

H4.2 Ice cap and glacier

Summary

Ice sheets and ice caps are permanent or near-permanent dome-like ice masses unconstrained by topography. Developing from long-compacted snow, they are typical for large and high cold mountain ranges and more extensively at lower altitudes in the arctic. Very few organisms can survive here, but there can be unicellular algae on the melting surface in summer. They are especially sensitive to climate warming which affects both snowfall and surface mass balance. Some ice caps in Iceland are also vulnerable to catastrophic volcanic eruption beneath.

Synthesis

The trend in quantity over the last 50 years and over a longer time period both result in the Red List category Vulnerable (VU) for the EU28 countries. For the EU28+ countries the declines are slightly smaller, leading to the Near Threatened (NT) category. Additionally, the trends in quality (large areas declined with slight severity) lead to the category Vulnerable for both the EU28 and EU28+.

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Vulnerable	A1, A3, C/D1, C1	Vulnerable	C/D1, C1

Sub-habitat types that may require further examination

No sub-habitats have been distinguished for further analysis.

Habitat Type

Code and name

H4.2 Ice cap and glacier



Aletsch glacier in the Swiss Alps (Photo: Raymond Delarze).



Austerdalsbreen, Jostedalbreen glacier, Norway (Photo: D. Dîté).

Habitat description

Glaciers are permanent or near-permanent ice masses, created by the compaction of the snow accumulated in cold climates. These deposits, when they are under pressure, behave like a viscous liquid. So, a glacier is a mobile element, because of its ability to slowly flow along a slope under the effect of gravity. Different types of glacier exist. Characteristic for the arctic regions, ice sheets and ice caps are dome-like ice masses unconstrained by topography. More characteristic of the large mountain ranges, but also present in the arctic regions, most glaciers are constrained by topography. This is the case for cirque

glaciers, valley glaciers, mountain glaciers and piedmont glaciers. The smallest form of glacier is derived from snow-drifting, avalanches, or ice deposition in cold-bottom karst dolines. Called glacierets, these small ice masses may have an existence limited to a few years. They are especially sensitive to global warming of the climate. Climate change may cause variations in both temperature and snowfall, causing changes in the surface mass balance. Due to the extreme conditions of this habitat, especially at low temperatures, very few organisms occur in this environment, which could almost be considered sterile. Only some unicellular algae occasionally grow on the melting snow cover of glaciers during summer. These ice formations are found in high altitude or high latitude. In Europe, they occur only in the summit region of the Alps, the Pyrenees, the Scandes, and in the arctic regions.

Indicators of good quality:

- Long-term balance between accumulation of ice and melting (crucial for sustainable surviving of glaciers), usually expressed as “mass balance” or “surface mass balance” (SMB) and in this way used as a sensitive climate indicator for glaciers.

Characteristic species:

Flora, Algae: *Chlamydomonas nivalis*

Classification

This habitat may be equivalent to, or broader than, or narrower than the habitats or ecosystems in the following typologies.

EUNIS:

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Euroveg Checklist:

Mesotaenion berggrenii Bültmann et Takeuchi in Bültmann et al. 2014

Annex 1:

8340 Permanent glaciers

Emerald:

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MAES-2:

Sparsely vegetated land

IUCN:

-

Does the habitat type present an outstanding example of typical characteristics of one or more biogeographic regions?

Yes

Regions

Alpine

Arctic

Justification

The habitat is restricted to the arctic zone and the alpine biogeographical region (including alpine areas in the boreal region).

Geographic occurrence and trends

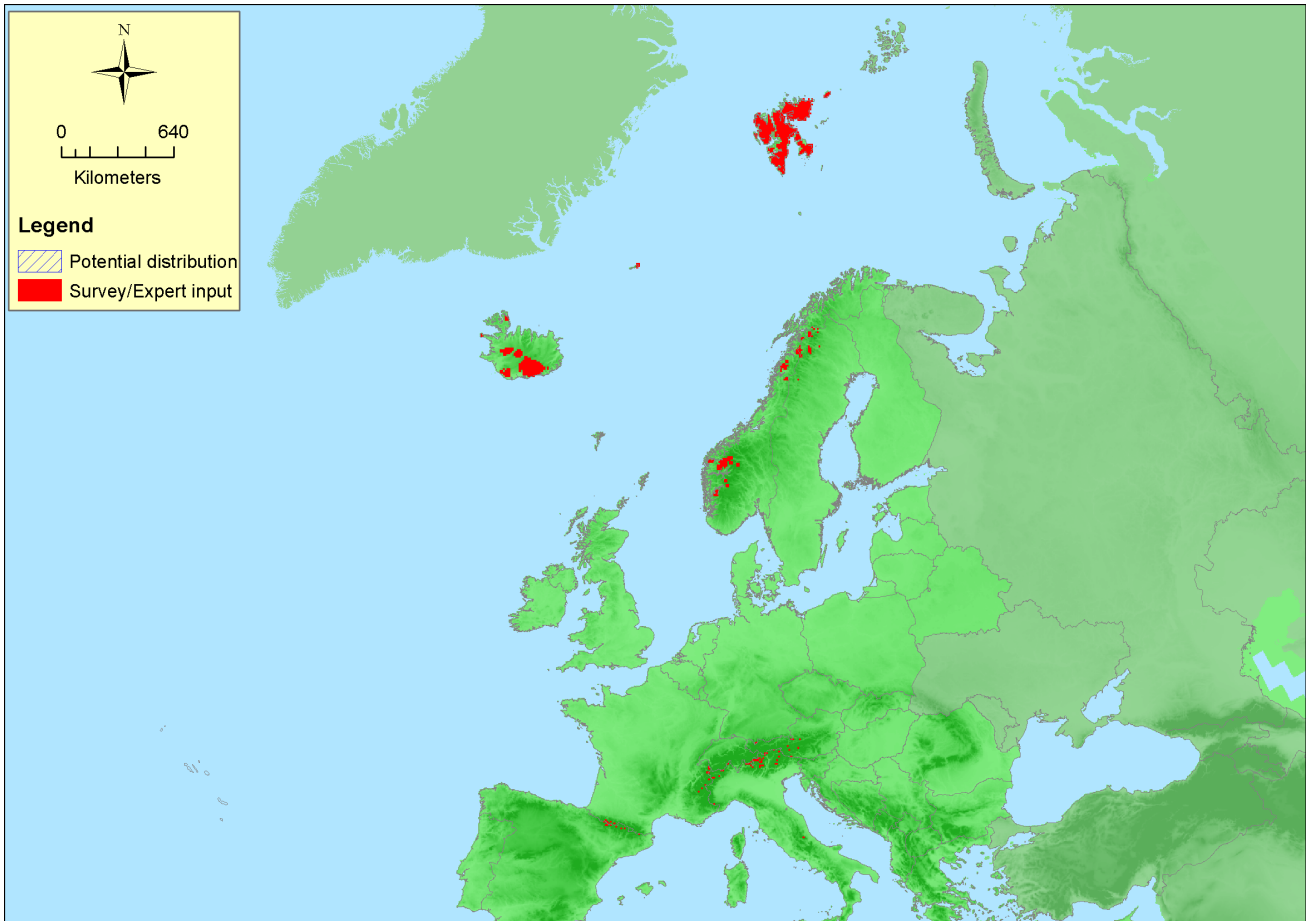
EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
<i>Austria</i>	Present	367 Km ²	Decreasing	Decreasing
<i>France</i>	France mainland: Present	275 Km ²	Decreasing	Unknown
<i>Germany</i>	Present	0.4 Km ²	Decreasing	Decreasing
<i>Italy</i>	Italy mainland: Present	413 Km ²	Unknown	Decreasing
<i>Slovenia</i>	Present	0.02 Km ²	Decreasing	Decreasing
<i>Spain</i>	Spain mainland: Present	8.6 Km ²	Decreasing	Decreasing
<i>Sweden</i>	Present	Unknown Km ²	Unknown	Unknown

EU 28 +	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
<i>Iceland</i>	Present	11000 Km ²	Unknown	Unknown
<i>Norway</i>	Jan Mayen: Present Norway Mainland: Present Svalbard: Present	46000 Km ²	Decreasing	Decreasing
<i>Switzerland</i>	Present	1050 Km ²	Decreasing	Decreasing

Extent of Occurrence, Area of Occupancy and habitat area

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
<i>EU 28</i>	1840350 Km ²	102	1100 Km ²	
<i>EU 28+</i>	5944150 Km ²	1022	60000 Km ²	

Distribution map



The map is complete, but maybe a bit overestimated for the Pyrenees. It is based on the Potential Vegetation Map of Europe (Bohn).

How much of the current distribution of the habitat type lies within the EU 28?

< 5%. Within Europe a much larger area of glaciers is found in the EU28+ countries, compared to the EU28 countries. In the northern hemisphere many glaciers exist elsewhere, outside Europe.

Trends in quantity

The trend in quantity is generally considered as decreasing in whole Europe.

- Average current trend in quantity (extent)

EU 28: Decreasing

EU 28+: Decreasing

- Does the habitat type have a small natural range following regression?

No

Justification

A regression is documented in many scientific papers, but the habitat has a wide range.

- Does the habitat have a small natural range by reason of its intrinsically restricted area?

No

Justification

The habitat occupies large patches in a wide range.

Trends in quality

Human interference during the last century increased, with atmospheric pollution and rising temperature due greenhouse gases as min pressures. This has reduced the (abiotic) quality of the habitat over large parts of the range. No quantitative data are available however.

- Average current trend in quality

EU 28: Decreasing

EU 28+: Decreasing

Pressures and threats

The glaciers are threatened by direct human input, such as 1. skiing off the tracks, by 2. other recreation activities and by 3. air pollution from industry and traffic. More problematic reason for threat is 4. global warming (higher temperature, radiation) and 5. input of CO₂ and other greenhouse gases in atmosphere. In some localities lying in volcanic active territories also activity of volcanoes can be considered as potential threat.

List of pressures and threats

Human intrusions and disturbances

Skiing, off-piste

Other outdoor sports and leisure activities

Skiing complex

Pollution

Air pollution, air-borne pollutants

Input of CO₂ and other greenhouse gases

Geological events, natural catastrophes

Volcanic activity

Climate change

Temperature changes (e.g. rise of temperature & extremes)

Conservation and management

The mass balance, meaning the difference between ice accumulation and melting (or sublimation) of a glacier, is crucial to the survival of glaciers. To manage these processes is beyond the present possibilities of human, even though glacier melting is a highly popular theme for politicians. The decrease of greenhouse gases in the atmosphere is a big task for the near future. Many important measures are needed, but they are not yet implemented or not sufficiently respected. The glaciers are threatened by other, direct human input, such as skiing off the tracks, by recreation activities and by air pollution from industry and traffic.

List of conservation and management needs

No measures

Measures needed, but not implemented

Measures related to urban areas, industry, energy and transport

Urban and industrial waste management

Specific management of traffic and energy transport systems

Conservation status

Annex I:

8340: ALP U2, BOR XX

When severely damaged, does the habitat retain the capacity to recover its typical character and functionality?

Glacier retreat is visible in the (relatively) low elevation regions. At higher altitudes climatic conditions are cooler and the decline has lower proportions. The increasing of mass balance can potentially reestablishing equilibrium. Restoration takes a long time period and can only happen through a natural way.

Effort required

200+ years
Naturally

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	-30 %	-21 %	unknown %	-55 %
EU 28+	-27 %	-21 %	unknown %	-49 %

Average European trends were calculated based on reported data from five countries (Austria, Slovakia, Germany, France and Switzerland). The present area of the habitat in these countries covers about 60% of the EU28 total area, but only less than 5% of the EU28+ data. For the EU28+ important trend data is missing from Norway and Iceland. However, it is likely that also there glaciers have decreased in area, though maybe less than in the Alps. Long historical trend data was reported by four of the five countries (Austria, Germany, France and Switzerland). The trends lead to the assessment Vulnerable for EU28 and Near Threatened for EU28+ for both criteria A1 and A3.

Criterion B: Restricted geographic distribution

Criterion B	B1				B2				B3
	EOO	a	b	c	AOO	a	b	c	
EU 28	>50000 Km ²	Yes	Yes	No	>50	Yes	Yes	No	Yes
EU 28+	>50000 Km ²	Yes	Yes	No	>50	Yes	Yes	No	Yes

The extent of occurrence (EOO) and Area of occupancy (AOO) are much larger than the thresholds for criterion B, and the habitat occurs in many locations. So, even if there are severe threats and ongoing declines, the habitat is assessed as Least Concern for criterion B.

Criterion C and D: Reduction in abiotic and/or biotic quality

Criteria C/D	C/D1		C/D2		C/D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	80 %	30 %	unknown %	unknown %	unknown %	unknown %
EU 28+	95 %	30 %	unknown %	unknown %	unknown %	unknown %

Criterion C	C1		C2		C3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	80 %	30 %	unknown %	unknown %	unknown %	unknown %
EU 28+	95 %	30 %	unknown %	unknown %	unknown %	unknown %

Criterion D	D1		D2		D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	unknown %	unknown%	unknown %	unknown%	unknown %	unknown%
EU 28+	unknown %	unknown%	unknown %	unknown%	unknown %	unknown%

Quantitative data on extent and severity of decline over the last 50 years was reported from four countries (Austria, Germany, Slovenia and Switzerland) and this data (covering 35% of the EU28 total and <5% of the EU28+ total) were used to calculate European average trends in quality. For the EU28+ it can be assumed that also in Iceland and Norway (from which countries trend data is lacking) large areas of glaciers have been slightly affected in the last decennia by increasing temperatures. No data were available for long historical and future trends in quality. The decline in quality relates mainly to abiotic changes, while nearly nothing is known about biotic declines. Therefore the same data can be used under criteria C/D1 and C1. They lead to the conclusion Vulnerable for criteria C/D1 and C1.

Criterion E: Quantitative analysis to evaluate risk of habitat collapse

Criterion E	Probability of collapse
EU 28	unknown
EU 28+	unknown

There is no quantitative analysis available that estimates the probability of collapse of this habitat type.

Overall assessment "Balance sheet" for EU 28 and EU 28+

	A1	A2a	A2b	A3	B1	B2	B3	C/D1	C/D2	C/D3	C1	C2	C3	D1	D2	D3	E
EU28	VU	LC	DD	VU	LC	LC	LC	VU	DD	DD	VU	DD	DD	DD	DD	DD	DD
EU28+	NT	LC	DD	NT	LC	LC	LC	VU	DD	DD	VU	DD	DD	DD	DD	DD	DD

Overall Category & Criteria			
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Confidence in the assessment

Medium (evenly split between quantitative data/literature and uncertain data sources and assured expert knowledge)

Assessors

M. Valachovič

Contributors

Type description: R. Delarze

Territorial data: E. Agrillo, S. Armiraglio, S. Assini, F. Attorre, G. Buffa, L. Casella, A. Čarni, R. Delarze, N. Juvan, J. Loidi, A. Mikolajczak, P. Finck, D. Paternoster, U. Raths, U. Riecken, A. Ssymank

Working Group Sparsely Vegetated Habitats: F. Essl, G. Giusso Del Galdo, A. Mikolajczak, D. Paternoster, M. Valachovič, M. Valderrabano

Reviewers

J. Janssen

Date of assessment

27/10/2015

Date of review

22/05/2016

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