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Centre for Economic Development,
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Transverse Electric Air Transportation in Western Barents Region

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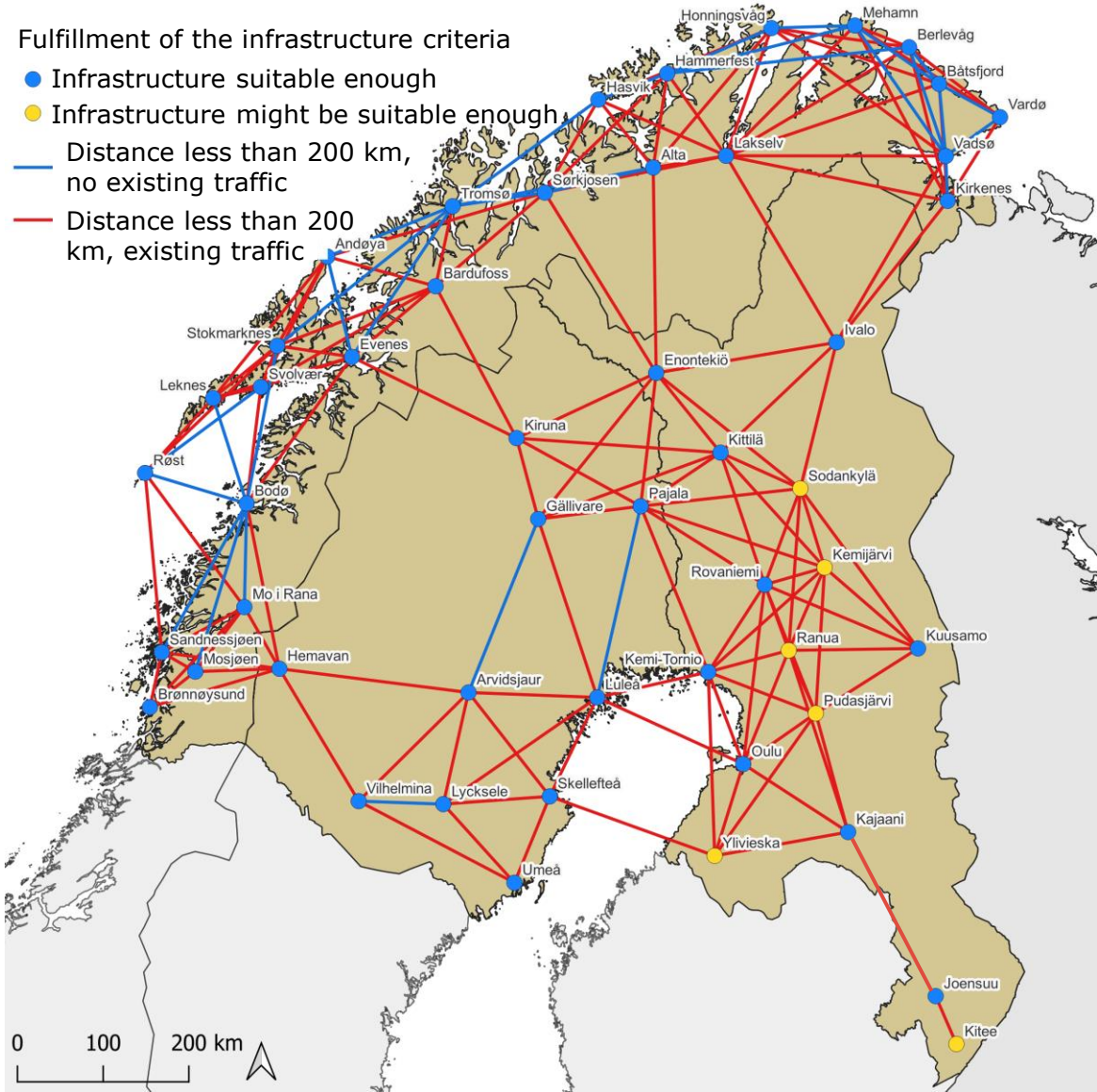
Background and Aim of the Study

- Aviation sector, as well as other sectors too, need to give up fossil fuels in order to achieve climate goals.

- Electric and hydrogen airplanes are in the development currently – however, we don't have a clear picture

- **The goal of the work** is to find out the possibilities of transverse electric air transportation in the western Barents region and also to understand the related change needs.



1. Status Quo analysis

- Air Transport in Western Barents Region (current routes, demand and infrastructure)
- Prospects of electric aviation (incl. hydrogen and hybrids)

2. Benchmarking

- Similar regions to Western Barents and their Air Transport system (routes, demand, finances)

3. Future outlooks

- Potential in the future
  - Tourism, business, leisure, public
  - Logistics (ecommerce, public sector)
  - Digital solutions (ATC, last mile…)

4. Stakeholder analysis

- Defining stakeholders and their role (aims, commitment, linkages etc.)

5. Visio and impact assessment

- Based on previous findings, what could be at Western Barents region and what kind of impacts would this future have

6. Creating next steps

- Creating a road map

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Prospects for the development of electric aviation

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Battery-electric could be the solution for shorter routes, like within Western Barents region

Comparison vs fossil kerosene	1 Battery-electric	2 H_2 fuel cell	2 H_2 turbine	3 Sustainable aviation fuel
Climate impact[i]	100% reduction[ii]	75%-90% reduction	50%–75% reduction	30%-60% reduction[iii]
Aircraft design	Low-battery density limits ranges to 500km–1,000km	Feasible only for commuter to short-range segments	Feasible for all segments except for flights >10,000km	Only minor changes
Aircraft operations	Same or shorter turnaround times	1-2x longer refuelling times for up to short range	2–3x longer refuelling times for medium and long range	Same turnaround times
Airport infrastructure	Fast-charging or battery exchange system required	LH_2 distribution and storage required		Existing infrastructure can be used

Major advantages Major challenges

Electric planes are expected to have about 10–40 % less operational costs than combustion engine planes which creates the opportunity for routes that were previously considered as unprofitable.

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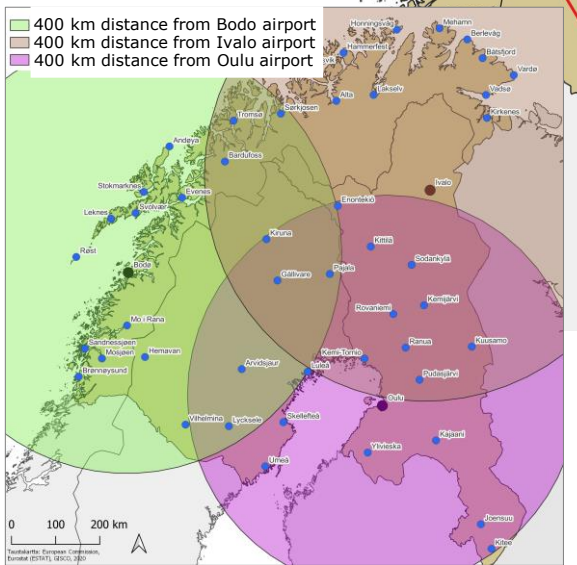
The range of battery electricity would enable numerous connections

- The 200 km commercial operating distance of small battery-electric passenger planes would enable numerous connections.
- In the future, when the commercial operating distance of battery-electric airplanes increases to 400 kilometers, it would be possible to cover the entire western Barents region through, for example, Oulu, Ivalo and Bodø airports.
- Battery-electric aircrafts require charging infrastructure investments at all airports.



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The potential of transverse air traffic

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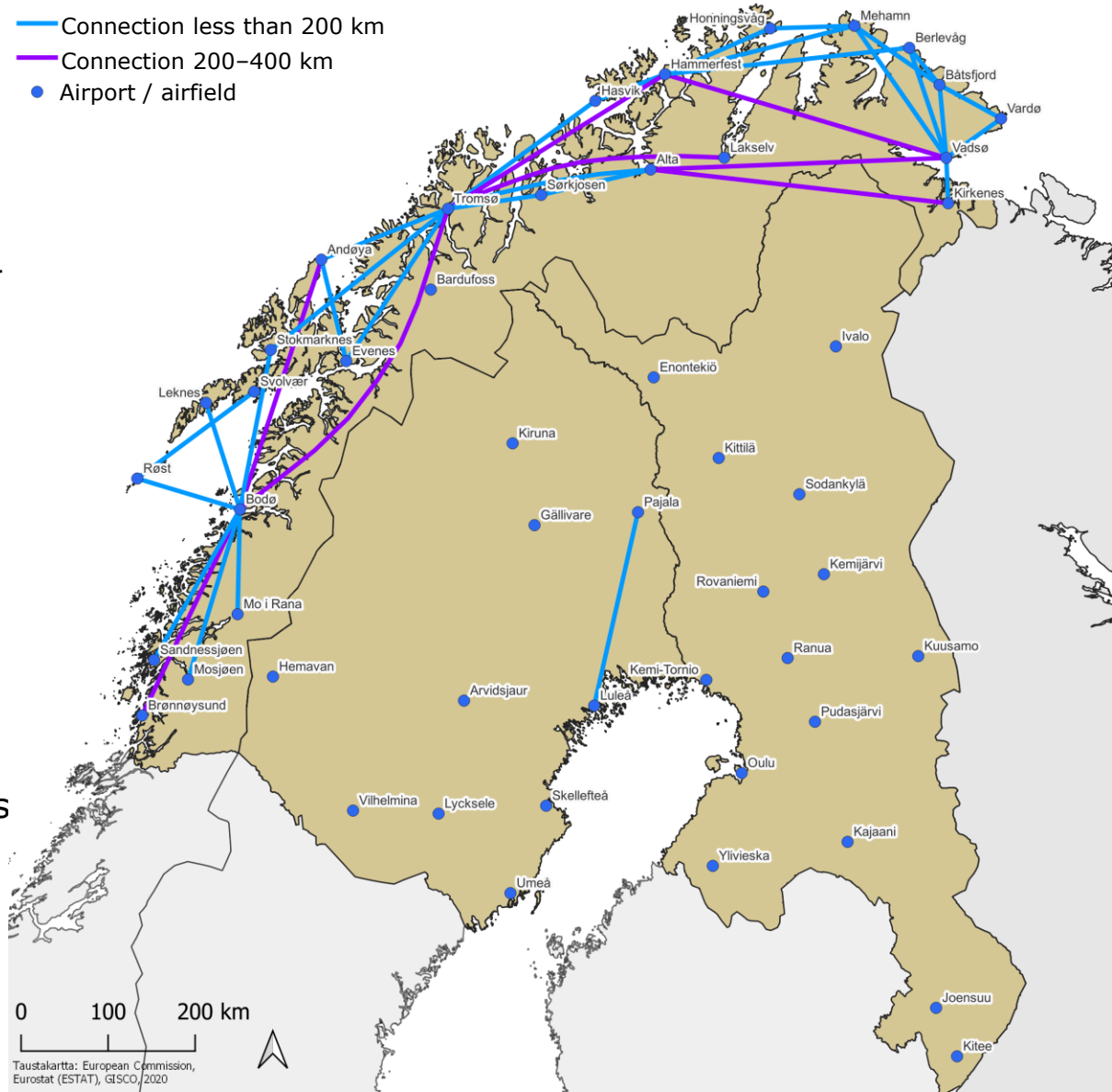
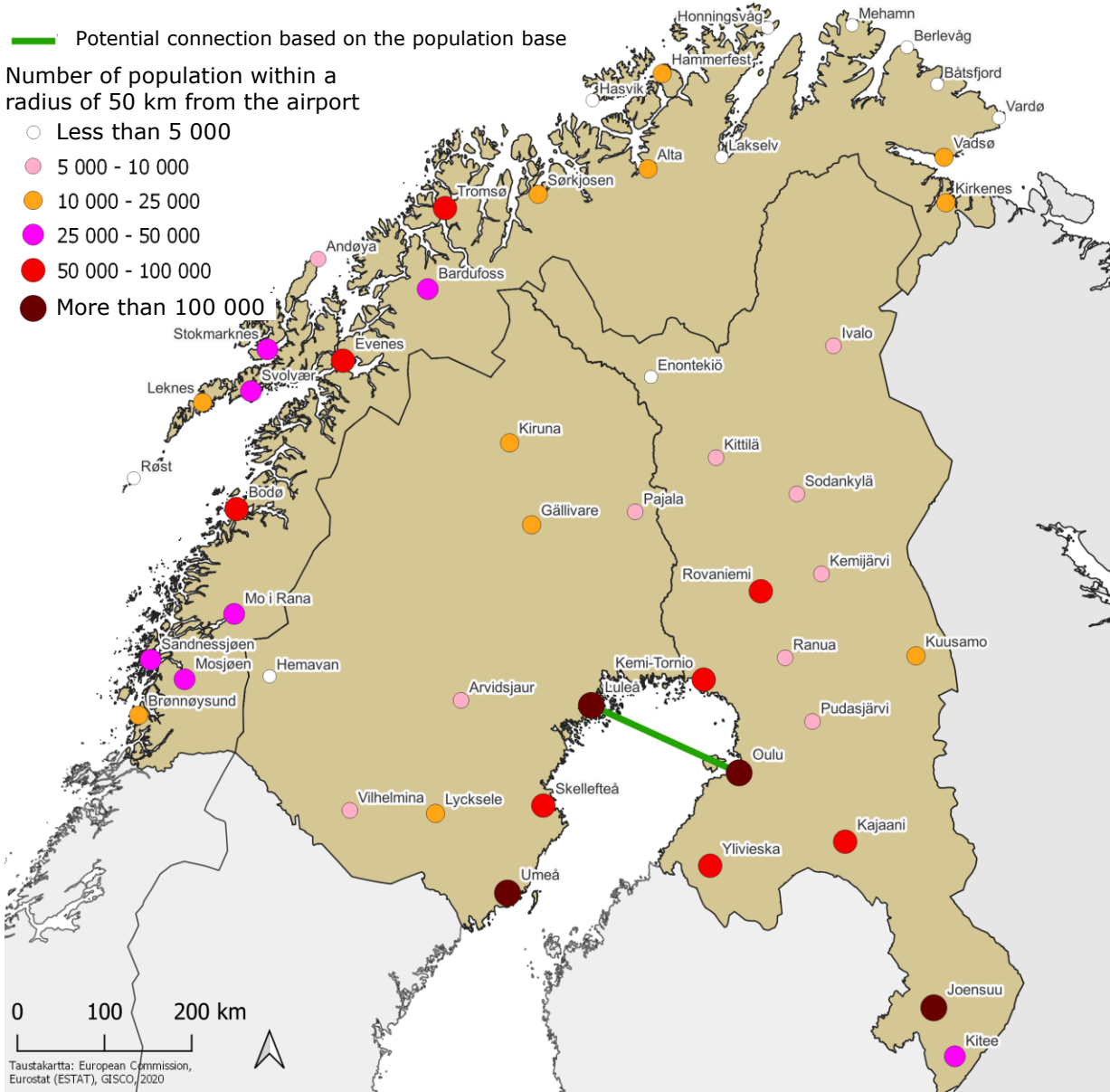
Electrification of existing flight connections

- The clearest potential of battery-electric air transport is related to the electrification of existing connections.
  - According to current information, operation is more cost-effective at the latest at the point when the fleet would be renewed anyway.
- In addition, at least the Norwegian state has expressed its intention to electrify the country's publicly subsidized transport.
- The electric airplanes of the initial phase are small, with 9–19 seats, while the most common type of aircraft in traffic in Northern Norway is the approximately 50-seat DASH-8.
  - A smaller type of aircraft could be used if the route's occupancy rate is low or by increasing the traffic volumes of the route.
- The connection in Sweden still has a 19-seat aircraft in use today.



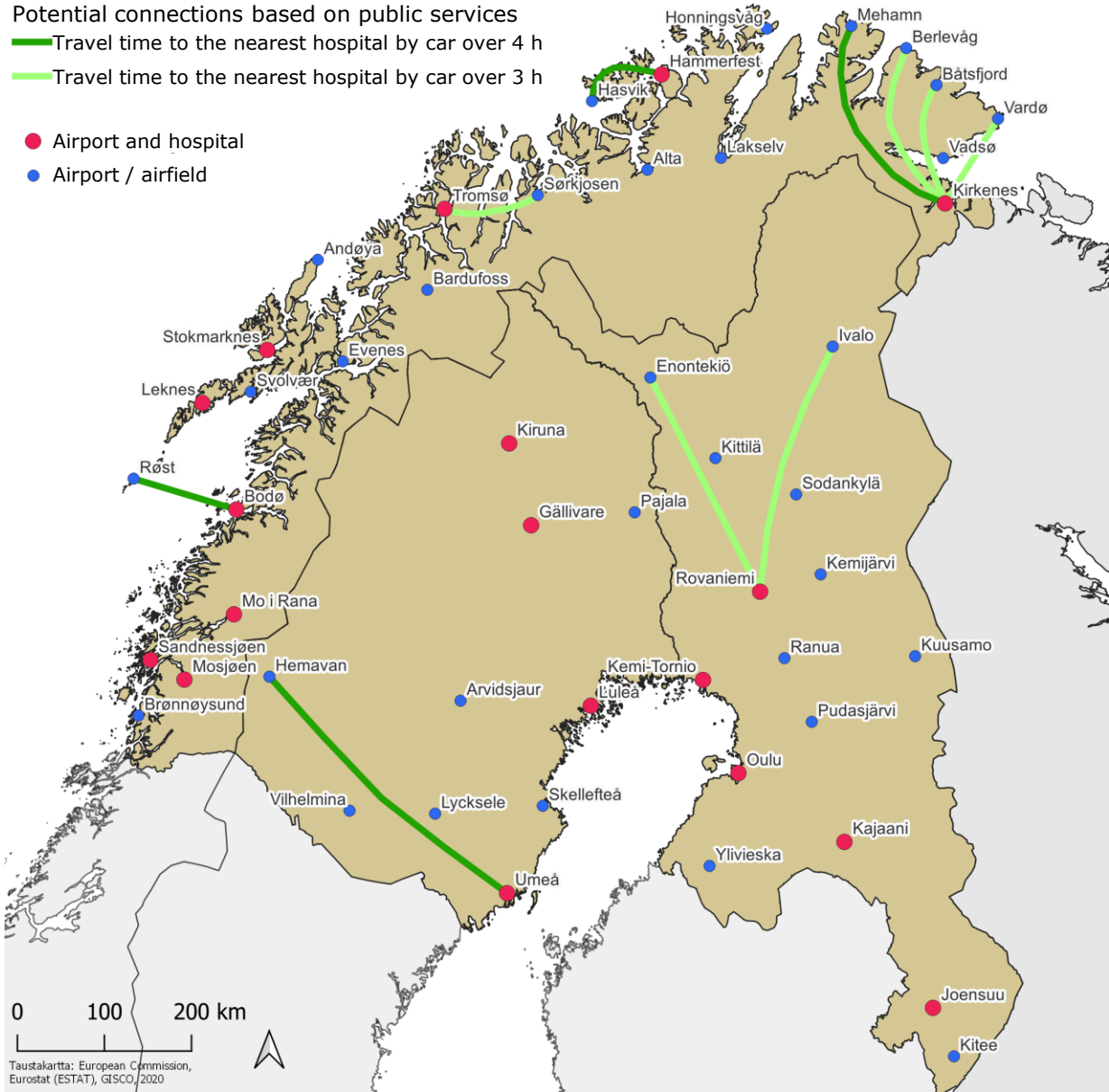
The potential created by the population base

- The potential of electric air transport was assessed through the population and the offer of other transport modes.
  - More than 100 000 inhabitants within 50 km of the airport (at least the other end of the connection)
  - Travel time by car more than 2 hours
  - No train connection
- With these criteria, Oulu-Luleå, Luleå-Gällivare, Luleå-Pajala and Umeå-Vilhelmina remained in the review.
  - The populations of Gällivare, Pajala and Vilhelmina are so small that there is no potential for an air connection.
  - → Oulu-Luleå is a potential connection, because both ends have more than 100 000 inhabitants and the connection travel time by car is more than 3 hours.
    - There has been air traffic in the past as part of the Oulu-Luleå-Tromsø connection.

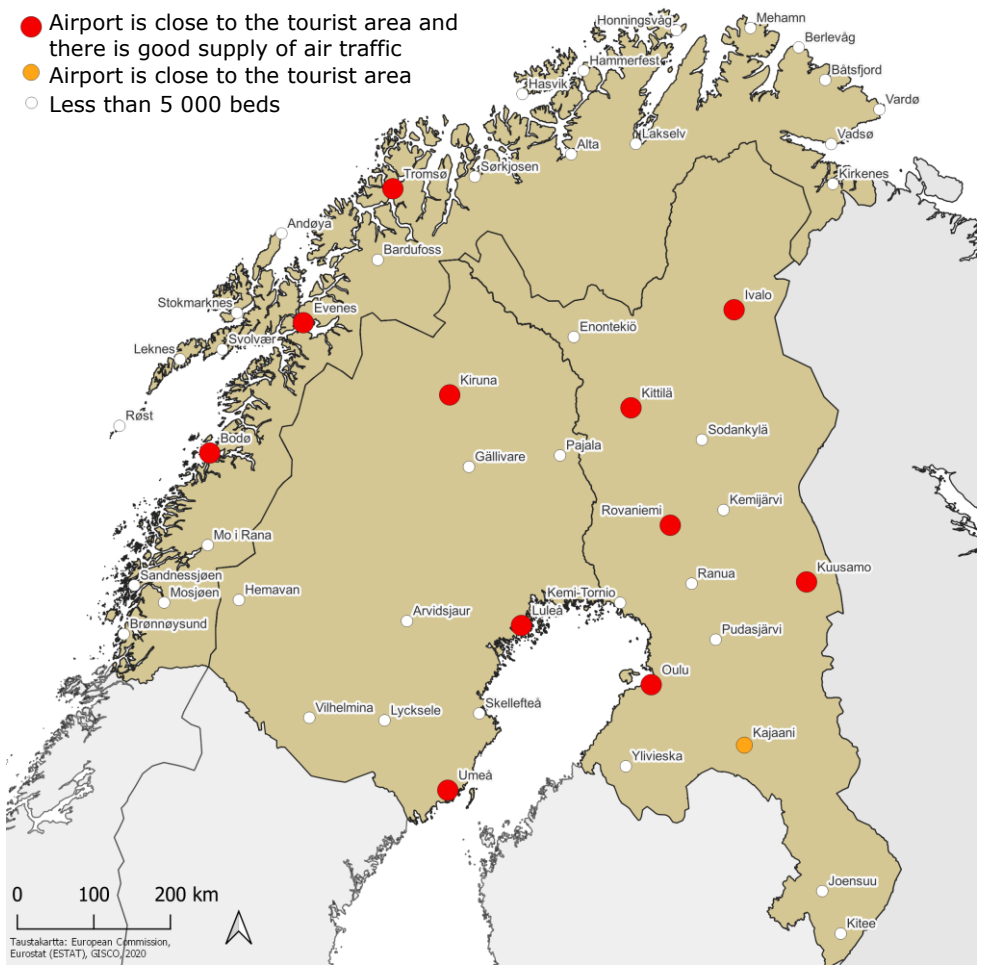


The potential arising from the centralization of healthcare services

- The potential was evaluated using the criteria used in Norway: at which connections is the travel time to the nearest hospital more than 3 or 4 hours by car?
  - Several connections in Norway, all existing connections at least via exchange connection
  - In Sweden Hemavan-Umeå and in Finland Enontekiö-Rovaniemi and Ivalo-Rovaniemi
- Operating hospital connections with a 9-seater electric plane would be many times more expensive than by taxi car.

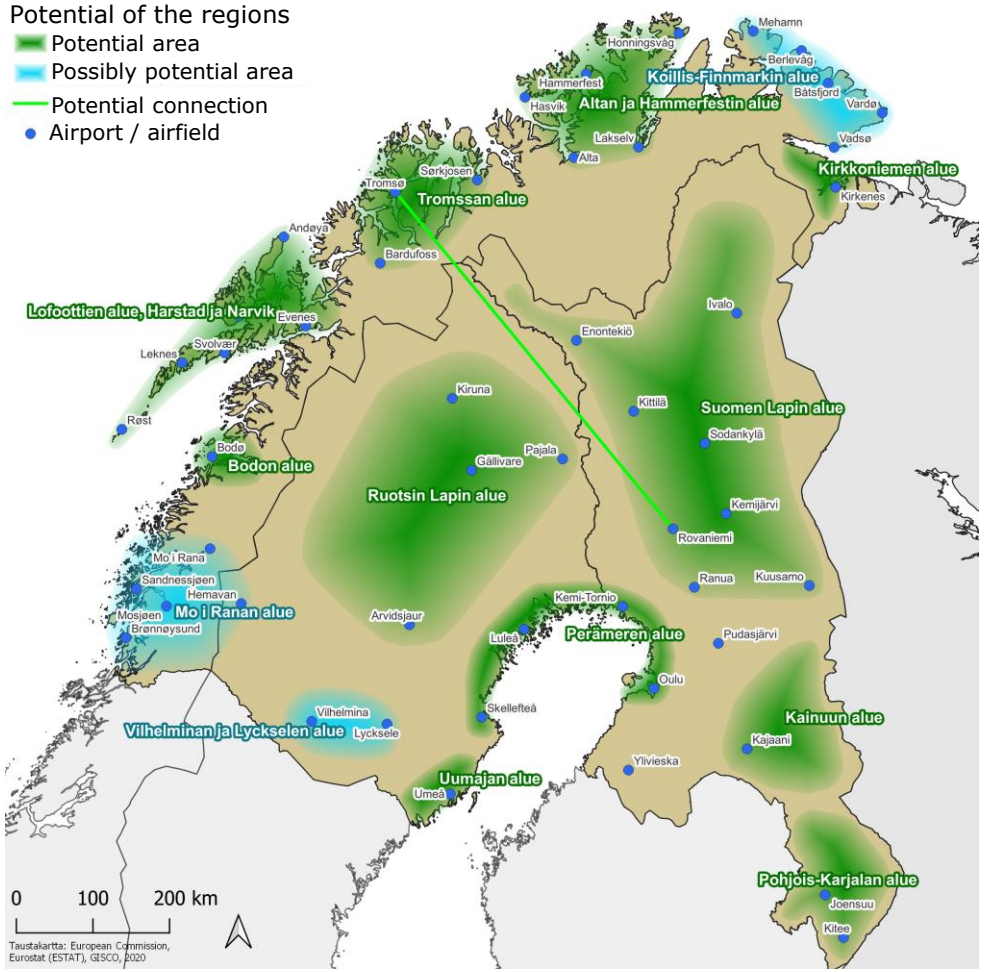


The potential created by tourism



Considered the potential for two types of connections

1. Onward connections from scheduled flights arriving in the area
   → no potential connections
2. Intra-regional tours enable connections
   → potential especially between Rovaniemi-Tromsø and between different tourist areas



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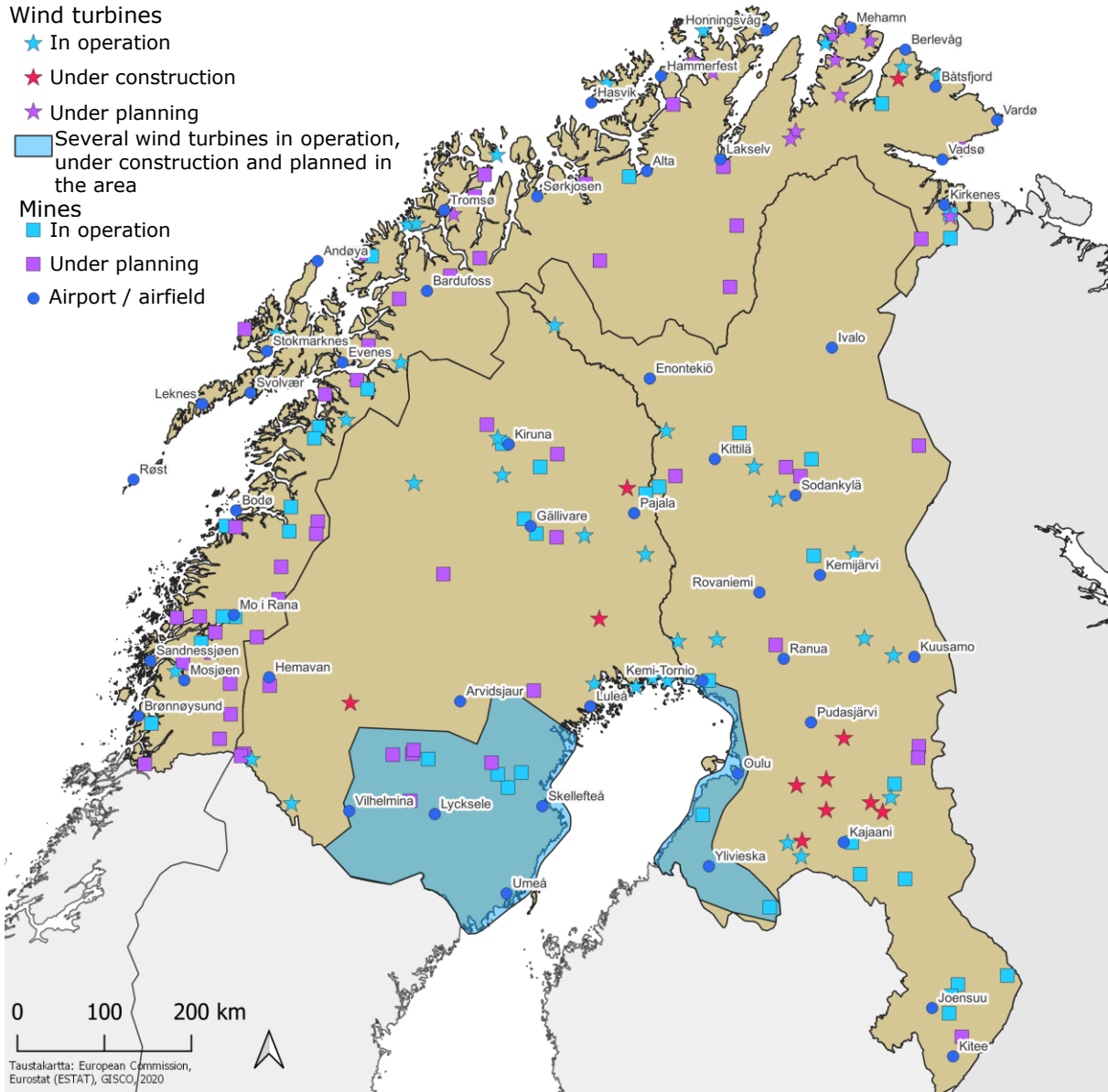
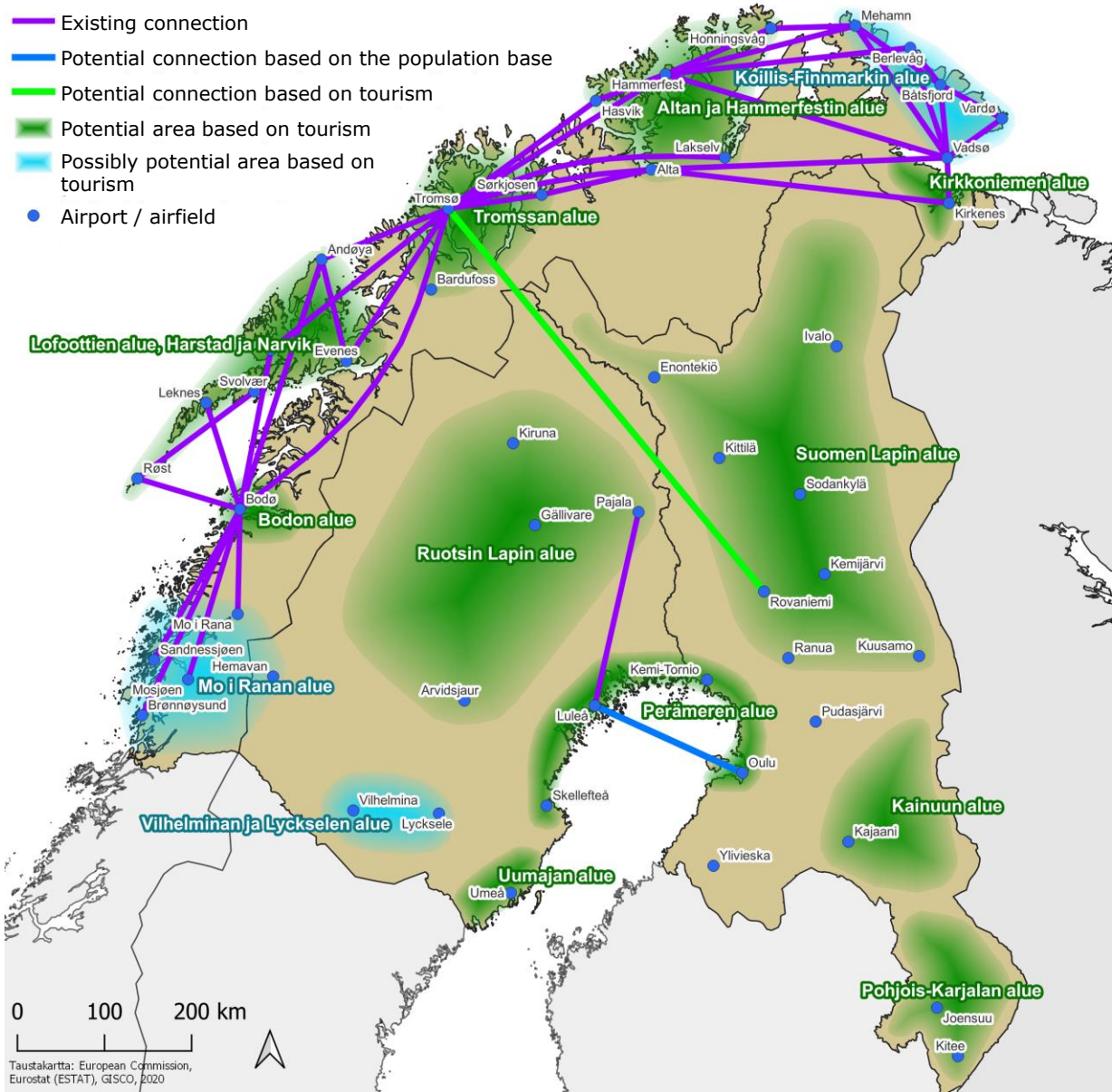
The potential arising from the movement needs of business life

- No individual potential connections were identified
- Air taxi operations could serve the needs of the area's booming business life
  - It would require a strong commitment from companies
  - With a 9-19-seater electric plane, the cost estimate would be approx. 500-1000 € per seat

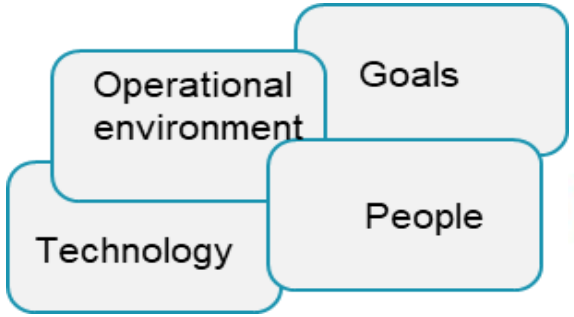


Summary of potential and open questions

- It is fairly certain that within 10 years there will be 9-19-seater electric airplanes on the market. Larger hydrogen and hybrid aircrafts will probably enter the market in the 2030s.
- Who finances the purchase of the fleet? What about the cost of the operation (small planes = higher costs/seat)?
  - Public parties committed to the electrification of existing traffic, support for new traffic does not seem likely
  - Private financing is possible if the benefits are seen as sufficient
- The strongest opportunities for new routes with tours and taxi flight operations



Intervieweers informed us



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Discussion on transversal aviation in Western Barents is based first of all in Finland on demand from industry and tourism, in Sweden demands from industry and in Norway the national transport strategies.

Airfields are running diverse demand-driven activities that maintain with low volume.

Airports growth of passengers is limited by the fact that narrow-body aircraft defines focus on passengers with limited capacity of cargo in nearest future.

From the public funding perspective, it evident to emphasise transport strategies, regional economy and effectiveness.

Municipalities and regional governments should first have an interest in airport land use or more broadly strategic planning.

Market-based systems would require investments and moving fast to 2040’s would require public investments and funding instruments.

The Western Barents electric and transversal aviation future trajectory