SEINÄJOKI-TARTU
DRONE ECOSYSTEM COOPERATION

INNOAVIA
AVIATION CONSULTANCY

CONTENTS

into SEINÄJOKI

LEADER Liiveri

Euroopan maaseudun kehittämisen maatalousrahasto: Eurooppa investoi maaseutualueisiin

1 INTRODUCTION

Into Seinäjoki commissioned Innoavia Oy to explore the possibilities of cooperation between Seinäjoki and Tartu in the drone business. During the mapping process, stakeholders from Seinäjoki and Tartu were interviewed during May-June. The interviews with stakeholders in Seinäjoki were conducted in a workshop and one-to-one meetings, while in Tartu the interviews were organised as organisation-specific meetings.

A total of seven organisations were interviewed in Seinäjoki and four in Tartu. The organisations in Seinäjoki were Into Seinäjoki, City of Seinäjoki, Seinäjoki Airport, Hyvä-EP, EP-Opisto, SeAMK, Sedu and Haaga-Helia. The organisations in Tartu were: City of Tartu, Spark-up, EAVA and Skycorp.

The identified cooperation opportunities are based on the drone activities that emerged from the discussions and represent only a sample of all possible cooperation opportunities. Based on previous studies conducted in the regions of Seinäjoki and Tartu, the identified cooperation opportunities represent the most significant development areas in the Seinäjoki-Tartu drone ecosystem in both regions. However, it is recommended to continue actively identifying new opportunities for cooperation. The study has been carried out as part of the project "Towards more sustainable logistics and new cooperation between the Seinäjoki and Tartu regions".

2 EXECUTIVE SUMMARY

The industrial structure and business culture of the Seinäjoki region and Tartu are similar in many ways. Both regions have invested in the development of unmanned aviation and the drone ecosystem. There are several drone-related projects in the regions and both have carried out various drone-related studies.

As close cooperation between the different cities is particularly important for the development of drone ecosystems, this report reviews the most important areas of cooperation. Some of the areas of cooperation are similar to the development of the two drone ecosystems, while others are of a different focus.

The main difference is that Seinäjoki focuses specifically on drone logistics, while Tartu focuses on data collection with drones to improve the efficiency of city operations. These differences enrich and strengthen the drone ecosystem between Seinäjoki and Tartu. 13 opportunities for cooperation were identified, related to the drone ecosystem development.

3 IDENTIFIED INTERESTS AND ACTIVITIES IN SEINÄJOKI

The following interests and activities have been identified for the development of drone cooperation between Seinäjoki and Tartu:

1. Last-mile/First-mile drone logistics pilot between Central Hospital-Aallokko
2. International drone logistics (Dronamics/mid-mile) between Seinäjoki and Tartu.
3. Regional drone logistics e.g. between the Central Hospital and health centres
4. Wind and solar power, use of drones for maintenance and repair of power plants
5. FlyingBasket Academy
6. Projects to coordinate manned and unmanned aviation
7. Kurjenneva-Roves pilot
8. Airport-Kurjenneva pilot
9. Kurjenneva bunker
10. Roves-Kurjeneva sandbox and LivingLab
11. Hyvä-EP - LivingLab in the city centre
12. Seinäjoki Airport LivingLab
13. Experiments at the Tartu Drone Competence Centre

3.1 LAST-MILE/FIRST-MILE DRONE LOGISTICS PILOT BETWEEN CENTRAL HOSPITAL AND AALLOKKO

The drone logistics pilot between the central hospital and Aalloko has been discussed in meetings with various stakeholders. In discussions with Hyvä-EP, the issue of drone logistics between the logistics centre of the central hospital and the new Aallokko building under construction in the city centre came up. Drones could be used to transport instruments needed for dental care, for example, from the central warehouse. In addition, the automation of the parcel handling chain has been discussed with various stakeholders, where a parcel brought in by a drone could be automatically transferred to a transport robot.

The challenge in implementing this pilot is the high ground risk and the resulting potentially high airworthiness requirement of the aircraft (SAIL III+). It is recommended to further assess the airworthiness requirements and carry out a feasibility study during the pilot. It is also important to discuss with Traficom and FinnHEMS before applying for funding.

COOPERATION OPPORTUNITIES

In discussions with the Estonian Aviation Academy (EAVA), interest in the use of drone logistics in healthcare emerged. However, in Tartu, a similar type of last-mile/first-mile drone logistics in healthcare was not considered essential. For EAVA, greater interest was shown in regional drone logistics in healthcare on a wider scale, covering the whole of Estonia. For more details on the potential for cooperation, see the section Regional drone logistics between the Central Hospital and health centres.

Although last-mile/first-mile drone logistics was not a priority in Tartu, it is recommended to at least share experiences from such a pilot among stakeholders in Tartu. To share knowledge, an annual Nordic-Baltic seminar on drone logistics could be considered, where the benefits of drone logistics in healthcare could be jointly discussed.

3.2 INTERNATIONAL DRONE LOGISTICS (DRONAMICS/ MID-MILE) BETWEEN SEINÄJOKI AND TARTU

International drone logistics in cooperation with Dronamics has been raised in several discussions. In the web-based survey of the "Future of Innovative Aerial Services" study published in early 2024, companies expressed a clear interest in fast international connections to transport goods. While Seinäjoki has a contract with Dronamics, Tartu has no such contract so far. However, the agreement does not necessarily guarantee that Dronamics will choose Seinäjoki as its location; Seinäjoki airport must meet certain criteria, such as sufficient air cargo per day.

A strong recommendation is therefore to find out more precisely what criteria Dronamics currently has and to proactively identify which criteria are met in the Seinäjoki area. At the same time, it should be assessed what measures should be taken to meet the criteria.

The guideline is that by being proactive, the likelihood of Dronamics being one of the first to choose Seinäjoki as its location is maximised.

COOPERATION OPPORTUNITIES

Once the criteria have been clarified and the assessment of fulfilling the criteria has been made, it would be of great benefit to Tartu if lessons learned were shared with it. This would help Tartu assess its suitability for Dronamics' activities and contribute to the establishment of a Memorandum of Understanding between Tartu and Dronamics.
The realisation of drone logistics between Seinäjoki and Tartu will require a study to identify logistical needs between the cities. Also a study of the commercial conditions to provide the service should be made.

3.3 REGIONAL DRONE LOGISTICS

Regional drone logistics also emerged in the discussions. In healthcare, this would mean drone transport between the central hospital and health centres/hospitals.

In discussions with EAVA, regional drone logistics focused on health care raised interest. In particular, drone logistics between Tartu University Hospital and Tallinn hospitals came up in the discussions. The distance between Tartu and Tallinn is about 160 km, which corresponds to an operational radius from Seinäjoki to places such as Vaasa, Jyväskylä, Tampere and Kokkola, and 180 km to Umeå. The hospitals in Kuressaare and Hiiumaa in Estonia are also within 180 km of Tallinn.

Drone logistics in healthcare within a 180 km radius could bring significant benefits both to Estonia and to the welfare regions of Ostrobothnia and South Ostrobothnia. At present, there are still few drones with a range of 180 km suitable for logistics purposes on the market, but over the next five years, the number of such vehicles will increase significantly.

It is recommended that a feasibility study be carried out to assess the benefits and costs of regional drone logistics.

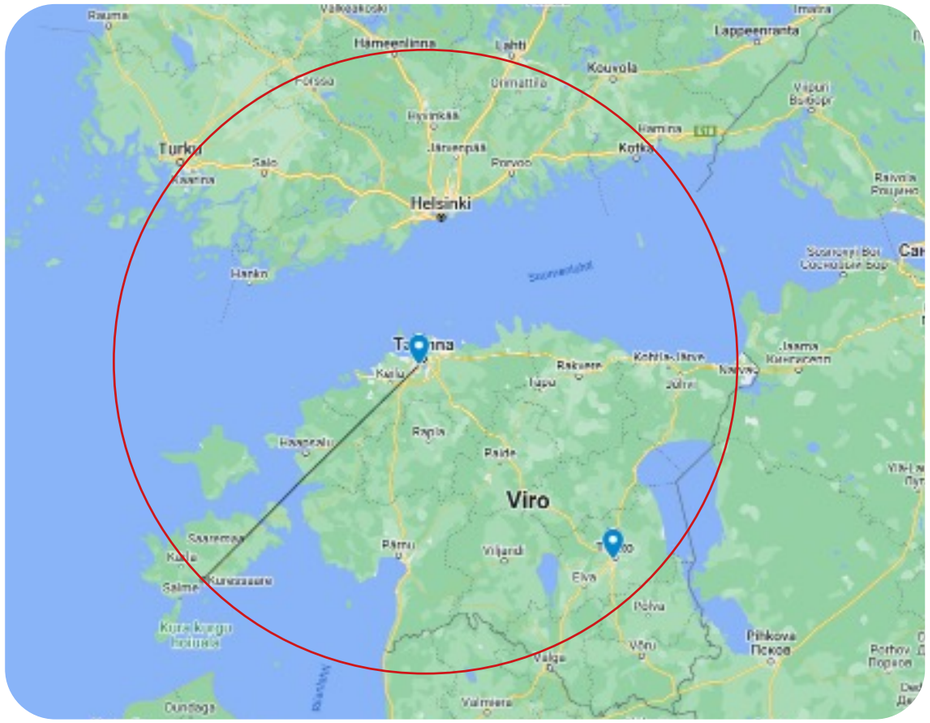
A range of 180 km can also enable international drone logistics flights between Tallinn and Helsinki. However, flights over the Gulf of Finland are technically challenging and costly, as there is no comprehensive mobile network in the sea that drones could use during flight. However, technical challenges should not be used as a reason to ignore the potential of such drone logistics.

COOPERATION OPPORTUNITIES

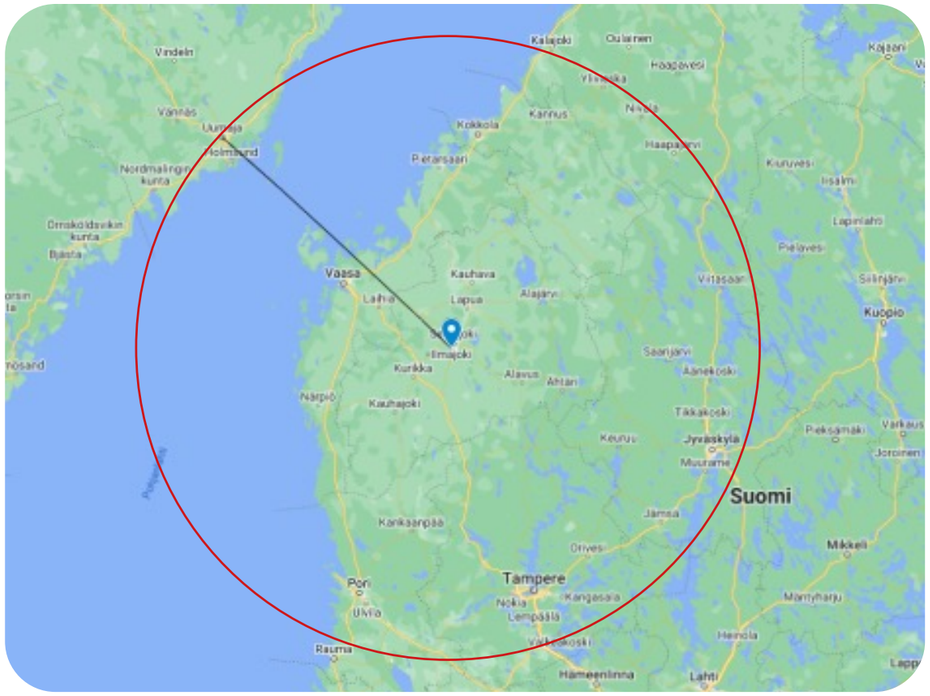
As long-range drone logistics could greatly benefit both Estonia and the welfare regions of Ostrobothnia and South Ostrobothnia, it is recommended to map the stakeholders, the needs of the parties and the potential of drone logistics through a feasibility study.

To open the discussion between stakeholders, a joint Finnish-Estonian drone logistics group could be established, where, for example, healthcare actors can share information and apply for joint funding for pilot projects. If a feasibility assessment can be carried out in the Seinäjoki region in the near future, the same method should be used to assess the feasibility of healthcare in Estonia.

It is also recommended that a series of experiments would be carried out in the welfare regions of South Ostrobothnia and Ostrobothnia and in Estonia to validate the conclusions of the feasibility study.



Picture 1: 180 km operating range from Tallinn



Picture 2: 180 km operating range from Seinäjoki.

3.4 FLYINGBASKET ACADEMY

Seinäjoki Airport has signed a letter of intent with the FlyingBasket Academy. The FlyingBasket Academy could operate in the Seinäjoki area as a training centre for pilots of heavy drones, with a focus on the maintenance of wind and solar power plants and other applications related to the transport and lifting of heavy goods. Currently, no known training organisation in Europe trains remote pilots of heavy drones. Such a training programme would distinguish Seinäjoki from other European drone training organisations.

COOPERATION OPPORTUNITIES

Cooperation with the FlyingBasket Academy could include training students from the Estonian Aviation Academy at the FlyingBasket Academy and providing opportunities for students to train as remote pilots of heavy drones.

3.5 WIND AND SOLAR POWER: USING DRONES FOR POWER PLANT MAINTENANCE AND REPAIR

At the end of 2023, there were a total of 1,601 operational wind turbines in Finland. During 2023, 212 new plants (1280 MW) were built across Finland. The majority of wind turbines were built in the regions of South Ostrobothnia, Ostrobothnia and North Ostrobothnia. North Ostrobothnia will account for 37% of the total number of wind turbines in the country[1]. The estimated lifetime of a wind turbine's foundation and tower is around 50 years. The estimated lifetime of the turbine's machinery is 20 years. However, the lifetime of wind turbines can be extended by adequate maintenance and replacement of parts[2].

Seinäjoki is a key location for the maintenance and construction of wind turbines. The competencies of the Seinäjoki Drone Centre of Excellence for lifting goods with drones offer a potential opportunity for wind turbine maintenance and repair work.

In addition, drones could be used more extensively for other lifting tasks, such as in mast and solar power plants. It is also recommended to assess the potential of drones for the construction and maintenance of offshore wind farms, where the benefits of using drones could be even greater than in onshore wind farms.

Combined with the FlyingBasket Academy, heavy lifting experts trained in the Seinäjoki region could bring significant development opportunities to the region.

COOPERATION OPPORTUNITIES

There are no wind turbines in the Tartu region because they interfere with the defence forces' radars. Instead, solar power plays an important role in the production of renewable energy in Tartu. The largest solar power park in the Nordic-Baltic region, covering 106 hectares, is under construction in Tartu Raad[3]. FlyingBasket's operating experience could be developed further in the construction and maintenance of solar power plants in Tartu.

In addition to cooperation with Tartu, it is recommended to explore the possibilities of cooperation with wind turbine maintenance companies, such as Vestas Finland Oy.

(Sources: 1 Tuulivoimayhdistys.fi, 2 Ympäristö.fi, 3 estikoenergia.ee)

3.6 PROJECTS TO RECONCILE MANNED AND UNMANNED AVIATION

Previous studies have shown an interest in drone logistics pilot projects where the second landing site is at the airport. Currently, landing at an airport requires the opening of an air traffic control tower for drone operations, which is not a cost-effective solution in the long term.

Pilot projects to land at the airport as well as future drone operations will require other methods than keeping the tower open. Going forward, it is important to start planning for cost-effective solutions for managing manned and unmanned aviation traffic at airports. The cost of acquiring U-space services is significant, so it would make sense to launch one or more projects to develop alternative methods of coordinating air traffic. Such methods could provide significant added value in internationally similar environments.

COOPERATION OPPORTUNITIES

The Estonian Aviation Academy (EAVA) in Tartu has expertise in U-space services and one of the cornerstones of the Tartu Drone Competence Centre is the U-space bunker, Sandbox and LivingLab. It is recommended that the development of methods for the coordination of manned and unmanned aviation should be carried out in close cooperation with EAVA. It is recommended that projects to develop these methods are carried out jointly with EAVA.

3.7 KURJENNEVA-ROVES PILOT

The RC Air Club of Seinäjoki operates at Kurjenneva Airfield. The airfield is located along the Kuortaneentie, 15 km from Seinäjoki. The east-west runway is approximately 160 m long, and the north-south runway as well as the southeast-northwest are approximately 100m long. Kurjenneva is well suited for various experiments and as a test site for drone companies.

Roves is one of the most important business areas in Finland, and a diverse logistics hub is being developed in the area. The development plans for the Roves area provide an interesting environment for a drone logistics pilot. The main objective could be to offer companies in the Roves the opportunity to explore drone logistics and its benefits.

In addition, the pilot project could collect end-user experiences with drone logistics and increase the visibility of Seinäjoki and Roves as an innovative and developing region.

COOPERATION OPPORTUNITIES

During interviews with the City of Tartu, it was noted that in Tartu drone logistics is not a top priority. However, from a drone logistics perspective, it is important to actively share the experiences of the pilot projects with Tartu and to keep drone logistics on the agenda. A visit could also be organised for stakeholders in Tartu to learn about drone logistics during the pilot project.

3.8 AIRPORT-KURJENNEVA PILOT PROJECT

The Airport-Kurjenneva pilot project should focus on testing the methods developed to reconcile manned and unmanned aviation and on gaining practical experience with the solutions developed. The pilot flights could be part of a project to develop and test these methods in a real environment.

COOPERATION OPPORTUNITIES

As mentioned in section 3.6, the EAVA has expertise in U-space services. It is therefore recommended that the measures for the co-ordination of manned and unmanned flights be carried out in close cooperation with the EAVA.

3.9 KURJENNEVA BUNKER

The Kurjenneva test site, or bunker, would serve as a test site for unmanned aviation, where drone manufacturers and operators can test and develop their products and services in a safe environment. A permissive UAS zone should be applied for, which could extend from the airfield to the east or even from the airfield to the south-east over Lake of Kuorasjärvi.

The facilities at Kurjenneva airfield should be further developed to meet the needs of companies and ensure basic facilities. It makes sense to develop the Kurjenneva bunker in cooperation with the RC Air Club of Seinäjoki, and the facilities to be built could also be used by members of the RC Air Club of Seinäjoki.

A large wind farm is planned in the vicinity of the Kurjenneva airfield, and it is important to assess its impact in more detail. It is not yet known when the wind farm will be built, and more precise plans for the construction date need to be clarified. If necessary, it would make sense to start looking for a new airfield early enough, in cooperation with the RC Air Club of Seinäjoki.

COOPERATION OPPORTUNITIES

Tartu is developing its own drone centre of excellence, and it is recommended to proceed the Kurjenneva bunker development in close cooperation with the Tartu Drone Centre of Excellence, experimenting together and learning from each other. The main objective of this cooperation is to ensure that the Seinäjoki and Tartu bunkers, testbeds and LivingLabs support and complement each other.

3.10 ROVES-KURJENEVA SANDBOX AND LIVINGLAB

The Sandbox is a "Proof-of-Technology" (PoT) testing and experimentation area. Similar to the Tartu Drone Centre of Excellence, Seinäjoki recommends a "crawl-walk-run" method, where services are initially tested in a bunker, and only sufficiently advanced and reliable services are allowed to enter the sandbox area for testing. After that, the concepts of reliable services can be tested in a real LivingLab environment.

The sandbox area could include the Kurjenneva airfield and landing site in the direction of Roves, at a safe distance from company premises and traffic. The exact test area will be determined in cooperation with Traficom. A second landing site could also be located closer to the companies in the Roves area, which would allow testing of different drone logistics concepts in cooperation with Roves companies.

A permissive UAS zone should be sought for the area. It is important to note that Highway 18 from Veneskoski to Koura is populated, with population densities ranging from 7 to 60 persons per square kilometre. This may affect the granting of a permissive UAS zone and may impose restrictions on operations.

COOPERATION OPPORTUNITIES

Similar to the Kurjenneva Bunker, it is recommended to develop the Sandbox and LivingLab areas in close cooperation with the Tartu Drone Competence Centre and to ensure that both test areas are mutually supportive.

3.11 HYVÄEP - LIVINGLAB IN THE CITY CENTRE

The LivingLab between the central hospital of South Ostrobothnia Wellbeing Service County (HyväEP) and the city centre should focus on Proof-of-Concept projects in drone logistics for healthcare, parcel supply chain integration and IT solutions.

Permitting a flight path from the central hospital to Aallokko can be challenging, and it is important to have early discussions with Traficom on possible flight paths and airworthiness requirements for drones. It is also essential to negotiate with Traficom and FinHEMS on the coordination of helicopter traffic and drones in the central hospital area.

Given the challenges of drone operations in the central hospital area, it is recommended that the LivingLab concept is initially developed with a focus on parcel handling chain integration and IT solutions. In addition, the feasibility of implementing flight paths from the central warehouse to areas with low population density should be assessed.

COOPERATION OPPORTUNITIES

As with the Kurjenneva bunker, it is recommended that the development of LivingLab be carried out in close cooperation with the Tartu Drone Centre of Excellence, with both test sites supporting each other. Interviews with stakeholders in Tartu indicated that drone logistics for healthcare did not emerge as a key area of interest. The experience of Seinäjoki in healthcare drone logistics may help Tartu in the future to assess potential benefits in Tartu.

3.12 SEINÄJOKI AIRPORT LIVINGLAB

A LivingLab around Seinäjoki airport could have two focus areas: Testing concepts for the integration of unmanned and manned aviation and testing of parcel handling chain integrations. Both focus areas will also be important elements for future activities such as Dronamics operations.

COOPERATION OPPORTUNITIES

As in other LivingLabs, close cooperation with the Tartu Centre of Excellence is recommended for the development of the LivingLab at Seinäjoki Airport. In addition, close cooperation with EAVA is recommended in the development of the integration of unmanned and manned aviation and to explore whether the Seinäjoki airport could be a testbed for the U-space service development for EAVA.

3.13 PLANNED TRIALS AT THE TARTU DRONE CENTRE OF EXCELLENCE

The City of Tartu and the Centre of Excellence under development will focus on urban flight operations services to collect data to support city decision-making and reduce current costs of activities.

The City of Tartu has identified the following use cases for drones:

Building control
To use drones to monitor land use and identify unauthorised buildings.

Monitoring the maintenance of pavement markings
Using drones to identify wear and tear on pavement markings on the street and road network. Artificial intelligence can be used to interpret the image information collected by the drone.

Monitoring of temporary road works and road closures
The drone will monitor how temporary road works and roadblocks cause congestion and track the progress of roadworks. It can also be used to monitor roadworks and roadblocks at night.

Road condition assessment
Drones can be used to identify cracks, potholes, ditches and road markings. Worldwide, drones are widely used to assess road conditions, and artificial intelligence is used in the assessment process.

Critical infrastructure monitoring
Drones can be used to monitor critical infrastructure using both visible light cameras and thermal cameras. The drone can wait for take-off in a weather-protected dock, where it is also recharged.

Vehicle parking surveillance
Drones can be used to identify whether vehicles are parked correctly and how long they have been parked. License plates can be read by the drone and the data automatically fed into information systems.

Monitoring of major events
Drones can provide valuable information for security managers at major events. Drones can be used for crowd control and searching for a person in the crowd.

Surveillance of waste collection points and maintenance of green areas
Drones can be used to check from the air the cleanliness, emptying and possible repair needs of collection points. Similarly, the need for maintenance of green areas can be assessed from the air.

Monitoring snow removal and landscaping work
Drones can be used to determine the snow removal needs of roofs from the air, reducing the need to climb on the roof. Similarly, other structures at high altitudes can be checked.

Monitoring of beaches and boat traffic
Drones can be used to monitor the safety of swimming beaches, for example to check whether swimming area markings and buoys are in the right place. In addition, boat traffic can be monitored in the same way as road traffic.

COOPERATION OPPORTUNITIES

It is advisable to follow this development and the Tartu trials closely. When relevant, discuss the possibilities of trying out solutions in Seinäjoki and assess the benefits of the solutions for the city of Seinäjoki as well. If, for example, EAVA does not train students to become operators of these use cases, it might be reasonable to consider providing training for these needs at the Seinäjoki Drone Competence Centre.

3.14 DRONE LOGISTICS IN HEALTHCARE -SEMINAR AND WORKING GROUP

Seinäjoki is interested in developing drone logistics in its area, and the South Ostrobothnia Wellbeing Service County (HyväEP) has also shown interest in developing drone logistics. There are plans for pilots and the intention is to develop the route between the Central Hospital and the city centre into Living Lab. Drone logistics can be beneficial for many welfare areas in Finland, but these benefits have not been evaluated in Finland as a whole.

Drone logistics is also thought of as a relatively futuristic form of transportation, and it is associated with many misconceptions in the welfare areas. The situation is similar in Estonia and probably also in other Nordic and Baltic countries.

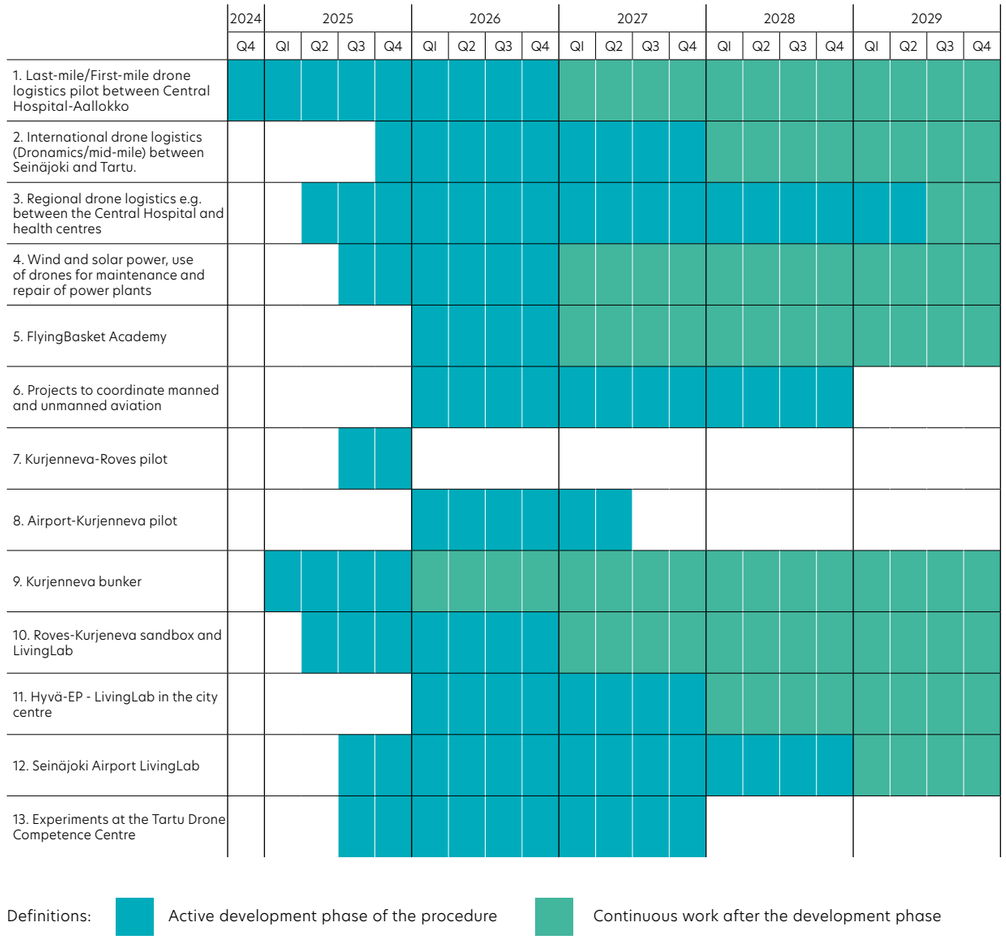
Seinäjoki could stand out by organizing an international seminar that deals with drone logistics in healthcare. Representatives of the Nordic and Baltic countries could be invited to the seminar. As a continuation of the seminar, a national or international working group could be established to discuss and identify the benefits of drone logistics.

4 SCHEDULE

A schedule has been planned for the identified cooperation measures, which determines the sequence and time when the measures would be possible to implement.

Some of the measures are of a project nature with a clear end date. Other measures, on the other hand, are with an active development phase, and after the development phase, operations may be continued in a business-oriented manner.

Most of the measures are scheduled for the years 2025 and 2026. As a first measure, it is recommended to start preparations for the Last-mile/First-mile drone logistics pilot project. At the same time, limitations related to legislation and aircraft equipment should be evaluated. The measures related to the development of the test area can also be started as soon as possible, starting with the studies concerning the Kurjenneva bunker.



INNOAVIA
AVIATION CONSULTANCY

Helsinki-East Aerodrome
Lentokenttä
49270 Pyhtää
FINLAND

info@innoavia.com

into
SEINÄJOKI

LEADER
Liiveri

Euroopan maaseudun kehittämisen maatalousrahasto: Eurooppa investoi maaseutualueisiin