Destination Earth and Harvester Seasons service supporting sustainable forestry operation planning

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Within the Destination Earth initiative Finnish Meteorological Institute (FMI) under the contact of the European Centre for Medium-Range Weather Forecasts (ECMWF) is implementing a use case on forestry. https://stories.ecmwf.int/destination-earth

Destination Earth (DestinE) is a European Commission initiative:

• aims to develop a highly accurate digital model of the Earth
• monitor and predict the interaction between natural phenomena and human activities
• DestinE will contribute to achieving the objectives of the Green Deal and Digital Strategy

In coordination with its Member States, partners and stakeholders in the wider scientific, technological and commercial communities, ECMWF, in Destination Earth's first phase, is developing the first two digital twins:

• digital twin on Weather-induced extremes
• digital twin on Climate Adaptation

The new developments as Destination Earth Use Case on forestry and its Harvester Seasons service will highly benefit from those efforts. https://harvesterseasons.com

➢ New products on harvestability, climate outlook on forest conditions and potential forest damage risk due to weather extremes
➢ improving service input data from 9km to high 1km resolution
➢ extending Finnish harvestability maps to European domain

This is a collaborative work between

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The Harvester Seasons service briefly:

• helps the forestry sector in Finland to better plan the use of heavy machinery on the complex forest terrains
• forest operations require optimum soil bearing capacity to prevent compacting the ground and destabilizing the ecosystem

Best condition for forest operations is typically the winter season, when the soil is frozen, or snow covered and hard enough to carry heavy machinery

In areas with a high percentage of peatland, summer harvesting is best possible having dry conditions. Changing climate with shorter winter and summer with higher risks of forest fires make it necessary to better adapt the operation planning without losing productivity.

The app provides harvestability information based on :
☐ soil moisture
☐ soil temperature   ➢ data available for Europe
☐ snow depth

☐ bias-correction based on ERA5-Land reanalysis data

☐ 16x16m high resolution static map on Finland soil classification provided by the Finnish forest center (Finnish "Kurjuukelpoisuus" map by Metsäkeskus)

☐ 10-day short-term forecast including weather forecast information
• weather forecast updates: daily

☐ 6-month long-term forecast based on 51 seasonal ensemble model information
• 90% of 51 seasonal forecast ensemble members agreeing on conditions good or bad, rest uncertain
• seasonal forecast updates: every 14th of month dependent on published data from Copernicus Climate Change service

☐ risk on fires ➢ European Forest Fire Information System (EFFIS), https://effis.jrc.ec.europa.eu

https://harvesterseasons.com/
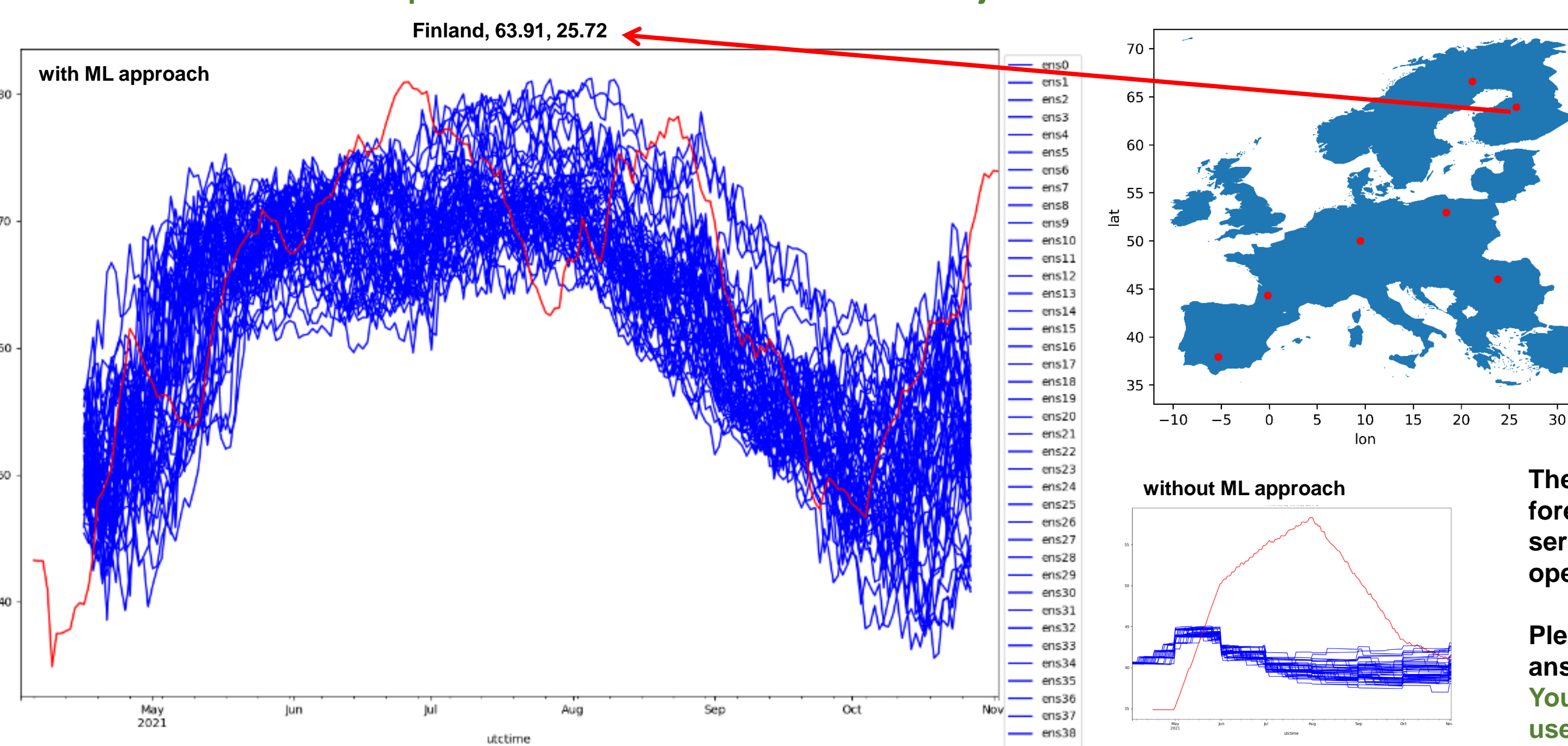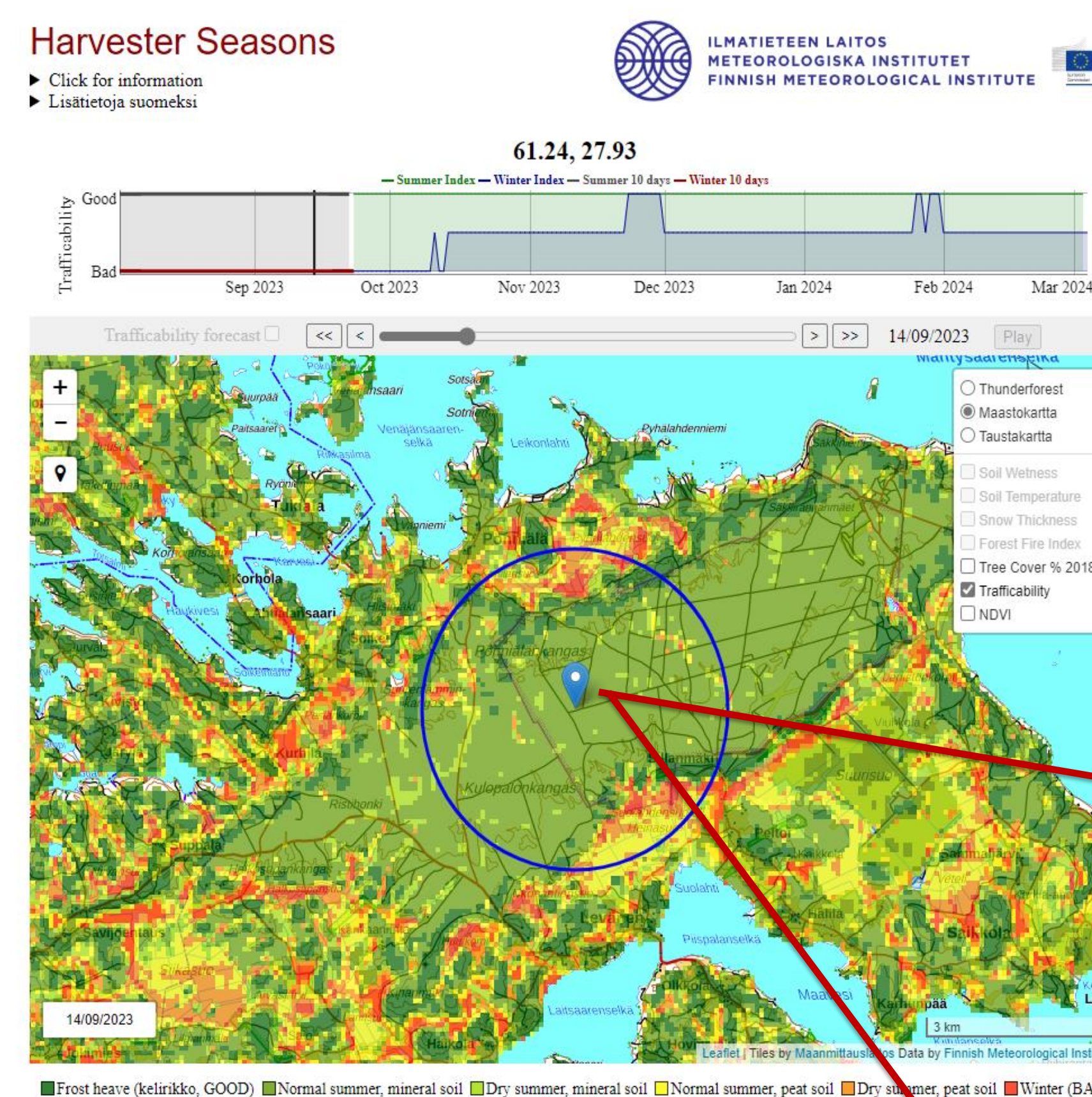
The Destination Earth use case on forestry:

• extend forest trafficability maps for Finland to full European domain
• fitting from 16 m static trafficability map of Finland (by the Finnish forest center "Korjuukelpoisuus"). Predictors from Copernicus high-res layers and soilgrids.org data.
• collect user feedback on European level to tailor the service to the user needs
• run services and develops AI models on CSC LUMI/EuroHPC servers
• machine learning models improve downscaling relevant parameters to 1km resolution
• Teaching data are soil water index EO product, SoilTempDB observations and ECA data combined with ERA5-Land and many EO or in-situ data

Upcoming service extensions:
• 10-30 years climate outlook based on Destination Earth global Climate Digital Twin (DT)
• wind gust information assessing storm damage risks based on global and on-demand forecasts by Destination Earth Extreme weather Digital Twin

Soil wetness downscaling already released
• major improvement over IFS volumetric soil wetness VSW
• demonstrates a great capability with ensemble forecasts to predict dry or wet condition probabilities several months ahead with useful skill
• below comparison for point in Finland with a 2021 April seasonal forecast ensemble compared with SWI observations compared with SWI-climate to ERA5-L bias adjusted VSW ensemble

Harvester Seasons
▸ Click for information
▸ Lisätietoja suomeksi

61.24, 27.93

TRAFFICABILITY MAP

Trafficability class
Min.soil / thaw season
Min.soil / normal summer
Min.soil / dry summer
Peatland / normal summer
Peatland / dry summer
Min.soil&peatland / winter

The service is developed in close collaboration with the forestry sector. Typical users of the Harvester Seasons service are forest harvesting contractors, operators and operation planners.

Please help us to collect the needs of the forestry sector by answering the short survey. It takes only ~5min!
Your input counts and helps us to tailor the service to the user needs!
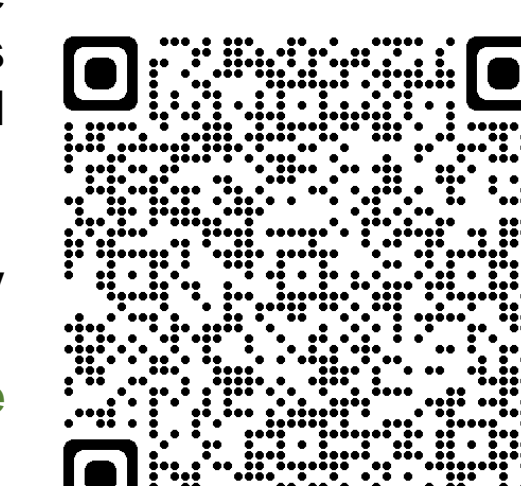
link to a user survey

If you want to know more about the service and what it can offer for your forest operations, check out:

https://harvesterseasons.com/ and Harvester Seasons on LinkedIn