<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>Challenges for coastal management in Ireland. Case study: The Maharees, Castlegregory, County Kerry</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Author(s)</strong></td>
<td>Farrell, Eugene; Lynch, Kevin; Wilkes Orozco, Sinead; Castro Camba, Guillermo</td>
</tr>
<tr>
<td><strong>Publication Date</strong></td>
<td>2016</td>
</tr>
<tr>
<td><strong>Link to publisher's version</strong></td>
<td><a href="http://dx.doi.org/10.13025/S8WC70">http://dx.doi.org/10.13025/S8WC70</a></td>
</tr>
<tr>
<td><strong>Item record</strong></td>
<td><a href="http://hdl.handle.net/10379/5551">http://hdl.handle.net/10379/5551</a></td>
</tr>
<tr>
<td><strong>DOI</strong></td>
<td><a href="http://dx.doi.org/10.13025/S8WC70">http://dx.doi.org/10.13025/S8WC70</a></td>
</tr>
</tbody>
</table>
Challenges for Coastal Management in Ireland
Case Study: The Maharees

Dr. Eugene Farrell (06 Feb 2016)
Dr. Kevin Lynch
Ms. Sinead Wilkes Orozco (Masters student)
Mr. Guillermo Castro Camba (Phd student)

Thank you: Marcia Ganter & Martin Lynch
Thank you: Peter Hennessy & Michael/Marilyn Spillane

Storm Response of Beach–Dune Systems in Ireland

Dr. Eugene Farrell & Dr. Kevin Lynch
Discipline of Geography & Ryan Institute
National University Ireland, Galway
WE DO KNOW WITH CERTAINTY THAT THE CLIMATE IS CHANGING...

Source: www.ncdc.noaa.gov

↑ Sea level
↑ Storm frequency
↑ Storm intensity
↑ Rainfall
↑ Coastal erosion
↑ Coastal flooding

Source: Adaptation Strategy Guideline (CMRC, UCC)

Storm surges and waves
Storm surge events will increase in frequency, with the height of extreme surges also increasing significantly on the western coasts during winter. Wave heights may also significantly increase, with extreme waves increasing by around 10% on the northwest coast.

Weather extremes
While the frequency of very intense cyclones affecting Ireland is likely to increase, it is difficult to say with any certainty how extreme weather events will be impacted by climate change. Nevertheless, additional energy trapped in the atmosphere by greenhouse gases is likely to continue to stimulate greater atmospheric volatility.

Fluvial flooding
There may be an amplification of the seasonal cycle in Ireland, increasing runoff to catchments in winter and decreasing flows in summer. There is likely to be a clear pattern of increased flows to river catchments in the winter and autumn and a decrease in flows during the summer, though the scale of change is difficult to accurately gauge. There will nevertheless be significant consequences for the management of flood defences, water supplies, waste treatment, and biodiversity conservation.

Sea level rise
Satellite altimetry has identified a rise of around 3.5cm per decade in the seas around Ireland, in line with the IPCC's global projections. However, any acceleration in the melting of polar ice sheets could see a substantial increase in sea level rise.

Precipitation
Autumn and winter will become significantly wetter by the end of the century, with summers likely to become substantially drier over the same period. Some models project increased rainfall in winter/autumn of up to 25% and a decline of up to 18% in summer. However, the accuracy of these projections has been problematic to verify, leaving the precise figures of the pattern of winter/wetters and drier summer difficult to unambiguously report.

Sea temperatures
Temperatures in the sea around Ireland have risen in recent decades, observations since the 1980s showing a warming trend of 0.3-0.4°C per decade in Irish waters, with the Irish Sea warming at an even faster rate. These changes will have a profound effect on the marine ecosystem, including the distribution and abundance of commercially significant species such as mackerel.
Ireland’s first ever climate change legislation

Climate Action and Low Carbon Development Bill 2015

• Provides a statutory basis for the national objective of transition to a low carbon, climate resilient and environmentally sustainable economy by the year 2050.

• Gives a solid statutory foundation to the institutional arrangements necessary to enable the State to pursue and achieve that national transition objective.

The imminent passing of the Climate Change Bill 2015 will require an Expert Advisory Council (EAC) to ‘advise and give recommendations’ on:

Climate Change Adaptability Strategy
National Mitigation Plan
National Adaptation Framework

EAC will prepare National Mitigation Plans requiring local authorities to improve flood defences along with the protection of key infrastructure, such as power and communication from extreme weather.
54% of the 90 days spanning W2013-14 had some level of storm warning:

- 05 (06%) days had a Code Red warning
- 25 (28%) days had a Code Orange warning
- 18 (20%) days had a Code Yellow warning
- 42 (46%) days had no warning: Code Green
# Irish Winter Storms of 2013-2014

<table>
<thead>
<tr>
<th>Local Authority</th>
<th>Coastline length (km)</th>
<th>Response, Clean-up, and Immediate Works</th>
<th>Roads, Infrastructure (€)</th>
<th>Piers and Harbours (€)</th>
<th>Coastal Protection Repairs (€)</th>
<th>Tourism Infrastructure (€)</th>
<th>Other Facilities (€)</th>
<th>Total damages (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clare</td>
<td>366</td>
<td>1,380</td>
<td>6,542,548</td>
<td>26,486,028</td>
<td></td>
<td></td>
<td>0</td>
<td>26,486,028</td>
</tr>
<tr>
<td>Waterford</td>
<td>170</td>
<td>330</td>
<td>3,140,000</td>
<td>15,170,000</td>
<td></td>
<td></td>
<td>0</td>
<td>15,170,000</td>
</tr>
<tr>
<td>Galway</td>
<td>689</td>
<td>700</td>
<td>3,360,755</td>
<td>14,387,180</td>
<td></td>
<td></td>
<td>0</td>
<td>14,387,180</td>
</tr>
<tr>
<td>Cork</td>
<td>1,118</td>
<td>3,200</td>
<td>706,500</td>
<td>8,799,825</td>
<td></td>
<td></td>
<td>0</td>
<td>8,799,825</td>
</tr>
<tr>
<td>Mayo</td>
<td>1,168</td>
<td>500</td>
<td>739,900</td>
<td>6,544,500</td>
<td></td>
<td></td>
<td>0</td>
<td>6,544,500</td>
</tr>
<tr>
<td>Wexford</td>
<td>264</td>
<td>300</td>
<td>3,602,0</td>
<td>5,059,000</td>
<td></td>
<td></td>
<td>0</td>
<td>5,059,000</td>
</tr>
<tr>
<td>Limerick</td>
<td>95</td>
<td>790</td>
<td>118,000</td>
<td>3,640,726</td>
<td></td>
<td></td>
<td>0</td>
<td>3,640,726</td>
</tr>
<tr>
<td>Kerry</td>
<td>684</td>
<td>520</td>
<td>3,597,585</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>3,597,585</td>
</tr>
<tr>
<td>Roscommon</td>
<td>0</td>
<td>210</td>
<td>2,715,886</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>2,715,886</td>
</tr>
<tr>
<td>Sligo</td>
<td>195</td>
<td>170</td>
<td>2,166,978</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>2,166,978</td>
</tr>
<tr>
<td>Donegal</td>
<td>650</td>
<td>230</td>
<td>1,272,043</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>1,272,043</td>
</tr>
<tr>
<td>Tipperary</td>
<td>0</td>
<td>400</td>
<td>943,421</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>943,421</td>
</tr>
<tr>
<td>Meath</td>
<td>21</td>
<td>110</td>
<td>753,500</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>753,500</td>
</tr>
<tr>
<td>Laois</td>
<td>0</td>
<td>330</td>
<td>566,500</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>566,500</td>
</tr>
<tr>
<td>Kilkenny</td>
<td>0</td>
<td>410</td>
<td>553,000</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>553,000</td>
</tr>
<tr>
<td>Carlow</td>
<td>0</td>
<td>210</td>
<td>505,500</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>505,500</td>
</tr>
<tr>
<td>Dublin</td>
<td>99</td>
<td>180</td>
<td>456,397</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>456,397</td>
</tr>
<tr>
<td>Wicklow</td>
<td>61</td>
<td>170</td>
<td>439,500</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>439,500</td>
</tr>
<tr>
<td>Offaly</td>
<td>22</td>
<td>130</td>
<td>357,883</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>357,883</td>
</tr>
<tr>
<td>Leitrim</td>
<td>0</td>
<td>140</td>
<td>334,675</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>334,675</td>
</tr>
<tr>
<td>Longford</td>
<td>64</td>
<td>140</td>
<td>207,000</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>207,000</td>
</tr>
<tr>
<td>Westmeath</td>
<td>0</td>
<td>210</td>
<td>181,953</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>181,953</td>
</tr>
<tr>
<td>Cavan</td>
<td>0</td>
<td>600</td>
<td>90,021</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>90,021</td>
</tr>
<tr>
<td>Kildare</td>
<td>0</td>
<td>180</td>
<td>24,174</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>24,174</td>
</tr>
<tr>
<td>Monaghan</td>
<td>0</td>
<td>140</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>102,651,175</td>
</tr>
</tbody>
</table>

**Storm Damage 2014**

**National Directorate for Fire and Emergency Management, Department of the Environment, Community and Local Government**

**REPORT ON SEVERE WEATHER FROM 13 DECEMBER 2013 TO 17 FEBRUARY 2014**
Locals fortify retreating dunes to protect at-risk homes  

Protrane, Co. Dublin

Local volunteer, 9 year old Darragh Brett helps out with repairs to the eroded sand dunes at The Burrow, Portrane.
Rossbehy, Kerry
Kerry County Council receives Government funding of €3.3m to repair storm damage

Sunday, December 28th, 2014 at 1:10 pm.

Maharees community calling for storm damaged rock armour and road to be repaired

Thursday, April 3rd, 2014 at 1:11 pm.

Winter storms leave Kerry facing bill for millions to repair damage

Saturday, January 16, 2016

Significant money is required for coastal works. Coastal protection works on the Tralee/Fenit regional road will require €250,000.

Coastal works at Rossbeigh and at Ballyheigue will cost a further €1m and a new road at Rossbeigh €1.1m, Mr Doyle said. Ballingskelligs pier was damaged and repairs are estimated at €160,000.

Details of the extent of the flooding were being submitted to the OPW.
By the way, it could have been a lot worse…

<table>
<thead>
<tr>
<th>Storm Period</th>
<th>Impacts</th>
<th>Mean Wind Speed</th>
<th>Max Hs (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storm #1 18 Dec 2013 12:00 to</td>
<td>Severe flooding in Salthill and Flood St/Spanish Arch; Record surge</td>
<td>37.5 kn (19.3 m/s)</td>
<td>3.83</td>
</tr>
<tr>
<td>19 Dec 2013 00:00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storm #2 26 Dec 2013 18:00 to</td>
<td>Extreme winds; No serious flooding</td>
<td>43.7 kn (22.5 m/s)</td>
<td>4.88</td>
</tr>
<tr>
<td>27 Dec 2013 09:00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storm #3 2 Jan 2014 18:00 to</td>
<td>Severe flooding in Salthill and Flood St/Spanish Arch; flooding in</td>
<td>36.4 kn (18.7 m/s)</td>
<td>4.52</td>
</tr>
<tr>
<td>3 Jan 2014 12:00</td>
<td>Galway Harbour; extensive damage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Graph showing tidal patterns with storm periods indicated](graph.png)
By the way, it could have been a lot worse...

<table>
<thead>
<tr>
<th>Storm Period</th>
<th>Impacts</th>
<th>Mean Wind Speed</th>
<th>Max Hs (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storm #1</td>
<td>Severe flooding in Salthill and Flood St/Spanish Arch;</td>
<td>37.5 kn (19.3 m/s)</td>
<td>3.83</td>
</tr>
<tr>
<td>18 Dec 2013 12:00 to</td>
<td>Record surge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Dec 2013 00:00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storm #2</td>
<td>Extreme winds;</td>
<td>43.7 kn (22.5 m/s)</td>
<td>4.88</td>
</tr>
<tr>
<td>26 Dec 2013 18:00 to</td>
<td>No serious flooding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27 Dec 2013 09:00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storm #3</td>
<td>Severe flooding in Salthill and Flood St/Spanish Arch;</td>
<td>36.4 kn (18.7 m/s)</td>
<td>4.52</td>
</tr>
<tr>
<td>2 Jan 2014 18:00 to</td>
<td>flooding in Galway Harbour; extensive damage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Jan 2014 12:00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Hypothetical Water Levels Based On Storm/Tide Activity

<table>
<thead>
<tr>
<th>Water Level</th>
<th>Hypothetical Water Levels Based On Storm/Tide Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.55 m</td>
<td>Maximum water level measured at Galway Port during Storm 3</td>
</tr>
<tr>
<td>3.85 m</td>
<td>Water level <strong>IF</strong> the maximum surge recorded during Storm 3 coincided with high tide on the morning of 3<strong>nd</strong> Jan</td>
</tr>
<tr>
<td>4.20 m</td>
<td>Water level <strong>IF</strong> the maximum surge recorded during Storm 2 coincided with high tide on the morning of 3<strong>rd</strong> Jan</td>
</tr>
</tbody>
</table>

---

- **Spring tide**
- **Neap tide**
- **High tide**

---

**Chart**

- Storm 1
- Storm 2
- Storm 3
“In Ireland, we like the big project, we tend to react rather than prepare, and we don’t study or understand the coastline... We also tend to hire in consultants from England and the Netherlands after a crisis, rather than building up our own core expertise. Sometimes there is natural coastal regeneration, and that is something we need to know about before we start imposing man-made solutions. Dunes are there to erode when a storm comes, and they have natural cycles.”

(Dr. Jimmy Murphy, Coastal Engineer UCC, Irish Times, January 13, 2014)
In theory, the amount of sand stays constant (equilibrium!). It just moves around because of the changing wave regime.
“In Ireland, we like the big project, we tend to react rather than prepare, and we don’t study or understand the coastline… We also tend to hire in consultants from England and the Netherlands after a crisis, rather than building up our own core expertise. Sometimes there is natural coastal regeneration, and that is something we need to know about before we start imposing man-made solutions. Dunes are there to erode when a storm comes, and they have natural cycles.”

(Dr. Jimmy Murphy, Coastal Engineer UCC, Irish Times, January 13, 2014)

A continuous monitoring programme is needed to understand these cycles; Proposal writing.....
Urgency grants are prompted by unexpected and transient scientific opportunities created by the occurrence of sporadic natural events such as earthquakes, droughts, floods or ephemeral events in ecosystems.

NERC Urgency grants are used to respond rapidly to unexpected and transient events affecting the environment, for example the 2010 Amazon drought or the eruption at Eyjafjallajökull volcano in Iceland in 2010.

Submission of an Urgency grant proposal is only permitted if relying on published funding opportunities would clearly result in a missed opportunity to undertake environmental research of high scientific importance. Urgency proposals must fall within the NERC scientific remit.

Prospective applicants must first contact the appropriate Science Programmes Officer for approval before submitting a proposal for consideration under the urgency scheme.
CHALLENGE #1: LACK OF BASELINE SCIENTIFIC INFORMATION

Science Opportunity: Coastal Flooding and Erosion

Storm Response of Beach–Dune Systems in Ireland

Dr. Eugene Farrell & Dr. Kevin Lynch
Discipline of Geography & Ryan Institute
National University Ireland, Galway

Department of the Taoiseach (PM)
Minister for the Environment, Community and Local Government
Minister for Arts, Heritage and Gaeltacht
Minister for Communications, Energy and Natural Resources
Local Authorities (County)
EPA
The Heritage Council
OPW €€€
RE: Proposal no. 3155. From source to sink: the response and recovery of coastal catchment ecosystems to large perturbations

From:
Dr. Eugene Farrell (National University Ireland Galway)
Dr. Kevin Lynch (National University Ireland Galway)
Dr. Terry Morley (National University Ireland Galway)
Dr. Tiernan Henry (National University Ireland Galway)
Dr. Mary Bourke (Trinity College Dublin)
Dr. Jonathan Turner (University College Dublin)

Challenge #1: Lack of baseline scientific information

Work packages (24 months)
1. Beach-dune systems
2. Dune moisture cycles
3. Groundwater
4. Biodiversity inventory & resilience
5. Suspended sediment and contaminant flux
6. Irelands Climate Information Platform (ICIP)
Adaptation vs. Resistance?

Since c.1984 800m of rock armour has successfully stabilised part of the shoreline;

2050 erosion line = 2013 position

OPW national-scale Irish Coastal Protection Strategy Study (ICPSS) is helping to define more fully the extent of erosion risk in Ireland
The current OPW national-scale Irish Coastal Protection Strategy Study (ICPSS) is helping to define more fully the extent of erosion risk in Ireland using modern survey and analysis methods (Lidar, Aerial Survey and GIS) and through the production of strategic erosion hazard mapping.

Aerial photographic records of the coastline from 1973-75, 2000 and 2006 were used as the primary basis for the erosion assessment and from these an annualised rate of erosion was derived and used to project where the coastline could potentially retreat to by 2030 and 2050 assuming the rate of retreat remained constant.
European Space Agency: Copernicus Project

COPERNICUS AND ITS SENTINELS

European Earth Observation Programme Copernicus: observing our planet for a safer world

Sentinel 1A: April 2014
Sentinel 1B: 2016
Sentinel 2A: June 2015
Sentinel 2B: mid-2016
Sentinel 3A: Dec. 2015
Sentinel 3B: +18-months
Sentinel 5P: Late-2016
Sentinel 4: Before 2020
Sentinel 5: Before 2020
Sentinel 6: Before 2020

Source:
www.esa.int
“Over five decades, measures have aimed to protect the marine environment have been dealt with by separate sectoral policies without fully integrating all relevant sectors.... resulted in a patchwork of EU legislation and resultant national legislation leading to a piecemeal approach to marine protection.”

(Boyes and Elliott, 2014)
Table 1
Hierarchy of planning strategies, guidelines and plans analysed.

<table>
<thead>
<tr>
<th>Competent authority</th>
<th>Plans and strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>National level planning</td>
<td>Department of the Environment, Community and Local Government</td>
</tr>
<tr>
<td>Regional level planning</td>
<td>Regional Authorities new guidelines every 6 years</td>
</tr>
<tr>
<td>Local level planning</td>
<td>Local Authorities 88 local planning authorities: 29 CC; 49 town councils; 10 Boroughs Corp.</td>
</tr>
<tr>
<td></td>
<td>National Spatial Strategy 2002-2020</td>
</tr>
<tr>
<td></td>
<td>National Development Plan 2007-2013</td>
</tr>
<tr>
<td></td>
<td>Regional Planning Guidelines (e.g. The Regional Planning Guidelines for the West Region) 2010–2022</td>
</tr>
<tr>
<td></td>
<td>Development Plans (e.g. County Mayo Development Plan)</td>
</tr>
<tr>
<td></td>
<td>Local Area Plans (e.g. Westport Town Plan)</td>
</tr>
</tbody>
</table>

Table 2
Coastal risks identified in legislation, policy and plans.

<table>
<thead>
<tr>
<th>Legislation, guidance documents and plans</th>
<th>Risks identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floods Directive</td>
<td>Coastal flooding; sea-level rise</td>
</tr>
<tr>
<td>The Planning System and Flood Risk</td>
<td></td>
</tr>
<tr>
<td>Management: Guidelines for Planning Authorities</td>
<td></td>
</tr>
<tr>
<td>SEA Directive</td>
<td>Flooding; coastal erosion</td>
</tr>
<tr>
<td>The SEA Guidelines for Regional Authorities and Planning Authorities Planning and Development Act 2000</td>
<td></td>
</tr>
<tr>
<td>EIA Directive</td>
<td>No specific risks identified</td>
</tr>
<tr>
<td>The National Spatial Strategy</td>
<td>No specific risks identified</td>
</tr>
<tr>
<td>The National Development Plan</td>
<td>Coastal flooding</td>
</tr>
<tr>
<td>National Climate Change Adaptation Framework</td>
<td>Coastal flooding</td>
</tr>
<tr>
<td>Irish Coastal Protection Strategy Study</td>
<td>Coastal flooding</td>
</tr>
<tr>
<td>The Regional Planning Guidelines for the West Region 2010–2022</td>
<td>Coastal flooding; coastal erosion</td>
</tr>
<tr>
<td>County Mayo Development Plan</td>
<td>Coastal flooding; coastal erosion</td>
</tr>
<tr>
<td>Westport Town Plan</td>
<td>No specific risks identified</td>
</tr>
</tbody>
</table>

An Bord Pleanála = Independent third part appeals board; Also hears cases for Strategic Infrastructure Developments that by pass local planning authorities: development of strategic economic or social importance to State & National Spatial Strategy.
WE KNOW THAT THE CLIMATE IS CHANGING.....

CHALLENGE: LACK OF BASELINE SCIENTIFIC INFORMATION

CHALLENGE: COASTLINES ARE BEING SQUEEZED

CHALLENGE: LACK OF INTEGRATED, APPROPRIATE LEGLISATION
Tombolo

Farming, Fishing & Recreation Activities

One road in, one road out

Total dune area: 322ha (SAC)
Fixed dunes, Mobile dunes, Large blow outs
Dune height: up to 12m

NPWS: pNHA, cSAC, SPA
EU Annex I (priority sand dune habitats), II, IV:
Fixed dunes; Dune slacks; Shifting dunes
along shoreline w/ *Ammophila arenaria*; Dunes
with *Salix repens*; Annual vegetation of drift lines
The extent of fixed dunes is rated as unfavourable-inadequate (Table). The decline in fixed dune area as a result of erosion is largely caused by human recreational activities and also by overstocking of cattle that graze the dunes. Land tenure is an important constraint in managing.

The little mobile dune habitat remaining is very fragmented and susceptible to increasing natural erosion and erosion from anthropogenic activities. There appears to have been a shift in the sediment dynamics particularly on the western side of the tombolo. A sediment budget for the area would give a clearer indication the future prospects of this habitat at this site.
The Maharees: A legacy of chronic coastal erosion

OPW Irish Coastal Protection Strategy Study (ICPSS)
2003 Coast of Ireland Oblique Imagery Survey

Peter Hennessy, Local resident
In recent years there has been evidence of significant erosion on the exposed western side of the dunes. Kerry County Council carried out a scheme to protect a section of the coastline a number of years ago and this has proven to be very effective. It would be very important that works of a similar nature were continued to protect the remainder of the dunes.

As landowners we can see the damage that uncontrolled access across the dunes is doing the area. As part of the management plan we would be willing to agree a number of controlled access points to the beach area.

We are therefore writing to you to see if you could secure funding from national level to protect this valuable national environmental and ecological resource.

It should also be pointed out that if the dune structures are not protected it will be very costly to repair the damage done in the future. The threat will be not only to the public road but to the longer term viability of the Maharees Peninsula.
Depositional vs Erosion Hazards

Hazard will increase over time
Human Impacts?

Consider limits to public access and use?

Conflict resolution?

Is it too late in some cases?
Shoreline Position Analysis

Historic shoreline change (1900 – 2015)

1900. (late 1800s–early 1900s) 6” Cassini B&W maps
1975. OSi map (1973-1978, no date received)
1995. OSi orthophotograph
2007. Airborne LiDAR (0.25m) Imagery Survey (TBI)
2012. Bing satellite image
2014-16. GPS surveys (+ KCC surveys???)
Shoreline retreat: 1900 - 2015

- 1900 - 1975
- 1975 - 1995
- 1995 - 2012
- 2012 - 2015

Average rate of retreat: 0.63 m/yr
Survey location
Shoreline retreat: 1900 - 2015

0.63 m/yr
Average rate of retreat
survey location
Dune failure processes
Dune failure processes

High tide and large waves lead to dune erosion

Example of mass dune slumping. Wave run-up scarps the base of dune which steepens the slope causing mass failure.
Long term monitoring of beach-dune system

<table>
<thead>
<tr>
<th>Feature</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topography</td>
<td>Trimble R8 GPS Rover; Phantom 2 Vision + Drone</td>
</tr>
<tr>
<td>Meteorology</td>
<td>Campbell Scientific BWS200</td>
</tr>
<tr>
<td>Sediment transport</td>
<td>Leatherman Traps</td>
</tr>
<tr>
<td>Nearshore and beach conditions</td>
<td>PlotWatcher Pro Hunting Camera</td>
</tr>
<tr>
<td>Sediment properties</td>
<td>Sediment Laboratory</td>
</tr>
<tr>
<td>Nearshore hydrodynamics</td>
<td>Marine Institute SWAN model?</td>
</tr>
</tbody>
</table>
Digital Elevation Maps (DEMs) from GPS surveys
Community driven activism is important

Kerry County Council, info@kerrycoc.ie: Save the Maharees from coastal erosion
The Maharees is one of the most beautiful places on the planet. A natural tombolo, and special area...

Petitioning Kerry County Council

Save the Maharees from coastal erosion

Sign this petition
1,384 supporters
116 needed to reach 1,500
Laura Mitchell signed this petition

First name
Last name
Email
Ireland
Your city

I'm signing because... (optional)

Share with Facebook friends

The Maharees is one of the most beautiful places on the planet. A natural tombolo, and special area of conservation, boasting one of the longest sandy beaches in Ireland on Brandon Bay; it is an engine of tourism for the north side of the Dingle Peninsula, providing employment, recreation and revenue and acting as a tourist draw for Castlegregory and its environs.
Purpose: provide funding to LAs to undertake minor flood mitigation works or studies to address flooding and coastal protection problems

Applications for schemes < €500,000 (up to 90% of cost)

OPW assesses: economic, social, environmental criteria + cost benefit ratio (1:1.5)

A detailed coastal erosion risk management study recommended by OPW to develop an appropriate plan to manage risk.

Exceptions:
1. Short length of coastline (<75 m) to replace existing protection structure ✗
2. Short length of coastline (<75 m) & not in close proximity to NHA, SAC, SPA  ✗
3. Emergency work where substantial risk to human life or health exists ❓
RECOMMENDATIONS....

1. Liaise with KCC so your ‘cell’ is represented in their plans for Capital Expenditure & OPW (Mr Eamonn Scanlon, Mr Brian Lennon)
   Give Councillors and TDs the requisite information to represent the problem/community

2. Community is engaged in the problem and united in finding a fix
   - Work and speak as a Group; active on social media; learn from other Groups
   - Initiate education programmes: ecology, vegetation, flora and fauna, geo! (added value!)
   - Citizen science?

3. Start collating the information for a version of a coastal erosion risk management study
   - Historical review (topographic; airborne and terrestrial LiDAR; historical maps)
   - Planning documents (National Strategy Plan; Regional Development; County/Local Plans)
   - Cost to fill gaps; walkover survey/inspection; compare to ICPSS; climate change impacts
   - Map existing and future erosion/deposition in study area (2050 & 2100)
   - Preliminary environmental/impacts assessment (Directives: SEA, EIA, AA) & Community
   - Consider different measures that will, by current guidelines, be investigated:
     Do nothing; Do minimum; Hold the Line; Advance the Line; Managed Realignment

4. What value does the NPWS place on this SAC? Always speak of the integrated dune system!
   What if they are lost to erosion? Issue: EU conservation status = “Unfavourable-Bad”
ACKNOWLEDGEMENTS

Dr. Kevin Lynch

Ms. Sinead Wilkes Orozco (Masters student)
Mr. Guillermo Castro Camba (Phd student)