Project information

Project title

TUNDRAscape: Analyzing the effect of climate and human uses on tundra ecosystems by remote sensing

Year

2011/2012

Project leader

Per Fauchald, NINA

Participants

- Per Fauchald, project leader, Norwegian Institute for Nature Research, Fram Centre, Tromsø
- Alma Thuestad, Norwegian Institute for Cultural Heritage Research, Fram Centre, Tromsø
- Hans Tømmervik, Norwegian Institute for Nature Research, Fram Centre, Tromsø
- Dorothee Ehrich, University of Tromsø, Tromsø
- Vera Helene Hausner, University of Tromsø, Tromsø

Flagship

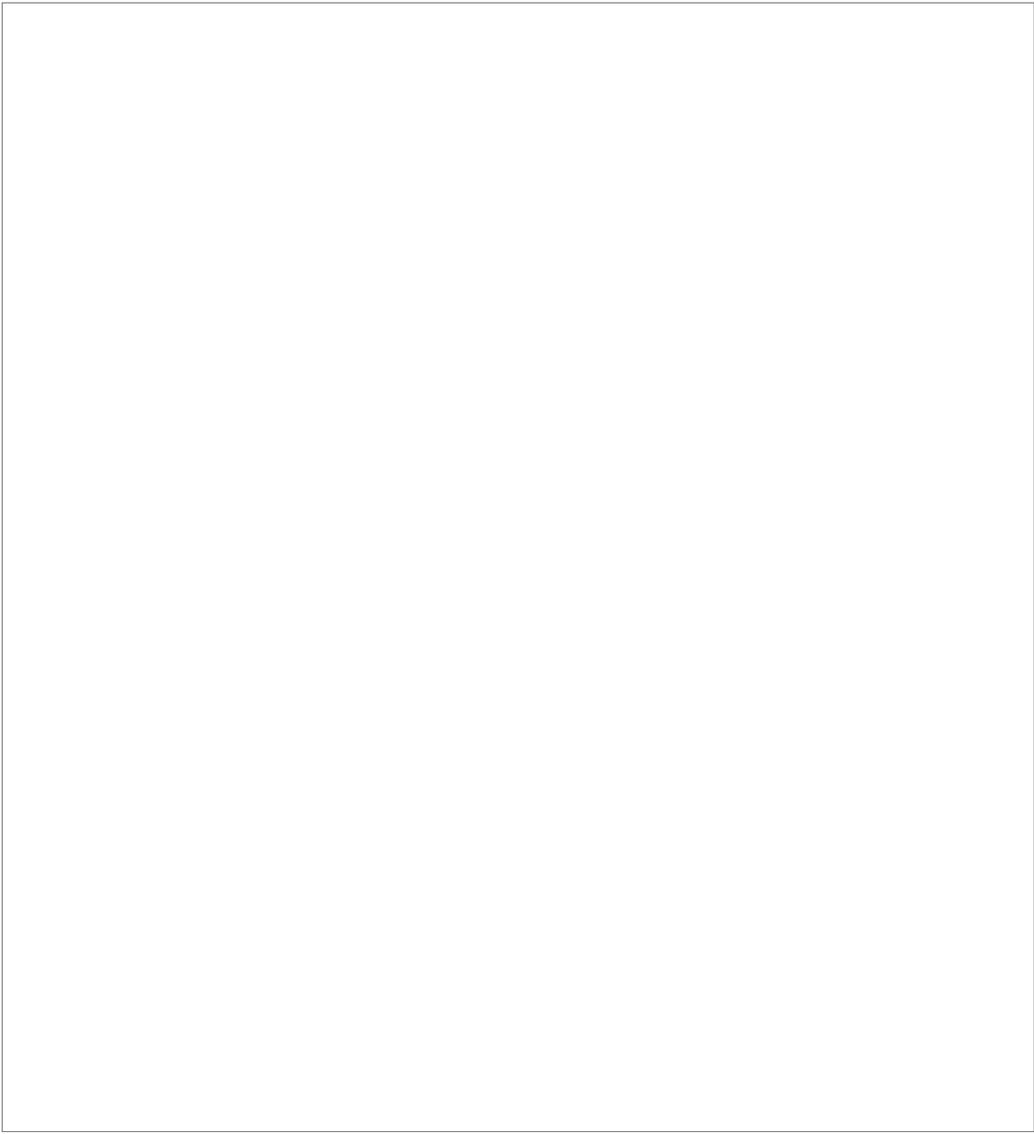Terrestrial, Theme: Vegetation state change and herbivore management
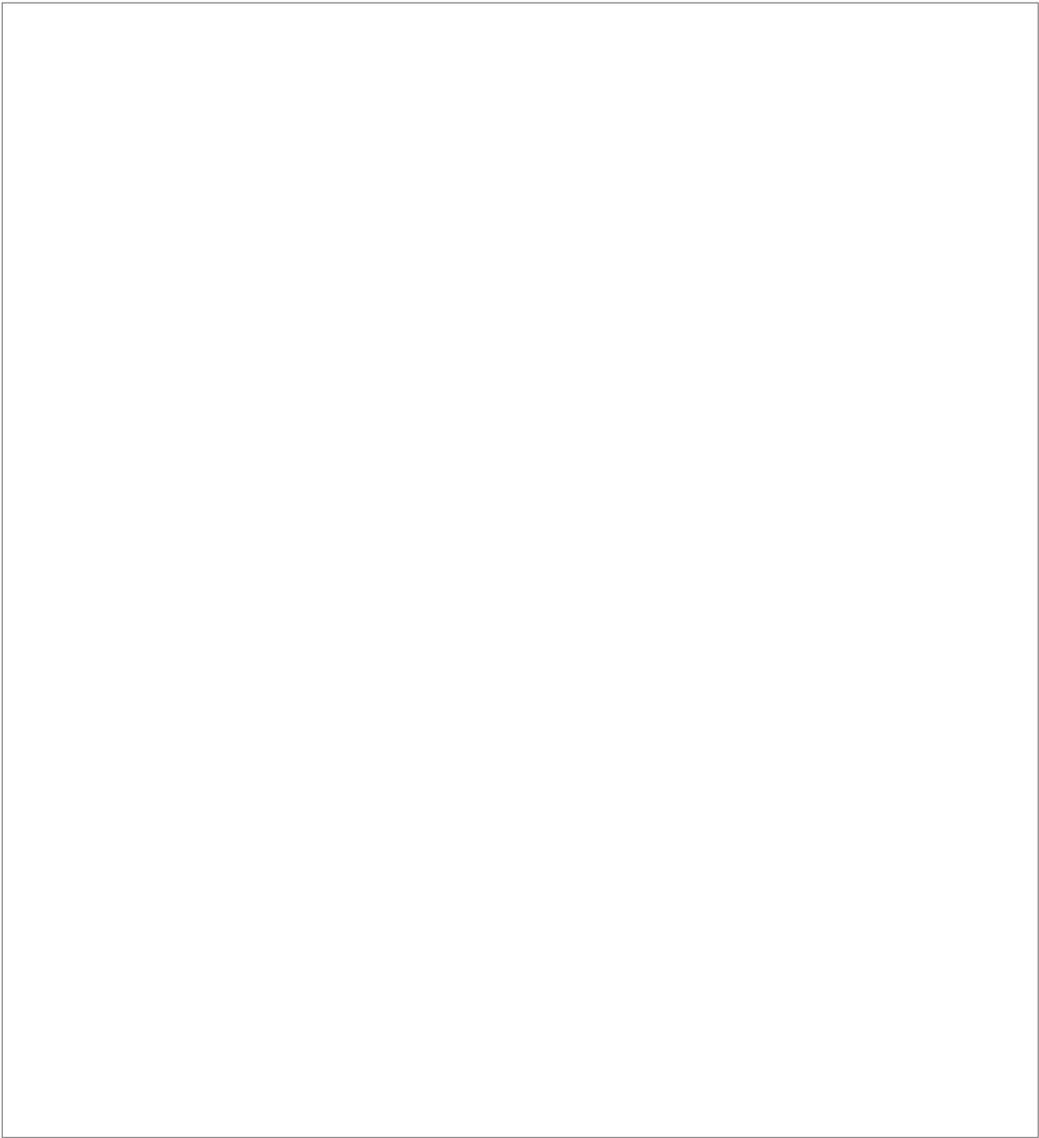

Summary of Results

In this project we analyze high-resolution remote sensing images of the landscape surrounding selected arctic tundra settlements in Russia, Alaska, Canada and Norway. One image covering the settlement and a reference image taken 30 km from the settlements are analyzed with respect to traces of human use and the state of the vegetation.

The remote sensing data will be related to data on structural variables such as climate, governance system, socio-economic conditions and ecosystem services to local people. These data are collected through the NRC funded project TUNDRA. 17 satellite scenes of settlements and 7 reference areas have been taken this summer. Additionally 15 archive scenes have been ordered.The settlements are also used as intensive study sites in theTUNDRA project, and interviews with local people in the settlements will be conducted in 2012-2013. The images were received in early September 2011, and the analyses of the images with respect to vegetation and human traces started immediately. A protocol for the analyses has been produced on the basis of the analyses of images from Khatanga (Russia) and Brevig Mission (Alaska). The analyses will continue throughout the winter 2011 and 2012 and analyses of the 39 images received so far will be finished in February 2012. Vegetation types identified include short and tall shrubs, forest, lichens, moss, grass, barren rock and soil. We identify fragments of homogeneous vegetation and calculate spatial indices of fragmentation. Traces of human use including ATV tracks, land-fills, fences, camps, mining activity and garbage deposits are detected. Community data collected in the TUNDRA project include: socio-economic conditions, infrastructure, governance regime, interview data including participatory mapping, history of the settlement, data on harvest and subsistence activity, activity related to extractive industries, data on reindeer husbandry, climate, bedrock and topography.

Fig. 1. Map showing the model settlements studied in TUNDRAscape. Settlements were chosen in adminstrative regions with contrasting governance systems (Taimyr / Yamal; Murmansk Obl. / Finnmark; Nunavut / Labrador; and Alaska). Within the regions settlements were chosen to have a contrast in economic structure with more (black dots) or less (white dots) opportunities for wage income.

A)

B)

Fig. 2 Examples of satellite images. a) Human traces mapped on the images from the settlement area of Brevig Mission in Alaska and from the area representing extensive use (chosen at random at 30km from the settlement. b) Vegetation cover map of the extensive use area close to the Khatanga in Taimyr (Russia) as determined by unsupervised classification.
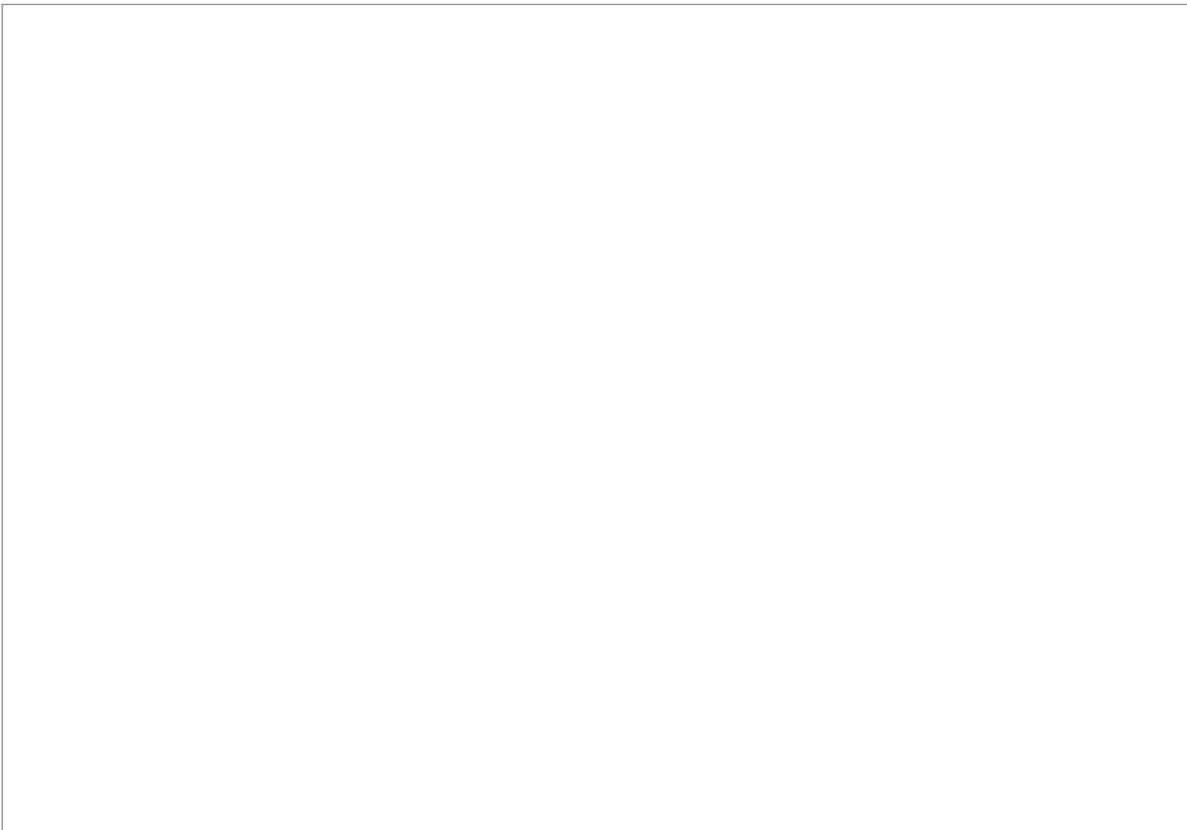

Fig. 3. Encroachment on tundra habitat in relation to settlement size. Squares represent settlements with real opportunities for wage income (2), whereas triangles represent settlements with little such opportunities (1). a) Area occupied by the settlement in km^2 in relation to the population (log scale).
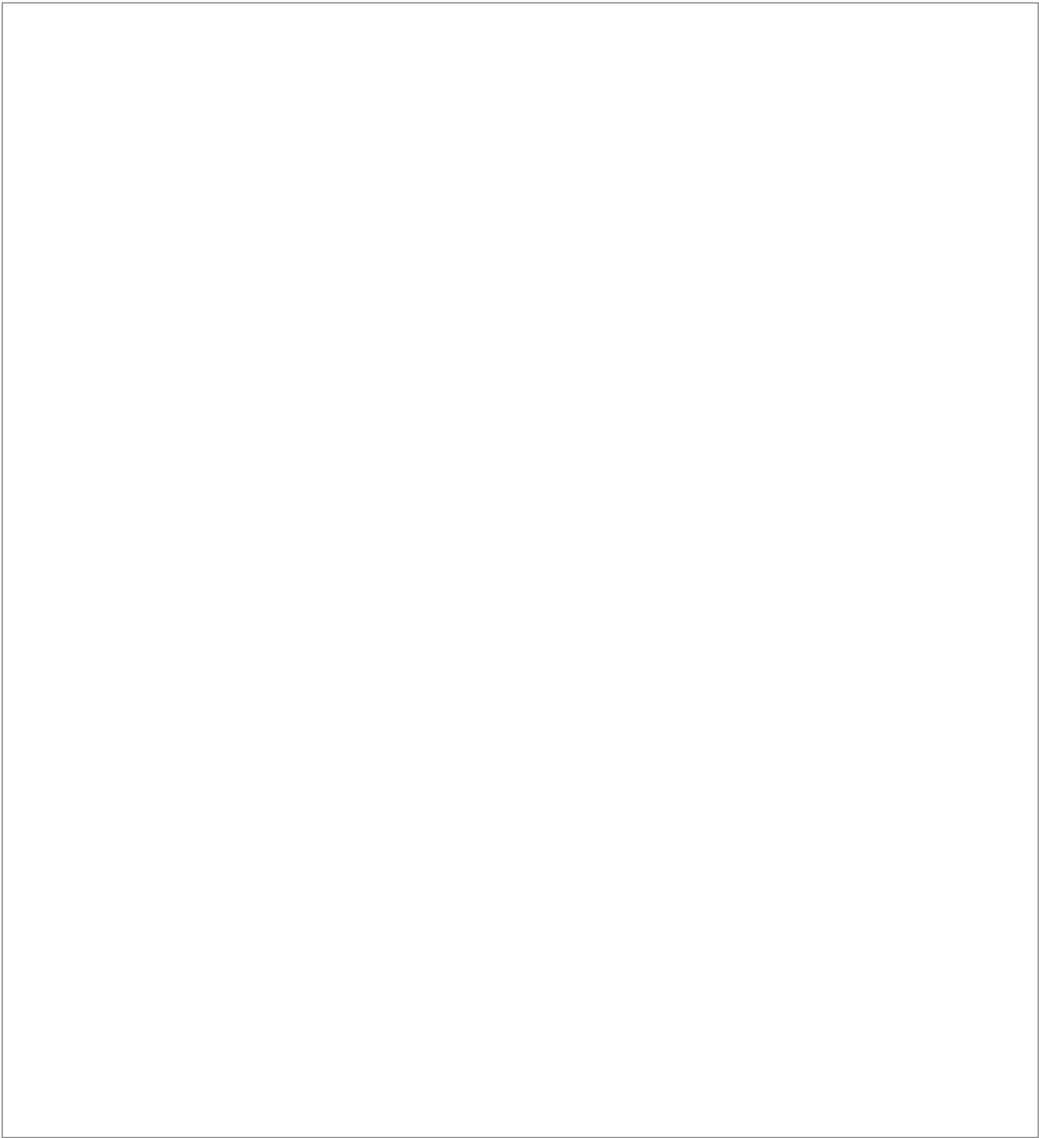
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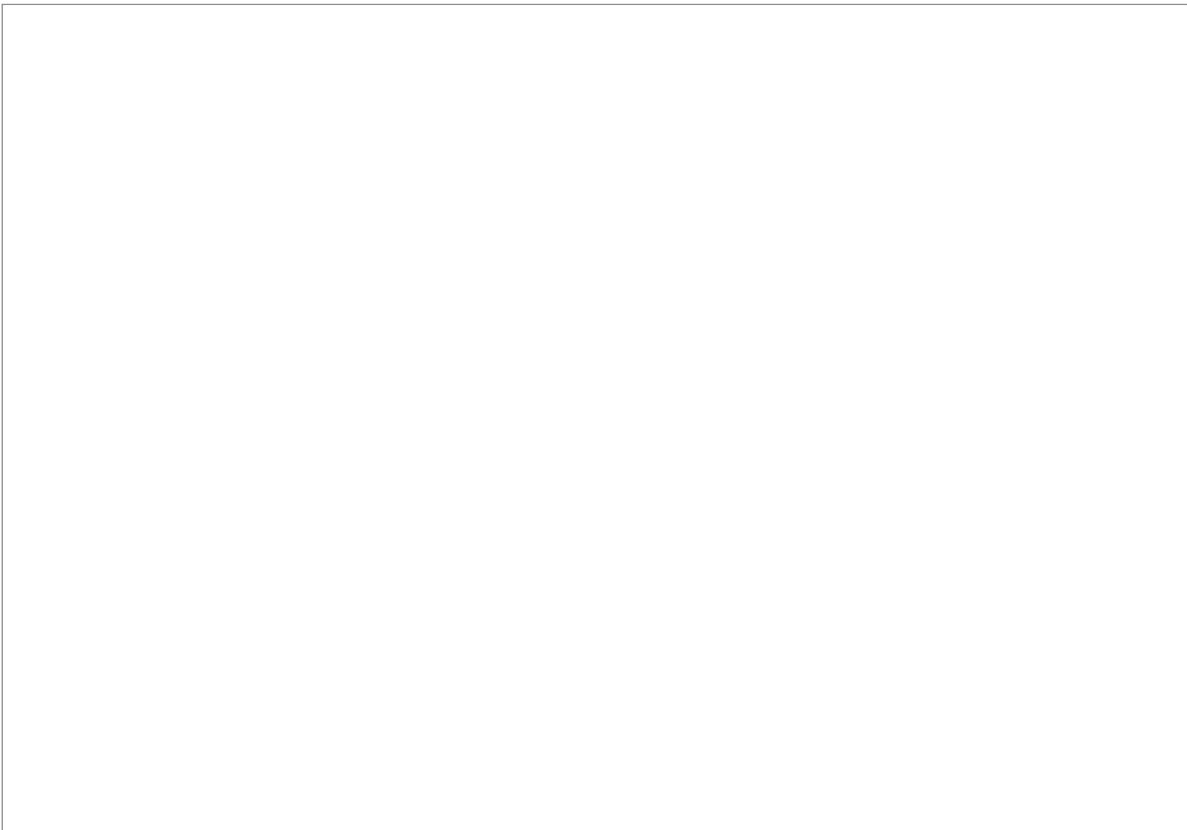

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Published Results/Planned Publications

We have not been able to publish anything from the project yet.

Communicated Results

Results will be communicated as fast as they appear.

Interdisciplinary Cooperation

The project involves researchers with different background including personnel with expertise in remote sensing, vegetation science, ecology, archeology and social sciences. The TUNDRA and TUNDRAscape are inter-disciplinary projects and the research would not have been feasible without this approach.

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Budget in accordance to results

The analyses of the remote sensing data would not have been done without the funding from the Fram Centre to TUNDRAscape. We believe that the datasets that we obtain through TUNDRAscape will be of large importance for the research in TUNDRA but also for future research on socio-ecological systems in Arctic areas.

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Could results from the project be subject for any commercial utilization

No

Conclusions

The present report is a progress report, and the project will be finished in February 2012. The datasets obtained in TUNDRAscape will be used as a basis for a wide array of future research. Specifically, the data will be used in analyses of:

a. human use of the landscape under different socio-economic conditions and

governance systems

b. how local people of the tundra use the landscape

c. vegetation transitions due to historic and contemporary human use

d. effects of grazing pressure and climate on the state of the vegetation