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I. DELIVERABLE INFORMATION

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Abstract

This report summarises the TULIPS Work Package 10 road maps, and more specifically the deliverable D10.2 project's work from January 2022 to May 2023, which aims to provide the road maps of the airports participating in the TULIPS consortium up to 2030. Input from Schiphol Amsterdam Airport, Avinor Oslo Airport, SAGAT Torino Airport in Italy and Hermes Airports operator of Larnaca Airport in Cyprus was collected through meetings, and knowledge sharing sessions.



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Public:

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PROOF OF DELIVERY

1. Executive Summary

This report presents the environmental footprint reduction roadmaps to 2030 of the four airports participating in TULIPS WP10.

The four airports are the lighthouse airport Schiphol Amsterdam Airport, and the fellow airports Avinor Oslo Airport in Norway, SAGAT Torino Airport in Italy and Larnaca Airport in Cyprus operated by Hermes Airports Ltd. The roadmaps outline the key initiatives and technologies that each airport has adopted and those that are planned to be implemented by 2030 to reduce their carbon footprint, while maintaining efficient operations.

These actions by the participating airports to reduce their environmental footprint are taken in alignment with the requirements of the EU Green Deal and more specifically with the package of proposals known as “Fit for 55” that applies to the aviation industry including the airports.

The roadmaps and related data were collected over a series of online meetings held between December 2022 and May 2023, where representatives from each airport presented and shared their aspirations, plans and emission reduction initiatives up to 2030.

It was agreed by the representatives of the participating airports that the information and data collected will be presented in tabular form using the framework of scope 1, 2 and 3 which is the widely recognised and globally accepted accounting tool for airports to measure and manage their greenhouse gas emissions.

2. Introduction

Fit for 55 is a legislative initiative of the European Union that aims to reduce greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels. This initiative has significant implications for the aviation sector including airports, as they are significant contributors to global greenhouse gas emissions.

To comply with Fit for 55 all the participating airports have developed energy reduction plans and climate change roads maps that describe the major components of their energy and greenhouse gas reduction strategies. Also, they have implemented sustainable practices and technologies to reduce their carbon footprints.

The roadmaps and related data of the participating airports were collected over a series of online meetings held between December 2022 and May 2023 where the representatives from each airport presented the goals and emission reduction initiatives up to 2030.



All participating airports have already taken significant steps to reduce their carbon footprint and are all planning further actions as reflected in their road maps.

Actions include initiatives to reduce their energy consumption and carbon dioxide emissions footprint such as:

- Improving insulation of buildings
- Improving efficiency of systems through projects or through operational changes
- Replacement of conventional lighting with LED
- Utilisation/installation of renewable energy sources, such as solar panels and wind turbines, for own on-site production to power their operations
- Promoting sustainable transportation options, such as electric vehicles and public transportation, to reduce emissions from ground transportation to and from the airport

Additionally, the airports are working with airlines to improve fuel efficiency and reduce emissions from aircraft. This includes the use of more efficient aircraft, and the implementation of more efficient operational procedures, such as optimizing flight paths, reducing aircraft idle time on the ground and stipulating the use of electric driven ground power units.

During the online meetings it was unanimously agreed to list the initiatives under scope 1,2 and 3, which is the standard followed when airports report emissions and reductions in the ACI Airport Carbon Accreditation Scheme. Also, the initiatives were linked to the EU Green Deal and more specifically to the Fit for 55 packages of 13 proposals, to the extent that this was applicable.



3. The road maps of the four airports participating in TULIPS WP10

The four airports participating in TULIPS WP10 are briefly introduced below regarding their major carbon emission reduction initiatives and their road maps.



Schiphol Airport

Royal Schiphol Group (RSG) the operator of Amsterdam Airport Schiphol, is the Lighthouse Airport in TULIPS and coordinates all the activities of TULIPS. RSG goal is to operate the most sustainable airports in the world. Schiphol Airport is accredited to Level 4+ “Transition” within the ACI Airport Carbon Accreditation program. Since 2018 Schiphol operates on 100% renewable electricity by 2030, it aims to become zero carbon emissions and zero waste for its own operations.

Sustainability Facts & Figures 2020



Figure 1: Schiphol Airport road map



Hermes Airports

Hermes Airports is the operator of Larnaca and Pafos International Airports in Cyprus, with Larnaca participating in the TULIPS project. At Larnaca Airport, Hermes will be validating several of the demonstration projects performed at the lighthouse airport including land carbon sequestration, hydrogen fuelled GPU and alternative power production through solar plant and battery storage of electricity generated by the solar plant. In 2023 a 3.5 MWp solar plant will be commissioned. Larnaca Airport is accredited to Level 3+ “Neutrality” within the ACI Airport Carbon Accreditation programme. By 2030 Hermes aims to reduce scope 1 and 2 carbon emissions by 96% compared to 2010.



Figure 2: Hermes Airports road map



SAGAT Torino Airport

SAGAT Torino Airport’s vision is to meet the mobility needs of people and organisations, contribute to the development of communities and the local area, and manage airport infrastructure and operations safely and in respect of the environment. SAGAT Torino Airport is accredited to Level 3 “Optimisation” within the ACI Airport Carbon Accreditation program. A major initiative is to create a smart grid in order to achieve the carbon neutrality targets for the airport system optimising the use of renewable energies such as photovoltaics, biogas/biomethane and green hydrogen. By 2030 the aim is to reduce of -39% the primary energy supply, reach the 40% of RES production and reduce of 55% the CO2 emissions (scope 1 and 2) with regard to 2010 baseline.

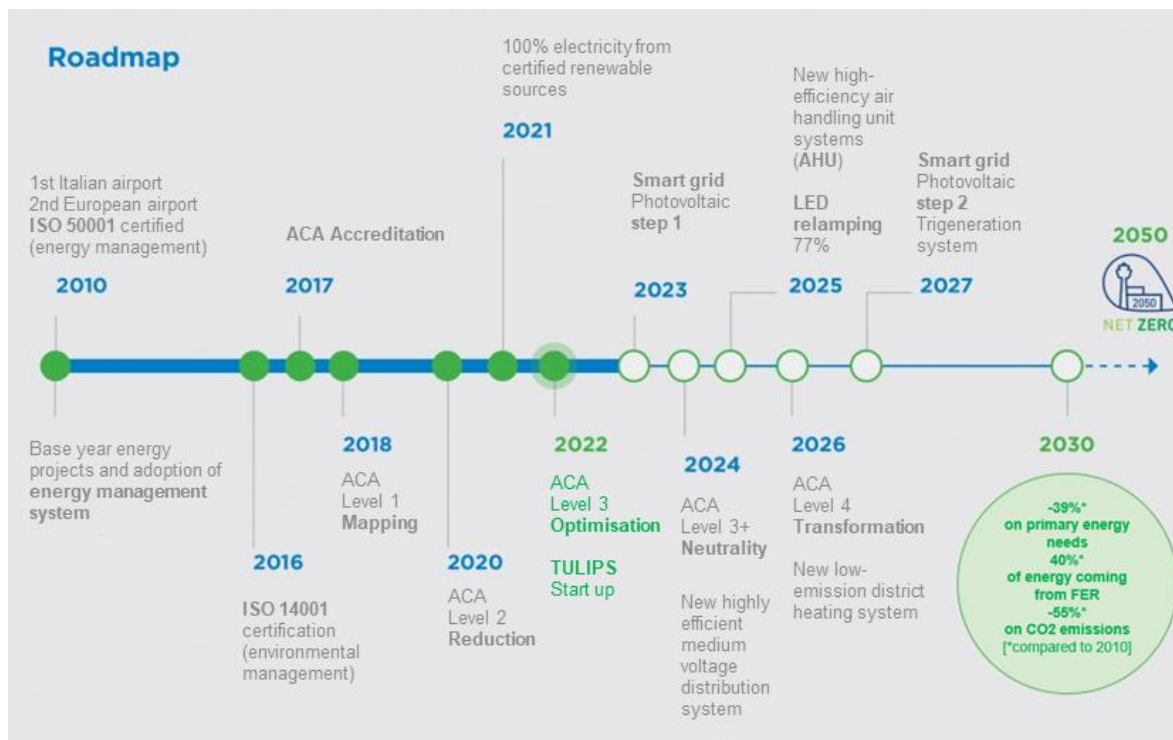


Figure 3: SAGAT - Torino Airport road map



Avinor Airports

Avinor’s vision is to connect Norway and the world through sustainable aviation. In this respect Avinor is developing sustainable airport operations by focusing on low-carbon ground handling, and renewable energy. Oslo Airport is accredited to Level 3+ “Neutrality” within the ACI Airport Carbon Accreditation programme. Regarding its own operations it has committed to a target of having fossil free airports by 2030. The target year for achieving net zero CO₂ emissions is however under review due to a process of setting SBTi-targets for Avinor.

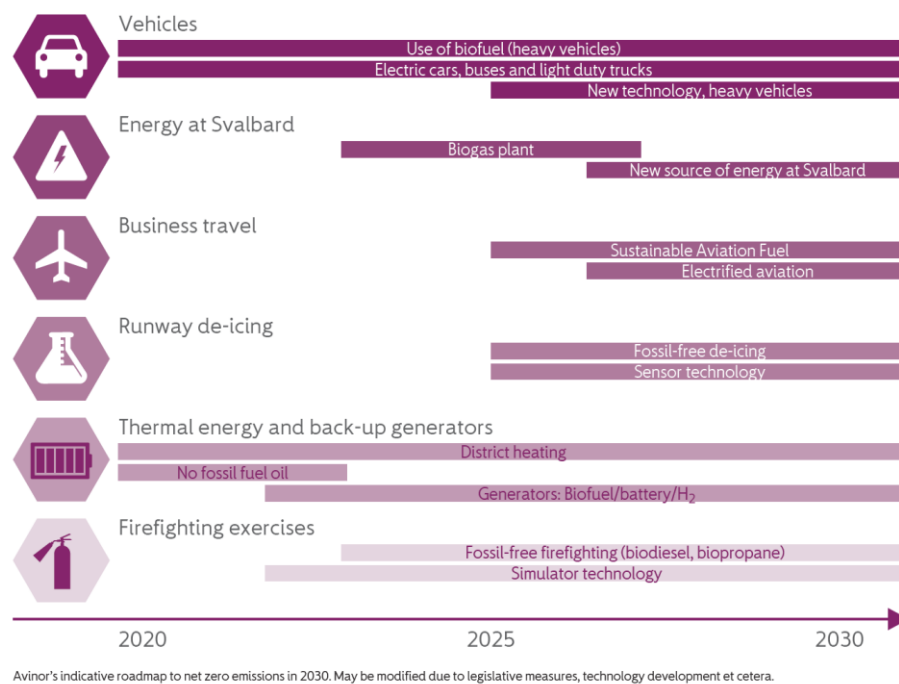


Figure 4: Avinor Airports road map



4. Reporting carbon emissions reduction initiatives

During the online meetings the representatives of the four airports participating in WP10 agreed to group their initiatives and actions into scope 1,2 and 3 following the Greenhouse Gas Protocol, (GHG Protocol) which is a widely recognised and globally accepted accounting tool for organisations to measure and manage their greenhouse gas emissions.

For airports the three scopes are normally defined as follows:

1. **Scope 1:** These are direct emissions from sources that are owned and controlled by the airport. This includes emissions from onsite combustion of fossil fuels in boilers and in generators, airport owned vehicles e.g., for ground servicing equipment and maintenance vehicles. Also, by airport owned aircraft, e.g., for airfield lighting calibration tests.
2. **Scope 2:** These are indirect emissions from the generation of electricity that is purchased by the airport. These emissions occur at the power stations that are owned or controlled by other entities.
3. **Scope 3:** These are all other indirect emissions that occur because of the airport's operations but are not owned or controlled by the airport itself. Scope 3 emissions include emissions from aircraft operations by the airlines, by ground transportation to and from the airport, business travel, and emissions associated with the waste management of waste generated at the airport.

For easy reference, a diagram showing the emission sources that usually take place at an airport is included (figure below). This diagram is created by the ACI ACA programme.

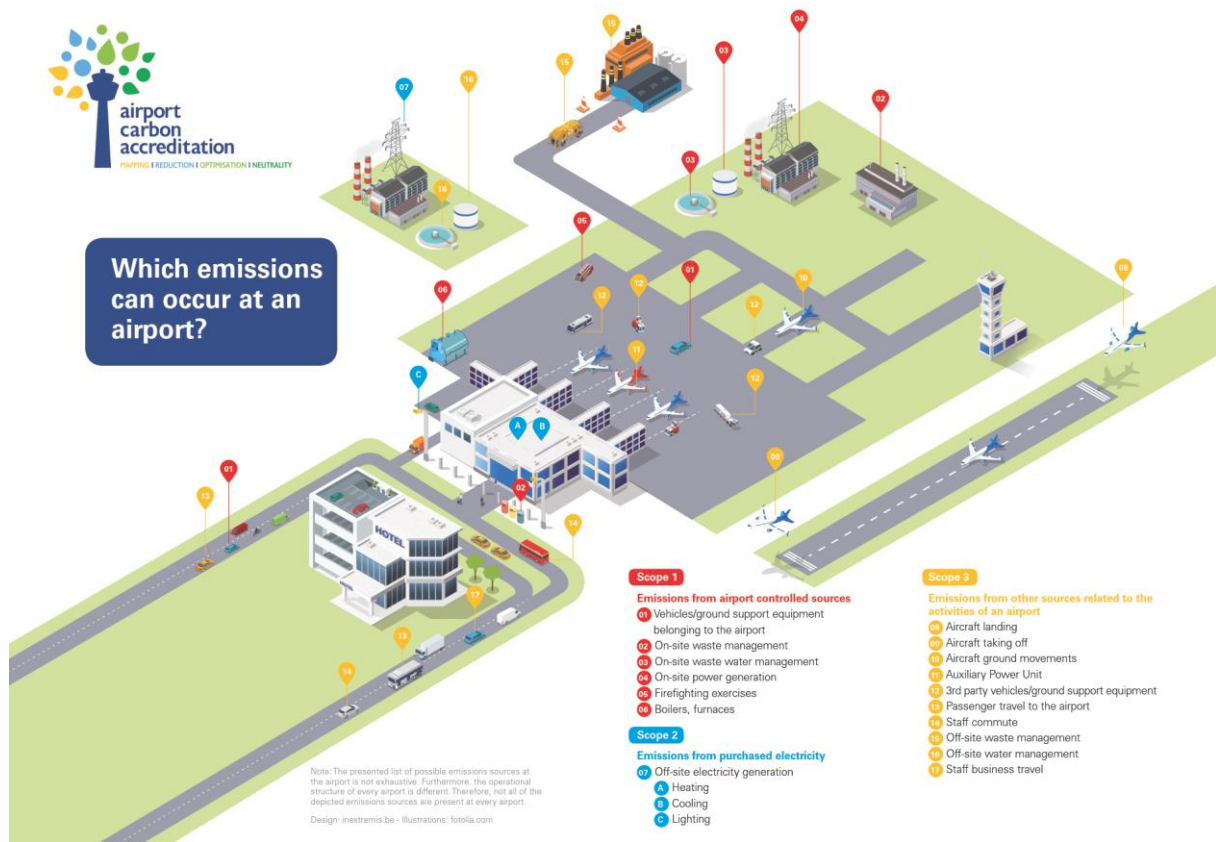


Figure 5: Carbon dioxide emissions at an airport



5. Initiatives and technologies included in the airports' road maps

Table 1: Sustainability strategies and objectives

Sustainability strategies and objectives					
Initiative	Hermes Larnaca Airport	SAGAT Torino Airport	Avinor	Schiphol	EU Green Deal
Vision	To be a leading airport within its category, (LCA - ACI Group 1) for carbon emissions reductions and energy conservation measures	To meet the mobility needs of people and organisations, contribute to the development of communities and the local area, and manage airport infrastructure and operations safely and in respect of the environment	We connect Norway and the world through sustainable aviation	To operate the most sustainable airports in the world	
Emissions baseline year	2010	2010	2012	2010	1990 for Fit for 55
2030 goal	96% less CO ₂ compared to 2010 (scope 1 and 2)	-39% on primary energy use, 40% of renewable energy sources production on primary energy use, -55% on CO ₂ emissions (scope 1 and 2)	Net zero carbon emissions from own operations*	Net zero carbon emission from own operations	Fit for 55: reducing EU-wide CO ₂ emissions by 55% in 2030 compared to 1990
2050 goal	Net zero	Net zero	Net zero	Net zero	Net Zero
Sustainability report	First published in 2021	Corporate and social responsibility report includes section on Torino "Green Airport", sustainability plan for 2023, published every year since 2014	Published annually	Integrated annual report, current emissions and reductions explained	

*The target year for achieving net zero CO₂ emission is currently under review

The main vision of all airports participating is to operate in the most sustainable way possible, while minimising environmental impact and taking innovative actions and leading the decarbonisation of the aviation and airports' sector. While all four airports have set a net zero target to 2050, the 2030 milestone targets differ between them. Schiphol and Avinor aim to net zero emissions from their



own operation by 2030, Larnaca Airport's target is to reduce by 96% all scope 1 and 2 emissions and SAGAT's target is to achieve a reduction of 55% on these two scopes of emissions. All four airports publish their progress and results annually in their sustainability report.

The initiatives of each airport that fall within scope 1 are presented in the table below:

Table 2: Scope 1 initiatives

Scope 1 initiatives					
Category	Hermes Larnaca Airport	SAGAT Torino Airport	Avinor	Schiphol	EU Green Deal
Airside facilities	Optimise the use of airport facilities and systems	Hydrogen ready fuel cell to cogenerate heat and power and open the way to green fuels	Backup generators (test project using batteries/biofuel instead of fossil fuel)	Increase charging infrastructure and facilities on airside	Fit for 55
Vehicles	Vehicle fleet electrification	40% of the airport's vehicles to become hybrid or electric engines by 2023	Electrification of cars, vans, trucks and buses is in progress	Vehicle fleet electrification by 2030	CO2 emissions standards cars and vans
Buildings	Development of advanced building management and control systems	Reduction on energy consumption through actions on HVAC (optimisation on management) and other energy intensive systems (for example through insulation)	De-icing: decision support related to utilising chemicals in winter operations	From 2025 all new buildings will be energy positive, in existing buildings replace gas with heat pumps and heat-cold storage	
Fuels		Blended fuel systems to be tested	Increased use of biofuels at airports with heavy snowfall, biodiesel available for vehicles and heating at 8 airports today	Use alternative fuels such as HVO100 for the vehicles that cannot be electrified before 2030	
Other				Employees can only choose zero-emission lease vehicles and multiple incentives for employees to use public transport and use of bicycles for short distance traffic	

Table two provides a description on how airports' aim to reduce their scope 1 emissions through the implementation of various projects. While the electrification of the fleet and vehicles is one of the most common actions towards the minimisation of scope 1 emissions, other initiatives like utilisation of biofuels or replacement of generators with energy storage solutions have been identified as part of the airports' roadmaps. Additionally, the introduction of hydrogen and the



replacement of natural gas with alternative solutions are amongst the projects aiming to reduce the scope 1 directly controlled emission sources.

The initiatives of each airport that fall within scope 2 are presented below.

Table 3: Scope 2 initiatives

Scope 2 Initiatives					
Category	Hermes Larnaca Airport	SAGAT Torino Airport	Avinor	Schiphol	EU Green Deal
Solar energy	On site PV solar plant for self-consumption	Installation of PV solar panels on terminal roofs	Solar panels at Svalbard and Stavanger airport (today), planned solar panels at Kristiansand, Oslo and Bergen 2023/2024	More solar power to increase grid strength (target of 21 MWp by 2030)	Energy efficiency directive, public buildings must be zero-emission as of 2027
Renewable energy	Purchase of green power	As of 2021 100% of purchased electricity has come from certified renewable sources with GOs (guarantees of origin)	Off-grid biogas plant at Svalbard airport in 2024	All energy is RE (100% wind energy)	
Energy consumption	Reduction of energy consumption Offsets and guarantees of origin	Reduction on energy consumption thanks to optimisation on existing systems and installation of more efficient ones	Energy measures at every airport	All new buildings delivered from 2025 onwards must be energy positive for the building related energy at a minimum	
Energy efficiency	Implement energy efficient investments LED technology lighting systems extended to aprons and airfield	Increased efficiency on lighting (re-lamping LED and dimming)		4% energy efficiency increase target every year using ISO50001 standards	

The scope 2 emissions, in most cases, form a great proportion of the airport operators' carbon footprint. Since it is directly related with the energy consumed at the airports, the aim is to reduce the energy consumption as much as possible, to introduce on-site production of renewable energies and finally to become energy positive. At the same time the initiatives affecting the scope 2 emissions includes the purchase of green power from the grid or the purchase of guarantees of origin (GOs).

The initiatives of each airport that fall within the Scope 3 definition are presented below.



Table 4: Scope 3 initiatives

Scope 3 initiatives					
Category	Hermes Larnaca Airport	SAGAT Torino Airport	Avinor	Schiphol	EU Green Deal
Fuel emissions	15% GHG emissions reduction from third parties by 2030, compared to 2015	To engage passengers and third parties involved in the mobility around the airport to measure their emissions and reduce them	Initiatives regarding SAF blend, electric and hydrogen short-haul flights	Emissions from aviation reduced to 2005 levels by 2030 14% SAF blend in the Netherlands in 2030	ReFuelEU
GSE	Aircraft APU restrictions policy with expanded deployment of eGPU's at all stands	Engagement stakeholder plan (ACA Level 3) and gradual electrification of GSEs	Infrastructure to be able to electrify GSE/offer biodiesel at the largest airports	Replace fossil fuel using GSE for electric/hydrogen options	Fit for 55/Alternative Fuels Infrastructure Directive
Water management	Sustain water consumption per passenger to 2019 levels	Plan for rainwater storage for reuse			Energy performance of buildings directive
Circularity/ Waste			Circular initiatives in Avinor, at Oslo Airport "Project Zero Waste 2030"	Zero waste in 2030 through circular design and reuse of construction material. Also by e.g. by phasing out single use products and better separating of commercial waste	
Public/ employee engagement	Increase airport and local communities awareness and achieve active participation and engagement	Mobility management on employees: emission reduction through carpooling initiatives and incentives on the use of public transport, direct connection with train from city center to airport available starting from 2024	Information regarding public transport, charging infrastructure available for employees and passengers driving electric cars	Stimulate a sustainable passenger journey, actively inform passengers about their sustainability impacts, and incentivise efficient and clean transport modes	

Despite the fact that scope 3 emissions are not directly controlled by the airport operators, it is considered a priority since a reduction in this category will have a great impact on the environmental footprint of the airport. The utilisation of Sustainable Aviation Fuels (SAFs) and the active engagement of participation of stakeholders and passengers are considered very important towards the decarbonisation of the industry. Other actions are also planned by all participant airports for the reduction of the airside emissions.



6. Conclusion

All airports participating in TULIPS WP10 have made significant progress towards the reduction of their carbon emissions. All have adopted strategies that include a combination of energy efficiency measures, sustainable infrastructure development and stakeholder engagement.

While each airport's roadmap has unique strengths and priorities reflecting the environment and the unique circumstances which each airport operates, the objective of reducing carbon emissions and mitigating the environmental impact of operations is shared by each airport.

By implementing these roadmaps, the airports are taking proactive steps to reduce their carbon footprints and to promote sustainability in line with the requirements of the Fit for 55 legislative initiatives of the European Union.

As part of the comparison of the four roadmaps, task 10.2 took into consideration and examined the outcome of the task 10.1 and its results until M18.

The next steps and outcomes are to further compare the various initiatives planned by each airport, to align the initiatives and actions whenever possible, and further enhance the decarbonisation roadmaps. Additionally, the outcome of the various demo projects will assist in the improvement and future development of the roadmaps. The results of each work package and its associated demos will be evaluated in relation to the place and contribution each one of them may have in the environmental footprint of each airport. Finally, this assessment will assist in highlighting synergies between EU Green Deal and other sustainability roadmaps in order to produce an overall roadmap with clear vision on Green Airport targets and measures.