

# Kulturminner i et endret klima

Vibeke Vandrup Martens, NIKU Er kulturminnene rustet for klimaendringer? CIENS frokostseminar, Forskningsparken, Oslo, 27. mars 2019

Photo: field work at Voldstad farm mound, Harstad, Troms. VVMI/NIKU

# Predicted climate change effects in Norway

Global climate change represents a variety of threats towards the preservation of cultural heritage sites. We need to assess the possibilities for long-term preservation of protected archaeological and built heritage sites in the context of geo-hazards caused by changing climate conditions, and to suggest tools for risk assessment, evaluation, mapping, adaptation, mitigation and sustainable management of heritage sites, landscapes and environments.





Illustration: Norwegian Meteorological Institute

# Blubber oven from 17th C whalers and WW2 plane wreck from 1942 on Svalbard



Photo: Blubber oven 17th C, Smeerenburg, Elin Rose Myrvoll/NIKU





# **Effects of climate change in Norway**

www.klimakommune.no

### Landslide risk zones and prehistoric burial sites

Frequence and uncertainties 2071-2100

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- No change, likely
- No change, very uncertain
- Some increase, likely
- Increased risk, likely



Photos from Gudbrandsdalen river delta, 'normal' and flooded: Børre K. Dervo



Løvø 2009

Archaeological Deposits in a Changing Climate. In Situ of Norway Preservation of Farm Mounds in Northern Norway (InSituFarms)

- Project financed by the Research Council of Norway, 2012-2016.
- NIKU (Elin Rose Myrvoll, Knut Paasche, Vibeke Vandrup Martens)
- Bioforsk/NIBIO (Ove Bergersen, Øyvind Rise)
- Tromsø museum, Tromsø University (Keth Lind)
- Troms County Council (Ragnhild Myrstad)
- Archaeological museum, University in Stavanger

(Paula Utigard Sandvik)

- MVH Consult (Michel Vorenhout)
- National Museum of Denmark

(Jørgen Hollesen; Henning Matthiesen)



Sub project: Archaeological Deposits in a Changing Climate. In Situ Preservation of Farm Mounds in Northern Norway. Case Varanger, Finnmark. Financed by Terrestrial Flagship, FRAM research centre

ARKEO

2013-2015



TROMS fylkeskommune ROMSSA fylkkasuohkan







Archaeological Deposits in a Changing Climate. In Situ Preservation of Farm Mounds in Northern Norway.

# InSituFarms sites



Sites well north of the Arctic circle. Stone age site; midden belonging to house of Gressbakken type, radiocarbon dated to a. 2200BC. Medieval site; farm mound, artefact dated to a. 1300 AD to present.





Late Stone Age midden, Baŋkgohppi, Finnmark



Medieval farm mound, Voldstad, Troms

# InSituFarms: Voldstad farm mound







# InSituFarms: Voldstad farm mound



Median moisture content and redox values. Green and red from the west section, blue and yellow from the north section





Median soil temperatures (yellow north, red west) and air temperatures (grey). Please note that the soil temperature does not og below zero.



5

7

ERM/NIKU







(5)

 $\overline{7}$ 

(8)

## Bankgohppi Late Stone Age midden

Measured soil temperatures,

Redox 1 13.6moh Redox 2 13.2moh

Median Moisture

air temperature (grey) and snow depth (pink)



Soil moisture and redox potential



Measured soil moisture (red), precipitation (dark blue), snow depth (pink) and redox values (blue and green)



# Degradation studies, climate change

Bankgohppi Late Stone Age midden (left) and Voldstad farm mound (right)



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# Tools for cultural heritage management

Threshold levels

https://www.researchgate.net/p ublication/309391613\_Preservi ng\_Rural\_Settlement\_Sites\_in\_ Norway\_Investigations\_of\_Arch aeological\_Deposits\_in\_a\_Cha nging\_Climate

### Threat evaluations

	% change of soil moisture	% change of surface damage	°C change of temperature	% change of decay rate	% loss/ damage to site caused by continued use	% loss/ damage to site caused by new use/ development
	11-	11-	2-	21-	21-	11-
$\bigcirc$	6-10	6-10	1-1.9	11-20	11-20	6-10
	0-5	0-5	0-0.9	0-10	0-10	0-5 ©VVM

GIS position	Monument type	ID	Lived on	Distance to populated area	Monitored	Possible threats	Threshold levels	Possible mitigation actions
Free text/ numbers field	Dropdown menu from national CH database	Number from database	Y/N field	Free text/ numbers field	Y/N field	Dropdown menu of fields below + free text	Dropdown menu (see Table 16)	Free text field
						use (continued)		
						development/ new use		
						infrastructure		
						erosion/ surface		
						temperature change (air/ soil)		
						precipitation change (less/ more, other)		©VVM

### Site valuation









# **Mitigation – plans and possibilities**





### Hamar Cathedral ruin in protective glass building. Photo: NIKU

# NKU

- lead excess surface water to green areas  $\rightarrow$  into deposits
- check vegetation, do not allow big trees
- avoid physical disturbance if at all possible
- secure disturbed sections with clay

### **Cemeteries/ burial sites/ shell middens**

keep dry

keep wet

- add chalk (spread on top of site) to preserve alkalinity
- keep down encroaching vegetation







## Urban water management and cultural heritage





**NKU**Photo and graphics: Anna Seither, NGU – the UrbanWATCH project.



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**NKU** Introducing a new RCN research project 2019-2023

CULICOAST

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# **CULTCOAST-** Cultural Heritage Sites in Coastal Areas

Use, Monitoring, Management and Preservation of Cultural Heritage Sites, Environments and Landscapes under Climate Change and Development Pressure

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# **Case sites**





- Sites (Russekeila and Hiorthamn, Svalbard; N-W coast of Andøya, Nordland) chosen with
- a) heritage remains, archaeology and/or buildings;
- b) b) existing maps and active geo-hazard processes;
- c) c) long meteorological data series.

For Andøya and Svalbard, long observational temperature time series are available, going back to the late 19th Century (1868 for Andøya and 1898 for Svalbard).

The precipitation records for these sites are shorter, but still cover more than 100 years.

This allows for a thorough assessment of temporal variability in temperature and precipitation.



# Hiorthamn, Svalbard. Coal mining site





Taubanesentral, jernbaneskinner og lokomotiv på stranden



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# Russekeila, Svalbard. Russian hunting station











# Likneset, Svalbard





Photo: Whalers' graves exposed to coastal erosion on Svalbard, Elin Rose Myrvoll/NIKU

# Heritage tourism – a preservation threat





Photo: heritage tourism, Smeerenburg Dutch whaling station on Svalbard, Elin Rose Myrvoll/NIKU

# Takk for oppmerksomheten!

## Thank you for your attention!

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Photo: Excursion to WW2 plane wreck, Adventdalen, Svalbard. VVM/NIKU