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IMPACT ASSESSMENT REPORT

ANNEX VIII-e

Accompanying the

proposal for a Regulation of the European Parliament and of the Council

on nature restoration

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Annex VIII-e: ROCKY AND DUNE HABITATS

Introduction

This paper provides information derived from the Member States' reports and assessments under Article 17 of the Habitats Directive. It is a background information to help identify possible restoration targets for the 'nature restoration law' under the EU Biodiversity Strategy to 2030.

The 'rocky and dune habitats' group include, 41 Annex I habitat types (see Table 1): sea cliffs, beaches, and islets (8 types), coastal and inland dunes (21 types), and rocky habitats (12 types).

Table 1 – Annex I Coastal and dune habitats types selected

Sea cliffs, beaches, and islets (8 types)		**Coastal and inland dunes (cont.)**	
1210	Annual vegetation of drift lines	2250	Coastal dunes with *Juniperus* spp.
1220	Perennial vegetation of stony banks	2260	*Cisto-Lavenduletalia* dune sclerophyllous scrubs
1230	Vegetated sea cliffs of the Atlantic and Baltic Coasts	2270	Wooded dunes with *Pinus pinea* and/or *Pinus pinaster*
1240	Vegetated sea cliffs of the Mediterranean coasts with endemic *Limonium* spp.	2310	Dry sand heaths with *Calluna* and *Genista*
1250	Vegetated sea cliffs with endemic flora of the Macaronesian coasts	2320	Dry sand heaths with *Calluna* and *Empetrum nigrum*
1610	Baltic esker islands with sandy, rocky and shingle beach vegetation and sublittoral vegetation	2330	Inland dunes with open *Corynephorus* and *Agrostis* grasslands
1620	Boreal Baltic islets and small islands	2340	Pannonic inland dunes
1640	Boreal Baltic sandy beaches with perennial vegetation	91N0	Pannonic inland sand dune thicket (*Junipero-Populetum albae*)
Coastal and inland dunes (21 types)		**Rocky habitats (12 types)**	

2110	Embryonic shifting dunes	8110	Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (‘white dunes’)	8120	Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)
2130	Fixed coastal dunes with herbaceous vegetation (“grey dunes’)	8130	Western Mediterranean and thermophilous scree
2140	Decalcified fixed dunes with *Empetrum nigrum*	8140	Eastern Mediterranean screes
2150	Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)	8150	Medio-European upland siliceous screes
2160	Dunes with *Hippophaë rhamnoides*	8160	Medio-European calcareous scree of hill and montane levels
2170	Dunes with *Salix repens* ssp. argentea (*Salicion arenariae*)	8210	Calcareous rocky slopes with chasmophytic vegetation
2180	Wooded dunes of the Atlantic, Continental and Boreal region	8220	Siliceous rocky slopes with chasmophytic vegetation
2190	Humid dune slacks	8230	Siliceous rock with pioneer vegetation of the *Sedo-Scleranthion* or of the *Sedo albi-Veronicion dillenii*
2210	Crucianellion maritimae fixed beach dunes	8310	Caves not open to the public
2220	Dunes with *Euphorbia terracina*	8320	Fields of lava and natural excavations
2230	*Malcolmietalia* dune grasslands	8340	Permanent glaciers
2240	*Brachypodietalia* dune grasslands with annuals		

Source: European Environment Agency – April 2021

'Rocky and dune habitats' coverage in the EU

The 41 habitat types selected cover close to **65 135 km²** (**1.7 %** of the EU terrestrial area[1]); this excludes areas reported by Romania, which are known to be largely overestimated[2].

The data available from Corine Land Cover[3] and from the Ecosystems Map of Europe[4] do not allow a straightforward comparison between the total area of 'rocky and dune habitats' in the EU and the area covered by Annex I habitats. This is mainly due to the nomenclatures used and the spatial resolution of the datasets. A comparison between these data sources is given in Table 2 below.

Table 2 – Rocky and dune land (km²) from different sources (EU27)

Corine Land Cover 2018 (level 3)

Open spaces with little or no vegetation	**62 554**
331 – Beaches, dunes and sand plains	2 966
332 – Bare rocks	20 145
333 – Sparsely vegetated areas	38 200
335 – Glaciers and permanent snow	1 243

Ecosystems map (level 3)

B – Coastal habitats	**2 728**
B1 – Coastal dunes and sandy shores	2 392
B2 – Coastal shingle	41
B3 – Rock cliffs, ledges and shores, including the supralittoral	295
H – Inland unvegetated or sparsely vegetated habitats	**39 811**
H2 – Screes	1 785
H3 – Inland cliffs, rock pavements and outcrops	22 364
H4 – Snow or ice-dominated habitats	1 261
H5 – Miscellaneous inland habitats with very sparse or no vegetation	14 401

The areas of rocky and dune habitats are widely distributed along the EU coast, mountain ranges, and inland sandy plains (see Map 1).

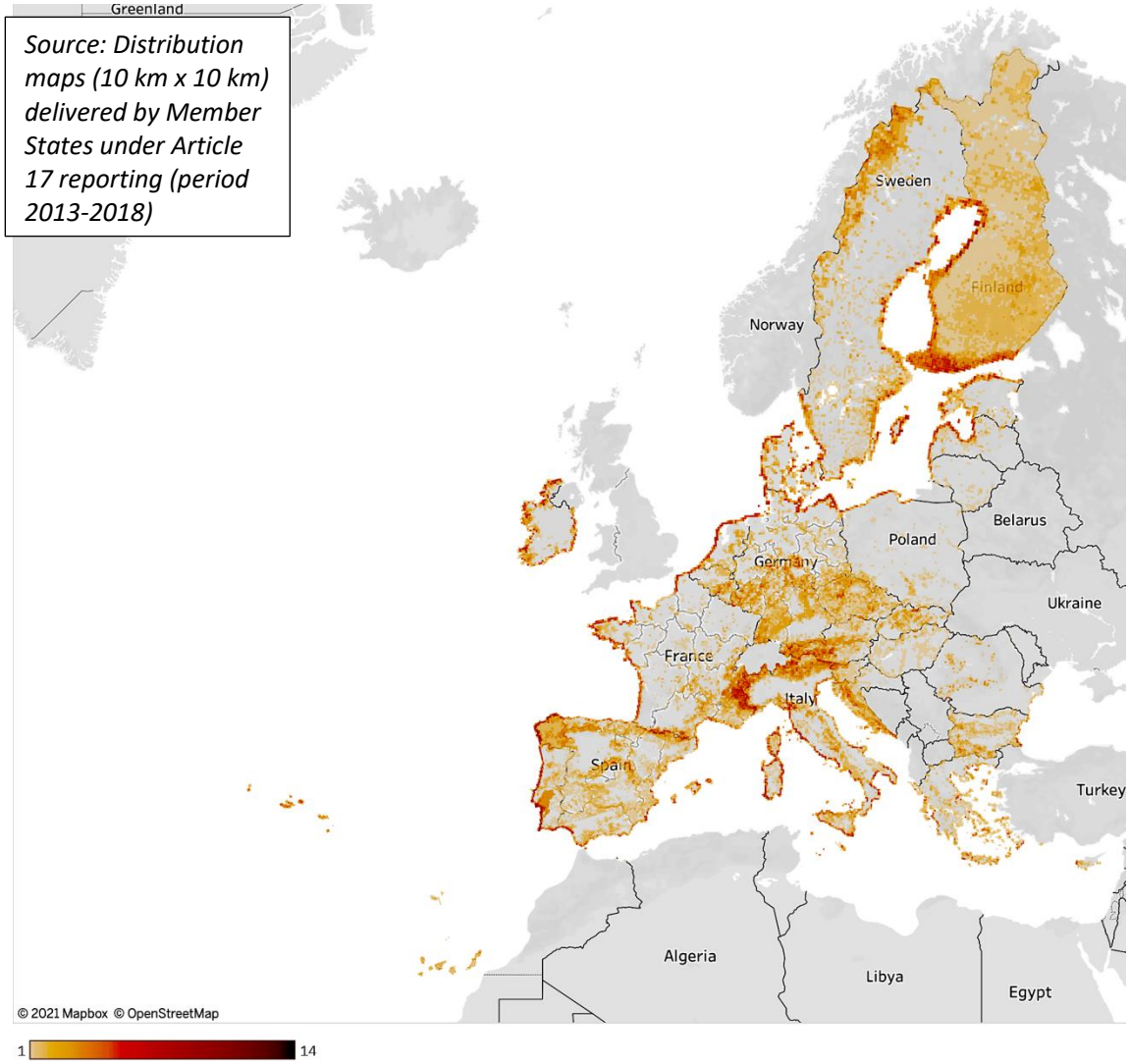
[1] Area of habitats calculated from the area reported by Member States as 'best estimate' or 'average of minimum/maximum'
[2] The average total area of rocky and dune habitats reported by Romania is 61 107 km²
[3] https://www.eea.europa.eu/data-and-maps/dashboards/land-cover-and-change-statistics
[4] https://www.eea.europa.eu/themes/biodiversity/mapping-europes-ecosystems

Table 3 gives the areas and proportion of rocky and dune habitats for each Member State, including coverage by Natura 2000.

From the **65 135 km^2** of rocky and dune habitats (excluding Romania), about **35 %** is estimated to be inside the Natura 2000 network (about **22 686 km^2**); this may be an underestimation since reports from Member States were not comprehensive on this regard. The coverage by Natura 2000 varies according to the sub-group; **72 %** for 'coastal and inland dunes', **30 %** for 'rocky habitats', and **27 %** for sea cliffs and beaches. The proportion of habitats per sub-group of 'rocky and dune' habitats and their coverage is detailed in Table 4.

Coverage by Natura 2000 also greatly varies according to the Member State: **from over 80 %** (Belgium, Croatia, Cyprus, Hungary, Lithuania, Netherlands, Slovakia, and Slovenia) **to less than 25 %** (Finland, and France) (Table 3).

Map 1 – Distribution of the 41 Annex I rocky and dune habitats in the EU



Source: Distribution maps (10 km x 10 km) delivered by Member States under Article 17 reporting (period 2013-2018)

Note: the shades of brown indicate the number of habitat types per 10 km x 10 km grid cell.

Source: European Environment Agency – April 2021

Table 3 – Area and proportion of rocky and dune habitats per Member State

	Member State area (km^2)	In the Member State		Proportion of the Steppe, heath & scrub area (%)	Inside Natura 2000	
		Steppe, heath & scrub area (km^2)	Steppe, heath & scrub area (%)		Steppe, heath & scrub area	% Steppe, heath & scrub area
Austria	83 944	2 847	3.4	4.4	1 340	47.1
Belgium	30 683	62	0.2	0.1	52	84.1
Bulgaria	110 995	549	0.5	0.8	305	55.6
Croatia	55 590	761	1.4	1.2	639	83.9
Cyprus	9 249	3	0.0	0.0	3	83.3
Czechia	78 874	81	0.1	0.1	40	49.5
Denmark	44 162	631	1.4	1.0	373	59.1
Estonia	45 382	113	0.2	0.2	85	74.8
Finland	338 004	3 868	1.1	5.9	857	22.2
France	551 881	32 467	5.9	49.8	3 280	10.1
Germany	362 177	624	0.2	1.0	480	76.9
Greece	132 014	801	0.6	1.2	467	58.3
Hungary	93 012	235	0.3	0.4	192	81.8
Ireland	70 699	184	0.3	0.3	137	74.2
Italy	301 321	7 633	2.5	11.7	4 484	58.7
Latvia	64 590	629	1.0	1.0	327	52.1
Lithuania	65 289	73	0.1	0.1	65	88.4
Luxembourg	2 595	5	0.2	0.0	3	68.0
Malta	316	43	13.6	0.1	24	57.0
Netherlands	39 898	500	1.3	0.8	457	91.4
Poland	312 683	456	0.1	0.7	178	39.1
Portugal (#)	92 378	595	0.6	0.9	1 434	241.0
Romania (*)	*238 404*	61 107	25.6	93.8	25 939	42.4
Slovakia	49 026	499	1.0	0.8	412	82.6
Slovenia	20 274	754	3.7	1.2	635	84.2
Spain	506 222	5 475	1.1	8.4	4 339	79.3
Sweden	450 110	5 247	1.2	8.1	2 076	39.6
Total	4 149 772	**126 242**	**3.0**		**48 625**	**38.5**
Total (without Romania)	**3 911 772**	**65 135**	**1.7**		**22 686**	**34.8**

Notes: Member States with more than 1 % (the EU average) of their terrestrial area covered by 'rocky and dune' habitats are highlighted; (*) areas reported by Romania are clearly overestimated; (#) Portugal reported

Source: European Environment Agency – April 2021

areas inside Natura 2000 but not overall for several habitats, which explain the abnormal figure of 241 % coverage by the network.

Table 4 – Area and proportion of rocky and dune per sub-group

		Inside Natura 2000	
EU27 excluding Romania	**Area (km^2)**	**Rocky and dune habitats (km^2)**	**% Rocky and dune habitats area**
Sea cliffs, beaches and islets	**5 728**	**1 533**	**27**
1210	172	238	(139)*
1220	359	97	27
1230	645	202	31
1240	494	220	44
1250	260	48	19
1610	555	161	29
1620	3 217	557	17
1640	27	10	39
Coastal and inland dunes	**7 376**	**5 314**	**72**
2110	165	125	75
2120	354	287	81
2130	1 322	763	58
2140	312	205	66
2150	72	781	1 079(*)
2160	154	129	84
2170	37	24	65
2180	2 069	875	42
2190	180	136	76
2210	44	33	77
2220	10	5	52
2230	79	66	84
2240	47	51	109(*)
2250	132	115	87
2260	431	284	66
2270	408	368	90
2310	100	79	80

Source: European Environment Agency – April 2021

2320	90	63	70
2330	1 304	880	67
2340	13	12	91
91N0	54	31	58
		Inside Natura 2000	
EU27 excluding Romania	**Area (km^2)**	**Rocky and dune habitats (km^2)**	**% Rocky and dune habitats area**
Rocky habitats	**52 031**	**15 839**	**30**
8110	5 567	2 268	41
8120	2 747	1 099	40
8130	1 827	1 179	65
8140	315	270	86
8150	21	15	72
8160	86	47	54
8210	5 875	3 747	64
8220	6 721	3 576	53
8230	1 134	678	60
8310	25 694	1 548	6
8320	728	575	79
8340	1 316	837	64
TOTAL	**65 135**	**22 686**	**35**

Note: (*) total area not reported for this habitat by Portugal, which reported surface area in Natura 2000

Conservation status and trends

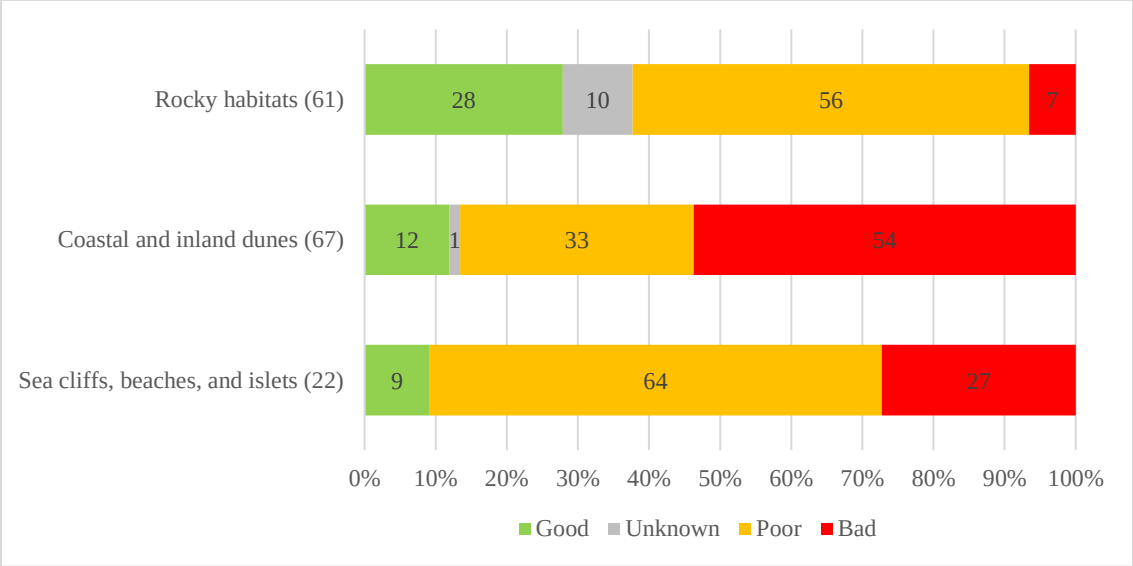
The vast majority (**78 %**) of the assessments of the 41 rocky and dune habitats at the EU level have an **unfavourable** conservation status (47 % poor and 31 % bad). **18 %** have a **good** conservation status. There are differences between the different habitat groups (Figure 1): 'rocky habitats' has the highest proportion of good status (28 %) and the 'sea cliffs, beaches, and islets' the worst status (91 % unfavourable).

Among the habitat assessments that do not have a good status, most have a **deteriorating** trend (**41 %**) while only **7 %** have an improving trend. An additional **33 %** maintain their unfavourable status; the conservation status trend is unknow for **20 %** of the assessments. The group with the worst conservation status trends is **'sea cliffs, beaches, and islets'** (**55 % deteriorating**); '**coastal and inland dune**' habitats have the higher proportion of

improving trends (**10** %), but also a very high proportion of deteriorating trends (54 %) (Figure 2).

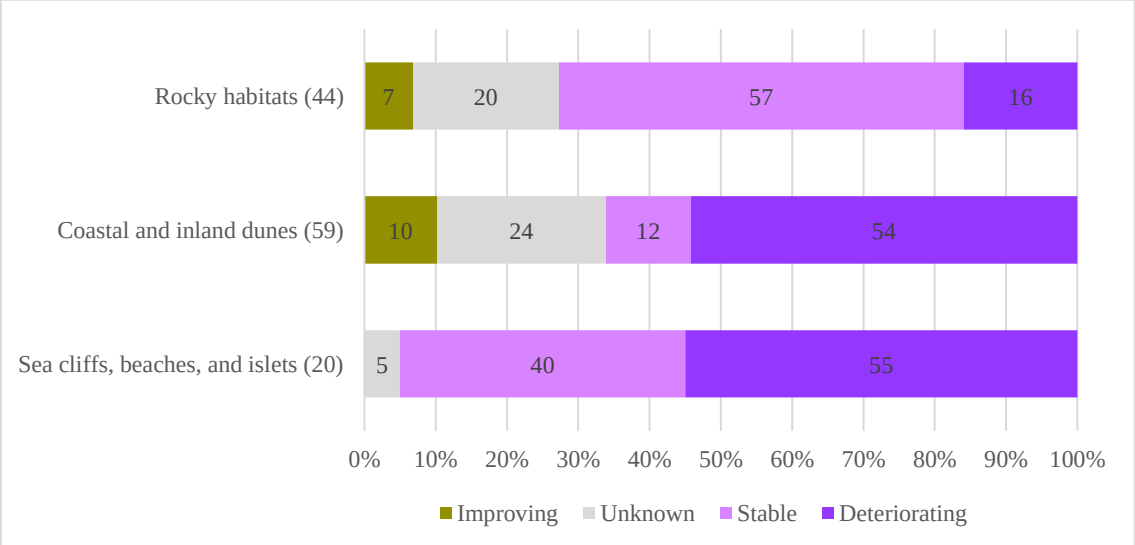
Details on conservation status and conservation status trends for each Member State are given in Table 5.

Figure 1 – Conservation status of rocky and dune habitats at the EU level (in percentage)



Note: Number of assessments per group shown in brackets.

Figure 2 – Conservation status trends of rocky and dune habitats at the EU level (in percentage)



Note: Number of assessments per group shown in brackets.

Source: European Environment Agency – April 2021

Table 5 – Conservation status and trends of rocky and dune habitats in the Member States (in percentage)

Member States	FV	U1-	U1+	U1=	U1x	U2-	U2+	U2=	U2x	XX
AT (16)	69				13	6		6	6	
BE (19)	16				5	5	11	32	32	
BG (27)				59	30					11
CY (11)	45			18		18			18	
CZ (15)	73			20		7				
DE (45)	42	11		11	2	27		2	4	
DK (32)	9	6			25	19			41	
EE (16)	81	6		13						
ES (44)	16	7	2	27	16	2		7	11	11
FI (20)	40	25		15		15			5	
FR (60)	30	15		13	13	17		5	3	3
GR (15)	47		7	47						
HR (14)	50	7		7		7		7	7	14
HU (7)	57			14		29				
IE (15)	13	13		67		7				
IT (44)	7	7		50		27		9		
LT (12)	33			8	42				17	
LU (6)	83			17						
LV (16)	25	13	13	25	6	6			6	6
MT (7)	14			14				71		
NL (12)	42			33	8			17		
PL (25)	32	4	8	32		12		4	8	
PT (40)	28	30		8		33				3
RO (21)	86		10	5						
SE (43)	33	5		9	5	12	5	5	28	
SI (12)	67			8	17	8				
SK (16)	81			6	6				6	

Notes: FV = good, U1 = poor, U2 = bad, XX = unknown conservation status '-' = deteriorating, '+' = improving, '=' = stable, 'x' = unknown conservation status trend; number of assessments per Member State shown in brackets.

Pressures

Rocky and dune habitats are subject to a wide diversity of pressures resulting in their degradation and extirpation. According to Member States reports under Article 17 of the Habitats Directive, the top three groups of pressures (in percentage of the total) are:

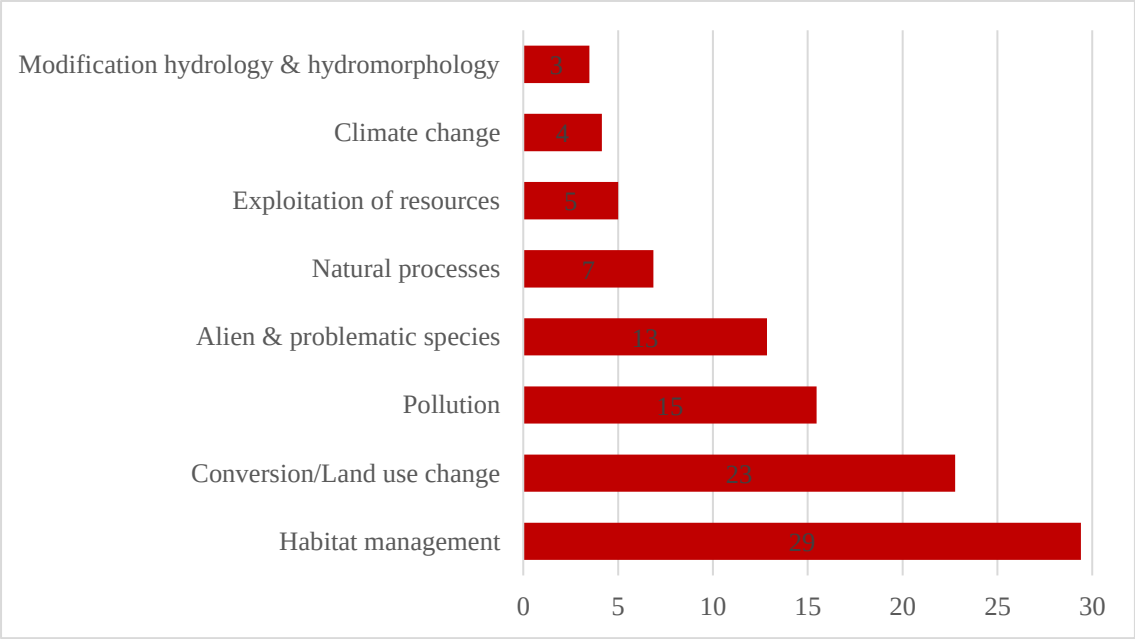
- **Habitat management** amounts to over **24 %**; from these, over 43 % arise from development of sports, tourism, and leisure activities, near one-third (32 %) is due

to abandonment, (on one hand), or intensification (on the other hand) of agricultural practices and, about 14 % from forest management activities

- **Conversion/Land use change** with near **23 %** of all pressures; from these, near 80 % arise from development of housing, industrial and recreational facilities, and coastal protection infrastructures
- **Pollution**, with over **15 %**; this is mainly due to mixed source air and water pollution (36 %), agricultural activities (35 %), and different types of urban, industrial and recreational activities (27 %).

Equally important are **alien & problematic species** with near **13 %**, particularly those species that are not listed in the EU regulation.

Figure 3 – Pressures reported for rocky and dune habitats (in percentage)



Note: based on pressures reported as 'high-ranking'.

Condition of habitats

Member States reported on the condition of habitat types under Article 17 of the Habitats Directive. This data can be used to estimate the area of rocky and dune habitats assessed as degraded (condition not-good) therefore, requiring restoration.

The area of rocky and dune habitats that would need to be restored, i.e., improved condition, is **at least 6 619 km^2**, representing **10 %** of the total area reported for this group of habitats (the values exclude Romania). However, the condition of habitats reported as 'unknown' (or not reported) is about 28 500 km^2 (44 % of the total area). This means that the area requiring restoration is bigger than 6 619 km^2; for example, assuming that half of the 'unknown' area is in a not-good condition, the area to be restored would be over 20 800

Source: European Environment Agency – April 2021

km^2 or 35 100 km^2 if all the 'unknown' is assumed to be in a 'not-good' condition (44 % of the total area). Table 6 gives information for each of the 41 rocky and dune habitats (excluding Romania) and Table 7 the condition areas and percentage for each of the Member States.

In addition to the habitat condition, Member States also reported on the 'favourable reference areas'[5]. Comparing this area with the actual habitat area allows to estimate how much area of the habitat would need to be re-created to achieve a good distribution and area of the habitat. Based on this data, it is estimated that a **strict minimum** of **355 km^2** would need to be **re-created** to achieve a 'favourable area':

- 22 km^2 for cliffs, beaches, and islets habitats
- 223 km^2 for costal and inland dunes (particularly for priority habitat 'Pannonic inland dunes)
- 111 km^2 for rocky habitats

However, these values are much higher since several Member States did not provide enough information in their reports to allow a more realistic estimation.

[5] The surface area in a given biogeographical region considered the minimum necessary to ensure the long-term viability of the habitat type; this should include necessary areas for restoration or development for those habitat types for which the present coverage is not sufficient to ensure long-term viability.

Table 6 – Condition of rocky and dune habitats per Annex I habitat type

		Condition (area in km2)			Condition (in percentage)		
	Habitat area	Good	Not-good	Unknown	Good	Not-good	Unknown
Total	**65 135**	**30**	**6 619**	**28 468**	**46**	**10**	**44**
Sea cliffs, beaches &	**5 728**	**2 367**	**397**	**2 964**	**41**	**7**	**52**
1210	172	76	52	43	45	30	25
1220	359	300	23	36	83	7	10
1230	645	574	65	6	89	10	1
1240	494	414	16	64	84	3	13
1250	260	133	23	104	51	9	40
1610	555	413	68	75	74	12	14
1620	3 217	440	141	2 636	14	4	82
1640	27	18	9	0	66	32	1
Coastal and inland	**7 376**	**2 339**	**1 412**	**3 625**	**32**	**19**	**49**
2110	165	39	18	109	23	11	66
2120	354	157	70	128	44	20	36
2130	1 322	512	513	298	39	39	23
2140	312	204	79	28	65	25	9
2150	72	65	1	6	90	1	8
2160	154	51	10	93	33	6	60
2170	37	11	6	19	31	17	53
2180	2 069	258	207	1 604	12	10	78
2190	180	90	58	32	50	32	18
2210	44	16	9	18	37	22	41
2220	10	9	0	1	90	0	10
2230	79	64	3	12	81	4	15
2240	47	14	32	1	31	68	1
2250	132	73	42	17	55	32	13
2260	431	343	81	7	80	19	2
2270	408	232	122	55	57	30	13
2310	100	36	23	41	36	23	41
2320	90	47	29	14	52	33	15
2330	1 304	99	74	1 131	8	6	87
2340	13	1	0	12	10	4	87
91N0	54	19	35	0	34	65	1
Rocky habitats	**52 031**	**25 343**	**4 810**	**21 878**	**49**	**9**	**42**
8110	5 567	1 593	224	3 750	29	4	67
8120	2 747	1 567	385	795	57	14	29
8130	1 827	1 168	306	352	64	17	19
8140	315	309	0	6	98	0	2
8150	21	12	2	8	54	9	37
8160	86	62	15	10	72	17	11
8210	5 875	2 864	561	2 449	49	10	42

Source: European Environment Agency – April 2021

		Condition (area in km2)			Condition (in percentage)		
	Habitat area	**Good**	**Not-good**	**Unknown**	**Good**	**Not-good**	**Unknown**
8220	6 721	3 783	274	2 663	56	4	40
8230	1 134	242	101	791	21	9	70
8310	25 694	12 885	1 966	10 844	50	8	42
8320	728	567	67	94	78	9	13
8340	1 316	291	909	115	22	69	9

Notes: Areas reported by Romania excluded from the table.

Table 7 – Condition of Annex I rocky and dune habitats per Member State

	Habitats area (km^2)				Percentage		
Member State	**Total**	**Good**	**Not-good**	**Unknown**	**Good**	**Not-good**	**Unknown**
AT	2 847	2 370	456	20	83	16	1
BE	62	26	31	5	42	50	8
BG	549	0	0	549	0	0	100
CY	3	3	0	0	87	9	4
CZ	81	58	5	17	72	7	22
DE	624	485	54	85	78	9	14
DK	631	358	271	2	57	43	0
EE	113	84	7	22	74	6	20
ES	5 475	2 257	360	2 858	41	7	52
FI	3 868	2 597	377	894	67	10	23
FR	32 467	14 814	3 941	13 712	46	12	42
GR	801	673	11	117	84	1	15
HR	761	759	0	1	100	0	0
HU	235	156	79	0	66	34	0
IE	184	142	42	0	77	23	0
IT	7 633	1 522	163	5 948	20	2	78
LT	73	41	9	23	56	12	32
LU	5	4	0	0	91	8	1
LV	629	93	47	489	15	7	78
MT	43	38	5	0	88	12	0
NL	500	169	164	167	34	33	33
PL	456	85	157	214	19	34	47
PT	595	318	107	170	53	18	29
RO (*)	61 107	53 508	526	7 074	88	1	12
SE	5 247	2 746	315	2 185	52	6	42

Source: European Environment Agency – April 2021

SI	754	245	15	494	32	2	66
SK	499	5	1	493	1	0	99

Notes: (*) areas reported by Romania largely overestimated.

Carbon stock and sequestration

Carbon sequestration and storage capacities of rocky and dune habitats are naturally low and, with few exceptions such as wooded dunes, provide only major contributions if the respective areas reach significant dimensions. Annual sequestration of these habitats is estimated to be about 5 Mio tons C per year or 18.4 Mio tons of CO_2. The storage capacity is estimated between 20 and 530 Mio tons of carbon equivalent to 73 to 1 945 tons of CO_2. Due to the nature of the habitats which are usually characterised by low vegetation and soil coverage the storage capacities are most likely more at the lower end of the estimated range. Only if covered by woody vegetation storage capacities per ha reach significant numbers even if annual sequestration rates are often low.

Table 8 – Carbon stock and sequestration of Annex I rocky and dune habitats

EU27 excluding Romania	Area (km^2)	Total Carbon Stock (Mt)		Potential carbon sequestration rate (Mt y^{-1})
		min	max	mean
Sea cliffs, beaches and islets	**5 728**	**0.00**	**42.97**	**0.43**
1210	172	0.00	1.29	0.01
1220	359	0.00	2.69	0.03
1230	645	0.00	4.84	0.05
1240	494	0.00	3.71	0.04
1250	260	0.00	1.95	0.02
1610	555	0.00	4.16	0.04
1620	3 217	0.00	24.13	0.24
1640	27	0.00	0.20	0.00
Coastal and inland dunes	**7 376**	**20.23**	**94.54**	**0.61**
2110	165	0.00	1.24	0.01
2120	354	0.00	2.66	0.03
2130	1 322	0.00	9.92	0.10
2140	312	2.34	4.68	0.07

Source: European Environment Agency – April 2021

EU27 excluding Romania	Area (km^2)	Total Carbon Stock (Mt)		Potential carbon sequestration rate (Mt y^{-1})
		min	max	mean
2150	72	0.54	1.08	0.02
2160	154	0.00	1.16	0.01
2170	37	0.00	0.28	0.00
2180	2 069	15.52	46.55	0.16
2190	180	0.00	1.35	0.01
2210	44	0.00	0.33	0.00
2220	10	0.00	0.08	0.00
2230	79	0.00	0.59	0.01
2240	47	0.00	0.35	0.00
2250	132	0.00	0.99	0.01
2260	431	0.00	3.23	0.03
2270	408	0.00	6.12	0.43
2310	100	0.75	1.50	0.01
2320	90	0.68	1.35	0.01
2330	1 304	0.00	9.78	0.10
2340	13	0.00	0.10	0.00
91N0	54	0.41	1.22	0.01
Rocky habitats	**52 031**	**0.00**	**390.23**	**3.90**
8110	5 567	0.00	41.75	0.42
8120	2 747	0.00	20.60	0.21
8130	1 827	0.00	13.70	0.14
8140	315	0.00	2.36	0.02
8150	21	0.00	0.16	0.00
8160	86	0.00	0.65	0.01
8210	5 875	0.00	44.06	0.44
8220	6 721	0.00	50.41	0.50
8230	1 134	0.00	8.51	0.09
8310	25 694	0.00	192.71	1.93
8320	728	0.00	5.46	0.05
8340	1 316	0.00	9.87	0.10
TOTAL	**65 135**	**20.23**	**527.74**	**4.95**

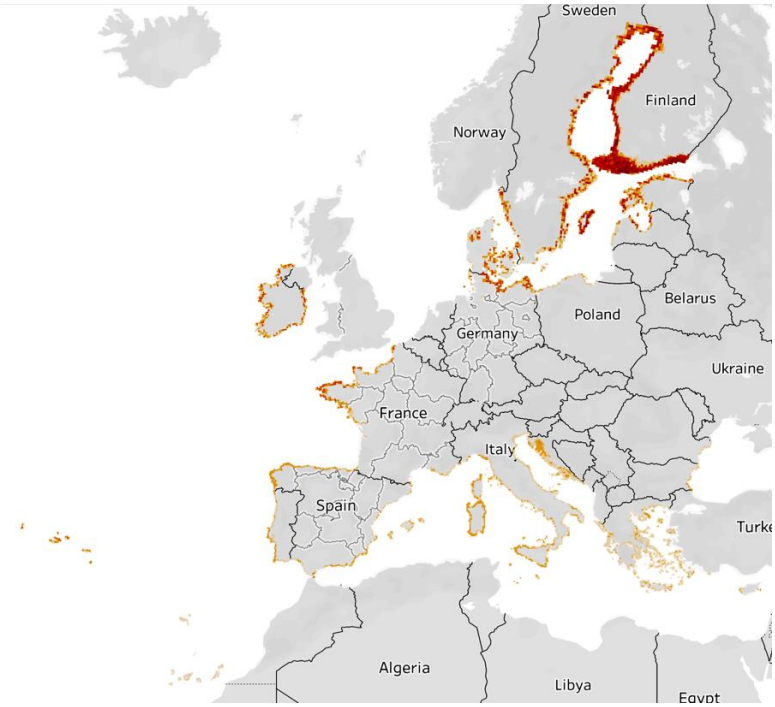
Source: European Environment Agency – April 2021

Note: areas reported by Romania note included.

Source: European Environment Agency – April 2021

Annex A

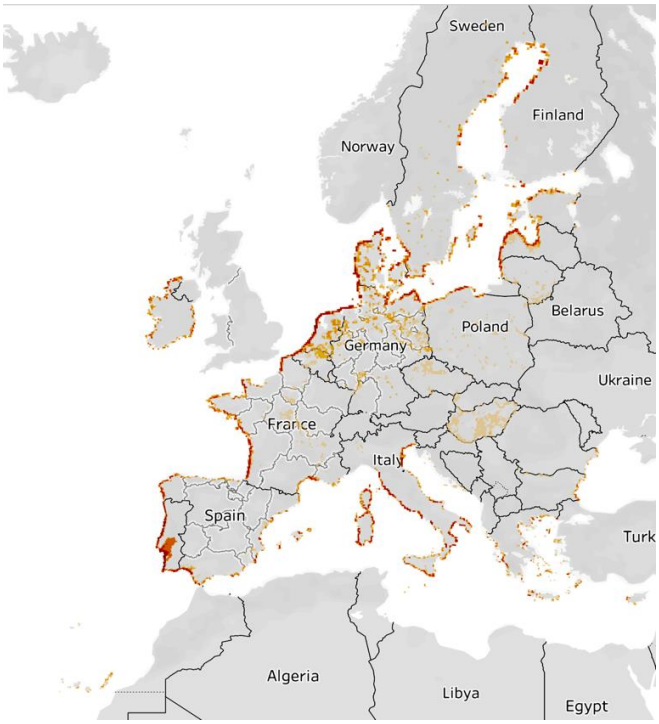
Map 2 – Distribution of Annex I sea cliffs, beaches, and islets (1210-1250, 1610, 1620, 1640)



Note: the shades of brown indicate the number of habitat types per 10 km x 10 km grid cell.

Map 3 – Distribution of Annex I coastal and inland dunes (2110-2190, 2210-2270, 2310-2340, 91N0)

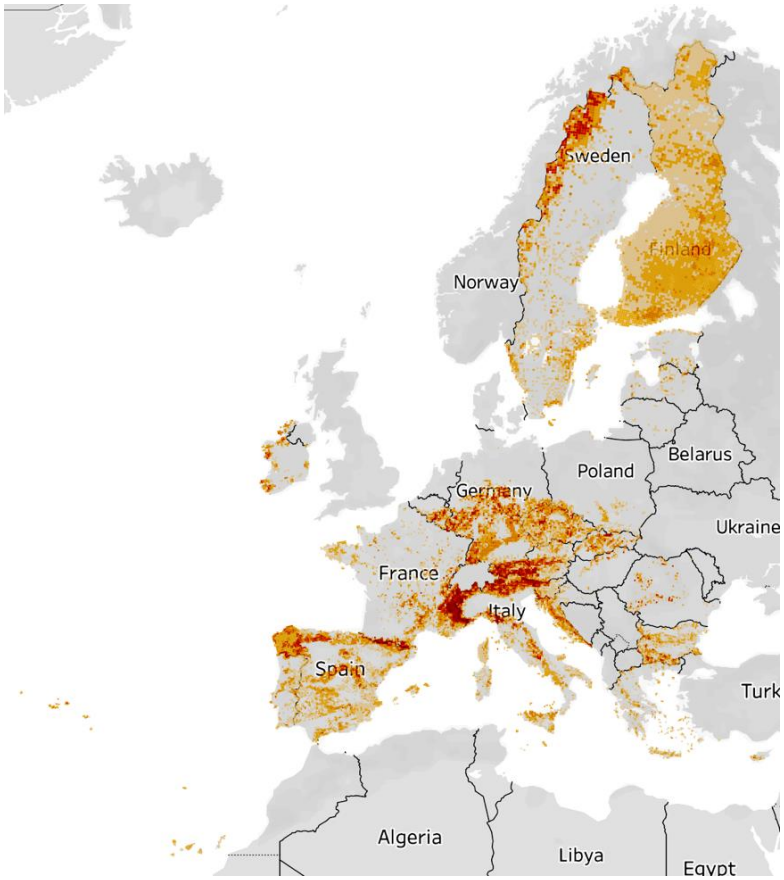
Source: European Environment Agency – April 2021



Note: the shades of brown indicate the number of habitat types per 10 km x 10 km grid cell.

Map 4 – Distribution of Annex I rocky habitats (8110-8160, 8210-8230, 8310-8340, except 8330)

Source: European Environment Agency – April 2021



Note: the shades of brown indicate the number of habitat types per 10 km x 10 km grid cell.

Source: European Environment Agency – April 2021