TRAFFIC ACCESSIBILITY STUDY FOR THE WIND FARMS OF NORTH OSTROBOTHNIA AND KAINUU REGIONAL PLANS

30 September 2022

Photo: Juha-Matti Kaataja 2022

KEMIN SATAMA Port of Kemi

PORT OULU

PORT OF RAAHE RAAHEN SATAMA

PORT OF KALAJOKI

KOKKOLAN SATAMA 1825

Elinkeino-, liikenne- ja ympäristökeskus

POHJOIS-POHJANMAA COUNCIL OF OULU REGION

KAINUUN LIITTO

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Contents

Translation: Monetra Tulkkipalvelu

1 Introduction

Introduction to the traffic accessibility study

- This presentation is a summary of ***The traffic accessibility study for the wind turbine area in the regional plans of North Ostrobothnia and Kainuu***.
- The study was commissioned by the Council of Oulu Region and the Regional Council of Kainuu, and carried out by Ramboll Finland Oy as consultancy work in June–September 2022.
- On 16 February 2022, the Ministry of the Environment granted the Council of Oulu Region a state subsidy for the preparation of a traffic accessibility study for the wind farms in the regional plans of North Ostrobothnia and Kainuu (VN/3195/2022-YM-3). The Regional Council of Kainuu and the Council of Oulu Region co-financed the project. Other contributors to the study were the ports of Kemi, Oulu, Raahe, Kalajoki and Kokkola.

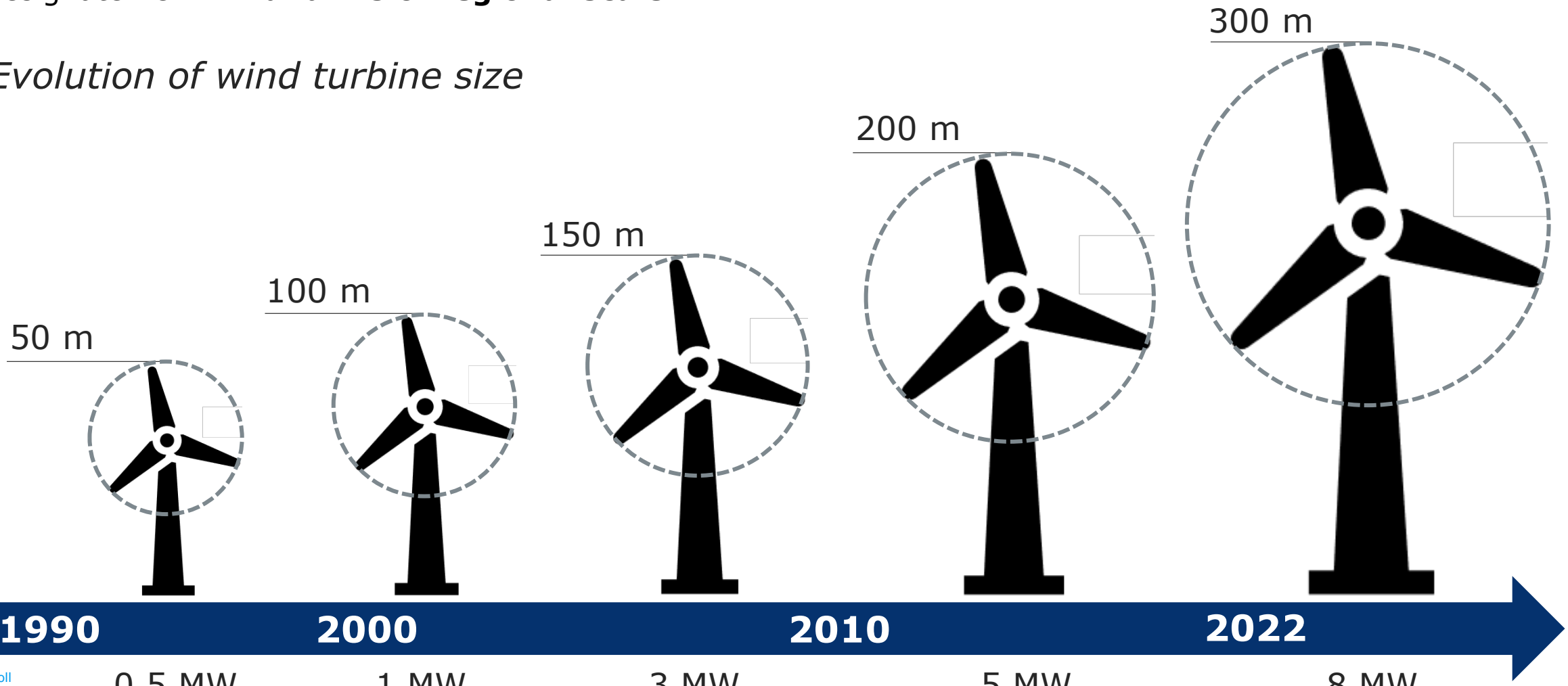
The steering group of the project consisted of:

Erika Kylmänen, Council of Oulu Region
Lauri Romppainen, Council of Oulu Region
Rauno Malinen, Council of Oulu Region
Sanna Schroderus, Regional Council of Kainuu
Martti Juntunen, Regional Council of Kainuu
Heino Heikkinen, ELY Centre of North Ostrobothnia
Risto Leppänen, ELY Centre of North Ostrobothnia
Jyrki Roukala, Port of Kokkola
Mika Suvanto, Port of Kokkola
Petri Nikupeteri, Port of Kalajoki
Pauli Sarpola, Port of Raahe
Marko Mykkänen, Port of Oulu
Markku Rautio, Port of Kemi
Hannu Tikkala, Port of Kemi
Kaisu Laitinen, Ramboll Finland Oy
Karri Hakala, Ramboll Finland Oy
Miikael Hyyrynen, Ramboll Finland Oy

Background to the report

- In 2021, **an estimated 45%** of the wind turbines planned for Finland will be located **in North Ostrobothnia** or **Kainuu** (Finnish Wind Power Association 2022).
- In both provinces, at the time of the feasibility study, a regional plan was being drawn up to designate new **wind farms of regional scale**.

Evolution of wind turbine size



Objectives and content of the report

- The aim of the study was to find the **most suitable special transport routes** for the wind farms in the regional plans of North Ostrobothnia and Kainuu.
- At the same time, **problems** and areas **for improvement** were identified so that they could be taken into account as input for the further phases.
- The main focus was on the routes for the special transport of wind turbine components from ports to wind farms. The review was primarily conducted from the perspective of the time that the report was drawn up.
- The study was prepared on the basis of available data, previous studies and expert assessments.

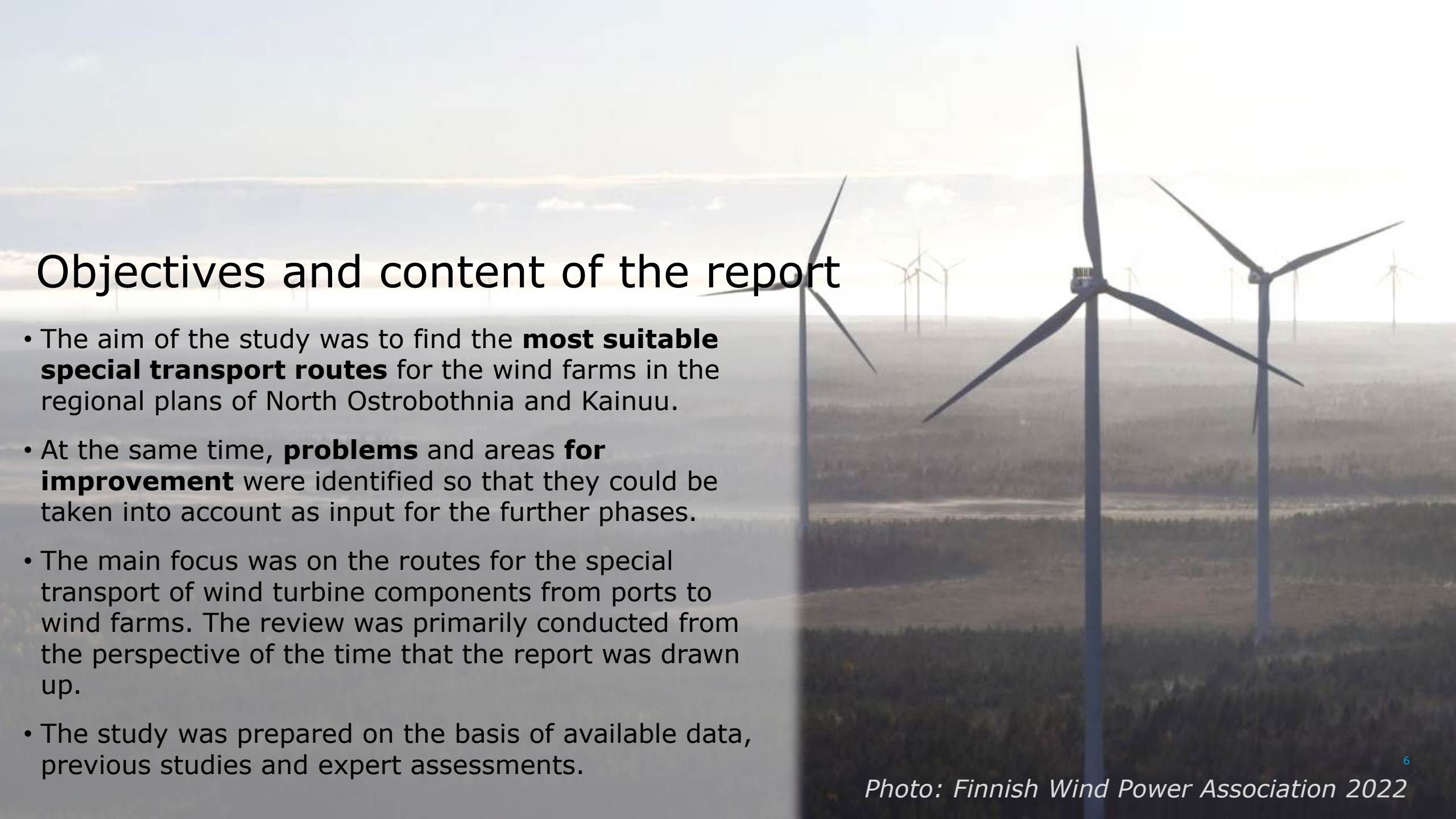
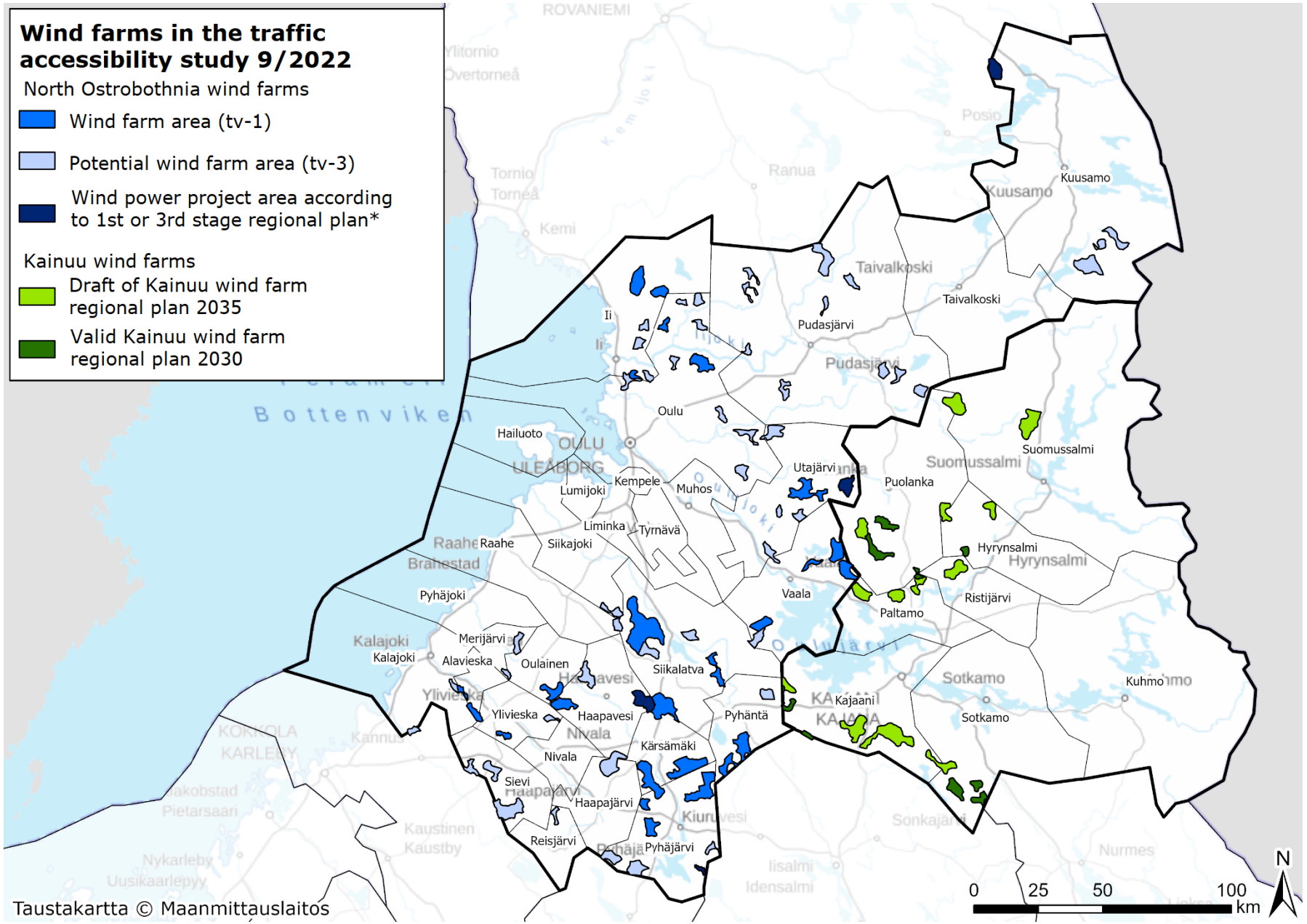


Photo: Finnish Wind Power Association 2022

Wind farms in North Ostrobothnia and Kainuu



The report included:

77

Wind farms in North Ostrobothnia

24

Wind farms in Kainuu

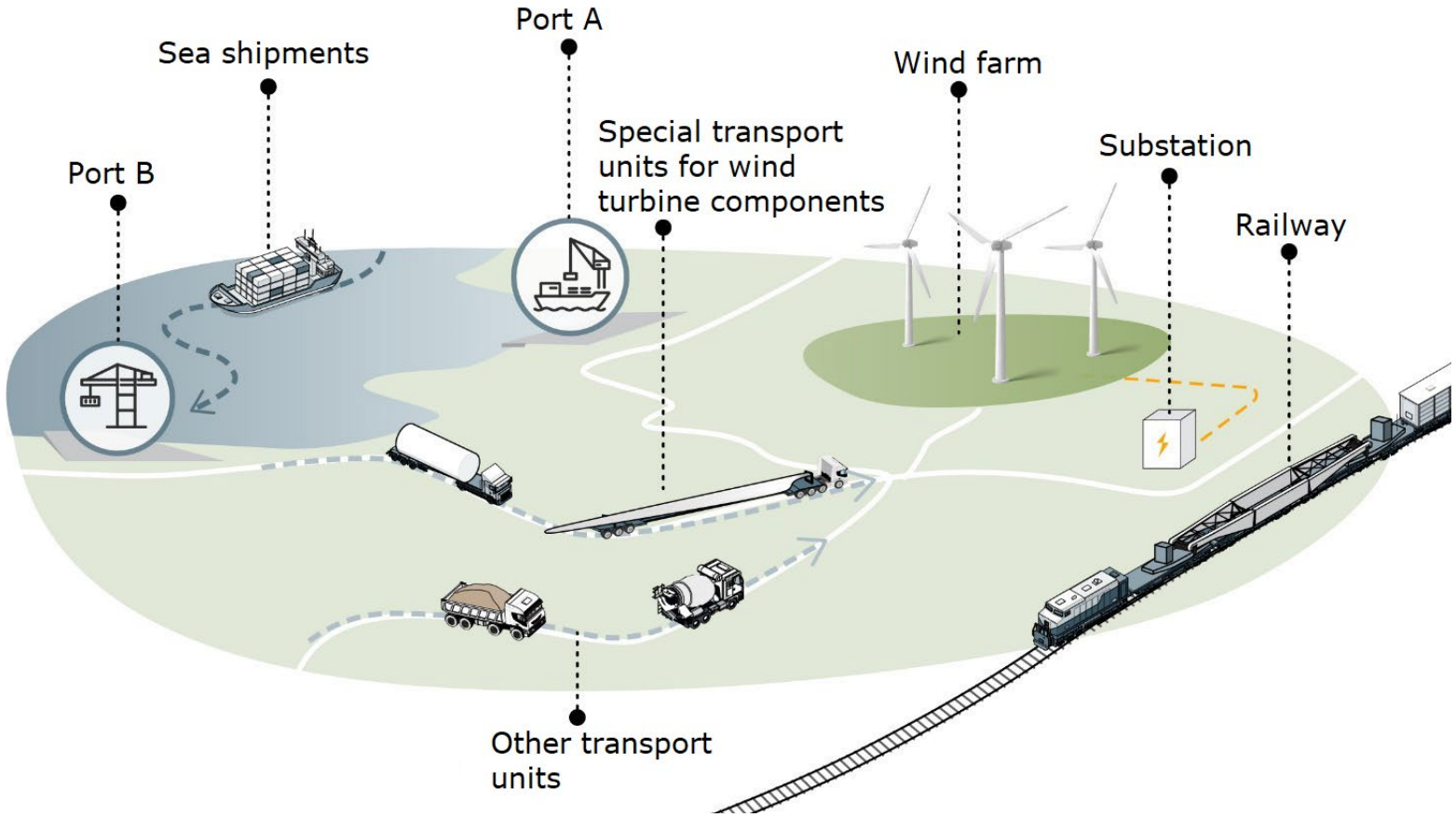
101

Wind farms in total

2 Transport needs related to wind power construction

Transport related to wind power construction in general

- Wind turbine components are typically shipped from the manufacturing country **by sea** to Finnish ports, from where they continue their journey to the wind turbine area by road as **special transport units**.
- **The road network** is also used for other wind power construction transport, at least some of which is specialised.
- **The rail network**, on the other hand, often plays a key role in transporting large heavy trans-formers to a transfer loading point, from where the final journey is made by road.

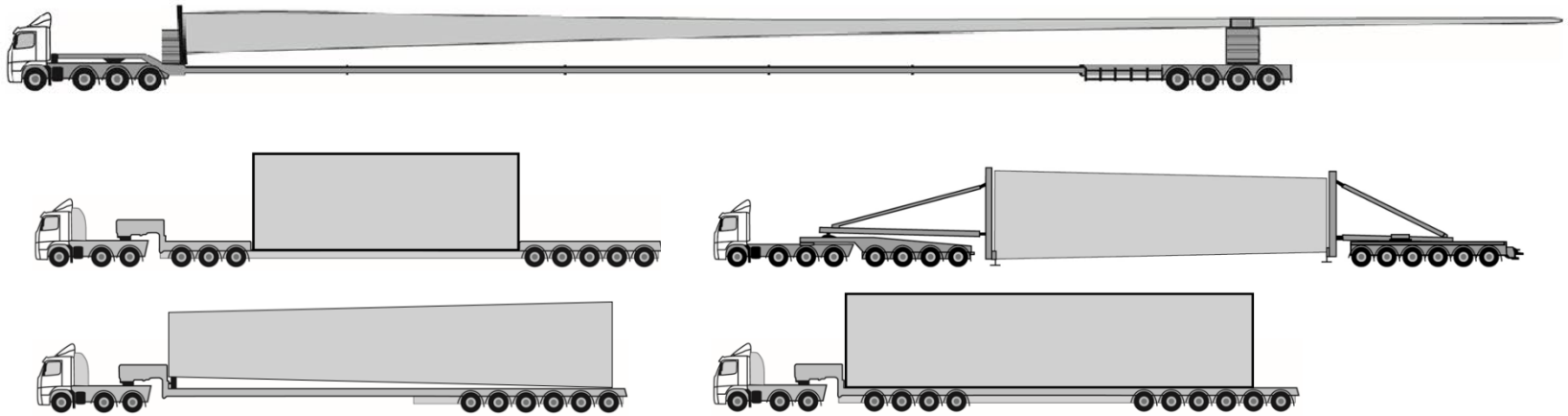


Transport related to wind turbine construction makes extensive use of the transport system.

Special transport of wind turbine components

- Flatbed transport units are exceptionally **long** forms of special transport.
- Tower block transports are **tall**, **wide** and **heavy**.
- Engine room transport as **the greatest total mass,** if the engine room is transported as a whole.

Flatbed and tower block transport



Transport of wind turbine components	Transport height (m)	Transport width (m)	Transport length (m)	Total transport mass (t)
Flatbed	4.5–5.5 m	4–5 m	**70–100 m**	70–100 t
Tower block	**5–8.5 m**	**4.5–7 m**	30–50 m	**130–190 t**
Engine room	4.4–6 m	4–5 m	20–30 m	**120–250 t**

Special transport of wind turbine components

Other transport related to wind power construction

Crusher transport

Photo: Transport company Matti Janhunen 2016

Large transformer transport

Photo: Lauri Savolainen 2016

Transport of industrial machinery

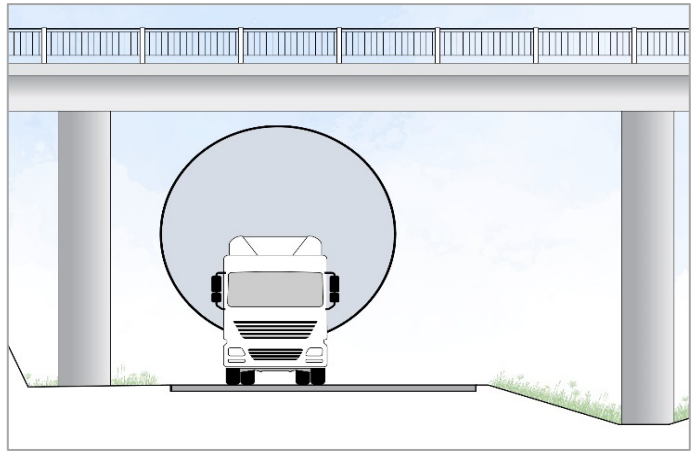
Photo: Juha Savolainen 2016

Vehicle lift

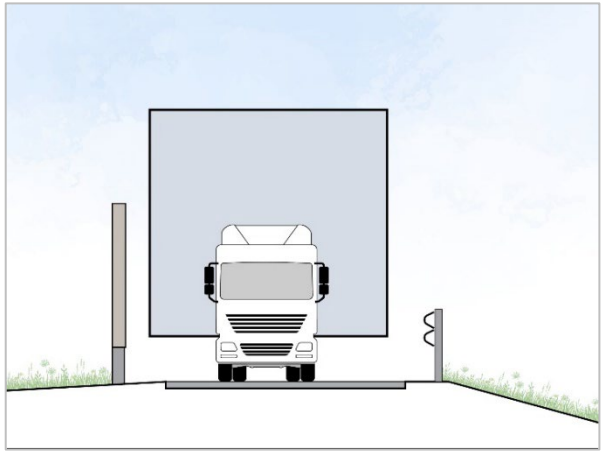
Photo: Transport company Matti Janhunen 2014

The challenges of transporting wind turbine components

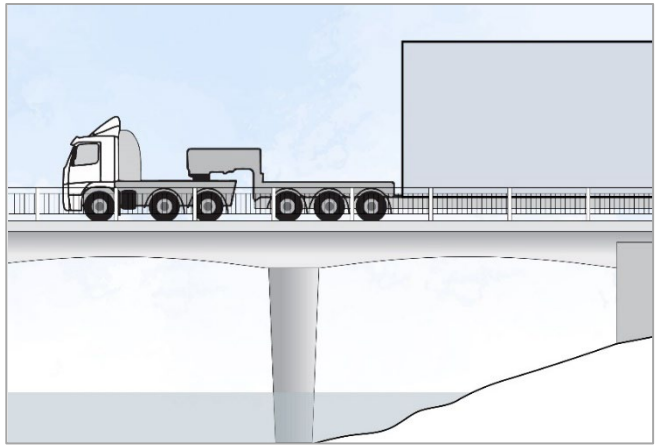
Height limits



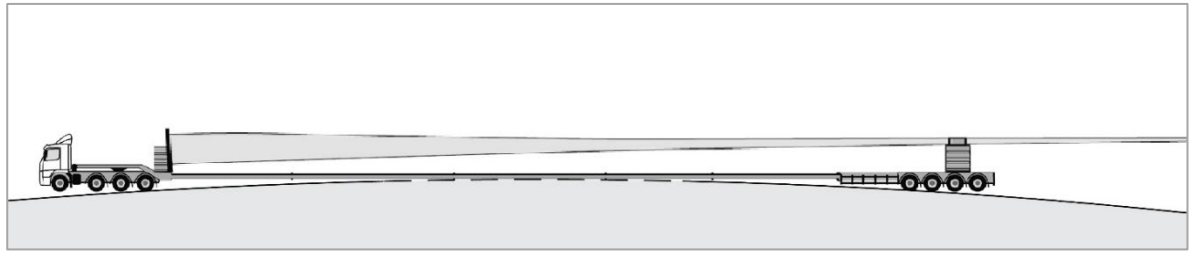
Width limits



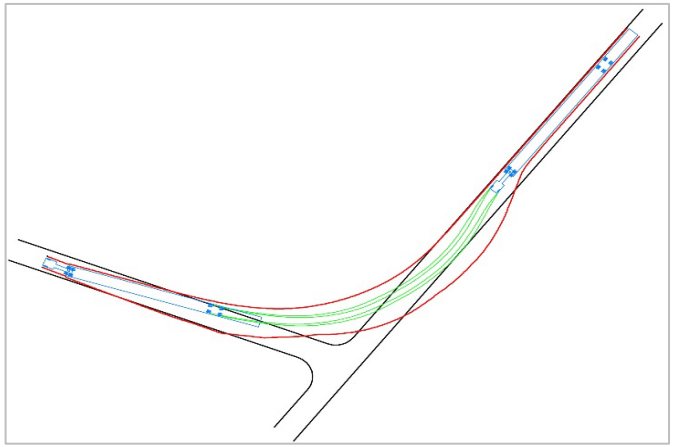
Load-bearing limits



Length limits



Turning, driving line



Measures

Level crossings on railways

Determining the transport routes for wind turbine components and the challenges involved

Challenges of the target road network for specialised transport

Determining the load-bearing capacity of bridges

Soil and road structure risk assessment

Coordination of large special transport operations with other traffic

Nature of a special transport authorisation decision

Uncertainties on the transport route

Changes on the route and how to anticipate them

The challenges of responsibility for implementing measures

Challenges related to information flow

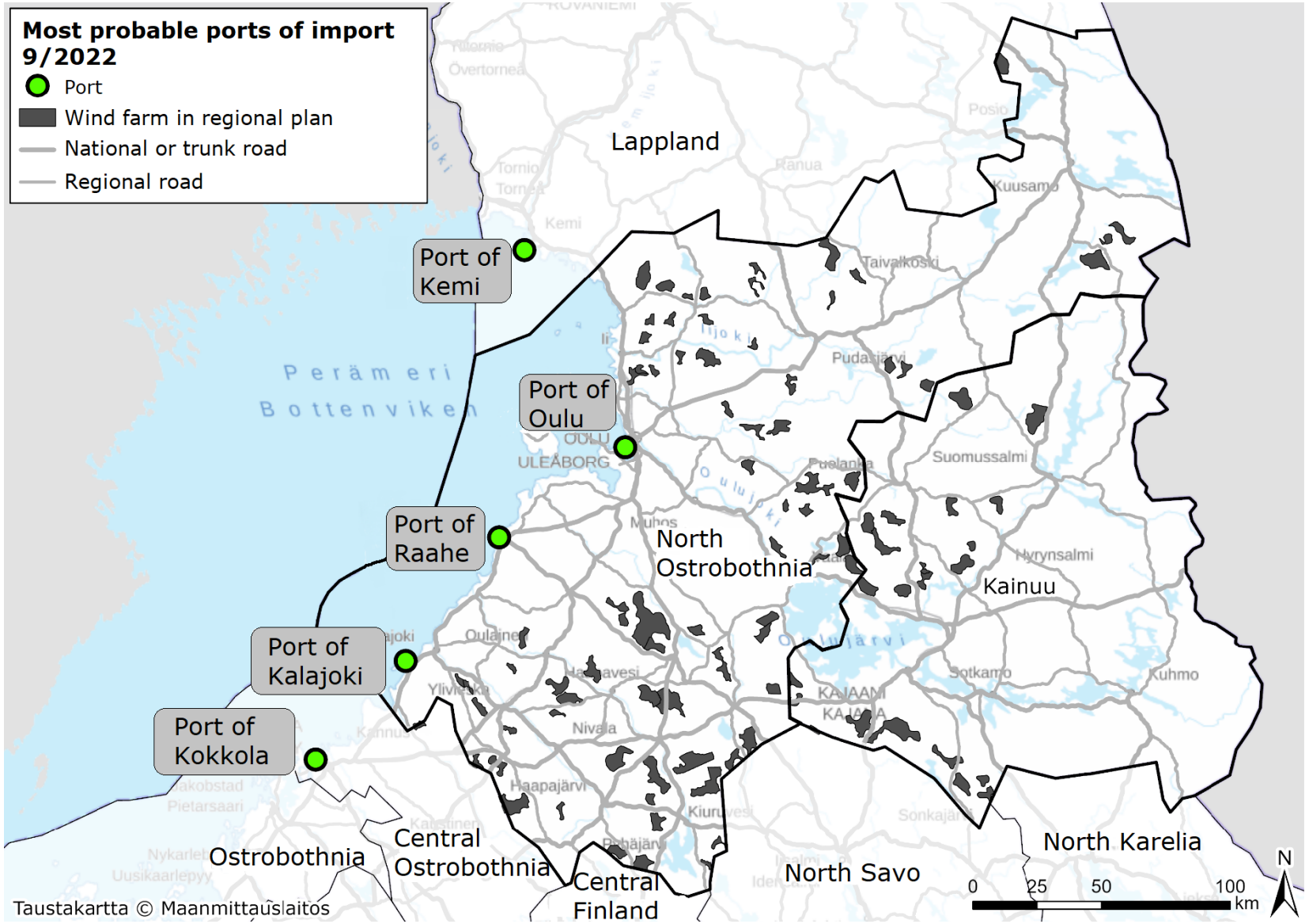
3 Main routes to wind farms in North Ostrobothnia and Kainuu

Route analysis from ports of entry to wind farms

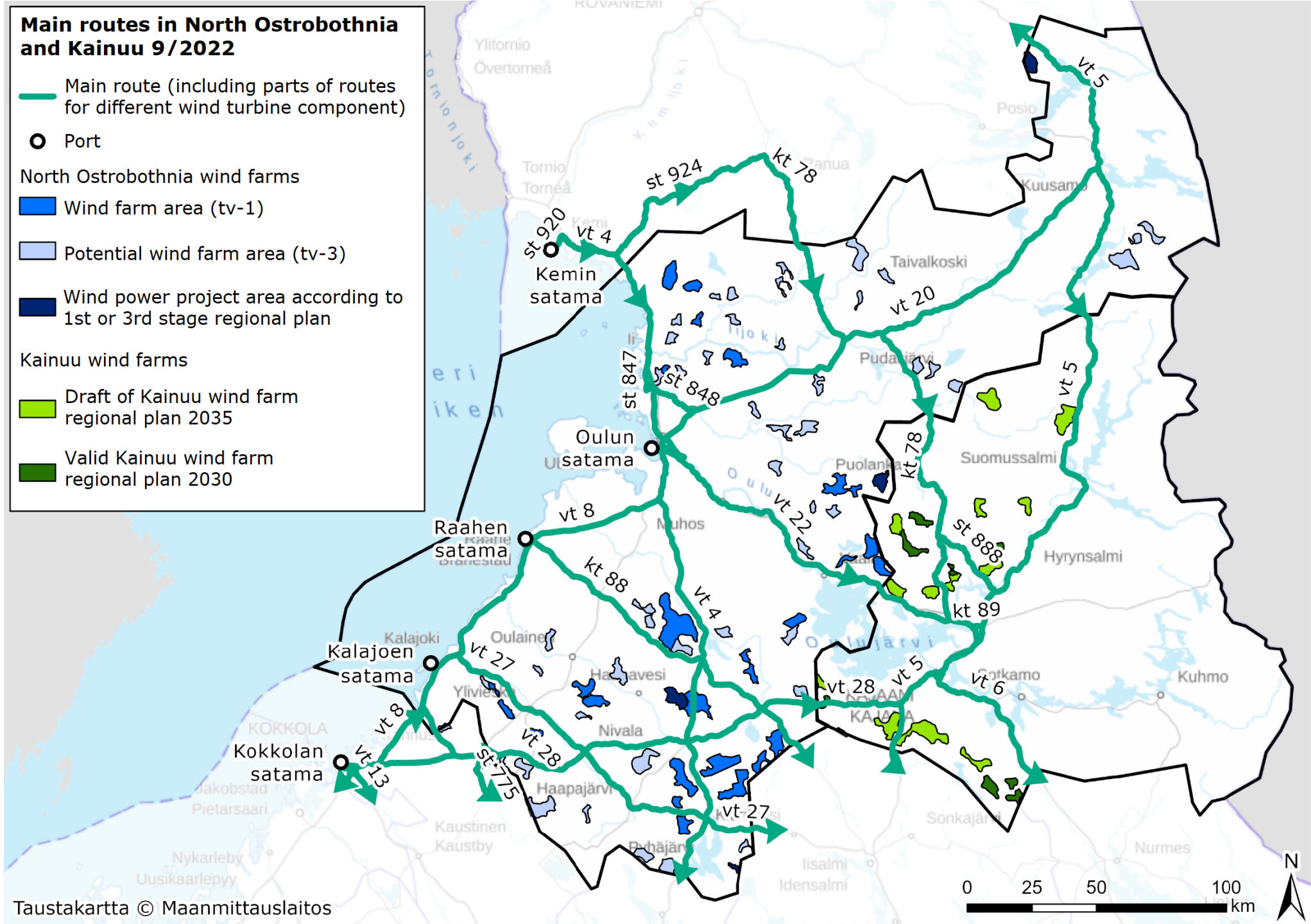
Connections from port areas to main routes

Main routes (including route elements for different parts of a wind turbine).

Connections from the main routes to wind farms



Main routes


Main routes in North Ostrobothnia and Kainuu 9/2022
Main route (including parts of routes for different wind turbine component)
Port
North Ostrobothnia wind farms
Wind farm area (tv-1)
Potential wind farm area (tv-3)
Wind power project area according to 1st or 3rd stage regional plan
Kainuu wind farms
Draft of Kainuu wind farm regional plan 2035
Valid Kainuu wind farm regional plan 2030
Kemin satama
Oulun satama
Raahen satama
Kalajoen satama
Kokkolan satama
st 920
vt 4
st 924
kt 78
vt 5
vt 20
st 847
st 848
kt 78
vt 5
vt 8
vt 22
st 888
kt 89
kt 88
vt 4
vt 27
vt 28
vt 5
vt 6
vt 8
vt 13
st 775
vt 27
Taivalkoski
Suomussalmi
Hyrynsalmi
Kuhmo
Nivala
Haapajärvi
Kalajoki
Oulainen
KOKKOLA
Jakobstad
Pietarsaari
Nykarleby
Uusikaarlepyy
Kaustinen
Kaustby
Taustakartta © Maanmittauslaitos
0
25
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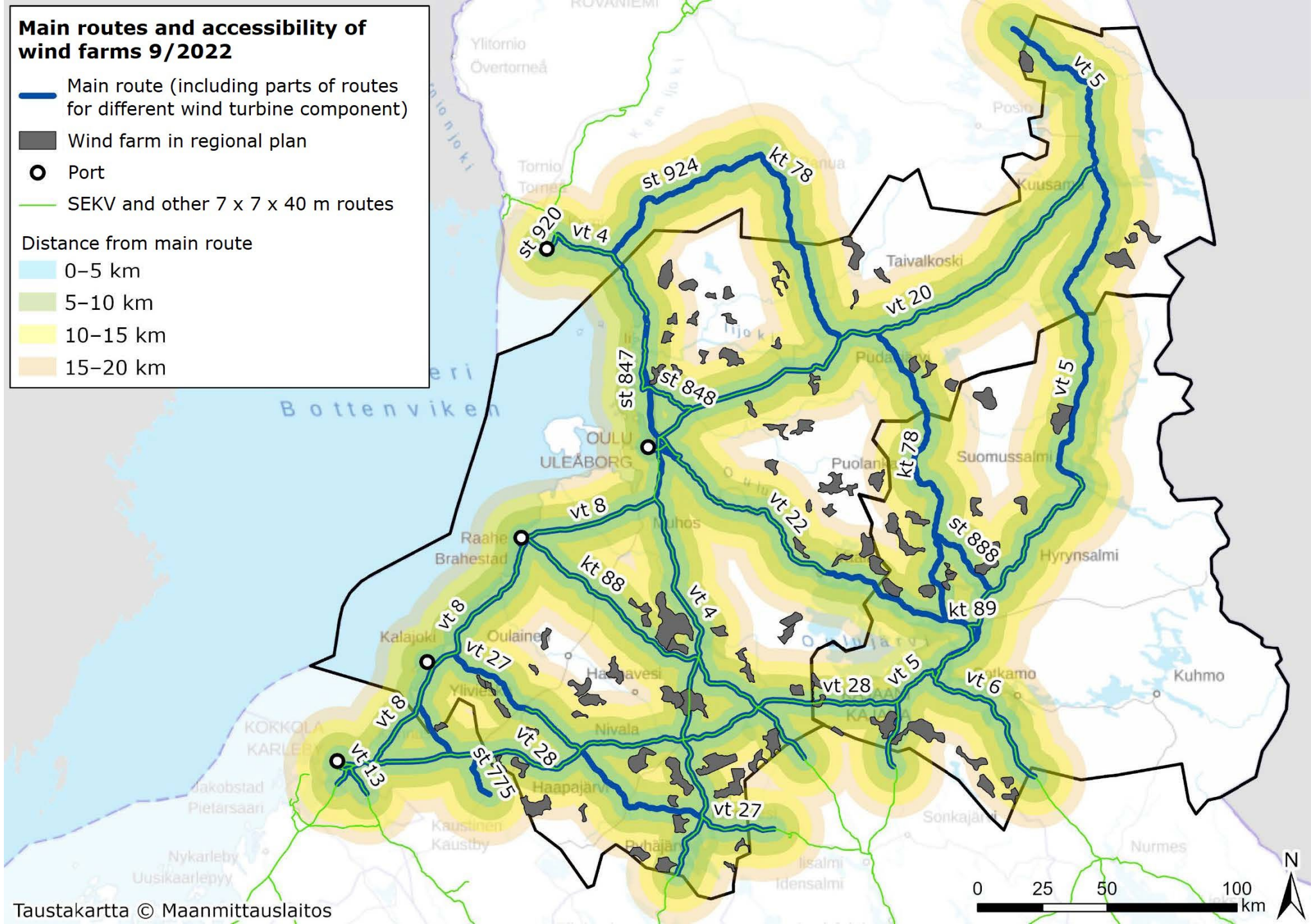
km
N

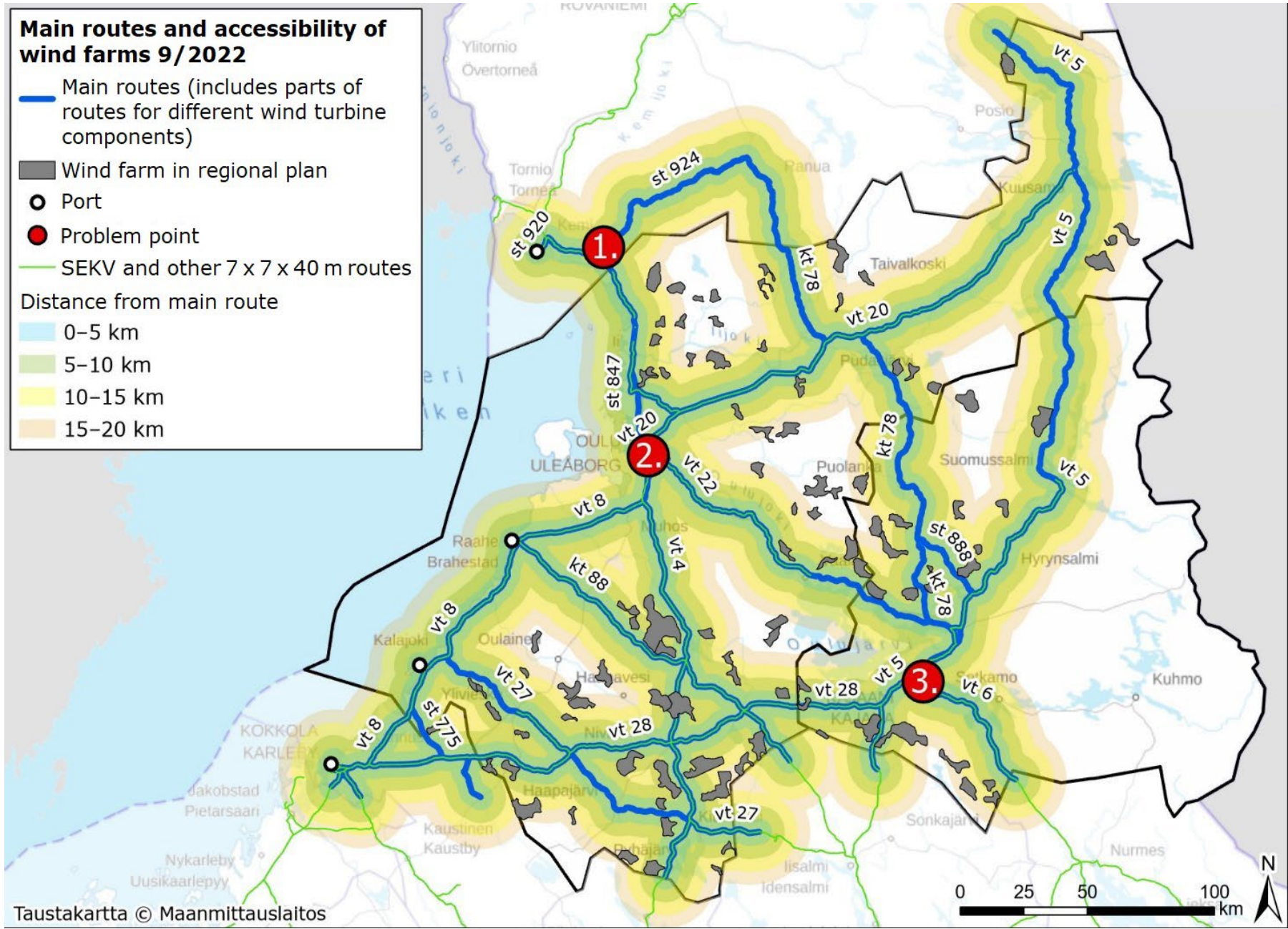
Accessibility of wind farms on the proposed main route network



Problem areas on the main routes

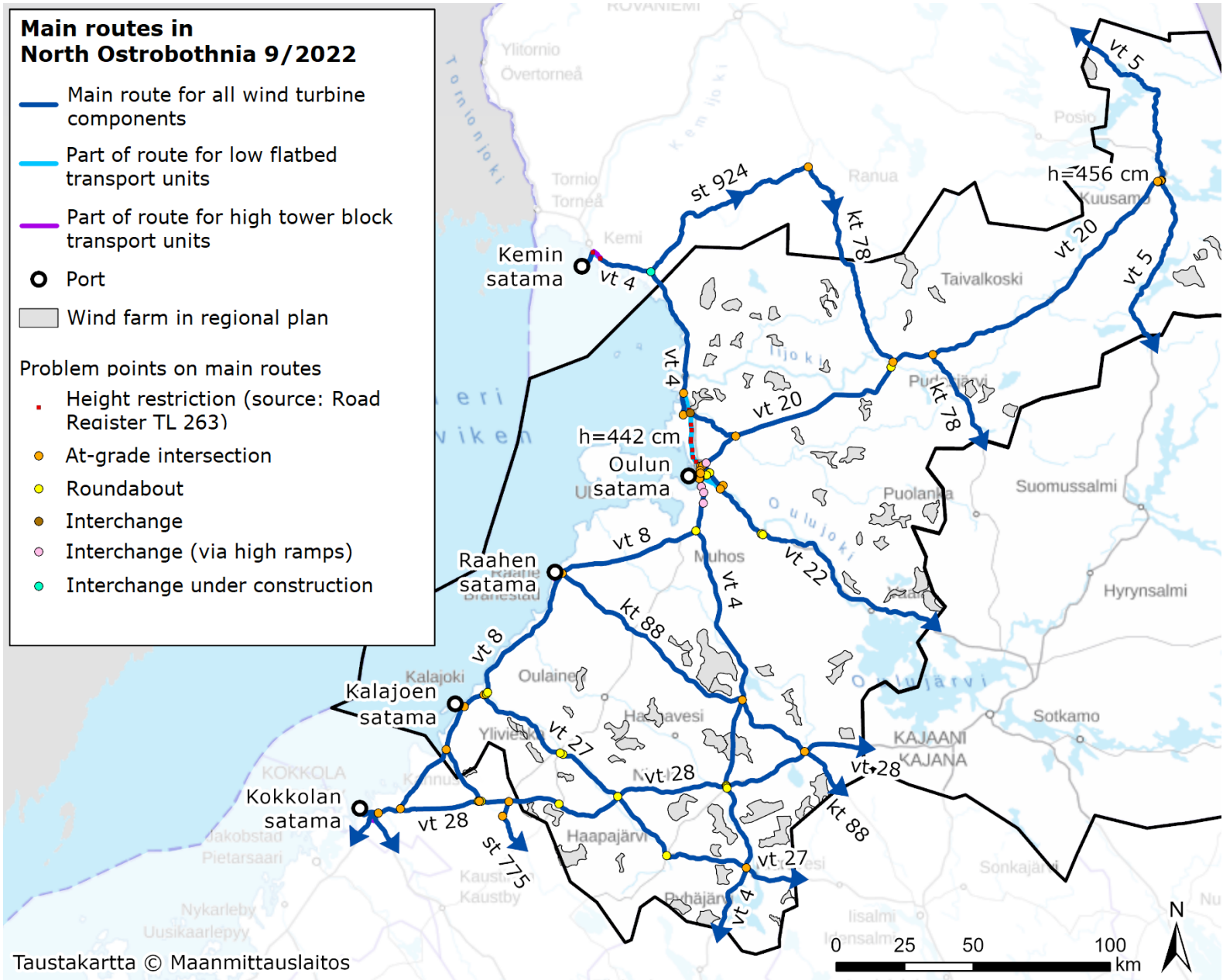
Identified the
most critical problem areas:

1. Simo (under construction at the interchange of national road 4 and regional road 924)
2. Oulu
3. Kajaani



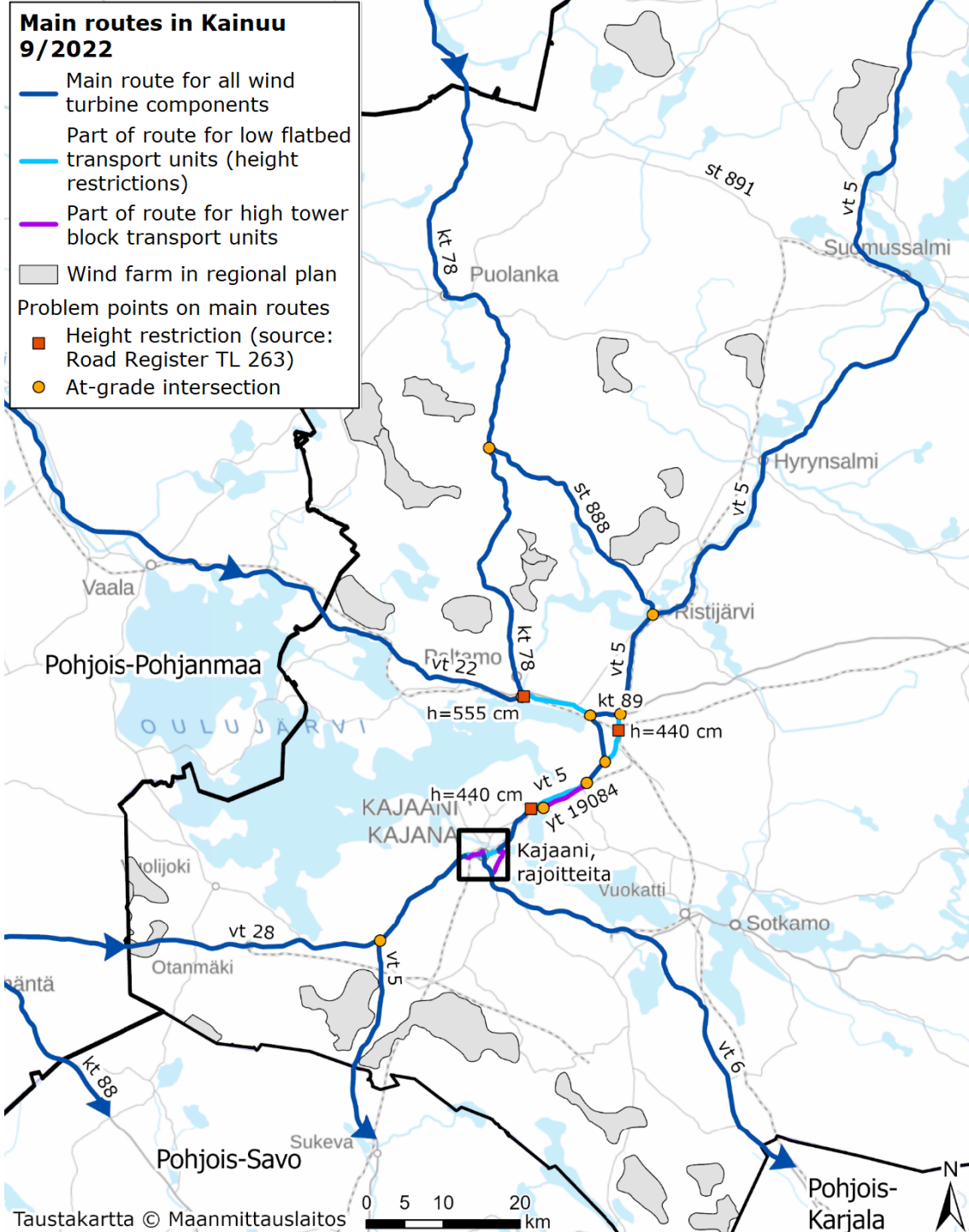
Main routes in North Ostrobothnia

- The coastal **national road 8** connects the ports of Kokkola, Kalajoki and Raahe.
- The main inland routes are **national roads 28 and 27**, **trunk road 88** and **regional road 775**.
- The main north-south route of national **road 4** connects the coast to the main inland routes, but national road 4 faces challenges in passing through Oulu.
- **National road 22** is the main route from Oulu to the north of Lake Oulu and on to Kainuu.
- In the northern part, the main eastbound connection is **national road 20**, from which the main routes across the Kainuu border are **national road 5** and **trunk road 78**.



Main routes in Kainuu

- The wind farms in the southern part of Kainuu are best accessed by entering Kainuu from the harbours from the west along **national road 28**.
- In the northern part of Kainuu, north of Lake Oulu, **national roads 5 and 22**, as well as **trunk road 78**, are potential main routes from North Ostrobothnia to Kainuu. The main route to **regional road 888** was also identified.
- There are height restrictions and interchanges east of Lake Oulu and in the Kajaani region, which limit traffic across Kainuu in the north-south direction.
- Through Kajaani, you have to go to the main route of **national road 6**, which can be a problem, especially for flatbed transporters.



Accessibility of wind farms by area 1/2

A rough map review and road data were used to identify possible links from the main routes to the wind farms. The regional maps are attached to the presentation.

Identified features affecting the accessibility of wind farms by road include:

Fixed height restrictions

Weight-restricted bridges

Level crossings on electric railway lines

Road surface condition and carriageway width

Photo: Google Maps 2022, Juha Mattila 2020 and Finlex 2018

Accessibility of wind farms by area 2/2

The rough analysis of the study did not allow an accurate assessment of the best routes and their future traffic capacity.

It is recommended that the following issues be considered more closely in further research:

Road geometry

Load capacity of bridges

Overhead cables

Interchanges

Load-bearing capacity of the road structure and soil

Measures

Photos: Juha Mattila 2020

4 Conclusions and policy recommendations

Accessibility to wind farms in the current situation

- The **main routes** identified in the study **form a network**, at least in parts of the provinces, which provides a variety of route options for specialised transport from ports to wind farms.
- The main route network is largely based on **the large special transport network (SEKV)** and other 7 x 7 x 40 m target routes, supplemented where necessary.
- In particular, the length of flatbed transport units is significantly longer than the SEKV target of 40 m. In principle, however, it makes sense to favour SEKV routes for large special transport units.
- **The most critical problem areas** on the main routes presented are located in **Oulu**, **Kajaani** and **Simo** in Lapland.
- In parts of North Ostrobothnia and especially in Kainuu, special transport on a similar scale has not been carried out before, so **the functionality of the roads and the problems on the main routes are not yet fully understood**.

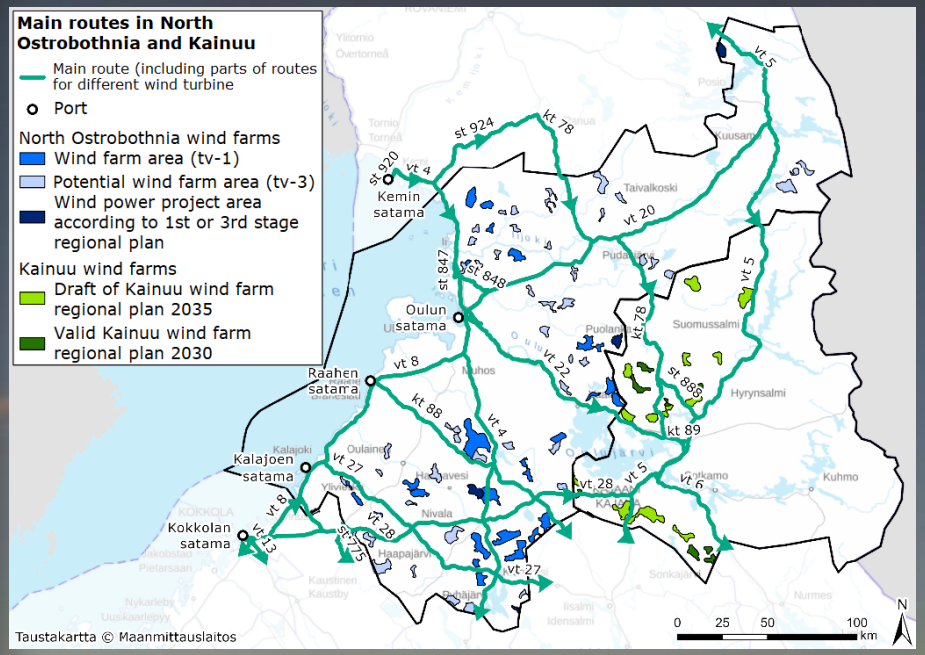


Photo: Vuorsola 2022

Impacts and challenges of increasing the transport size of wind turbine components

- The current special transport of wind turbine components is already challenging and puts pressure on **the performance of the road infrastructure** and **other traffic**.
- It is not yet possible to precisely identify the effects of an increase in the transport size of wind turbine components. Almost all current transport of wind turbine components already requires some form of **road transport**.
- With larger transport dimensions, **the turning** and **space requirements** for flatbed transport will **increase**, especially at intersections such as interchanges and level crossings. The amount of tree clearance, road embankment widening and structure removal required will increase compared to today.
- The increase in the transport unit size of wind turbine components will require major arrangements and measures. Therefore, **instead of increasing the transport unit size**, a more likely development is to **improve the efficiency of** wind turbines or to promote **solutions that improve transportability** . This could include new types of transport vehicles or the splitting of wind turbine components into several parts.

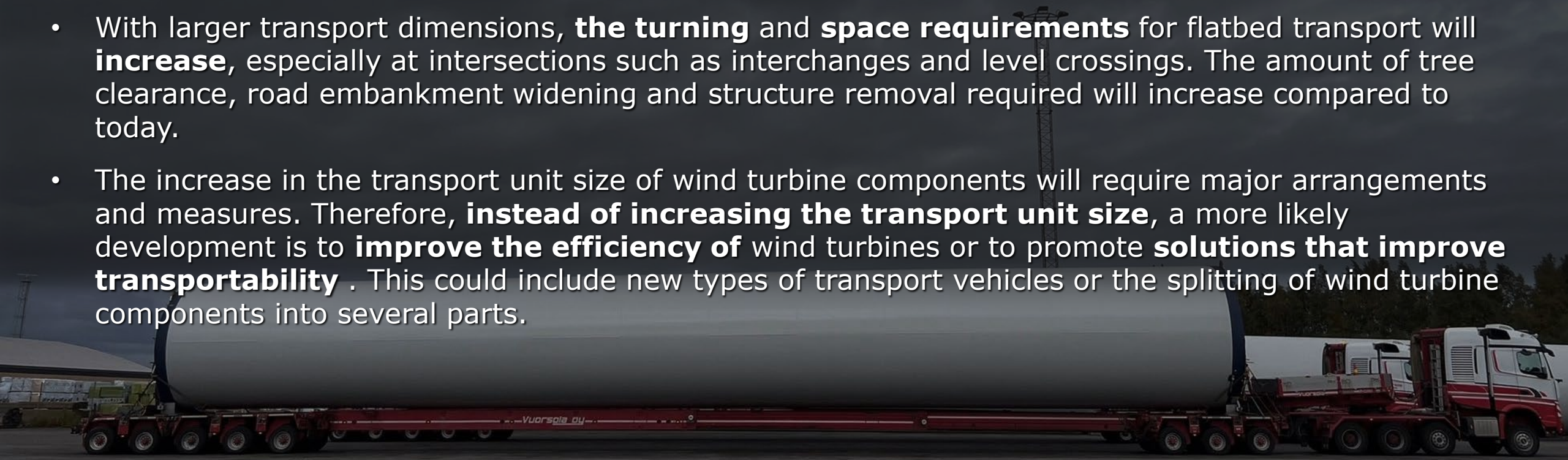


Photo: Vuorsola 2022

Recommendations for next steps in transport route development

- The most critical problem areas on the main routes are **Oulu** in North Ostrobothnia and **Kajaani** in Kainuu.
  The interchange of national road and regional road 924 under construction at Simo, Lapland, partially blocks the use of the port of Kemi and the northern route connection to wind farms in the northernmost interior parts of the provinces.
- **Improving the functionality of port connections** to facilitate the transport of wind turbine components and to provide permanent arrangements for traffic management and traffic safety.
- The next steps in the development of the main route network are to **refine the transportability data**, for example through **a survey** and **load-bearing capacity analysis**, to **identify the needs for measures,** to formulate a programme of measures and to implement them in practice.
- **More detailed studies** and **plans are** needed to ensure accessibility.
- As wind power construction increases and expands, organising transport for it in a way that takes into account other traffic **requires ever closer cooperation** between wind power operators, transport infrastructure companies, the transport industry and other key players.

Photo: Vuorsola 2022

5. 5 List of sources

Finnish Wind Power Association, 2022, website, available (accessed 18.5.2022): https://tuulivoimayhdistys.fi/

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6 Annexes

- Suitability of the road network in North Ostrobothnia and Kainuu for special transport
- Route maps for the whole area
- Maps of the main routes in North Ostrobothnia
- Maps of the main routes in Kainuu
- Maps of port connections on the main routes
- North Ostrobothnia area-specific maps
- Kainuu area-specific maps