The Future of Drones in Estonia

SKYCORP

Technologies

31.01.2024 - Tartu

EU Green Deal
Carbon Neutrality by 2050

- Transport emissions reduction by 90%
- Transport forms 25% of total GHG, aviation ~12%
- FIT FOR 55, European Hydrogen Strategy, REPowerEU
- European Drone Strategy 2.0 – U-space regulation 26.01.2023
- IPCEI, ReFuel EU, JTF, RRF, Clean Hydrogen Partnership, Clean Aviation, Horizon Europe, SESAR JU, Innovation Fund, ERDF, RED II -> RED III
- Climate Neutral Cities by 2030
- Russia's war against Ukraine put Energy security and Deeptech at the forefront
- Baltic / Nordic airspace perfectly suited for climate neutral (manned and unmanned) aviation testing and business case validation
- Needs working ecosystems in a cross-industrial approach, cooperation

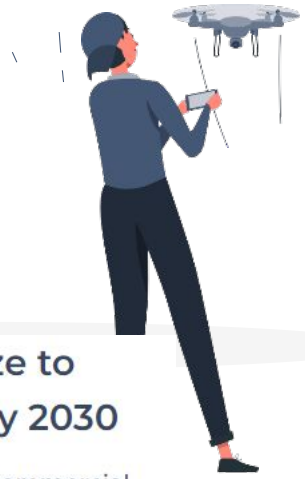
solution < 0.5 meter

EVERYONE LIKES NUMBERS – Let's set the

- Drones **can save 60-90%** of typical inspection costs and time
- Removing **just one car off the street** can save **5-11 tonnes of CO2e** annually, which is over **80+ times** more environmentally friendlier.
- **Surveying 1 ha of crops** by hand = **1 week**, by drone = **3 minutes**
- Potential for **40% savings in delivery costs**
- **150x+** cheaper than manned aviation

- For "air taxies" – imagine bypassing traffic for the price of roughly **0.6-1€ / km** while saving **1+ minute per km vs car.**

Estimated impact on UK economy by **2030** = **€50 billion! (GDP)**, **€19 billion cost savings**, **760 000 drones, 628 000 jobs** (Source: PWC)
Estonia **€568M GDP**, **€300M savings**, **8700 drones**, **7400 jobs**, **6174**

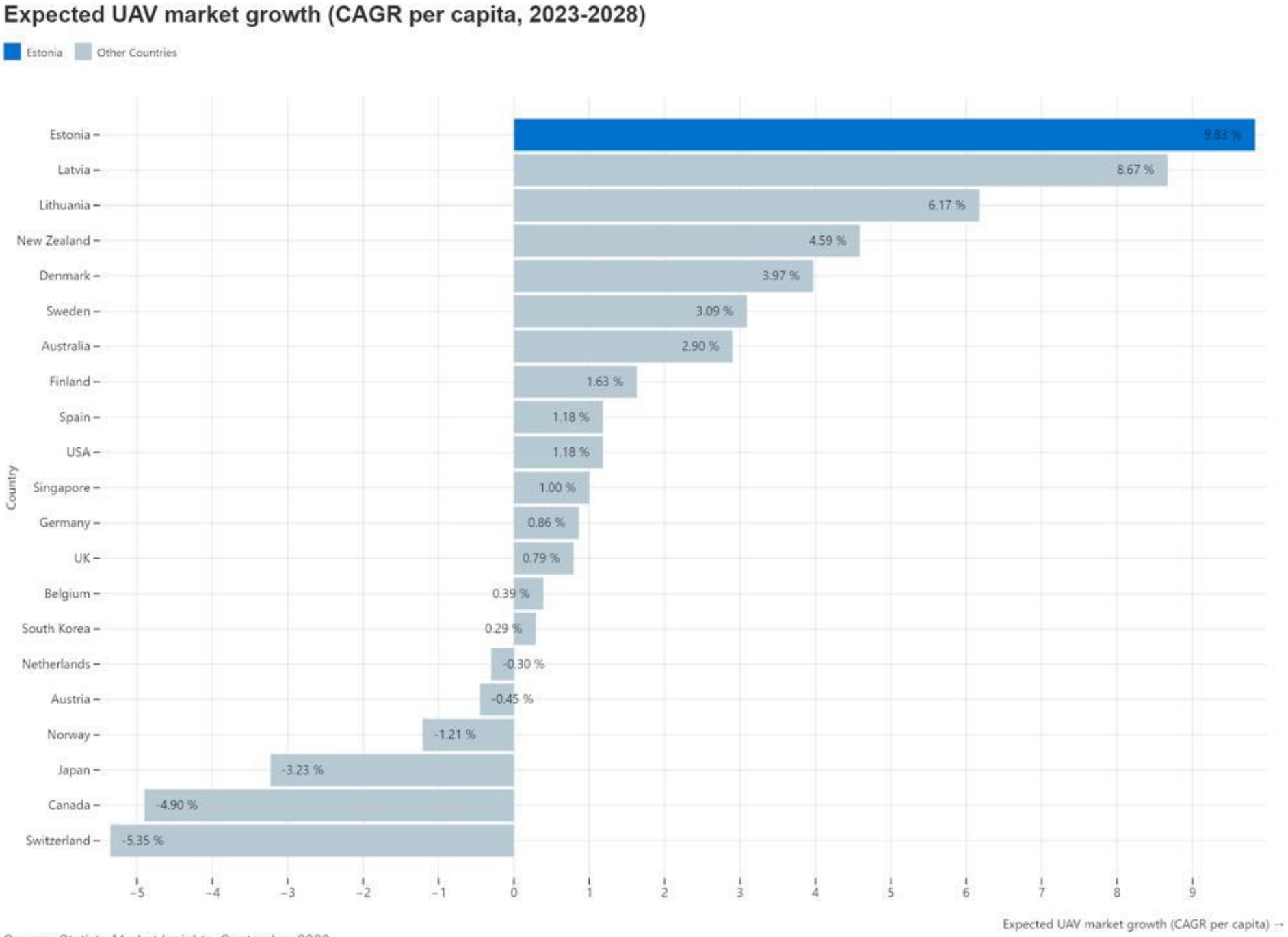


- Global market numbers (thinking in Billions)
  - Drones heading towards €38 billion by 2025
  - Air taxis €32 billion by 2035
  - Hydrogen Aviation €140 billion by 2040

Commercial Drones Market Size to Worth Around USD 504.5 Bn by 2030

According to Precedence Research, the global commercial drone market size is expected to be worth around USD 504.5 billion by 2030 and is poised to grow at a CAGR of 46.04% over the forecast period 2022 to 2030.

July 22, 2022 18:00 ET | Source: Precedence Research

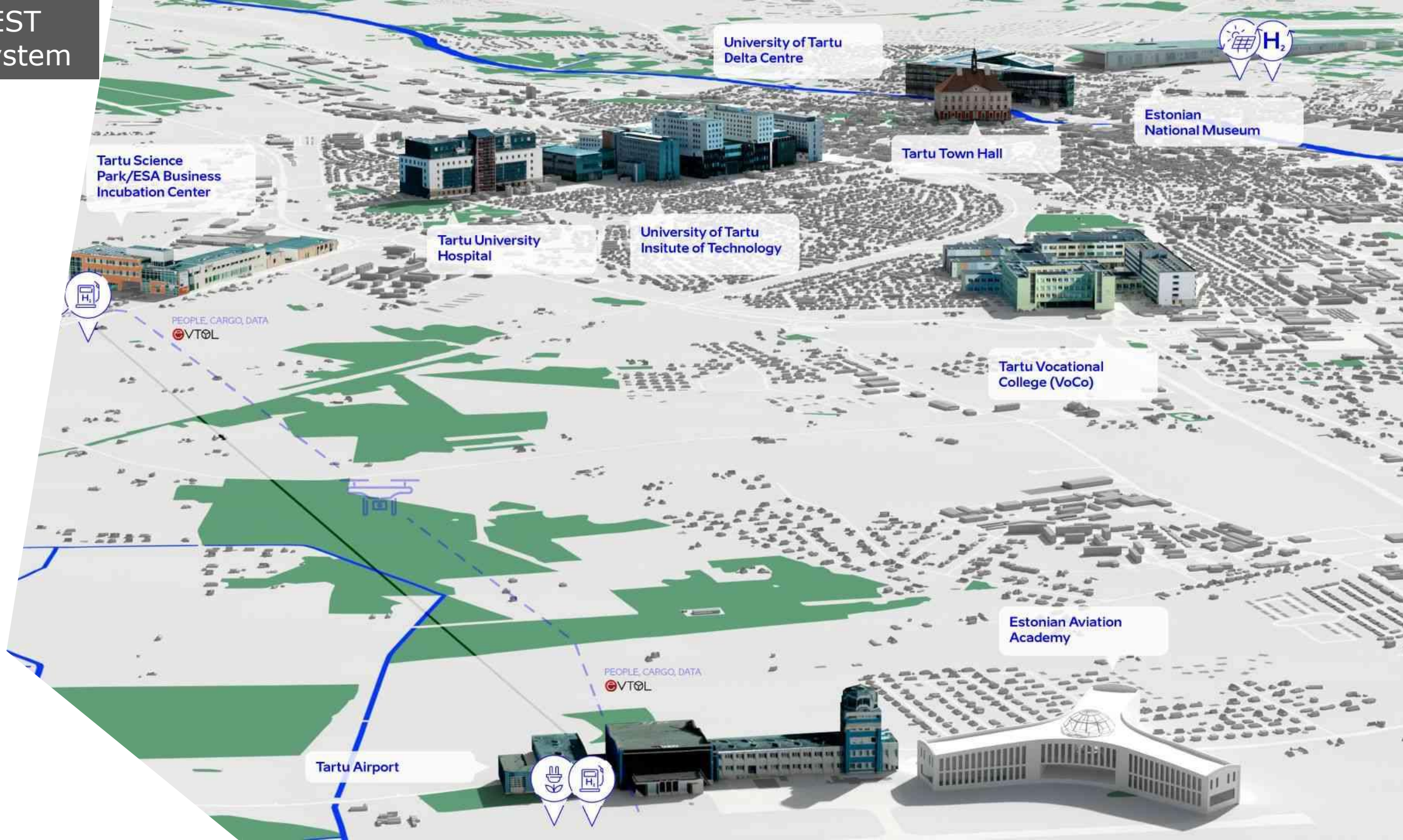


Source: Statista Market Insights, September 2023

Estonia has the highest growth potential

- ZeroEST ecosystem
- U-space sandbox
- Innovative companies
- Drone centres of applied research
- R&D cooperation
- Digital country
- Cooperation in key EU projects
- Lifesaver (Airbus, International SOS)
- Incubation and Acceleration support
- Deeptech focus
- PPP dialogue
- NATO DIANA

ZeroEST ecosystem

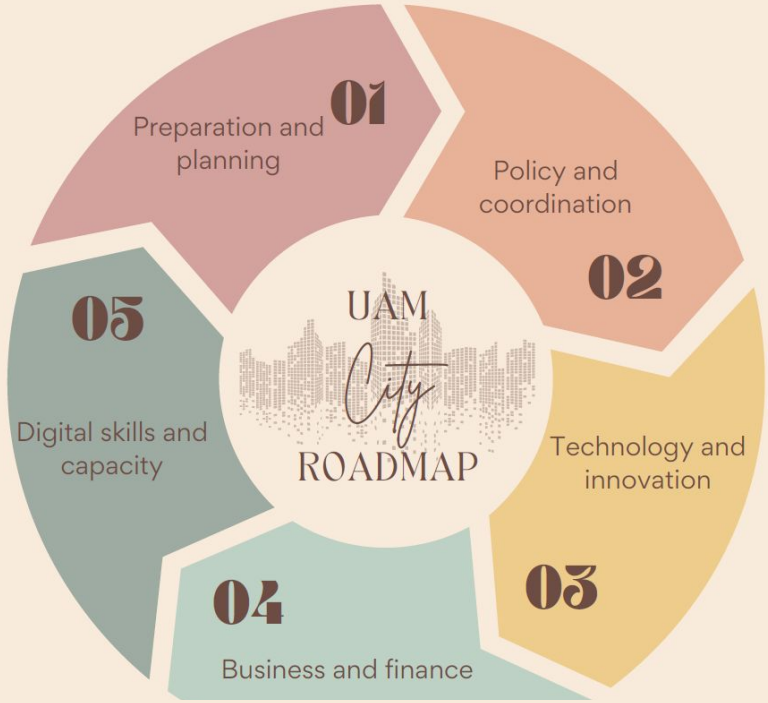


- **Aerospace Centre** - the crown-jewel of Northern Europe climate neutral aviation with plenty of space for housing top-notch aerospace companies at Tartu Science Park. Both facilities will offer a low-ground-risk pilot VTOL route between each other (5km) as well as an autonomous bus line servicing the route.
- **Dynamic operating environment** for manned and unmanned aircraft to eventually operate safely in a shared airspace. The goal is to ensure fair and efficient access for all airspace users as established in the EU U-space regulatory framework and provide dual-fuel opportunities where possible.
- **Airport Hub** just right beside Estonian Aviation Academy together with state-of-the-art rooftop vertiport, also future certification test centre for EASA.

City of Tartu and **Tartu County** have included the **aerial domain** within their strategies

Works conducted

- ESA Space4UAM FS -> UAM City Roadmap
- EAVA –> Airspace assessments
- EAVA -> Tartu Airport study
- ANRA Technologies/ TSP/EAVA/TRAM -> Tartu U-space Sandbox CACTUS -> Validation done in September 2023
- ZeroEST -> Living Lab
- Tartu –> CityAM project – Ongoing
- Flying Forward 2020 -> Completed
- SAFIR-Ready –> Ongoing
- Airbus Lifesaver -> Ongoing
- Project/Initiative alignment 15+



UAM City ROADMAP

Urban Air Mobility (UAM) is leveraging on new innovative technologies to bring aviation and aerial mobility solutions closer to people and hence, to the cities. The regions and cities are currently trying to understand how to integrate UAM into urban mobility planning and development. Introducing UAM into urban environment is a strategic decision for long-time planning and enables transforming the cities into more livable by creating sustainable mobility ecosystem.

The proposed UAM city roadmap is based largely on a Sustainable Urban Mobility Planning (SUMP) framework, outlined by the European Commission's Urban Mobility Package and described in detail in the European SUMP Guidelines by UIC2. In addition, during the ESA Project Space4UAM, user requirement mapping was executed with city stakeholders to outline the existing state, existing challenge, challenge areas, understanding and priorities. As a result, a priority list of 5 use-case archetypes was created for in-depth analysis. Based on these materials, a more detailed step-by-step roadmap was composed to assist the cities to work on UAM integration.

Environmental implications

Lessons learnt from **Flying Forward 2020**
Battery drones vs baseline

Let's try last mile deliveries vs Business as Usual

Mission Metrics	Unit	Last-Mile 2-way	IC last mile 2-way	EV last mile 2-way
Cost of mission	€/per mission	2.30	1.17	1.00
Cost of KM	€/km	2.67	0.65	0.55
Total emissions	CO2e kg	0.064	0.351	0.210
CO2 abatement	CO2e kg saved	0.287	-0.287	-0.146
Time spent	minutes mission	35	37	37
Time saved	compared to baseline	2	-2	-2
Total Cost of operations	total € per use-case	48.96	8.57	8.40
Costs saved	compared to baseline	-40.39	40.39	40.57

← Cost and lifetime of HW

← Batteries charged at the evening from grid

← SORA, mission planning, safety buffers etc.

← Now add the fair pay for a trained pilot

Today, any drone delivery outside of lifesaving, is unfeasible!

In U-space conditions with droneports– split cost of ops with 10-20 drones instead of 1 per pilot?
Remote operations rather than drive & fly & drive (this can mitigate environmental savings completely)
Operational workflow improvement (less prep-work) – automation is a key development, U-space is required to automate
Actual time savings for the operation without setting danger zones or other temporary fixes to increase mission

Hydrogen droneport + 1 drone service area = 4072 km2 (36 km radius area)
Battery droneport + 1 drone service area = 79 km2 (5km radius area)
LCA footprint difference 1-to-1 is 3.5x less at worst case scenario, yet both are superior to other means
Combining droneports and different capabilities for a multi-mission profile approach is most beneficial for cities

SAFIR-Ready

DORAI - Drone Operator Requirements Aero Initiative
Release v01, August 2023, Joint UA Operator Statement
Unmanned Aerial Vehicle specifications

DORAI Objective
Ensure efficient and effective technology development for the unmanned aviation economically viable services, by aligning on use case based requirements. Inform Equipment Manufacturers (OEMs) and unmanned aviation related technological p operator needs for sustainable operations, by providing a clear, publicly reference future development. This statement is meant to give the guidelines to make desig drone market is able to use in practice and to move towards a homogeneous dron

Release and feedback schedule
This statement is subject to updates based on feedback from other operators and In addition, the list with requirements will be extended. Therefore, DORAI can pu updates on a 6 monthly basis. Feedback can be sent to drones@anwb-maa.nl, mikael.shamim@helicus.com and/or nicolas.brieger@tcs.ch.

- Current release v01, August 2023
- Expected next release v02, 1 February 2024
- Deadline for feedback on release v01: 1 December 2023

A. Short-Term Priorities 2023-2024 (next iteration of current platform)
Objective: Obtain demonstrations in the air
Requirements:

- Focus on automatic flight demonstrations
- Manual payload loading; 2,5 kg (net) payload
- In compliance with M2 High requirements (typically ASTM accredited par
- In compliance with Enhanced Containment
- Ability to fly with (heavy) rain conditions (at least IP56)
- Ability to fly with up to 15m/s (29kts) of wind, including gusts
- Long range (Range >= 100km) and/or short-range applications depending type and weight choice (see table under point B)

B. Long-Term Priorities 2025 (Planned UA developments)
Objective: Obtain scalable and automated operations
Requirements:

- Design Verification on UA for SAIL IV operations for BVLOS operations in p environment (mitigations ground risk)
- Payload: ensure both automatic and manual unloading (e.g. bottom loadi
- Package, which are bottom fed, should be fixated (e.g. Clamping) in length
- Adhere to standard minimum payload outward dimensions (Length x Wid included in the following table:

	Length	Width	Height	Volume (external)
Minimal	375 mm	200 mm	140 mm	10,5 liters
Cylinder	375 mm	160 mm	160 mm	9,6 liters
Standard	375 mm	250 mm	250 mm	23,4 liters
Large	375 mm	250 mm	345 mm	32,3 liters

Additional guidance to numbers in the table:

- focus on minimum 250 mm width (as this will allow for modular payload swapping)
- FYI: ground automation handles heights between Minimal (140mm) and Large (345mm)

- Total cargo weight ranges (including packaging/box):
  - Light: 3 kg
  - Medium: 5 kg
  - Heavy: >=10 kg
- Open interface UA to independent Command & Control Center (without passing via UA manufacturer cloud system), with following functions:
  1. telemetry,
  2. flight path upload/activation (pre-flight and in flight),
  3. activatable low latent FPV feed,
  4. control instructions to allow VFR (as redundant safety mode),
  5. remote ground interaction (battery charging/H2 refueling, payload release/clamping, high volume data exchange)

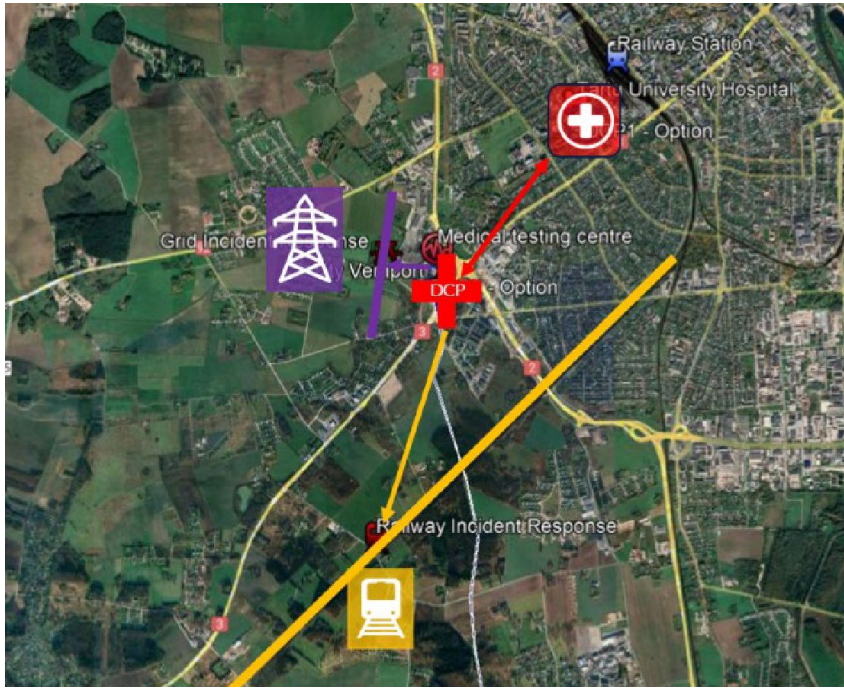
Undersigning Operators

Signed	Signed	Signed
ANWB (NL)	Avionord (IT)	Delivrone (FR)
Simon Prent	Laura Koller	Pierre Lebel
Manager Drones	BU Lead	CEO
Signed	Signed	Signed
FIA (CH)	Helicus (BE)	HUSI (EL)
Nicolas Brieger	Mikael Shamim	Christos Skliros
Head of DAVMA	CEO	Technical Director

First full-scale validation - **SAFIR-Ready**
“Enabling mission ready drone services ground and airspace automatic integration”

Tartu

Medical flights between University Hospital and medical testing center (RED), Critical infrastructure inspection: Railway incident response (YELLOW), Electric grid inspection (LILAC) BVLOS flights in urban environment; sparsely to highly populated areas; Flight planning and flight approval in urban areas; Mission readiness and Automation; Incident response coordination



Safir-Ready

Development roadmap towards enabling a multibillion industry

- ZeroEST Center of Excellence Roadmap completion
- Development towards a Living Lab
- Work with Metrosert to support Drone Center of Applied Research
- Cooperation with the Ministry of Climate for the Aviation roadmap and climate law
- Government implementing latest EU directives affecting unmanned systems to national law
- Estonian Air Navigation Services to become CISP (Common Information Service Provider)
- ANRA Technologies will become Europe's first USSP and has selected Estonia and Switzerland as first certification countries – enables U-space service provision
- Tartu U-space sandbox development and upkeep
- Lifesaver project (Advanced Air Response is led by ZeroEST)
- Finalise on-going projects (SAFIR-Ready, CityAM etc.), wait for results for submitted projects and continue cooperation towards new initiatives and programmes supporting the development
- Tartu ecosystem supports nationwide off-take (first pilots, city as an enabler)
- Alignment with NATO DIANA and incubation/acceleration of companies (Tartu Science Park)
- Infrastructure development to support drones and airtaxies
- Participation in EU U-space stakeholder network, Urban Air Mobility Cities Community and events such as Amsterdam Drone Week

- **Constant learning, educational and cooperation development!**

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION

17 PARTNERSHIPS FOR THE GOALS

Towards a fully holistic aerial ecosystem of the future

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