS in 2050. Assets within both EA and EI are expected to be 'affected' by erosion.*

| Item | Unit | Amount | | Source / version |
|---|---|---|---|---|
| Number of Residential Properties in Scotland | # | 2.6M | | link |
| Number of Residential Properties within 1km of MHWS | # | 594,031 | | Coastal_RPs_Poly.shp |
| Number of Residential Properties within 50m of MHWS | # | 36,811 | | |
| Length of coastal defences | km | 612 | | DC2_Defences_Scot.shp |
| Number of properties within 50m of MHWS & Defences | # | 15,951 | | Coastal_RPs_Poly.shp |
| Number of properties up to 25m behind defences | # | 6,923 | | ResProp Defended |
| Value of properties up to 25m behind defences | £ | 1.1B | | 2020 Ave. house (link) £161,510 x 6,923 |
| Number of *properties* modelled | # | 29,285 | | Select by Loc, WS2_200m buff Flat ended buffer |
| Number of *defended properties* modelled | # | 1,516 | | ResProp Defended within 200m flat buff of WS2_2020_MHWS |
| Number of *properties* expected to erode by 2050 | # | 217 | (EA) | total Eroded.shp QA Pass |

| | | | | |
|---|---|---|---|---|
| based on a High Emissions Scenario, **and if both artificial and natural defences are not maintained**, in locations modelled | | 430<br>647 | (EI)<br>(EA+EI) | |
| Number of *properties* expected to erode by 2050, based on a High Emissions Scenario, and if those **artificial defences are maintained (100% effective) but natural defences aren't maintained**, in locations modelled | # | 70<br>199<br>269 | (EA)<br>(EI)<br>(EA+EI) | Eroded.shp where Defended_25m = No (i.e. defences work so remove these props from total) |
| Number of *properties* otherwise at risk of erosion, which remain protected by 2050 if **artificial defences are maintained (100% effective)** | # | 147<br>231<br>378 | (EA)<br>(EI)<br>(EA+EI) | Eroded.shp where Defended_25m = Yes |
| Length of *rail* affected by erosion by 2050 (where **both artificial and natural defences are not maintained**) | km | 1.22<br>3.74<br>4.95 | (EA)<br>(EI)<br>(EA+EI) | |
| Length of *rail* affected by erosion by 2050, excluding those defended (i.e. defences are 100% effective) | km | 1.06<br>2.34<br>3.40 | (EA)<br>(EI)<br>(EA+EI) | Defended_25m = No |
| Length of *road* affected by erosion by 2050 (where **both artificial and natural defences are not maintained**) | km | 19.2<br>36.4<br>55.6 | (EA)<br>(EI)<br>(EA+EI) | |
| Length of *road* affected by erosion by 2050, excluding those defended (i.e. defences are 100% effective) | km | 15.1<br>29.5<br>44.6 | (EA)<br>(EI)<br>(EA+EI) | Defended_25m = No |
| Value of modelled *property* at risk under a High Emissions Strategy by 2050 where **both artificial and natural defences are not maintained**. | £ | 35M<br>64M<br>**104M** | (EA)<br>(EI)<br>(EA+EI) | 2020 Ave. house (link) £161,510 x 647 |
| Value of *properties* expected to erode, excluding those defended (i.e. defences are 100% effective) | £ | 11M<br>32M<br>**43M** | (EA)<br>(EI)<br>(EA+EI) | 2020 Ave. house (link) £161,510 x 269 Defended_25m = No |
| Value of *rail* affected by erosion by 2050 (where **both artificial and natural defences are not maintained**) | £ | 182M<br>561M<br>**743M** | (EA)<br>(EI)<br>(EA+EI) | £150M/km x 4.95 |
| Value of *rail* affected by erosion by 2050 excluding those defended (i.e. defences are 100% effective) | £ | 159M<br>351M<br>**511M** | (EA)<br>(EI)<br>(EA+EI) | £150M/km x 3.40 Defended_25m = No |
| Value of *road* affected by erosion by 2050 (where **both artificial and natural defences are not maintained**) | £ | 125M<br>236M<br>**361M** | (EA)<br>(EI)<br>(EA+EI) | £6.5M/km x 55.6 |
| Value of *road* affected by erosion by 2050 excluding those defended (i.e. defences are 100% effective) | £ | 98M<br>192M<br>**290M** | (EA)<br>(EI)<br>(EA+EI) | £6.5M/km x 44.6 |
| Total minimum value of *Road, Rail & Residential Properties* at risk by 2050 under a 'do nothing coastal management' strategy, where **both artificial and natural defences aren't maintained** | **£** | **1.2B** | | 104 + 743 + 361 = £1,208M |
| Total minimum value of *Road, Rail & Residential Properties* at risk by 2050 if artificial defences are maintained, but natural defences are not maintained | **£** | **0.8B** | | 43 + 511 + 290 = £844M |

Figure 2a–c provides an impression of the distribution of residential properties, being affected by erosion by 2050 under a High Emissions Scenario and where artificial and natural defences are not maintained. Erosion Area (EA) is the eroded land seaward of the 2050 MHWS position, Erosion Influence (EI) is a 10m buffer landward of the

anticipate position of MHWS in 2050. Assets within both EA and EI are expected to be 'affected' by erosion. Erosion Vicinity (EV) considers the adjacent assets a further 50m from the Erosion Influence, these assets are not expected to be affected by erosion and are identified for awareness raising and future planning.

*Figure 2a Distribution of residential properties affected by anticipated erosion, by 2050 under High SLR Do-Nothing ('Erosion Area')*

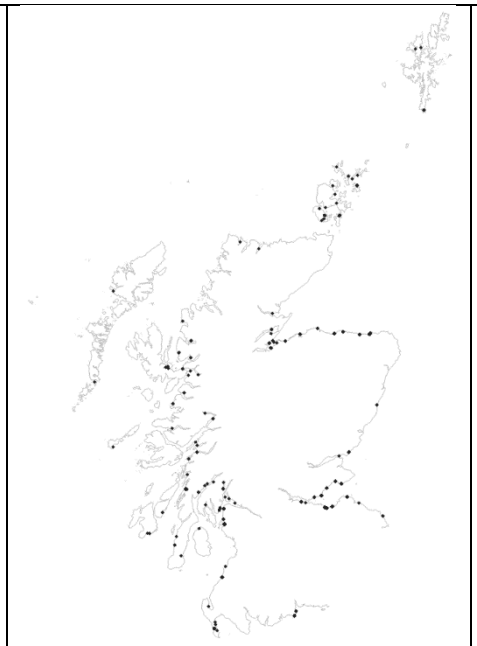

*Figure 2b Distribution of residential properties within 10m of anticipated MHWS, by 2050 under High SLR Do-Nothing ('Erosion Influence')*

*Figure 2c Distribution of residential properties within 60m of anticipated MHWS, by 2050 under High SLR Do-Nothing ('Erosion Vicinity')*

See the link below for an interactive web-map of the results:

| Browser link |
| --- |
| www.dynamiccoast.com/webmaps.html |

*Table 3 National Coastal Erosion Risk Assessment summary table highlighting the infrastructural assets at risk under a low (RCP2.6) and high (RCP8.5) emission scenario and a 'do nothing' coastal management strategy. Any associated minimum replacement costs where known are indicated. Assets within both EA and EI are expected to be 'affected' by erosion.*

| Asset | Unit | RCP2.6 2050 EA | RCP2.6 2050 EI | RCP8.5 2050 EA | RCP8.5 2050 EI | RCP2.5 EA+EI £M | RCP8.5 EA+EI £M |
|---|---|---|---|---|---|---|---|
| Residential Property | # | 173 | 279 | 217 | 430 | 73 | 104 |
| Non Residential Property | # | 51 | 103 | 70 | 151 | | |
| Roads (Trunk & non Trunk) | m | 12,773 | 26,499 | 19,215 | 36,362 | 256 | 361 |
| Roads (Trunk & non Trunk) (EA+EI) | # | 591 | n/a | 727 | n/a | | |
| Rail | m | 457 | 2,776 | 1,216 | 3,737 | 485 | 743 |
| Rail (EA+EI) | # | 54 | n/a | 63 | n/a | | |
| Community Services | # | 1 | 0 | 1 | 0 | | |
| Utilities | # | 3 | 2 | 3 | 3 | | |
| Runways | m2 | 8,994 | 4,479 | 9,587 | 4,597 | | |
| Runways | # | 6 | 6 | 6 | 7 | | |
| **Total** | | | | | | **£814M** | **£1,209M** |

It is acknowledged that whilst some of the assets can be readily costed (Residential Property for example), non-residential property and the associated utility networks are harder to cost but are likely to increase the total value of assets at risk (although we have established the total numbers and lengths involved). Table 3 estimates the value of roads, rail and residential property at risk under a Low Emissions scenario and Do Nothing Coastal Management Strategy is £814M; compared with the equivalent High Emissions Scenario is £1.209B. Thus, the minimum avoided damaged costs of a Low emissions future compared with a High Emissions Scenario is ca. £395M by 2050. It is noted that there are substantial assets which remain un-costed within Table 4, Table 5 and Table 6. Further analysis can be undertaken by partner organisations. An example of collaboration with Scottish Water is shown below in Table 4, informing the differential impacts of a 'do nothing' coastal management strategy for either a Low Emissions or High Emissions future, by 2050.

*Table 4 National Coastal Erosion Risk Assessment summary table highlighting the wastewater assets at risk under a low (RCP2.6) and high (RCP8.5) emission scenario and a 'do nothing' coastal management strategy. Assets within both EA and EI are expected to be 'affected' by erosion. Network assets refer to pumping stations, combined sewer overflows and sewer network tanks, and treatment assets refer to treatment works and outfalls.*

| Asset | Unit | RCP2.6 2050 EA | RCP2.6 2050 EI | RCP8.5 2050 EA | RCP8.5 2050 EI |
|---|---|---|---|---|---|
| Rising Mains | m | 3,204 | 7,172 | 7,165 | 10,197 |
| Rising Mains | # | 113 | 166 | 146 | 206 |
| Gravity Pipes | m | 8,022 | 11,292 | 12,185 | 15,128 |
| Gravity Pipes | # | 676 | 942 | 849 | 1196 |
| Wastewater Network Assets | # | 47 | 59 | 58 | 69 |
| Wastewater Treatment Assets | # | 162 | 114 | 149 | 119 |

Table 5 provides a similar breakdown for green spaces, cultural and natural heritage interests assuming a 'do nothing' coastal management strategy for either a Low Emissions or High Emissions future, by 2050.

*Table 5 National Coastal Erosion Risk Assessment summary table highlighting the cultural and natural heritage assets at risk under a low (RCP2.6) and high (RCP8.5) emission scenario and a 'do nothing' coastal management strategy. Assets within both EA and EI are expected to be impacted by erosion.*

| Asset | Unit | RCP2.6 2050 EA | RCP2.6 2050 EI | RCP8.5 2050 EA | RCP8.5 2050 EI |
|---|---|---|---|---|---|
| Properties in Care | ha | 0.3 | 0.9 | 0.6 | 0.9 |
| Properties in Care | # | 6 | 5 | 6 | 5 |
| Scheduled Monuments | ha | 61 | 7 | 67 | 9 |
| Scheduled Monuments | # | 52 | 68 | 59 | 74 |
| Gardens & Designed Landscape | ha | 29 | 21 | 37 | 26 |
| Gardens & Designed Landscape | # | 29 | 30 | 30 | 32 |
| Battlefields | ha | 2 | 1 | 2 | 2 |
| Battlefields | # | 3 | 3 | 3 | 3 |
| Golf Courses | ha | 40 | 25 | 54 | 31 |
| Golf Courses | # | 45 | 54 | 48 | 61 |
| Greenspace (incl. Golf Courses) | ha | 57 | 0 | 73 | 43 |
| Greenspace (incl. Golf Courses) | # | 182 | 237 | 265 | 255 |
| National Nature Reserves | ha | 31 | 4 | 35 | 5 |
| National Nature Reserves | # | 5 | 5 | 6 | 6 |
| Special Areas of Conservation | ha | 310 | 109 | 403 | 125 |
| Special Areas of Conservation | # | 53 | 52 | 53 | 52 |
| Special Protection Areas | ha | 362 | 143 | 483 | 169 |
| Special Protection Areas | # | 55 | 55 | 57 | 56 |
| Sites of Special Scientific Interest | ha | 601 | 248 | 776 | 292 |
| Sites of Special Scientific Interest | # | 200 | 198 | 204 | 202 |
| Nature Conserv. Marine Protected Areas | ha | 0.7 | 0.7 | 1.4 | 1.0 |
| Nature Conserv. Marine Protected Areas | # | 8.0 | 7.0 | 8.0 | 7.0 |

## Local Authority Risk Assessment Results

The GIS-based analysis with Dynamic Coast also enables a more detailed and regional appraisal of the spatial data, for example, based on Local Authority areas and Coastal Cells. A coastal cells approach, based on the nature of sediment exchanges, would be a preferred scientific approach to coastal management however, the reality is that coastal management is delivered by Local Authorities (LA) and so a breakdown by LA is depicted below in Table 3. The asset data was aggregated into points (e.g. utilities), lines (e.g. road lengths) and polygons (e.g. nature reserve) datasets and intersected or 'selected by location' with the EA, EI & EV areas noted above. Where assets straddled more than one of these erosion areas, the greatest risk (most-seaward) group was reported. Although the detail in the WS2 reports presents all three areas of Erosion Area, Erosion Influence and Erosion Vicinity (see Annex), the summary in Table 3 below reports only the combined Erosion Area and Erosion Influence area results, i.e. those directly affected by future

erosion, under a 'do-nothing' high-emissions scenario and a 'do nothing' coastal management scenario. The table below also report the 'number of linear features' affected by erosion.

*Table 6 National Coastal Erosion Risk Assessment Local Authority summary table highlighting the assets at risk under a High Emission Scenario and a 'do nothing' coastal management scenario, which assumes that artificial and natural defences are not maintained, and where present erosion impacts landward assets.*

| Local Authority | Residential Property | | Non-Residential Property | | Roads (all) | | | | Rail | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2050 EA | 2050 EI | 2050 EA | 2050 EI | 2050 EA | 2050 EA | 2050 EI | 2050 EI | 2050 EA | 2050 EA | 2050 EI | 2050 EI |
| | # | # | # | # | km | # | km | # | km | # | km | # |
| Aberdeenshire | | 37 | | 19 | 0.1 | 6 | 0.9 | 13 | | | | |
| Angus | 1 | 2 | 1 | 1 | | | | 2 | | | | 1 |
| Argyll & Bute | 25 | 35 | 12 | 28 | 3.6 | 59 | 10.9 | 145 | | | | 3 |
| City of Edinburgh | 2 | 17 | 1 | 1 | | 1 | 0.1 | 2 | | | | |
| CnES | | | | | 0.2 | 4 | 0.7 | 10 | | | | |
| Dumfries & Galloway | 11 | 25 | 2 | 8 | 0.9 | 11 | 2.5 | 33 | | | | |
| Dundee City | 2 | 1 | | 3 | | | | 1 | 0.1 | 1 | | 1 |
| East Lothian | 33 | 51 | 10 | 5 | 1.0 | 11 | 0.7 | 12 | | | | |
| Falkirk | | 13 | | | 0.1 | 1 | 0.2 | 2 | | | | |
| Fife | 41 | 21 | 7 | 12 | 1.5 | 13 | 0.5 | 22 | 0.2 | 4 | 1.0 | 12 |
| Highland | 21 | 43 | 14 | 31 | 6.7 | 99 | 11.1 | 214 | 1.0 | 24 | 2.7 | 65 |
| Moray | 19 | 26 | 3 | 5 | 0.3 | 11 | 0.1 | 6 | | | | |
| North Ayrshire | 13 | 79 | 1 | 6 | 1.0 | 13 | 2.1 | 39 | | | | |
| Orkney Island | 8 | 26 | 11 | 21 | 1.7 | 20 | 4.5 | 58 | | | | |
| Scottish Borders | | 2 | | 4 | | | | | | | | |
| Shetland Islands | | 3 | 1 | 3 | 0.2 | 7 | 1.4 | 21 | | | | |
| South Ayrshire | 41 | 30 | 5 | 4 | 1.8 | 25 | 0.6 | 29 | | | | |
| West Lothian | | 1 | 2 | | 0.1 | 2 | | 2 | | | | |
| Scotland | 217 | 412 | 70 | 151 | 19.2 | 283 | 36.3 | 611 | 1.3 | 29 | 3.7 | 82 |

Table 6 demonstrates a clustering of anticipated impacts within a handful of Scottish Local Authority areas. For example, around half of the residential properties across Scotland that are expected to be affected by erosion, under a do-nothing high emissions scenario, are located in the Highland Council, East Lothian and North Ayrshire Council areas. A similar pattern exists for Non-Residential Property, and an even greater clustering is anticipated for road (trunk and non-trunk) network where half of the erosion affected road length is found between Highland and Argyll & Bute Council areas.

Whilst care should be taken in the over interpretation of these results, namely they should not be used for property level protection, the analysis herein provides decadal-level anticipated impacts. These data have been made available for Local Authorities and Public Sector Partners in support of their statutory duties.

**End.**