
Climate Postcard from Bergen

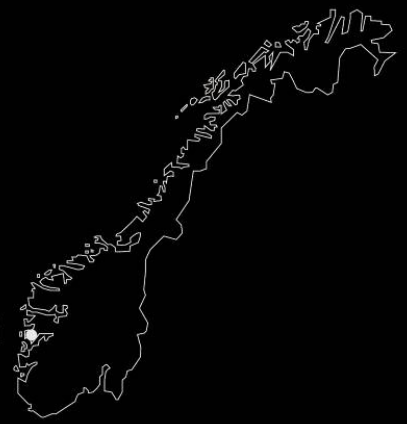
Presentation of Bergen - participants

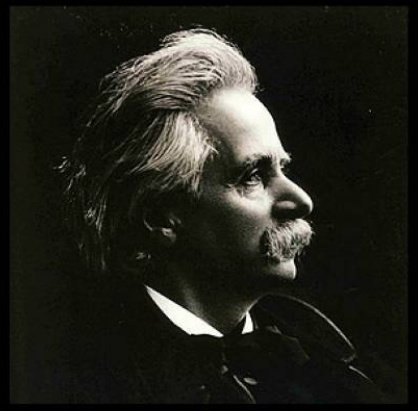
Silje Lund Sørland
Senior Climate consultant
Sweco, Bergen (Team Green transition)
Background: PhD in meteorology and climate

Carina Knudsen
Climate consultant Sweco, Bergen (Team Green transition)
Background: MSc in meteorology and climate

Thea Aske Haugen
Climate adviser
Agency for Planning and Building Services
Background: MSc in geohazards and paleoclimate,
and land management

Bergen





Established by King Olav Kyrre in 1070 with the name *Bjørgvin* which means 'the green meadow among the mountains'

Bryggen i Bergen (historical wharf) part of the Hanseatic League - exclusive rights to mediate trade between Northern Norway and abroad. Today Bryggen (the dock), is a World Cultural Heritage

Lively city with 290,000 inhabitants (42,000 city centre)

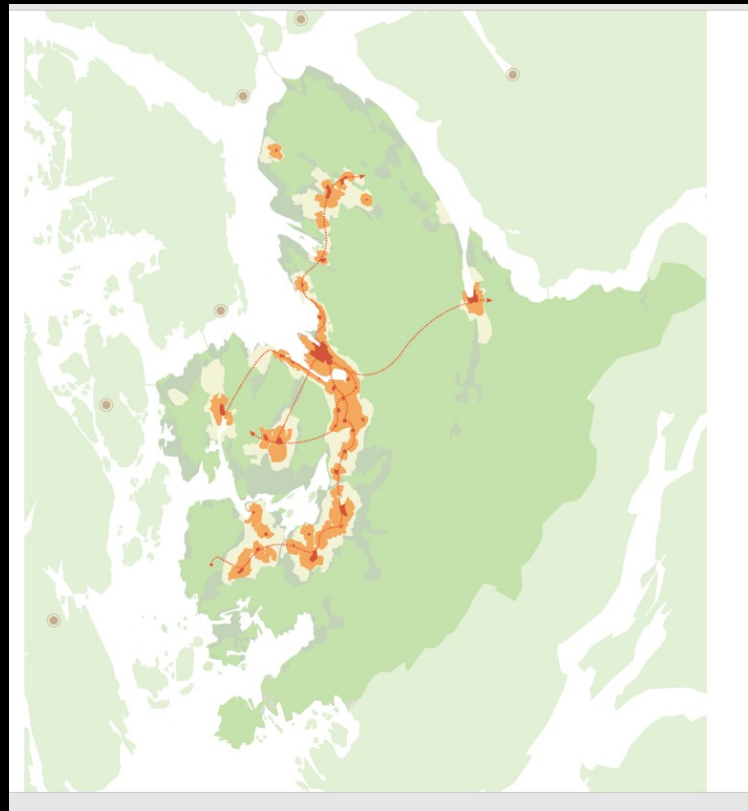






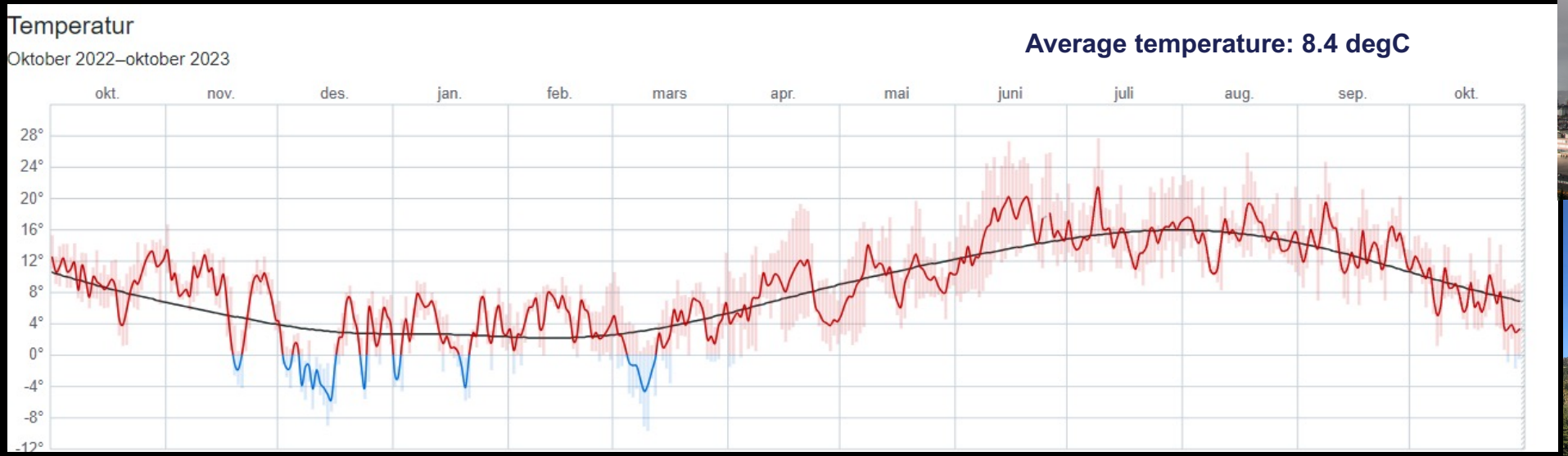

Bergen – the city between the fjord and steep mountains

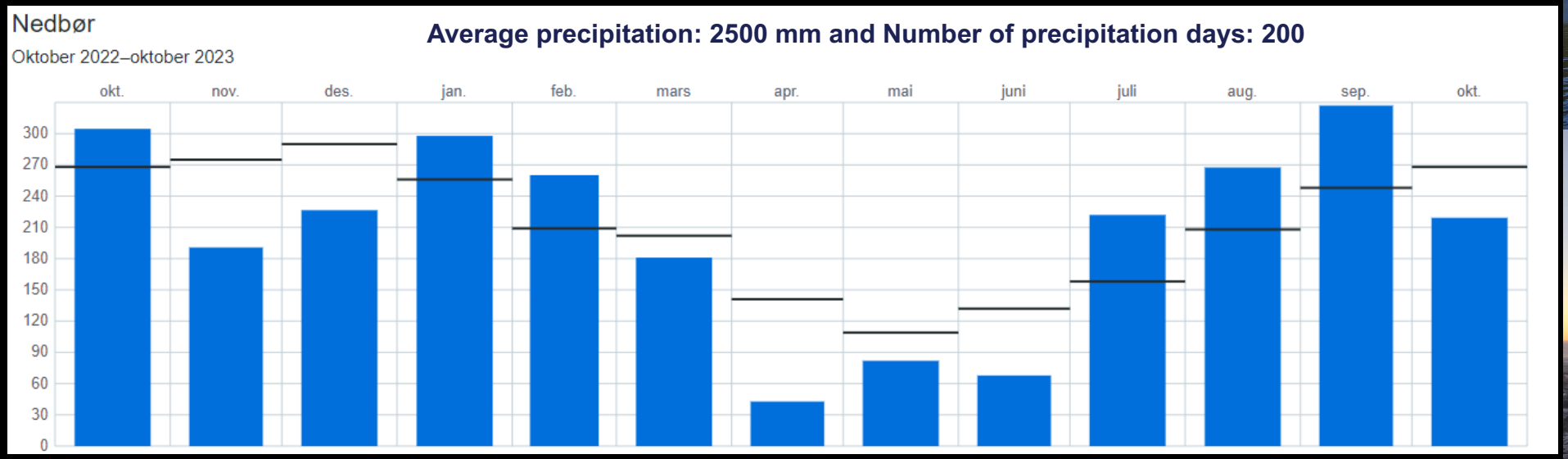
Limitations in area have placed the buildings on the seafront and up the mountainsides, a distinctive building tradition that preserves and adapts to the landscape's opportunities and challenges.



In the 1800s, Bergen was Europe's largest wooden city, and had a distinctive urban environment with dense wooden houses and busy streets, squares and alleyways.

The climate in Bergen





yr.no

Rain in Bergen - 17 words for rain

Bergens mange ord for nedbør

Kjært barn har mange navn? Ifølge en av karakterene i Stig Holmås sin bok «Regn», finnes det alt i alt 17 ord for regn i Bergen.

Musk, yr, duskregn, sipregn, regnbyger, flobyger, høljeregn, styrtregn, pøsregn, plaskregn, drivregn, valleslette, sludd, slaps, tørr snø, våt snø og hagl.

Leter man enda litt mer finner man også andre ord assosiert med regn, som f.eks. "å stå i øse pøs på Staddaen" eller fenomenet "opplett", som rett og slett er tiden mellom regnbygene.

https://www.utdanningibergen.no/studiebyen-bergen/om-bergen/regn-i-Bergen

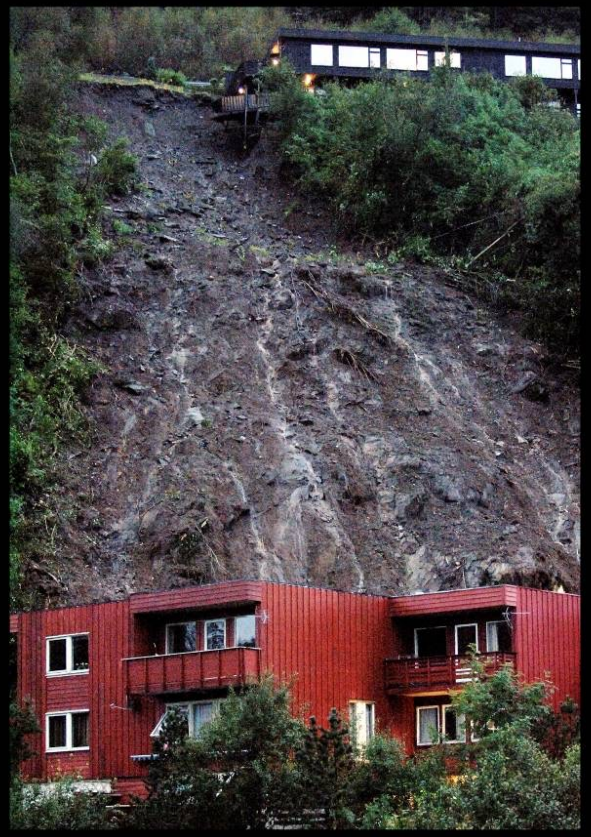
Sometimes it rains for almost 100 days…

VG LIVE VGTV VG+ SPORT TV-GUIDE TIPS OSS KJØP VG+

Stopp for nedbørsrekord

Utrolig, men sant: Det siste døgnet er det ikke målt nedbør i Bergen. Dermed stoppet rekordforsøket på 85 dager.

What changes have we noticed



…. Temperature heat records ….

2018: 32,2 °C

Tips oss

Bergens Tidende

Bergens gamle varmerekord er knust

– Denne sommeren har virkelig vært perfekt, sier Kim Skåtun.

KJØLER SEG NED: Djurre Siccama og Kim Skåtun brukte rekordvarme fredag i Bergen ved vannet. Siccama testet SUP-brett for første gang. FOTO: BÅRD BØE

Av **Adalheidur Audardottir Oldeide** og **Paul André Sommerfeldt**

Publisert: 27. juli 2018

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Av **Adalheidur Audardottir Oldeide** og **Paul André Sommerfeldt**

Publisert: 27. juli 2018

2019: 33.4 °C

4°

Tips oss

Bergens Tidende

Nå er 33,4 den nye varmerekorden i Bergen

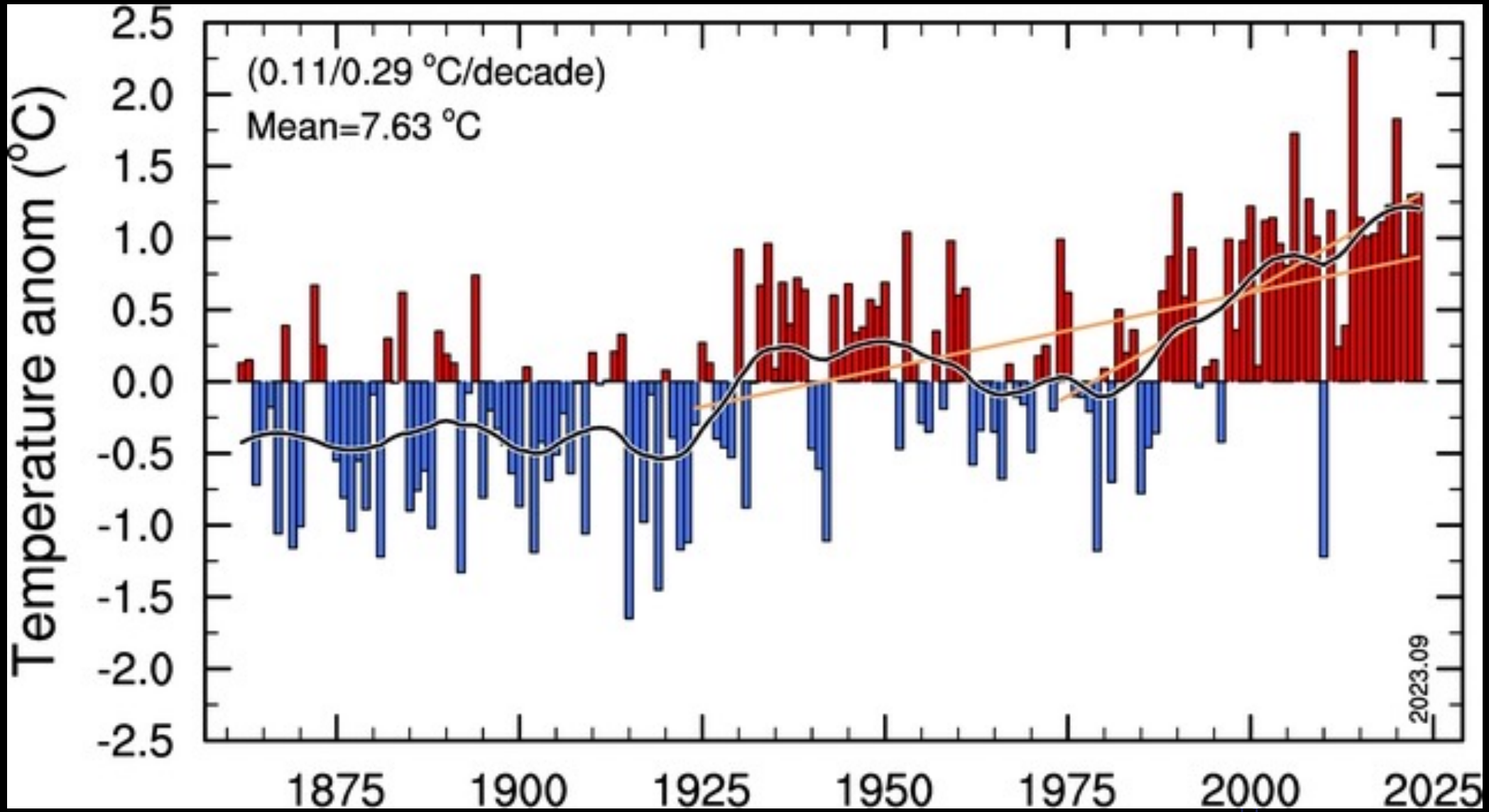
Aldri før har det vært så varmt i Bergen som fredag ettermiddag.

HETT OG TETT: Mange tok turen til stranden på Møhlenpris fredag. FOTO: PAUL S. AMUNDSEN

Av **Per Lindberg**, **Kristin Jansen**, **Hanne Ørnhaug Eskeland** og **Lars Kvamme**

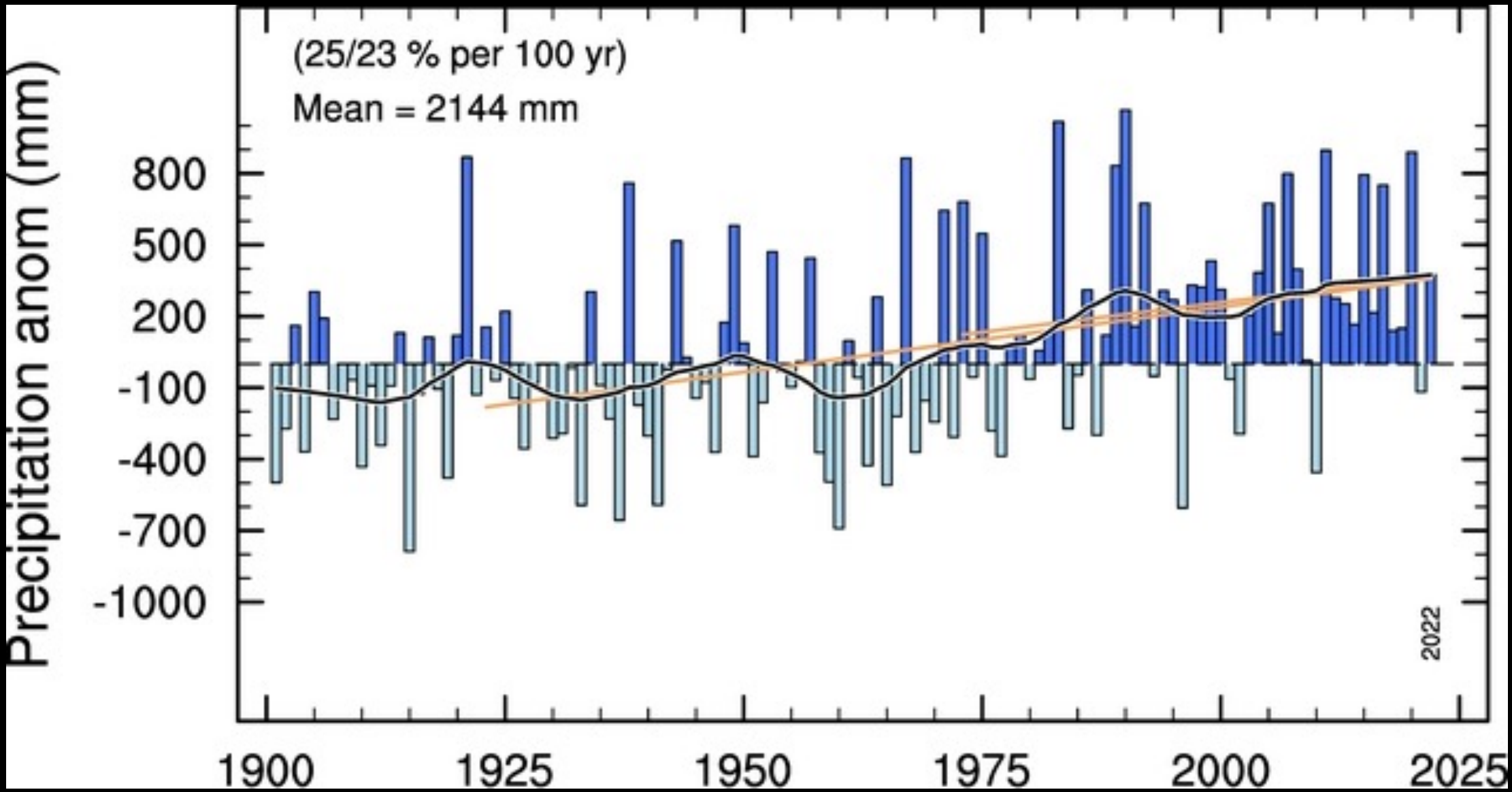
Publisert: 26. juli 2019

It’s become warmer



https://folk.uib.no/ngfhd/Climate/climate.html

And it’s become wetter



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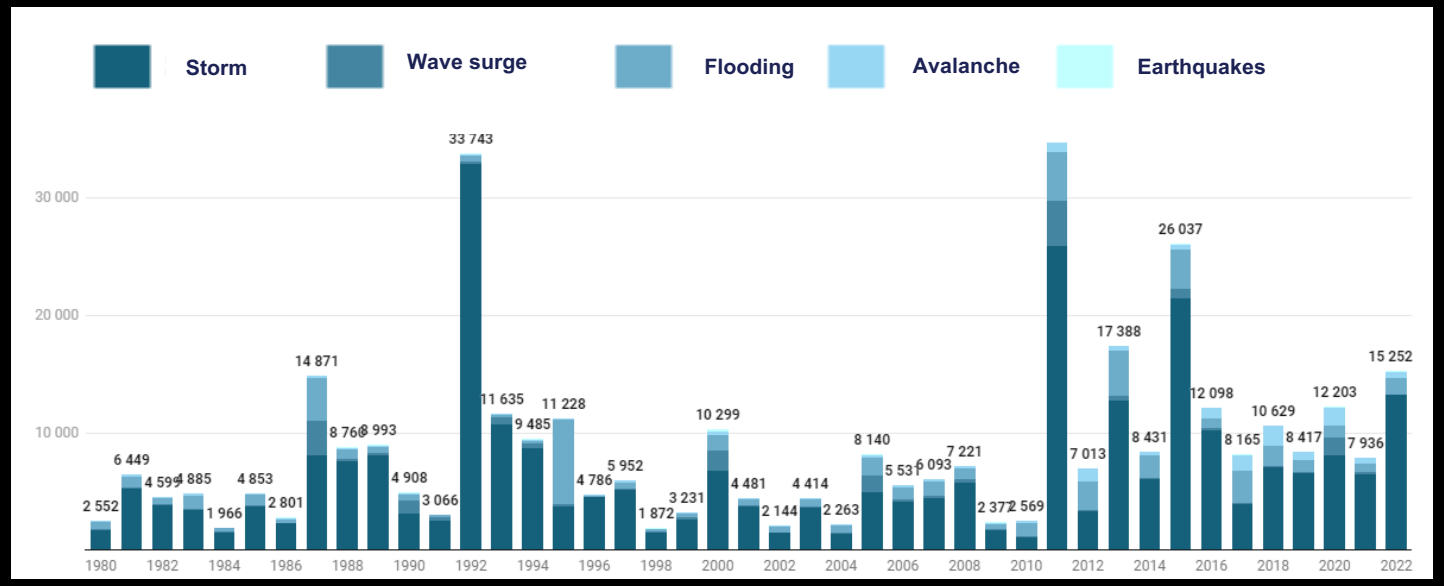
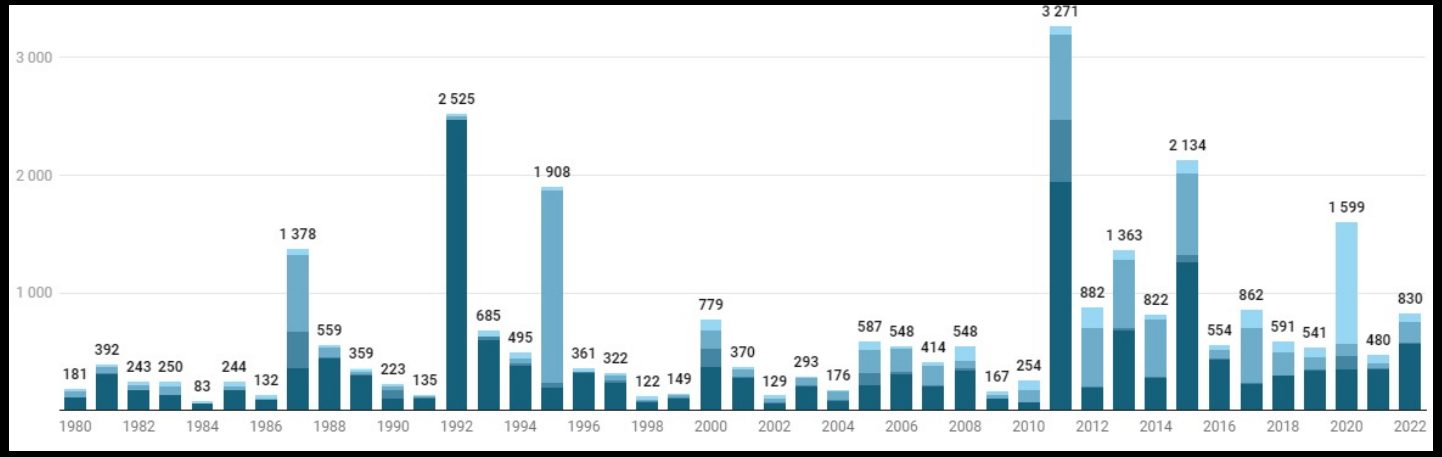
What are the most hard-hitting weather events?

Number natural hazard events



Natural hazards compensation



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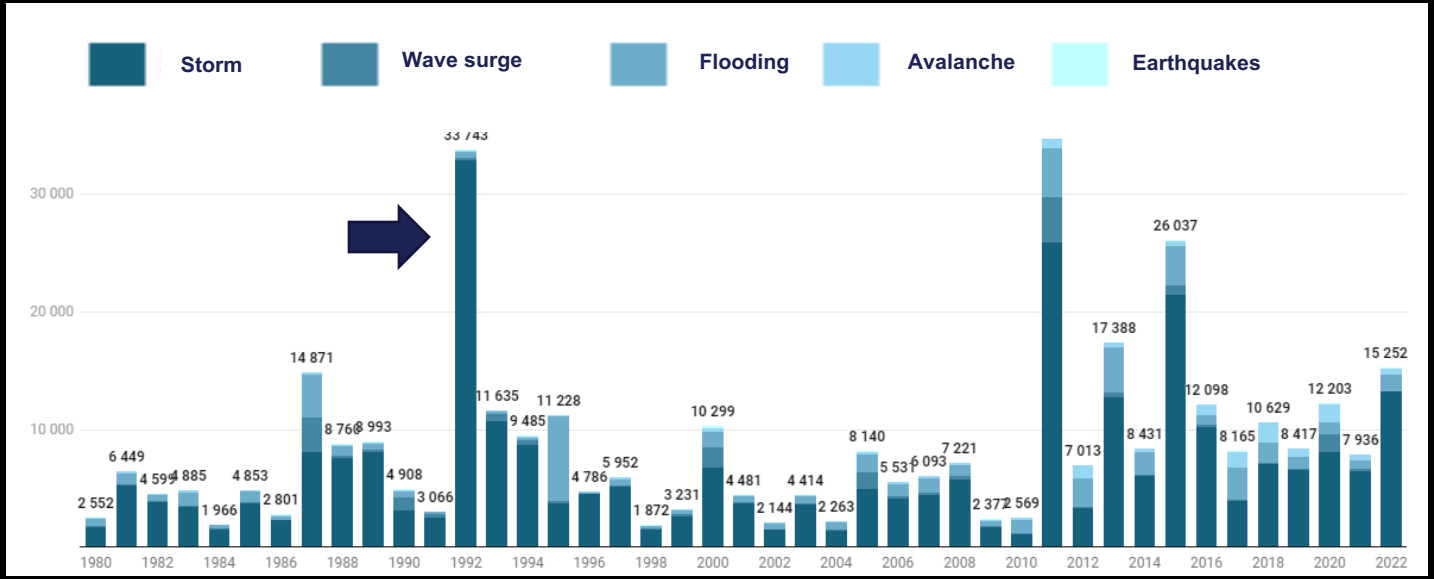

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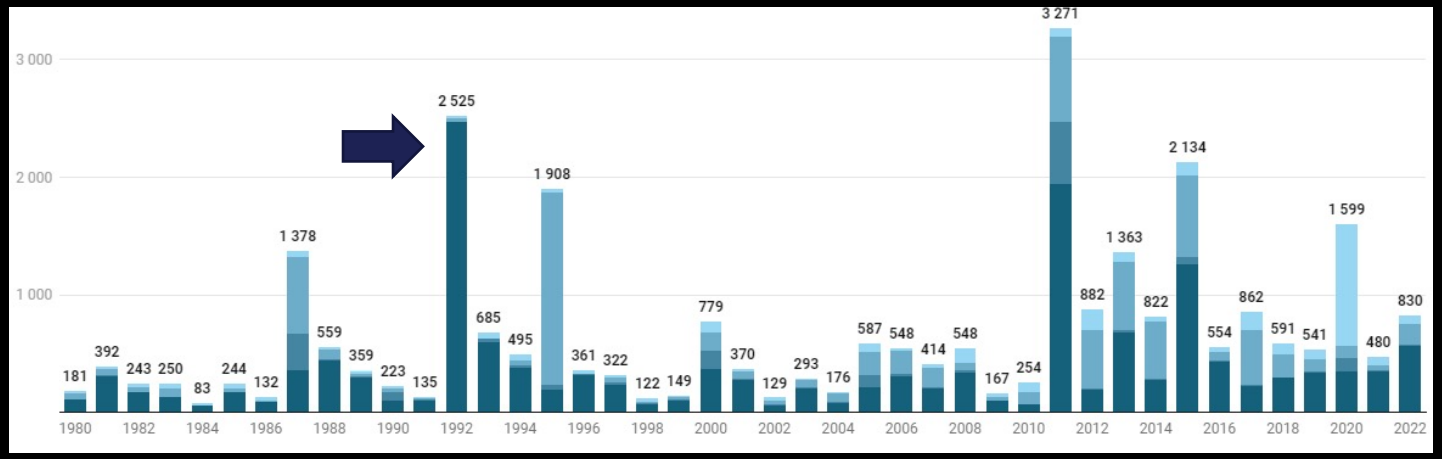


1992 New Year's Day Storm

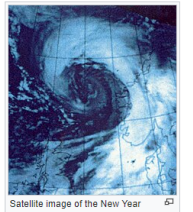
2 languages

Article Talk | Read Edit View history Tools

From Wikipedia, the free encyclopedia

Coordinates: 60.75°N 0.89°W

The New Year's Day Storm (Norwegian: *Nyttårsorkanen*), known in Scotland as the 'Hogmanay Hurricane', was an intense European windstorm that affected much of northern Scotland and western Norway on 1 January 1992. DNMI estimated the strongest sustained winds (10 min. average) and the strongest gusts to have reached 103 mph (166 km/h; 46 m/s) and 138 mph (222 km/h; 62 m/s), respectively.[1] Unofficial records of gusts in excess of 170 knots (87 m/s) were recorded in Shetland, while Statfjord-B in the North Sea recorded wind gusts in excess of 145 knots (75 m/s). There were very few fatalities, mainly due to the rather low population of the islands, the fact that the islanders are used to powerful winds, and because it struck in the morning on a public holiday when people were indoors. In Norway there was one fatality, in Frei, Møre og Romsdal county. There were also two fatalities on Unst in the Shetland Isles. Despite being referred to by some as a 'Hurricane', the storm was Extratropical in origin and is classified as an Extratropical Cyclone.



Satellite image of the New Year Hurricane that hit Norway 1 January 1992. Image taken 04 UTC.

Meteorological synopsis [edit]

The New Year's Day Storm was classified as an Extratropical Cyclone, also known as a Mid-latitude cyclone, which are common in this part of the world, especially during the winter and autumn months.[2] In Europe, these are habitually referred to as European Windstorms.

By 1200 UTC on 31 December 1991 an Atlantic low pressure centre of 985 mb had developed at the left exit of a strong WSW jet stream and was at 57°N 27°W. At this time a very sharp thermal trough (cold air) extended from south-west Iceland to the Hebrides with a thermal ridge building (warm air) behind it in the Atlantic.[3] A satellite image at 1600 UTC on 31 December showed a 'clear eye' in the cloud comma which indicates the dry air from the stratosphere descending into the developing low pressure as is a signature of explosive cyclogenesis. By 1800 UTC the low had deepened to 966mb.[3] At midnight (0000 UTC 1 January) the left exit of the jet stream was just behind the top of a sharp thermal ridge just west of Faroe, rapidly deepening the low centre to 957mb. Travelling at a speed of around 55 knots (63 mph; 102 km/h; 28 m/s), the low continued to deepen as it passed over Faroe and to the north of Shetland. Pressure falls were 5mb/hr across Shetland and 7mb/hr across Faroe.[3] The strongest winds arrived over the Shetland islands between 0100 UTC and dawn.[4]

The system is described as a 'Weather Bomb' due to its explosive cyclogenesis, exceeding the criteria of deepening by 24 mb in 24 hours greatly.[5] Explosive cyclogenesis usually occurs where dry air from the stratosphere flows down into a developing low pressure area and causes air within the depression to rise very quickly. This will increase its rotation, which in turn deepens the low pressure centre and creates a more vigorous storm.[3] The New Year's Day 'Weather Bomb' may have experienced double explosive cyclogenesis: firstly from the draw-down of cold dry air from the stratosphere and secondly the intercept of this already rapid development in the left exit of the jet stream with the warm air of a marked thermal ridge.[3]

What are the most hard-hitting weather events?

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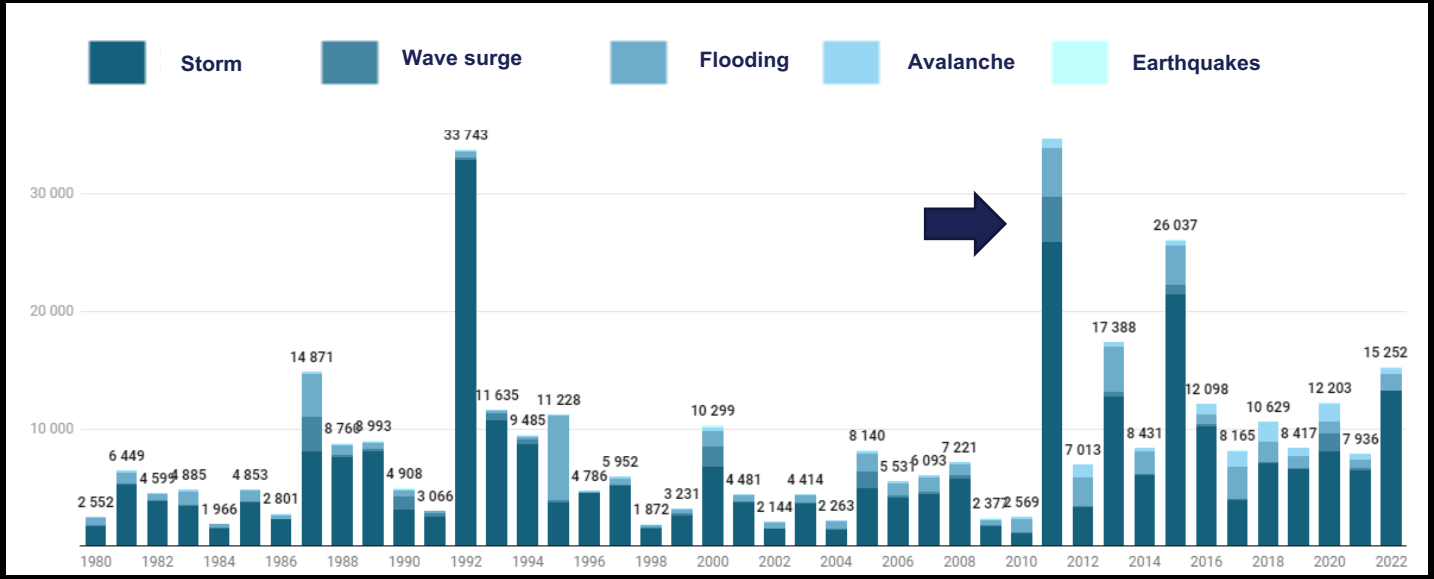

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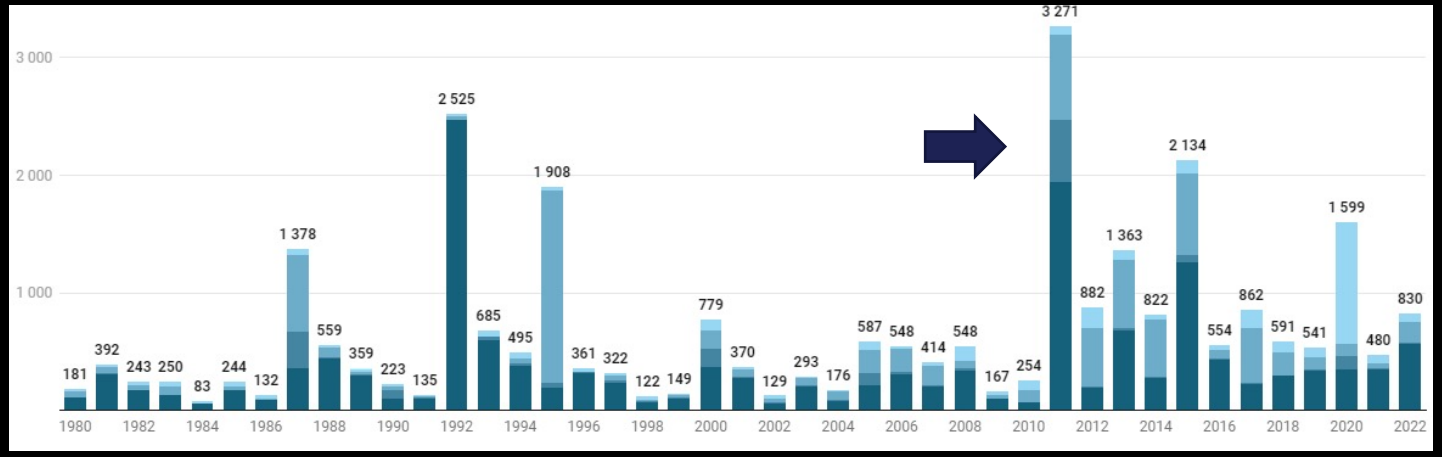

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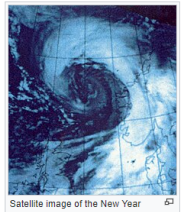

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Cyclone Dagmar

6 languages

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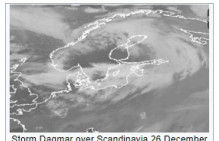
Cyclone Dagmar[3] (also referred to as **Cyclone Tapani** in Finland[4]) and as **Cyclone Patrick** by the Free University of Berlin) was a powerful European windstorm which swept over Norway on Christmas Day 2011, causing severe damage in central coastal areas, before continuing over the Scandinavian peninsula towards the Baltic Sea and Gulf of Finland. The storm caused $45 million (2011 USD) in damage.[5]

Cyclone Dagmar



Storm Dagmar over Scandinavia 26 December 2011

Type	European windstorm, Extratropical cyclone
Formed	24 December 2011
Dissipated	27 December 2011
Fatalities	2[1][2]
Damage	$45 million (2011 USD)
Areas affected	Norway, Sweden, Finland, Estonia, Russia

Meteorological history [edit]

Patrick formed as a small low just south of Newfoundland on 24 December.[6] The system raced across the north Atlantic, deepening rapidly to 956 mb (28.2 inHg) by Christmas Day.[7][8] Patricks extraordinary windspeed was due to it being a secondary low to the deep cyclone Oliver to the north and the powerful high Cora to the south, enhancing the southwesterly winds on the south side of the low.[9] On 26 December, Patrick made landfall in western Norway with a central pressure of 964 mb (28.5 inHg).[10][11] The storm continued to move eastwards at a rapid pace, however, as it was overland it had weakened significantly.[12] It hit Finland the same day, St. Stephen's Day (*Tapani* in Finnish), and got the Finnish name due to that day. It then moved out of the Free University of Berlin's tracking charts the next day.[13]

Impact [edit]

Norway [edit]

Patrick (Dagmar) arrived in Norway as a southwesterly storm, with windspeeds estimated to be on average 110 km/h (30 m/s; 67 mph) on the coast. Up to 160 km/h (44 m/s; 98 mph) 10 minute sustained winds was measured at Kråkenes Lighthouse, Sogn og Fjordane, before the anemometer broke. Powerful winds occurred in Sogn og Fjordane, Møre og Romsdal and Trøndelag during the night of 24 December and early morning of 25 December. Extreme high storm surge in Finnmark estimated to be 50–80 cm (20–31 in) over normal sea levels, although this was due to the preceding storm Cato (Oliver). In Norway comparison was made with the New Year's Day Storm of 1992, however this storm was not as strong[14] Patrick (Dagmar) is believed to be the third strongest storm to hit Norway in 50 years.[15][16][17] A large landslide on 1 January 2012 close to the Norwegian city of Trondheim has been attributed to the warm weather and large amounts of rain the system brought to the area, which resulted in 50 people being evacuated.[18][19][*dubious – discuss*] The pier area of Trondheim was badly damaged during the storm, heavily damaging the façade of the Pirbadet water park.[20] A F2 tornado was reported in Hellesylt, Norway. The Tanker BW Thames was disabled and adrift northwest of Bergen as the storm approached, however the crew were able to regain power and survived the storm without incident.[21] The Russian trawler Krasnoselsk sank in Hundeidvika harbour, Sykkylven, Norway.[22][23] Dagmar knocked out 390 Telenor communication masts leaving 40,000 customers without mobile or landline telephone connections.[2] Royal Dutch Shell's Ormen Lange gas processing plant was inoperable after its electricity was cut off by the storm, which left gas supplies in the UK vulnerable as this facility can supply up to 20 percent of the UK's supply via the Langeled pipeline.[24]

Damaged outbuilding in Norway

Damage in Molde, Norway

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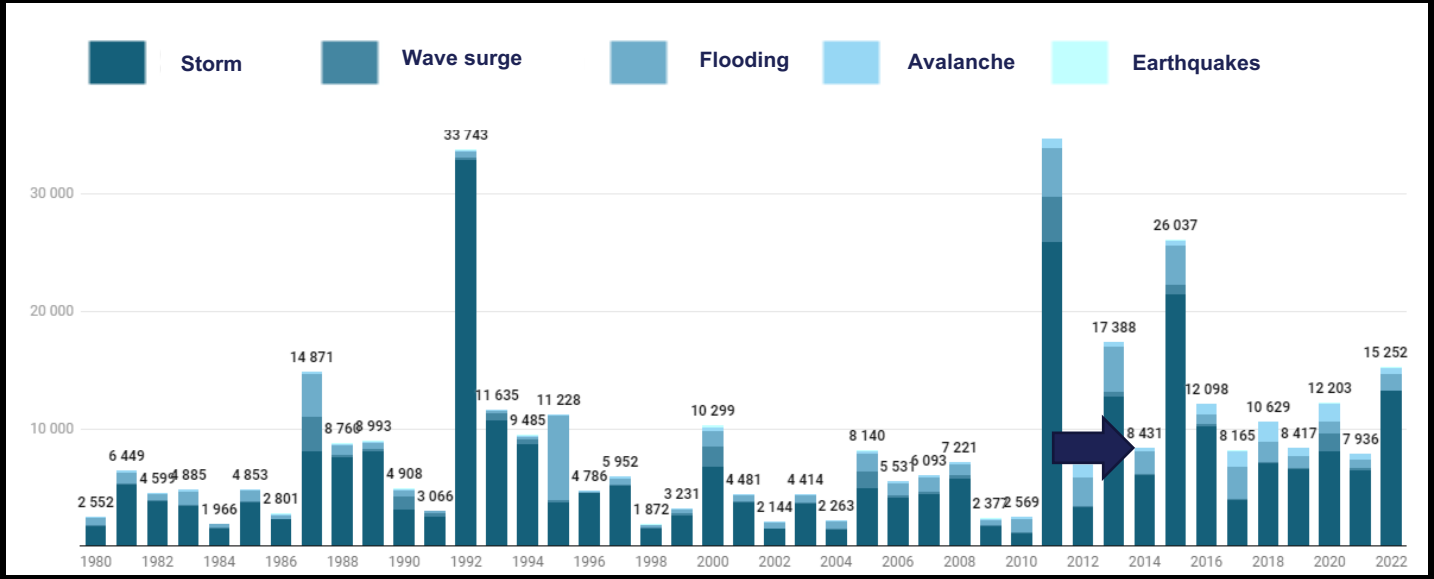

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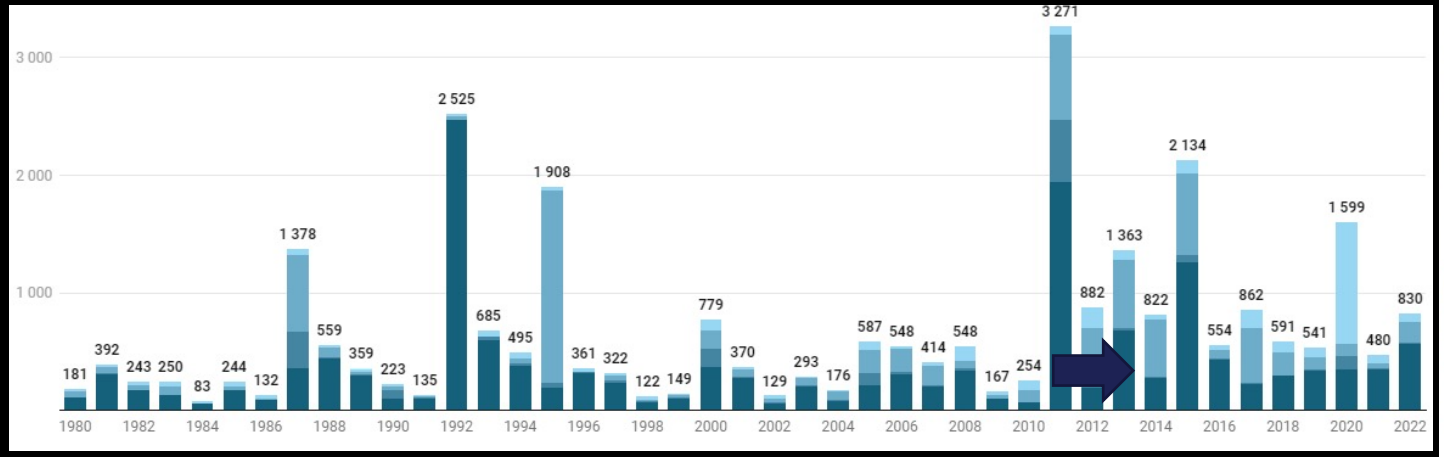

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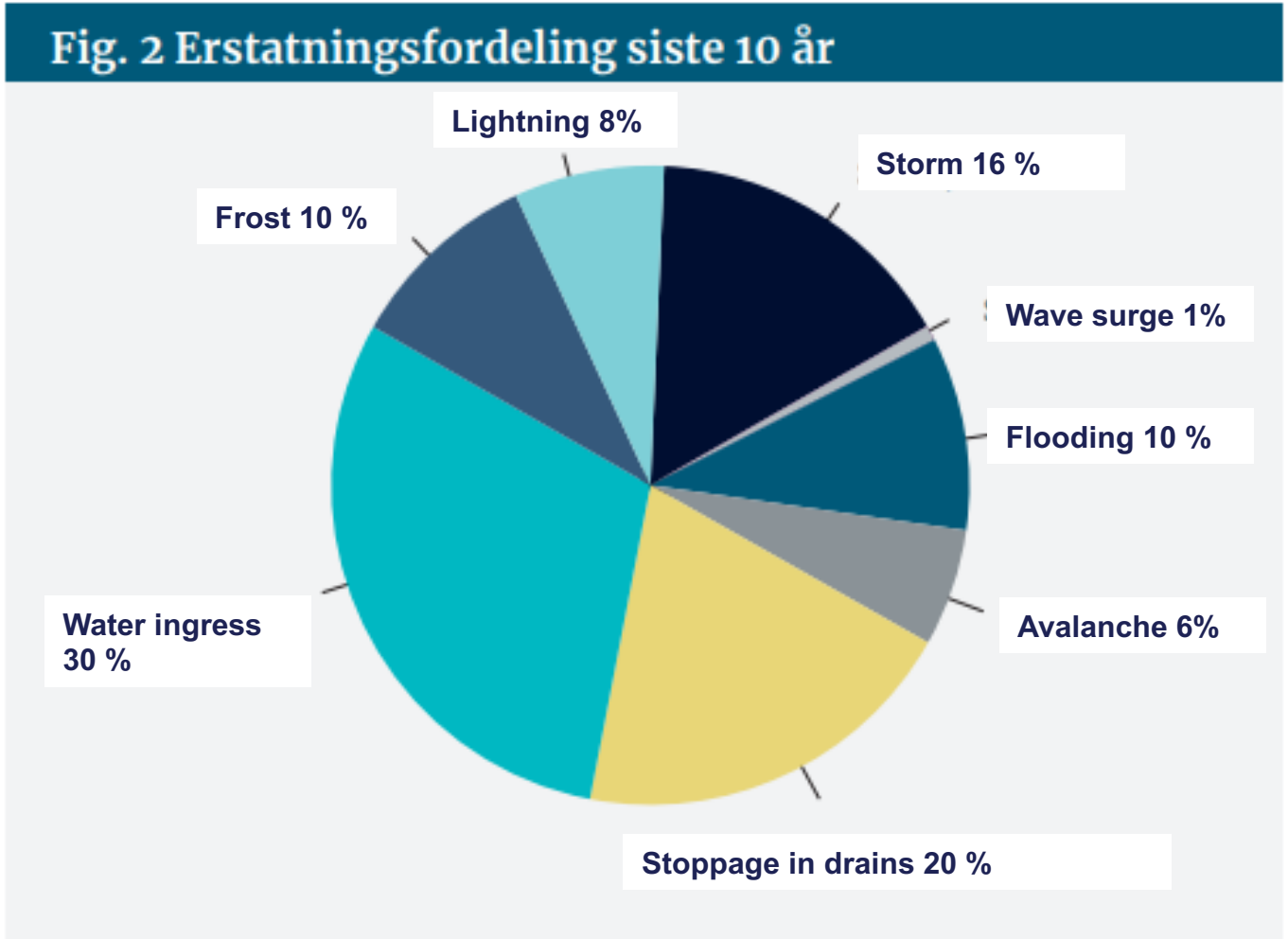
Flåm i Aurland fikk store flomskader høsten 2014. Denne våren er det flomfare i hele landet, og særlig i Nord. *Foto: NVE*

Damaged outbuilding in Norway

Damage in Molde, Norway

Compensating* for the natural hazards



*on buildings and household goods.
Cars and boats are excluded. Damages on infrastructure is outside the insurance's scope

https://www.finansnorge.no/siteassets/statistikk-og-analyse/klimarapport/finans-norge---klimarapport-2023-enkeltsider.pdf

How do we work with climate adaption in Norway

All sectors and administrative levels have an independent responsibility to reduce the impact of current and future climate within their own area.

How do we work with climate adaption in Norway

Ministry of Climate and Environment: Has a special responsibility for facilitating the Government's comprehensive work in the area of climate change adaptation.

Norwegian Environment Agency: Is the agency that supports the Ministry in its work on adaptation and is responsible for coordinating the national work on climate change adaptation.

Local government Municipalities: The local nature of climate change places municipalities on the front line in the face of climate change.

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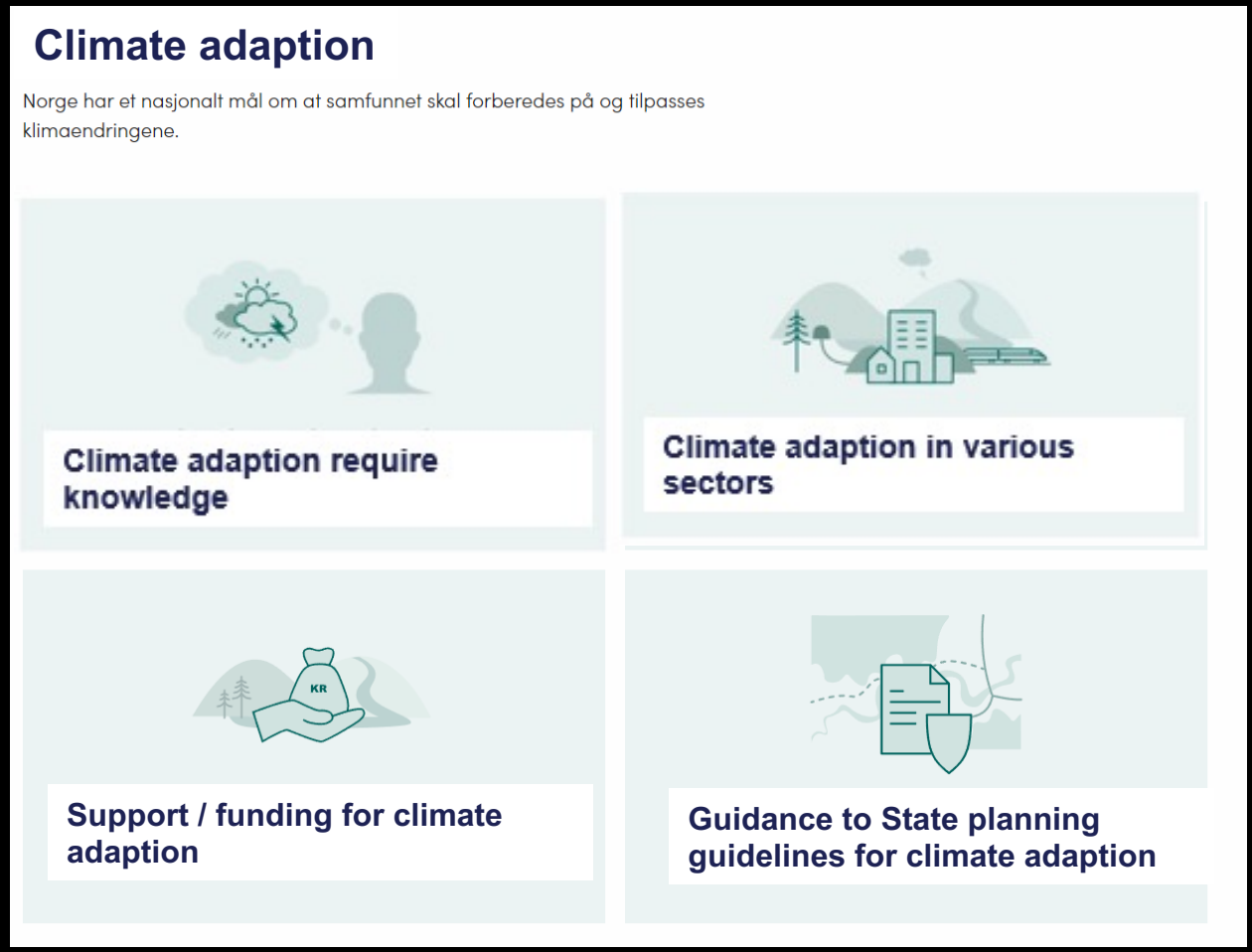
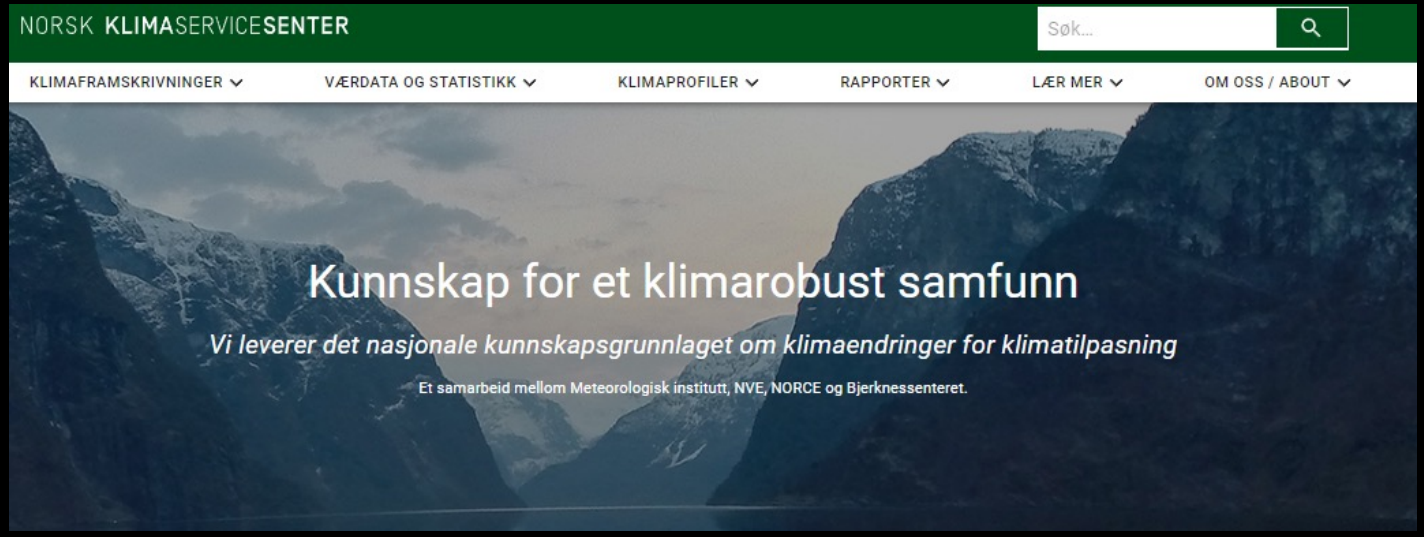
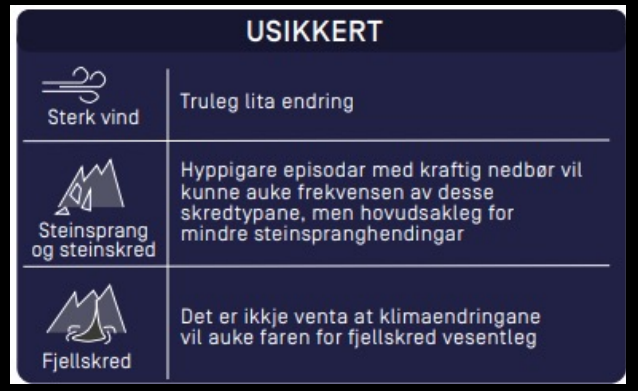


Klimatilpasning - forberede oss på og tilpasse oss til klimaendringene - Miljødirektoratet (miljodirektoratet.no)

How do we work with climate adaption in Norway





How do we work with climate adaption in Norway

Construction

Fishing and aquaculture

Health

Infrastructure and transport

Cultural heritage and cultural environment

Agriculture and reindeer husbandry

Nature and outdoor activities

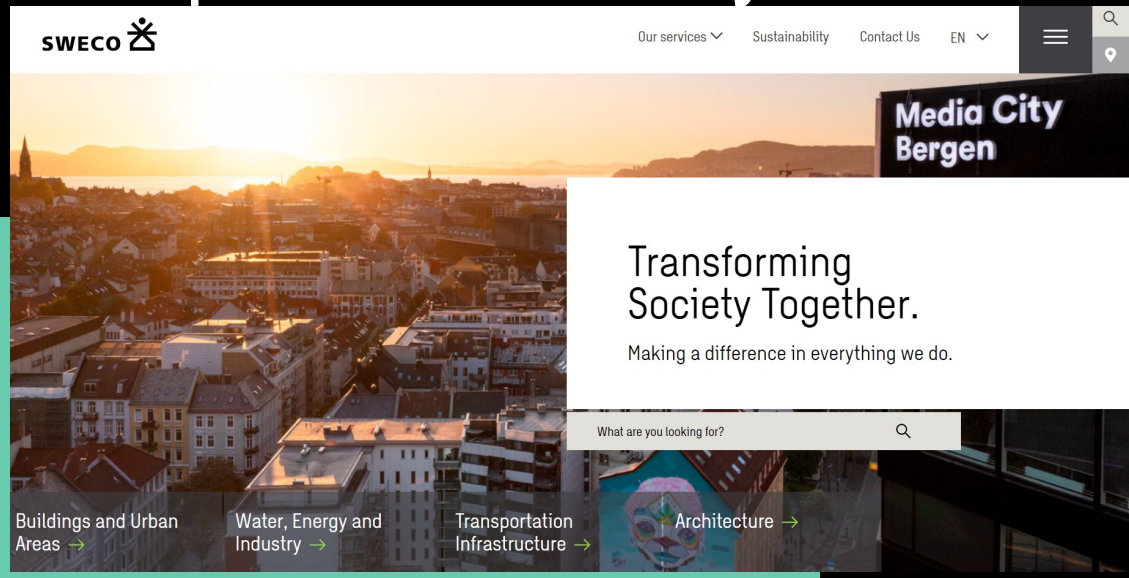
Civil protection and emergency preparedness

Water and wastewater

How do we work with climate adaption in Norway

Example from Sweco

- Construction
- Fishing and aquaculture
- Health
- Infrastructure and transport
- Cultural heritage and cultural environment
- Agriculture and reindeer husbandry
- Nature and outdoor activities
- Civil protection and emergency preparedness
- Water and wastewater

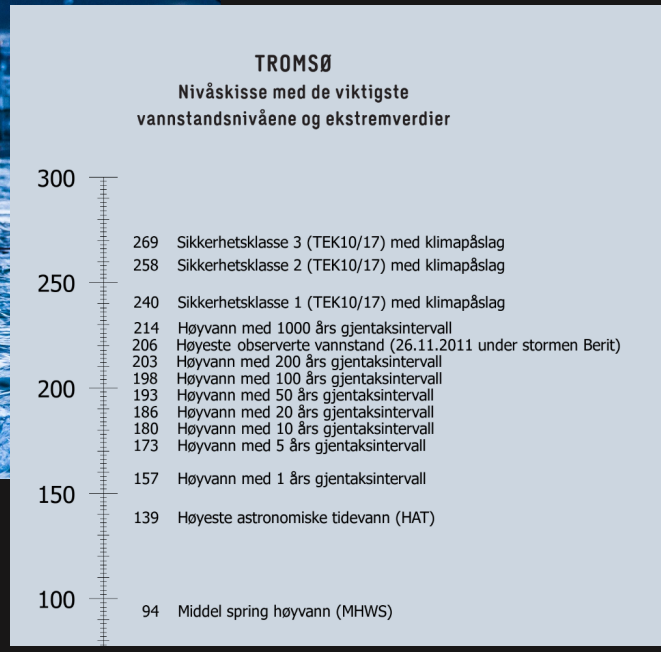


Example from work in Sweco

IMPETUS

DYNAMIC INFORMATION MANAGEMENT APPROACH FOR THE IMPLEMENTATION OF CLIMATE RESILIENT ADAPTATION PACKAGES IN EUROPEAN REGIONS

- Havnivåstigning – Tromsø By
- Troms og Finnmark: Jordskred, snøskred, høyere temperaturer, nye arter, endring i grunnvannregimer, etc



Strategies for rising sea levels

1. Accepting the flood
2. Retreat
3. Adapting the buildings
4. Defense
5. Attack


Thank you!