

<b>Institution:</b> Liverpool Hope University		
<b>Unit of Assessment:</b> C14 Geography and Environmental Studies		
<b>Title of case study:</b> Dynamic coastal dunes: improving understandings and changing management to benefit a threatened habitat		
<b>Period when the underpinning research was undertaken:</b> 1/3/2001 to 31/12/2020		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b>	<b>Role(s) (e.g. job title):</b>	<b>Period(s) employed by submitting HEI:</b>
Reverend Paul Rooney	Head of Department, Geography and Environmental Science	4 <sup>th</sup> January 1999 to present
<b>Period when the claimed impact occurred:</b> 1 <sup>st</sup> August 2013 and 31 <sup>st</sup> December 2020		
<b>Is this case study continued from a case study submitted in 2014?</b> No.		
<b>1. Summary of the impact</b> (indicative maximum 100 words)		
<p>The European Union (EU) has identified an urgent need to improve the conservation status of coastal dunes. The university has led the development of new models of dynamic dune management to help meet this need. Research is strongly embedded in practitioner relations. This has produced management guidance for dynamic dunes that sustain ecosystem services. National and international policies to protect and conserve dynamic dunes have been tested and strengthened. Understanding of dynamic dunes is improved for specialist and non-specialist stakeholders.</p>		
<b>2. Underpinning research</b> (indicative maximum 500 words)		
<ul style="list-style-type: none"> <li> <b>Coastal dunes: properties, values, problems and solutions</b> <p>Coastal dunes are aeolian landforms whose ecosystem services are founded on their dynamic geomorphological and ecological nature. The UK National Ecosystem Assessment identified coastal dunes as a highly valued economic, environmental and tourism resource.</p> <p>Traditional models of dune management promoted stabilisation of landforms. This, together with the ongoing losses of dunes to development and the continuing impacts of other stabilising factors are reducing the extent, beneficial functions and desirable qualities of coastal dunes in north west Europe.</p> <p>The work presented here has challenged the traditional 'static state' dune management model and worked with diverse sectors to create and apply new dynamic management models. This has required an exchange of information and experience among stakeholders who share the aim of conserving dunes as dynamic landscapes. Work at the university led this, with Paul Rooney forming the Sand Dune Network in 2006. He serves as the Director for this network of over 300 land managers, policy makers, academics and scientists.</p> </li> </ul>		
<ul style="list-style-type: none"> <li> <b>Leading the development of new models of dune management</b> <p>Evidence of leadership to develop new models of dynamic dune management is demonstrated in a number of edited collections significant in the field, such as <i>Coastal dune management: shared experience of European conservation practice (R1)</i>. This addresses the key issues for dune conservation management in northwest Europe for the early twenty-first century. It stimulated thinking on dynamic dunes with land managers, policy makers and scientists and promoted early thinking that viewed dunes as both geomorphological and ecological systems.</p> </li> </ul>		

The development of new models of dune management was furthered by Paul Rooney organising an international conference 'Changing Perspectives in Coastal Dune Management' between 31st March and the 3rd April 2008 in Liverpool, UK. The conference attracted around 120 delegates from five continents, the majority of whom were land managers. This resulted in Rooney leading the production of a 2010 Special Issue of the Journal of Coastal Conservation, Planning and Management (JCCPM) (R2). Each of the papers presented in this publication promote the values and properties of a dynamic dune system. Guidance is provided for those tasked with coastal dune management including that, while working within the possible limits of climate, management actions should wherever possible work at the geomorphological level.

Recognising a need to develop an aspect of dynamic dune management that had previously been overshadowed by an emphasis on geomorphology and ecology, Rooney organised a dune hydrology conference between the 9th and 11th September 2013 on the theme of 'Dealing with Dynamics and Extremes'. The meeting brought together researchers, land managers and policy makers to share current knowledge and experience. Nine of the papers from this event were brought together in a 2017 Special Issue of the JCCPM (R3). From hydrological and hydro-chemical processes to new techniques for monitoring vegetation dynamics, the breadth of papers reflects the range of disciplines that took an active part in the meeting. The findings emphasised that effective management of coastal dune wetlands requires a multidisciplinary approach linking science and management.

Due to the growing popularisation of the idea of the Anthropocene, Rooney initiated and led the organisation of the 'Littoral 2017' conference titled 'Change, Naturalness and People'. The event was promoted by the European Community and hosted at the university, between 5th and 7th September 2017. With an emphasis on coastal dunes, it examined how humans and human processes influence the littoral and how these influences may now be viewed as natural, as much as any other natural processes. The event gathered land managers, policy makers, advisers, engineers and scientists to explore current management issues of relevance to dune coasts in the context of the idea of the Anthropocene. Proceedings were published in 2020 (R4).

Led by Rooney, these activities and their outputs brought people together from diverse sectors to advance the understandings and management models for dynamic coastal dunes. This demonstrates significant leadership and stature in a process to develop new understandings and improved dynamic dune management that sustains ecosystems services.

- **Dynamic dunes: understanding their geomorphology and ecology**

Coastal dunes are aeolian systems that are valued for their geomorphological and ecological features and processes. Understanding this is crucial to the implementation of new models of management for dynamic dunes.

Research conducted into dune ecology (R5) provided for the first time a systematic account on all aspects of the biology of Eryngium maritimum L. (Sea Holly) that are relevant to understanding its ecological characteristics and behaviour. In many coastal regions, E. maritimum is one of the rarest and most threatened plant species and is therefore listed in Red Data Books (which evaluate species extinction risk). The research informs dynamic dune management practices that will support the operation of natural processes to achieve long-term viability for this species.

Research conducted into dune geomorphology (R6) demonstrated for the first time that wind flow direction within the deflation basin of a parabolic dune is highly controlled by the depth and width of the deflation basin. This new understanding informs dynamic dune management that

seeks to reinitiate aeolian activity of parabolic dunes stabilised by vegetation growth. This is now a management intervention being adopted by EU-funded LIFE projects including 'Dynamic Dunescapes' (LIFE 17 NAT/UK/000570).

### 3. References to the research (indicative maximum of six references)

**R1** - Houston, J.A., Edmondson, S.E. and Rooney, P.J. (Eds.) (2001) *Coastal dune management: shared experience of European conservation practice*. Liverpool University Press: Liverpool. ISBN 0-85323-854-5. XIII, 458 pp.

**R2** - Rooney, P. (2010) Changing perspectives in coastal dune management. *Journal of Coastal Conservation*, Vol.14 (2), p.71-73 DOI 10.1007/s11852-010-0092-5

**R3** - Stratford, C. and Rooney, P. (2017) Special issue – coastal dune slack hydro-ecology. *Journal of Coastal Conservation* Vol.21 (5), p.573-576 DOI 10.1007/s11852-017-0559-8

**R4** - Jones, L., Smyth, T. and Rooney, P., (Eds.) (2020) *Proceedings of the 2017 Littoral conference 'Change, Naturalness and People'*. UK Centre for Ecology & Hydrology, 116pp. Available at <http://nora.nerc.ac.uk/id/eprint/528695>

**R5** – Isermann, M. and Rooney, P. (2014) Biological Flora of the British Isles: *Eryngium maritimum*. *The Journal of Ecology*, Vol.102 (3), p.789-82 DOI: 10.1111/1365-2745.12243

**R6** - Smyth, T.A.G, Delgado-Fernandez, I., Jackson, D. W.T, Yurk, B. and Rooney, P. (2020) Greedy parabolics: wind flow direction within the deflation basin of parabolic dunes is governed by deflation basin width and depth, *Progress in Physical Geography*, Vol.44 (5), p.643-660 DOI: 10.1177/0309133319899306

- Grant from Natural England to Paul Rooney at Liverpool Hope University. Title – 'Sustainable dune management: practical tools' for a memorandum of agreement project which ran from 1st March 2012 until February 2014. Value - £20,000
- Grant from the 'Dynamic Dunescapes' EU-funded LIFE project - LIFE 17 NAT/UK/000570 to a partnership of the Centre for Ecology & Hydrology (CEH) and Paul Rooney at Liverpool Hope University. Duration: 10<sup>th</sup> September 2018 – 28<sup>th</sup> February 2019. Value - £7,500
- Grant from NERC to Huddersfield University but with Paul Rooney at Liverpool Hope University as co-investigator. Grant title: Landscape-scale environmental drivers of coastal dune mobility. Funded Value: £44,908 Funded Period: Oct 19 - Sep 21. Project Reference: NE/T00410X/1 – see <https://gtr.ukri.org/projects?ref=NE%2FT00410X%2F1>

### 4. Details of the impact (indicative maximum 750 words)

#### • Meeting urgent conservation needs

The research benefits one of the most threatened habitat types in Europe: a habitat type identified by the EU as in urgent need of conservation action. The aim of the Sand Dune Network is to assist the conservation coastal dunes as dynamic landscapes by linking science and management. Led by Paul Rooney as the Director of the Sand Dune Network, the impact has contributed to identifying and in part addressing this urgent need. The impact continues to change the understandings and improve the practices of conservation land managers, environmental policy advisers and scientists concerned with coastal dunes. Through this it also benefits the public through an enhanced protection of the ecosystem services provided by dynamic coastal dunes. Actions leading to impacts include workshops and conferences; media and social media activities; contracted projects to produce management guidance; and provision of expert consultation and evidence that shaped policy and practice at national and European scales.

- **Providing research informed management guidance for dynamic dunes**

On 1<sup>st</sup> March 2012 Natural England commissioned the university to produce a ‘Sustainable Dune Management Toolkit’ (**S1**), providing technical information for their conservation and planning advisers, and enabling them to respond more effectively to case work and provide them with evidence to support new approaches and solutions to respond to a changing environment. In February 2014 the ‘Sustainable Dune Management Toolkit’ was made available on the intranet of Natural England (**S2**). On 12<sup>th</sup> February 2014 the Senior Environmental Specialist – Coastal Habitats for Natural England, wrote “*we are promoting it as the first ‘go to’ source of information by our advisers*” and identified it as a “*very valuable resource*” (**S3**).

In September 2018 a partnership of the Centre for Ecology & Hydrology (CEH) and the university were awarded a grant from the ongoing ‘Dynamic Dunescapes’ EU-funded LIFE project (LIFE 17 NAT/UK/000570 - partners Natural England, Plantlife, The National Trust, Natural Resources Wales and Wildlife Trusts; <https://dynamicdunescapes.co.uk/>) which aims to improve the condition of internationally important dune sites and implement best practice techniques. This funded a ‘Sand Dune Managers Handbook’ (produced 28<sup>th</sup> February 2019) to assist the project to initiate urgent management, change the thinking about how sand dune systems need to be managed, and improve public engagement with sand dunes. Rooney distilled the basic principles of dynamic dune management and provided expert input on specialist and innovative techniques. The handbook forms a key part of a ‘Sand Dune Site Manager Learning Programme’ which cascades expertise across the project partners and to other sand dune land managers during and beyond the project delivery phase (**S4**).

Between 2013-2020, EU-funded LIFE nature projects on coastal dunes invited Paul Rooney to share his expertise at land manager-led events with the purpose of clarifying conservation needs and stimulating practical action. Examples include PROVIDUNE in Italy ([https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n\\_proj\\_id=3354](https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3354)) and REDOCHA in Denmark ([https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n\\_proj\\_id=4618](https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4618)). The LIFE programme is the EU’s funding instrument for the environment and climate action. Projects address the EU critical and urgent nature conservation priorities.

- **Protecting dunes: testing and informing policy**

On 2<sup>nd</sup> November 2018 Paul Rooney was invited by Scottish Natural Heritage to act as their expert witness (**S5**) to oppose a development proposal at the internationally important dunes at Coul Links, Sutherland, Scotland (**S6**). He gave expert evidence at the public inquiry in March 2019 on the adverse impact of the development on the dune habitat. The inquiry reporters agreed with him that there would be a likely significant adverse effect on dune heath, that the likely overall effect on lichens would be significantly adverse and that there would be a likely significant adverse effect on the overall system of sand dune. Scottish Ministers accepted the inquiry reporters’ decision to reject the development proposal.

Following the much-criticized 2008 decision by Scottish Ministers to allow the Trump dune development at Menie Links, Aberdeenshire, the Coul Links decision was a crucial test of the Scottish government’s support for nature conservation and its resolve to defend internationally protected sites for nature conservation. Paul Rooney’s expert evidence was central in achieving the development decision. The Principal Adviser – Casework & Advice for Scottish Natural Heritage wrote on 16th April 2019 of Paul Rooney’s expert contribution:

*“..this was a high profile case located in a highly important ecological site with multiple designations. Scotland’s nature is a national asset, and we need to provide high quality information at the right time to influence decisions about its future. We have to convey how nature works to deliver benefits for people and nature. Knowledge and expertise are vital to our success. Your knowledge and expertise in coastal dunes, and their management, enabled us to do this at inquiry. Your contributions ..helped present a professional, coherent, and well-argued case to the reporters.. you produce[d] an extremely high standard of work.”(S7)*

The European Commission invited Paul Rooney to participate in an expert consultation regarding the Natura 2000 sand dune habitats and / or species (S8). The results formed the programme of the second Atlantic Seminar 25<sup>th</sup>-27<sup>th</sup> October 2016. Rooney was invited by the European Commission to attend this seminar as an expert in coastal dunes. He was one of only four habitat experts invited from the UK. The event developed and agreed a ‘Dune Roadmap’ (S9). This identifies key actions for the conservation of dynamic coastal dunes in the Atlantic Biogeographical region. As an output of the Natura 2000 Biogeographic Process and the EU-LIFE Platform Meeting on coastal dunes, it has a direct link through to European Commission policy and priorities.

- **Developing a popular understanding of dynamic dunes**

Hosted by the university, since 2000 Paul Rooney has maintained the ‘Sands of Time’ web site [www.sandsoftime.hope.ac.uk](http://www.sandsoftime.hope.ac.uk). This provides easily accessible information on coastal dune dynamics and ecology aimed at the interested lay person and A-Level students. Between 2007 and the end of 2020 it received an average of 20 unique page loads per day. On 11<sup>th</sup> August 2009 Rooney first appeared on the BBC programme ‘Coast’ (Series 4, Episode 5) watched by 3.41 million people (S10) in a feature explaining dune dynamics, habitats and species. Since this first showing it is repeated to the present day at various intervals on BBC channels, BBC iPlayer, various digital platforms such as Netflix and other TV channels including those in Australia. The programme was released on DVD in 2010 and as part of a box set in 2011. The box set is available to purchase in the present day as new items through sites such as Amazon.

#### 5. Sources to corroborate the impact (indicative maximum of 10 references)

S1 – MOA Dune toolkit schedule TC\_01032012;

S2 – NE Dune Toolkit;

S3 – NE Dune Toolkit\_intranet;

S4 – Dune Managers Handbook\_CEH\_Liverpool Hope;

S5 – Coul Links\_invitation;

S6 – Coul Links – see <http://www.dpea.scotland.gov.uk/CaseDetails.aspx?id=119883>;

S7 – Coul Links\_SNH

S8 – Invitation from the EU to habitat experts;

S9 – Roadmap for dunes of the Atlantic Region- V1.1- see

[https://ec.europa.eu/environment/nature/natura2000/platform/documents/atlantic\\_seminar/atlantic-seminar-report-Ireland-oct-2016-final-draft\\_en.pdf](https://ec.europa.eu/environment/nature/natura2000/platform/documents/atlantic_seminar/atlantic-seminar-report-Ireland-oct-2016-final-draft_en.pdf);

S10 – BBC Coast data [https://en.wikipedia.org/wiki/Coast\\_\(TV\\_series\)](https://en.wikipedia.org/wiki/Coast_(TV_series))