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Net zero airports: From ambition to execution

Conference report:
Sustainability

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Executive summary

The sustainability track at PTE World Conference 2026 opened with a number that reframed the entire conversation. At Heathrow, over 99% of emissions sit beyond the airport's direct control. At Changi, Scope 1 and 2 account for just 15% of the total footprint, with 68% coming from the landing and takeoff cycle alone. At every airport that presented, the pattern held: the share of emissions the airport directly controls is small relative to the share it cannot.

And yet, the conversations that followed were highly constructive. They were, collectively, among the most operationally grounded sustainability discussions this conference has produced. Airports are increasingly presenting net zero as more than a communications strategy. They are presenting it as an engineering, regulatory, financial, and political challenge that requires simultaneous progress on at least eight fronts, most of which are outside their direct authority.

The question is no longer whether airports should pursue net zero. It is whether the systems around them – airlines, energy grids, regulators, waste law, fire codes, and national climate policy – will move fast enough to make it possible.

Key Findings

- **The Scope 3 trap is structural, not rhetorical.** Every presenter acknowledged that 85-99% of airport emissions are outside direct control. Net zero for airports is literally impossible without parallel decarbonisation of airlines, energy grids, and supply chains.
- **Climate adaptation is no longer a planning exercise.** Malpensa projects +64% maximum daily rainfall by 2040. Venice received 20 cm of rain in 20 minutes in May 2024. Kansai's single typhoon cost 470 million euros. These are not projections for 2100. They are the current operating environment.
- **SAF mandates are outperforming voluntary commitments.** Singapore's SAF levy – 1% of ticket cost, rising to 3-5% by 2030 – is the model. Voluntary targets have not delivered at scale.
- **Circular economy gains are constrained by current regulation.** At Rome Fiumicino, only 3% of unsorted waste is actually non-recyclable, pointing to a large recovery opportunity. At Schiphol, 3,000 tonnes of cabin waste is incinerated annually because EU law classifies it as Category 1 animal by-product. The waste is not the problem. The classification is.
- **Energy independence is the highest-leverage resilience investment.** Pittsburgh's microgrid runs in full island mode on natural gas and solar. Delta lost over \$100 million from a single blackout in Atlanta. The business case is compelling.
- **Sustainability reporting is about to get the same scrutiny as financial reporting.** Aena's 120+ ESG KPIs, ISSA 5000's shift to reasonable assurance, and CSRD's legal mandates mean reliance on shadow spreadsheets and year-end data scrambles is ending.



1. Beyond the fence line: Understanding the Scope 3 dependency

One of the most significant realities in airport sustainability is also among the most important: airports do not produce the emissions that matter most. They host them.

In Asia, an airport quantified the dependency: Scope 1 and 2 account for approximately 15% of the airport group's footprint, while 68% comes from the landing and takeoff cycle.

This is a structural reality that many airport sustainability strategies still understate. An airport can electrify every vehicle, install every solar panel, and achieve every certification available, and still find that 85-99% of its total emissions profile has not moved. The Scope 3 dependency is not a footnote. It is the whole story.

What is changing, however, is how the most sophisticated airports are responding to this dependency. Rather than treating it as someone else's problem, they are building influence infrastructure. Heathrow now requires all infrastructure projects to demonstrate embodied carbon reduction, embedding PAS 2080 across its supply chain. Noida International Airport has written EV mandates and sustainability performance clauses into every concessionaire agreement from day one. Swedavia has signed fossil-free agreements with all ground partners across all ten Swedish airports.

The pattern is clear: airports cannot decarbonise alone, but they can set the terms of engagement for everyone who operates on their land.

The forward-looking question: If airports control less than 1% of the emissions attributed to them, should they be measured on absolute reductions – or on the effectiveness of the influence systems they build to move the other 99%?



2. Climate adaptation has stopped being theoretical

For most of the last decade, climate adaptation at airports was a risk register exercise: identify the hazards, assign probability scores, file the report. That era has ended, as flooding reached terminal car parks..



“When we had an increase of traffic of 4.7%, weather-related delays grew 48%. The relationship between traffic and delays is not linear and shows how weather conditions increasingly affect flight punctuality.

Giorgio Medici, environment and funded initiatives director, SEA Milan Airports



“We estimated +64% in maximum daily rainfall by 2040, and +80% by 2060. These are not 2100 projections – this is something we are going to see in our lifetimes.”

Davide Canuti, head of the environmental assessment and certifications office, SEA Milan Airports

In 2021, water levels at Malpensa reached 1.5 metres in the terminal car park. Across 25 years of delay data, summer has now surpassed winter as the peak delay season – a complete reversal of the historical pattern. The infrastructure designed for past winters is becoming irrelevant. The infrastructure needed for future summers does not yet exist.

Venice Airport’s experience was even more visceral. In May 2024, 20 centimetres of rain fell in 20 minutes – equivalent to what the airport would normally receive across 68 months. Operations were suspended for four hours.

At Kansai, Typhoon Jebi in 2018 caused 103 million euros in physical damage, 43 million euros in lost revenue, and 324 million euros in lost regional economic opportunity – a single-event cost of 470 million euros. The airport, built on a reclaimed island that is still sinking (6 centimetres per year on Island 1, 21 centimetres on Island 2), has since revised its seawall design standards.

What finally forced action was not regulation. It was money.



“Our shareholders – investment funds, banks – were starting to ask: what are you doing for climate change? Because they want to protect and save their asset.”

Dr Davide Bassano, sustainability director, Save, Italy

Where this is heading: Mediterranean airports face a complete reset of their infrastructure design standards within this decade. The airports that embed adaptation into routine maintenance cycles will spend far less than those that wait for the next catastrophic event to force action.

3. SAF as one lever among many on the path to net zero

Sustainable aviation fuel is the industry's consensus answer to flight emissions. It is also the answer most likely to disappoint if it remains the only answer.

Singapore has gone further than any other country in converting SAF aspiration into SAF policy. Changi's Hoi Wen Au Yong described the mechanism: a mandatory SAF levy launched in April 2025, set at 1% of ticket cost (approximately \$2 USD for short-haul, \$16 USD for long-haul flights), rising to 3-5% by 2030. Revenue is pooled centrally and allocated by the regulator to airlines and environmental projects.

This is significant because it removes SAF adoption from the realm of voluntary corporate virtue and places it in the realm of regulated cost.

Swedavia's Jan Eklund reframed SAF as a national security asset as much as an environmental one:



“Local production of eSAF, if within the European Union, could also provide locally produced fuel for our air force. It’s just a good side effect in these times.”

Jan Eklund, strategy manager - intermodality, Swedavia Airports

This is not greenwashing. It is geopolitics intersecting with climate policy, and it may prove a more durable political foundation for SAF investment than emissions targets alone. But the structural challenge remains supply. The EU's Fit for 55 mandates are in scope. Sweden's national target of 70% transport emission reduction by 2030 is under political review. And the production capacity for SAF globally is a fraction of what the mandates require.

The strategic bet: Singapore's levy model will be replicated. The airports and nations that build domestic eSAF production capacity will gain both energy security and a competitive advantage in attracting airlines under tightening mandate regimes.



4. Airport land as an emerging biodiversity asset

Here is a proposition that would have seemed absurd a decade ago: some of the most effective biodiversity refuges in Europe are located inside airport perimeters.

Venice Airport sits surrounded by the Venice Lagoon, one of the most environmentally protected areas in Europe under the EU Habitats Directive. Approximately 400 hectares of salt marsh habitat are under active monitoring.



“Wildlife is much smarter than human beings. They know what corridors are affected by landing and takeoff and they stay far from that area – but they stay and rest in the surrounding areas because there’s no disturbance.”

Giacomo Rosina, biodiversity and ecosystem specialist, SAVE

The accidental logic is elegant. Airport buffer zones exclude humans by design. Runways and taxiways create involuntary no-go areas. The result is large tracts of land with minimal human disturbance. Bird species are using airside margins for nesting and reproduction. From 2027, Venice will add bats to its monitoring programme.

At Schiphol, of the airport’s 2,800 hectares, 25% is agricultural land and 15% is designated biodiversity zone. Forty percent of the total site is non-built.



“If you neglect nature and biodiversity, at some point it’s going to come back to bite you. You’re prone to flooding, to heat stress, to erosion. And you need to think about how you protect your runways in a way that requires active ecosystem design.”

Faiza Oulahsen, director of sustainability, KPMG the Netherlands

But the biodiversity-positive agenda runs headlong into the oldest safety concern in aviation: bird strikes. Nature-based solutions like long grass, ponds, and wildflowers increase bird activity. Managing for biodiversity while reducing wildlife hazard requires active, expert-led management rather than passive rewilding.

“Biodiversity is not as simple as climate – you can’t reduce everything to a number of emissions. It’s much more complex.”

Faiza Oulahsen, director of sustainability, KPMG the Netherlands

The emerging opportunity: Airport perimeters represent some of the largest privately managed green corridors in urban regions. The airports that professionalise biodiversity management – not as compliance, but as infrastructure – will simultaneously reduce flooding risk, lower cooling demand, and build regulatory goodwill for future expansion.



5. The circular economy opportunity hiding in plain sight

The waste data from Rome Fiumicino highlights a significant opportunity for airports across the sector. When Aeroporti di Roma analysed the contents of their unsorted waste bins, only 3% of what passengers threw away was actually residual waste. The other 97% was recyclable material that could be diverted from incineration. Beverage packaging alone accounts for more than 40% of total waste by weight in terminal bins.



“Visual messaging gave the most impact in improving segregation. In just the first campaign, we reduced the wrong segregation rate of plastic bottles by 60%.”

Enrico Mazzoli, senior sustainability manager, Aeroporti di Roma

Smart bins equipped with AI sensors now track waste type in real time, generating data that changes not just sorting behaviour but upstream procurement decisions. The real value is not waste management. It is procurement reform: changing what gets sold in the terminal in the first place.

But the biggest circular economy failure at airports is not operational. It is regulatory. At Amsterdam Schiphol, approximately 3,000 tonnes of cabin cleaning waste is incinerated every year. Not because it cannot be recycled. Because EU law classifies all international catering waste as Category 1 – the same classification as animal by-products – requiring incineration regardless of content.



“For cabin waste, most of it is incinerated given EU law treating international catering waste as Category 1. If we were able to identify the origin of that waste, the EU portion could be treated as household waste and some of it could be recycled.”

Sara Solis, circular economy lead, Royal Schiphol Group

A track-and-trace pilot with Transavia achieved 80%+ identification of cabin waste bags at flight level, but the process required three independent systems, four parties, five new devices, and manual integration. It worked technically. It did not scale.

The reusable coffee cup pilot showed encouraging results: 83% return rate over four weeks in a single lounge, no negative impact on sales, and a positive business case. But scaling from one lounge to an entire terminal involved eight parties and infrastructure that grows in complexity non-linearly.



“It’s not the top priority of an airport – getting the operations running is. But it is an important part. Each trial that we do sparks the fire to keep going.”

Jonathan Rens, project manager, Brussels Airport Company

The regulatory fix that would unlock billions in value: Reclassifying EU-origin cabin waste from Category 1 to household waste would instantly redirect thousands of tonnes of recyclable material away from incineration. The technology to identify waste origin exists. The regulation does not yet permit it.



6. Energy independence: The case for going off-grid (and the nuclear question)

When the lights went out at Atlanta's Hartsfield-Jackson Airport in 2017, Delta Air Lines lost over \$100 million. One airport. One blackout. One airline's losses.



“Airports are national critical infrastructure. The planes have to land. Heathrow had to shut down about a year ago. We took this very seriously way back in 2017 – how do we really make energy independence a reality?”

Vince Gastgeb, chief government and corporate affairs officer, Pittsburgh International Airport

Pittsburgh's answer is a microgrid that operates in full island mode: five natural gas generators producing 20 MW, a 3 MW solar farm built on a former landfill, and 14 natural gas wells on a campus that sits atop one of the largest Marcellus shale deposits in the world. The airport's daily operational load is 14 MW. One generator can be taken offline for maintenance at any time. The grid is remotely operable. And it was built with third-party capital – no airport authority investment required.

“We built the solar farm on a former landfill. Not only are you putting up a solar farm, you're mitigating a landfill at the same time. You start getting people on side.”

Vince Gastgeb, chief government and corporate affairs officer, Pittsburgh International Airport

The tension is obvious: Pittsburgh's microgrid runs on natural gas. It is energy independence, not decarbonisation. The airport positions these as sequential goals.

Sweden's approach in Sweden is structurally different and more aligned with decarbonisation. Stockholm Arlanda uses an aquifer for near-zero-carbon heating and cooling. Sweden's national grid is almost 100% fossil-free, giving Sweden a structural advantage.

And then there is nuclear. Thomas Roddey of AtkinsRéalis made the case for small modular reactors at airports:



“Small modular reactors are ideally suited for airports – scalable, adaptable, providing predictable power for electric buses, electric planes, electric cars at a hub. If you need more power, you can add another module rather than building a full-scale plant, like adding a light bulb.”

Thomas Roddey, vice president for business development - commercial nuclear, AtkinsRéalis

The technical case is compelling: SMRs starting from approximately 20 MW units, 40-60% thermal efficiency, passive safety designs that cool themselves for 72 hours without operator intervention. The barriers are equally real: public perception, construction timelines, and waste storage challenges.



“When thinking about critical infrastructure, you want something that's around 24/7 – not just on windy days or sunny days.”

Jake Lefman, VP - energy market, Acuity International

The 10-year outlook: The first airport-adjacent SMR installation will be announced before 2030. The airports that begin site assessment and regulatory engagement now will be positioned. Those that defer engagement with nuclear options may face energy constraints in the decade when electrification demand peaks.



7. Noise: An underweighted sustainability metric and a growth constraint

Every sustainability report leads with carbon. Some mention waste. A few reference water. Almost none give noise the weight it deserves. And noise may be the sustainability metric that most directly determines whether an airport can grow.

This is counterintuitive. Aircraft movements have not returned to pre-pandemic levels at many airports. The aircraft themselves are certifiably quieter. Yet complaints are rising. The explanation is behavioural, not acoustic: during COVID, communities experienced silence. The soundscape reset permanently. Decibel-based noise metrics, calibrated to absolute levels, cannot capture a shift in baseline expectation.



“At the aircraft level, there are trade-offs that probably a lot of aircraft manufacturers know but that’s now coming to the airport.”

Ana Luisa Maldonado, senior acoustician, Arup

Open-rotor engine designs, projected to save up to 30% in fuel burn, are acknowledged to be noisier than current turbofan engines. In other words, the next generation of fuel-efficient aircraft may be louder than the current generation. If airports are to decarbonise aviation through fleet transition, they may simultaneously worsen the noise experience for surrounding communities. Carbon and noise are, at the aircraft design level, in direct conflict.

AGS Airports invested in Arup’s “sound lab” tool for community engagement: a system that allows residents to listen to current and future aircraft sounds and visualise overflights in real time. Smith described it as the “most powerful tool” in the airspace change consultation that engaged thousands of people across Scotland’s central belt.

The challenge for the next decade: Noise is the sustainability metric most likely to constrain airport growth, most difficult to solve technologically, and most neglected in sustainability reporting. The airports that invest in community trust on noise will have the social licence to grow. Those that treat noise solely as an engineering problem may face ongoing community tension.



8. Toward Assurance:

Sustainability reporting approaches financial-grade audit

The era of sustainability reporting as a communications exercise is ending.

Aena manages 120+ ESG KPIs across its operations in Spain, Brazil, and Luton. It is in Year 3 of implementing an internal control system for sustainability data. The reason is not ambition. It is law. The EU's Corporate Sustainability Reporting Directive (CSRD) and the European Sustainability Reporting Standards (ESRS) now legally mandate robust internal controls for sustainability data. The ISSA 5000 standard is shifting ESG assurance from limited to reasonable assurance – the same rigour applied to financial reporting.

The implications cascade through every department. Segregation of duties – separating who captures, validates, and approves sustainability data – is now table stakes. Shadow spreadsheets and late manual adjustments will become critical audit red flags. IT controls including access management, version control, and automated anomaly detection must replace manual reporting processes.

Approximately 34% of Aena's ESG KPIs are environmental, 48% social, and 18% governance. The breadth suggests the scale of the data infrastructure challenge. Most airports are nowhere near this level of systematic measurement.

There is an irony: the EU Commission has proposed scaling back from reasonable to limited assurance under CSRD. But Milanese argued the stricter standard is worth maintaining regardless – not because the regulation demands it, but because the market does. Investors, lenders, and rating agencies are converging on a level of ESG data scrutiny that will exceed whatever the final regulatory floor turns out to be.

The compliance cliff: By 2028, airports subject to CSRD will face ESG audits with the same legal and financial consequences as financial statement audits. The airports that build continuous evidence generation into daily processes now will be prepared. Those that do not may face greater compliance and reputational exposure.

From ambition to execution: What happens next

The sustainability track at PTE World Conference 2026 revealed a sector in transition between two eras. The first era, which lasted roughly from the Paris Agreement to the pandemic, was defined by ambition-setting: net zero targets, voluntary commitments, certification collections, and reporting as storytelling. That era is not quite over, but it is fading.

The second era, now visibly beginning, is defined by execution constraints. Airports know what they need to do. They are discovering that the systems required to do it – energy grids, waste regulation, SAF supply chains, hydrogen safety codes, noise metrics, biodiversity frameworks, and ESG audit infrastructure – are either broken, missing, or designed for a different problem.

Five structural shifts will define the next decade:

1. From Scope 1 and 2 to Scope 3 influence.

The airports that matter will be the ones that build contractual, commercial, and collaborative mechanisms to move the 99% of emissions they do not directly control. Carbon reduction within the fence line is necessary but no longer differentiating.

2. From mitigation to adaptation.

Climate adaptation investment will match or exceed mitigation investment at Mediterranean, tropical, and coastal airports within five years. The airports that embed adaptation into routine maintenance cycles will spend a fraction of what those waiting for the next catastrophe will pay.

3. From grid dependence to energy sovereignty.

Microgrids, own-grid management, and eventually SMRs will become the baseline for airports that take critical infrastructure status seriously. The definition of resilience is expanding from “can survive a disruption” to “does not depend on systems that can be disrupted.”

4. From waste management to circular procurement.

The opportunity is not in better bins. It is in reforming what enters the terminal in the first place, reclassifying cabin waste regulation, and embedding circularity into every procurement contract.

5. From reporting to assurance.

Sustainability data will be audited with the same rigour as financial data. The airports that build the control infrastructure now will pass. The rest will learn the hard way that incomplete ESG controls carry the same reputational and legal risk as incomplete financial controls.



“Net zero is won or lost in procurement decisions made years before the operations began.”

Keshav Singhal, head - environment and sustainability, Noida International Airport

The decisions being made now – in design studios, procurement offices, regulatory sandboxes, and boardrooms – will determine whether the 2050 targets are achievable or aspirational. PTE World Conference 2026 made clear that the industry knows the difference. Execution is the only remaining question.

Appendix: Sessions referenced

REPORT SECTION	SESSIONS
Executive summary	Cross-session synthesis; Everybody's business: role of collaboration and leadership in carbon management (Heathrow Airport); Building a sustainable and resilient airport for tomorrow (Changi Airport Group); Circular economy strategies for airports: waste, technology and value creation (Aeroporti di Roma); Panel discussion: PIT's Path to Energy Resilience and Independence (Pittsburgh International Airport); Controls over sustainability report information (Aena)
1. The Scope 3 dependency trap	Everybody's business: role of collaboration and leadership in carbon management (Heathrow Airport); Building a sustainable and resilient airport for tomorrow (Changi Airport Group); Redefining net zero: integrating sustainability from design to operation (Noida International Airport); Airports of tomorrow: sustainable multimodality and holistic energy use approach (Swedavia Airports)
2. Climate adaptation	Climate adaptation at Malpensa: a resilient airport for a sustainable future (SEA Milan Airports); Panel discussion: From climate change risk assessment to adaptation plans and actions (Save; Aeroporto di Bologna; WSP); Adaptation to climate change for infrastructure (Kansai Airports)
3. SAF	Building a sustainable and resilient airport for tomorrow (Changi Airport Group); The quiet revolution: futureproofing airports for climate and community (AGS Airports; Arup); Airports of tomorrow: sustainable multimodality and holistic energy use approach (Swedavia Airports)
4. Biodiversity	Biodiversity and airports: can deserts be turned into oases? (SAVE); Nature-positive transitions: boosting biodiversity and resilience at Schiphol (KPMG the Netherlands; Royal Schiphol Group); Redefining net zero: integrating sustainability from design to operation (Noida International Airport)
5. Circular economy	Circular economy strategies for airports: waste, technology and value creation (Aeroporti di Roma); AI-rports of the future: where tech meets circularity (Royal Schiphol Group); Panel discussion: EU Green Deal initiatives: between waste management and circularity (Brussels Airport Company; Royal Schiphol Group; Dublin City University Business School)
6. Energy independence	Panel discussion: PIT's Path to Energy Resilience and Independence (Pittsburgh International Airport); Panel discussion: Airports as energy hubs (SEA Milan Airports; Aeroports de Catalunya; Airport Regions Council); Panel discussion: Nuclear energy in aviation applications (AtkinsRéalis; Acuity International); Airports of tomorrow: sustainable multimodality and holistic energy use approach (Swedavia Airports)
7. Noise	The quiet revolution: futureproofing airports for climate and community (AGS Airports; Arup)
8. Sustainability reporting	Controls over sustainability report information (Aena)
Conclusion	Cross-session synthesis; Redefining net zero: integrating sustainability from design to operation (Noida International Airport)



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