

Conservation of coastal dune habitats in the Atlantic Biogeographical Region

Roadmap for knowledge exchange and networking for the period 2023-2027: Supporting the EU Biodiversity Strategy for 2030

Version 4: May 2023



The roadmap has been compiled for the 'dune network'¹ by John Houston based on the outputs of the Natura 2000 Atlantic biogeographical seminars and the contributions of experts.²

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¹ The contributors to the roadmap are all members of the Beach and Dune Network <https://www.eucc-d.de/beach-and-dune-network.html> hosted by EUCC-D and coordinated by Maike Isermann

² Suggested citation and the contact addresses for all contributors can be found at the end of the document

Purpose

This version of the dune Roadmap marks over 10 years of productive networking between policy makers, scientists and coastal dune managers across the Atlantic Biogeographical Region within the framework of the EU's *Natura 2000 Biogeographical Process*.

The current version spans three reporting periods under the nature directives, three rounds of biogeographic seminars and numerous conferences, workshops, study tours, publication of best-practice manuals and research papers (listed in the roadmap).

The focus of the roadmap is the EU Habitats Directive's long-term aim of achieving *Favourable Conservation Status* (FCS) for all coastal dune habitats, and associated species, characteristic of the Atlantic region. FCS is a term applied at biogeographical level and expects cooperation between Member States. The contributors to the roadmap feel that this ambition will continue to remain out of reach unless there is a more concerted effort by Member States to address together the known pressures and threats to these valuable habitats.

By looking at a set of dune habitats across a biogeographical region the roadmap aims to contribute to the *EU Biodiversity Strategy for 2030* and its targets for halting deterioration and improving habitat status by 2030. In particular, based on previous seminars, experience in habitat restoration and ongoing and proposed LIFE projects, the roadmap can identify habitats in Member States where the 'low hanging fruits' approach can deliver results within the 2030 timeframe. The roadmap also provides links to best practice across the region which can assist in the setting of realistic restoration and re-creation targets for the 'nature restoration law' at Member State level.

The roadmap presents eight targeted actions arising from workshops at the biogeographical seminars, and shows what progress has been made, and what further steps are needed. Whilst networking and knowledge exchange is good amongst practitioners, as shown in the cooperation between LIFE projects and the sharing of knowledge through the *Beach and Dune Network* hosted by EUCG Germany, there is little activity to report, as far as we are aware, in terms of cooperation between Member States at policy level. However, the 'national pledges' to halt deterioration across all habitats and to identify those habitats currently failing which can be improved by 2030 will give new impetus to the process.

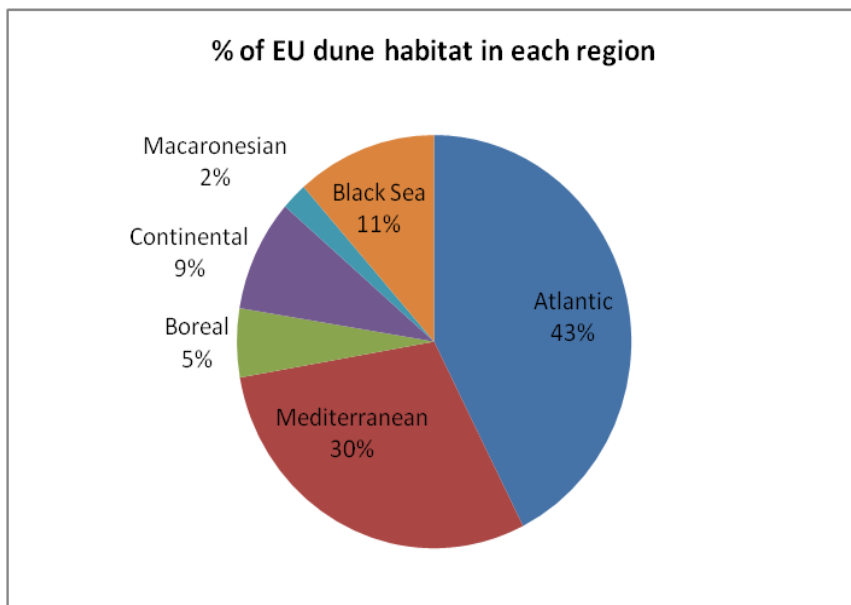
The practitioners supporting the roadmap are aware of the continued pressures and threats to coastal dunes as reported in the *EU State of Nature Report 2020*. There are suggestions in the roadmap for actions that could be taken to secure genuine improvements to habitat condition and conservation status. Management approaches proven to be effective could be supported through transfer and replication across the Atlantic region with the support of Member States. The network can help with the translation and dissemination of best practice documents such as the Dutch report on small scale wind erosion for the benefit of dune grasslands.

The current version of the roadmap is based on the 2013-2018 Habitats Directive Article 17 reports (and a specific review of the state of Atlantic dune habitats – summary below) and therefore includes information for the UK. But it also shows how the relative distribution of reported dune habitats has now changed following the exit of the UK from the European Union. The UK, however, will continue to mirror the actions taken by the EU through its participation in international agreements and through the Emerald Network of Areas of Special Conservation Interest³.

³ <https://www.coe.int/en/web/bern-convention/emerald-network>

Background

The Atlantic biogeographical region holds the largest area of coastal dune habitat in EU-28 (43%) but also has the lowest percentage of habitat in good condition (28%).



The set of Habitats Directive Annex I coastal dune habitats for the Atlantic biogeographical region, the *Sea Dunes of the Atlantic, North Sea and Baltic coast* described in the Interpretation Manual of EU Habitats, are:

- 2110 Embryonic shifting dunes
- 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
- 2130* Fixed coastal dunes with herbaceous vegetation (grey dunes)
- 2140* Decalcified fixed dunes with *Empetrum nigrum*
- 2150* Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)
- 2160 Dunes with *Hippophae rhamnoides*
- 2170 Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)
- 2180 Wooded dunes of the Atlantic, Continental and Boreal Region
- 2190 Humid dune slacks
- 21A0 Machairs (* in Ireland)

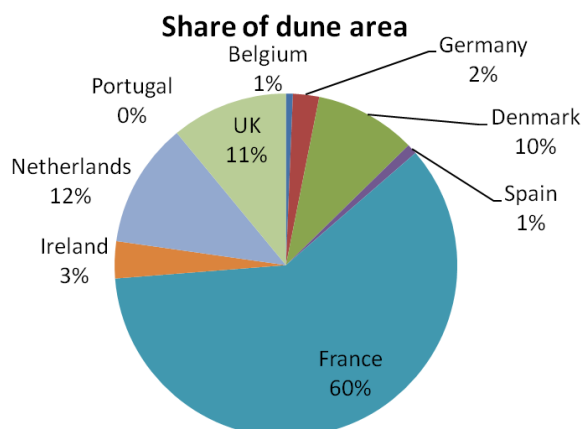
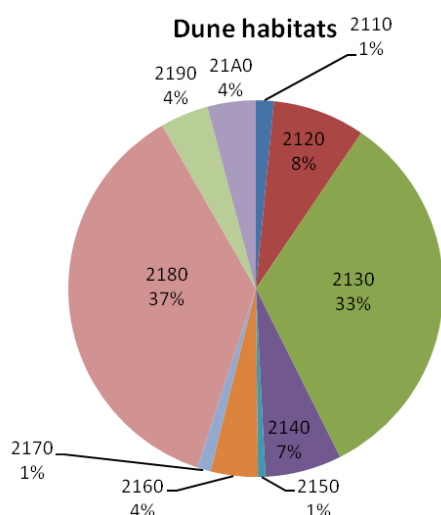
* Signifies that the habitat is a priority habitat

Habitats also considered relevant to coastal dune systems are 1210 Annual vegetation of drift lines (the strandline community which is the precursor of 2110), 1220 Perennial vegetation of stony banks (dune systems which overlie shingle formations are known as dry core systems) and, particularly for Denmark, 3130 Oligotrophic standing waters where the habitat forms part of the dune mosaic, e.g. in parabolic dunes.

The table below gives the 2018 distribution and condition of these habitats in the Atlantic region (i.e. the total for nine Member States including the UK). N.B. the lack of any quantitative information from Portugal in the 2013-2018 reporting is raised as an issue in the roadmap.

Habitat	Habitat code	Area (ha)	Overall ATL assessment
Embryonic shifting dunes	2110	5,456	U1 poor
Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes)	2120	28,232	U1 poor
Fixed coastal dunes with herbaceous vegetation (grey dunes)	2130*	117,321	U2 bad
Decalcified fixed dunes with <i>Empetrum nigrum</i>	2140*	23,377	U1 poor
Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>)	2150*	2,271	U2 bad
Dunes with <i>Hippophae rhamnoides</i>	2160	14,439	FV good
Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>)	2170	4,136	U1 poor
Wooded dunes of the Atlantic, Continental and Boreal Region	2180	129,807	U1 poor
Humid dune slacks	2190	14,751	U2 bad
Machairs (* in Ireland)	21A0	14,768	U1 poor
Total for Atlantic region		354,558	

FV= Favourable; U1 = Unfavourable-inadequate; U2 = unfavourable-bad



The habitats can be grouped into the mobile dune types 2110 and 2120 (9% of the total), fixed dunes and dune scrub 2130, 2140, 2150, 2160 and 2170 (46%), dune slacks 2190 (4%), dune woodlands 2180 (37%) and the machairs of the UK and Ireland 21A0 (4%). By country France has by far the largest proportion of dune habitats (60%) following by UK, Denmark and The Netherlands (c. 11% each). In Europe, sand dune habitats are characteristic of the Atlantic region and three types, 2120 mobile dunes, 2130* fixed dunes and 2190 dune slacks, were selected for attention and workshop discussion at the first Atlantic seminar in 2012. The current roadmap is an extension of these early discussions.

The Habitats Directive six-yearly Article 17 reports show that across Europe dune habitats - coastal and inland - have the least proportion of assessments marked as 'favourable'. The *State of Nature Report 2020* for the period 2013-2018 did show some progress for some habitats but also a decline in quality for others. Although the situation remains challenging there is evidence that targeted LIFE projects, and similar programmes, can make a difference.

The first draft of the roadmap was developed after a LIFE Platform meeting on coastal and inland dunes held in The Netherlands in 2016. It was presented at the second Atlantic Biogeographic Seminar in Ireland in 2016. The eight action points in the current roadmap were agreed in a workshop at that meeting. An update of the roadmap was presented at the third Atlantic seminar in Belgium in 2019 and the current version coincides with the fourth Atlantic seminar to be held in Germany in 2023.

The need for a European Dune Network

An aspiration and recommendation from the first Atlantic seminar was to establish an expert-network of governmental agencies responsible for management of coastal dunes in the Member States. Although in the 10 years since that meeting no formal network has been established, there is an active, but loose network of practitioners mostly with connections to the LIFE programme. It is this network which has prepared the roadmap and shares knowledge through the *Beach and Dune Network* website but there is no staff time dedicated to maintaining a network. Support from nature conservation bodies in the Member States, perhaps linked to the habitat restoration targets, could ensure that the expertise is not lost at this critical time. Actions which benefit from international cooperation include:

- An early warning system for Invasive Alien Species and the sharing of practical experience in control
- A comparative review of Conservation Objectives for dune habitats in Member States to help standardise reporting under Article 17 of the Habitats Directive
- Developing and promoting joint research programmes on issues with an international dimension e.g. impacts of N-deposition and climate change
- Guidelines on how to incorporate dynamics into the interpretation of Favourable Conservation Status of habitats and species
- Further interpretation of EU habitat types, especially fixed dune and slack sub-types
- Strengthening cross-border and cross-biogeographical region (and also within Member State) management initiatives
- Assessing expected changes to habitats as dune systems respond to climate change
- Sharing management practices and results, especially through LIFE projects

Although there are several established national networks in the region these do not have the capacity, or the remit, to lead on some of the issues in this list, especially those where Member State cooperation is required. Other actions will require cooperation between policy, science and management organisations, perhaps through EU programmes.

Introduction to the Atlantic dune roadmap

The dune roadmap for knowledge exchange and networking is an initiative from practitioners, many with experience of the LIFE programme. These managers know that networking is an effective and time-saving way to share new techniques and local or national networking can lead to European networking. In the Atlantic region almost all opportunities for international networking over the last 10 years have been provided by LIFE projects.

The roadmap develops eight actions agreed at the second Atlantic seminar.

1. Development of guidelines on how to incorporate dynamics into the interpretation of Favourable Conservation Status
2. Understanding and embracing dynamic coastal change with attention to sandy beaches and formation of strandline vegetation and embryonic shifting dunes
3. Interpretation, mapping and management guidelines for EU habitat types
4. Restoration of ecological connectivity in fragmented dune belts along strongly urbanised coasts
5. Addressing protection and management of 2130* fixed dunes (and other fixed dune habitat types 2140* and 2150*)
6. Identifying habitats where genuine improvements in habitat status could be made in the medium term ('low hanging fruit' habitats)
7. Developing and promoting a research programme on, e.g. impacts of N-deposition, dune hydrology and monitoring of outcomes of restoration projects
8. Early warning system for Invasive Alien Species (IAS) and sharing of practical control methods with costs

Other topics could be added in future iterations of the roadmap and some of the current actions might either be completed or replaced.

Following a standard biogeographical process format the actions are broadly categorised as:

Action type	Code
Sharing and/or dissemination of information	D
Seminars or network meetings	S
Guidance, organisational and/or legal actions	G
Research	R
Local actions	L

For actions in Part I of the roadmap (see table below), lead bodies and a timetable are identified. In some cases a lead has been offered, in others a lead has been proposed by the European Commission through the biogeographical process and in others there are suggested lead bodies.

Part II of the roadmap is a rolling record of activity, listing the development of networks, outputs from events, proposed projects and publications.

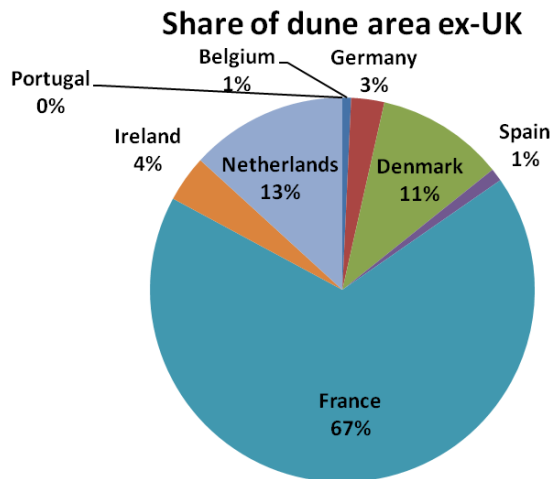
Overall, the roadmap acts as an *aide-memoire* to put on record the issues that have been discussed by practitioners over the last decade and as a stimulus for new activities that could be included in, e.g. the national pledges under the EU Biodiversity Strategy for 2030, habitat restoration and re-creation targets, LIFE projects, cooperation between research bodies or direct funding through Member States' conservation bodies.

The roadmap has been fully updated following the 2013-2018 Article 17 reporting period and looks ahead to the next reporting round for the period 2019-2024. Although the roadmap looks forward to 2030 it will be reviewed following the next *EU State of Nature* report in 2025 as a contribution to the Natura 2000 Biogeographical Process.⁴

⁴ https://ec.europa.eu/environment/nature/natura2000/seminars_en.htm

The impact of the UK leaving the EU

The UK left the EU in January 2020. Therefore the next EU reporting round under the Habitats Directive for the period 2019-2024 will only present information for eight countries in the Atlantic biogeographical region. For coastal dunes the distribution will be as shown below.



The main impacts are that the total dune area is reduced by c. 39,000ha, France now holds two thirds of all the dune area in the EU Atlantic region, Ireland alone holds the c. 3,000ha of machair in the EU and for decalcified fixed dunes 2150* the situation changes significantly from 70% held by the UK to 62% held by the Netherlands.

All UK dune habitats, with the exception of 21A0 machair, are reported in 2020 as unfavourable-bad and declining (U2-) so when the information is reset for the next reporting round there is likely to be some improvement in the conservation status of EU coastal dunes of the Atlantic region. From a political perspective it is an opportunity that should be considered as it makes achieving positive trends for some habitats across the region more achievable.

The UK is geographically an integral part of the Atlantic biogeographical region and the UK National Sites Network (which includes European sites and European offshore marine sites) are within the Emerald Network, under the Bern Convention, which sits alongside the Natura 2000 network as part of a Trans-European Nature Network. It is expected that the UK will continue to report on the condition and status of Habitats Directive Annex I habitats and Annex II species. The UK *25-year Environment Plan* and *Environmental Improvement Plan 2023* provide targets for reporting on designated sites and species recovery. The UK's ambitions for habitat improvement and habitat creation are very similar to those of the EU.

Points to note

The roadmap does not cover to any extent issues of interest such as recreation, tourism, cultural heritage and education except where they impact on or support nature conservation objectives. This is because the primary purpose of the roadmap is to assist in the efforts towards reaching FCS for all habitats and species listed in the Habitats Directive.

The roadmap has been developed for the Atlantic biogeographic region so that it ties in completely with the biogeographical process led by the European Commission. However, the ambition of a European Dune Network is to share experience across all biogeographic regions. Especially for the

Atlantic region there are close similarities with work in both the Boreal and Continental regions and networking extends across Europe and further afield. Fixed dunes 2130*, for example, are widespread across 18 Member States in six biogeographical regions and, given that the overall condition is unfavourable, and with less than 60% of the 132,200 ha included in Natura 2000, there would be a strong case for either a EU Habitat Action Plan or a similar pan-European study into the feasibility of protection and restoration.

Annex 1. Coastal dune roadmap V4 2023 Action Scheme

Actions included in the roadmap for the Atlantic biogeographical region linked to the Natura 2000 biogeographical process

Part I: Actions

Action Type: D: Dissemination, S: Seminars, G: Guidance, R: Research, L: Local Actions

Description	Relevance	Type	Timing	Lead	Support	Progress
Action 1. Guidelines on how to incorporate dynamics into the interpretation of Favourable Conservation Status (FCS) – important for habitat restoration and re-creation						
The understanding of FCS should include bare sand and dune forming processes. This is true in mobile habitats as well as 'fixed' habitats and for creation of embryo dune slacks	Target values can be set for bare sand / dynamics in dune habitats. The scale is important with a balance between large mobile features, smaller blowouts and scrapes.	G	Since 2012 there is greater understanding of the role of dynamics in maintaining habitat quality.	Practitioners, assisted by science input, have developed effective techniques for creating more mobility and bare sand within systems.	Site manager and LIFE project support through practical works which include funding for monitoring.	<input checked="" type="checkbox"/> Dutch national studies on notches and blowouts. UK workshop on sustaining mobile sand dunes. French studies of natural dynamics and blowouts and notches. Strong research interest attracting grants.
A <i>de facto</i> dynamic approach to dune management where fixed dune habitat is rejuvenated by sand burial may not conform to strict interpretation of Habitats Directive policy. An evidence based approach should be endorsed by the EC.	The tried and tested approaches to dynamic dune management, and the science supporting it, need to be translated into MS guidelines for assessing habitat condition. It is still the case that bare sand and mobility within dune systems is not universally	G	Before next Article 17 assessment in 2024	This is a question which could be addressed through the biogeographical process and/or the Expert Group on the birds and habitats directives (NADEG).	Workshops to explore issues, as proposed in France, could be supported by national science/management networks.	<input type="checkbox"/> Little progress on this issue which raises concerns about challenges to the dynamic approach.

Description	Relevance	Type	Timing	Lead	Support	Progress
	accepted.					
Action 2. Addressing dynamic coastal change with attention to sandy beaches and formation of strandline vegetation 1210 and subsequent formation of 2110 embryonic shifting dunes						
Dune systems are part of the shallow sea, beach and dune sand-sharing system and are moulded by large scale and long term changes in climate, sediment supply and sediment movement.	Beach management is a component of dune system management. Inappropriate beach management, including beach cleaning, may prevent embryo dune growth and sand accretion. Issues are addressed in projects across the region.	G	Ongoing projects but little overview of the subject. Sharing knowledge becoming more urgent to show how coast will adapt to climate change.	Various leads from research and academia, shoreline management authorities (e.g. Rijkswaterstaat (NL), Environment Agency (UK) and BRGM (FR), NGOs, and conservation agencies.	Dune managers and beach managers with interest in habitats and protection of birds breeding on beaches.	<input checked="" type="checkbox"/> Issues addressed by Interreg2Seas project ENDURE, RSPB (UK) 'sustainable shores' project and National Trust (UK) 'shifting shores' project.
Action 3. Interpretation, mapping and management guidelines for EU habitat types						
For some habitats there is generally very good understanding of ecology and management. This is the case for 2130* and 2190	EC technical reports on the management of Natura 2000 habitats have been prepared for fixed coastal dunes 2130* ⁵ and humid dune slacks ⁶	G	Prepared in 2008 and still in use	European Commission	Liverpool Hope University	<input checked="" type="checkbox"/> Publications are still referenced and relevant. Could be updated along with a management model for mobile dunes 2120
Several habitats appear to be interpreted differently between Member States. These may	It is difficult to assess progress towards FCS if not comparing like with like.	G	Before next Article 17 assessment in 2024	Either at request of EC, or independently, MS nature	Exercise could be supported by national networks and national	<input type="checkbox"/> Little progress and increasing need especially

⁵ https://ec.europa.eu/environment/nature/natura2000/management/habitats/pdf/2130_Fixed_coastal_dunes.pdf

⁶ https://ec.europa.eu/environment/nature/natura2000/management/habitats/pdf/2190_Humid_dune_slacks.pdf

Description	Relevance	Type	Timing	Lead	Support	Progress
include 2170 Dunes with <i>Salix repens</i> ssp. <i>argentea</i> , 2160 Dunes with <i>Hippophae rhamnoides</i> and 2180 Dune woodland	There seem to have been no discussions on these issues to add to the EU Interpretive Manual. Vegetation experts would support further studies into 2180 as little is known about oak woodland on dunes.			conservation agencies could lead workshops with habitat experts.	scientific bodies (e.g. OBN, INBO, CEH, Conservatoire Botanique National de Bailleul etc). Coordination could be offered from the European Topic Centre on Biological Diversity (ETC/BD)	for 2180 dune woodland where area identified in France has increased from 7,500ha in 2012 to up to 121,000ha in 2018.
For Portugal there is only limited information in the Article 17 reports. Conservation status of 2110, 2120, 2150*, 2180 and 2190 is bad and status of 2130* is inadequate. No area information given.	The situation in Portugal cannot be assessed in relation to other countries as there is no area data.	R	Before next Article 17 assessment in 2024	Lead has to be from national nature conservation agency.	It was previously reported that surveys were planned and that NGO Quercus would convene a working group on coastal dunes	<input checked="" type="checkbox"/> But noted that Portugal only has a relatively small area of the Atlantic biogeographical region
For Spain, there are two biogeographical gaps. 2150* and 2190 are not included in Atlantic Terrestrial Reference List for Spain although they are included in French and Portuguese Atlantic lists.	As these habitats are not included in the Atlantic Terrestrial Reference List they cannot be included in the corresponding SDFs, no LIFE projects can be applied for to restore these habitats and they are not being assessed in Article 17 reporting.	G	Before next Article 17 assessment in 2024	Lead has to be from national nature conservation agency. LIFE INSULAR could work as a catalyst	There is extensive knowledge of 2150* and 2190 presence in Northern Spain. At least in Galicia (NUT ES11) there are several good examples, > 600 ha of 2150* and > 100 ha of 2190, identified in the Interpretation Manual of Galician habitats. ⁷	<input checked="" type="checkbox"/> Galician SAC management plans ⁸ have registered these habitats. 2190 has been included in SDFs and has been assessed in the 2013-2018 Article 17 report. <input checked="" type="checkbox"/> But it is only the first assessments for 2190 and 2150*. Neither appears in the 2022 Spanish

⁷ <https://www.ibader.gal/UserFiles/0010-Manual-Habitats/fichasPDF/m2150.pdf>

⁸ https://www.xunta.gal/dog/Publicados/2014/20140331/AnuncioCA02-270314-0001_es.html

Description	Relevance	Type	Timing	Lead	Support	Progress
						Atlantic reference list.
Action 4. Restore ecological connectivity in fragmented dune belts along strongly urbanised coasts and allow dune roll-back						
Urbanisation and intensification of agriculture in coastal areas has led to fragmentation.	The possibilities to restore connectivity for habitats and populations of species should be re-examined in light of EU habitat restoration targets in the proposed EU Nature Restoration Law and national restoration plans.	G	The issue is long-term but should be incorporated in national plans and restoration projects.	This has been an issue of particular relevance in Belgium and has been addressed in several LIFE projects. In the UK hard infrastructure has been removed to restore connectivity, and 'habitat potential maps' have been prepared to allow dune roll-back.	Sharing of experience between Member States and at networking events.	<input checked="" type="checkbox"/> Several case studies presented at LIFE FLANDRE conference 2018, case studies and a report in the framework of Interreg VEDETTE ⁹ , and work in UK.
Drainage of dune wetlands, conversion to fields and plantations has fragmented the distribution of specialist species e.g. in humid dune slacks 2190.	To restore populations of species such as Natterjack toad and Alcon blue it is necessary to restore natural dune hydrology.	L	The issue is long-term but should be incorporated in national plans and restoration projects.	Addressed in several projects e.g. LIFE REDCOHA in Denmark and in Aquitaine in France.	Sharing of experience between Member States and at networking events.	<input checked="" type="checkbox"/> Ditches and drains have been blocked in several LIFE projects, <input type="checkbox"/> but there is still much to do.
Action 5. Addressing protection and management of 2130* fixed coastal dunes (and 2140* and 2150* decalcified fixed dune habitats)						
Fixed coastal dunes 2130* is by far largest habitat type by area but only 47% of the 110,880 ha in the Atlantic region is within the Natura 2000 network	Conservation needs of c. 60,000 ha of fixed dune outside the Natura 2000 network in Atlantic region must be addressed	G	Urgent to assess the ongoing pressures and threats on all fixed dune habitat (inside and outside	Lead could be taken by NADEG to propose development of EU-wide <i>Habitat Action Plan</i> for the habitat	For priority habitat all national Prioritised Action Frameworks (PAFs) should already include assessment and actions	<input checked="" type="checkbox"/> Scientific knowledge of the structure and function of this habitat type is

⁹ <https://www.vedetteinterreg.com/>

Description	Relevance	Type	Timing	Lead	Support	Progress
according to EEA data.			Natura 2000) before next Article 17 reporting in 2024	type (it is already on the NADEG short-list).	for 2130*, 2140* and 2150*.	good. <input type="checkbox"/> But there is no ready knowledge of habitat outside Natura 2000
				But if EU-wide Habitat Action Plan is not feasible in the short term, a review by ETC/BD could assess the situation.		<input type="checkbox"/> The scale of the pressures and threats to fixed dune habitats is not clear outside Natura 2000 areas.
Threats to 2130* include encroachment with scrub and grasses, invasive alien species, intensification of agriculture, enrichment with N and P and afforestation.	Measures for maintenance and improvement are required in all MS.	G	Article 17 reports 2018 show continued threat.	MS should share experience, act on evidence of successful measures, and develop national programmes.	Partners in European Dune Network can continue to promote links between science and management.	<input checked="" type="checkbox"/> Fixed dune habitats are addressed in several ongoing LIFE projects.
Action 6. Identifying habitats where genuine improvements in habitat status could be made in the medium term, possibly 2030, ('low hanging fruit' habitats) supporting the targets of the EU Biodiversity Strategy for 2030						
Background documents for 2 nd Atlantic seminar identified where step changes could be made in overall conservation status of 2140* to U1+, 2180 to U1+ and 21A0 to FV in the Atlantic region.	Although the proposal that resources could be targeted towards 'low hanging fruits' was not adopted by Member States at the meeting the idea has been retained in the setting of habitat improvement targets through 'national pledges'. ¹⁰ Already there	S	<i>State of Nature Report 2020</i> noted genuine improvements in several dune habitats, including FV for 21A0 machair in UK (directly attributable to a LIFE project).	Priorities for habitat restoration are set by individual MS through national PAFs	The Biogeographical Process encourages MS to work together to help improve the conservation status of habitats	<input checked="" type="checkbox"/> Some progress reported in State of Nature report but <input type="checkbox"/> also several habitats had declined

¹⁰ <https://circabc.europa.eu/sd/a/e1a37f29-76f7-4b9a-bdbf-2b1ca98f62ff/Doc%20NADEG%2020-10-04%20Draft%20Technical%20Note%20-%20Criteria%20for%20species%20and%20habitats%20to%20be%20restored.docx.pdf>

Description	Relevance	Type	Timing	Lead	Support	Progress
	has been genuine progress made with 21A0 machair					
2140* decalcified fixed dunes with <i>Empetrum nigrum</i> . 78% of the habitat type in the Atlantic region is in Denmark. Five LIFE projects have addressed the habitat. Challenge is to step up from U1- to U1+ or FV ¹¹	The conservation status has declined from U1= to U1 – in most recent assessment. A further push is required to achieve FV in DK. Overall the future prospects for this habitat type are good.	S	Application for LIFE funding for additional effort	Denmark has led on experience with the management of this habitat.	Share knowledge with DE, IE and NL. A Natura 2000 management guidelines document for 2140* could be prepared (perhaps within an update of that for 2130*)	☑ Results of two Danish LIFE projects disseminated at final seminar 2019.
2150* Atlantic decalcified fixed dunes. The UK has the largest area of this rare 'dune heath' habitat - 1592ha. With UK exit from EU the habitat is now recorded from The Netherlands (420ha), Germany (39ha), France (200ha) and Ireland (20ha).	In The Netherland the habitat has been U1= for the last two reports. Some extra effort, in communication with the other Member States might be able to secure either U1+ or FV for this habitat type.	S	Assess status before next Article 17 reporting in 2024	NL now identified as the lead as MS with greatest area.	Share knowledge between NL, DE, FR and IE (leads to be identified).	☑ Habitat addressed in UK LIFE projects. Experience can be shared.
2180 wooded dunes of the Atlantic, Continental and Boreal region identified for step up from U1= to U1+	The habitat is mainly associated with the French Atlantic coast but also prevalent in the Boreal and Continental regions	S	Review habitat across Europe before next Article 17 assessment. Expert opinion is that not enough is known about definition and management of this habitat in the Atlantic region.	FR (with 121,000 ha) and NL (with 8,100 ha) identified as lead in Atlantic.	Conservatoire National de Bailleul could lead research in FR. As first step FR could organise workshop to discuss identification, monitoring and management across three biogeographic regions.	☑ Large increase in the habitat type recorded in France – but ☒ only a small proportion (c. 20%) in Natura 2000
21A0 machair. The UK held 79% of this habitat type and Ireland 21%.	The habitat improved in the UK from U1+ to FV in the period 2013-2028 due to the work of the Machair LIFE project. With UK exit	S	Ongoing LIFE project. Progress made in Ireland through LIFE Aran project and LIFE on Machair (2022-	NPWS in Ireland	Machair is only dune habitat totally dependent on agricultural activity. Support is through agri-environment payments.	☑ LIFE on Machair project may be able to secure FV status for this rare

¹¹ Conservation status is coded as favourable FV, inadequate U1 or bad U2 with trends given as = no change, + improvement and – decline.

Description	Relevance	Type	Timing	Lead	Support	Progress
	from EU Ireland holds all machair in EU – 3088ha		2028)			habitat in Europe.
Action 7. Developing and promoting a research programme on, e.g. impacts of N-deposition, dune hydrology, dune species and monitoring of outcomes of restoration projects						
For many years there has been a strong link between science and management for dune conservation, pioneered by EUCC and its <i>Journal of Coastal Conservation</i> and Littoral conferences.	Scientific bodies such as OBN can assist in developing applied science programmes.	R	Continuous dissemination of scientific outputs through publications and conferences (e.g. Littoral events)	MS should support bodies such as OBN, CEH, INBO to cooperate in preparing regional science programmes.	Dune science programmes can be promoted through dune networks and LIFE projects.	☑ Several examples of international cooperation on research themes. More could be done.
A dune management 'decision tree' was developed by the LIFE co-op project on bogs and dunes.	Decision tree and 'PROMME' approach provided managers with decisions based on scientific evidence including impact of N deposition.	D	Completed and no longer updated	Radboud University Nijmegen(Stichting Bargerveen) developed the knowledge base	If useful support through OBN and other networks could develop the tool for wider use in NW Europe. There is interest in France for such a management tool.	☒ The tool is no longer supported – knowledge is incorporated into more recent guidance.
Dune habitats are impacted by Nitrogen deposition. Scientific knowledge and management responses should be shared across the region.	Funding is provided (e.g. in the Netherlands) to counter the impact of Nitrogen deposition on habitats.	R	Continuous research theme.	UK Dynamic Dunescapes project will prepare Shared Nitrogen Action Plans (SNAPS) for two large dune systems.	Scientific bodies in NL, BE and UK already share knowledge and reviews at biogeographical level	☑ Scientific background (impact on N on dune soils and vegetation) well understood. More results of management should be shared.
Several research themes have a regional dimension. There is added value in sharing monitoring programmes to broaden scope of studies and	Examples include work on dune notches, creating self-sustaining dune mobility, grazing, invasive alien species, hydrology, and	R	Continuous activity. Take opportunity to coordinate national studies to give European added	LIFE projects, national agencies, dune managers, research institutes, researchers.	LIFE projects, dune managers, citizen science programmes, wildlife specialists etc.	☑ Most meetings across the region have an international dimension –

Description	Relevance	Type	Timing	Lead	Support	Progress
relevance of outputs.	rejuvenation of dune habitats. Studies of species, e.g. <i>Liparis loeselii</i> , <i>Epidalea calamita</i> , <i>Lacerta agilis</i> , also benefit from comparison across the region.		value.			regional communication benefits from on-line meetings
Southern European dune habitats (2120, 2130*) host plant species (e.g. <i>Omphalodes littoralis</i>) and breeding bird species (e.g. <i>Charadrius alexandrinus</i>) which are threatened from tourism and public pressure (recreation areas, boardwalks, parking lots, sand extraction, intensive trampling, motorized sports)	Measures for protection of these species are required, mainly related to the regulation of the presence of visitors	R	Article 17 reports 2018 show continued threat.	LIFE projects, national agencies, dune managers, research institutes, researchers.	MS should address this problem. Protection/governance actions should be developed, maybe through new conservation projects	❌ Future prospects are very negative in southern Europe.
Action 8. Early warning system for Invasive Alien Species (IAS) and sharing of practical control methods with costs						
Development of a 'black list' for Atlantic dunes	Clear evidence of South-North spread of IAS. Expert workshop held by LIFE DUNIAS in May 2022. Guidelines and advice should be shared across the region.	G	Focus on the issue through LIFE DUNIAS 2021-2026	Agency for Nature and Forests - Belgium. LIFE DUNIAS focuses on eradication of IAS on the Belgian dunes but will also lead on the 'black list' for the Atlantic region.	Expert input from Maïke Isermann and others. Support from national bodies such as OBN, INBO, ATEN, CEH, Quercus etc. The resulting report/list was presented at the Dynamic Dunescapes workshop in Devon (2023) and will be updated regularly.	✅ Significant progress but with more input needed from each MS (and UK)
Best practice examples of control of IAS	Mainly through dissemination of experience from LIFE projects.	D	Ongoing.	Mainly case studies published by site managers and LIFE	Experts and research bodies	✅ Well published case studies and development of

Description	Relevance	Type	Timing	Lead	Support	Progress
	Presentations/ workshops at Littoral 2017, LIFE-FLANDRE conference and LIFE DUNIAS.			projects. LIFE DUNIAS will publish a best practice document for tackling IAS in English and share it with the dune network (based on research, contacts with experts and own project experience). LIFE INSULAR will provide knowledge about plant IAS control in Southern European dunes, including a best practice handbook.		local programmes
Specific review of experience in the control of <i>Rosa rugosa</i> with details of costs and development of national programmes	<i>Rosa rugosa</i> recognised as a serious threat to dune sites in NW Europe. Confirmed at LIFE DUNIAS workshop. Best practice guide published by LIFE REDCOHA for Denmark 2019 ¹²	S	Ongoing through several LIFE projects	Compilation of experience across Europe by Maike Isermann.	LIFE projects and national authorities. Removal of <i>Rosa rugosa</i> a key target in DuneLIFE LIFE17 NAT/UK/000570	☑ Continued interest in sharing experiences.

¹² All reports from LIFE REDCOHA available from https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=4618

Part II: Record of communication and networking, meetings and publications

Communication actions – across the Atlantic region

Description	Relevance	Type	Timing	Lead	Support	Progress
Maintain an informal European Dune Network	Value of communication stressed in biogeographical process and from practitioners.	D	Ongoing- website covering Europe	Lead taken by Maike Isermann in developing the <i>Beach and Dune Network</i> website through EUCC-DE ¹³	Website is managed on a voluntary basis with contributions from members.	☑ Initiative taken by EUCC-DE. There are plans to further develop the resource.
Recommendation from first biogeographical seminar was to establish an expert-network of governmental agencies responsible for management of coastal dunes in the Member States (MS)	The Natura 2000 biogeographical process encourages MS to cooperate and share knowledge to help address joint concerns.	D	As yet no such arrangement has been established through the biogeographical process.	Although no MS has offered to lead there is good communication between nature conservation bodies at project level.	Recognition of the roadmap by both EC and MS would help to promote knowledge exchange.	☒ The work of the informal European Dune Network has no recognition at MS level
Maintain existing regional and national networks, websites and newsletters	The Coastal & Marine Union-EUCC, based in Leiden, supports the implementation of the roadmap for coastal dunes	D	Ongoing - but low key for dunes as part of its green coasts programme	EUCC would be willing to support new initiatives for coastal dunes if opportunities permit	EUCC will continue to support regional offices	☒ In recent years EUCC has not been able to secure funding or support to develop initiatives for European dunes
World Sand Dune Day	Initiative of the projects Dynamic Dunescapes and Sands of LIFE (UK) and Stichting Duinbehoud in The Netherlands	D	First held in June 2021 and to be repeated every year on last Saturday in June	UK LIFE projects (Natural England and Natural Resources Wales)	Coastal managers, community groups and conservation organisations in the UK, Europe and beyond	☑ UK initiative has joined with Dutch 'dag van de duinen'. LIFE INSULAR will hold events until 2026.

¹³ <https://www.eucc-d.de/beach-and-dune-network.html>

Communication actions – country by country

Description	Relevance	Type	Timing	Lead	Support	Progress
UK Sand Dunes and Shingle Network	Formed in 2007. Currently 500 contacts on LinkedIn group. Maintains links to Ireland.	D	Active: website to be refreshed	Paul Rooney – Liverpool Hope University	UK network is supported by national agencies.	☑ Some progress but requires more financial support from UK agencies
LIFE projects in UK	Mainly England and Wales – but involving a range of national agencies, NGOs and private landowners.	D	Active: focus on communication and community engagement, social-media, newsletters, websites, blogs and published reports	Kathryn Hewitt/ Sands of LIFE & Verity Pitts/ DuneLIFE (Dynamic Dunescapes)	Site managers and conservation staff.	☑ Extensive communication and education programmes
LIFE projects in Ireland	LIFE on Machair works mainly with farming community	D	Active: website for community engagement and dissemination	LIFE on Machair/ Catherine Farrell	Farming and tourism bodies	☑ Website active ¹⁴
EUCC France	EUCC France ¹⁵ maintains programme of events, publications and newsletters	D	Active: international meetings Merlimont 2014 and Littoral 2016	Sandrine Aubié (Secretary General)	EUCC-France supported by Ministry of Ecological Transition and membership.	☑ EUCC- France provides a networking service for coastal habitat management
Office National des Forêts (ONF)	ONF manages 400km of coastline, mostly on behalf of the French State. It has considerable expertise in dune management including publication of technical manuals	D	Active: regular newsletters and best practice guidance	David Rosebery - Natural Risks Manager- ONF Coastal Division	ONF communicates with communities across France.	☑ ONF publish the annual newsletter <i>Grains de Sable</i>
LIFE projects in Spain	LIFE projects have shared experience. LIFE ARCOS and LIFE Stop Cortaderia had	D	LIFE ARCOS joint ES/FR seminar on dunes under human pressure -	LIFE INSULAR/ Javier Ferreiro (IBADER)	Previous support from EUCC to help disseminate results.	☑ Succession of LIFE projects in northern Spain

¹⁴ <https://lifeonmachair.ie/>

¹⁵ <http://euccfrance.fr/>

Description	Relevance	Type	Timing	Lead	Support	Progress
	close links to France. LIFE INSULAR is partnered with Ireland, will network with European dune projects, and supports the European Dune Network		meetings in Santander 2017 and Dunes des Pays de Monts 2018. LIFE INSULAR has newsletters, website, social media, scientific publications, and expected best practice handbook.			helps to maintain links
EUCC - Germany	EUCC-D website hosts the English language Beach and Dune Network.	D	Ongoing	EUCC-D / Maïke Isermann	150 people in Beach and Dune Network.	☑ EUCC-D has taken a lead in expanding its website
Netherlands	Support for European Dune Network	D	Ongoing	Main contact Luc Geelen / Waternet-Amsterdam Dunes	Also connection to the OBN expert team for Coast & Dunes	☑ Updates of all work in NL disseminated through Beach and Dune Network website
LIFE projects in Belgium	Support for European Dune Network	D	Ongoing	Main contact Reinhardt Strubbe / ANB	Support from INBO, European dune network, IUCN France	☑ Multiple dissemination actions (English best practices IAS report planned)
Denmark	Support for European Dune Network	D	Ongoing	Jeppe Pilgaard / Thy National Park	Dutch, Belgian and UK dune managers	☑ Study tour to Dutch sites organised in 2022 ¹⁶

¹⁶https://www.eucc-d.de/files/eucc/Netzwerke/Duenennetzwerk/pdf_files/Report_Reinhardt_Strubbe_etal_2020small.pdf

Key international meetings held: conferences, workshops and events 2016 -2023

Description	Relevance	Type	Timing	Lead	Support
Littoral 2016 conference Biarritz, France	Geomorphology, biodiversity and management in relation to climate change.	S	October 2016	EUCC-France	EUCC branches
Littoral 2017 conference Liverpool, UK	Discussions and field trips on dune management.	S	September 2017	Liverpool Hope University	EUCC
LIFE FLANDRE international workshop on management of coastal dunes and sandy beaches. Event supporting the biogeographical process	Restoration and management of coastal dunes. Presentation and workshop on dune roadmap.	S	June 2018	Flemish Agency for Nature and Forests	Support from project partners, dune networks and other LIFE projects.
Final seminar of LIFE REDCOHA, Thy, Denmark	Presentation of findings in the area especially related to control of <i>Rosa rugosa</i> .	S	June 2018	Danish Nature Agency	Paul Rooney - Liverpool Hope University
Littoral 2018 conference Leeuwarden, The Netherlands	Session on cultural heritage and dunes	S	October 2018	Van Hall Larenstein University /EUCC	EUCC
Final seminar of LIFE REWETDUNE and LIFE WETHAB, Skagen, Denmark	Sharing lessons learned from two projects focusing on habitats 2130*, 2140* and 2190	S	May 2019	Danish Nature Agency	International experts, LIFE projects
Sands of LIFE project - international workshops	Bring together experts from Atlantic Region	S	June 2019 and October 2021	Natural Resources Wales (NRW)	International experts, LIFE projects.
LIFE DUNIAS expert meeting on IAS in the Atlantic region. Event supporting the biogeographical process	Expert meeting to consider development of a blacklist for the Atlantic dunes	S	May 2022	Agency for Nature and Forests (ANB)	INBO
Littoral 2022	Workshop on Beaches and Dunes	S	September 2022	EUCC workshop by Frank van der Meulen / Luc Geelen	Nova School of Science and Technology
LIFE Dynamic Dunescapes	Final meeting of project to share experience on creating notches, conservation grazing, managing invasive species and how the project provided	S	March 2023	Natural England - Verity Pitts	Natural Resources Wales, Plantlife, National Trust and Wildlife Trusts

Description	Relevance	Type	Timing	Lead	Support
	training, learning and engagement.				

Conferences planned

Description	Relevance	Type	Timing	Lead	Support
Sands of LIFE project- international conference	For technical experts and policy makers	S	TBC (May/June 2024)	Natural Resources Wales	Dune networks
LIFE DUNIAS - final dissemination event	Discussion of IAS black list for the Atlantic Region	S	TBC (probably 2026)	Agency for Nature and Forests (ANB)	INBO, Dune networks
LIFE INSULAR workshops in Spain, France and Portugal	Three workshops about management of insular and coastal habitats	S	TBC (probably between 2024 and 2026)	Javier Ferreiro (IBADER)	French and Portuguese nature conservation agencies and local stakeholders
LIFE INSULAR Final seminar	Sharing project knowledge and results with other managing bodies	S	TBC (probably between September and December 2026)	Javier Ferreiro (IBADER)	Galician nature conservation competent agency and Spanish National Park body
French dune symposium to review research and practice, especially in relation to dynamic dune management and adaptation to climate change	The ONF has provided sites for research projects on natural dune remobilisation and parabolic dune development, blowout promotion and notch creation, in order to improve the adaptive management of coastal dunes in a context of climate change. The conclusion is that, in some places, in the face of marine erosion, dunes can regain resilience and retain their roles through improved natural functioning (natural mobility).	S	TBC (probably 2025)	David Rosebery (ONF)	French ministries, dune networks, EUCC, research and academic bodies

Completed projects

Description	Relevance	Type	Timing	Lead	Support
Flemish and North French Dunes Restoration LIFE FLANDRE Link to Layman's Report ¹⁷	Cross-border project on Belgian and French dunes	L	2013-2020	Agency for Nature and Forests (ANB)	Conservatoire du Littoral (FR) and Departement du Nord (FR)
In situ and Ex situ innovative combined techniques for coastal dune habitats restoration in SCIs of northern Spain, LIFE ARCOS Layman Report ¹⁸ and after-LIFE conservation plan	LIFE Nature Project aimed to improve the conservation status of dune systems located in Northern Spanish Natura 2000 areas	D	2014-2018	Universidad de Oviedo	Project partners and nature conservation competent agencies
ENDURE (Ensuring Dune Resilience Under Climate Change). ERDF Interreg 2 Seas programme 2014-2020 ¹⁹ .	Trans-national project (UK, FR, BE and NL) addressing dune responses to climate change pressures	D	2018-2020	Norfolk County Council (UK)	Project partners and observers

Ongoing projects

Description	Relevance	Type	Timing	Lead	Support
Sands of LIFE LIFE17 NAT/UK/000023.	Dune dynamics, grazing (rabbit), and invasive species. Addresses Actions 1 and 4 of roadmap.	L	2018-2023	Natural Resources Wales	Networking and scientific studies relevant to the dune network
DuneLIFE (Dynamic Dunescapes) LIFE17 NAT/UK/000570 covers eight dune SAC sites in England, seven dune Annex I habitat types and four Annex II species	Dune dynamics, grazing, invasive species, hydrology and nutrient deposition. Addresses Actions 1, 5 and 8 of roadmap.	L	2018 -2023	Natural England with Plantlife UK, Wildlife Trusts and National Trust.	Local partners and managers. Additional funding from UK Heritage Lottery Fund to widen community engagement.

¹⁷ <https://www.natuurenbos.be/projecten/west-vlaanderen/life-project-flandre/flandre/life-nature-project-flandre-english>

¹⁸ <https://www.arcoslife.eu/>

¹⁹ <https://www.endure.eu.com/>

LIFE 100% favourable LIFE18 NAT/UK/000838	Aims to achieve favourable condition for range of habitats. Actions for dunes are scrub control, grazing and removal of invasive species including <i>Rosa rugosa</i> . Addresses Actions 2 and 8 of roadmap.	L	2019-2024	Royal Society for the Protection of Birds (RSPB)	Support from NatureScot
LIFE DUNIAS Dune restoration by tackling Invasive Alien Species LIFE20 NAT/BE/001442	Actions to tackle IAS in ten salt-marsh and sand dune habitats. Addresses Actions 4 and 8 of the roadmap	L	2021-2026	Agency for Nature and Forests (ANB)	Natuurpunt and several partners.
LIFE on Machair LIFE20 NAT/IE/000263 – to improve the conservation condition of Irish priority machair habitat 21A0* and fixed dunes 2130* including breeding waders and pollinators in nine SACs and four SPAs	Both target habitats reported as unfavourable-bad in 2019. Project will network with former UK machair LIFE projects. Addresses actions 5 and 6 of the roadmap	L	2022- 2028	Irish Department of Housing, Local Government and Heritage	Machair is only dune habitat wholly dependent on agricultural systems. Project support given by farmers, communities and national agricultural bodies.
LIFE INSULAR LIFE20 NAT/ES/001007 targets restoration of fixed dunes 2130* and European dry heaths 4030 on five islands of the Atlantic Ocean, spread across Atlantic and Macaronesian biogeographical regions	Focus on removal of senescent forest plantations to restore open dunes and control of invasive alien species. Addresses Action 8 of the roadmap	L	2021-2026	Lead from IBADER (University of Santiago)	Galician nature conservation agency, Spanish National Parks Body, TRAGSA, Department of Housing, Local Government and Heritage (Ireland) and Coillte Nature (Ireland).
LIFE WADER LIFE20 NAT/UK/000277 targets environmental restoration on the Northumbrian coast of UK	Includes actions for the control of IAS <i>Acaena novae-zelandiae</i> on coastal dune paths. Addresses Action 8 of the roadmap.	L	2021-2026	Natural England	Tweed Forum, Environment Agency and University of Newcastle

Key publications 2016-2023

Description	Relevance	Type	Timing	Lead	Support
Journal of Coastal Conservation Vol. 21 (5) October 2017. Coastal Dune Hydro-ecology special edition	Some open access papers and reference to dune roadmap	R	2017	Centre for Ecology and Hydrology/ Liverpool Hope University	British Geological Survey, Natural England, Natural Resources Wales
LIFE and Coastal Habitats ²⁰	Summary of contribution of LIFE programme	D	2017	European Commission	NEEMO external monitoring team
Wadden Sea Quality Status Report Beaches and Dunes ²¹ . A.V. de Groot <i>et al.</i>	Chapter on invasive species in dunes.	D	2017	TMAG Trilateral Monitoring and Assessment Group	co-author Maïke Isermann
Guide to managing dunes and associated beaches (in French) ²²	Technical guide prepared by ONF at request of Ministry of Ecological Transition	G	2018	Compiled by Loïc Gouguet - published by Editions Quae	ONF, Conservatoire du Littoral, BRGM, EUCC-France, CEREMA, Rivages de France and others
Small scale wind erosion for the benefit of coastal dune grasslands. M. van Til <i>et al.</i> English summary translation of the Dutch study <i>Restoring grey dunes by reactivating small-scale dynamics</i> ²³	Explains importance of small scale wind erosion for health of fixed dune landscapes. Original study linked to the Dutch Nitrogen Programmatic Approach (PAS)	D	2019	Compiled by OBN Dunes and Coastal Areas Expert Team	English publication assisted by European dune network members
Exotic Invasive Species in Galicia: A worrisome problem in the protection of Biodiversity [In Spanish] ²⁴	Report on invasive alien species in Galicia	D	2019	Javier Ferreiro/IBADER	Galician Atlantic Islands National Park
Insular environment: anthropization and expansion of invasive alien species. Situation in the Maritime-Terrestrial	Analyses environmental and management aspects of the islands, focused on the	D	2019	Javier Ferreiro/IBADER	Galician Atlantic Islands National Park

²⁰ <https://op.europa.eu/en/publication-detail/-/publication/c6515bde-5bdd-11e7-954d-01aa75ed71a1>

²¹ <https://qsr.waddensea-worldheritage.org/reports/beaches-and-dunes>

²² <https://www.quae.com/product/1367/9782759224838/guide-to-managing-dunes-and-associated-beaches>

²³ https://www.natuurkennis.nl/Uploaded_files/Publicaties/obn-greydunes-def2.ad1ff6.pdf

²⁴ <https://www.ibader.gal/download.php?f=00-invasoras01-PR-171.pdf>

Description	Relevance	Type	Timing	Lead	Support
National Park of the Atlantic Islands of Galicia [In Spanish] ²⁵	problem of exotic and invasive species.				
Proceedings of the 2017 Littoral conference 'Change, Naturalness and People'. ²⁶	Papers on Dune Roadmap, IAS in Dutch dunes, rabbit grazing in Dutch dunes, FCS for dune habitats and long-term vegetation change	D	2020	Jones, Smyth and Rooney (eds)	Published by UK Centre for Ecology and Hydrology (NERC)
The state of coastal dunes of the Atlantic biogeographical region 2020. Published on beach and dune network website ²⁷ .	Review of Article 17 reports for the dune habitats of the Atlantic Biogeographical Region. Gives drive to the roadmap by identifying habitats and species in unfavourable condition	D	2021	John Houston	Based on information published in EU State of Nature report 2020
Sand Dune Managers Handbook – version 1 Jones <i>et al.</i> 2021 ²⁸	Handbook of techniques in UK including foredune notches, grazing, scrub control and invasive species.	G	2021	Centre for Ecology and Hydrology, Liverpool Hope University and Dynamic Dunescapes partners	Case studies drawn from Dynamic Dunescapes projects
Dutch studies on remobilisation projects. Overview of projects by M. Nijenhuis and management guide for the creation of notches and parabolic dunes ²⁹ . Links also on beach and dune network website including a scientific overview by van Kuik <i>et al.</i> 2022.	21 projects along the Dutch coast to create notches in the foredunes are described by M. Nijenhuis and a practitioners guide summarising good practice is published by the program towards a rich Wadden Sea	G	2022	Several studies	Land managers for the good practice guide and review. Translation should be considered.

²⁵ <https://www.ibader.gal/download.php?f=00-invasoras06-JAF-789.pdf>

²⁶ <https://nora.nerc.ac.uk/id/eprint/528695/>

²⁷ https://www.eucc-d.de/files/eucc/Netzwerke/Duenennetzwerk/pdf_files/Coastal%20dunes%20of%20the%20Atlantic%20biogeographical%20region-Article%2017%20analysis.pdf

²⁸ https://dynamicdunescapes.co.uk/wp-content/uploads/2021/10/The-Dynamic-Dunescapes-Sand-Dune-Managers-Handbook-June-2021_Oct-Update.pdf

²⁹ <https://rijkewaddenzee.nl/thema/2-natuurlijke-dynamiek/index.htm>

Description	Relevance	Type	Timing	Lead	Support
Review of invasive species in UK and Ireland ³⁰ . Published by Dynamic Dunescape	Review of past, present and future threats from invasive plant species	D	2023	John Houston	Contributions from Irish experts
Assessment of current and future invasive plants in protected habitats of the Atlantic coastal region. Adriaens <i>et al.</i> 2022 ³¹ A scientific publication will follow.	Output of the LIFE DUNIAS workshop on alien invasive species, May 2022	D	2022	Research Institute for Nature and Forest (INBO)	Workshop participants
Galician Atlantic Islands National Park: Challenges for the Conservation and Management of a Maritime-Terrestrial Protected Area ³²	Evaluates the past and present challenges for conservation in Galician Atlantic Islands National Park (NW Spain)	D	2022	Javier Ferreiro/IBADER	Galician Atlantic Islands National Park

³⁰ <https://dynamicdunescape.co.uk/wp-content/uploads/2023/02/Dune-Management-Invasives-J-Houston-Report.pdf>

³¹ https://purews.inbo.be/ws/portalfiles/portal/90178920/Adriaens_etal_2022_AssessmentCurrentAndFutureInvasivePlants.pdf

³² https://www.lifeinsular.eu/archivos/pdfs/461/2022_IntechOpen-57.pdf

ANNEX 2: Version management

Version 1.0 2016

As a contribution to the Natura 2000 Biogeographic Process a LIFE Platform meeting on coastal and inland dunes, hosted by Waternet, PWN and Natuurmonumenten, was held in Zandvoort, The Netherlands, from 15-17 June 2016. The meeting was organised by the Neemo LIFE team and ECNC on behalf of the European Commission and focused on sharing experience on the restoration of dune habitats. The LIFE Platform meeting reinforced the conclusions of the Dynamic Dunes 2015 conference organised by Dutch LIFE projects. Platform participants contributed to a draft roadmap for knowledge exchange for discussion at the 2nd Atlantic biogeographic seminar held in Ennistymon, Ireland, from 25-27 October 2016.

Version 1.1 2016

Version 1.1 of the roadmap was prepared as an output from the 2nd Atlantic Biogeographic seminar, 25-27 October 2016, Ennistymon, Ireland .

Version 2.0 2018

Version 2 was the product of several meetings and workshops involving representatives of the Atlantic member states at the 2012 and 2016 Atlantic Biogeographic Seminars, the Dutch LIFE 'Dynamic Dunes 2015' conference, the LIFE Platform meeting on coastal and inland dunes 2016, Littoral 2016 in Biarritz and Littoral 2017 in Liverpool. Further input to V2 was provided by Katy Owen (Norfolk County Council), Luc Geelen (Amsterdam Waterworks Dunes), Sue Rees (Natural England), Maike Isermann (EUCC-Germany), Julie Creer (Natural Resources Wales), Eric van Dijk (EUCC Netherlands & Duinbehoud) and Eva Remke (B-Ware B.V.). Version 2 was presented at the LIFE+ FLANDRE international workshop on management of coastal dunes and sandy beaches, Dunkirk, 12-14 June 2018

Version 3.0 2019

Version 3 was the result of further discussions at LIFE+ FLANDRE international workshop on management of coastal dunes and sandy beaches, Dunkirk, 12-14 June 2018. It was presented at the third Atlantic Biogeographical Seminar, Antwerp, 12-14 June 2019.

Version 4.0 2023

Version 4 follows presentation and discussions at the Sands of LIFE workshop in Bridgend, Wales in June 2019, the publication of State of Nature report in 2020 (the results of the Article 17 process 2013-2018), the second international workshop held by Sands of LIFE in October 2021, presentations at the LIFE DUNIAS workshop on invasive alien species in May 2022, presentations at Littoral 2022 in Lisbon and the LIFE Dynamic Dunes conference in March 2023. Version 4 is a contribution to the 4th Atlantic biogeographic seminar to be held in Germany in September 2023. Additional input to V4 provided by Pablo Ramil-Rego (IBADER - ES), Manuel Rodríguez Guitián (IBADER - ES), Graham Weaver (Natural England - UK), Rachael Mills (Natural England - UK), Mark van Til (OBN Network - NL)

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