Advancing Urban Air Mobility: Lessons from the Use Case Pilots, Usefulness of the GIS Tool, and the Impact of CITYAM based on Societal Embeddedness Assessment

Impact and process evaluation of the solutions and the longer-term impact of CITYAM, Deliverable 2.5

Jaanus Müür, Heleri Partvei, Erkki Karo

19.12.2025

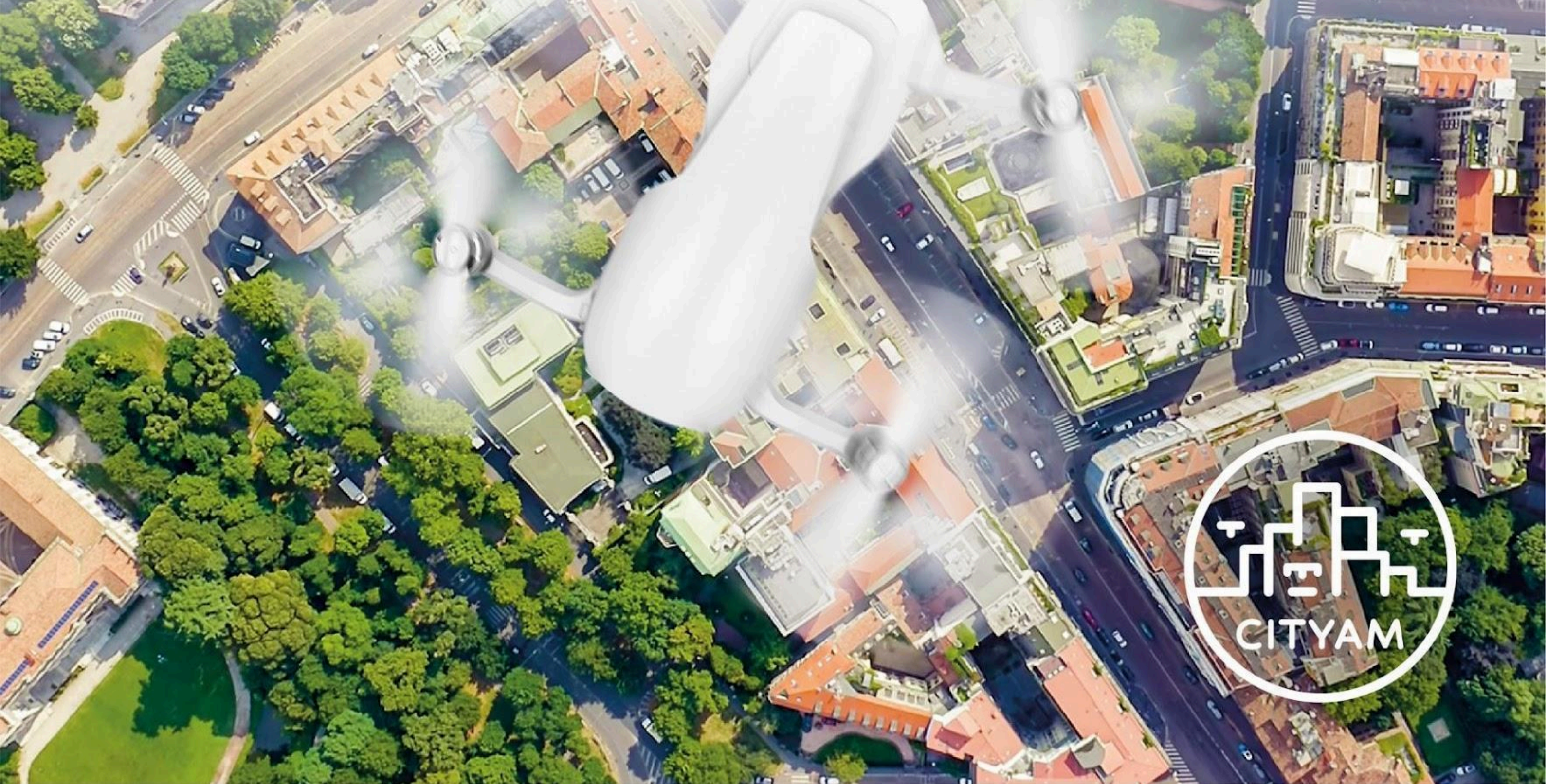


Table of Contents

The authors would like to thank the following individuals for their input, comments, and suggestions: Renske Martijnse-Hartikka, Zacharoula Syrivli, Pyry Kettunen, Jaanus Tamm, Karolina Pamp, Johanna Löfblom, Kristaps Niedols, Magdalena Szymańska, and Denise Braemer

1. Introduction and executive summary

The current report is Deliverable 2.5, part of Activity 2.5 "Impact and process evaluation of the solutions and longer-term impact of CITYAM," under Work Package 2 of the CITYAM project, funded by the Interreg Baltic Sea Region (2023-2025). The work related to Activity 2.5 was carried out from 2024 to 2025.

The aims of Activity 2.5 included capturing and presenting the impact of the CITYAM project on the partner cities by using the societal readiness assessment framework, adjusted for the project during Activity 1.5 (Müür 2024); collecting insights on the GIS tool for landing site planning and prioritisation developed as part of the CITYAM project, including the benefits of such a tool and how it could be further developed; looking at the planning and operational processes of use case pilots, including what were the obstacles related to planning and operating such pilots and how they were overcome. The results were also used to provide recommendations and insights to the partner cities and others for their future activities.

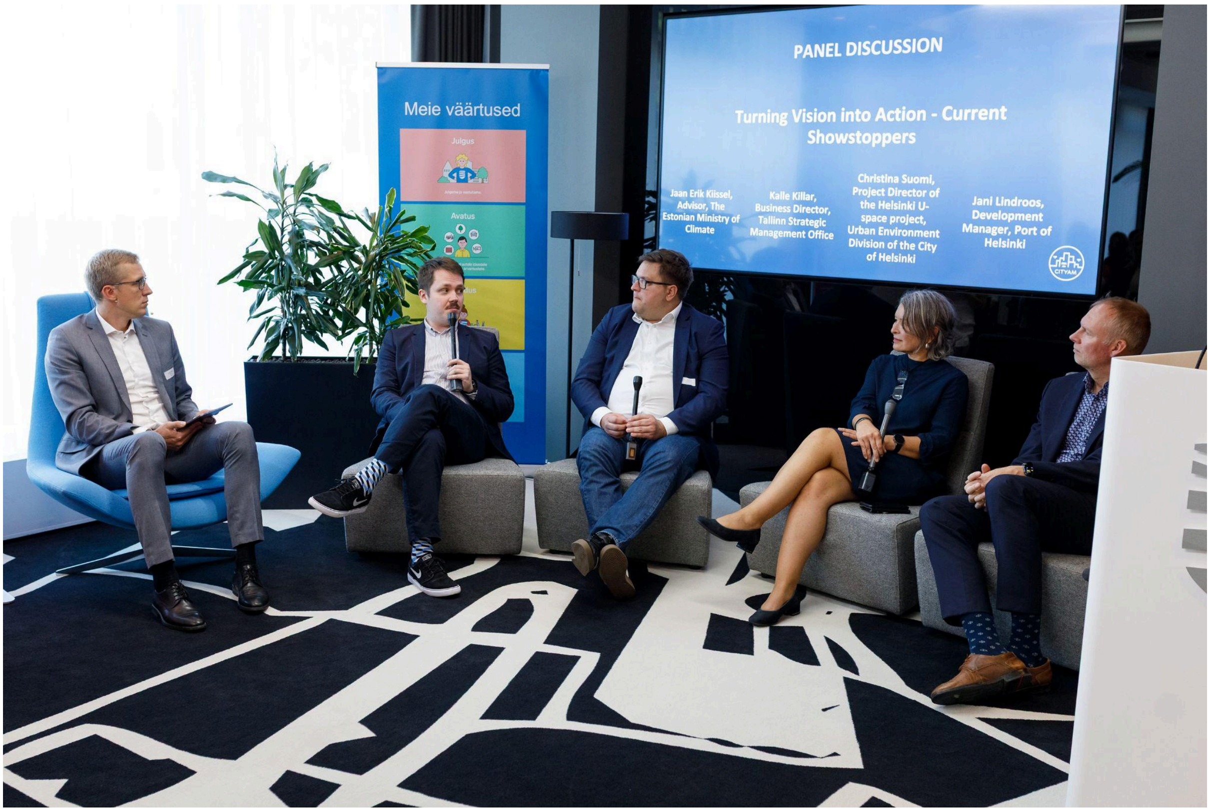
Across the partner cities, CITYAM has delivered clear and measurable progress at the activity level in all four dimensions of societal embeddedness. While none of the partner cities have yet reached full Societal Embeddedness Level 1 (SEL1) across all dimensions, this outcome reflects the early-stage maturity of UAM in Europe rather than limited project impact. Notably, the project enabled cities to move from abstract exploration towards hands-on learning through pilots, structured assessments, and interdepartmental coordination. CITYAM has strengthened institutional capacity and internal coordination within city administrations. Cities are now better equipped to discuss UAM as part of broader mobility, innovation, and digitalisation agendas. However, UAM governance remains highly dependent on external regulatory developments, underscoring the importance of continued inter-city collaboration and joint advocacy at national and EU levels. The most substantial gains are observed in cities that implemented concrete use-case pilots, which served as catalysts for progress across multiple dimensions simultaneously. Pilots accelerated learning-by-doing, clarified regulatory bottlenecks, mobilised stakeholders, and revealed real resource needs.

The GIS tool for landing site planning demonstrated potential as a decision-support instrument, particularly for early-stage planning, scenario testing, and cross-departmental dialogue. Cities valued the GIS tool's ability to visualise constraints, identify feasible locations, and support transparent decision-making. At the same time, the tool's effectiveness depends on data availability, interoperability with local systems, and organisational capacity. Smaller municipalities could especially find such a tool useful, given their limited GIS capabilities.

The pilots confirmed that technical feasibility is rarely the main obstacle. Instead, challenges most often arise from regulatory uncertainty, procurement complexity, coordination across authorities, and resource constraints. Pilots also generated spillover benefits far beyond their immediate objectives, including improved stakeholder trust, clearer governance routines, and increased political confidence in drone applications. However, due to financial constraints, the organisation of future use case pilots will depend on the availability of external funding.

Public acceptance surveys indicate generally cautious but pragmatic attitudes towards the use of drones. Results vary by context and use cases, rather than by city. Issues such as safety, security, and privacy protection remain relevant.

This publication is divided into six sections. Section 2 presents, city-by-city, the impact assessment results and provides recommendations for future steps. Section 3 serves as an introduction to Sections 4 and 5, providing an overview of the political and strategic readiness of the six partner cities in the context of urban air mobility (UAM). The section is based on interviews conducted to collect data on the use case pilots and the GIS tool. Section 4 focuses on the GIS tool developed by the Finnish Land Survey (MML) and Aalto University. The section is based on interviews with representatives from each of the six partner cities who had the opportunity to try this tool. Section 5 examines the use-case pilots in five partner cities. The section is based on interviews with people responsible for organising such pilots. Section 6 provides an overview of how public acceptance surveys were organised in each of the six partner cities, along with key results.



Panel discussion at the Tallinn - Helsinki UAM event, September 29, 2025. Photographer Aleksandr Gužov.

2. CITYAM's impact on the cities and their societal readiness to adopt drones based on the societal embeddedness assessment framework

2.1 Overview of the assessment

Section 2 of this report presents the impact of the CITYAM project on the partner cities, using the societal embeddedness assessment framework (Geerdink *et al*., 2020; Sprenkeling, 2022). The assessment questionnaire was modified to meet the project's needs and the context of drone technology. The exact details regarding the framework's assessment logic, the rationale for its selection, and the modifications made to suit the CITYAM project's needs are available in Deliverable 1.5 of the project (Müür 2024).

The societal embeddedness assessment framework helps determine a technology's level of societal embeddedness at the time of assessment. To assess the CITYAM project's impact in the six partner cities, two assessment rounds were conducted. The difference in results between the two assessments should indicate the CITYAM project's impact. For data collection, a survey method was used with each of the four societal embeddedness assessment dimensions (*Environment*, *Policy & Regulation*, *Stakeholder involvement*, *Market Readiness & Resources*) having its own dedicated survey.

All six partner cities participated in both assessment rounds. The first assessment was conducted from March 1 to May 1, 2024. Compared to the questionnaires presented in Deliverable 1.5, additional changes were implemented, primarily to enhance the phrasing of the milestone descriptions and questions. The changes did not impact the overall logic and integrity of the assessment questionnaires. The results were shared with partner cities, as they could also be used to plan steps and activities related to the planning of use case pilots and UAM development.

The initial schedule for conducting the second round of assessment was Spring 2025. However, during the consortium meeting in Gdańsk, it was decided to postpone it to Autumn 2025, as by then the cities should have completed their drone use case and landing site pilots, and the results would better reflect the actual societal embeddedness level (SEL) of partner cities. Postponement was also necessary because the organisation of several use-case pilots took longer than initially planned due to factors beyond the control of the partner cities. The second assessment was conducted from October 15 to November 12, 2025. Minor adjustments were made to some of the explanations added to the questions.

The following subsections 2.2 to 2.7 will present city-by-city the societal embeddedness assessment results from both assessment rounds, together with recommendations for next steps. It must be emphasised that UAM development across Europe remains in the early stages. At the beginning of the CITYAM project, the partner cities were at different starting points, as reflected in the SEL assessment results. That is why comparing partner cities' assessment results can create a misleading impression that some cities have not progressed during the project. The same impression can be given by the fact that, based on the societal embeddedness assessment logic, none of the six partner cities has reached SEL1. The closest is Helsinki, where three additional milestones for SEL1 must be reached, requiring completion of six activities.

However, when we observe the progress at the level of individual activities, of which there were 216 in total, all six partner cities show good results. Focusing on individual activities also enables us to examine the milestones that have not yet been reached (marked in red). Therefore, it was decided that, in addition to indicating the SEL level that cities have reached in each of the four dimensions, we will also show the progress cities have made at the activity level in each of the four dimensions.

For this, a scoring system was implemented in which each completed activity is worth 1 point, an ONGOING activity is worth 0.5 points, and an unstarted activity is worth 0 points. The overall score equals the percentage of the maximum. For example, the *Environment* dimension includes 83 activities across all four SEL levels and 22 milestones. In the Round 1 assessment, Hamburg received 47 points, and in Round 2, 48 points, across all activities under the *Environment* dimension. Therefore, Hamburg's score in Round 1 was 56.6% and in Round 2, 57.8%. Tables 1 and 2 serve as guides for interpreting the results.

0-50%
51-60%
61-70%
71-80%
81-90%
91-100%

Table 1. Progress made in a specific dimension at the activity level.

Milestone	At least one activity under the milestone has not yet started.
Milestone	At least one activity under the milestone is ONGOING, whereas the others are complete.
Milestone	All activities under the milestone have been finished.

Table 2. Progress at the milestone level

In the Round 2 assessment, all cities reported at least one activity for which progress relative to Round 1 was downgraded. This was partly because the representatives of the partner cities in the CITYAM project had become more knowledgeable of the actual situation (e.g., Stockholm). This dependence on the knowledge level of individuals who complete the assessment questionnaires is also a significant weakness of the method used and, in practice, may have been the reason Gdańsk's initial position was shown to be weaker than it actually was. However, the number of such corrections was minimal. In addition, some of the corrections reflected actual changes. In Tartu, Round 2 results indicated a worsening situation regarding financial resources, linked to the overall economic situation in Estonia, more limited access to project funding, and a clearer understanding of the costs of drone operations.

2.2 Hamburg

Compared with Round 1, the overall SEL of Hamburg has remained unchanged, and no additional milestones have been achieved. However, at the level of individual activities, Hamburg has reported progress in six activities across the *Environment* and *Stakeholder involvement* dimensions. Hamburg was the first partner city to operate drone pilots, with the Hamburg Port Authority (HPA) planning to adopt drones for its routine operations. It also meant that Hamburg had to begin earlier with the activities described in the assessment framework, which explains the initial rapid progress observed in the Round 1 results and the modest developments observed in the Round 2 assessment.

	Round 1					Round 2			
	SEL1 Exploration	SEL2 Development	SEL3 Demonstration	SEL4 Deployment		SEL1 Exploration	SEL2 Development	SEL3 Demonstration	SEL4 Deployment
Environment 56,6%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Environment 57,8%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2			Milestone 2	Milestone 2	Milestone 2	
	Milestone 3	Milestone 3	Milestone 3			Milestone 3	Milestone 3	Milestone 3	
	Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4	
	Milestone 5	Milestone 5	Milestone 5			Milestone 5	Milestone 5	Milestone 5	
	Milestone 6	Milestone 6	Milestone 6			Milestone 6	Milestone 6	Milestone 6	
		Milestone 7					Milestone 7		
		Milestone 8					Milestone 8		
		Milestone 9					Milestone 9		
Stakeholder involvement 76,6	Milestone 1	Milestone 1		Milestone 1	Stakeholder involvement 79,8%	Milestone 1	Milestone 1		Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
		Milestone 3	Milestone 3	Milestone 3			Milestone 3	Milestone 3	Milestone 3
		Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4
		Milestone 5	Milestone 5				Milestone 5	Milestone 5	
		Milestone 6					Milestone 6		
Policy & Regulations 87%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Policy & Regulations 84,5%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
	Milestone 3	Milestone 3	Milestone 3	Milestone 3		Milestone 3	Milestone 3	Milestone 3	Milestone 3
	Milestone 4	Milestone 4	Milestone 4	Milestone 4		Milestone 4	Milestone 4	Milestone 4	Milestone 4
Market & Resources 81,8%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Market & Resources 81,8%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
			Milestone 3	Milestone 3				Milestone 3	Milestone 3
		Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4

Table 3. Hamburg SEL assessment results from Round 1 and Round 2

2.2.1 Environment

The potential impacts of drones (Milestone 4, SEL1) and their support systems (Milestone 4, SEL2) on various aspects of the **natural environment** (water, air, flora, fauna) remain ONGOING. This is important, considering that the Elbe River flows through the city. However, as the HPA already operates drones, it would be practical to assess how current operations affect, and could further impact, the natural environment in the area of drone operations. This would help Hamburg to reach Milestone 7, SEL2 and Milestone 1, SEL3.

Looking at **built and artificial environments**, Hamburg has made minor progress compared to the Round 1 assessment, with the potential impact of drone flights on buildings now ONGOING (Milestone 5, SEL1). The potential impact of support systems has been completed.

When comparing results **focusing on the social environment**, Hamburg reports that they have started exploring the potential impacts on social interactions (Milestone 6, SEL1).

However, other activities under the mentioned milestone, such as looking at the potential impacts of drone flights on physical surroundings, institutions, and cultural milieus, have not yet started.

KEY recommendations for reaching SEL1 and progress further under *Environment* dimension:

- Finish analysing the potential impacts of drone flights and support systems on the natural environment (Milestone 4, SEL1; Milestone 4, SEL2).
- Finish analysing the (potential) impact of drones and their support systems on built and artificial environments (Milestone 5, SEL1; Milestone 8, SEL2; Milestone 2, SEL3).
- Hamburg has started the evaluation how drone flights could impact social interactions. However, to reach SEL1, HPA could analyse how increasing use of drones could impact nearby institutions and the port area's attractiveness as a place for leisure (port area as a physical surrounding and cultural milieu) (Milestone 6, SEL1).
- Integrate the aforementioned evaluations focusing on the actual impact with the current HPA operations.

2.2.2 Stakeholder involvement

Hamburg has finished all the activities related to **stakeholder mapping**. However, further progress is required in direct stakeholder participation and in assessing their sentiments and questions regarding drone technology (Milestone 4, SEL 2). On a positive note, Hamburg has reported that all activities under the *Stakeholder involvement* dimension are, if not completed, ONGOING.

Regarding **the sentiments and questions on drone technology**, a helpful step would be to finish the analyses focusing on identifying the (potential) influence of social and traditional media on stakeholders' perspectives and attitudes towards drones and drone-based services. This could be achieved through surveys and social media monitoring, including monitoring local community groups. The results of such analyses would contribute to the planning of future drone pilots. Hamburg has reported progress under Milestone 5, SEL3, related to taking steps to provide information to various stakeholders on drone flights, including what impacts they experience, and to secure their cooperation. However, the milestone has not yet been reached, as stakeholder expectations remain under assessment.

While Hamburg has made significant progress in mapping the pool of relevant stakeholders and identifying those most relevant to the development of drone-based services, the exact roles of these stakeholders (i.e., **direct stakeholder participation**) have not yet been determined. The situation is similar to stakeholders relevant to the deployment of drone-based services.

KEY recommendations for reaching SEL1 and SEL2 under *Stakeholder involvement* dimension:

- Agree with relevant stakeholders their individual contributions to the development and deployment of drone-based services (Milestone 2, SEL2; Milestone 1, SEL4).
- Finish the analyses focusing on identifying the (potential) influence of social and traditional media on stakeholders' perspectives and attitudes towards drones and drone-based services (under Milestone 2, SEL1; Milestone 4, SEL2).
- Assess the sentiments and questions of stakeholders regarding drone-based services which can hamper their further development (Milestone 4, SEL2).
- Identify the possible trust issues (e.g., privacy, safety, security) among the citizens that they have towards drones and the required support systems (Milestone 6, SEL2).

2.2.3 Policy & Regulations

Compared to the Round 1 assessment, no changes were reported during Round 2. Hamburg has already reached SEL1 in the *Policy & Regulations* dimension. Reaching SEL2 requires integration of drones in strategic planning documents (local/regional/national) (Milestone 1, SEL2; Milestone 4, SEL3; Milestone 4, SEL4) and development and implementation of policies that support the development of drone-based services (Milestone 2, SEL2). On a positive side, the development of the Hamburg Drone Strategy is ongoing and should be finished in 2026 (see also Section 3).

From a policy perspective (Milestone 2, SEL2, Milestone 1, SEL4; Milestone 2, SEL4), Hamburg can support UAM development and drone adoption by supporting piloting activities and the work done by the local drone network Windrove within the local aviation cluster, Hamburg Aviation. HPA's status as an authority has also helped here (see also Sections 5.1.1 and 5.1.2). However, aviation policy and legislation are developed and implemented at the national and European levels. As the current policy and regulatory barriers have already been assessed, the next step should be to identify the most crucial barriers as priorities. Hamburg should leverage its access to the national and European level policymaking due to its unique position as one of the three city-states in Germany.

KEY recommendations for reaching SEL2 under *Policy & Regulations* dimension:

- In addition to finishing the local Hamburg Drone Strategy, integrate UAM in local mobility- and innovation-related strategies (Milestone 4, SEL3). This helps to cover both the adoption and development aspects of drones and related solutions.
- Hamburg has mapped the current policy and regulatory barriers (Milestone 2, SEL1; Milestone 1, SEL2; Milestone 2, SEL2). Overcoming them requires also the support of the State Government as these changes need to be promoted at the national level (Milestone 2, SEL4).

2.2.4 Market & Resources

Compared to the Round 1 assessment, no changes were reported during Round 2. The main obstacles for reaching SEL1 and SEL2 under the *Market & Resources* dimension are related to securing sufficient financial resources for the exploration of ideas of using drone-based services for civilian purposes in urban environments and the necessary research and development activities. The elimination of existing policy and legal barriers could be beneficial here, as it would attract private actors with available financial resources to invest in such activities and collaborate with already existing active stakeholders, such as HPA. On a positive side, Hamburg Aviation is actively seeking collaboration opportunities for externally funded research, development, and innovation projects.

KEY recommendations for reaching SEL1 and SEL2 under *Market & Resources* dimension:

- Finish the ONGOING feasibility and cost-benefit studies (Milestone 3, SEL3). The results of these analyses could be helpful for gaining additional funding to continue the ongoing demonstrations and start the new ones.

2.3 Helsinki

Compared with the Round 1 results, Helsinki has taken significant steps across all four dimensions of the assessment framework. In total, Helsinki has made progress in 117 activities, resulting from organising and running two successful use-case pilots.

	Round 1 results					Round 2 results			
	SEL1 Exploration	SEL2 Development	SEL3 Demonstration	SEL4 Deployment		SEL 1 Exploration	SEL 2 Development	SEL 3 Demonstration	SEL 4 Deployment
Environment 45,8%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Environment 82,5%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2			Milestone 2	Milestone 2	Milestone 2	
	Milestone 3	Milestone 3	Milestone 3			Milestone 3	Milestone 3	Milestone 3	
	Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4	
	Milestone 5	Milestone 5	Milestone 5			Milestone 5	Milestone 5	Milestone 5	
	Milestone 6	Milestone 6	Milestone 6			Milestone 6	Milestone 6	Milestone 6	
		Milestone 7					Milestone 7		
		Milestone 8					Milestone 8		
		Milestone 9					Milestone 9		
Stakeholder involvement 58,5%	Milestone 1	Milestone 1		Milestone 1	Stakeholder involvement 97,9%	Milestone 1	Milestone 1		Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
		Milestone 3	Milestone 3	Milestone 3			Milestone 3	Milestone 3	Milestone 3
		Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4
		Milestone 5	Milestone 5				Milestone 5	Milestone 5	
		Milestone 6					Milestone 6		
Policy & Regulations 58,3%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Policy & Regulations 84,5%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
	Milestone 3	Milestone 3	Milestone 3	Milestone 3		Milestone 3	Milestone 3	Milestone 3	Milestone 3
	Milestone 4	Milestone 4	Milestone 4	Milestone 4		Milestone 4	Milestone 4	Milestone 4	Milestone 4
Market & Resources 54,5%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Market & Resources 87,5%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
			Milestone 3	Milestone 3				Milestone 3	Milestone 3
		Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4

Table 4. Helsinki SEL assessment results from Round 1 and Round 2

2.3.1 Environment

Under the *Environment* dimension, Helsinki has made progress in 43 activities. Most progress has been made in activities related to the **natural environment**. However, SEL1 has not yet been reached as the potential impacts of drone flights on the natural environment are mostly ONGOING, and the analysis focusing on the impact on water has not yet started (Milestone 4, SEL1). Significant progress has been made in SEL2 and SEL3 activities. However, to reach SEL under the *Environment* dimension, more attention should be directed towards analysing the (potential) impacts of drones and their support systems on water areas. Understandably, not all use case pilots take place next to such areas. However, this should be a medium- to long-term goal as Helsinki has 131 km of shoreline and more than 300 islands[1], which may be involved in future use-case pilots.

Almost all the activities related to **built and artificial environments** have been finished. The only ONGOING activities are analyses of the actual impact of drones and their support systems on buildings, airspace, and infrastructure (Milestone 8, SEL2; Milestone 2, SEL3). All activities related to **social environments** have been finished.

KEY recommendations for reaching SEL1-SEL3 under *Environment* dimension:

- In the medium- to long-term, more attention should be directed towards analysing the (potential) impacts of drones and their support systems on water areas (Milestone 4, SEL1; Milestone 4, SEL2; Milestone 7, SEL2; Milestone 1, SEL3).
- Finish analysing the actual impact of drones and their support systems on buildings, airspace, and infrastructure (Milestone 8, SEL2; Milestone 2, SEL3).

2.3.2 Stakeholder involvement

Based on the Round 2 assessment results, Helsinki has made progress in 34 activities under the *Stakeholder* dimension, completing all SEL1 and SEL4 activities. To achieve all the SEL2 and SEL3 milestones, Helsinki has to finish its ONGOING activities of assessing the influence of (social) media to the public, and stakeholders' perspective and attitudes (Milestone 4, SEL2) which should later be used as an input for planning further projects which aim to develop drone-based services and their support systems (Milestone 4, SEL3). This could be achieved through surveys and social media monitoring, including monitoring local community groups. The results of such analyses would contribute to the planning of future drone pilots.

KEY recommendations to reach SEL4 under *Stakeholder involvement* dimension:

- Finish the analyses focusing on identifying the (potential) influence of social and traditional media on stakeholders' perspectives and attitudes towards drones and drone-based services (Milestone 4, SEL2).
- Integrate the results of the aforementioned analyses into upcoming project applications (Milestone 4, SEL3).

2.3.3 Policy & Regulations

Compared to the Round 1 results, progress has been made in 17 activities under the *Policy & Regulations* dimension. SEL1 has not yet been reached, as regulatory stability supporting the development of drone solutions and drone-based services has not yet been reached. This is also a key factor for reaching SEL2. However, achieving a supportive regulatory environment does not depend on Helsinki. While the City of Helsinki has been supportive of piloting drone use cases, sources of uncertainty lie at the national level (Finnish CAA Traficom and ANSP Fintraffic; see Sections 5.2.1 and 5.2.2).

[1] According to the City of Helsinki homepage. Available: https://www.myhelsinki.fi/visit-helsinki/why-helsinki/

KEY recommendations to achieve SEL1 and SEL2 under *Policy & Regulations* dimension:

- Continue to highlight the issue of restrictions on the use of drones in controlled airspace (Milestone 1, SEL1; Milestone 4, SEL3; Milestone 2, SEL4; Milestone 4, SEL4). Consider raising it at the ministerial level in the Finnish Ministry of Transport and Communications. Collaboration with other nearby cities such as Espoo and Vantaa, and raising the issue at the regional level could be helpful here (Milestone 4, SEL2; Milestone 2, SEL3).

2.3.4 Market & Resources

Helsinki has made progress in 23 activities under the *Market & Resources* dimension and has almost reached SEL1 and SEL2. Helsinki has identified units, departments, and subsidiaries that could use, or are already using, drones in their day-to-day operations. In addition, the identification of current drone market prices is ONGOING (Milestone 2, SEL1), and this is the only activity remaining to be completed to reach SEL1. The assessment of market prices is also ONGOING (Milestone 2, SEL2). Reaching SEL2 also depends on finding resources (see Section 5.2.3) for research, development, and innovation activities related to drone-based services (Milestone 1, SEL2).

KEY recommendations to achieve SEL1 and SEL2 under *Market & Resources* dimension:

- Finish the identification and assessment of the current drone market prices (Milestone 2, SEL1; Milestone 2, SEL2).
- To overcome budgetary constraints (Milestone 1, SEL3), look for possible funding sources and partners who could be interested in civilian drone projects in urban environments in the future by utilising its already existing network.

2.4 Stockholm

Compared to the Round 1 assessment, Stockholm has made progress in 85 activities. In addition, as the Stockholm representatives in the CITYAM project have gained more knowledge and information, the progress in 25 activities was downgraded relative to the Round 1 results.

	Round 1 results					Round 2 results			
	SEL 1 Exploration	SEL 2 Development	SEL 3 Demonstration	SEL 4 Deployment		SEL 1 Exploration	SEL 2 Development	SEL 3 Demonstration	SEL 4 Deployment
Environment 51,8%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Environment 80,7%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2			Milestone 2	Milestone 2	Milestone 2	
	Milestone 3	Milestone 3	Milestone 3			Milestone 3	Milestone 3	Milestone 3	
	Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4	
	Milestone 5	Milestone 5	Milestone 5			Milestone 5	Milestone 5	Milestone 5	
	Milestone 6	Milestone 6	Milestone 6			Milestone 6	Milestone 6	Milestone 6	
		Milestone 7					Milestone 7		
		Milestone 8					Milestone 8		
		Milestone 9					Milestone 9		
Stakeholder involvement 59,6%	Milestone 1	Milestone 1		Milestone 1	Stakeholder involvement 92,6%	Milestone 1	Milestone 1		Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
		Milestone 3	Milestone 3	Milestone 3			Milestone 3	Milestone 3	Milestone 3
		Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4
		Milestone 5	Milestone 5				Milestone 5	Milestone 5	
		Milestone 6					Milestone 6		
Policy & Regulations 64,3%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Policy & Regulations 67,9%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
	Milestone 3	Milestone 3	Milestone 3	Milestone 3		Milestone 3	Milestone 3	Milestone 3	Milestone 3
	Milestone 4	Milestone 4	Milestone 4	Milestone 4		Milestone 4	Milestone 4	Milestone 4	Milestone 4
Market & Resources 46,6%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Market & Resources 48,9%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
			Milestone 3	Milestone 3				Milestone 3	Milestone 3
		Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4

Table 5. Stockholm SEL assessment results from Round 1 and Round 2

2.4.1 Environment

Under the *Environment* dimension, Stockholm has made significant progress in SEL2 and SEL3, having completed all activities related to the built and social environments. Compared with Round 1, progress has been made in 10 activities related to built and artificial environments and in 14 activities related to the **social environment**.

Among activities related to **natural environments**, progress has been made in five activities. Stockholm has completed several assessments on how drone-based services' support systems impact land and air (Milestone 1, SEL3). The potential impacts of the drone-based services' support systems on animal life have also been explored (Milestone 4, SEL2). Some of the activities, such as (potential) impact analyses of drone-based services' support systems on some aspects of the natural environment, such as flora, water, and animal life, have not yet been started (Milestone 4, SEL2; Milestone 1, SEL3). To reach SEL1, attention should be directed towards analysing the (potential) impact of drone flights on the natural environment (Milestone 4, SEL1; also linked to Milestone 7, SEL2). Reaching SEL2 and beyond requires additional use case pilots in the future that include support systems such as landing sites or additional signal masts for improved connection between the drone and the operator, which would provide additional possibilities to analyse their impacts on the natural environment.

KEY recommendations for reaching SEL1 and SEL2 under *Environment* dimension:

- Attention should be directed towards analysing the (potential) impact of drone flights on natural environment (Milestone 4, SEL1; Milestone 7, SEL2).
- Similar to Stockholm's second use case pilot, the future use case pilots should also include support systems such as landing sites, signal masts, or other pieces of additional infrastructure. This would enable to analyse the impact of such systems on flora, water, and animal life (Milestone 4, SEL2; Milestone 1, SEL3).

2.4.2 Stakeholder involvement

Stockholm has progressed in 31 activities under the *Stakeholder involvement* dimension and has reached SEL1. The progress is significant, and only five ONGOING activities and one unstarted activity need to be completed to reach SEL4. While Stockholm has made great progress in mapping the pool of relevant stakeholders and has identified those most relevant for the development of drone-based services, their exact roles (**direct stakeholder participation**) have not yet been determined. The situation is similar to stakeholders relevant to the deployment of drone-based services. However, based on the interviews, this is not an issue within the Stockholm administration (see Section 5.3.1).

Roundtable discussion on the Farsta use case pilot in Stockholm, October 10, 2025.

KEY recommendations to reach SEL4 under *Stakeholder involvement* dimension:

- Agree with relevant stakeholders their individual contributions to the development and deployment of drone-based services (Milestone 2, SEL2; Milestone 1, SEL4).
- Attention should also be directed towards including stakeholders who could have a negative impact on drone-based services due to their reluctance towards drones or other reasons (Milestone 3, SEL2). It will help to avoid increasing conflicts in the future and can provide valuable input for the service development.
- Finish putting together a (social) media strategy (Milestone 3, SEL4) and during future use case pilots take into account how (social) media can influence public and stakeholders' attitudes (Milestone 4, SEL3).

2.4.3 Policy & Regulations

Progress has been reported in 11 activities under the *Policy & Regulations* dimension. In addition, as the Stockholm representatives in the CITYAM project have gained more knowledge and information, the progress in 11 activities was downgraded relative to the Round 1 results.

The key reason SEL1 has not yet been achieved is the lack of regulatory support and policy certainty for the use of drones (Milestone 1, SEL1). However, the situation in Stockholm is similar to other partner cities, where reaching such certainty depends on the national government. In addition, the establishment of contacts between the relevant local and national government units for the development of key support system elements is ONGOING (Milestone 4, SEL1).

Stockholm has also assessed relevant local, national, and European policies and regulations (Milestone 1, SEL2) and the policy and regulatory barriers (Milestone 2, SEL2). However, the assessment on how different local, national, and European policies and regulations interact with each other has not yet started (Milestone 1, SEL2). Currently, such knowledge has been gained through learning by doing. For example, the second use case pilot started later than intended, as it came out that NOKIA, the procurement winner, had to secure the SORA approval in their home country before applying for a permit in Sweden (see Section 5.3.2).

KEY recommendations to achieve SEL1 and progress in SEL2 under *Policy & Regulations* dimension:

- Highlight the issues related to lack of regulatory support and policy uncertainty.
- Take advantage of the already established contacts with local and national government actors to also highlight needs related to support systems for drone operations.
- On the basis of experience gained from organising the second use case pilot, assess how relevant local, national, and European policies and regulations could interact with each other.

2.4.4 Market & Resources

Compared to Round 1, Stockholm reports progress in 14 activities under the *Market & Resources* dimension. Corrections were made in 10 activities. The main obstacles for reaching SEL1 are related to securing sufficient financial resources for the exploration of ideas of using drone-based services for civilian purposes in urban environments and necessary research and development activities (Milestone 1, SEL1). In addition, the identification of city units, departments, and subsidiaries and drone-based substitutes to their current means of providing public services, and the identification of drone market prices, are still ONGOING (Milestone 2, SEL1).

KEY recommendations for reaching SEL1 and SEL2 under *Market & Resources* dimension:

- To overcome budgetary constraints, look for possible funding sources and partners who could be interested in civilian drone projects in urban environments in the future by utilising its already existing network.
- Finish the identification of city units, departments, and subsidiaries and drone-based substitutes to their current means of providing public services and assess their needs and potential drone-based substitutes to the current means of service provision (Milestone 2, SEL2).

2.5 Gdańsk

Compared with the Round 1 results, Gdańsk has made good progress across all four dimensions of the assessment framework. In total, Gdańsk has made progress in 98 activities. In one activity, the progress was downgraded compared to the Round 1 results.

	Round 1 results					Round 2 results			
	SEL1 Exploration	SEL2 Development	SEL3 Demonstration	SEL4 Deployment		SEL1 Exploration	SEL2 Development	SEL3 Demonstration	SEL4 Deployment
Environment 0%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Environment 18,7%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2			Milestone 2	Milestone 2	Milestone 2	
	Milestone 3	Milestone 3	Milestone 3			Milestone 3	Milestone 3	Milestone 3	
	Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4	
	Milestone 5	Milestone 5	Milestone 5			Milestone 5	Milestone 5	Milestone 5	
	Milestone 6	Milestone 6	Milestone 6			Milestone 6	Milestone 6	Milestone 6	
		Milestone 7					Milestone 7		
		Milestone 8					Milestone 8		
		Milestone 9					Milestone 9		
Stakeholder involvement 4,3%	Milestone 1	Milestone 1		Milestone 1	Stakeholder involvement 56,4%	Milestone 1	Milestone 1		Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
		Milestone 3	Milestone 3	Milestone 3			Milestone 3	Milestone 3	Milestone 3
		Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4
		Milestone 5	Milestone 5				Milestone 5	Milestone 5	
		Milestone 6					Milestone 6		
Policy & Regulations 11,9%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Policy & Regulations 45,2%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
	Milestone 3	Milestone 3	Milestone 3	Milestone 3		Milestone 3	Milestone 3	Milestone 3	Milestone 3
	Milestone 4	Milestone 4	Milestone 4	Milestone 4		Milestone 4	Milestone 4	Milestone 4	Milestone 4
Market & Resources 4,5%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Market & Resources 30,7%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
			Milestone 3	Milestone 3				Milestone 3	Milestone 3
		Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4

Table 6. Gdańsk SEL assessment results from Round 1 and Round 2

2.5.1 Environment

Compared to the Round 1 assessment results, Gdańsk has made progress in 23 activities under the *Environment* dimension. Regarding the natural environment, Gdańsk has progressed in two activities, but the majority of activities have not yet started. The first key activity to move forward with would be the identification of natural environments relevant to drone services (Milestone 1, SEL1), which would be one of the starting points for finding suitable areas for future use case pilots. The second key activity would be the analysis of the potential impact of drone flights on the natural environments (Milestone 4, SEL1), which can support the first activity and is also necessary in the long term.

Looking at the **built and artificial environment**, Gdańsk has progressed in seven activities. Among these is the identification of built and artificial environments relevant to drone services (Milestone 2, SEL1), where all three activities are currently ONGOING. Identification of buildings relevant or impacted in the context of the drone-based services' support systems is also ONGOING (Milestone 2, SEL2). Activities that require more attention include analysing the (potential) impact of drone fights on buildings, airspace usage, and infrastructure (Milestone 5, SEL1).

Gdańsk has progressed in 14 activities related to **social environments**. Some of the key activities completed include the identification of social interactions, physical surroundings, and institutions relevant in the context of drone-based services (Milestone 3, SEL1). The analyses of the potential impact of drone flights on social interactions and institutions are currently ONGOING, while such an analysis focusing on physical surroundings and cultural milieus has not yet started (Milestone 6, SEL1).

KEY recommendations to progress in SEL1 under *Environment* dimension:

- Finish the identification of land areas and start the identification of water areas and airspaces relevant to drone services (Milestone 1, SEL1) which is useful for finding suitable areas for future use case pilots.
- Attention should be directed towards analysing the (potential) impact of drone flights on natural environment (Milestone 4, SEL1).
- Planning and running additional use case pilots would help Gdańsk in achieving SEL1 under *Environment* dimension. For example, the analysis of the potential impact of drone flights on buildings, airspace usage, and infrastructure (Milestone 5, SEL1) could be done as part of the ground impact assessment which is necessary for some use case pilots.

2.5.2 Stakeholder Involvement

Gdańsk has made progress with 41 activities under the *Stakeholder involvement* dimension. All activities related to **stakeholder mapping** are currently finished or ONGOING. For example, Gdańsk has mapped the preliminary list of stakeholders relevant to drone-based services and their support systems (Milestone 1, SEL1). The identification of all relevant stakeholders related to drone-based services and their support systems (Milestone 1, SEL2; Milestone 5, SEL2) is currently ONGOING.

Regarding direct stakeholder participation, Gdańsk has identified stakeholders relevant to the development of drone-based systems, but the identification of their participation levels and potential contributions is currently ONGOING (Milestone 2, SEL2). The arrangement of stakeholder participation is ONGOING, focusing on those actors who potentially can have a positive impact on the development of drone-based services (Milestone 3, SEL2). However, the inclusion of stakeholders with potentially negative impact, due to their sentiments or other reasons, has not received attention.

Currently, all activities focusing on **sentiments and questions related to drone technology** are ONGOING. Gdańsk has so far been very successful in conducting public surveys among its residents, which evaluate public acceptance of drones (see also Section 6.4). Based on Round 2 assessment results, additional efforts should be directed towards identifying sentiments and questions of (potential) key stakeholders related to drones (Milestone 2, SEL1).

KEY recommendations to reach SEL1 and progress in SEL2 under *Stakeholder involvement* dimension:

- Continue with the mapping of different stakeholders and parties, e.g., stakeholders impacted by drone-based services and their support systems (Milestone 1, SEL2; Milestone 5, SEL2)
- Attention should also be directed towards including stakeholders who could have a negative impact on drone-based services due to their reluctance towards drones or other reasons (Milestone 3, SEL2; Milestone 3, SEL3). It will help to avoid increasing conflicts in the future and can provide valuable input for the service development.
- Additional efforts should be directed towards identifying sentiments and questions of (potential) key stakeholders related to drones (Milestone 2, SEL1). However, this activity can also depend on the nature of future use case pilots and their exact locations in the city.

2.5.3 Policy & Regulations

Progress has been reported in 21 activities under the *Policy & Regulations* dimension. In addition, as the representatives of Gdańsk in the CITYAM project have gained more knowledge and information, the progress in one activity was downgraded compared to the Round 1 results.

The key reason SEL1 has not yet been reached is the lack of regulatory support and policy certainty for the use of drones (see also Section 4.1.2) (Milestone 1, SEL1; Milestone 2, SEL2; Milestone 4, SEL3; Milestone 2, SEL4). However, the situation in Gdańsk is similar to other partner cities, where reaching such certainty depends on the national government. On a positive side, contacts have been made with relevant national and local government units (Milestone 3, SEL1). However, to move forward with potential collaboration, it is crucial to conduct assessments of the current policy and regulatory barriers that hinder the development and deployment of drone-based services and their support systems (Milestone 1, SEL2; Milestone 2, SEL2; Milestone 3, SEL3).

KEY recommendations to achieve SEL1 and progress in SEL2 under *Policy & Regulations* dimension:

- Move forward with assessments focusing on the current policy and regulatory barriers hindering the development and deployment of drone-based services and their support systems (Milestone 1, SEL2; Milestone 2, SEL2; Milestone 3, SEL3).

2.5.4 Market & Resources

Compared to the Round 1 assessment, Gdańsk has made progress with 13 activities under the *Market & Resources* dimension. As in other partner cities, one of the main barriers, including for reaching SEL1, is the availability of financial resources for exploring and developing drone-based services (Milestone 1, SEL1; Milestone 1, SEL2; Milestone 1, SEL3).

Gdańsk has identified and assessed city units, departments or subsidiaries that could use drones to provide public services. However, activities focusing on the detailed assessment of their specific needs, drone-based substitutes for current means of providing public services, market prices of drones, and their providers have not yet begun (Milestone 2, SEL1; Milestone 2, SEL2).

KEY recommendations for reaching SEL1 and SEL2 under *Market & Resources* dimension:

- Finish activities related to the assessment of the specific needs of city units, departments, and subsidiaries and how drones could substitute current means of service provision (Milestone 2, SEL1; Milestone 2, SEL2). This can be used as a basis for activities focusing on finding the necessary funding to develop, demonstrate, and deploy such drone-based solutions.

- To overcome budgetary constraints, look for possible funding sources and partners who could be interested in civilian drone projects in urban environments in the future by utilising its already existing network (Milestone 1, SEL1; Milestone 1, SEL2; Milestone 1, SEL3).

2.6 Riga

Compared with the Round 1 results, Riga has made good progress across all four dimensions of the assessment framework. In total, Riga has made progress in 100 activities and has reached SEL1 in the *Stakeholder involvement* and *Policy & Regulations* dimensions. In one activity, the progress was downgraded compared to the Round 1 results.

	Round 1 results					Round 2 results			
	SEL1 Exploration	SEL2 Development	SEL3 Demonstration	SEL4 Deployment		SEL1 Exploration	SEL2 Development	SEL3 Demonstration	SEL4 Deployment
Environment 22,9%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Environment 57,8%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2			Milestone 2	Milestone 2	Milestone 2	
	Milestone 3	Milestone 3	Milestone 3			Milestone 3	Milestone 3	Milestone 3	
	Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4	
	Milestone 5	Milestone 5	Milestone 5			Milestone 5	Milestone 5	Milestone 5	
	Milestone 6	Milestone 6	Milestone 6			Milestone 6	Milestone 6	Milestone 6	
		Milestone 7					Milestone 7		
		Milestone 8					Milestone 8		
		Milestone 9					Milestone 9		
Stakeholder involvement 40,4%	Milestone 1	Milestone 1		Milestone 1	Stakeholder involvement 84%	Milestone 1	Milestone 1		Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
		Milestone 3	Milestone 3	Milestone 3			Milestone 3	Milestone 3	Milestone 3
		Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4
		Milestone 5	Milestone 5				Milestone 5	Milestone 5	
		Milestone 6					Milestone 6		
Policy & Regulations 54,8%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Policy & Regulations 81%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
	Milestone 3	Milestone 3	Milestone 3	Milestone 3		Milestone 3	Milestone 3	Milestone 3	Milestone 3
	Milestone 4	Milestone 4	Milestone 4	Milestone 4		Milestone 4	Milestone 4	Milestone 4	Milestone 4
Market & Resources 36,4%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Market & Resources 55,7%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
			Milestone 3	Milestone 3				Milestone 3	Milestone 3
		Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4

Table 7. Riga SEL assessment results from Round 1 and Round 2

2.6.1 Environment

Compared to the Round 1 assessment results, Riga has made some progress under the *Environment* dimension. Related to the **natural environment**, Riga has progressed in 14 activities and has finished several key activities, such as identifying airspaces relevant to drone services (Milestone 1, SEL1) and exploring the potential impact of drones on flora (Milestone 4, SEL1). However, activities have not yet started related to the potential impact of drone flights on parts of the natural environment (air, water, animal life) (Milestone 4, SEL1) and the identification of land areas relevant to drone services is ONGOING.

Looking at the **built and artificial environments**, Riga has made progress in 11 activities. Among the key activities, Riga has finished identifying built and artificial environments relevant to drone services (Milestone 2, SEL1) and the potential impact of those flights on infrastructure (Milestone 5, SEL1). However, key activities need to be started, such as exploring the potential impacts of drone flights on buildings, or finished, such as exploring the potential impact of such flights on airspace usage, to reach SEL1 (Milestone 5, SEL1).

Riga has progressed in 16 activities related to **social environments**. Riga has completed an assessment of the potential impact of drone flights on social environments (Milestone 6, SEL1) and has identified physical surroundings and cultural milieus relevant to drone-based services as part of Milestone 3, SEL1. However, Milestone 3 has not yet been reached as the identification of social interactions relevant to drone services is ONGOING. Finishing that particular activity can, to a large extent, depend on the nature of future use case pilots. Riga has also made great progress in identifying social environments relevant to the drone support systems and exploring the potential impact of the latter on the former.

KEY recommendations for reaching SEL1 under *Environment* dimension:

- Finish the identification of land areas relevant to drone services (Milestone 1, SEL1.)
- More attention should be directed towards analysing the (potential) impact of drone flights on natural environment (Milestone 4, SEL1).
- Planning and running a use case pilot would help Riga in achieving SEL1 under *Environment* dimension. For example, the analysis of the potential impact of drone flights on airspace usage and buildings (Milestone 5, SEL1) could be done as part of the ground impact assessment which is necessary for some use case pilots. The potential use case pilot would also help to identify social interactions relevant to drone services (which also depend on the nature of the use case).

2.6.2 Stakeholder involvement

Riga has made significant progress, reaching SEL1 in the Stakeholder involvement dimension and is close to reaching SEL2. Riga has finished all the activities related to **stakeholder mapping.** However, several key activities related to **stakeholder participation** are still ONGOING. Additional efforts are needed to determine how stakeholders relevant to the development of drone-based services could be included in the process (Milestone 2, SEL2). The same implies to stakeholders that may have a negative impact on the development of drone-based services due to their negative stance on drones or other reasons (Milestone 3, SEL2). The latter is also linked to assessing the sentiments and questions of stakeholders that can hamper the development of drone-based services, which is currently ONGOING (Milestone 4, SEL2).

KEY recommendations to reach SEL4 under *Stakeholder involvement* dimension:

- Agree with relevant stakeholders their individual contributions to the development of drone-based services (Milestone 2, SEL2).
- Attention should also be directed towards identifying and assessing the sentiments and questions of stakeholders that can hamper the development of drone-based services (Milestone 4, SEL2) and including stakeholders with negative stance to the process (Milestone 3, SEL2). It will help to avoid increasing conflicts in the future and can provide valuable input for the service development.

2.6.3 Policy & Regulations

Riga has made great progress by reaching SEL1 in the *Policy & Regulations* dimension. Several key activities on the SEL2 level are currently ONGOING. These include the assessment of policy and regulatory barriers related to drone-based services (Milestone 2, SEL2). Based on the results of Round 2 assessment, it seems that Riga is still trying to find the best way to integrate drones into the strategic planning documents (Milestone 1, SEL2). To make it happen at the national level, Riga should also push it at the political level to get an additional regulatory push for the development of drone-based services (Milestone 2, SEL2). Based on results, it also seems that relevant interest groups have not yet been mobilised (Milestone 4, SEL2), which could additionally support these efforts.

> **KEY recommendations to achieve SEL2 under *Policy & Regulations* dimension:**
>
> - Finish assessing the policy and regulatory barriers related to drone-based services which can provide input for strategic planning at the local level (Milestone 1, SEL2; Milestone 2, SEL2).
> - Take advantage of the strong political support in Riga (see Section 3) by including them into the process to support the necessary policy and regulatory changes at the national level (Milestone 2, SEL2). Mobilise additional interest groups to support these efforts (Milestone 4, SEL2).

CITYAM Roadshow Event in Riga, November 12, 2025.

2.6.4 Market & Resources

Compared to the Round 1 assessment, Riga has made progress with 12 activities under the *Market & Resources* dimension. In addition, as the representatives of Riga in the CITYAM project have gained more knowledge and information, the progress in one activity was downgraded compared to the Round 1 results.

Riga has completed mapping and assessing city units, departments or subsidiaries that could use drones for public service provision together with their needs, market prices, and potential suppliers (Milestone 2, SEL1; Milestone 2, SEL2). The identification and assessment of drone-based substitutes to current means of service provision is currently ONGOING (Milestone 2, SEL1; Milestone 2, SEL2). However, based on the results, one of the main barriers, including for reaching SEL1, is the availability of financial resources for exploring and developing drone-based services (Milestone 1, SEL1; Milestone 1, SEL2).

KEY recommendations for reaching SEL1 and SEL2 under *Market & Resources* dimension:
• To overcome budgetary constraints, look for possible funding sources and partners who could be interested in civilian drone projects in urban environments in the future by utilising its already existing network (Milestone 1, SEL1; Milestone 1, SEL2).

2.7 Tartu

Compared with the Round 1 results, Tartu has made great progress across all four dimensions of the assessment framework. In total, Tartu has made progress in 151 activities. In addition, as the representatives of Tartu in the CITYAM project have gained more knowledge and information and due to macro-level changes (e.g., shifts in public sentiment, availability of funds), the progress in 10 activities was downgraded compared to the Round 1 results.

	Round 1 results					Round 2 results			
	SEL1 Exploration	SEL2 Development	SEL3 Demonstration	SEL4 Deployment		SEL1 Exploration	SEL2 Development	SEL3 Demonstration	SEL4 Deployment
Environment 9,6%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Environment 81,3%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2			Milestone 2	Milestone 2	Milestone 2	
	Milestone 3	Milestone 3	Milestone 3			Milestone 3	Milestone 3	Milestone 3	
	Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4	
	Milestone 5	Milestone 5	Milestone 5			Milestone 5	Milestone 5	Milestone 5	
	Milestone 6	Milestone 6	Milestone 6			Milestone 6	Milestone 6	Milestone 6	
		Milestone 7					Milestone 7		
		Milestone 8					Milestone 8		
		Milestone 9					Milestone 9		
Stakeholder involvement 37,2%	Milestone 1	Milestone 1		Milestone 1	Stakeholder involvement 70,2%	Milestone 1	Milestone 1		Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
		Milestone 3	Milestone 3	Milestone 3			Milestone 3	Milestone 3	Milestone 3
		Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4
		Milestone 5	Milestone 5				Milestone 5	Milestone 5	
		Milestone 6					Milestone 6		
Policy & Regulations 46,4%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Policy & Regulations 66,7%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
	Milestone 3	Milestone 3	Milestone 3	Milestone 3		Milestone 3	Milestone 3	Milestone 3	Milestone 3
	Milestone 4	Milestone 4	Milestone 4	Milestone 4		Milestone 4	Milestone 4	Milestone 4	Milestone 4
Market & Resources 28,4%	Milestone 1	Milestone 1	Milestone 1	Milestone 1	Market & Resources 60,2%	Milestone 1	Milestone 1	Milestone 1	Milestone 1
	Milestone 2	Milestone 2	Milestone 2	Milestone 2		Milestone 2	Milestone 2	Milestone 2	Milestone 2
			Milestone 3	Milestone 3				Milestone 3	Milestone 3
		Milestone 4	Milestone 4	Milestone 4			Milestone 4	Milestone 4	Milestone 4

Table 8. Tartu SEL assessment results from Round 1 and Round 2

2.7.1 Environment

Based on Round 2 results, Tartu has progressed in 75 activities under the *Environment* dimension. Tartu has finished all the activities related to **natural environments**. This has largely resulted thanks to the SAFIR-Ready project, which ran from 2023 to 2026.

Tartu has progressed in 18 activities related to **built and artificial environments**. Importantly, Tartu has finished analysing the (potential) impact of drones on buildings and infrastructure (Milestone 5, SEL1; Milestone 8, SEL2). The City of Tartu has collaborated with the University of Tartu to develop and test a new methodology for ground risk assessment that also accounts for near-real-time mobile positioning data (see also 5.5.5).

Compared to natural environments and built and artificial environments, the progress in activities focusing on **social environments** has been more modest. Progress has been made in 24 activities, but the large majority of them are ONGOING. While the analysis on potential impacts can be done without drones flying as part of a use case pilot (Milestone 6, SEL1; Milestone 3, SEL2; Milestone 6, SEL2), the actual impacts would require a use case pilot that would operate for an extended period of time (Milestone 3, SEL3; Milestone 6, SEL3).

KEY recommendations for reaching SEL1 and SEL2 under *Environment* dimension:

- Finish analysing the potential impacts of drone flights and support systems on airspace usage (Milestone 5, SEL1; Milestone 5, SEL2);
- Finish analysing the potential impacts of drone flights and support systems on social environments (Milestone 6, SEL1; Milestone 6, SEL2).
- To conduct the above mentioned analyses, the City of Tartu could take the potential future use cases such as construction inspection as a basis.

2.7.2 Stakeholder involvement

Tartu has made good progress under the *Stakeholder involvement* dimension and has moved forward with 31 activities. Tartu has almost finished **mapping** all the relevant **stakeholders** related to drone-based services (Milestone 1, SEL1; Milestone 1, SEL2). The identification of stakeholders relevant to drone-based services' support systems is ONGOING (Milestone 5, SEL2).

Good progress has also been made on the **direct participation** of relevant stakeholders. For example, different stakeholders are included in the development and demonstration phases, including those who could have a negative impact due to their sentiments or other reasons (Milestone 3, SEL2; Milestone 2, SEL3). However, the identification of stakeholders, their best-fitting participation level, and potential contributions in the development process are still ONGOING (Milestone 2, SEL2), which also refers to an open process.

More attention should be directed towards activities related to identifying **the sentiments and questions** that the general public and stakeholders have **related to drone technology** and their usage for service provision. These include sentiments and questions that people have related to developments in drone technology and drone-based services, the influence of (social) media on these sentiments, and measures and actions related to focusing on trust-building (Milestone 2, SEL1; Milestone 4, SEL2).

KEY recommendations to reach SEL1 and SEL2 under *Stakeholder involvement* dimension:

- Agree with relevant stakeholders their individual contributions to the development of drone-based services (Milestone 2, SEL2).
- Attention should be directed towards identifying and assessing the sentiments and questions of stakeholders that can hamper the development of drone-based services (Milestone 2, SEL1; Milestone 4, SEL2).
- Identify stakeholders who can impact or be impacted by the drone-based services' support systems (Milestone 5, SEL2).

2.7.3 Policy & Regulations

Tartu has made progress in 20 activities under the *Policy & Regulations* dimension. However, in six activities, the progress has been downgraded compared to the Round 1 results. For example, additional legal barriers related to the GDPR have been identified, and influencing regulations has proven to be a greater challenge than initially expected (Milestone 1, SEL4; Milestone 4, SEL4). Collaboration between local and national government units has been established. Still, it has lacked a clear structure, and in time, platforms bringing together interest groups have included an additional number of stakeholders, making both of them an ONGOING process (Milestone 4, SEL2). Drones have been included in different policy documents (Milestone 3, SEL3; Milestone 4, SEL4), and additional internal documents are being developed in collaboration with key stakeholders in Tartu to support UAM development in the city (see also Section 3).

Based on the Round 2 assessment results, a key issue is the lack of regulatory support and policy certainty regarding drone-related innovations (Milestone 1, SEL1; Milestone 4, SEL3; Milestone 2, SEL4; Milestone 4, SEL4). A key barrier in the Estonian context is local governments' inability to collect and process specific drone-collected data (e.g., video) due to legal restrictions (see Section 5.5.2). Allowing such data collection requires additions to the national Law Enforcement Act.

KEY recommendations to achieve SEL1 and SEL2 under *Policy & Regulations* dimension:

- Highlight the issue of restrictions on the use of drones by local governments. Consider raising it at the ministerial level at the Ministry of Climate and the Ministry of Justice and Digital Affairs (Milestone 1, SEL1; Milestone 3, SEL1; Milestone 4, SEL1; Milestone 4, SEL 2).
- Finish identifying the relevant existing European, national, regional, and local policies and regulations for drones and assess how these regulations interact with each other and what are the policy and regulatory barriers (Milestone 2, SEL1; Milestone 2, SEL2).

2.7.4 Market & Resources

Tartu has made progress in 25 activities under the *Market & Resources* dimension. However, in three activities, the progress has been downgraded compared to the Round 1 results. For example, Tartu reports that the public position for using drone-based services has become more negative due to the war in Ukraine (Milestone 2, SEL4). In addition, opportunities to fund the demonstration of drone-based services and their support systems have decreased over time (Milestone 1, SEL3). However, the search for such opportunities continues (Milestone 1, SEL1).

KEY recommendations for reaching SEL1 and SEL2 under *Market & Resources* dimension:

- To overcome budgetary constraints, look for possible funding sources and partners who could be interested in civilian drone projects in urban environments in the future by utilising its already existing network (Milestone 1, SEL1; Milestone 1, SEL2; Milestone 1, SEL3).

3. Political Support and Strategic Readiness

Section 3 of this report can be considered an introduction to Sections 4 and 5, as it is based on interviews conducted on the GIS tool and use-case pilots, focusing on responses under the political & administrative dimension to reflect political support and strategic readiness across cities.

During the interviews, it was noted that topics related to drones, their landing sites, and UAM are relatively new to cities. However, the partner cities expressed a variety of positions regarding political sensitivity. For example, Stockholm, Helsinki, and Gdańsk expressed that UAM is not currently a sensitive topic due to its novelty, although it could become one in the future. The experiences with use-case pilots illustrate this, as political involvement was mainly described as minimal and political support as indirect. None of the cities reported significant pushback at the political level. As the interviewees from Gdańsk noted, although drones are visible due to their widespread use, primarily for recreational purposes, dedicated drone infrastructure is absent. In Gdańsk, the pilots did not require political endorsement because the use cases aligned with municipal priorities for traffic safety and public order. However, in Hamburg, concerns related to ground risk and privacy, essential issues in Germany, have been raised.

Regarding the pilots, political support in Hamburg was visible, and interest in scaling operations was expressed. However, there remains caution regarding the integration of drones. In Tartu, decision-makers were not opposed, but legal uncertainty led to hesitation (see Section 5.5.2). After the pilot was changed, there were no issues on the political level. Political support in Riga is strong, accompanied by a readiness to deploy drones and their vertiports in the urban environment. In Helsinki, the first pilot did not rise to the political agenda, though a small group of city and ministry representatives were invited to observe a demonstration. The second pilot received support from the former mayor when a support letter was drafted to allow the take-off place in controlled airspace (see Section 5.2.1).

Additionally, due to the novelty of the topic, the cities had not yet incorporated UAM into their strategic documents. However, several cities expressed such plans. For example, Tartu has begun work on a drone strategy. Currently, Tartu's central question is where it should act as a driver and where as an enabler. This question was also addressed in a roundtable, where the city's role was discussed with stakeholders. This strategy, currently in draft form, covers six areas and aims to define Tartu's approach and next steps. Tartu considers it essential to avoid chaotic development and to guide progress in a more structured manner. For now, the city plans to keep this as a working document and, if possible, integrate activities into the development plan, master plan and/or budget strategy. In addition, Tartu wants to integrate UAM into its upcoming Sustainable Urban Mobility Plans (SUMP). The process for developing a new SUMP is expected to begin in 2026. Therefore, details related to drones have not yet been discussed. The minimum is to mention that the use of drones will increase, and the city government must address it. Similarly, the interviewee from Riga stated that UAM will have a section in their next SUMP.

Hamburg is developing a broader drone strategy in collaboration with different units in the city administration and industry stakeholders, though it is not yet finalised. The document should be released in early spring 2026, signalling a long-term commitment to this emerging sector. In Helsinki, it has been recognised that lower airspace and urban aviation issues extend beyond traffic concerns, affecting various functions and operations in the city. The city is embedding UAM incrementally rather than through a single standalone strategy. The new four-year city strategy for 2025-2029 does not explicitly mention drones, but it emphasises cleaner mobility, innovation, data-driven transport, and crisis preparedness – policy pillars under which UAM pilots can be situated. Parallel work is advancing through sub-strategies and land-use plans, including the allocation of future landing sites in neighbourhood redevelopment plans and the contribution of U-space perspectives to the regional land-use and transport planning (MAL) framework.

Stockholm lacks a formal UAM or drone strategy. Instead, the Stockholm Traffic Department has so far developed an internal guidance document for city employees using drones to help city employees use drones as operational tools, including requirements on regulatory compliance, data protection, and operational safety to help them address the UAM issue in the short term. Gdańsk is not currently planning to update its SUMP, which was adopted in 2018. However, if the city finds resources to develop its sustainable urban logistics plan (SULP), then UAM and drones could be addressed in that document. One of the interviewees from Gdańsk emphasised that UAM should be explicitly addressed in strategic documents, as the current basis for decisions on where to locate landing sites or how drone corridors should be configured is missing, indicating that the city has already encountered practical strategic needs.

KEY TAKEAWAYS:

- Political involvement in use case pilots was limited and mostly indirect across the cities.
- UAM is not yet politically sensitive, though it was noted that this could change as operations scale and become more visible.
- Strategic documents such as SUMP, SULP and others are not yet addressing issues related to urban air mobility and drones but cities have expressed the need for it. This would provide a basis for future actions related to UAM, including decisions on land planning related to drone landing sites.

4. GIS Tool and Urban Air Mobility – Insights from Six European Cities

As part of Activity 1.4, the National Land Survey of Finland (MML) and Aalto University developed a geospatial tool for landing site planning and prioritisation (Mladenović et al., 2024). The tool was designed and constructed in Activity 2.1 (Honkavaara et al., 2025) and piloted in all six partner cities as part of Activities 2.1 and 3.2: Helsinki, Hamburg, Gdańsk, Tartu, Stockholm, and Riga. As part of Activity 2.5, interviews were conducted with representatives from all six cities to gather information on how the developed GIS tool could support decision-making, identify stakeholders who could benefit from its use, identify obstacles to its adoption, and how the tool could be further improved.

The interviews were conducted with civil servants who tested the GIS tool and who use such tools in their everyday work. The interviews covered political & administrative, economic, social, technical, environmental, and legal dimensions. The questions under each dimension covered opportunities, benefits, and obstacles related to the adoption and use of the GIS tool. The questionnaire is provided in **Appendix I,** and the list of interviewees in **Appendix II**.

4.1. Political, policy, administrative, and legal considerations

4.1.1 GIS tool - decision-making and participation

The partner cities expressed positive opinions regarding the idea and functionality around which the GIS tool developed by MML and Aalto was built. It is viewed as a tool that supports reaching a final decision, rather than a decision-making tool. One reason is that the real world is more complex than its depiction on a map, which does not capture all the nuances and details of the physical urban space. Additionally, exceptions and compromises, which often require dialogue and can be conflict-prone, play an essential role in urban planning.

As UAM is broader than just a traffic or transportation issue, it also requires a more inclusive dialogue within the city administration. It was agreed that visualisation of areas un/suitable for landing sites would support internal dialogue in the city administration. This would be especially good for the internal inclusion of departments with little or no GIS expertise. In addition, the visualisation provided by the developed GIS tool would facilitate dialogue with companies seeking to build drone landing sites.

However, departments may have their own priorities and preferences related to restrictions. The tool is based on multi-criteria analysis, in which a weight between -1 and +1 is assigned to each data layer. Clear guidelines on how to use weights would be necessary to ensure objectivity and minimise the risk that each stakeholder produces analysis results tailored to their interests. It was also noted that the tool is simple enough to be considered beginner-friendly, meaning that departments lacking GIS capabilities could use it for their everyday work, compared to more advanced GIS tools that require specialised training.

Although the GIS tool was developed for city governments, during the interviews, the city representatives were also asked about using the tool for public participation by making it publicly available. Most of the interviewed cities were cautious about it. For example, privacy concerns in general (Hamburg, Gdańsk) and specifically linked to the accuracy of population data (Helsinki) were mentioned. Another concern was data on critical infrastructure (Helsinki, Gdańsk), which further limits open access to the GIS tool. Additionally, without clear guidelines, the tool could be used by any interested party (including internal actors within the city government) to generate results tailored to their interests, which could hinder the planning process (e.g., due to NIMBY attitudes). Instead, as Stockholm pointed out, residents could be included by collecting their input and opinions on the results of the analyses conducted with the GIS tool by the relevant city departments. However, Tartu noted that much of the data used in planning is already publicly available, including information on areas subject to flight restrictions, such as those operated by the military. The opinion from Riga was that, although with some additional developments, the tool could be used for public participation (e.g., functionality to leave comments and suggestions), better ways exist to involve a broader public in these discussions. Interviewees from Gdańsk noted that, in the context of UAM, the GIS tool would help residents better understand what is permitted in their district or on their property.

KEY TAKEAWAYS:

- GIS tools support reaching the final decision, but are not decision-making tools. The real world is more complicated than its depiction on a map, as the map does not capture all the nuances and details of the physical urban space.
- As UAM is broader than just a traffic or transportation issue, it also requires a more inclusive dialogue within the city administration. That is why departments with little or no GIS expertise could benefit from easy-to-use GIS tools such as the one developed by MML and Aalto during the CITYAM project.
- The developed GIS tool is based on multi-criteria analysis, where a weight between -1 and +1 is assigned for each data layer. Clear guidelines on how to use weights would be necessary to ensure objectivity and minimise the possibility of each stakeholder generating analysis results suitable for them.
- The GIS tool developed by MML and Aalto could be beneficial for the general public. However, open access could only be done with less accurate data due to privacy and security concerns.

4.1.2 Administrative and Legal Considerations

Various GIS tools are already used in the everyday work of different city departments. One of the main questions is whether the cities would like to adopt a new GIS tool, such as the one developed by MML and Aalto. For example, Helsinki suggested that a similar analysis could be conducted using the GIS tools they already employ, which are already used by larger and/or wealthier cities. However, it was added that the GIS tool developed by MML and Aalto could be useful for smaller municipalities with less advanced GIS capabilities. Tartu and Riga expressed the opinion that similar functionality could be incorporated into the GIS tools they already use. The specific technical reasons for that are discussed below. Gdańsk is also already using a tool with similar functionalities.

The GIS tool requires access to high-quality geospatial data, access to which can be limited. For example, Riga noted that legal uncertainties regarding data sharing between the state and municipality persist. To solve this, better coordination between the state and municipalities is required. Similarly, the interviewee from Riga noted that access to data from private companies, such as Google, can also be limited and depends on available financial resources. In Helsinki, most of the data belongs to the city. Similarly, Tartu, Stockholm, and Hamburg indicated that much of the data is already publicly available.

Privacy was another concern mentioned by cities. Helsinki, Hamburg, and Gdańsk mentioned privacy and security issues related to excessively precise data. However, this would mostly be an issue if access to the GIS tool were public. Gdańsk also highlighted potential conflicts with the Polish legislation. Because the GIS tool's server is currently located outside Poland, it is not possible to upload highly accurate data to the tool.

The legally defined responsibilities of local municipalities were also highlighted by Gdańsk. Because municipalities have no responsibilities related to aviation, the local government has no obligation to prepare for UAM, as such preparation would divert attention from pressing issues it is required to address. In addition, cities seeking to influence drone traffic by limiting ground infrastructure could create conflicts with national aviation authorities, who could also argue that municipalities lack authority in aviation.

KEY TAKEAWAYS:

- Larger cities are already using various GIS tools that can be used for the same analysis as the GIS tool developed by MML and Aalto, or can be updated with a similar functionality. However, this GIS tool could be beneficial for smaller municipalities with less developed GIS expertise.
- In some countries, the data required for the mapping of suitable landing sites can be divided between local and national authorities. Coordination between the state and municipalities could be required to guarantee access to data.
- It must be taken into account that, for legal reasons, the GIS tool must be located on a server located in the country where the city is located to perform the analysis.

4.2 Economic considerations

4.2.1 Cost-Effectiveness

Several cities noted that the GIS tool developed by MML and Aalto has the potential to improve the efficiency of decision-making and planning processes. Helsinki stated that the tool could be handy for GIS experts and land-use planners to support their decision-making and reduce the time required for this work. Gdańsk similarly noted that the tool can serve as a shortcut by simplifying and automating certain aspects of the process. Hamburg noted that the tool enables data visualisation that brings everyone onto the same page, which could expedite internal coordination. Stockholm also noted that the tool could make certain internal tasks easier and faster by consolidating multiple data layers into a single location, thereby reducing the need to manually check various sources. Riga, drawing on its experience with a similar planning tool used for charging stations, likewise emphasised that such tools can significantly speed up decision-making processes.

Gdańsk also highlighted potential economic benefits, noting that by identifying suitable areas for drone infrastructure on city-owned land, the municipality could generate ongoing income through leasing. They also pointed to possible indirect benefits, such as boosting local business opportunities and property values near well-planned landing sites, provided that potential concerns, such as noise and privacy, are effectively managed.

However, Riga, Tartu, and Helsinki also raised questions about the cost-effectiveness of maintaining a standalone tool. As discussed in section 4.1.2, these cities already operate advanced GIS systems and thus questioned whether the effort required to maintain a separate tool would be economically justified. Instead, they preferred to extend their existing systems as needed. Gdańsk made a similar observation, noting that the GIS tool is useful but less relevant to them, given their strong commitment to developing the GeoGdańsk platform. Tartu also indicated that, given the present situation, the costs of developing a similar functionality within their existing systems would not be justified, as there is currently little demand for it. Stockholm added that adopting a new system would require additional time and resources, as staff would need to learn how to use it. The interviewee from Helsinki further explained that while a budget is generally available for such tools and data, the city is encouraged to prioritise open-source solutions. In practice, this means a shift away from purchasing proprietary software towards open-source alternatives, such as QGIS.

KEY TAKEAWAYS:

- The GIS tool could improve efficiency in planning and decision-making by reducing manual work and saving time for city departments.
- The tool can also be seen as a potential source of economic benefits, for example, by helping to identify city-owned land that could be leased for drone infrastructure.
- Maintaining a standalone tool may not be economically justified for cities with advanced GIS systems. Expanding existing platforms with new functionalities was seen as a preferable approach.

4.2.2 Economic Feasibility by Municipality Size

Helsinki also noted that while the GIS tool developed by MML and Aalto may offer limited added value for larger cities with existing advanced GIS infrastructures, it could be more useful for smaller municipalities with fewer resources, GIS capabilities, and less complex spatial data requirements. Stockholm agreed, noting that they already use advanced tools. At the same time, Tartu, with a population of nearly 100,000, argued that, given the low current demand for drone infrastructure and the relatively high cost of updating and preparing data for the tool, it does not currently see a clear economic benefit in using it. The interviewee, however, noted that even if there were sufficient demand, they would still prefer to develop the functionality on top of their existing GIS system. Nevertheless, it remains unclear whether even smaller cities have the capacity or resources to maintain the tool cost-effectively, especially since Helsinki also acknowledged that technical considerations, such as data compatibility (further discussed in 4.3.1), may pose challenges for smaller municipalities.

KEY TAKEAWAYS:

- Larger cities suggested that the GIS tool developed by MML and Aalto could be more useful for smaller municipalities with limited GIS capabilities and resources. However, it remains uncertain whether such municipalities would have the capacity to maintain the tool in a cost-effective way, especially given challenges like data compatibility.
- The notion of what counts as a "smaller municipality" in this context also remains unclear, making it difficult to determine exactly which cities could benefit most from the GIS tool.

4.2.3 Data Availability

In both Hamburg and Riga, not all relevant data are owned or collected by the city. Some datasets must be purchased or require permission to access, thereby adding cost and complexity. For instance, as noted in Section 4.1.2, Riga indicated that access to certain private-sector data may be limited and may require additional financial resources. However, Helsinki, Tartu, and Stockholm indicated that most of the relevant datasets are already available as open data, suggesting that data availability is not a significant concern in those cities. Hamburg noted that authorised users can easily access and use the necessary data as well. Gdańsk, however, pointed out that not all data can be put on external servers, which may limit availability if the tool were to be made public.

KEY TAKEAWAYS:

- Most of the relevant datasets are already available as open data, making access for municipalities relatively straightforward.
- Some municipalities may face challenges, as access to certain datasets may involve additional costs or permissions when the data is not owned or directly accessible to municipalities.

4.3 Technical considerations

4.3.1 Data Compatibility

A technical issue reported by Riga and Tartu concerned data compatibility, particularly differences between the coordinate systems used in the city datasets provided and those required by the GIS tool developed by MML and Aalto. Riga also noted that to make their files compatible with the tool, attribute data had to be stripped. Another concern highlighted by Tartu was the outdated nature of the data, as the data in the tool does not update automatically and therefore requires manual updates. Gdańsk reported similar obstacles, noting that their land surveyors had to break down large GeoGdańsk layers into smaller components before they could be used in the tool.

The interviewee from Riga also highlighted challenges in integrating municipal and national datasets, noting that layers are not available online, change over time, and are managed under different frameworks, which creates difficulties in aligning national and municipal data.

In contrast to the challenges reported by Riga, Tartu, and Gdańsk, Hamburg reported that it is usually able to provide data in the required formats. Helsinki also noted that with broad ownership and access to geographic data, compatibility is not a barrier for them. However, the interviewees from Helsinki cautioned that smaller municipalities with fewer resources may face greater difficulties in this regard.

Beyond technical compatibility, Hamburg also highlighted that the quality of the tool's outputs depends heavily on the quality of the input data. Their geodata providers noted that improved underlying datasets would not only enhance the tool's outputs but also make planning discussions more transparent for stakeholders, as planning processes would be supported by reliable evidence.

KEY TAKEAWAYS:

- GIS tool users may encounter technical issues such as incompatible coordinate systems, the need to break down large data layers, and the fact that data does not update automatically and must be refreshed manually.
- Integrating municipal and national datasets may present challenges when they are not aligned or are managed under different frameworks.
- The quality of the tool's outputs depends on the quality of the input data.

4.3.2 Functionality

Weighting of data layers is a common concern among cities. The tool uses weights in the range between -1 and 1. However, this means that, without clear guidelines, the tool could be used by stakeholders to generate results that suit their purposes. This would be primarily a concern if the tool were made available to the general public. Here, Helsinki and Tartu used simple values (-1, 0, 1), which diminishes the amount of "grey" areas, while Hamburg and Stockholm experimented with nuanced weights. Riga, Stockholm, Hamburg and Tartu emphasised the need for clear guidelines. Gdańsk emphasised the need for a UAM strategy from the municipality's side, which should also provide the basis for the values of the data layer.

Helsinki and Tartu find limited added value due to existing GIS capabilities. Riga, Hamburg and Stockholm see potential for visualisation and internal dialogue. Hamburg also values the tool for understanding data quality and stakeholder complexity.

Looking ahead to more advanced planning needs, Tartu emphasised the limitations of a static tool architecture and highlighted the importance of incorporating dynamic or time-sensitive data. For instance, they noted that certain areas, such as school zones, may require restriction only during specific hours of the day. Without this technical capability, the tool's functionality in planning drone operations within complex urban environments remains limited.

Stockholm suggested that the GIS tool developed by MML and Aalto could be further improved to serve as a shared workspace for urban planners and internal stakeholders, thereby facilitating discussions and collaboration in selecting suitable landing sites. However, this would be an internal feature rather than one involving public participation. Riga, which already operates a city GIS platform (GeoRiga), found the Finnish tool technically challenging and less intuitive to use due to issues related to file formats and coordinate systems. Rather than maintaining a separate system, Riga plans to integrate similar functionality into its platform, complemented by thematic maps and drone flying corridors aligned with its forthcoming UAM guidelines. The city appreciated the Finnish tool's heat map concept but noted the need for improved usability and supporting materials, such as tutorial videos and a feedback function to enhance user experience.

The interviewee from Helsinki also noted that during the pilot phase, they experienced error messages when running analyses. However, these issues were understood as part of the ongoing testing process and were not considered major long-term concerns.

Tartu, Hamburg, Gdańsk and Helsinki acknowledged that the GIS tool developed by MML and Aalto is easy to use and user-friendly for those with no GIS expertise. However, as noted in Section 4.1.1, Tartu also emphasised that actual decision-making relies on significantly more precise data. While the tool is valuable for gaining a general overview, it does not provide all the necessary details for final decision-making, such as land ownership, natural boundaries, and other factors. Riga and Hamburg noted that the tool can help initiate discussions, but differing approaches to applying weights may lead to varying interpretations of the results, meaning the tool alone cannot provide a definitive answer. Stockholm and Helsinki similarly observed that the tool can help visualise and explain the reasoning behind decisions to other departments or external stakeholders. However, as with Tartu, the interviewees pointed out that even with many layers added, not everything can be visualised in the tool.

Hamburg highlighted the GIS tool's web-based design as a practical advantage, as it provides straightforward access without requiring the installation of additional software, such as ArcGIS or QGIS. According to the interviewee from Riga, the heat map functionality was one of the tool's strengths. Riga also highlighted the need for tutorial videos to guide users in effective use of the tool and suggested that a feedback feature or communication channel could enhance participation by allowing users to submit questions, ideas, or proposals. Gdańsk indicated that the tool would be more useful if it incorporated information based on legislation, such as controlled zones, as additional layers to support drone planning. The interviewees further noted that the tool could also support longer-term planning by monitoring the density and pace of drone infrastructure development, helping to forecast future investments and aerial activity.

KEY TAKEAWAYS:

- The GIS tool developed by MML and Aalto shows strong potential in visualisation, supporting internal dialogue and contributing to longer-term planning, including forecasting drone infrastructure development.
- The functionality of the tool was seen as limited due to its static nature. Suggestions included incorporating dynamic or time-sensitive data and developing it as a shared internal workspace for planners.
- The tool's outputs were considered insufficient for providing definitive answers, as crucial information is missing, meaning it can only support decision-making rather than replace it.
- The GIS tool is easy to use without requiring GIS expertise, though additional features such as tutorial videos were suggested to enhance usability.

4.4 Social and Environmental Implications

4.4.1 Environmental Aspects

Several cities acknowledged the potential of the GIS tool to support planning that takes environmental aspects into account. Stockholm explained that the tool could support planning that avoids disturbing parks or green areas important for wildlife. Gdańsk likewise pointed out that when using the tool, taking into account data on biodiversity, protected areas, and bird nesting zones helps to ensure infrastructure is not located in ways that could cause environmental harm. The interviewees illustrated this with the example of wildfires, noting that if drone ports are located near, but not within, sensitive areas, they could support emergency services in protecting the environment while avoiding harm in daily operations. Riga also valued the opportunity to account for noise and visual pollution during planning processes. At the same time, Tartu highlighted that the GIS tool could enable a more spatially balanced distribution of drone activity. Hamburg highlighted the tool's potential to manage the number and placement of landing sites, thereby supporting a more evenly spaced network. Helsinki, however, noted that as the tool is primarily intended for site selection, environmental benefits are limited and not a central focus of its functionality. Overall, no city pointed to direct environmental obstacles that would complicate the adoption of the tool. Instead, they emphasised its potential to support planning that accounts for environmental factors.

KEY TAKEAWAYS:

- The GIS tool developed by MML and Aalto could support planning that considers environmental factors account, such as wildlife, biodiversity, protected areas, as well as noise and visual pollution.
- The GIS tool may help to spatially balance drone infrastructure and activity, supporting a more even distribution or network across the municipality.
- No environmental obstacles that would complicate the adoption of the GIS tool were raised.

4.4.2 Social Aspects

Several interviewees acknowledged the potential of the GIS tool developed by the Finnish National Land Survey to support more socially aware planning processes. The interviewee from Tartu suggested that the tool, with its visualisation capabilities, could be valuable for informing and communicating with external stakeholders. Stockholm viewed the tool's social potential primarily as supporting internal collaboration, enabling planners and departments with less GIS expertise to work together more effectively when discussing potential landing sites. Both Gdańsk and Tartu noted that the tool could help manage noise and visual disturbance by enabling a more spatially balanced distribution of drone activity.

Cities also discussed how the MML-developed tool could be used if it were made public in the future. Tartu noted that, since the maps are already public, there is no risk of exposing sensitive or potentially concerning information, such as the locations of military objects or sites. According to Riga and Gdańsk, the tool could improve awareness and provide people with information about developments happening near them. Gdańsk highlighted its potential for communication by showing residents which data are considered when selecting landing sites. Hamburg similarly noted that if the tool were made more widely available, it could increase transparency in the planning process and potentially lead to greater acceptance within the community. Tartu also highlighted the tool's value for communicating with external stakeholders, though they noted that NIMBY attitudes are more broadly related to the introduction of drones themselves than to the use of the tool.

However, the interviewee from Riga also acknowledged that there are more effective ways to engage the public, as most people are not sufficiently informed or equipped to use GIS tools, whether the MML-developed tool or others. Hamburg and Gdańsk raised similar concerns, cautioning that if the MML-developed tool were made freely available without oversight, results could be easily manipulated by adjusting weights or omitting important layers. Helsinki likewise emphasised that the tool is not intended for public participation, noting that some aspects of land use planning are best handled by professional planners rather than opened to citizens. Stockholm instead suggested that citizen engagement could be better supported by sharing the results of analyses (e.g. proposed drone landing sites) through other channels, such as the city website, where residents could provide feedback. Riga suggested using surveys as a more effective means of engaging a wider public. Gdańsk also identified potential social obstacles to making GIS tools public, noting that some groups or individuals are likely to oppose drone infrastructure regardless of communication efforts. Concerns may relate to safety, noise, or fears of increased surveillance. In relation to noise, Tartu also emphasised the importance of citizen consultation in the planning process to help avoid possible future issues.

As one of the cities that already operates advanced GIS systems and therefore questions the cost-effectiveness of maintaining a standalone tool, Riga saw the MML-developed tool as a useful concept but emphasised the importance of integrating similar functionality into the city's existing platform. From a social perspective, Riga emphasised that such a tool should not only support decision-makers and planners but also be accessible to residents and companies engaged in related products and services. While they considered the MML-developed tool a good example and believed that, in principle, it could support public participation if published online, they also acknowledged that the current version is not intended for public use and would require significant improvement before being made openly available.

Riga also highlighted the potential of GIS tools to support more socially aware planning processes. For example, they noted that the tool can help avoid sensitive areas such as schools, hospitals, and parks, thereby reducing potential disturbance to residents and minimising noise-related concerns.

KEY TAKEAWAYS:

- While the GIS tool developed by the MML could provide benefits if made public, other methods were regarded as more effective for engaging citizens, especially given concerns about data misuse or misinterpretation of results.
- GIS tools were seen as supportive of socially aware and responsible planning by helping planners take into account sensitive areas such as schools, hospitals, and parks, making the MML-developed tool socially beneficial even without direct public access.

5. The pilots of use cases and landing sites

Dimension Use case pilot	Hamburg P1: Polder control P2: Infrastructure inspection	Helsinki P1: Water rescue P2: Healthcare logistics	Stockholm P1: Herding geese P2: Drone as a service	Gdańsk P1: Safety audit P2: Traffic monitoring	Tartu P1: Drone-based public alert system
Political/ Admin	• Strong political, city and port authority support • HPA autonomy enabled fast decisions	• Limited political role; • P1 supported by the port and Rescue Services • P2 required more administrative backing	• Limited political role • P2 implemented through smooth internal coordination	• Implicit support • Coordination mainly with the police	• Decision-makers supportive but cautious • Consultations with the Data Protection Inspectorate and Transport Admin.
Legal	• BVLOS blocked in controlled airspace • SAIL certification is costly • First SAIL III drone validated (step toward BVLOS)	• P1 required an extra permit for dropping a flotation device • P2 BVLOS hindered by lack of CTR procedures between CAA and ANSP • P2 slow cross-border SORA process	• P2 BVLOS delayed by cross-border SORA • GDPR manageable as P1 captured no personal data and P2 did not film	• GDPR is manageable with operational limits • Police mandate covers enforcement • No major legal hurdles	• High uncertainty for data-collecting municipal use cases • BVLOS complex • Eventually, no data collected
Economic	• Costs exceeded plan due to the infrastructure and permitting process • Competitive market • HPA expanding staff	• P1 cost €10k; P2 cost €75k • P1 procurement difficult (short demo, limited interest) • P2 tender drew multiple bids • Permanent city staff emerging • External consultant support used for P2	• P1 Simplified procurement • P2 cost €91k • Docking station supplier market is smaller than expected • External consultant support used for P2	• Low cost (~€350) • Procurement competitive • Drones are cheaper than fixed cameras for episodic audits	• Cost ~€1.6k, planned €20k BVLOS pilot cancelled • Limited local BVLOS market • Direct procurement used
Social	• Positive acceptance • Proactive communication • Clear public authority identity reduced concern	• Neutral-positive • Proactive outreach in P2 • In P1, privacy concerns were minimal	• P1 positive acceptance due to clear citizen value • P1 on-site signs enabled engagement • P2 proactive communication	• Overall positive •Curiosity common • Proactive communication in P1 • Minor privacy query resolved on site	• On-site surveys neutral-positive • Alerts softened due to the security climate • Privacy remains top concern
Technical	• P1 connectivity improved after 5G upgrade • P2 camera/ georeferencing issues resolved • Swiss software for data security	• P2 one precautionary postponed flight due to GPS jamming risk • P2 weather dependency affected operations (wind gusts)	• P1 used AI acoustic deterrence • P2 tested docking station integration • P2 parachute debated, later not used	• Minor disruptions from GPS interference and rain • Backup drone enabled continuous filming	• Drone-in-a-box used manually due to regulations • Future need for on-drone data processing and system integration
Environ-mental	• Industrial site minimised impact • Wind/cloud as main operational limits	• Minimal impact • No permits required	• Minimal impact • P1 targeted geese without affecting other birds • P2 rooftop siting avoided disturbance	• Minimal impact • Urban noise masked drone sound	• River corridor route and short duration minimised impact • Noise dissipated due to urban background

Table 9. Summary overview of the pilots of use cases and landing sites

5.1. Hamburg use cases

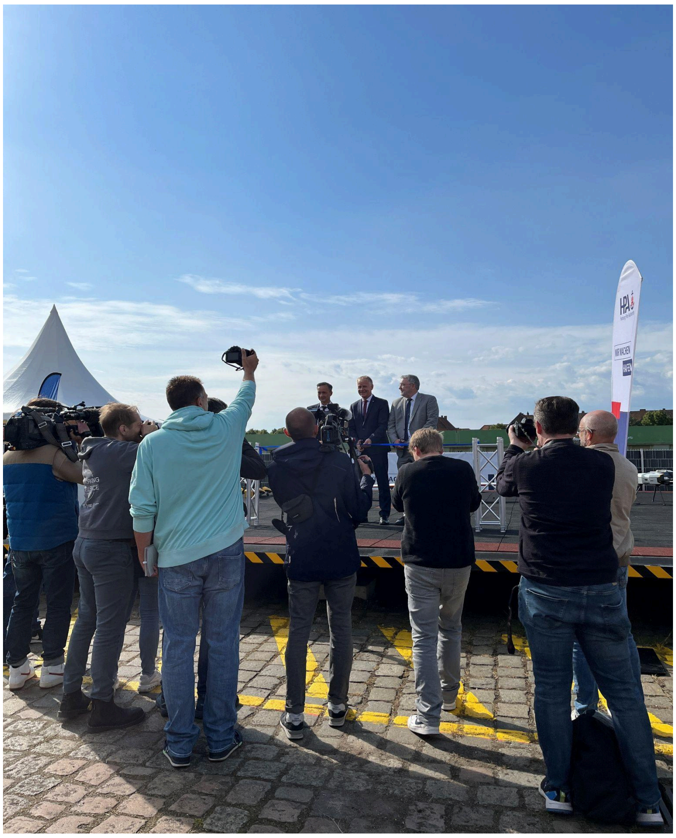
Hamburg has emerged as one of the most proactive European cities in exploring urban air mobility, leveraging its unique governance structure through the Hamburg Port Authority (HPA). Two distinct drone pilots were implemented: one focused on polder control monitoring along the Elbe River, and the other on infrastructure inspection within the port area. Both initiatives were designed to test operational feasibility, regulatory compliance, and public acceptance of drone technology in a complex urban-industrial environment.

5.1.1 Political and Administrative

Political and administrative support for drone pilots in Hamburg has been strong and visible. Representatives from the city attended the opening of the drone port, and senior political leadership also engaged directly, including a visit by the State Councillor for Economic Affairs, who expressed interest in scaling the operations. Overall, Hamburg supports UAM, though some caution remains regarding integration and the practical implementation of future U-space regulations. This positive starting point is likely partly due to the long-running Windrove drone network, which has been active since 2016 and made local actors more familiar with drone operations over time. Hamburg's approach to UAM has been strategic: rather than reacting to industry developments, the city has sought to develop a forward-looking regulatory framework that enables the safe and efficient integration of drones into urban systems.

From an administrative perspective, HPA's status as an independent port authority meant decisions could be made quickly within the port area, without long multi-agency approval chains. HPA had previously cooperated with the police, which made coordination smoother. For routine flights, police were notified in advance, ensuring awareness and avoiding unnecessary incident responses. This was adopted after early flights prompted several citizen calls. Air-traffic coordination for visual line of sight (VLOS) and extended visual line of sight (EVLOS) flights was otherwise limited to notifying the air navigation service provider (ANSP) before and after operations to ensure safe integration with other air traffic. However, beyond visual line of sight (BVLOS) flights remain prohibited since around 80-90% of Hamburg's port area lies in controlled airspace linked to the city's two airports. This regulatory gap has delayed the full implementation of the polder control use case, which was initially designed for long-range monitoring.

Landing site approval followed standard construction procedures, though initial confusion arose when the authority responsible for construction and buildings suggested helicopter pad requirements. This was resolved through dialogue with aviation authorities, confirming that drone pads do not require such specifications. Cross-organisational collaboration was facilitated through the Windrove network, funded by the Ministry of Economic Affairs, which hosts coordination meetings among public authorities, universities, and industry stakeholders.



The public, Hamburg authorities, and the press attended the opening of the Hamburg DronePort in June 2024.

5.1.2 Legal

There is legal clarity for VLOS operations, but BVLOS remains restricted under current German and EU regulations, particularly in controlled airspace. The main legal hurdle for authorising BVLOS operations was compliance with the European Union Aviation Safety Agency (EASA) requirements associated with the Specific Assurance and Integrity Level (SAIL) classification and the corresponding technical and operational safety requirements. To fly BVLOS in controlled airspace, a high assurance level (SAIL III or IV) is required. Initially, the Hamburg Port Authority had no drones that met these standards, which prevented approval for the pilot. The validation process required additional manufacturer testing and formal EASA verification, and lengthy testing timelines delayed progress. Following that process, HPA now has its first SAIL III-validated drone, an important step toward future urban BVLOS operations. Overall, these barriers delayed BVLOS pilots and limited the scope of the polder control pilot to shorter-range operations.

This challenge is especially significant in Hamburg because most of the port area lies within controlled airspace, and there is currently no standard process for permitting routine BVLOS flights. As a temporary measure, BVLOS flights can be conducted approximately 6 km from the port area in non-controlled airspace, where existing rules permit such flights. However, this does not solve port-based long-range use cases. Looking ahead, Hamburg expects a regulatory solution for BVLOS flights in controlled airspace to emerge soon.

Regarding the landing site, it was approved under standard construction and building rules rather than drone-specific regulations, since no dedicated rules exist yet.

5.1.3 Economic

Economic considerations were a significant factor for Hamburg's pilots, and costs ultimately exceeded those initially planned. Meeting SAIL III requirements was a significant cost driver, as the required manufacturer testing and EASA verification cost approximately €25,000 per drone. Costs also rose due to infrastructure upgrades, such as the installation of a landing pad equipped with flashing lights, each requiring separate cabling and power supply. Additionally, HPA invested in supporting infrastructure, such as drone detection systems and upgraded equipment, which incurred additional costs. Procurement itself was not problematic, as Hamburg has access to many capable drone companies. The HPA described a competitive market with substantial interest from suppliers in collaborating.

Expanding operations required additional staff. The HPA team has increased from two to six certified drone operators. That increase made regular operations possible, but demand continues to grow as other authorities increasingly request drone support for tasks such as traffic monitoring, disaster response, and measurement flights. As a result, HPA is now flying two to three times per week or more. On the city side, Hamburg has not built a central UAM unit or hired dedicated UAM coordinators. Instead, drone capabilities are distributed across multiple authorities, each staffing and developing its own drone operations. The city's role is therefore more indirect, supporting coordination and wider development through the Windrove network.

Financially, HPA views drone operations as a service that should eventually be self-funding. Their goal is to generate income by flying for other authorities and to reach break-even by the end of 2025. Current revenue streams remain modest, but demand is increasing organically through word-of-mouth and visibility at public events. HPA views expanding into more diverse use cases as the primary driver of long-term scaling.

5.1.4 Social

Public acceptance of drone operations in Hamburg has been generally positive, supported by a transparent approach and proactive engagement. The HPA organised open days and distributed 5,000 flyers to residents living near the drone port, inviting them to come observe flights and learn about the project. Attendance was low, which may indicate limited opposition or concern. Questions raised during these events focused less on the flights themselves and more on how the use-case pilots were funded, data privacy, and general curiosity about the drones. Explaining that the pilots were funded through EU programs helped mitigate concerns. Notably, no participants expressed outright opposition or demanded that flights be stopped.

Public acceptance in Hamburg has been supported by the way drone use is framed. The city has deliberately led with small drone public service applications (e.g., inspections, public safety support, and flood protection monitoring) rather than starting with commercial or industry-driven deployments. Day-to-day operations also benefited from looking official as pilots conducted flights in their HPA workwear and used visibly branded vehicles, which reduced public suspicion and made conversations about safety or data issues easier because residents recognised the activity as official.

In addition, the drone port's industrial location minimised social impacts, as it is situated in the industrial harbour on HPA territory and does not encroach on residential or recreational space. The landing site, therefore, did not become a social concern for the pilot.

5.1.5 Technical

Technical challenges were significant, particularly for the infrastructure monitoring use case. Initial camera setups were insufficient for close inspection: they lacked sufficient zoom and resolution, and images were not georeferenced, which made it difficult to pinpoint the exact location of a detected defect. With more than 75 test flights in this use case, the operators gradually improved results by upgrading cameras, increasing zoom capability, and refining workflows. By contrast, the most significant technical constraint for the polder-control pilot was not equipment but the regulatory BVLOS limitation. Polder control could therefore only be tested under EVLOS, with a maximum range of approximately 3 km. Wind can be another challenge, as it exceeds 5 Beaufort on approximately 135 days per year, thereby grounding operations in Hamburg. However, in future, HPA hopes to acquire drones that can handle 7-9 Beaufort and are wind-tolerant.

A few additional technical hurdles arose as well. Older drones experienced magnetic interference from the metal landing pad, but this was solved through adjustments and is no longer an issue with newer drones. In addition, connectivity for BVLOS operations was initially unreliable when relying on 4G networks; moving to 5G networks resolved most of these issues. While GPS jamming is a concern in some parts of Europe, the operators reported no such interference in Hamburg. Data security concerns were addressed by replacing Chinese software with a Swiss alternative to ensure compliance with European data protection standards.

5.1.6 Environmental

Environmental considerations were primarily operational rather than ecological. Because the drones are electric, they operate on battery power rather than fuel, resulting in no direct exhaust emissions. Physical obstacles, such as harbour cranes that reach up to 136 meters, required flight altitudes of approximately 150 meters. Weather conditions also posed frequent limits. Flights are prohibited when the cloud base drops below 1,500 feet (about 500 m) because rescue helicopters must fly low beneath the clouds, and drones cannot safely share that airspace. In autumn and winter, this can mean one to two weeks without flight opportunities.

Ecological impacts were considered but remained minimal because the drone port sits in an industrial harbour area. During site selection, HPA checked multiple location options and worked with BUKEA (Hamburg’s authority for environment, climate, energy and agriculture) to review bird routes and ensure the chosen site avoided sensitive areas. Since operations for the infrastructure pilot took place over water, safety measures included predefined emergency landing points, a parachute system that enables controlled descent at 4 m/s, and a CO_2 flotation system that activates automatically if drones land in water.

5.1.7 Conclusion

Hamburg's experience demonstrates the benefits of strong political support, administrative autonomy, and proactive stakeholder engagement in advancing UAM initiatives. However, regulatory constraints on BVLOS operations and escalating infrastructure costs remain critical challenges. Technical adaptability and safety measures have enabled the successful implementation of VLOS and EVLOS flights, while public acceptance has been fostered through transparency and outreach. To fully realise the potential of drone technology, Hamburg must accelerate regulatory pathways for BVLOS, optimise infrastructure planning, and expand revenue streams through formalised service offerings. Its governance model and innovation ecosystem position Hamburg as a benchmark for integrating drones into complex urban environments.

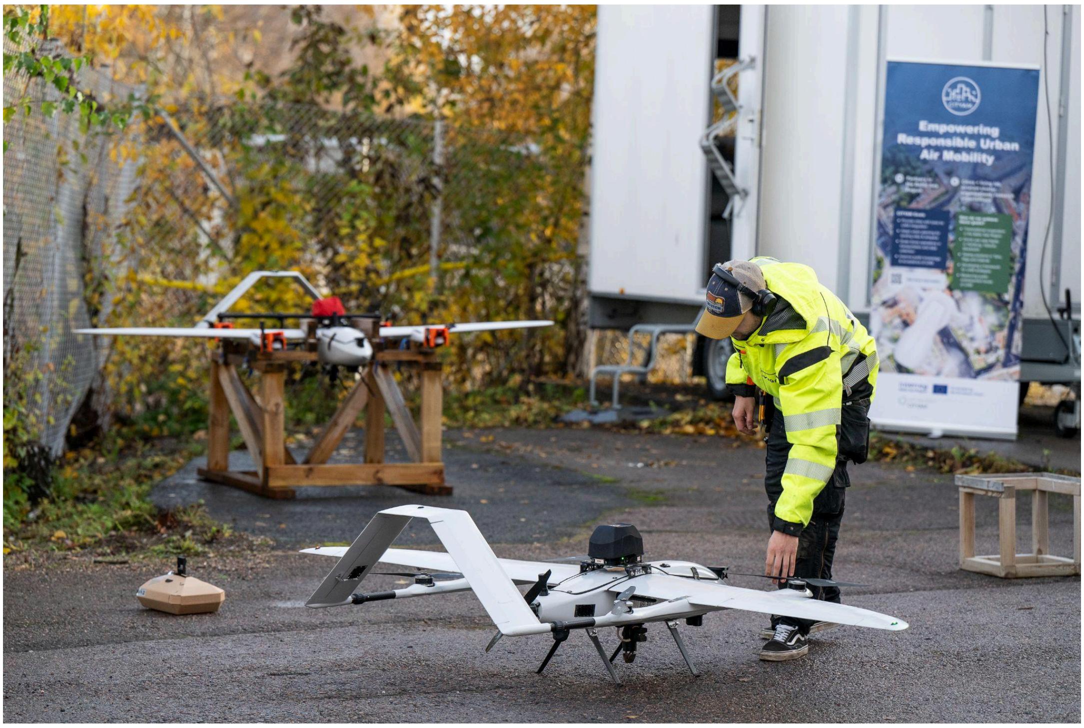
5.2 Helsinki use cases

Helsinki conducted two distinct pilots that together illustrate how the city and its partners approach urban air mobility from both emergency-response and logistics-resilience perspectives. The first pilot was a short, one-day demonstration at the Port of Helsinki, in which a drone delivered floating rescue devices to a simulated victim in the water under visual line of sight. The second pilot was a multi-day BVLOS logistics trial delivering real, non-medical supplies to a healthcare centre over a 7-kilometre route, monitored remotely from Oslo, with local ground crew handling battery swaps and loading/unloading. The two efforts involved different stakeholders – Helsinki City Rescue Services and Port of Helsinki in the first, and Stara (the city's construction services company) plus healthcare logistics in the second – and faced very different administrative and technical realities. Together, they offer a comprehensive view of what works and what remains to be developed in Helsinki's UAM journey.

5.2.1 Political and Administrative

Political involvement was limited in both pilots, but support was available when needed. The water rescue pilot was short and led by the Port of Helsinki and Helsinki City Rescue Services. The organisers invited city and ministry representatives to observe the demonstration in the closed port area, and around five of them attended. Civil servants and politicians, therefore, had a limited role, and there was no pushback because the activity was small-scale and never rose to the political agenda. Administratively, the water rescue pilot benefited from the fact that both key partners were accustomed to using drones in their respective domains. Rescue Services already deploy drones equipped with thermal cameras from fire trucks, and the port served as a cooperative facilitator. Although the flight itself occurred outside the closed port area, the command and viewing areas were located within it, requiring port accompaniment and gate access control.

The healthcare logistics pilot required deeper administrative engagement. Early plans placed the take-off site within controlled airspace (CTR), and the project sought political backing through a support letter signed by the former mayor and senior leaders of the relevant city units. This demonstrated a strong commitment to supporting the pilot, even though the route was ultimately not approved for CTR operations, prompting the team to select a route outside controlled airspace. On the operational side, local administrative coordination worked smoothly once the route was changed: city property owners provided informal access to sites, electricity for charging, and allowed temporary access to fenced areas for safe package winching adjacent to the medical centre. The police were notified in advance of both pilots. However, the second pilot revealed internal coordination issues, as a citizen's call prompted the police to contact the liaison, suggesting uneven internal information flow within the police.



On the picture, the drones used for Helsinki's second use case pilot. As a service provider, Aviant's ground crew in Helsinki diligently prepared the drone for each takeoff and conducted all necessary pre-flight checks and safety protocols.

5.2.2 Legal

Legally, the water rescue pilot encountered permit requirements tied to the act of dropping an object rather than to the flight itself. Although VLOS flights typically require a relatively straightforward authorisation process, dropping the flotation device triggered a formal flight permit, which extended the approval timeline and required scheduling the demonstration after summer. The VLOS flight authorisation was still required, but the external drone operator handled it under standard VLOS procedures, and the city had limited direct contact with the CAA. The permits came very close to the flight date, creating scheduling uncertainty. In addition to flight authorisation, photography and filming in the port required approval to avoid identification of containers and other commercially sensitive infrastructure. This approval was obtained through close coordination with the port. The permitting process was simplified because no environmental or event permits were required, as the activity was brief and did not constitute a public event.

The healthcare logistics pilot exposed the principal legal and procedural gaps around BVLOS logistics in Helsinki. There are no established procedures between Traficom (the Finnish CAA) and Fintraffic (the Finnish ANSP) for BVLOS drone operations within the CTR. Both referred responsibility to each other: the CAA to ANSP for operational conditions, and ANSP to the CAA for rule-setting and safety. This institutional deadlock effectively blocked CTR flights, compelling a redesign outside controlled airspace. Even for flights outside CTR, ANSP required phone notifications before and after each flight, despite the absence of a clear legal basis for this, underscoring the lack of scalable U-space processes. The permission process itself was described as cumbersome. For cross-border SORA submissions, there was no clear template or guidance for foreign operators; the CAA's digital systems struggled with large submissions; and the process lacked transparency in tracking. Approvals and processing also depended heavily on a single inspector's availability, creating unpredictable timelines. GDPR was not a binding constraint because the logistics flights carried generic supplies and did not record identifiable personal data, as the cameras were used only briefly to confirm the drop-off area was clear. An additional unexpected challenge was last-minute requirements from ANSP, for example, a Finnish-speaking contact person with a Finnish phone number.

5.2.3 Economic

The water rescue pilot cost approximately €10,000, roughly double the initial estimate of €5,000, primarily due to the unexpected workload associated with securing flight permission for object dropping and the cost of the permit itself. In addition, the operator travelled from Northern Finland, and there were modest event costs (e.g., vehicles and videographer/photographer). Approximately €500 was spent on imported floating devices, some of which were subsequently donated to Rescue Services for continued internal testing. The port's usual filming and photography fee was also waived. From the market perspective, procurement was possible, but a challenge was the limited operator interest. Many operators were reluctant to bid for short demonstrations funded by project budgets because they offered little profit, and follow-up work could not be guaranteed. Nevertheless, enough offers were received, and the pilot proceeded. The demonstration validated the use case for Rescue Services, and they are considering integrating floating-device drops with their own drones, thereby replacing external service procurement with internal capability.

The healthcare logistics pilot's procurement contract was €60,000, later increased by €15,000 due to prolonged permission processes and back-and-forth with the CAA, resulting in actual costs exceeding the plan. Despite the BVLOS and CTR hurdles, the international tender received five offers from eleven invited providers, and the selection benefited from a UAM consultant who strengthened the technical criteria and supported the evaluation.

Strategically, Stara views drone logistics as both a resilience tool (e.g., enabling urgent deliveries during crises) and an efficiency tool (e.g., avoiding back-and-forth driving for construction or maintenance). Stara prefers to buy drone logistics as a service rather than own fleets and envisions a multipurpose, city-wide framework so providers can justify fleet investments and cities can flexibly order logistics, mapping, and monitoring over multi-year horizons via dynamic procurement. Follow-up pilots are planned, including potential fleet operations from Stara's main warehouse and mobile depot concepts, but they are contingent on external funding. Helsinki is also starting to resource UAM more permanently, with two full-time city staff now focusing on aviation/U-space and land-use integration, signalling a shift from project-based experimentation toward institutional capability.

5.2.4 Social

Socially, the water rescue pilot did not raise public acceptance issues because it took place by the port, in an area without nearby residents, and its short duration minimised citizen exposure. Engagement focused on stakeholder coordination and privacy of commercial infrastructure rather than residents. Given the lack of nearby housing and the pilot's short length, no citizen outreach was undertaken.

For the healthcare logistics pilot, the context was markedly different because flights operated adjacent to a busy healthcare centre, with schools, a church, and a shopping area nearby. The organisers adopted a proactive communication strategy by placing posters at key nearby locations, and the schools also circulated information through internal channels. At the operator's request, they additionally informed the Ukrainian Embassy in advance to pre-empt concern because it was close to the route. The pilot was also broadly covered in Finnish media before and after the operations. During the pilot, there was one citizen call to the police reporting a large drone. Police verified permits through the designated Finnish-speaking contact required by ANSP and closed the matter. Although the police had been informed beforehand, the situation revealed uneven internal information flow within the police. Online reactions to media articles ranged from scepticism about noise and necessity to supportive messages, as expected. No protests or site-specific objections were reported, and safety measures, such as fencing, were deemed appropriate for the area.

5.2.5 Technical

Technical performance in both Helsinki pilots was largely reliable, with only a few practical constraints. In the water rescue pilot, the primary technical task was ensuring that flotation devices were attached and released accurately. The operator pre-tested the hook-and-rope release and demonstrated reliable deployment under favourable weather conditions, acknowledging that real rescues often occur in rougher conditions than those encountered on the day. The demonstration required three crew members, one pilot-in-command and two pilots maintaining line-of-sight. The crew size is manageable for demonstrations, but would not be realistic for routine emergency use without greater automation or regulatory allowances for emergency services to operate beyond VLOS. No origin-of-technology constraints emerged beyond the operator's internal choices, and concerns about GPS jamming were noted as a broader regional risk, though not experienced during this short test.

The healthcare logistics pilot demonstrated stable BVLOS performance over a 7km route, remotely monitored from Oslo with a single ground crew locally. The logistics workflow relied on winching packages from 60m, avoiding ground landing amid dense surroundings and aligning with CAA-approved safety envelopes, parachute availability, and mapped emergency landing sites. The biggest operational limiter was wind. The drone operator's wind-gust limit is approximately 10 m/s; therefore, planned flights were cancelled on one day after on-site wind checks and app-based forecasts indicated gusts above that threshold. Another precautionary cancellation occurred when a GPS interference map flagged Helsinki as high-risk. The alert cleared soon after, illustrating the need for robust, low-altitude-relevant interference indicators and procedures (e.g., return-to-base) should GPS interference occur mid-flight.

Other technical issues were related to landing-site logistics. Late in the process, the Border Guard asked for rooftop antennas at both ends of the route to improve visibility and redundancy. Installing them required roof access and electricity, which were readily arranged at the healthcare centre but more challenging at the depot because the roof was harder to reach and electricity availability was uncertain. Technology's origin did not create major technical or data concerns, as the drone operator Aviant uses Norwegian drones, removing data sovereignty concerns that sometimes arise with non-EU equipment.

5.2.6 Environmental

Environmental impacts were minimal in both pilots, and neither required formal environmental permitting. For the water-rescue pilot, the city's Environmental Department advised that short VLOS demonstrations typically do not require noise notifications. Given the port location and limited flight distance, no other environmental concerns were raised.

In the healthcare logistics pilot, noise drew attention but did not become an obstacle. A city environmental officer initially expressed interest in measuring noise levels on-site, and the city considered commissioning a specialist firm to conduct the measurements. Still, neither effort materialised, and the pilot proceeded without a noise permit. Based on informal checks and operator-provided noise data, the city concluded that a permit was not required. The flights did not involve protected areas, and the organisers reported no issues related to wildlife or animals at the take-off and landing sites. Overall, environmental impacts remained secondary to operational constraints, such as wind.

5.2.7 Conclusion

Helsinki's two pilots together demonstrate a city steadily building institutional capacity while testing real-world use cases under constraints typical of European urban airspace today. The water rescue pilot demonstrates how targeted VLOS emergency applications can be organised quickly when stakeholders already use drones. In this case, the primary permitting requirement arose from the specific operation of dropping flotation devices, not from the flight itself. The healthcare logistics pilot exposes the central barrier to scaling urban BVLOS logistics. It revealed procedural and governance gaps between CAA and ANSP for flights in controlled airspace, as well as non-scalable manual notifications even for flights outside controlled airspace.

Economically, the healthcare logistics pilot encountered cost increases due to lengthy permissions and process uncertainty. Even so, it delivered operational learning and helped establish a pathway toward service-based procurement that could eventually work across the wider metropolitan area. Socially, proactive communications avoided friction and created visibility. From a technical perspective, the trials confirmed that BVLOS logistics can be conducted with remote monitoring, while also showing that wind and GPS interference are practical constraints that still require advanced operational solutions. Environmental impacts were minimal as the short duration and urban routing kept impacts low, although noise monitoring remains an open topic for future standardisation.

Moving forward, Helsinki's priorities are clear. The city needs to work with national actors to agree on a regulatory process for BVLOS flights in controlled airspace, transition manual calls to U-space services, formalise dynamic procurement models with multi-city demand, and embed landing-site allocation and UAM language in land-use and sub-strategies. With two dedicated city staff now bridging strategy, land-use, and U-space, Helsinki is well-positioned to convert pilots into repeatable services, provided the regulatory pathway and market mechanics mature at the same pace.

5.3 Stockholm use cases

Stockholm conducted two distinct drone pilots under the CITYAM framework, each representing different levels of complexity and regulatory engagement. The first pilot focused on wildlife management, using drones to herd geese from public beaches to improve water quality and recreational accessibility. This approach emerged after earlier mitigation methods, such as protective hunting and herding dogs, proved less effective over time because geese adapt quickly and learn to avoid familiar hunting routines. The second pilot aimed to test a drone-in-a-box solution for traffic monitoring. However, due to permit constraints, the scope was significantly reduced to infrastructure integration and public-acceptance testing rather than full-scale data collection. Together, these cases illustrate Stockholm's incremental approach to urban air mobility, balancing innovation with regulatory realities.

5.3.1 Political and Administrative

Political involvement in both pilots was minimal but supportive. The geese herding pilot was initiated by the City Management Office's Innovation Department and executed jointly with the Traffic Department. Initially, the pilot drew little political attention, but interest increased thereafter. Internally, the team also coordinated with other departments, e.g. regarding permits for flights near nature reserve areas (see Section 5.3.6). The civil aviation authority and the air navigation provider were not involved since the activity was a low-altitude VLOS operation. The pilot also relied on practical cooperation with three park engineers from different city subsidiaries that manage the beaches, and these local actors were described as enthusiastic because the pilot directly addressed a problem in their day-to-day responsibilities.

For the second pilot, political conditions were again supportive, as there was no resistance. The pilot was regarded as a routine component of Stockholm's role as a lead city in the project and did not necessitate political escalation. Administratively, the second pilot showed that internal coordination across city units can work smoothly when roles are clear. The Traffic Administration led the work, while the Real Estate Department and the Sports Management Office supported approvals and logistics for the rooftop docking station. Requirements such as bearing capacity assessments and the installation of temporary electrical connections were addressed without significant hurdles, and the collaboration was described as straightforward. As an administrative issue, only two people are working on SORA applications at the Swedish Transport Agency, which led to a slow permitting process and was one of the reasons behind the changes to the initial pilot plan (see Section 5.3.2).

5.3.2 Legal

The geese-herding pilot operated under VLOS conditions and did not require any aviation permits beyond confirming compliance with existing rules. Minor legal considerations concerning privacy were addressed by ensuring that no footage was recorded or stored and by explicitly stating that live video was used solely for drone navigation.

The second pilot exposed more complex legal dynamics, particularly around BVLOS operations and cross-border service provision. Stockholm initially intended to conduct long-range flights to collect data for traffic analysis, which would have required a SORA-based permit. Since the selected operator, Nokia, is a Finnish company, it had to obtain SORA approval in Finland before applying for a cross-border permit from the Swedish Transport Agency, which does not process applications from foreign operators until the operator's home country has approved them. This process took too long to meet the project timeline, and the permit was not received until seven months later. As a result, this forced a pivot to a simplified use case focused on integrating the docking station and observing public reaction. Overall, the experience indicates that when a foreign operator is procured, early verification of the operator’s permits and cross-border approval procedures are necessary.

Other legal questions were resolved without significant difficulty. Insurance arrangements were clarified to ensure Nokia bore liability for any damage to city property. The city also determined that a building permit was not required for the docking stations because the installation was temporary. Placing it on the roof also avoided the need for additional permits. In addition, there were no data protection issues, as no cameras were used in this pilot.

5.3.3 Economic

The geese-herding pilot was low-cost and straightforward. The pilot’s success has prompted discussions about repeating the service in subsequent summers, though scalability remains contingent on budget and operational priorities.

The second pilot involved a significantly larger budget of about SEK 1 million (about €91,000), covering the drone-in-a-box system and an external public acceptance study. While costs did not exceed planned budgets, the experience highlighted market limitations. There are only a few Nordic providers capable of delivering docking station solutions, and initial expectations of broad competition proved unrealistic. Stockholm worked with a research-oriented consultant from Research Institutes of Sweden (RISE) to structure procurement and engage potential suppliers. Even so, the experience indicates that future tenders will require more thorough market analysis and early dialogue to avoid misaligned expectations or delays.

From a strategic perspective, Stockholm envisions drones as complementary tools. Potential savings are expected in areas such as inspections, permit compliance, construction oversight, and targeted traffic monitoring, whereas stationary sensors or cameras may be better suited to other tasks. However, the economic viability of large-scale deployment remains uncertain, and the city anticipates service-based procurement models rather than asset ownership, at least until the market is broader and the regulatory pathway for routine operations is more straightforward. At this stage, there is no concrete hiring need, but the pilots have initiated internal discussions regarding additional competence requirements. For now, the city can manage through staff training and with occasional support from external consultants. If Stockholm proceeds with complex BVLOS operations that require in-house SORA work, a dedicated technical advisor or a similar role may become necessary as activities scale.

5.3.4 Social

Public response to both pilots was largely positive. The geese-herding initiative addressed a tangible citizen concern. Cleaner, goose-free beaches are a public benefit, which explains why people reacted well. The city supported acceptance through visible on-site communication – the beaches had clear signs and QR codes, allowing residents to interact and report geese sightings or request interventions. Privacy concerns were minimal, limited to one parent asking whether the drone was filming children on the beach; this was easily clarified, as the drone operator was on site. Feedback was described as surprisingly enthusiastic, reinforcing the wider pattern that public support is strongest when drones solve a problem people immediately recognise.

The second pilot adopted a proactive outreach strategy, partly because the pilot took place in a more populated everyday setting. Residents near the swimming hall received postal notices, and information sheets were available in the swimming hall. Visual observers were present during flights to answer questions. Observational analysis and street interviews conducted during the test revealed curiosity rather than resistance: most citizens were aware of the test but lacked clarity about its purpose, indicating a need for clearer messaging. There were no major privacy concerns. The city had communicated that cameras were not being used for the tests, and interviewees reported only isolated questions about filming. Social impacts were also limited by the choice of a rooftop landing site, which was perceived as safer and less intrusive than a ground-level site in a public green area. Minor disturbances occurred when drone noise disrupted gym classes. However, that was resolved through schedule adjustments.

However, the pilot's timing coincided with regional drone-related security alerts (airport closures in Denmark and Norway due to unidentified drones), raising concerns about public perception. These concerns did not materialise into resistance, but they underscore the sensitivity of drone operations in a broader security context.

5.3.5 Technical

Technically, the first pilot was straightforward from the city's perspective. Flox deployed DJI drones equipped with speakers to play AI-generated sounds tailored to geese, so that other birds or animals would not be disturbed. No significant technical failures were reported to the city, and VLOS operations mitigated the risk of crashes or interference. GPS jamming was not observed, and no concerns were raised regarding data systems or the country of origin for this specific use case. Landing sites were not an issue in this pilot because the drone was operated manually and landed directly with the pilot. If the city proceeds with the planned follow-up using a drone-in-a-box system next summer, reliable electricity for charging at the beaches will become a practical requirement.

The second pilot introduced additional infrastructure and integration challenges due to the drone-in-a-box setup. Installing the docking station on the swimming hall roof required repeated bearing-capacity assessments for various placement options and structural adaptations to protect the rooftop surface. A temporary electrical line was installed to power the station, and the facility owner arranged the other necessary connections. A brief discussion arose regarding the parachute as a risk-mitigation tool. Nokia preferred to use it, but city experts noted that doing so would expand the required ground safety area and interfere more with the everyday facility use. Ultimately, technical requirements were met without major failures during the hovering tests.

Country of origin and cybersecurity were treated as positive technical quality factors in procurement. Interviewees reported that the city placed greater emphasis on avoiding Chinese drone platforms and valued Nordic suppliers because equipment designed for the same climate zone is more likely to withstand wind, ice, and winter operating conditions.

5.3.6 Environmental

Environmental considerations were minimal in both pilots. For geese herding, the primary concern was ensuring the method was safe and non-harmful for wildlife. The deterrent sounds were designed to target only geese, and there was no indication that other birds were affected during the pilot. At the same time, they acknowledged that it would be worth double-checking this in future. Because some of the beaches lie within nature reserves, the city's Environment Department was consulted regarding the applicable regulations and concluded that the pilot did not require any additional permits. Because the flights were VLOS and short-range, any environmental risk posed by a malfunction or crash was considered manageable. If longer flights under SORA or BVLOS are pursued later, the interviewees noted that environmental and safety measures would need to be defined more thoroughly.

For the second pilot, no environmental obstacles were reported. Installing the docking station on the rooftop avoided disturbance in public green areas and reduced the need for extra permitting or fencing. Noise was briefly considered, but city environmental staff did not require formal measurement or notification for this type of limited test. Overall, the pilots were considered environmentally low-impact in their current form, with a more detailed assessment becoming relevant only if flight volumes, distances, or operational complexity increase.

5.3.7 Conclusion

Stockholm's pilots illustrate a pragmatic, phased approach to UAM adoption. The first pilot used a low-risk, high-visibility use case to build public trust and operational confidence. The second pilot, despite regulatory delays, yielded valuable insights into infrastructure integration, interdepartmental coordination, and citizen perceptions. Key lessons include the need for early regulatory engagement, particularly for BVLOS and cross-border operations; stronger market mapping to align procurement expectations with supplier capabilities; and clear communication strategies to contextualise drone activities within broader security narratives. Looking ahead, Stockholm anticipates expanding drone applications for traffic monitoring and urban inspections, but this depends on streamlined permitting processes and scalable service models. The city's experience underscores that, although technical readiness exists, institutional and regulatory frameworks remain the critical enablers of UAM maturity.

5.4 Gdańsk use cases

Gdańsk implemented three distinct drone use cases within a single pilot program, each addressing public safety and urban mobility challenges. The first use case introduced aerial perspectives into annual school safety audits, complementing traditional ground-based assessments to identify hazardous traffic patterns around five primary schools. The second use case, conducted in partnership with the police, focused on monitoring compliance at high-risk intersections, particularly detecting vehicles running red lights during peak hours. The third use case, also involving the police, targeted preventive measures at informal car-racing gatherings, using drones as a visible deterrent and to signal enforcement capability. Together, these cases illustrate Gdańsk's pragmatic approach to leveraging drones for public service tasks while navigating operational, legal, and social considerations.

5.4.1 Political and Administrative

Political support for the pilots was mostly indirect, and there was no indication of political resistance. City leadership did not need to provide a formal endorsement as the initiative aligned with municipal priorities for traffic safety and public order.

Administratively, the pilots were managed within the city's traffic and mobility unit, which routinely conducts school safety audits to identify risk points and improve traffic arrangements around schools. Since this was already part of their regular work, no additional city departments were involved, aside from the communications teams that supported public information dissemination. Coordination with police was central for the second and third use cases, enabling real-time monitoring and enforcement. Landing sites were selected by the on-site operator, prioritising unobtrusive positions that preserved natural traffic flow and minimised interference with pedestrian movement. This was done deliberately to avoid influencing everyday traffic behaviour and to keep audits as natural as possible.

5.4.2 Legal

Legal compliance was straightforward. All drone operations complied with Poland's national regulations, as the city has no local drone-specific laws or strategic framework. The drone operator assumed responsibility for securing necessary permissions, which in these cases amounted to simple notifications rather than formal permits, as flights occurred in non-sensitive urban areas. There are additional national restrictions related to regional security, such as bans on filming strategic infrastructure, such as railways or military areas, but these were not applicable because none of the use cases were located near such sites.

Data protection considerations were addressed through clear operational limits. The unit's GDPR specialist confirmed that the pilots were acceptable as long as the operator avoided zooming on faces, did not single out one person on screen, and did not capture car license plates near schools. The police-supported pilots were the easiest from a legal standpoint. Police involvement meant that enforcement-related footage fell under their mandate to process personal data, which is why a police officer was present alongside the operator to ensure compliance. Overall, both national aviation and data protection regulations were considered manageable and did not constrain pilots.

5.4.3 Economic

Procurement posed minor challenges, primarily around setting a realistic price. Initial quotes from operators exceeded their publicly advertised rates, prompting the city to conduct market research and engage multiple providers. Ultimately, three bids were received from a pool of twelve contacted operators, including outreach via the National Union of Drone Pilots. The winning bid covered all three use cases for approximately 1,600 PLN (approximately €350), significantly below early estimates of 5,000 PLN per location, as suggested by national advisors. Although the low bid initially raised concerns, the operator's detailed proposal and professional background in construction-site safety audits gave the city confidence in service quality. The pilots demonstrated that drones can deliver measurable benefits at modest cost relative to fixed infrastructure solutions, such as traffic cameras, which entail high upfront investment.

In the traffic monitoring use case, drone-supported patrols detected approximately three times as many red-light violations in the same period as standard methods. Even so, the drone helped identify additional violations that the police could not process on-site, because stopping vehicles and completing procedures limited the number of drivers that could be processed during each audit. Early reflections also indicate that the main bottleneck may not be flying but processing video material, since police currently lack the staff time to review footage manually, which makes IT- or AI-supported analysis an essential next step for scaling. The city also plans to conduct a safety audit on the ground around the school to compare the results with those of the drone-based audit. Gdańsk noted that while drones are not necessarily the cheapest option for continuous enforcement, they offer flexibility for targeted checks and occasional audits, making them economically attractive for cities lacking pervasive surveillance systems.

Looking ahead, the city expects follow-on procurements for these use cases and sees continued outsourcing as the realistic path, using external operators until there is sufficient evidence of value to justify bringing drone capability in-house. At this stage, however, Gdańsk does not see a need to hire dedicated drone staff, because UAM is still too new in the municipal system. However, drone skills might become an added qualification rather than a separate job role.

5.4.4 Social

Public response to the pilots was overwhelmingly positive. Around schools, children reacted playfully by waving and interacting with the drones, while parents and other passersby primarily expressed curiosity rather than concern. One isolated incident occurred when a resident briefly thought the drone was facing her apartment. However, on-site clarification resolved the issue. The geopolitical context shaped broader sentiment, as Ukrainian residents viewed drones favourably, associating them with national defence efforts. Negative reactions were limited to occasional social media comments under police-related pilots.

Proactive communication underpinned social acceptance. Information was disseminated through school channels to parents and students, as well as using posters, on-site stands, police social media, and city websites to reach a wider audience. Previously conducted surveys indicate broad approval, with scepticism focused on commercial drone applications rather than public-service use cases. Internally, some concerns were raised about potential public sensitivity to drones. The team worried that heightened regional security incidents involving military drones crossing Polish borders might cause unease in residents. However, these fears did not materialise, and proactive communication mitigated the risks of misunderstanding.

5.4.5 Technical

Technical performance was generally reliable. One school audit was postponed first because a solar magnetic storm coincided with GPS interference that the team attributed to possible Russian jamming, and then because of rain. The third attempt succeeded, showing that GPS dependence and weather still require contingency planning. Regarding the traffic monitoring pilot, the police initially expected the drone to enable monitoring of all directions and types of violations at the junction. However, the aerial perspective revealed that the situation was too dynamic to cover everything simultaneously. Therefore, each audit had to focus on one violation type in a single direction at a time.

Operationally, the DJI Air 3S served as the primary platform, supplemented by the DJI Mini 4 Pro units to maintain continuous coverage during battery swaps. This redundancy ensured uninterrupted 45-minute recordings for school audits, a critical requirement given narrow observation windows before classes began. Image quality met HD-ready standards, and workflow design minimised gaps in footage. No cybersecurity or data sovereignty concerns arose. However, future tenders may incorporate origin-of-technology criteria as awareness of supply-chain risks increases.

5.4.6 Environmental

Environmental impacts were considered minimal. All flights occurred in dense urban areas, away from parks, protected sites, or bird nesting areas, and no environmental permits were required. The operator reported no problematic bird interactions. Birds were sometimes briefly curious but quickly lost interest. Drone noise was masked by ambient city sound. It was noted that it may change if future flights move into parks or other areas, where both wildlife disturbance and noise could require closer ecological assessments. It was noted that weather remains a practical constraint on drone use, as discussed in Section 5.4.5.

5.4.7 Conclusion

Gdańsk's pilots demonstrate the versatility of drones in enhancing urban safety and operational efficiency. Key achievements include tripling enforcement effectiveness at intersections relative to traditional patrols and enhancing school audits with comprehensive aerial imagery. The main challenges were primarily operational and environmental. Scheduling had to adapt to unpredictable weather and short episodes of GPS disruption. Procurement also needed extra effort because quoted prices varied widely from advertised rates. Legal and social acceptance proved favourable, aided by clear communication and alignment with public-interest objectives.

Strategically, Gdańsk remains at an exploratory stage. The absence of a UAM framework (see Section 3) limits institutionalisation, and reliance on external operators reflects a cautious, cost-efficient approach. Future priorities include integrating drone provisions into broader mobility and safety strategies, developing AI-assisted video analytics to offset police resource constraints, and formalising procurement standards to ensure scalability. By addressing these gaps, Gdańsk can transition from episodic pilots to systematic deployment, leveraging drones as a mainstream asset in urban governance.

5.5 Tartu use cases

Tartu's engagement with urban air mobility under the CITYAM project reflects both ambition and regulatory reality. The city initially planned an automated BVLOS construction supervision pilot, aiming to integrate drones into municipal oversight processes. However, after months of dialogue with the Estonian Data Protection Inspectorate and the Transport Administration, the initiative was abandoned primarily due to legal constraints on the processing of personal data. In its place, Tartu executed a public warning pilot, testing drones equipped with audible and visual alert systems for crisis communication. This pivot illustrates the tension between technological readiness and legislative maturity in Estonia's UAM landscape.

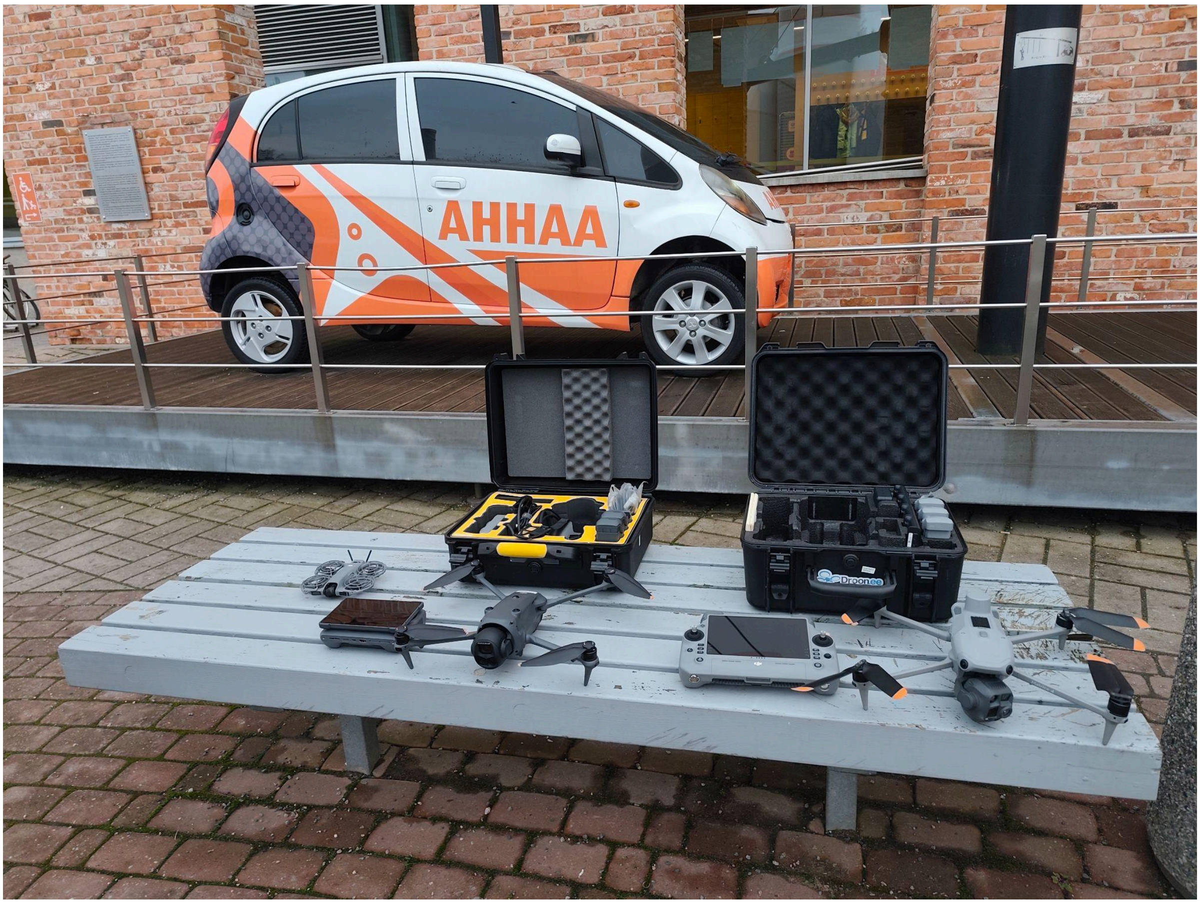
5.5.1 Political and Administrative

Political support for drone innovation in Tartu is closely tied to regulatory clarity. Decision-makers expressed no opposition to either pilot concept, but uncertainty around data protection laws deterred approval of the construction supervision use case. In contrast, the audible public warning pilot faced no such barriers and was endorsed without hesitation, provided that the city communicated with relevant institutions and the public. Notifications were issued to residents and authorities, including the Police and Border Guard Board, Rescue Service, and the Emergency Response Centre. The latter raised concerns about potential spikes in emergency calls, prompting the city to adjust its communication accordingly. Throughout the process, communication with national authorities focused primarily on the Data Protection Inspectorate and the Transport Administration. Internally, the pilot helped build confidence and familiarise staff with drone technology.

5.5.2 Legal

Legal constraints were decisive in shaping Tartu's pilot trajectory. There is considerable legal uncertainty as the Estonian Data Protection Inspectorate is hesitant to take a clear position. The Inspectorate generally formalises its position after something is already implemented. From their perspective, Estonia's current legal framework does not permit municipalities to collect or process personal data via drones, which made the initially planned construction-supervision use case legally too risky for the city to pursue. Consultations with the Inspectorate confirmed that national legislative amendments are planned, but the timeline remains unclear. The city is therefore preparing to act once national regulations are clarified. The city secretary highlighted the complexity of compliance: lawful drone-based supervision would require revising numerous sectoral acts (e.g., Construction Act, Law, and Enforcement Act) or introducing an overarching regulation to harmonise requirements. However, it remains unclear how responsibilities between the national and municipal levels will be distributed under the national legislative amendments. So for now, technology-based supervision remains very limited.

Mainly for these reasons, the initial plan was replaced with an audio- and visual-notice public warning pilot, which faced significantly fewer legal obstacles. No special permits were required, and operations only needed coordination with institutions such as the Police and Border Guard Board, the Rescue Service, and the Emergency Response Centre. In contrast to the initial plan, data protection was not an issue as no data was collected. However, they still had to comply with specific requirements for public warning sirens.



Picture from the CITYAM Roadshow Event in Tartu, December 3, 2025.

5.5.3 Economic

Economic dynamics underscore the contrast between planned and executed pilots. The construction supervision pilot had an estimated budget of €20,000, reflecting the complexity of automated BVLOS operations and data integration. In comparison, the audible warning pilot cost approximately €1,500–€1,600, including organisational expenses. The lower cost also reflects the nature of the pilot, as it was less complex and shorter.

Regarding procurement, the city conducted market research early in the project and found no service provider in Estonia with the necessary licenses for automated BVLOS flights; therefore, international operators were also considered. Over time, local capabilities improved, and the city opted for direct procurement, engaging Droon.ee, Estonia's sole provider of drone-in-a-box solutions, which had prior experience. This suggests that future tenders for more complex use cases may require cross-border engagement unless local capabilities continue to expand. Looking ahead, Tartu aims to continue experimenting, with potential follow-up pilots depending on regulatory developments.

Tartu has also considered hiring a coordinator or establishing a special unit for drone-related services. These discussions have included preliminary proposals for potential placement within the municipal structure and possible areas of responsibility. However, such a role or roles would likely be introduced after the drone strategy (see Section 3) has been finalised.

5.5.4 Social

With respect to social considerations, the city focused on clear communication and notifications to ensure that the public and all relevant institutions (as noted in section 5.5.1) were informed. Because drones can create unease in the current security climate, Tartu deliberately softened audible warnings to avoid causing unnecessary stress. On-site feedback was neutral to positive, as no concerns were raised. Instead, people were interested in the technology and how it was being used in the pilot. In Tartu's view, pilots like this help normalise drones as civilian tools and reduce uncertainty among both residents and decision-makers.

To support this, the city has worked to harmonise its messaging, for instance, through CITYAM training sessions. Tartu recognises that privacy remains the dominant public concern, as surveys show that while residents generally support drones for public service applications, they express strong reservations about commercial use and privacy risks. Tartu takes these concerns into account when planning future activities.

5.5.5 Technical

Technical challenges centred on regulatory limitations rather than hardware deficiencies. The inability to conduct BVLOS flights meant that operations had to be manual, even though a drone-in-a-box system was present on-site. In addition, it was found that the Transport Administration does not yet have a methodology for ground risk assessment, which is required for BVLOS flights. To address this, Tartu collaborated with the University of Tartu to develop one and received initial feedback. However, the work was paused after the city withdrew its plan to conduct BVLOS flights.

For the public warning pilot, the drones were equipped with speakers and LED arrays to deliver audible and visual alerts. Regarding GPS jamming, Tartu relied on the service provider's experience and capability to handle such issues.

A potential technical improvement would be on-drone data processing (e.g., blurring faces) to strengthen data protection and minimise transmission of raw footage. However, this option is not yet available in Estonia. Another anticipated technical challenge is integrating drone data with municipal information systems to support advanced use cases, such as traffic analysis. Because the city already uses multiple information systems, integration would require additional development work.

5.5.6 Environmental

To minimise environmental impacts, the pilot was conducted along the Emajõgi River corridor, where there was little activity and minimal environmental impact. The timing in autumn further reduced the risk, as no people or boats were in the water. As for the audible warnings, the noise levels were modest because the drone itself produces minimal sound. Although the warnings reached approximately 120 dB at the source, wind, distance, and noise from the city environment attenuated the sound. Before the pilot, potential effects on birds and aquatic life were considered but deemed insignificant given the short duration and small spatial footprint. As noted earlier, power supply was managed via portable units, thereby avoiding the need for intrusive infrastructure. In addition, the team made operational pauses for battery changes that further minimised disturbance.

5.5.7 Conclusion

Tartu's experience reflects a strong ambition to adopt drone technology, constrained by regulatory and operational obstacles. The cancelled construction supervision pilot underscores the urgent need for legislative modernisation, while the public warning pilot demonstrates the feasibility and value of low-risk applications. Key lessons include the importance of early regulatory engagement with the Estonian Data Protection Inspectorate and the Transport Administration, risk-sensitive communication with agencies such as the Emergency Response Centre and Rescue Service, and technical foresight, particularly in privacy-preserving data processing.

Strategically, Tartu is advancing toward a structured approach: drafting a two-year roadmap, exploring coordinator roles, and considering dedicated units for drone services. Continued pilots will be essential for building institutional competence and validating economic models. With regulatory alignment and targeted investment, Tartu can transition from cautious experimentation to scalable integration.

5.6 Strategic Recommendations

1. Regulatory Harmonisation and Legal Framework Development

Why: Every city faced BVLOS restrictions and legal uncertainty, including around GDPR and personal data processing. Tartu's cancelled pilot highlights the severity of these gaps.

ACTIONS:

- **National-Level Advocacy**: Form a joint task force to lobby for harmonised BVLOS procedures and U-space implementation across Estonia, Finland, Sweden, Germany, Latvia and Poland.
- **GDPR-Compliant Standards**: Develop a shared protocol for privacy-preserving drone operations, including:
    - On-drone data processing (e.g., real-time anonymisation, face/license plate blurring).
    - Clear data retention and deletion policies for municipal pilots.
- **Cross-Border Permit Streamlining**: Address delays like Stockholm's SORA approval bottleneck by creating a fast-track mechanism for foreign operators under EU frameworks.

2. Institutional Capacity and Governance

Why: None of the cities has fully institutionalised UAM governance. Hamburg, Helsinki and Tartu are drafting strategies; Stockholm is relying on internal guidelines.

ACTIONS:

- **Dedicated UAM Coordinator Roles**: Appoint sectoral coordinators within city administrations (Helsinki's model) to:
    - Oversee compliance.
    - Act as liaison with national authorities.
    - Drive integration into land-use and mobility plans.
- **Embed UAM in Existing Strategies**: Instead of standalone documents, integrate UAM into:
    - Smart Mobility Plans.
    - Land-Use Development Plans (e.g., Helsinki's MAL framework).
- **Knowledge-Sharing Network**: follow Hamburg's Windrove model for cross-city learning and joint pilots.

3. Market Development and Procurement Innovation

Why: Helsinki and Stockholm faced limited supplier pools for advanced solutions; Gdańsk and Tartu relied on single providers.

ACTIONS:

- **Joint Procurement Frameworks**: Launch regional tenders for drone-in-a-box systems, BVLOS-capable platforms, and AI analytics to:
    - Aggregate demand.
    - Reduce costs.
    - Stimulate supplier investment.
- **Dynamic Procurement Models**: Adopt flexible frameworks allowing cities to purchase multi-purpose drone services (e.g., logistics, inspections, traffic monitoring) on demand.
- **Industry Engagement**: Host Drone Innovation Challenges to attract startups and accelerate solution development.

4. Public Engagement and Social Acceptance

Why: All cities emphasised transparency, while privacy concerns dominate public discourse.

ACTIONS:

- **Unified Communication Toolkit**: Develop a standardised messaging template for pilots, including:
    - Purpose and benefits.
    - Privacy safeguards.
    - Emergency contact protocols.
- **Visible Public-Benefit Use Cases**: Prioritise pilots with clear societal value (e.g., rescue, flood monitoring, safety audits) to build trust.
- **Citizen Feedback Loops**: Institutionalise surveys and participatory workshops to inform strategy and address concerns proactively.

5. Technical Innovation and Infrastructure

Why: Technical readiness varies; BVLOS automation and data security remain critical gaps.

ACTIONS:

- **Invest in Edge AI:** Support R&D for on-drone analytics to minimise raw data transmission and ensure GDPR compliance.
- **Shared U-Space Services**: Develop a regional U-space platform for real-time air traffic coordination, reducing reliance on manual notifications (e.g., Helsinki's 78 phone calls per pilot as one had to be made before and after each of the 39 flights).
- **Climate-Resilient Hardware**: Specify procurement criteria for drones capable of operating in Nordic weather conditions (wind, snow, low temperatures).

6. Environmental and Risk Management

Why: Environmental impacts were minimal but require formalisation for future scale-up.

ACTIONS:

- **Standard Environmental Assessment Protocols**: Create guidelines for:
  - Noise measurement.
  - Wildlife impact mitigation.
- **Risk-Based Flight Planning**: Adopt conservative corridors (e.g., Tartu's river route) and emergency landing protocols as baseline standards.

6. Public acceptance surveys

One of the outputs of the CITYAM project is Output 2.3, the Public Acceptance Toolkit. As the authors of the toolkit, Sternfeldt & Mädamürk (2025) describe the importance of social/ public acceptance:

Social acceptance of UAM gauges the willingness of communities to support the integration of aerial vehicles and accompanying infrastructure into urban transportation systems. Acceptance includes attitudes toward UAM technologies, considering factors like environmental impact, safety, privacy, visual and noise pollution, trust in technology and authorities, and perceived benefits.

This section provides a summarising overview of the surveys conducted by CITYAM partner cities during the project and the methods used to collect the data.

6.1 Hamburg

Hamburg contracted with the polling company Parlametric to conduct a representative survey of 500 city residents. The CITYAM public acceptance general questionnaire was used 2 times, once in the spring of 2024 and again in the autumn of the same year, after HPA had flown approximately 150 use case demonstration flights and expanded the public outreach. During the second round, the use case questionnaire was also used to see what the residents thought of the use cases.

Hamburg was pleased with the polling company, as they were highly professional and helped provide excellent representative insights across multiple age groups, education levels, and genders. The results were presented in an easy-to-understand format that could be shared with city stakeholders.

For Hamburg, it was clear that the more positive results were associated with use cases tied to public benefit, such as emergency response, including medical delivery, and infrastructure inspection. On the low end of the acceptance spectrum were private goods delivery and personal transport. One notable difference compared with the other five cities in the project, Hamburg had a slightly higher proportion of “I don't know” responses. Since the surveys were conducted slightly differently for the most part, it may be that other cities had more UAM-interested participants, or that there is a greater need for public engagement and education here to bring this topic to the forefront.

Given the survey results, which are overall positive regarding public-benefit use cases, Hamburg believes that Hamburg UAM integration activities are on the right track, as this has been the focus of these activities. The aim is to conduct the surveys periodically and assess how the results inform current opinions on drones and various use cases.

6.2 Helsinki

Helsinki conducted five public acceptance studies within CITYAM to build a solid understanding of attitudes toward drones. A total of 2351 responses were collected and analysed. Forum Virium Helsinki contracted a polling company to conduct several representative surveys among the city's residents. As in Hamburg and Stockholm, the Swedish polling company Parlametric was selected for most of the work. The CITYAM public acceptance general questionnaire was used twice, once in spring 2024 and again in spring 2025. They were representative of the population by gender and age and covered the Helsinki capital region. The use case survey was done twice, corresponding to the two different drone use-case pilots that were carried out. Lastly, a qualitative survey was conducted by the Finnish polling agency Taloustutkimus, comprising only open-ended questions. This combination of various survey types provided a comprehensive, complementary picture of social acceptance of drones in Helsinki.

General survey 1 was done in spring 2024 and had 502 responses. In addition to the Parlametrics panel of 300 respondents, Forum Virium Helsinki independently collected 200 responses, which were combined with the Parlametrics panel for analysis. Among others, Forum Virium Helsinki disseminated the survey to the so-called Helsinki “Trial Troops”: a group of around 500 people who had previously registered to take part in various surveys or workshops related to innovations in Helsinki and, where possible, to test them in their neighbourhood. Through these and other channels, Forum Virium Helsinki collected 200 responses following extensive dissemination efforts. It confirmed that the choice to (also) use an external expert agency was a good one.

General survey 2 was conducted in March-April 2025 and had 500 responses. The overall acceptability of the various use cases decreased compared to the 2024 survey. The ranking stayed the same, though: drones for emergency & disaster response were most accepted in both surveys, environmental monitoring second and construction/infrastructure inspection third. Conversely, concerns about drones increased across all accounts relative to 2024, although personal injuries and property damage remained the top 2 concerns.

Use case survey 1 was done in October-November 2024, around the period of the water rescue pilot. Parlametric collected 400 responses, and Forum Virium Helsinki collected 63 responses independently. The answers were combined in the analysis. Respondents saw this particular use case as easy to understand, beneficial for everyone and improving safety.

Use case survey 2 was conducted in November 2025 by Parlametric during the period when medical logistics drones were operating in Helsinki (38 flights). The survey received 511 responses, including additional responses regarding attitudes toward medical drone delivery services. Most residents believed drones could be more environmentally friendly than fossil-fuel–based solutions, although some remained neutral or sceptical. There was noticeable concern that drones could be misused for criminal purposes, with a majority considering this at least reasonably likely.

The qualitative survey conducted in November 2025 received 375 responses from the Helsinki capital region and was carried out and analysed by Taloustutkimus in Finland. There were only open questions in this survey. A remarkable result was that, when asked “What thoughts do drones evoke in you?", there was a significant predominance of negative connotations over positive ones, with "fear," "anxiety," and "war" mentioned most often. Whereas in the 2024 general survey, the overall analysis indicated a more positive than negative attitude toward UAM. This negative trend is important for cities to be aware of and to address.

All results, as well as the overall public acceptance toolkit (survey questions in Finnish, Swedish and English), have been transferred to the communication department within the City of Helsinki, as well as to the people in the city occupied with Urban Air Mobility via one of the Training Activities part of Work Package 3. They will continue polling citizens' opinions on this topic. In addition, the newly launched Metropolitan UAM (European Regional Development Funding) project will integrate the CITYAM tool and Helsinki-specific survey results into its work over the next two years.

6.3 Stockholm

Stockholm conducted four studies within CITYAM to build a broad and nuanced understanding of public attitudes toward drones. The data collection included an extensive digital survey through the City's Citizen Panel (2025), two quantitative surveys carried out by Parlametric, the first in 2024 linked to the drone-based goose management trials at public beaches, and the second in autumn 2025 focusing on general attitudes and trust as well as a qualitative study by Origo during the drone-in-a-box tests at Farsta swimming hall. Together, these studies captured perspectives from residents, beach visitors, pool visitors, staff and passers-by, providing a rich and diverse sample.

A mixed-methods approach was used, including digital surveys, on-site observations, semi-structured interviews, and QR code interactions at the beaches. This combination enabled Stockholm to obtain both statistically robust insights and a deeper qualitative understanding of how people respond to drones in real urban settings.

Several aspects of the work functioned particularly well. The concrete, easy-to-understand use cases – such as geese herding or the installation at Farsta – made it straightforward for citizens to understand the purpose, resulting in generally positive attitudes. Communication efforts, including information letters, signage and QR codes, were well received and helped build trust. The qualitative study also provided important nuance around issues such as noise, clarity of purpose and expectations.

At the same time, areas for improvement emerged. Despite prior information, many visitors at Farsta did not fully understand the purpose of the tests, underscoring the need for clearer, more explicit communication. Concerns related to privacy, data use, and general transparency were evident across several studies, signalling the importance of clearer messaging about safeguards and governance. At Farsta, noise from the docking station also affected staff, illustrating the need to assess site-specific operational impacts earlier.

A few results stand out as particularly important for Stockholm. Residents tend to support drones when their purpose is clearly beneficial for society. However, concerns about privacy, noise, safety and transparency remain central for long-term acceptance. There are also distinct preferences about where drones should take off and land – rooftops and industrial areas are perceived as appropriate, while sidewalks and transit areas are not.

The results are now being used as key input to Stockholm's continued work on urban air mobility. They inform the development of the city's long-term UAM strategy, guide future pilot projects and communication efforts, and support the implementation of the CITYAM UAM Roadmap. The studies also strengthen the city's internal knowledge base and contribute to future policy development, infrastructure planning and the integration of drones into Stockholm's transport system.

6.4 Gdańsk

In Gdańsk, the public acceptance survey was conducted twice to measure general social acceptance of urban air mobility. The first round was conducted between March 14th and 28th, 2024, with 2,609 Gdańsk residents participating. The second round took place between September 19th and October 3rd 2025. Although more than 1,600 residents participated in the second round, the sample comprised 1,254 respondents, defined as those who completed the entire questionnaire.

The questionnaire was prepared in an interactive format using a tool developed by the Social Research and Analysis Unit of Gdańsk City Hall. Links to the survey were distributed via a newsletter associated with the Gdańsk Resident Card. The newsletter has 360,000 subscribers, ensuring a broad reach of information to card users and a high survey response rate. The downside of this form of communication is that the results are not representative; they cannot be generalised to the entire population of Gdańsk. For example, there was an overrepresentation of people with higher education. However, this challenge was overcome by engaging a research agency, which analysed and compiled the results for us using a data weighting procedure. As a result, the results we present are representative of Gdańsk. However, it should be noted that during the first round of research, an additional press release was issued to inform the public about the research and encourage participation.

In both 2024 and 2025, the vast majority of Gdańsk residents (over 90%) reported having heard of drones before the study. The primary source of information on UAVs is the media (social media, television, and other sources). It is worth noting that in 2025, the percentage of respondents declaring this source is visibly higher – 83% in 2025 vs 74% in 2024. It may be due to extensive media coverage of the hostile incursion of Russian drones into Polish territory in September 2025.

Roughly half of the respondents also declare their personal experience – they have seen or heard about drones at some point before the study. Some Gdańsk residents report that they are UAV pilots themselves; others learned about drones in school or at a university, or at industry conferences and fairs. Gdańsk residents declare a moderate level of knowledge regarding urban air logistics. One in three admits no knowledge of the subject. And the declarations on lack of knowledge are slightly more frequent in 2025 (36% in 2025 vs 33% in 2024).

When it comes to acceptance, both rounds of the study show that the greatest social acceptance of urban air mobility occurs mainly in the context of ensuring the safety of residents. In that regard, the level of acceptance stays roughly the same in 2024 and 2025. But minor changes in attitudes in this regard can be observed in the strength of acceptance for certain types of drone use. Most of them are slightly less acceptable now than they were 1.5 years ago.

As for concerns, Gdańsk residents tend to be more apprehensive in 2025. It may be attributed to the psychological aftermath of the Russian drone attacks on Polish territory in September this year. The most significant concerns regarding drones in both rounds of the study were misuse of data (75-78% of respondents in 2024 and 2025), privacy breaches (74-77%), and national security (63-68%).

The most suitable locations for drone take-offs and landings are industrial areas and the rooftops of commercial or public buildings. On the other hand, there is little or no consent for drones to take off and land from public transport stops or sidewalks. Acceptance of drone take-off and landing places slightly changed in 2025. Some sites are now perceived as somewhat more suitable than in 2024 – e.g. residential areas (suitable for 15% of respondents in 2024 vs 22% in 2025) or commercial areas (44% in 2024 vs 48% in 2025). On the other hand, other sites are deemed less suitable for drones in 2025 – e.g. roofs of private buildings, pavements, recreational areas or bus stops. With respect to site selection, authorities should pay particular attention to proximity to pedestrian zones and residential areas, cargo content, safety, and the frequency of landings and takeoffs. In 2025, the importance of many factors has increased markedly compared with 2024. For example, area security is important to 84% of respondents in 2025 (compared with 77% in 2024). The same applies to, e.g., the frequency of landings and takeoffs (79% in 2025 vs 72% in 2024).

Preliminary results of a cross-city comparison study and detailed results of surveys conducted in Gdańsk in 2024 and 2025 were presented and used during the local training event ‘Creating public acceptance for urban air mobility in Gdańsk which took place on November 24, 2025. The training aimed to provide participants with knowledge, tools and practical skills related to building public acceptance for urban air mobility. Fifteen people from different departments participated. The training programme consisted of two parts. The first part presented the general concept and research tools related to the subject of the training. The second part consisted of workshop exercises aimed at diagnosing problems related to residents' concerns about urban air mobility, discussing the priorities for drone applications, and developing proposals for communication and consultation activities to increase public acceptance of the services being implemented. The exercises were developed based on research findings on the level of public acceptance of urban air mobility.

During the workshop, participants analysed the priorities for drone applications in the city. Among the recommendations for building public acceptance of sustainable urban air mobility, several key proposals stand out:

1. Creating an urban standard for communication about drones, which would include information on flight rules, designated no-fly zones and the responsibilities of operators. The standard should be drafted in a simple, understandable, and practical manner.
2. Developing channels of communication with residents – the Gdańsk Contact Centre could play a key role as an information point. It would also be worth considering publishing answers to frequently asked questions (‘FAQ: drones in Gdańsk’).
3. Intensification of inter-institutional cooperation and networking of organisations in local communities for the purpose of exchanging information and undertaking educational activities. Among the entities that could participate in these activities are, for example, schools, district councils and non-governmental organisations.
4. Implementation of pilot projects in selected locations, which would allow residents to become directly familiar with the technology and its possible applications. This would also help to strengthen trust in the city as an operator of air mobility activities.
5. Regularly survey public opinion using tools developed in the project to track changes in the level of acceptance of urban air mobility, evaluate the effectiveness of communication and education activities, and quickly identify new areas of concern.

6.5 Riga

In Riga, two community surveys were carried out to assess public acceptance of urban air mobility. The first survey, conducted in March 2024, received approximately 420 responses, indicating significant community interest. The second survey was conducted in October 2025 and gathered around 70 responses. Although the smaller sample size in the second round limited representativeness, the two surveys together provided valuable insights into both initial perceptions and subsequent changes in community acceptance over time.

The surveys were administered via the city’s survey platform, which integrates with GIS systems, enabling respondents to provide spatially relevant input, particularly regarding preferred drone take-off and landing locations. Dissemination relied primarily on the city's official Facebook page and outreach to the city's own neighbourhood community centres. As a result, no additional costs were incurred, and social media proved good for reaching diverse neighbourhood groups. However, the city also noted that reliance on social media may exclude residents who are less active online, and that participation and inclusivity could be strengthened through additional channels, communication, reminders, and advance notice of survey topics to encourage more thoughtful responses.

The results showed the highest level of social acceptance for public-benefit use cases. Emergency and medical services were the most widely supported (70–85%), followed by public surveillance and safety tasks (64%). Notably, the residents did not consider drone noise as a significant concern in either round. The acceptance was lowest for private goods delivery and passenger transport (34–35%), and respondents expressed clear reservations about locating drone take-off sites in recreational areas. Overall, residents expressed a welcoming attitude toward UAM, provided that there is clear communication and that advance notice and health and safety applications remain the top priorities.

Insights from both surveys will inform future engagement campaigns, pilot projects, and policy frameworks to ensure UAM development aligns with public priorities. The results also support practical planning decisions, particularly site selection for drone take-off and landing infrastructure, by avoiding recreational areas and considering more suitable locations, such as parking spaces. Community feedback underscores that clear and transparent communication strategies are essential for maintaining trust and public support, and the findings will inform ongoing UAM-related projects and planning.

6.6 Tartu

Public acceptance in Tartu was assessed in two survey rounds conducted in April 2024 and October 2025. Both surveys were organised as online questionnaires on the city's official website. The number of respondents was 153 in 2024 and 126 in 2025, which was considered satisfactory and comparable to participation levels in other similar municipal public opinion surveys.

In the first round, around two-thirds of respondents were male. However, female participation increased from 34% to 47% in the second survey. The average age of respondents decreased from 42 to 37 years between the two rounds. In 2024, 71% of respondents reported higher education, declining slightly to 62% in 2025, while the share of respondents with secondary education remained similar (28% in 2024 vs 30% in 2025). The share of respondents who were employed decreased from 90% to 78%.

The results indicate that residents are generally aware of drones and their potential applications. Acceptance was higher among residents with higher education. The findings indicated that residents accept the use of drones for the common good, including emergency services, scientific research, and environmental or infrastructure monitoring. In contrast, the acceptance was lowest for passenger transport and commercial logistics, showing that support increases when drone activity is clearly linked to public benefit and decreases when it is perceived as commercial. The main concerns of residents are privacy, proper data management, and security. In addition, the results showed that the active use of drones in residential areas was considered unacceptable, and that pilot projects and awareness-raising through engagement are needed.

The survey results were incorporated into the city's strategic drone (UAM) roadmap, and, based on these findings, key messages were formulated for future communications in the field. Tartu plans to continue conducting surveys in the coming years, providing an opportunity to monitor public opinion dynamics and to organise communication activities based on the results.

References

Geerdink, Tara, Marit Sprenkeling, Adriaan Slob, and Hanneke Puts (2020). "D3.1. Guideline Societal Embeddedness Assessment." Available: https://norceresearch.brage.unit.no/norceresearch-xmlui/bitstream/handle/11250/3063714/D3.1.%20Guideline%20Societal%20Embeddedness%20Assessment%20%281%29.pdf?sequence=1

Honkavaara, Eija, Kettunen, Pyry, Rönneberg, Mikko, Jussila, Anssi, Niemi, Leo, Hadaway, John, Farstad, Miia, and Mladenović, Milos (2025). "Consolidated geospatial tool for landing site planning and prioritisation." Available: https://interreg-baltic.eu/wp-content/uploads/2025/01/CITYAM-O2.1-Consolidated-geospatial-tool-for-landing-site-planning-and-prioritisation.pdf

Mladenović, Milos, Niemi, Leo, Saif, Atiullah, and Honkavaara, Eija (2024). "Development of a geospatial decision-support tool for Urban Air Mobility landing and launch site location planning: Analysis, framework and technical setup." Available: https://interreg-baltic.eu/wpcontent/uploads/2024/01/D1.4-Development-of-a-geospatial-decision-support-tool-forUrban-Air-Mobility-landing-and-launch-site-location-planning.pdf

Müür, Jaanus. 2024. "CITYAM empowers responsible urban air mobility: Deliverable of Activity 1.5 - Setting up the evaluation framework." Available: https://interreg-baltic.eu/wp-content/uploads/2024/02/D1.5-Setting-up-the-evaluation-framework-final.pdf

Sprenkeling, Marit, Tara Geerdink, Adriaan Slob, and Amber Geurts (2022). Bridging Social and Technical Sciences: Introduction of the Societal Embeddedness Level. *Energies*, 15, 6252. Available: https://doi.org/10.3390/en15176252

Sternfeldt, Silver and Kaja Mädamürk (2024). "Consolidated Urban Air Mobility Public Acceptance Toolkit." Available: https://interreg-baltic.eu/wp-content/uploads/2025/02/O2.3.-Consolidated-Urban-Air-Mobility-Public-Acceptance-Toolkit-1.pdf

Appendix I Questionnaire on the GIS tool

Political/administrative

What are the main political concerns in the context of drone landing sites?

Does the city have a consolidated UAM strategy that also covers drone landing sites?

What would the current planning processes look like if a company approached the city government to establish drone landing sites?

- Openness
- Length
- Technical difficulty

Would the adoption of the GIS tool require changes in the current planning processes?

- Would using a GIS tool require a more inclusive process based on the tool's logic, both internally and externally (e.g., determining the weights of different datasets, which data to include)? Is it feasible, considering the existing administrative culture?
- Are there administrative obstacles or concerns that would complicate the adoption of the GIS tool?

Legal

Are there legal obstacles or concerns related to the use of data necessary for the tool?

Are there gaps between legally set technical standards related to planning and the availability of geo-informational data in the format and precision suitable and necessary for the tool?

Economic

Are there economic obstacles or concerns that would complicate the adoption of the GIS tool?

Social

Are there social concerns or obstacles related to the GIS tool?

Technical/Technological

Possible technical obstacles or concerns that complicated piloting the GIS tool or would complicate the adoption:

- Availability of geoinformation datasets
- Availability of knowledge on how to determine weights

Environmental

Are there environmental concerns or obstacles related to the GIS tool?

Appendix II List of interviewees on the GIS tool

Interview 1

Representatives of the City of Helsinki: Urban Environment Division, December 12, 2024

Interview 2

Representative of the Free and Hanseatic City of Hamburg: Agency for Geoinformation and Surveying, December 19, 2024

Interview 3

Representatives of the City of Stockholm: Transport Department, January 31, 2025

Interview 4

Representative of the City of Tartu: Department of Communal Services, April 21, 2025

Interview 5

Representative of the City of Riga: Department of City Development, April 29, 2025

Interview 6

Representatives of the City of Gdańsk: Municipal Transport Authority in Gdańsk, August 5, 2025

Appendix III Questionnaire on the use case pilots

POLITICAL/ADMINISTRATIVE

Overview of the pilot:

- Its focus, reasons why this pilot was chosen, etc

Did the drone pilot have support and endorsement from the city's political leadership?

- What were the main political concerns related to organising a drone pilot? How were they overcome?
- Does the city have a consolidated strategy for UAM that supports drone pilots?

Did the pilot have support and interest from national authorities such as CAA, ANSP and others?

- Administrative hurdles related to organising and running the drone pilot (e.g., permits, procedures):
    - Were there any administrative hurdles related to organising drone flights? If yes, which ones? How were they overcome?
    - Were there any administrative hurdles related to finding, establishing and using a landing site? If yes, which ones? How were they overcome?
- Challenges related to cross-organisational collaboration in organising and running the drone pilot (resources, interest, knowledge):
    - Were there cross-organisational collaboration challenges related to organising drone flights? If yes, which ones? How were they overcome?
    - Were there cross-organisational collaboration challenges related to finding, establishing and using a landing site? If yes, which ones? How were they overcome?

Did the pilot have support from different city departments and units related to the drone pilot?

- Administrative hurdles related to organising and running the drone pilot (e.g., permits, procedures):
    - Were there any administrative hurdles related to organising drone flights? If yes, which ones? How were they overcome?
    - Were there any administrative hurdles related to finding, establishing and using a landing site? If yes, which ones? How were they overcome?
- Challenges related to cross-organisational collaboration in organising and running the drone pilot (resources, interest, knowledge):
    - Were there cross-organisational collaboration challenges related to organising drone flights? If yes, which ones? How were they overcome?
    - Were there cross-organisational collaboration challenges related to finding, establishing and using a landing site? If yes, which ones? How were they overcome?

LEGAL

- Legal gaps and obstacles at the **local level** related to organising and running a drone pilot:
    - Were there legal gaps or obstacles related to organising drone flights? If yes, which ones? How were they overcome?
    - Were there legal gaps or obstacles related to finding, establishing and using a landing site? If yes, which ones? How were they overcome?
- Legal gaps and obstacles at the **national level** related to organising and running a drone pilot:
    - Were there legal gaps or obstacles related to organising drone flights? If yes, which ones? How were they overcome?
    - Were there legal gaps or obstacles related to finding, establishing and using a landing site? If yes, which ones? How were they overcome?

ECONOMIC

- Were there challenges related to procuring the drone for piloting purposes? If yes, which ones? How were they overcome?
- Were the planned costs related to pilot implementation realistic or were the actual costs higher? (planned vs actual costs)
- Was there local know-how from the industry's side that supported organising the pilot?
- Does UAM require hiring new people with drone-related competencies?
- Will the pilot have a follow-up procurement or any other next steps that would bring about economic benefits?

SOCIAL

- Social concerns and obstacles related to organising and running a drone pilot:
    - Were there social concerns or obstacles related to organising drone flights? If yes, which ones? How were they overcome? (Privacy, social annoyance, societal openness/acceptance)
    - Were there social concerns or obstacles related to finding, establishing, and using landing sites? If yes, which ones? How were they overcome? (Privacy, social annoyance, societal openness/acceptance)

TECHNICAL/TECHNOLOGICAL

- Technical concerns/obstacles/gaps related to organising and running a drone pilot:
    - Were there technical concerns/obstacles/gaps related to organising drone flights? If yes, which ones? How were they overcome?
    - Were there technical concerns/obstacles/gaps related to finding, establishing, and using landing sites? If yes, which ones? How were they overcome?
- Were there any additional technological concerns (e.g., country of origin, data + its ownership)? If yes, which ones? How were they overcome?
    - And foreign interference / GPS jamming challenges?

ENVIRONMENTAL

- Environmental concerns and obstacles related to organising and running a drone pilot:
    - Were there environmental concerns or obstacles related to organising drone flights? If yes, which ones? How were they overcome?
    - Were there environmental concerns or obstacles related to finding, establishing, and using landing sites? If yes, which ones? How were they overcome?

Appendix IV List of interviewees on the use case pilots

Interview 1

Representatives of the City of Helsinki: Forum Virium Helsinki, September 9, 2024

Interview 2

Representatives of the City of Stockholm: Transport Department, Kista Science City, October 11, 2024

Interview 3

Representatives of Hamburg: Hamburg Aviation, Hamburg Port Authority, November 26, 2024

Interview 4

Representative of the City of Gdańsk: Municipal Transport Authority in Gdańsk, October 31, 2025

Interview 5

Representatives of the City of Stockholm: Transport Department, Kista Science City, November 10, 2025

Interview 6

Representatives of the City of Helsinki: Forum Virium Helsinki, November 13, 2025

Interview 7

Representative of the City of Tartu: Department of Communal Services, November 19, 2025