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Sitowise Oyj

Electric vehicle charging points in Päijät-Häme

Executive Summary, Jan 2023

Objectives and contents of the report

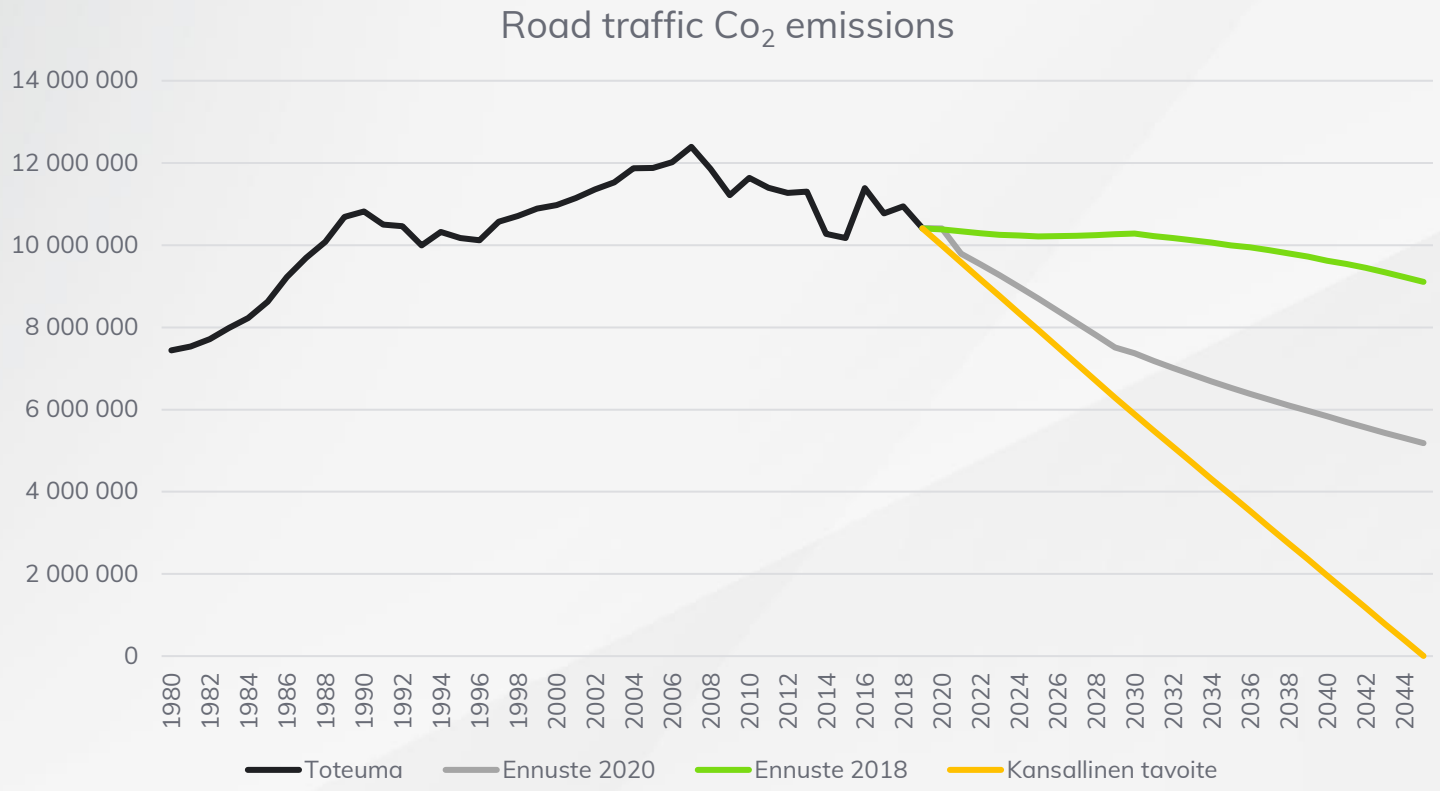
+ The objective of the report is to describe what measures the cities and municipalities of Päijät-Häme province can use to further the implementation of a public charging network for electric vehicles.
+ The initial goal is the realization of public charging points based on market conformity.
+ The report focuses on public passenger car charging points.

+ The report considers the following:
  - Under what conditions can charging stations be built in the target areas?
  - How can the city and municipalities act most effectively as an enabler of charging points in the planning and construction of a market-based charging network?
  - In what ways could the city and municipalities act as a service provider to fulfil requirements in areas where charging points have not been built due to market conditions?

Climate goals and legislation as an enabler of electric transport

Traffic CO2-emission forecast 2020-2045

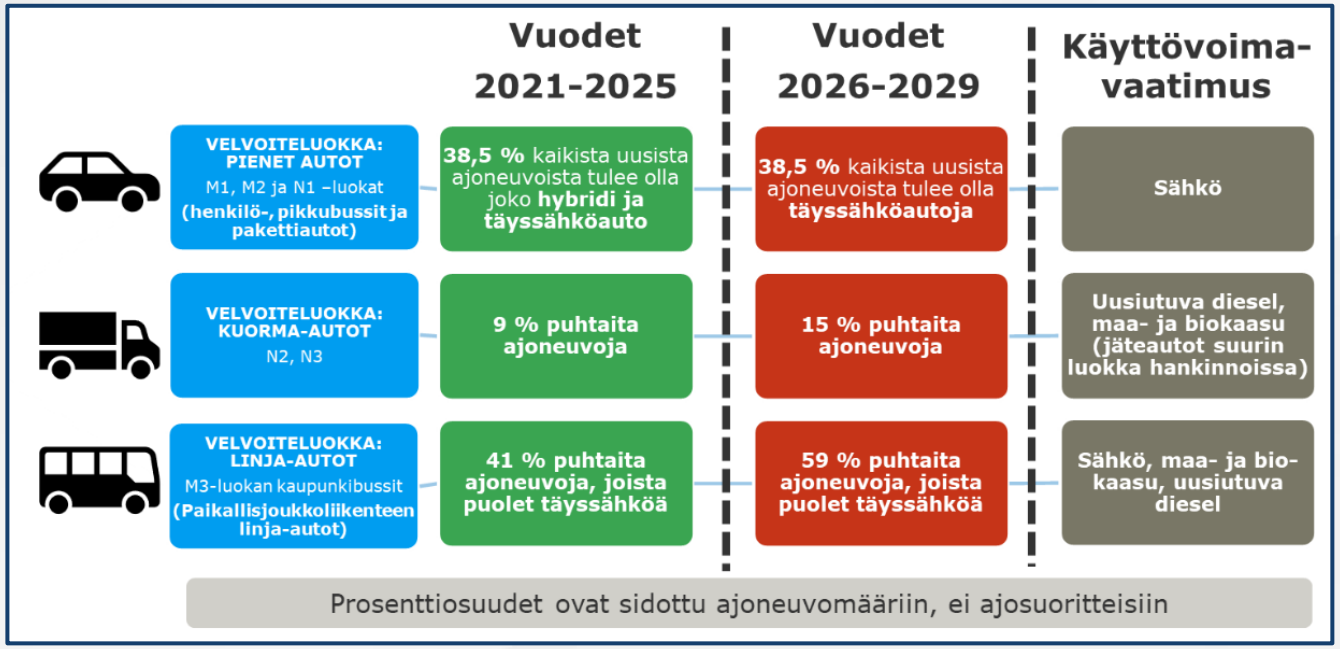
- CO2 emissions from road traffic are predicted to decrease by 58% from the 2007 level by 2045.
- The goal of the road map for fossil-free transport (Finnish Government decision 6 May 2021) is to halve road traffic greenhouse gas emissions in 2030 and remove them completely in 2045.



Source: VTT/Lipasto 2022

Clean Vehicles Directive

- The European Union Clean Vehicles Directive sets strict requirements for publicly procured vehicles. Clean vehicles include electric vehicles and, to a limited extent, vehicles that use renewable fuels.
- The national obligation according to the directive has entered into force in August 2021.



The effects of the Clean Vehicles Directive on different categories of vehicles. Image source: Smart mobility. A report on the cost-effective national implementation of the Clean Vehicle Directive (CVD). Report 30 January 2020. Ramboll Finland Oy.

Legislation and guidance

- The charging and fuel directive for alternative fuels is regulated in the EU's AFI directive (2014/94/EU).
- Relative recommendations of the AFIR directive → public charging points on average 1:10 per electric car.
- In 2020, there were 55,318 electric cars and 4,771 public charging points in Finland, or an average of 1:12.6 charging points per electric car
- In 2022, there were 4,150 electric cars and 541 public charging points in Päijät-Häme, or an average of 1 charging point per 7.6 cars

+ Electric vehicle charging recommendation: https://sesko.fi/wp-content/uploads/2021/11/SESKO_lataussuositus_2021-02-17.pdf

SESKO

SUOSITUS 2021 1 (8)

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Sähköajoneuvojen lataussuositus

Sähköajoneuvojen (täyssähköautot, lataushybridit ja kevyet sähköajoneuvot) lataamiseen käytettävissä sähköverkoissa ja niiden suunnittelussa on noudatettava pienjänniteasennuksia käsittelevässä standardisarjassa SFS 6000 esitettyjä perusvaatimuksia.

Standardissa SFS 6000-7-722 annetaan erityisvaatimuksia sähköajoneuvojen lataamiseen tarkoitetuille asennuksille. Tässä suosituksessa esitetään täydentäviä ohjeita sähköajoneuvojen lataukseen käytettäville uusille asennuksille ja olemassa olevien asennusten laajentamiselle sekä muuttamiselle sellaisiksi, että niistä voidaan sähköajoneuvoja ladata turvallisesti.

Tämä suositus korvaa neljännen painoksen vuodelta 2019. Uudistettuun painokseen on tehty muutamia täsmennyksiä sanamuotoihin sekä kotitalouspistorasioiden latauskäytön turvallisuusohjeisiin.

Charging point availability required by law

Charging point availability applies to both commercial and public properties as well as residential properties and related parking buildings. Charging point availability applies to both new buildings and those with pending large-scale repairs, as well as existing sites.

	Number of parking spaces	Required amount of charging points	The required share of parking spaces with charging-ready spaces	To be considered in plans
New and extensively repairable	11-30	At least 1 pcs Type 2 or 1 CCS	50 %	10.3.2021
	31-50	At least 1 pcs Type 2 or 1 CCS	20 % or at least 15 pcs of spaces	10.3.2021
	51-100	At least 2 pcs Type 2 or 1 CCS	20 % or at least 15 pcs of spaces	10.3.2021
	Over 100	At least 3 pcs Type 2 or 1 CCS	20 %	10.3.2021
Existing	Over 20	At least 1 pcs Type 2 or 1 CCS	-	31.12.2024

Current state and forecast of electric cars and charging points

Transportation is becoming more electric

31 %

Share of fully electric cars and plug-in hybrids in first registrations of new cars in 2021.

68 %

The share of fully electric cars and plug-in hybrids in the first registrations of new company cars in 2021.

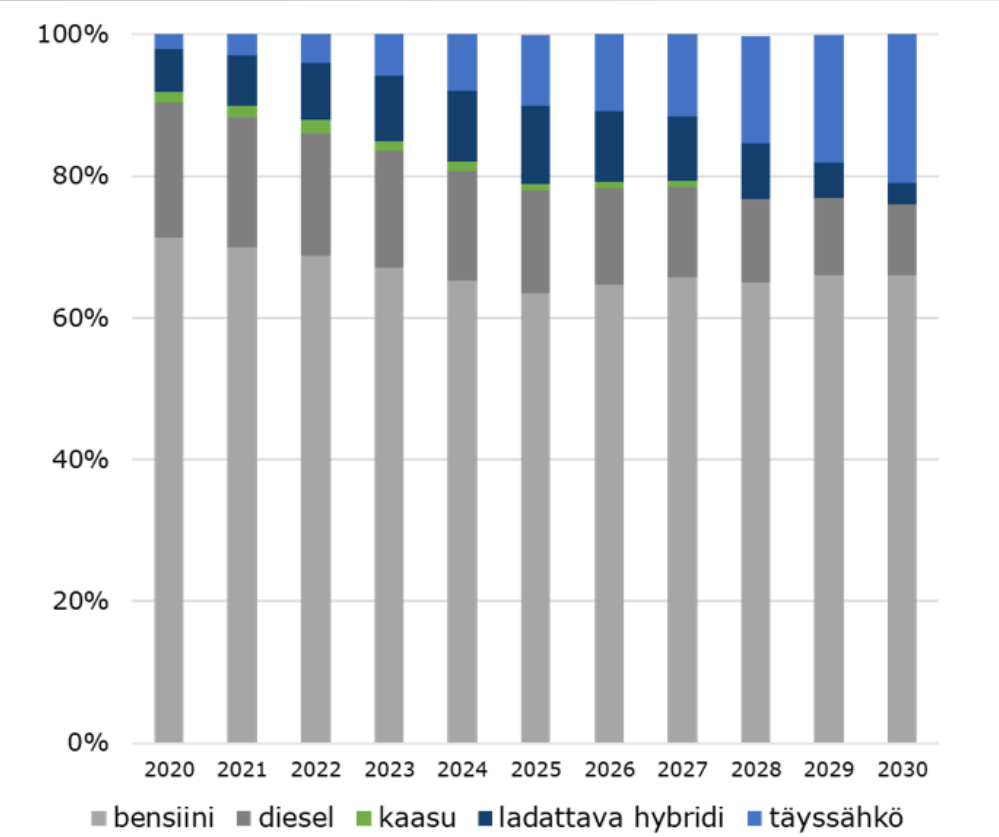
240 %

Growth of first registrations of fully electric cars in 2021 compared to 2020.

The number of imported fully electric used cars increased by 375 % from 2020 to 2021.

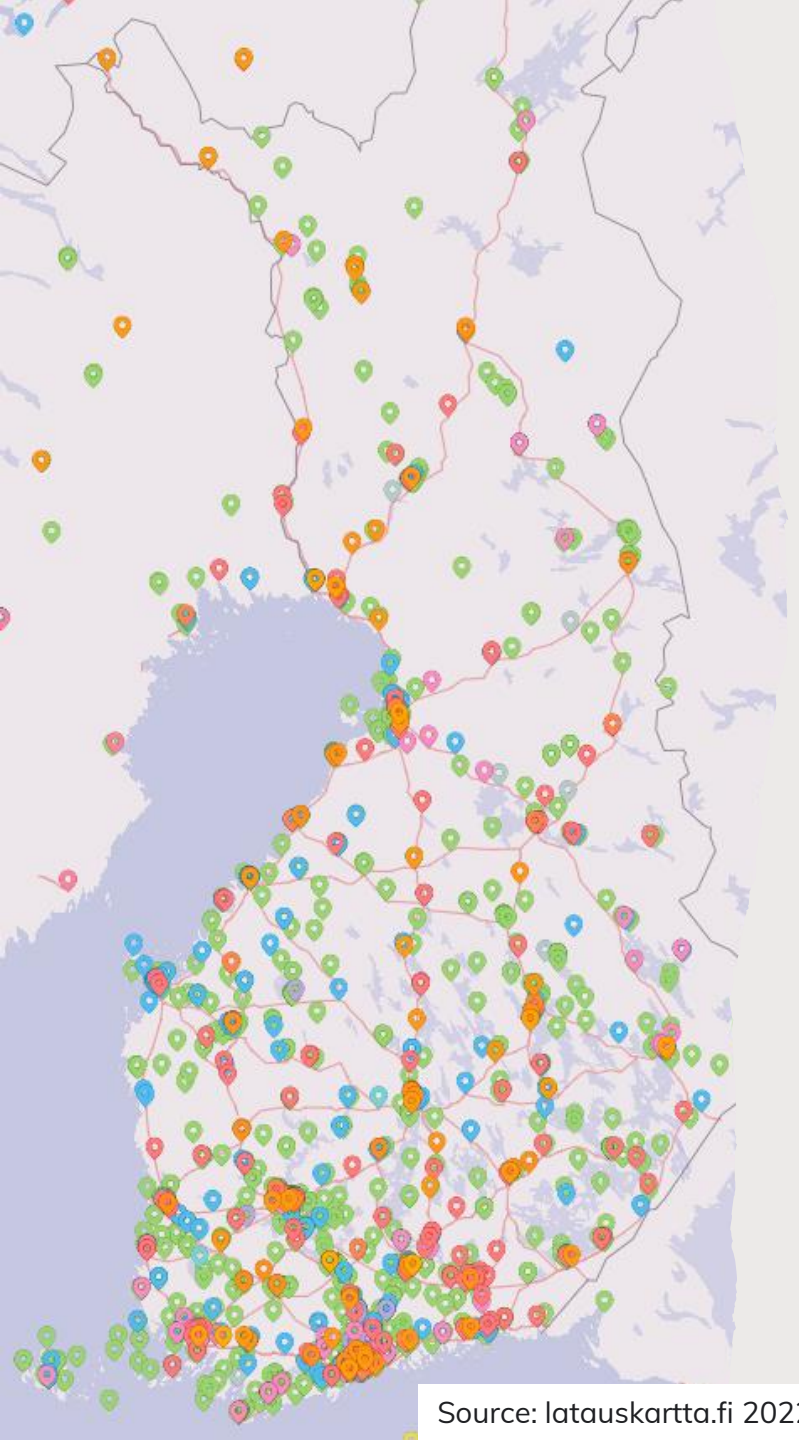
Lähde: Ministry of Transport and Communications 2020, Roadmap to fossil free transport

The number of electric passenger cars continues to grow



Henkilöautojen ensirekisteröintien kehittyminen vuosina 2020–2030 perusennusteen mukaan. Lähde: LVM.

- In 2021, a total of 99,911 electric passenger cars were in traffic use in Finland:
  - 22 911 fully electric cars
  - 76 990 chargeable hybrids
- In 2021, the number of electric cars increased by 81%, the number of fully electric cars increased by 136%.
- In the basic forecast of greenhouse gas emissions from traffic 2020-2045, fully electric cars will increase their share by more than 20% by 2030. The share of plug-in hybrids will increase in the early years but decreases towards 2030. (LVM 2021)



Source: latauskartta.fi 2022

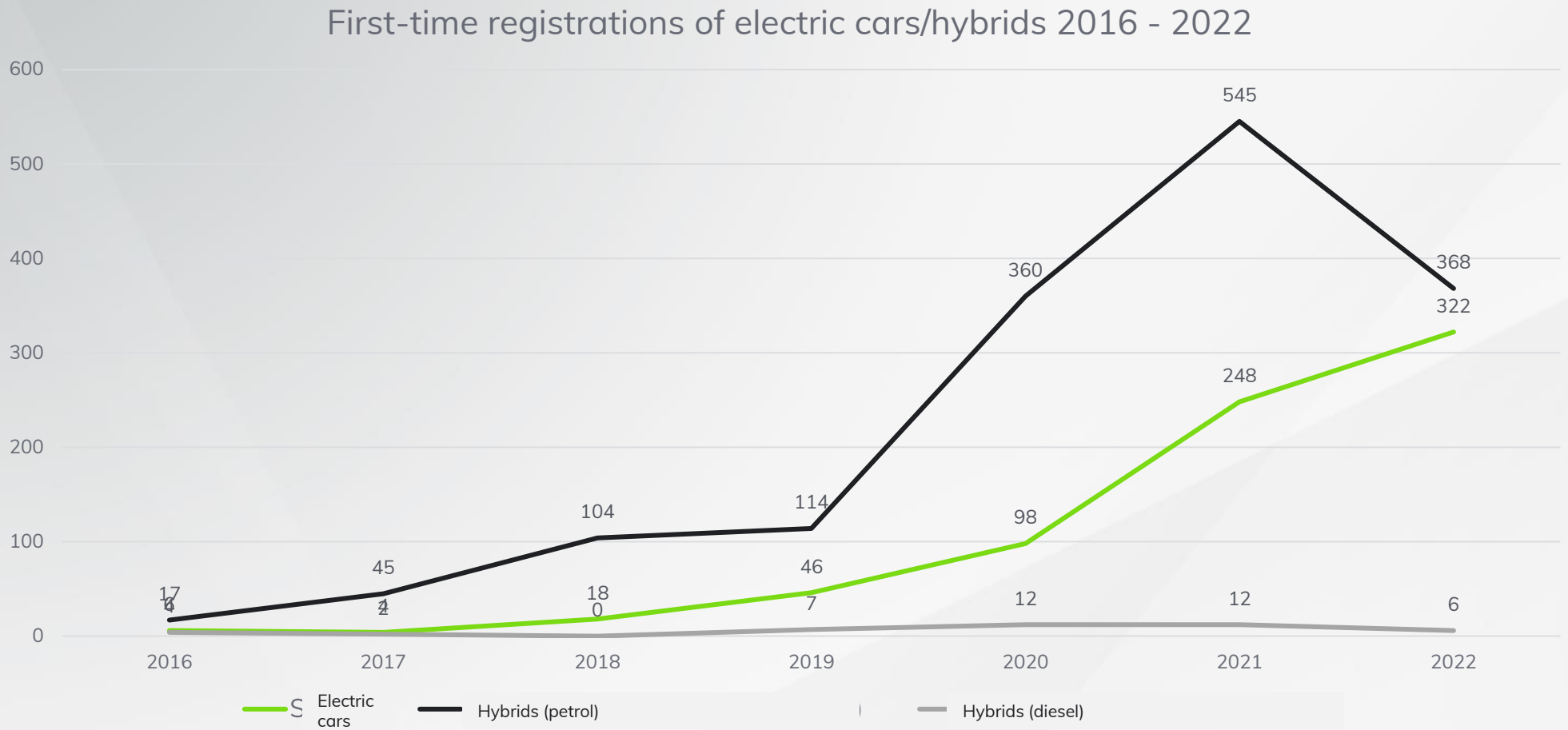
The current state of public electric car charging infrastructure in Finland

- In almost all of Finland, the nearest charging station can be found within a radius of 50 kilometers. In southern and western Finland, a charging station can almost always be found within a radius of 25 kilometers. Fast charging points are concentrated in cities and along the most significant main roads. The nearest charging station is less than 50 km away from all population centers. All settlements with more than 10,000 inhabitants have at least one charging station.

- The coverage of the public charging infrastructure is already good in its current state. There are still significant regional gaps in the availability of fast and high-power charging. The availability of public charging infrastructure is at its best in southern and southwestern Finland, and especially in cities and along main roads. Charging facilities are good for local mobility needs in larger cities and their surrounding areas.

- There is already a relatively comprehensive network of high-power charging points intended for fast charging of fully electric cars along the highways. Both basic charging for plug-in hybrids and high-power charging for fully electric cars are often built alongside shopping locations. Hotels and other sites intended for longer-term parking are mostly equipped with basic charging points.

First-time registrations of electric cars in Päijät-Häme



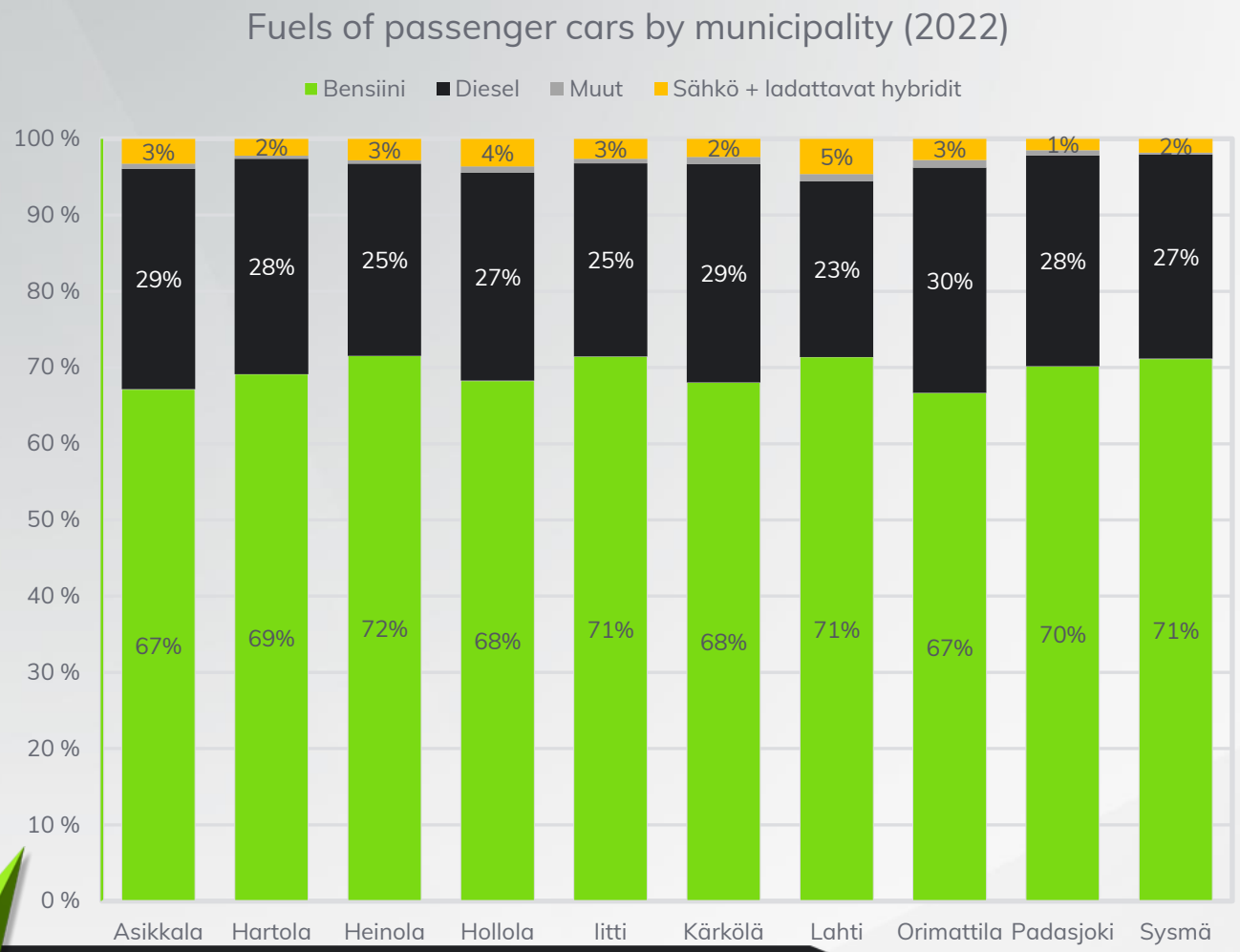
The number of first-time registered vehicles each year, not the total number of vehicles.

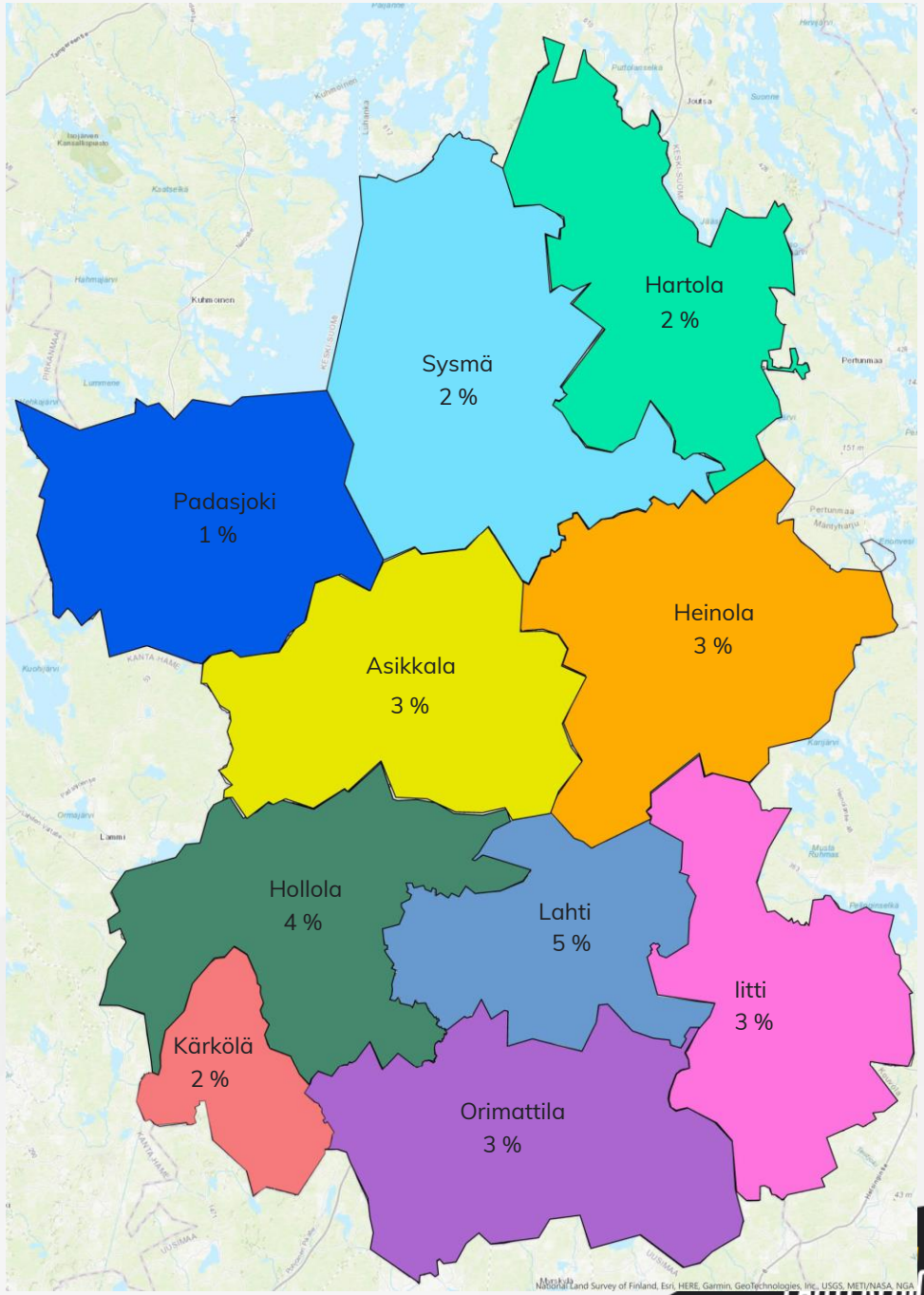
The number of electric cars in Päijät-Häme (2022)

Municipality	Electric	Petrol/Electric (chargeable hybrid)	Diesel/Electric (chargeable hybrid)
Asikkala	36	117	9
Hartola	12	21	1
Heinola	61	210	15
Hollola	126	333	17
Iitti	32	70	2
Kärkölä	20	40	3
Lahti	731	1865	95
Orimattila	79	177	15
Padasjoki	4	21	0
Sysmä	7	29	2
Total	**1108**	**2883**	**159**

Amount of chargeable cars by municipality

Fuels of passenger cars in Päijät-Häme (2022)

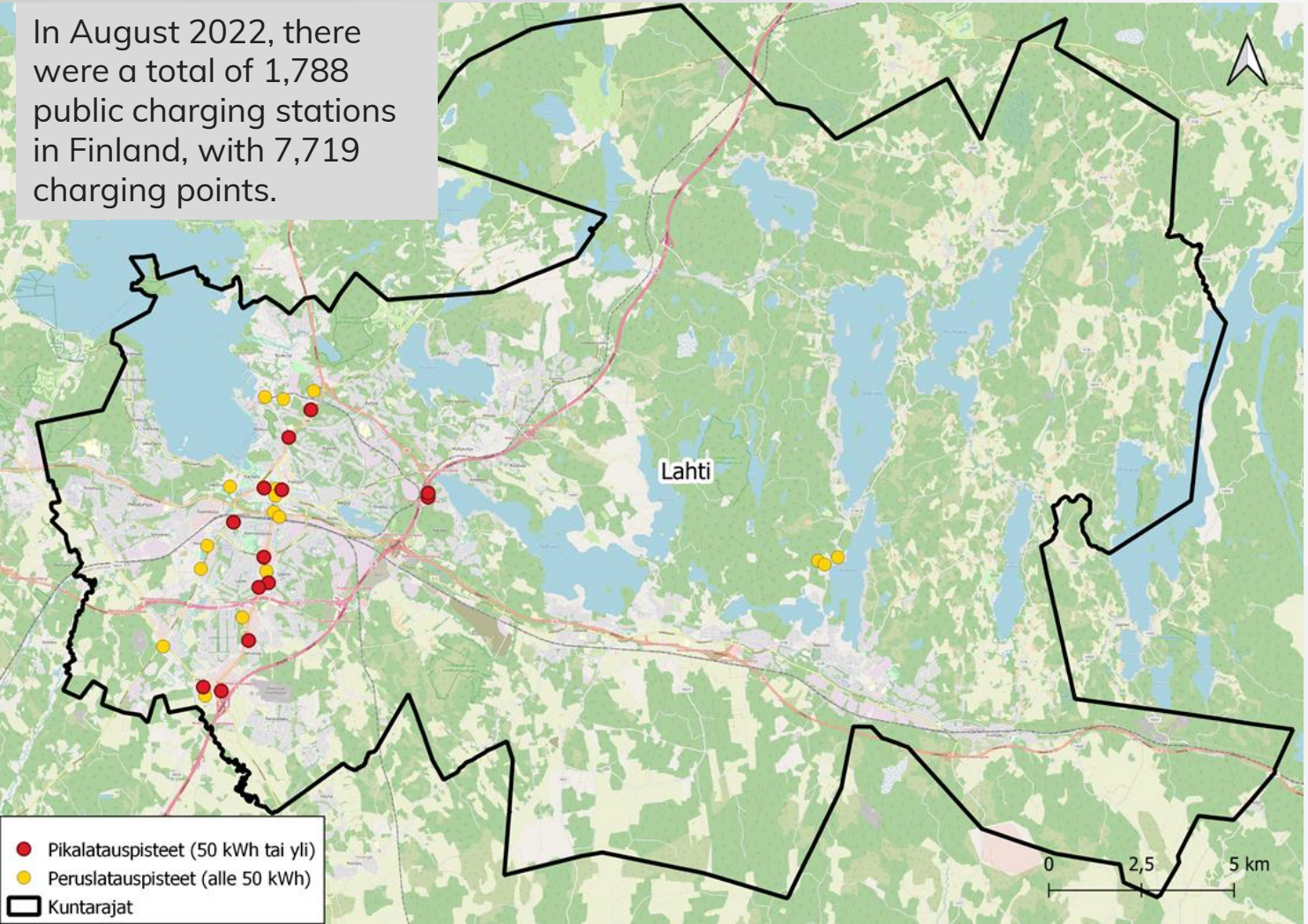




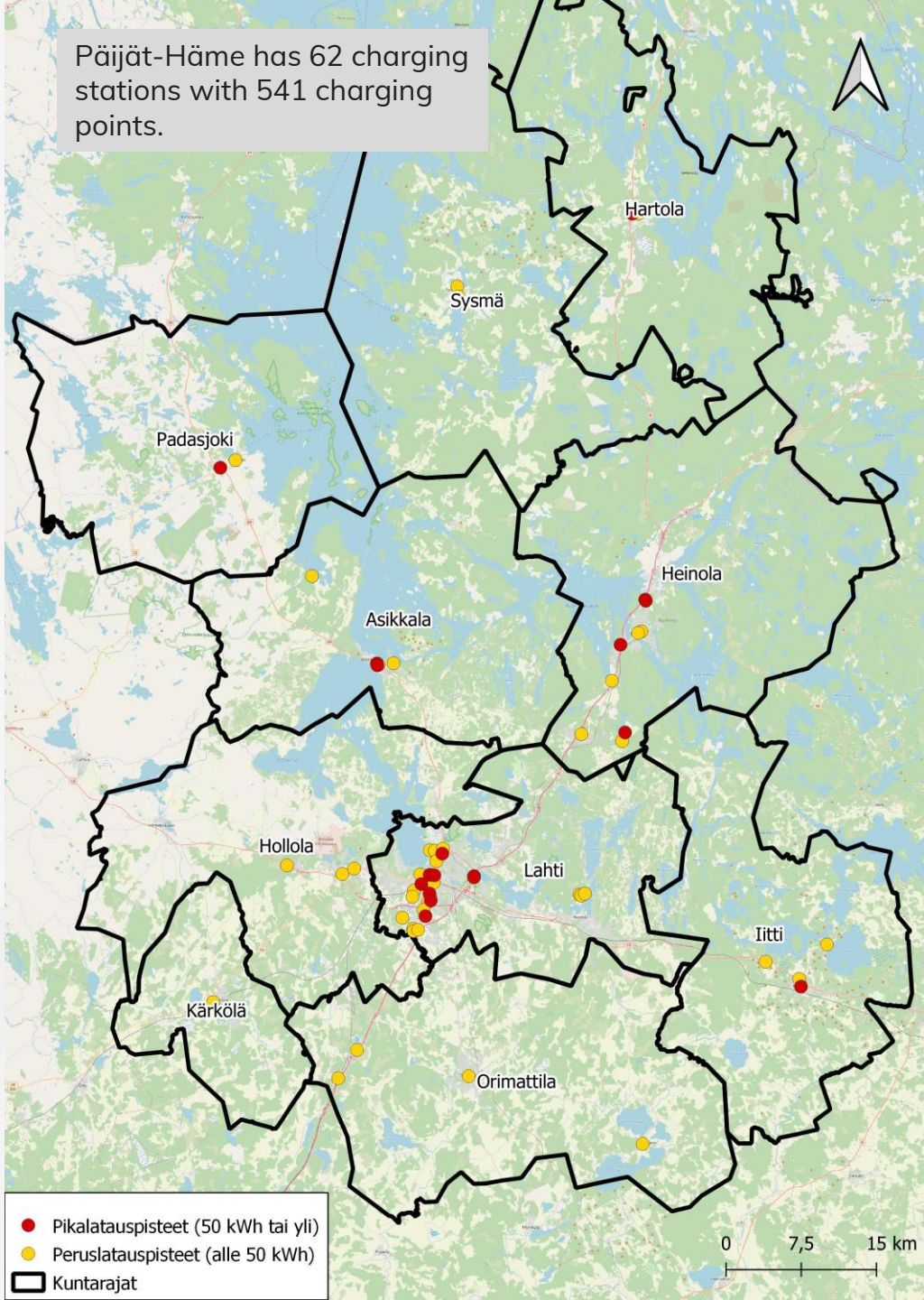
Percentage share of electric vehicles of total passenger cars

Charging points for electric cars in Päijät-Häme

In August 2022, there were a total of 1,788 public charging stations in Finland, with 7,719 charging points.



Päijät-Häme has 62 charging stations with 541 charging points.



Electric vehicle charging fundamentals and requirements

Electric car charging

Amount of driving kilometers achievable in one hour of charging with different charging capabilities			
Household outlet	**Home and workplace charging, basic public charging point**	**Public fast-charging network**	
Slow charge	Basic charge	Fast charge	High-power charge
Under 3,7 kW	11–22 kW	22–90 kW	100+ KW
Under 20 km	50–100 km	100–350 km	350+ km

Table. Modified: Motiva 2022

- Rechargeable vehicles are mainly charged at home and at work - public charging points are rarely used
- 85% of plug-in hybrid users and 60% of users of fully electric cars charge their car at home at least three times a week
- The lack of home charging is one of the worst bottlenecks of the electrification of transport

Plug-in hybrids are equipped with a Type 2 charging connection, which achieves a charging power of around 4 kW. In this case, charging from empty to full takes a few hours. Some hybrids also have a CCS power charging connection, which shortens the charging time significantly.

Fully electric cars usually receive a basic charge with a power of about 11 kW, in which case the charging time is a few hours. They accept power charging under optimal conditions with a power of 50–150 kW, in which case the charging time ranges between some tens of minutes and a maximum of two hours. Even higher capacities are supported in some cars, but it must be remembered that the peak output does not last for the entire duration of the charging event. The average power of the charging event is decisive. (Motiva 2022.)

Public charging requirements

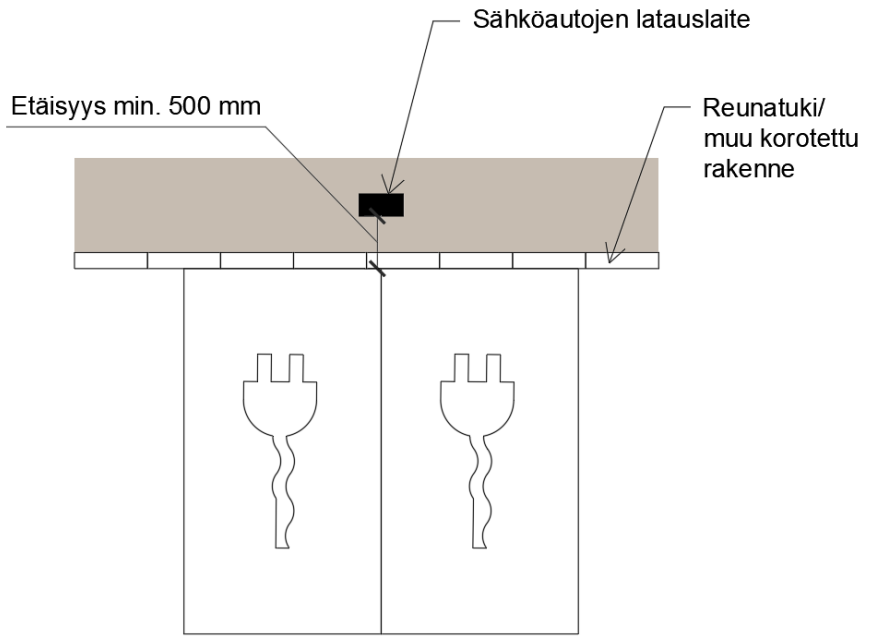
- EU directives set technical requirements for the public charging point for electric cars:
  - The public charging point must be open to everyone
  - The minimum requirement for a public charging point is Type 2.
  - Information regarding the geographical location of public refueling or charging points is available to all users in an open and non-discriminatory manner
- Additionally, the directives outline the following regarding charging points:
  - Time limits and different identification, use and payment conditions may be set for public use of a charging point.
  - The operator can not require that the user or consumer must commit to a contract or membership in order to perform a single charge or refuel.
  - When charging electric vehicles, smart charging systems should be used whenever possible.

Charging device space requirements

- The sizes of charging devices at public charging points vary depending on the manufacturer and charging power
  - Devices for basic charging are generally a maximum of 700x700 mm wide (general size approx. 550 mm x 150 mm) and 1500 mm high.
  - For fast charging, you should reserve a space of 1500 mm x 1500 mm (significantly smaller devices are also available). The size must be confirmed well in advance from the suppliers!
- Wall-mounted chargers are also available

Charging point placement

- It is recommended to reserve a parking space where only electric car charging is allowed for the public electric car charging point.
- A good placement for the charging point is one that it is easily noticeable. However, the availability of electricity also affects the suitable location.
- The charging device should be located at least 500 mm from the edge of the parking space. The best location for the charging device is on top of an edge support/other elevated structure. If a raised structure is not possible, you should consider protecting the charging device from collisions in another way.
- Maintenance, especially winter maintenance, should be considered when selecting a location for the device.
- The charging device must not cause danger or disruption to car traffic, walking or cycling.



Technical charging point requirements

- The technical requirements of a public charging point vary depending on the equipment to be chosen, its power and the number of charging points
- It is usually possible to implement a few basic charging points with the existing electricity network
- The implementation of several basic charging points or fast charging stations may require the strengthening of the electrical network; for example, the expansion of the transformer
- When planning public charging points, you should be in contact with the local electricity network company at an early stage. If necessary, the network company can tell you if the implementation of the charging points requires strengthening the network (timetable) and the costs resulting from laying power lines
- The implementation of each public charging point requires individual planning - detailed electrical technical instructions cannot be provided
- When implementing charging points, you must follow Sesko's recommendation for charging electric cars: https://sesko.fi/wp-content/uploads/2021/11/SESKO_lataussuositus_2021-02-17.pdf

The city's opportunities to further the implementation of public charging points

Ways for municipalities to promote the implementation of public charging stations adhering to market conditions

The permit process is clear and predictable	Preparing for charging implementation in new projects and renovation sites	The municipality does not charge a parking fee for charging points
Permits are valid for a sufficient period	Making use of market dialogue in the implementation of charging points	The municipality does not charge rent for the parking space
No unreasonable demands in permits/contracts	If necessary, implementing the necessary infrastructure for charging points	The municipality does not charge fees for permits

The municipality's means for furthering the implementation of public charging points

+ **The municipality does not charge a parking fee or charge the operator for the costs related to the rent of the charging point**
  - The municipality does not initially charge a parking fee for charging an electric car at charging points. An alternative in parking garages, is that separate fee is not charged, but is included in the parking fee.
  - The municipality supports the implementation of charging points on market terms by handing over a parking space to the charging point operator and does not charge rent for the location.

+ **The municipality's permit process is clear**
  - The municipality's contact person is clearly displayed
  - The permit process and requirements are described on the municipality's website
  - The permit process is as fast as possible, and the estimated duration is communicated to the applicant
  - The granted permit is valid for a sufficient period - due to current unforeseen delivery problems, the permit should be valid for at least one year
  - The municipality does not charge a fee for necessary permits

The municipality's means for furthering the implementation of public charging points

+ Active dialogue with market operators

- Maintaining an active dialogue with market operators
- Taking equality into account in dialogue, a good way is to make use of a market dialogue process
- If several different operators want to implement charging points in the same locations, the city can tender the sites

+ Preparedness in the planning of new areas and renovation construction sites

- Considering the increase in the number of electric vehicles in the future by ensuring the implementation possibilities of charging points in the future
- Preparing with sufficient piping in parking lots
- Reserving sufficient spaces for the charging device and the electrical center during the street and building planning phase
- Ensuring an active dialogue with the local electricity grid company at an early stage

Procurement of public charging points - if the charging points are not implemented on market terms

If public charging points are not implemented according to market conditions, the municipality can further the implementation with different types of procurement methods. When planning the implementation, it is advisable to have an active dialogue with market participants.

+ Invite tenders for the implementation of the charging points

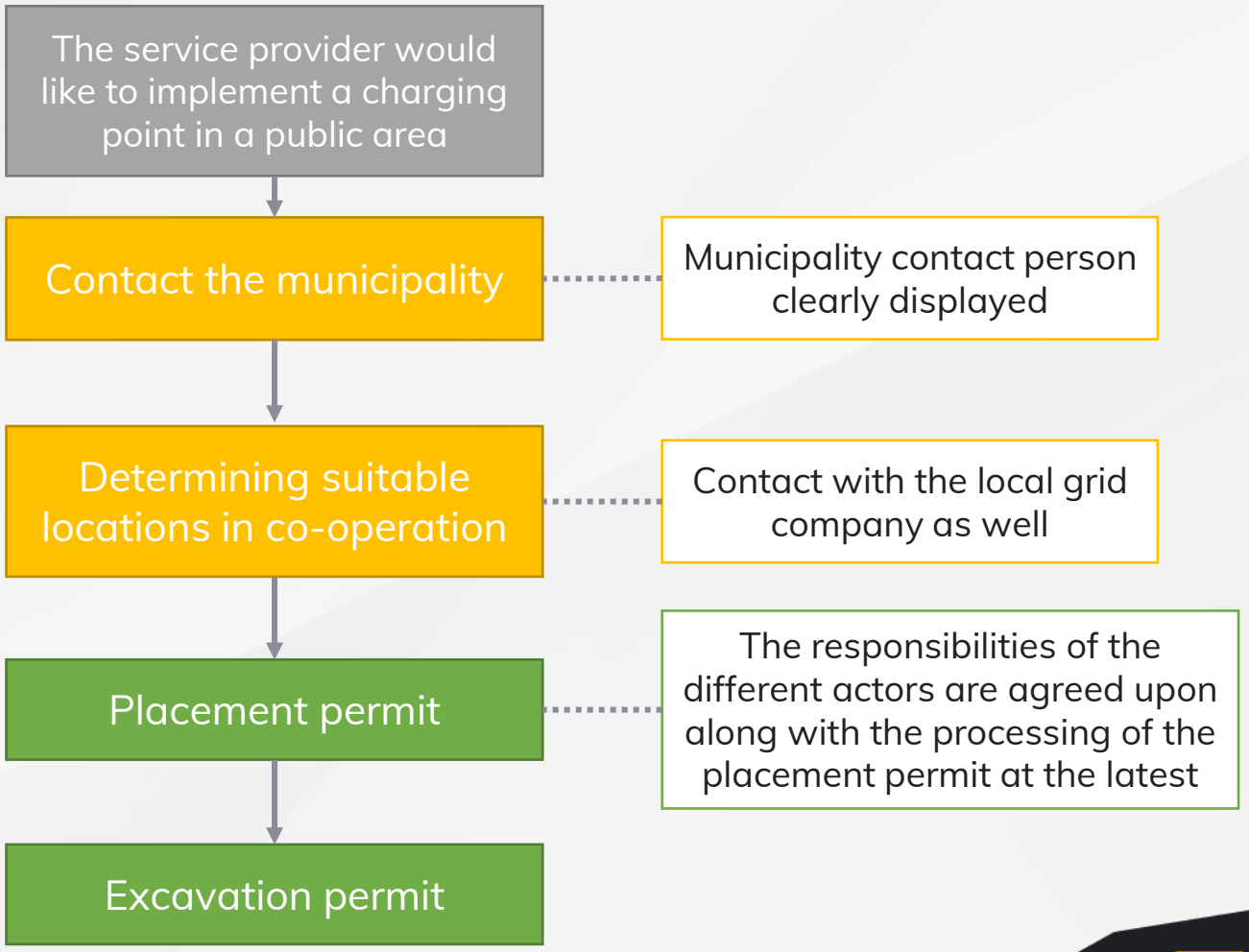
- The implementation and operation of the charging points along with their expenses will be put out to tender
- Depending on the locations, the municipality pays for the implementation/operation of the charging points, or the service provider pays the municipality rent for the general area
- As an alternative, add both good and not so profitable locations to the tendered entity -> the possibility of having a broader network of charging points implemented at once
- The responsibilities of the service provider and the municipality are agreed on a case-by-case basis

+ The city participates in the implementation costs

- The municipality can promote implementation under market conditions by participating in infrastructure costs (e.g., electricity lines, paving, road signs)
- Delivery of charging points, for example, through market dialogue/competition
- The municipality owns the infrastructure
- The private operator is responsible for the device and operation costs
- After the end of the contract, the infrastructure remains property of the city

Implementation of public charging points in public areas - required permits

- The municipality determines what permits are required to implement a public charging point in public areas
- Generally, the practice is to apply for a placement permit for the charging point. A placement permit is required when placing devices, cables, pipes or structures permanently in a street or park area.
- Before starting construction work, a street work permit, excavation permit or similar is required.



Implementation of a public charging point - contract

- When implementing a public charging point for electric cars on land owned by the city or municipality, it would be beneficial to make an agreement between the municipality and the service provider about the implementation
- It is also recommended to make the contract when the charging points are realized on market terms.
- The contract should not demand unreasonable or unnecessary demands from the service provider - only necessary things are agreed upon
- The service provider forms the necessary agreements with the electricity network company.
- The contract should contain the following:
  - Who will implement and pay for the necessary future changes to the infrastructure, including electricity?
  - Who implements and pays for the necessary road sign arrangements?
  - If the service provider terminates the contract, whose ownership will the piping, cabling, infra etc. implemented by the service provider transfer to?
  - Who is responsible for the upkeep and maintenance of the charger's surroundings?
  - Who is responsible for the upkeep and maintenance of the parking lot?
  - The owner of the device takes care of removing the device when its use is stopped
  - What information must the service provider open to public interfaces/use by the city?

The city’s furthering opportunities in the city plan and building permit phases

The local detailed plan and building permit stages for furthering the implementation of charging points for electric cars are often rigid. The law obligates the implementation of charging points in new buildings.

A detailed plan or an amendment to the detailed plan is drawn up for land owned by the city. Future lots will be sold or rented.

A detailed plan or detailed plan change is prepared for land owned by a private entity. The future plots will remain in private ownership.

The land transfer condition is the most effective way to control the implementation of charging points for electric cars when the land is owned by the city.

The detailed plan is a strong, but rigid way to control the implementation of charging points. The land transfer conditions are a more flexible means of controlling the implementation of charging points for electric cars than the detailed plan.

Alongside or after the detailed plan, **a quality manual, quality and environmental guidelines or construction method guidelines** can be drawn up to clarify the plan presented in the detailed plan. When applying for a building permit, building supervision authorities may require compliance with the quality manual, but the legal weight of the quality manuals is less than that of the detailed plan.

Land use agreements are made when a private entity prepares a detailed plan for the land it owns. In principle, obligations related to the implementation of charging points can be included in the land use agreement.

Applying for a building permit in accordance with the legally valid detailed plan for the city's rental plot.

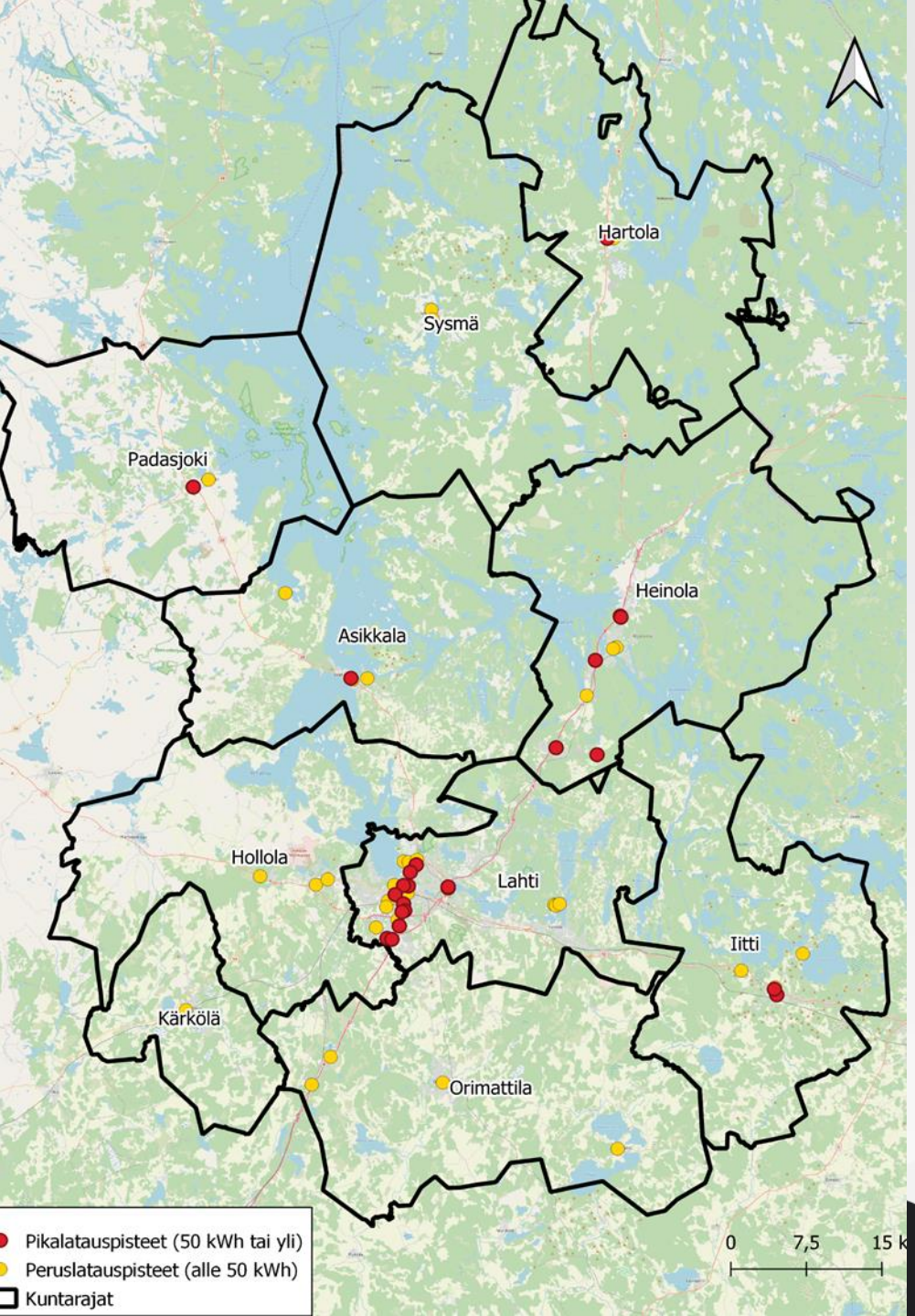
Applying for a building permit in accordance with the legally valid detailed plan for a privately owned plot

If the site already has a legally binding detailed plan and a building permit is applied for, the plot transfer agreement, land use agreement, detailed plan cannot be used. In some cases, the city can use the building ordinance as a control tool to implement charging points.

The building ordinance can be invoked at the building permit stage if some requirements for charging points are written there. At the building permit stage, it is difficult to obligate something that is not specified in the plan. The building ordinance applies to the entire city or district and is therefore not a very precise control tool.

https://www.hel.fi/hel2/ksv/julkaisut/los_2016-6.pdf

Accessibility of public charging points in Päijät-Häme



Public charging points for electric cars in Päijät-Häme

- Päijät-Häme has public charging points for electric cars within every municipality's area
- Most of the charging points are in Lahti and along highways
- There are 46 basic charging points and 16 fast charging points

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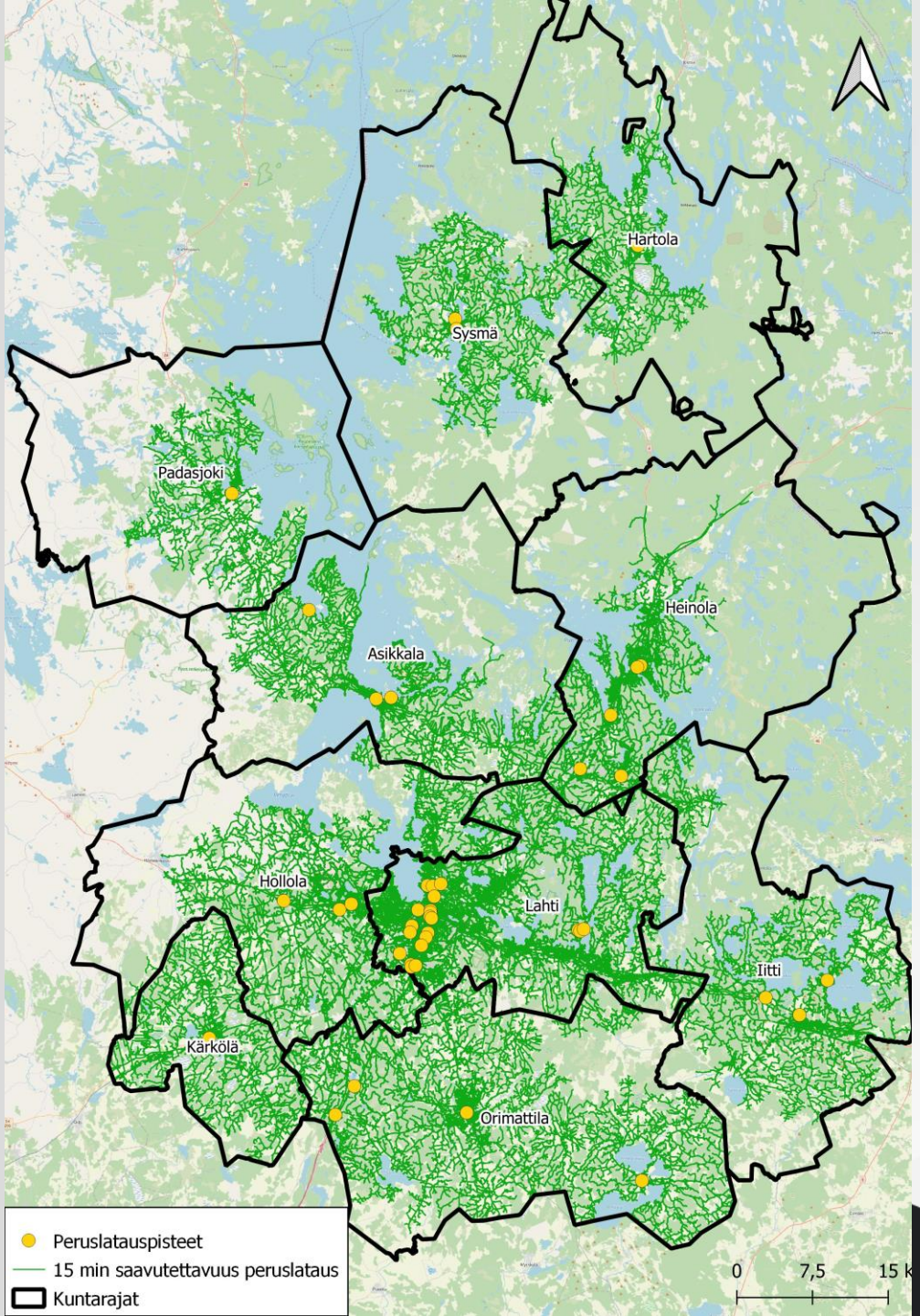
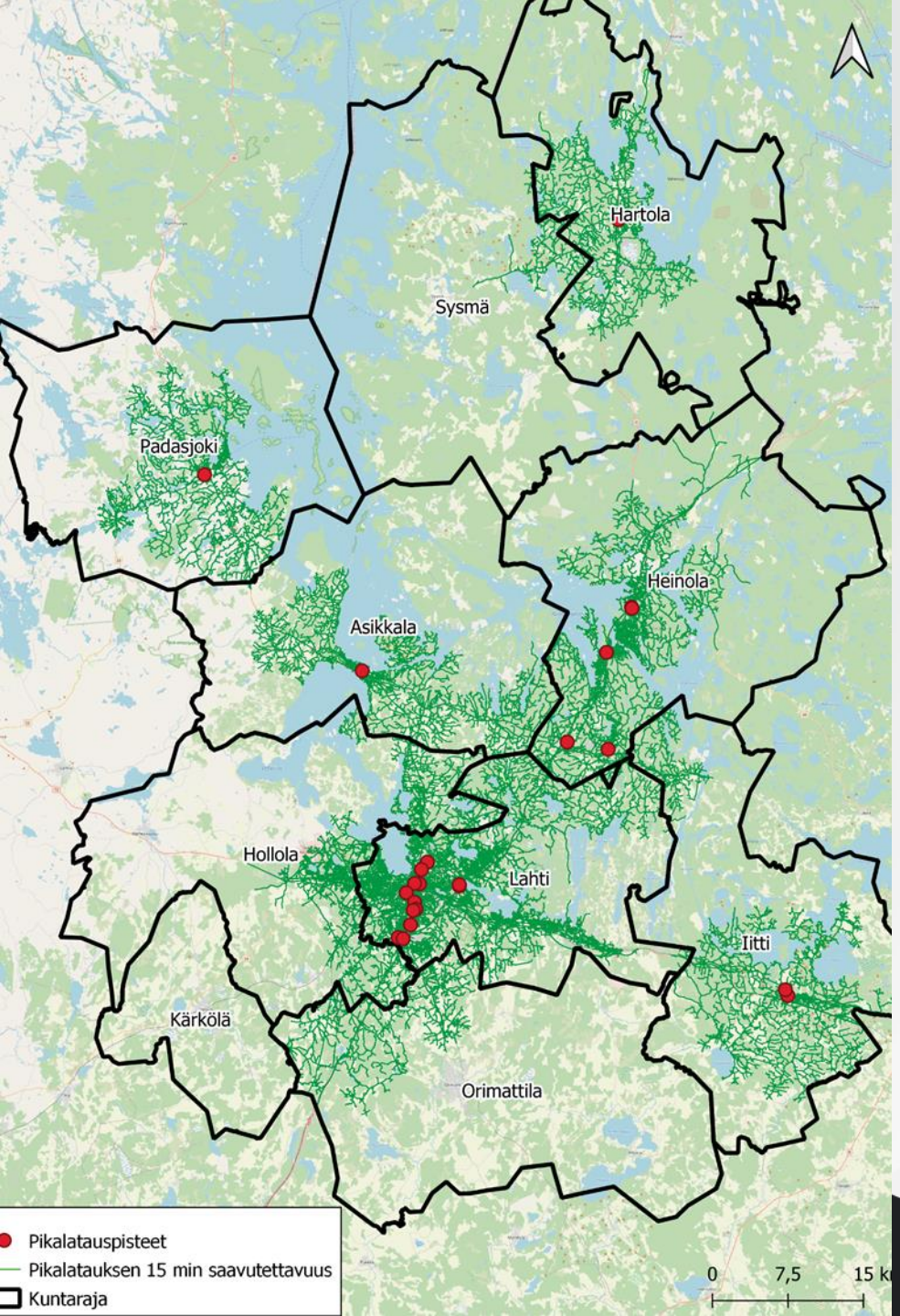


Accessibility of current basic charging points

- Public charging points are located in the center of every Päijät-Häme municipality
- The basic charging point network is within 15 minutes of a large part of Päijät-Häme's permanent residents
- There are areas without nearby charging points between Heinola, Hartola and Sysmä, at Padasjoki and east of Päijät-Häme

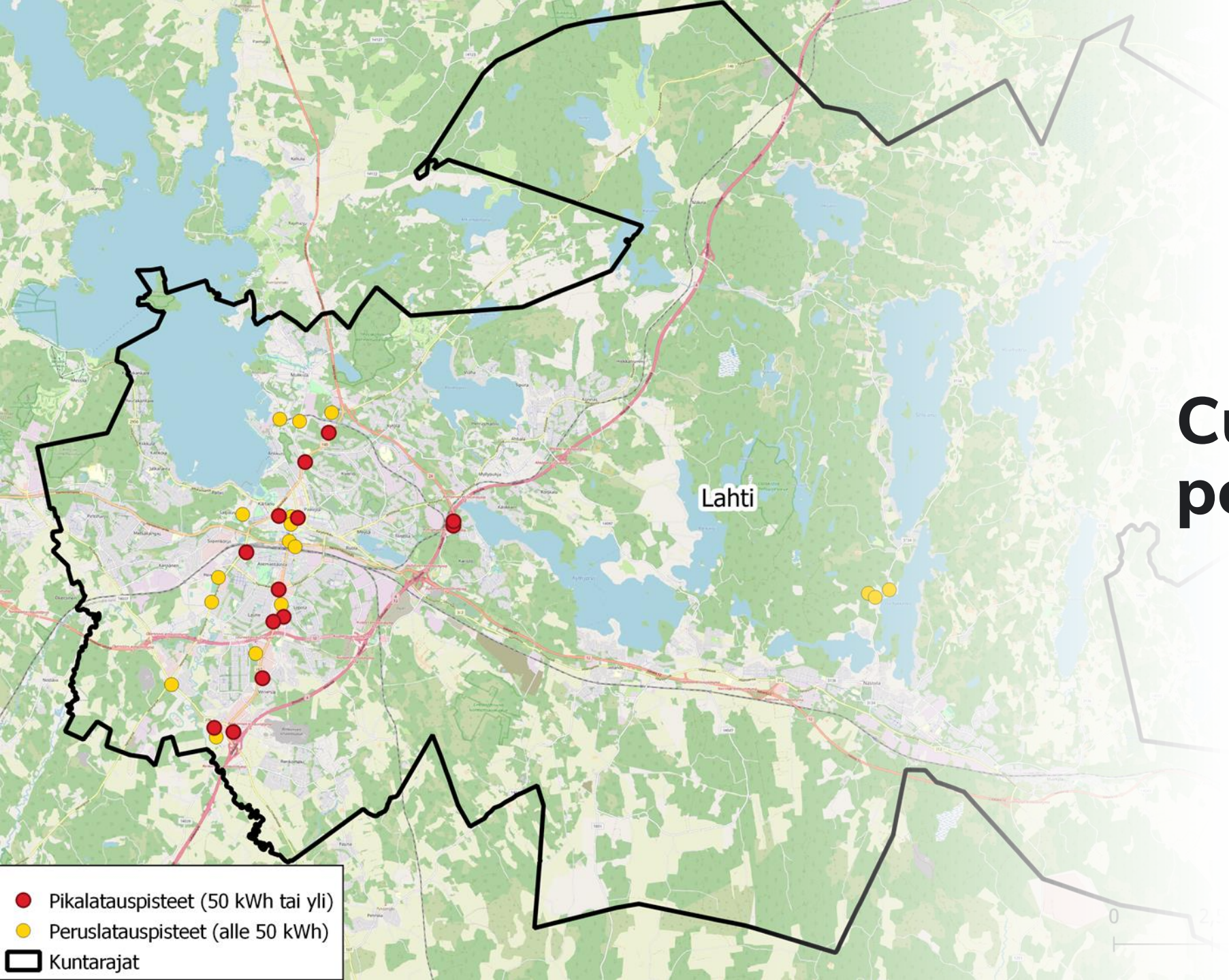


Accessibility of current fast charging points

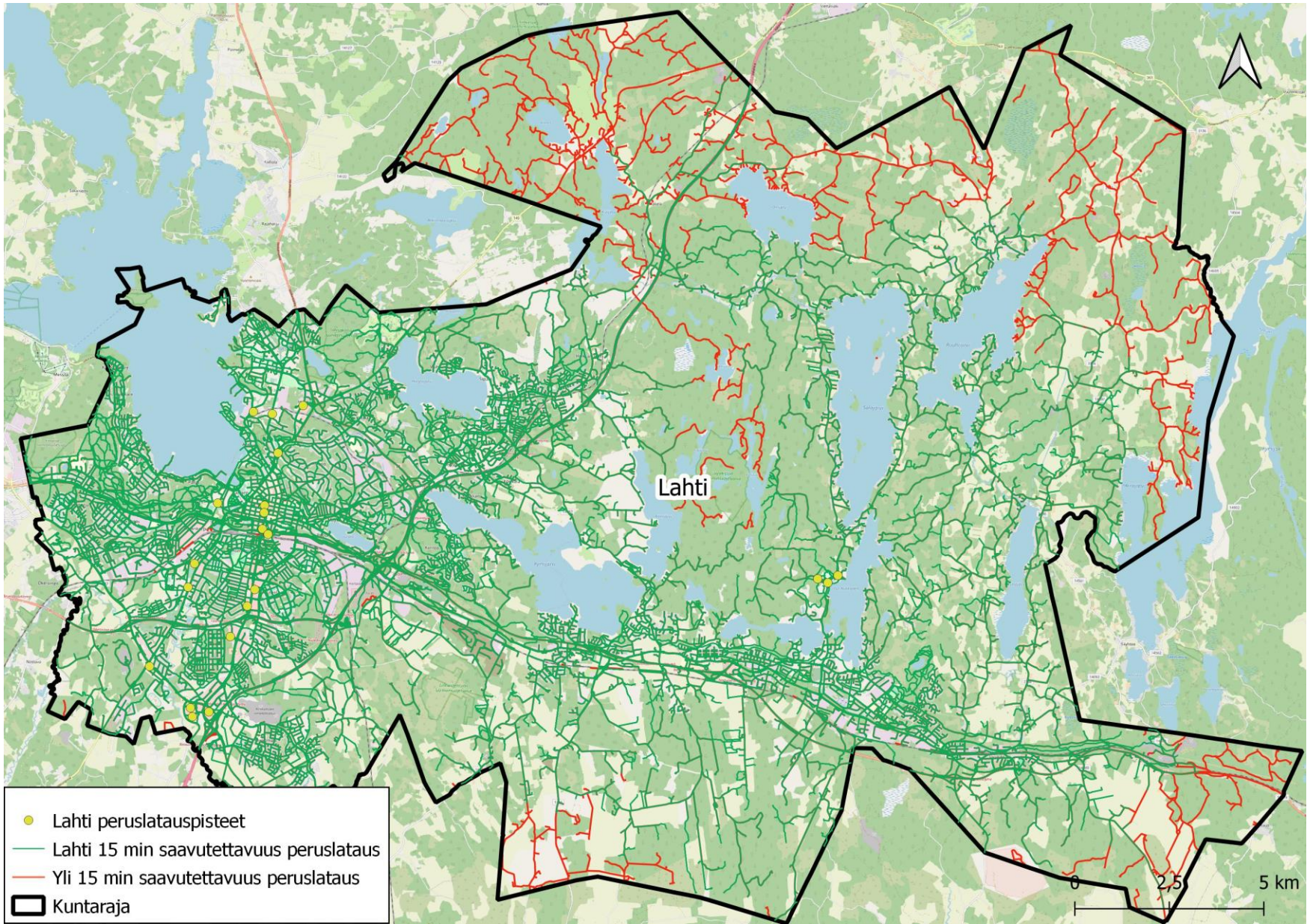
- Fast charging points are concentrated along highways – often used by long distance traffic
- Fast charging points are located within 15 minutes of municipal centers, with the exception of Sysmä, Hollola and Kärkölä
- There are a few areas without coverage on the highway 4 segment

Accessibility of charging points in the city of Lahti

Current charging points in Lahti

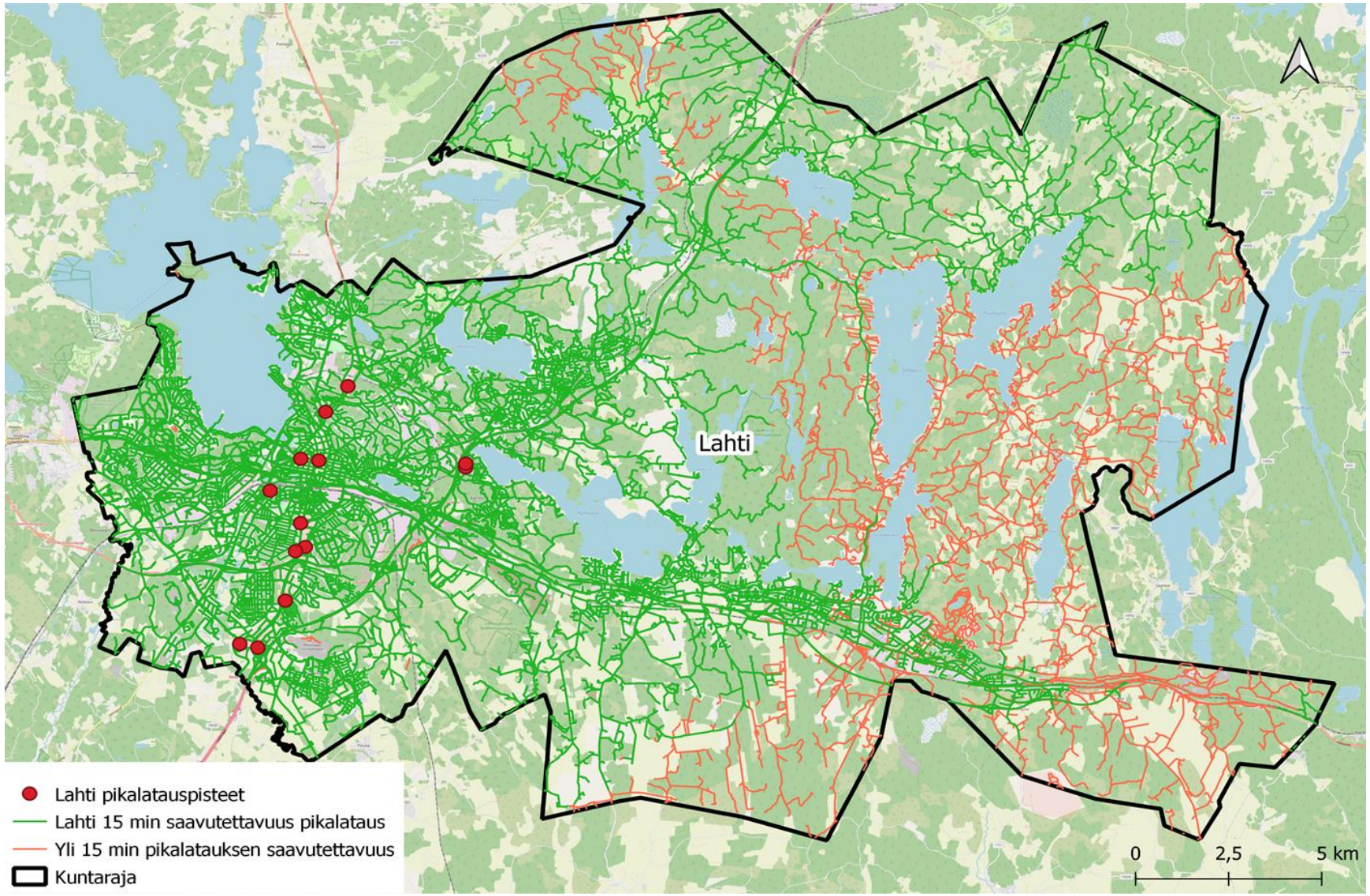


Accessibility of charging points, basic charging



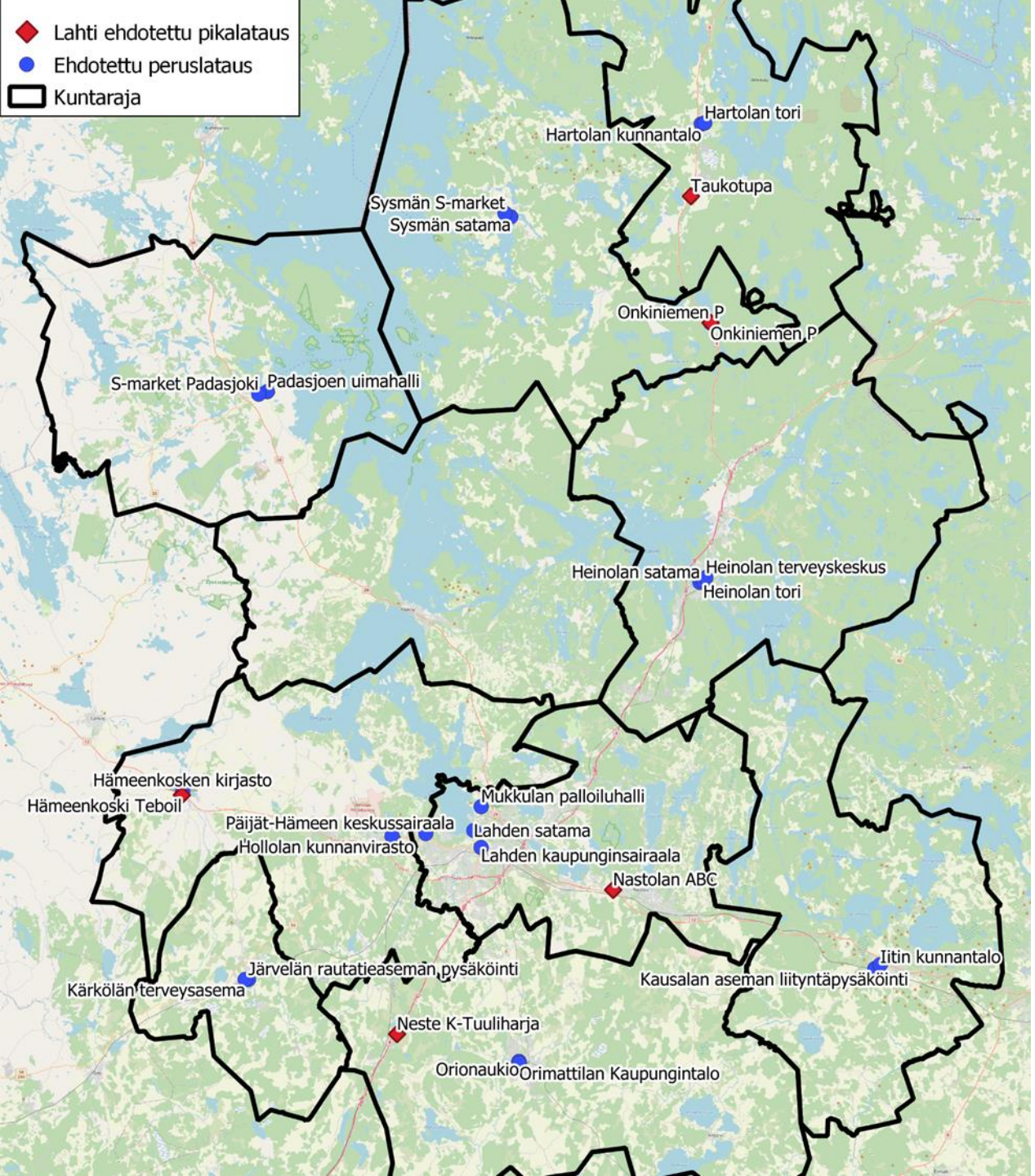
- 15-minute accessibility
- Covers almost the entire area of the city of Lahti

Accessibility of charging points, fast charging

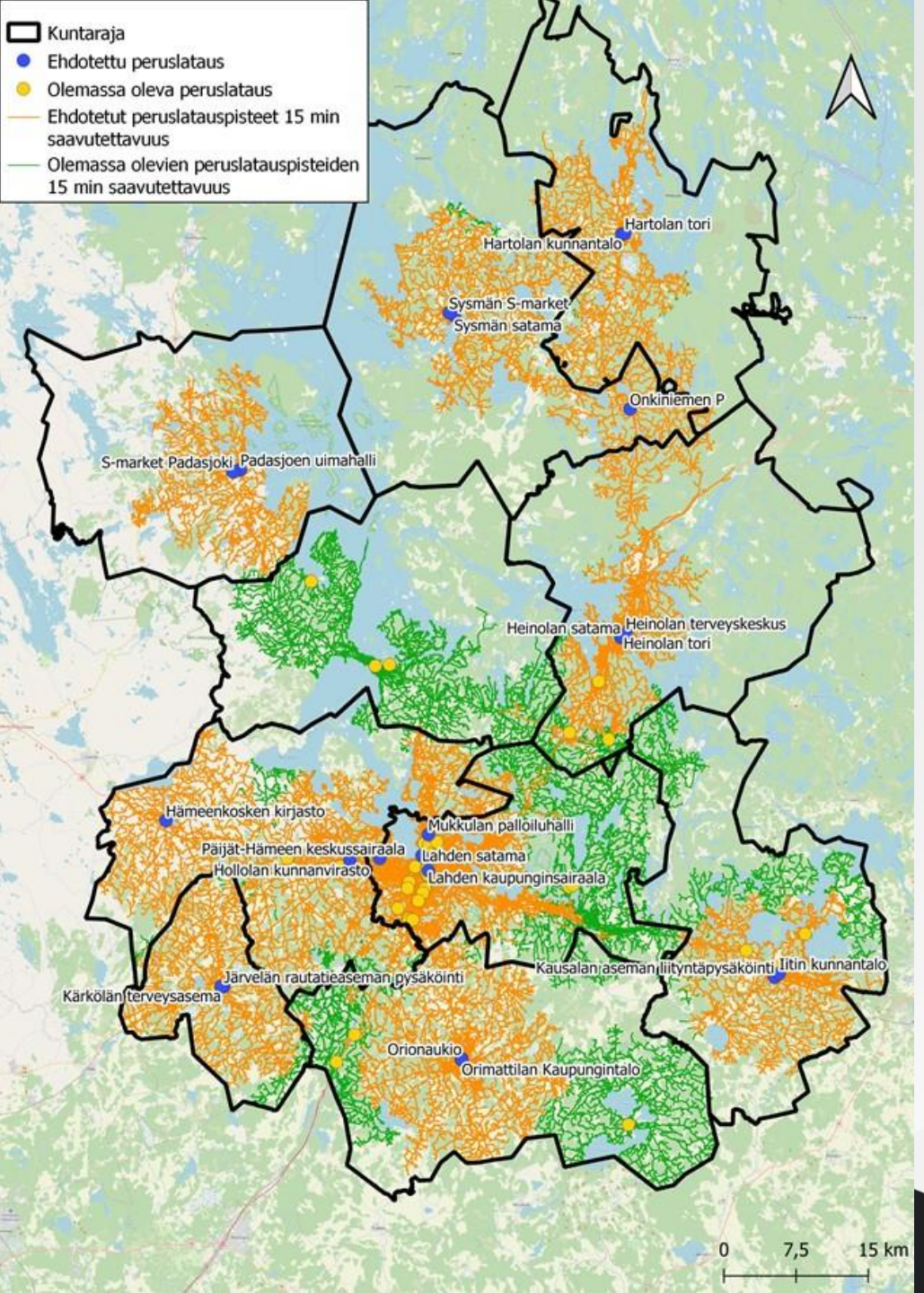


- 15-minute accessibility
- Less accessible areas in the eastern part of Lahti
- Does not cover highway 12 completely

Preliminary plan of charging points in Päijät-Häme



Locations of proposed new charging points



The accessibility of basic charging in Päijät-Häme and the relationship with previous accessibility of fast charging

- The locations of new charging points complement current locations
- The new locations ensure that central areas also have a public charging point in connection with public functions → supply security
- The most significant connection parking areas have charging points
- Placing a few basic charging points in the displayed locations is possible at a reasonable cost from the electricity network's point of view

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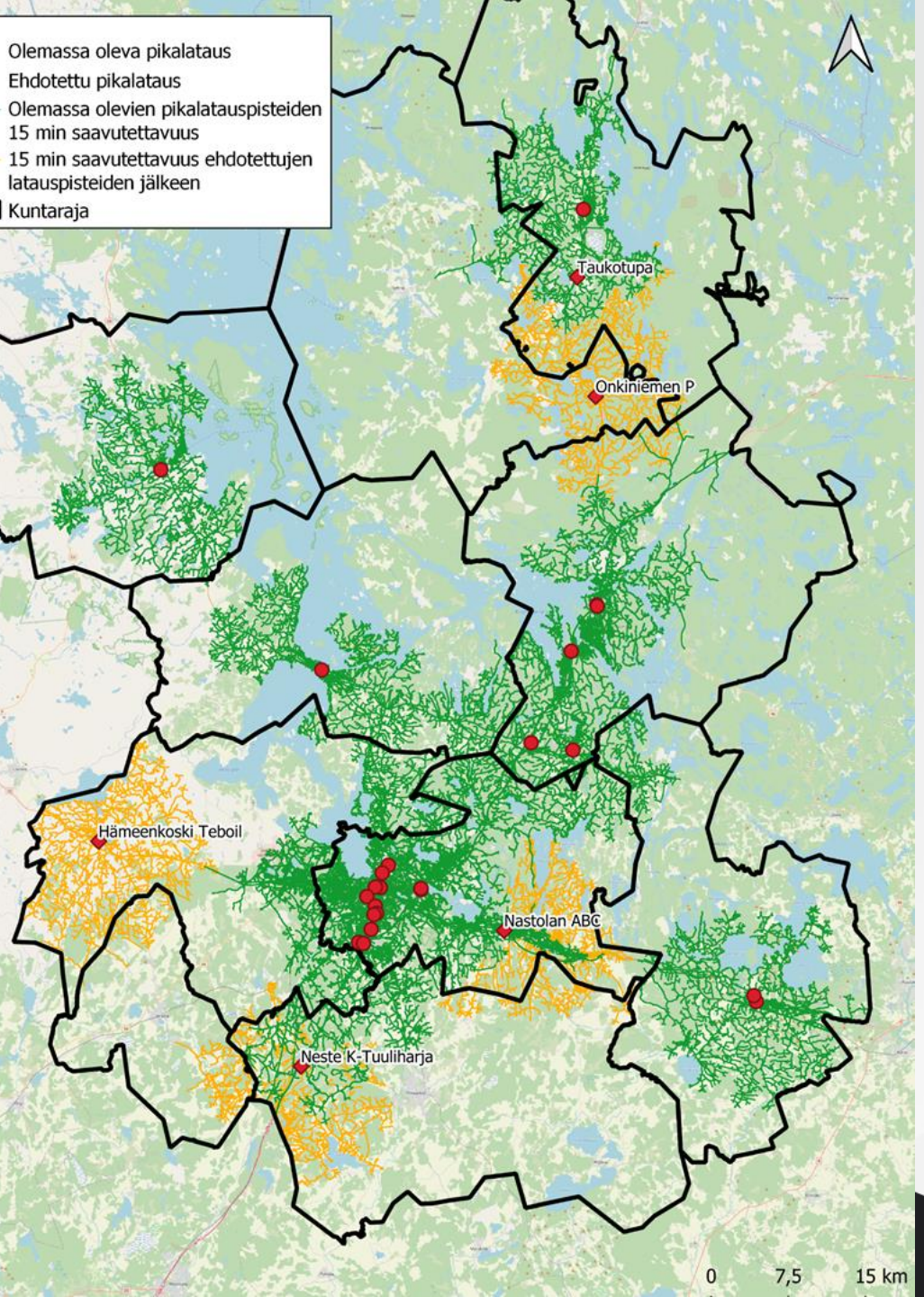
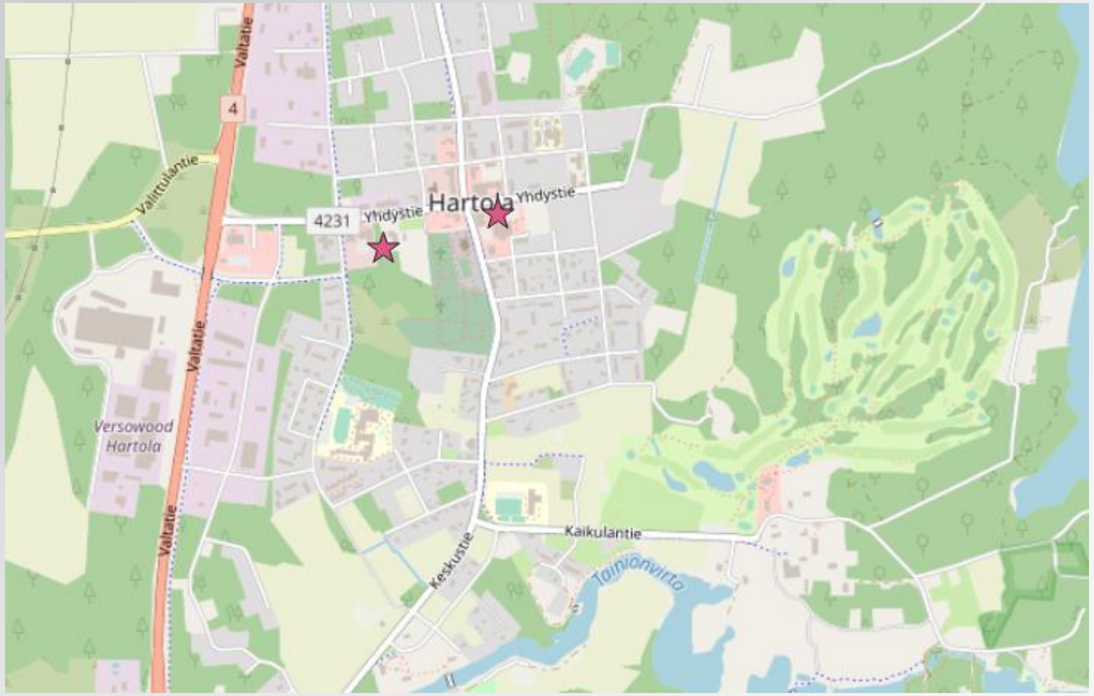
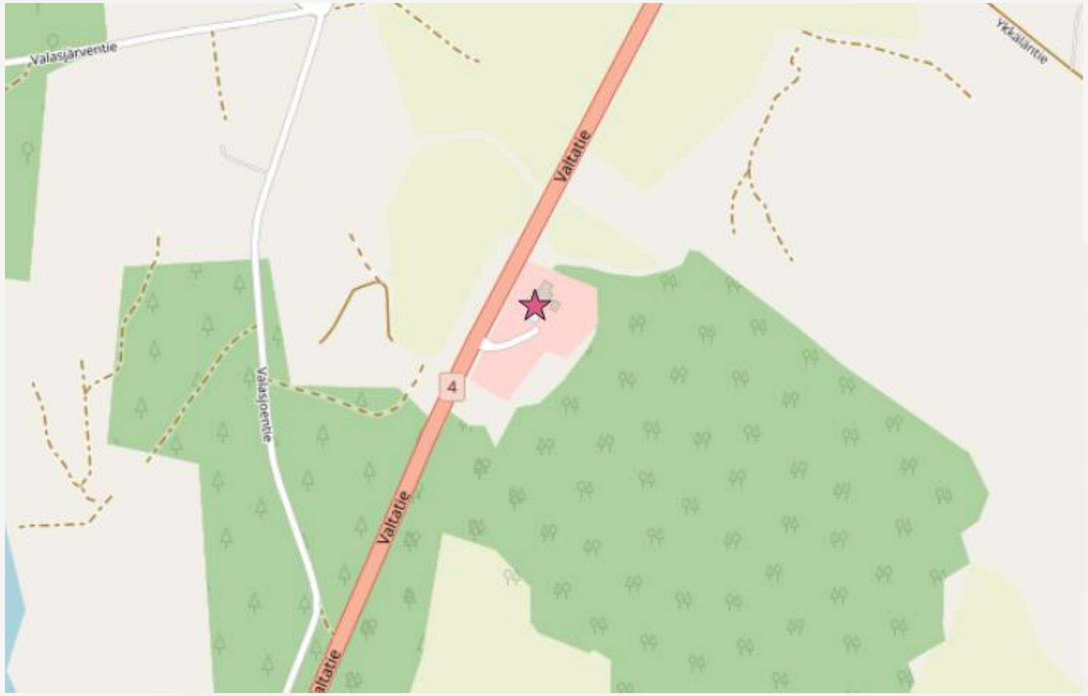


The accessibility of fast charging in Päijät-Häme and relationship with previous accessibility of fast charging

- The new locations will ensure that there are fast charging stations with an accessibility level of at least 15-minute intervals on highways 4 and 12

Hartola



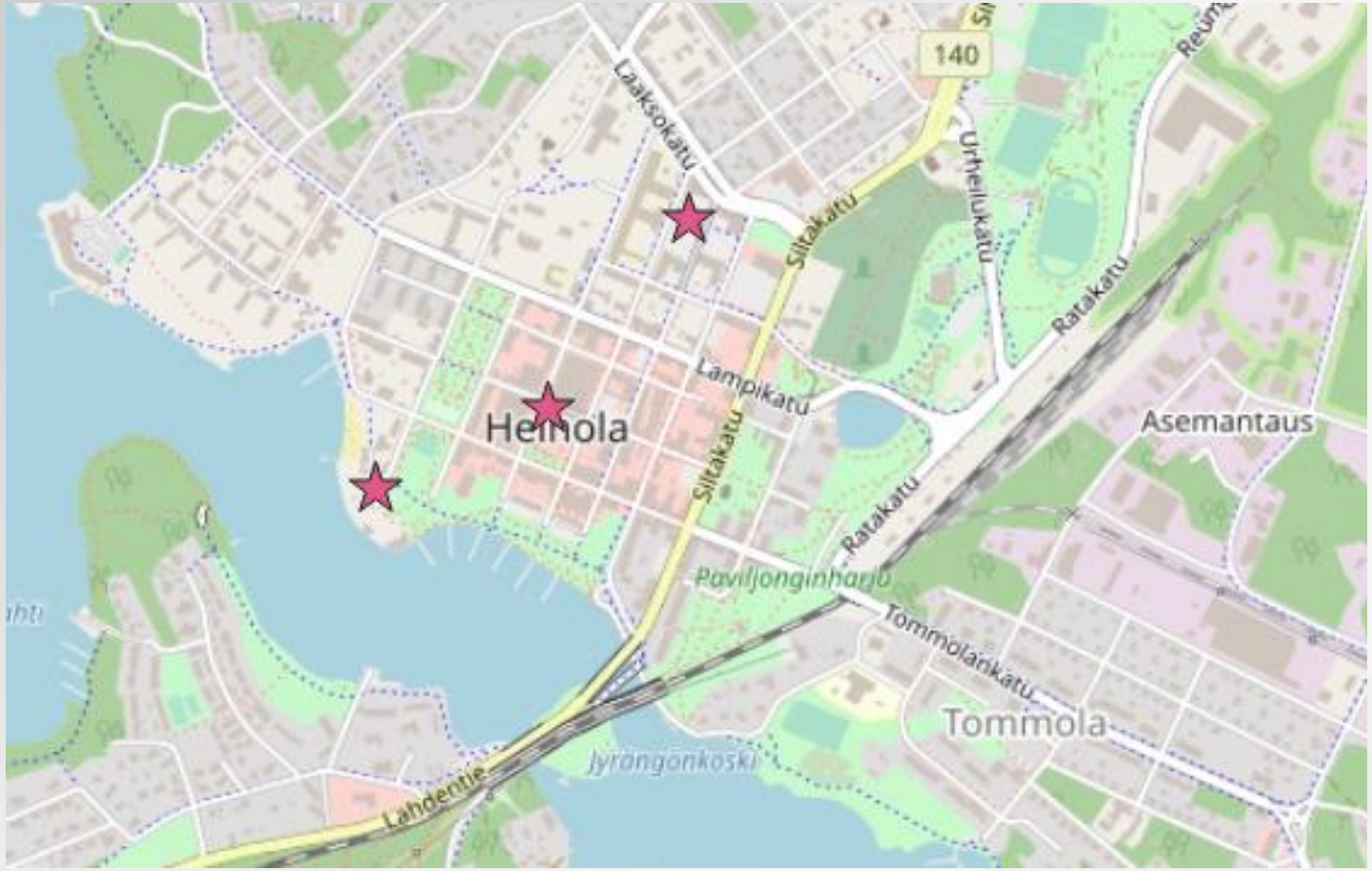


Proposal for the location of new charging points

- Concentration of municipal services (municipality hall, library, social services office)
- Market

A possible location of a new charging point in Hartola alongside highway 4 in connection with a cafe (fast charging).

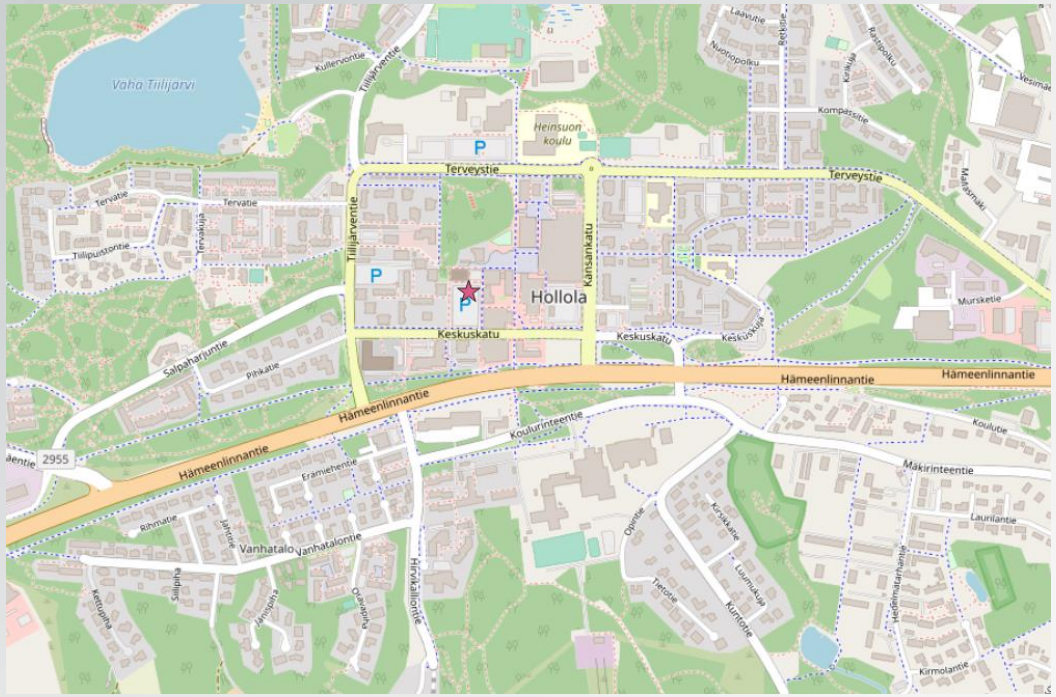
Heinola



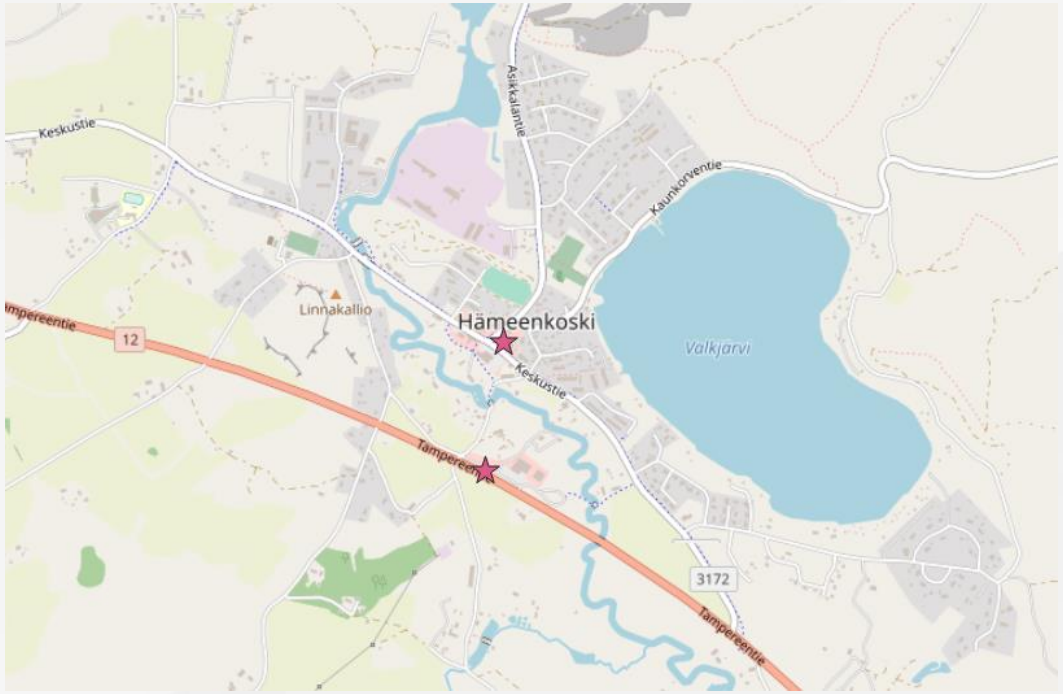
Proposal for the location of new charging points in Heinola:

- Market (previous interest by a private operator)
- Harbour (active port operator)
- Healthcare center
- Hospital

Hollola



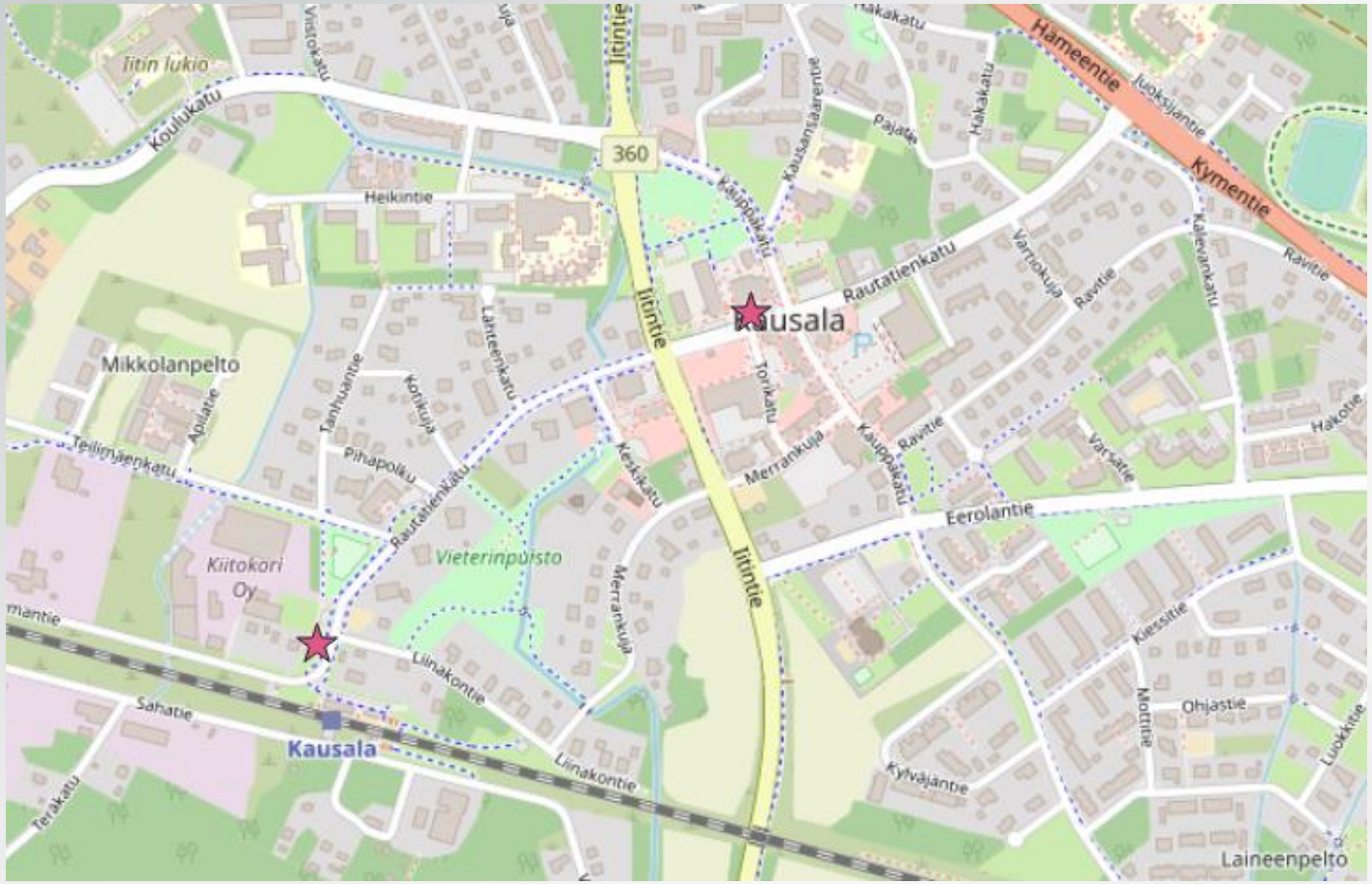
Proposal for the location of a new charging point in connection with the municipality hall



Proposal for the location of new charging points:

- Library
- Teboil service station (fast charging)

litti



Proposal for the location of new charging points:

- Connection parking at Kausala railway station
- Municipality hall

Kärkölä

Proposal for the location of new charging points:

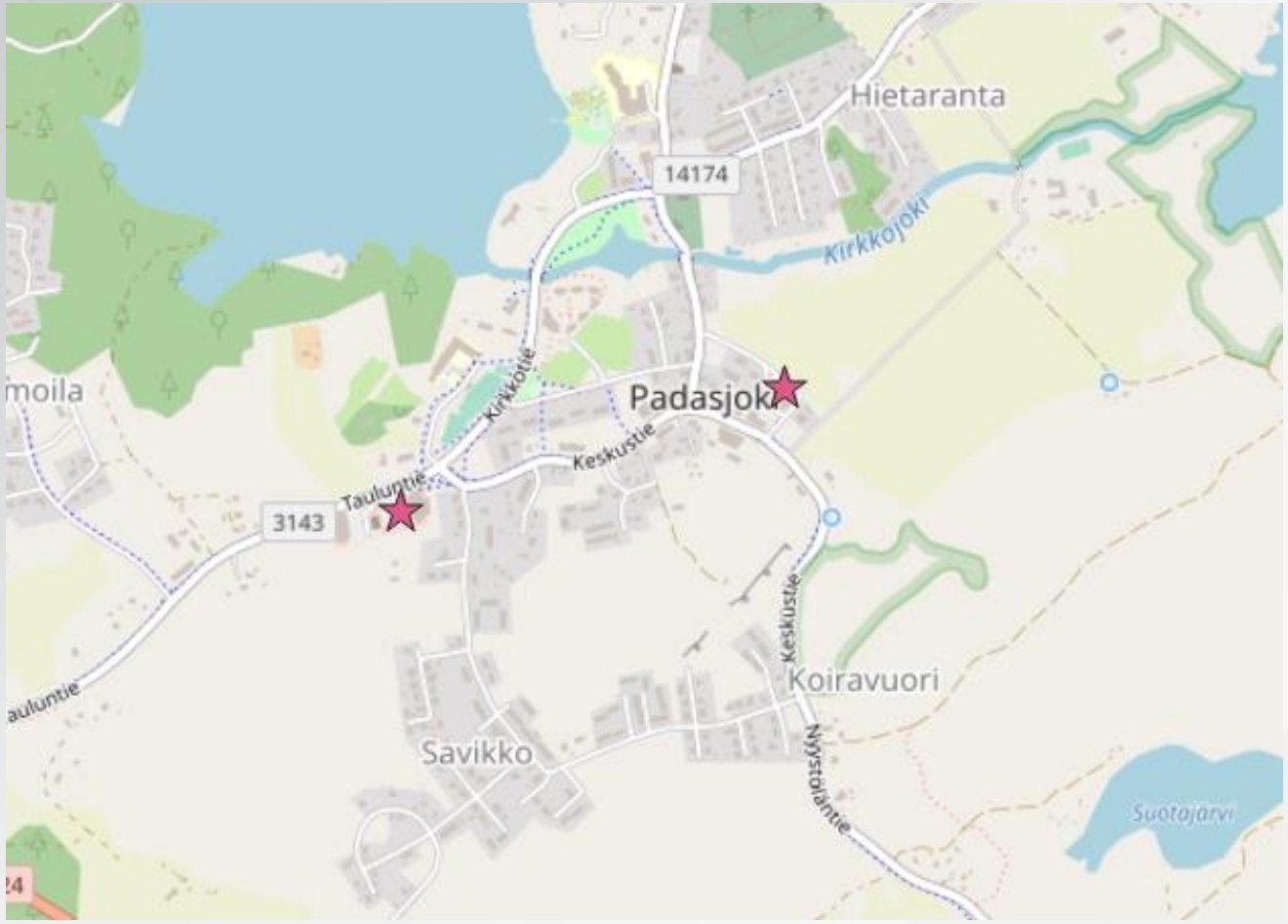
- Järvelä railway station parking
- In connection with municipal services (swimming hall and healthcare center)

Orimattila

Proposal for the location of new charging points:

- Municipal hall
- Orioninaukio

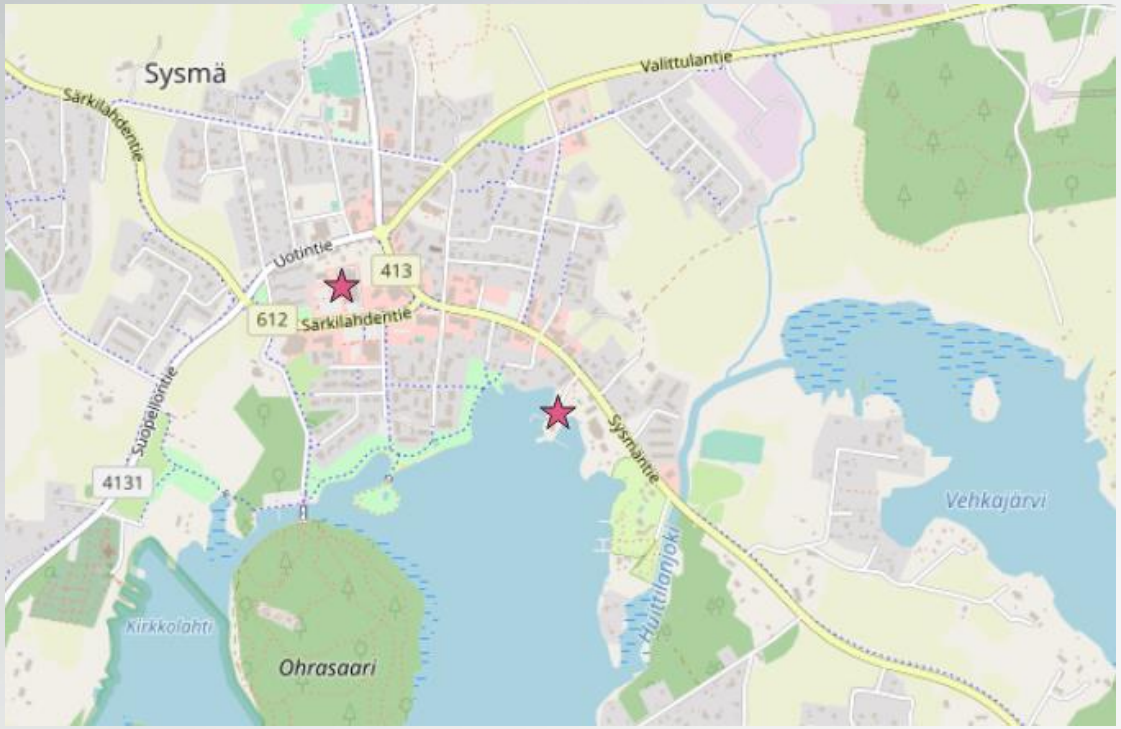
Padasjoki



Proposal for the location of new charging points:

- Healthcare center and municipality hall
- S-market

Sysmä



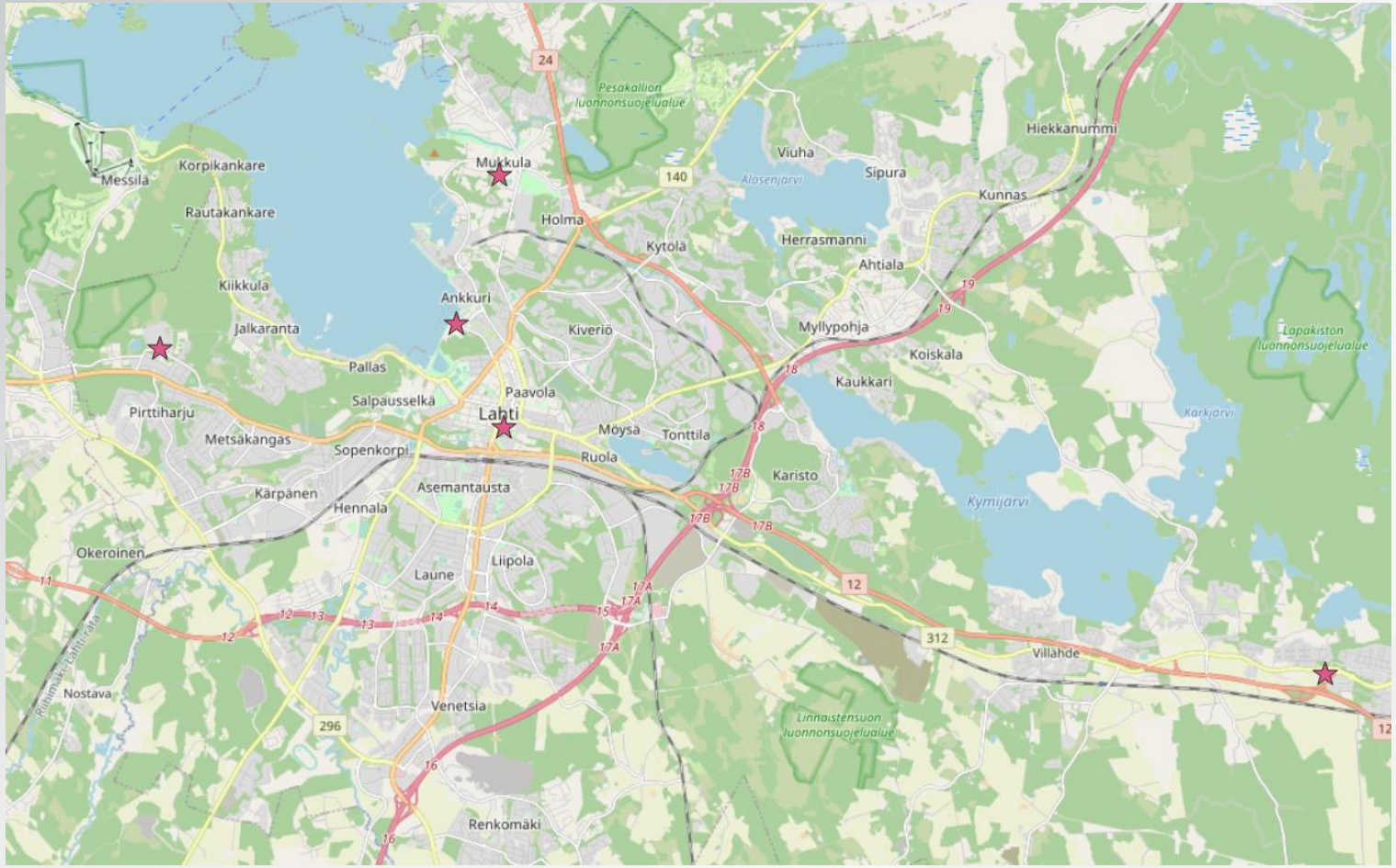
Proposal for the location of new charging points:

- Harbour
- S-market

Proposal for the location of new charging points along highway 4 in connection with the parking lot of the Onkiniemi bus stop. There is a need for both fast charging and basic charging.

Preliminary plan of charging points in Lahti

Lahti

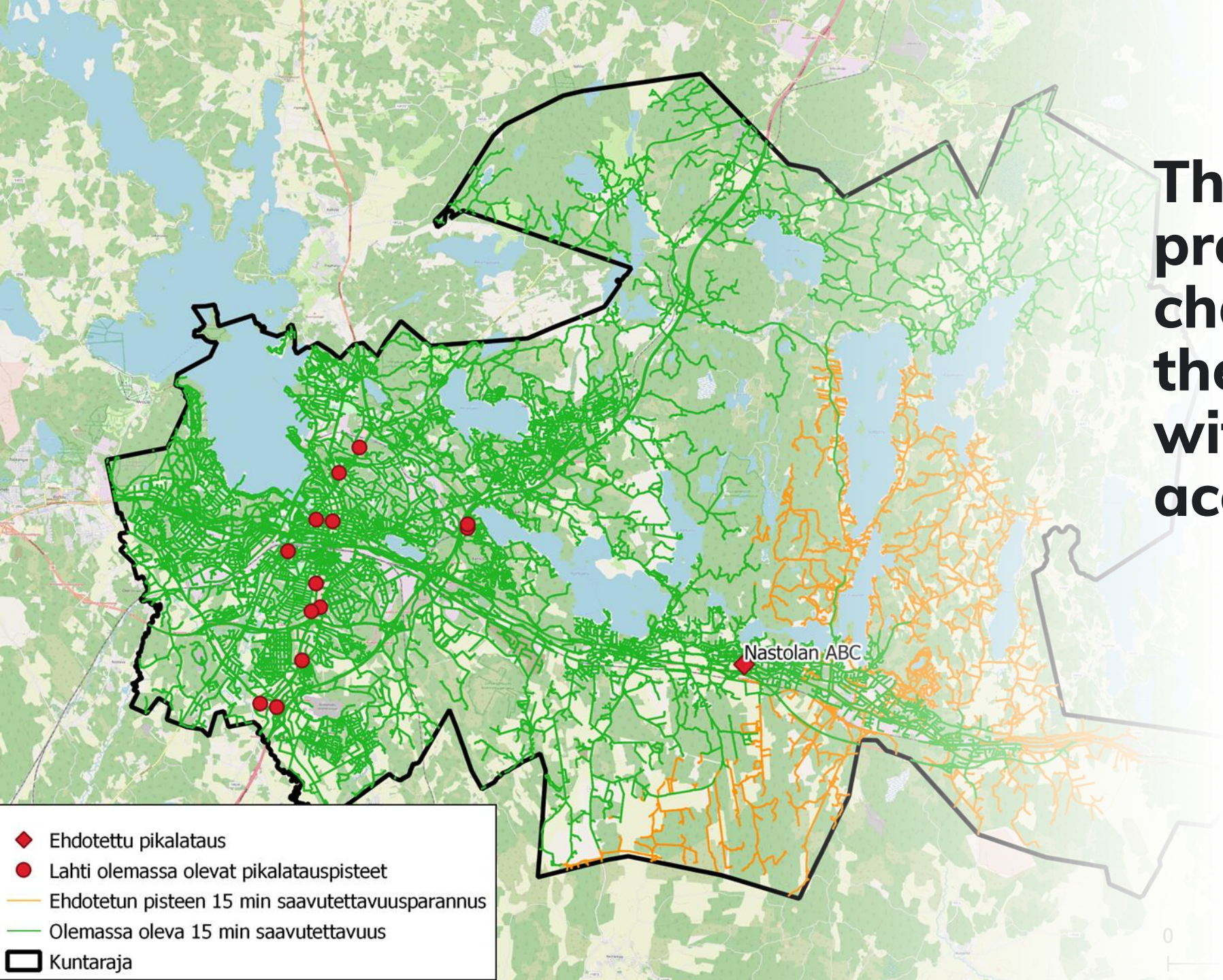


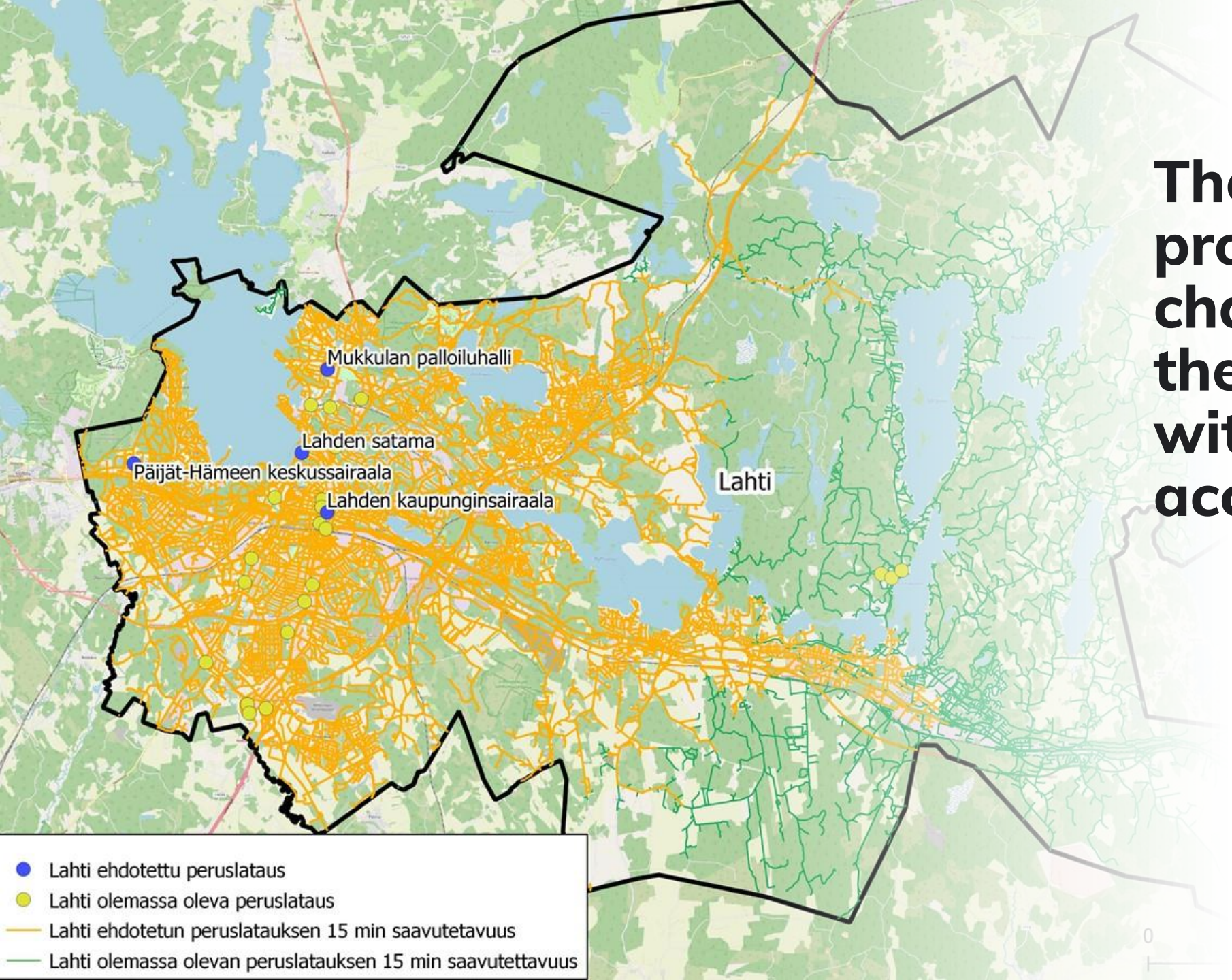
New locations in Lahti:

- Päijät-Häme Central Hospital
- Lahti City Hospital
- Lahti Harbour
- Mukkula sports hall
- Nastola's ABC service station (also fast charging)

When planning charging places, the residents' roadside parking spaces in the center of Lahti and the electrification of taxis should also be taken into account.

The locations of the proposed new fast charging points and their relationship with previous accessibility in Lahti





The locations of the proposed new basic charging points and their relationship with previous accessibility in Lahti

Conclusions

The facilitation of public charging points - conclusions

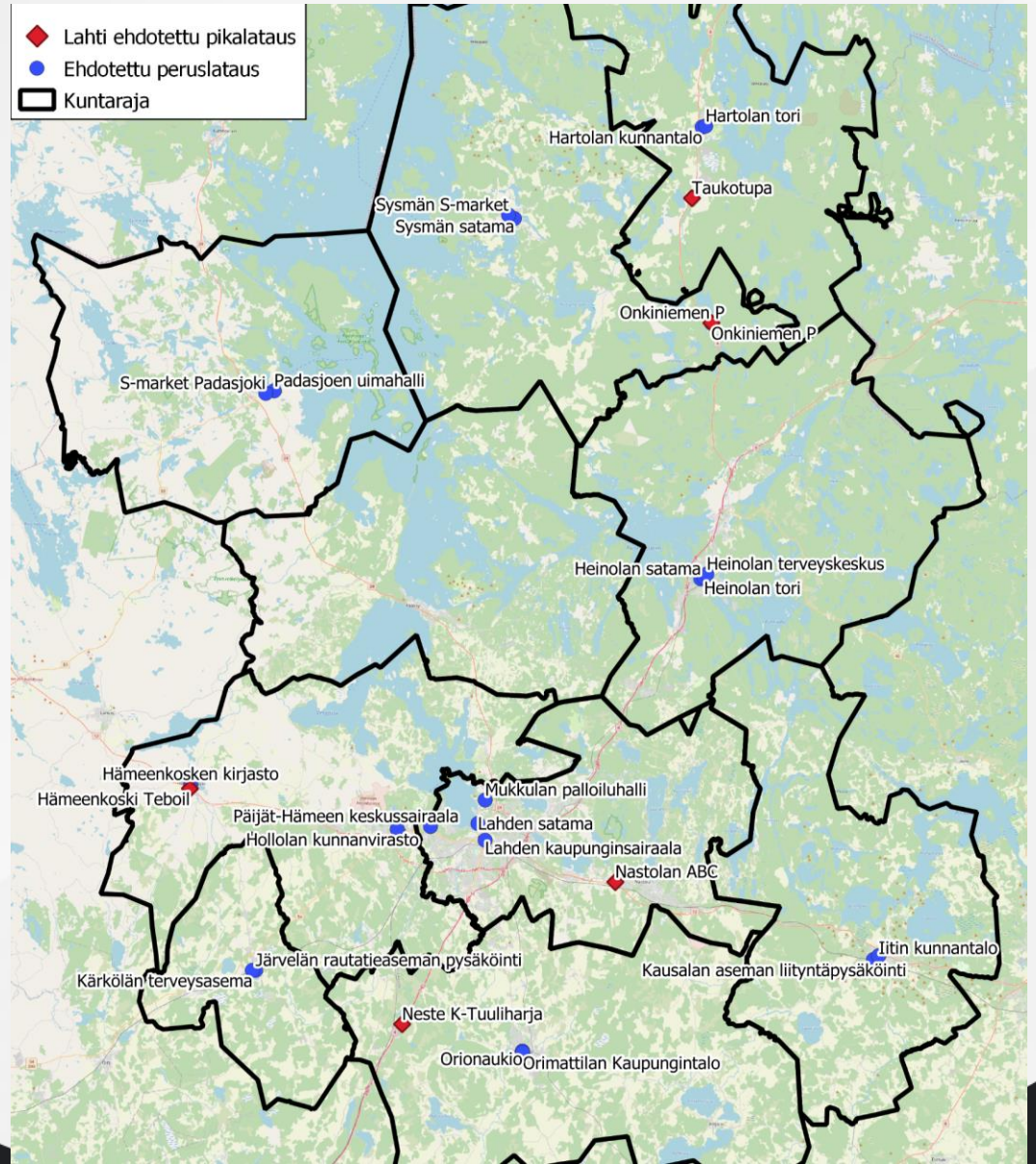
- The number of electric cars (full electric cars and plug-in hybrids) is growing strongly. The number of fully electric cars has more than doubled in the past year (2022) and the number of plug-in hybrids has increased by 40%.
- The strong growth in the number of electric cars creates new business potential for the market-based implementation of public charging points. Commercial operators are also actively investing in public charging points in their own parking areas.
- Public charging points for electric cars can be realized in accordance with market conditions in those destinations where there is demand and implementation is cost-effective.
- The starting point is that public charging points are implemented on market terms - the role of municipalities is to enable charging points to be implemented also in areas and properties owned by public operators.
- The law on the availability of charging points for electric cars (concerning commercial, public and residential real estate and related parking buildings) contributes to the implementation of new charging points.
- In connection with the renovation of public properties, it should be assessed whether most of the charging points could be public.

The facilitation of public charging points - conclusions

- When cities/municipalities are planning the implementation of public charging points, there should already be an active dialogue with operators providing charging services in the early stages.
- The local electricity network company should be involved in determining the location of the charging points - the restrictions and costs related to the electricity network partly guide the locations of the charging points.
- The most important ways for cities/municipalities to promote the realization of public charging points:
  - Active dialogue with different actors
  - A clear permit process if the operator wants to implement a charging point in the public area
  - No unnecessary requirements for contracts related to the implementation of charging points
  - Preparing for the implementation of charging points in connection with new projects and repair projects with piping and space reservations
  - The implementation of the infrastructure needed by the charging points, if the charging points are not implemented on market terms

Preliminary plan of public charging points

- The charging network in Päijät-Häme is quite comprehensive, especially the service level of basic charging in the central areas is good.
- The network currently meets the requirements of the AFI directive for 2025. Not all 2030 requirements are met.
- There is a particular need for new charging points in municipal centers and highway gas stations.
- There are a total of 27 new proposed charging points, of which 5 are fast charging and 22 are basic charging.
- The new locations would support the fulfillment of the criteria of the AFI directive update in the future in Päijät-Häme.



Effects of the update of the AFI directive on the implementation of charging points

- The update of the AFI directive may introduce new requirements for public operators to implement public charging points for electric cars.
- With the number of fully electric cars and plug-in hybrids growing rapidly, the charging point network is not necessarily expanding fast enough according to market conditions
- The implementation needs of public charging points in Päijät-Hämee are related to the requirements for charging points of the TEN-T core network in 2030 and the TEN-T comprehensive network in 2035
- If the number of electric cars starts to grow very quickly, the charging point requirements related to the number of electric cars registered in the area can also cause challenges. In the current situation, however, the charging network is sufficient for these requirements.
- The increase in the number of electric cars also enables the market-based development of the public charging point network

Green Electrification of Mobility Cluster

LAHTI GEM

The events and actions of the Lahti GEM are implemented as a part of the project: Carbon Neutralization Ecosystem (Dnro.8 / 00.01.05.21 / 2021), funded by the Regional Council of Päijät-Häme and the Regional Support for Sustainable Growth and Vitality (AKKE)