JFK International Arrivals Building © Frederick Charles

Change in the air: creating a sustainable aviation industry

Insights and actions to support sustainable aviation

October 2016

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ARUP

Introduction

The aviation industry supports almost 63 million jobs globally, generates $664bn of global GDP per year and contributes 2% of human induced carbon dioxide. However the aviation industry needs to assess and improve its activities to become truly sustainable.

This paper summarises the key sustainability trends influencing this industry and outlines more than 20 opportunities to accelerate towards more sustainable aviation.

Arup's ownership structure supports the investment of time and resources into researching the latest issues, so that we can continue to shape a better world. We are focused on knowledge sharing and future proofing to deliver sustainable development with beneficial outcomes.

The following six research goals have been established to set a scope to support sustainable aviation.

Terminal 4 Melbourne Airport, Victoria © Kim Johnsen

Research goals

1. Analyse lessons learnt

Draw on global case studies that delivered robust solutions with tangible benefits for operators and passengers

2. Evaluate best practice

Document successful sustainability initiatives that streamline operations and improve whole of life outcomes

3. Future airports

Understand what the airport of the future will look like in light of current drivers and projections for demographics, urbanisation and climate change

4. Knowledge sharing

Engage with and improve knowledge sharing with airport operators and airlines to accommodate best practice sustainability initiatives and climate resilient design

5. Resilience

Incorporate cost effective sustainable infrastructure and climate change resilient design that safeguards and future proofs airports against shocks and stresses

6. Optimise operations and revenue

Develop and apply bespoke, pragmatic solutions and advice that optimises operations and revenue and provides a leading edge

Global trends

These global trends are influencing sustainability around the world.
They can start high level conversations, enhance understanding and support sustainability.

Environmental

- A changing climate is likely to impact on vital infrastructure
- Adoption of appropriate adaptation measures and offsetting is increasing
- Sustainable procurement, design and proactive management to efficiently use resources and minimise waste and discharge are becoming standard

Social, people and communities

- Greater investment in multi-modal public transport hubs and infrastructure that integrates with nearby communities
- Broadening of corporate annual and sustainability reports to incorporate indicators for human and social factors
- Demand for a built environment, infrastructure and products that support healthy lifestyles
- Requirement for real time information to be available at a glance to enable human centred design

Technology

- Smart technologies shifting labour patterns to increase efficiency, provide greater value for money and improve return on investment
- Data engagement and analytics becoming increasingly prevalent and driving innovation through digital masterplanning

Built environment and infrastructure

- Growth in investment and emphasis on developing and retrofitting infrastructure to improve resilience, particularly to extreme events such as sea level rise and flooding
- Focus on sustainable procurement and reducing in-use and embodied carbon during design and construction

Global flight paths © Arup

Aviation trends

These aviation trends are influencing sustainability in the aviation industry.
They can help focus and encourage sustainable, resilient design, construction and operational solutions for the industry.

Environmental

- Increasing scrutiny and concern around potential noise and air quality impacts associated with aircraft movements
- Increasing drive towards institutionally endorsed and third party sustainability certification including ACI Airport Carbon Accreditation and LEED

Social, people and communities

- Passenger growth is thriving, particularly middle class customers in developing countries
- Growing demand for optimal passenger experience and reliability due to greater choice and liberalisation of markets
- Airport cities are catalysing local economies and enriching local communities through voluntary charitable efforts and enhanced dialogue with local residents

Economic

- Growth of low cost business models focused on carrier capacity and purpose-built no frills terminals
- Shift in fleet mix as medium and larger aircrafts prevail
- Indirect economic activity through neighbourhood terminals and industrial activities that capitalise on economies of scale and agglomeration
- Growth of non-aeronautical services to increase revenue for airport operators and tenants

Built environment and infrastructure

- Changing security processes along with new technology require built assets to be adaptable to future requirements
- Digitalisation becoming more viable in lieu of extensive construction to streamline passenger processing and support air traffic growth

Johannesburg International Airport © Hugo Barnard

Building a sustainable aviation industry

Aviation is one of the most innovative and influential industries in the world and we must collaboratively work towards positive change for sustainability. Arup has identified a suite of opportunities to build a more sustainable aviation industry.

Eight high level opportunities that can be embraced to support the sustainability agenda are outlined. Additionally, opportunities catered to the needs of airports and airlines to support sustainable development and business are detailed.

The sustainability agenda

The airport's agenda

The airline's agenda

The sustainability agenda

New Civil Aviation Department, Hong Kong
© Marcel Lam Photography

Eight opportunities for sustainable thinking and differentiation that complement the global sustainability agenda and are relevant for a range of industries.

Decarbonisation

Carbon is a key driver for climate change and decarbonisation incorporates the quantification and minimisation of carbon and greenhouse gas emissions over the lifetime of a development. Transitioning to a low carbon economy while reducing direct and indirect emissions illustrates best practice: sustainability leadership.

Balancing in-use and embodied carbon

Reducing in-use and embodied carbon through the specification of low carbon alternatives and procurement of sustainable supply chains offers a range of long-term advantages. This frequently delivers high return on investment as well as quantitative environmental benefits.

Proactive energy management

Real-time energy management systems can capture, monitor, trend and report performance of assets. This can help manage peak energy consumption trends, spark discussion on ways to reduce consumption and avoid waste, thereby reducing resource use and operational expenditure.

Climate change resilience and adaptation

Climate change adaptation and resilience infers consideration and planning for the potential impacts of climate change. The risk and severity of potential climate change impacts can be assessed and reduced by delivering adaptation plans and more resilient infrastructure that can cope with potential shocks and stresses. This would complement strategic business continuity planning.

Integrated resource management

An integrated approach to manage waste, water and energy supply and demand allows for optimised resource consumption. Integrated resource management is cognisant of the circular economy, recognises resource constraints, delivers economic, social and environmental efficiencies and supports the provision of secure, long-term sustainable supplies.

Reporting

Sustainability and corporate social responsibility reporting demonstrates organisational capacity to prioritise and communicate economic, environmental, social and governance performance. This integrates sustainability into the decision making process, highlights corporate achievements and contributions to environmentally and socially sustainable development by setting targets to incentivise sustainable behaviour and performance.

Sustainable mobility

Sustainable mobility that facilitates incremental behaviour change towards active travel can enhance surface access and health outcomes whilst minimising environmental impacts. The provision of direct and sustainable connection options can improve passenger experience, reduce congestion and deliver health, social and economic outcomes.

Healthy lifestyles

The integration of health into design and the enhancement of inclusivity are being prioritised to support healthy lifestyles and facilitate stakeholder buy-in. Such initiatives can address air quality, water and noise alongside amenity, social cohesion, nutrition, fitness, relaxation and psychology. These are able to improve physical and mental health and wellbeing outcomes for end users and local communities.

The airport's agenda

Jet Blue Terminal, JFK Airport, NY © Nic Lehoux Gensler

Seven opportunities to improve construction and operational activities at airports.

Certification and standards

Long-term commitment to sustainability, international recognition and the accreditation of green airports is increasing. The voluntary development of sustainability guidelines and achievement of Airport Carbon Accreditation and third party sustainability ratings demonstrate leadership and performance that is environmentally, socially and economically responsible.

Sustainable construction

Sustainable construction considers environmental, social and economic considerations alongside other value-for money aspects such as price, quality and reliability. Sustainable construction at airports targets local priorities such as local employment and apprenticeships to generate societal and economic benefits that minimise environmental impacts.

Noise modelling and auralisation

Aviation noise is often a contentious issue and the use of GIS analysis, verified modelling and sound demonstrations using facilities such as Arup's SoundLab have proven effective in delivering a greater understanding of potential impacts. This enables positive stakeholder engagement, enhances credibility of noise outcomes and allows for the development and testing of bespoke acoustic design measures for airports.

Smart airside design

Smart airside design presents an opportunity to innovate and optimise valuable airside land and improve terminal layout to facilitate on-time performance.

The consideration of taxi times, processing times, walking distance to stands and productive dwell time can enhance punctuality, performance, non-aeronautical revenue, passenger experience and provide a competitive advantage.

Digitalisation and security operations

Technology and data analytics is driving change in the design and operation of airports. For example, smart security operations can streamline passenger movement and reduce waiting times. Automated border control gates and customs systems in combination with IT based security systems present an opportunity to create a secure, streamlined operational environment and passenger experience.

Integrated transport systems

Airports are multi-modal transport hubs that act as regional gateways and catalyse inward investment at airport cities. Investment in integrated transport systems can be critical to the competitiveness of an airport and deliver regional service clusters and economic development opportunities.

Community focused sustainable development

As airports become influential economic generators, the consideration of the local community is increasingly important to ensure stakeholder buy-in. Support for stakeholder engagement, inclusivity, community partnerships, shared facilities and critical infrastructure can enrich local communities and provide cost-effective agglomeration benefits to the region.

The airline's agenda

British Airways A380 Project, London © IAC

Six opportunities to improve commercial airline activities.

Alternative fuels

The momentum of change from traditional fossil fuels to alternative fuels (derived from biomass) is growing thanks to successful trials and supply agreements. This shift can be undertaken without changing aircraft or infrastructure. It can reduce greenhouse gas emissions associated with fuel consumption and present procurement opportunities. The shift to alternative fuels by airlines exemplifies sustainability leadership and long-term commitment to decarbonisation .

Carbon offsets and emissions trading

There are a number of opportunities to reduce greenhouse gas and carbon emissions through voluntary schemes, fiscal policy and market based measures.
Initiatives such as the IATA Offsets Program compensate for primary greenhouse gas emissions from aircraft on a particular journey by investing in carbon reduction projects, thereby reducing the carbon footprint of airlines.

Smart baggage processing

Logistical solutions for baggage handling are central to the success and efficiency of aircraft turnarounds. Intelligent forecasting and automated handling can be integrated and coordinated with smart passenger processing and IT systems to optimise security, efficiency and convenience for passengers and airlines. This can also assist IATA members with their obligations for Resolution 753 by maintaining an accurate inventory of baggage.

Digitalisation and smart passenger monitoring

Efficient passenger movement and smart monitoring through terminals is crucial to maximise capacity, competitiveness and revenue. Real-time monitoring can assist forecasting and feedback on services provided by airlines. Digitalisation can help identify logistical priorities for strategic business planning and support a user-centric approach to improve the passenger experience.

Quieter aircraft

Aviation noise is one of the greatest concerns for neighbouring communities. There has been a notable reduction in aircraft noise attributable to the evolution of jet engine design and fleet dynamics. When combined with more efficient taxiing and flight path optimisation, airlines can surpass acoustic targets and respond to dynamic stakeholder and operational environments that demand quieter aircraft.

Emerging materials

The use of emerging composite materials reduces aircraft weight, fuel consumption and embodied impacts associated with the design and manufacture of aircraft. Investment in research and development of emerging materials is gaining traction. This is particularly important as fleets evolve towards more medium and large aircrafts, 'cradle to grave' environmental impacts are better understood in light of the circular economy and there is increasing evidence for the long-term economic benefits for airlines using such materials.

Arup in Aviation

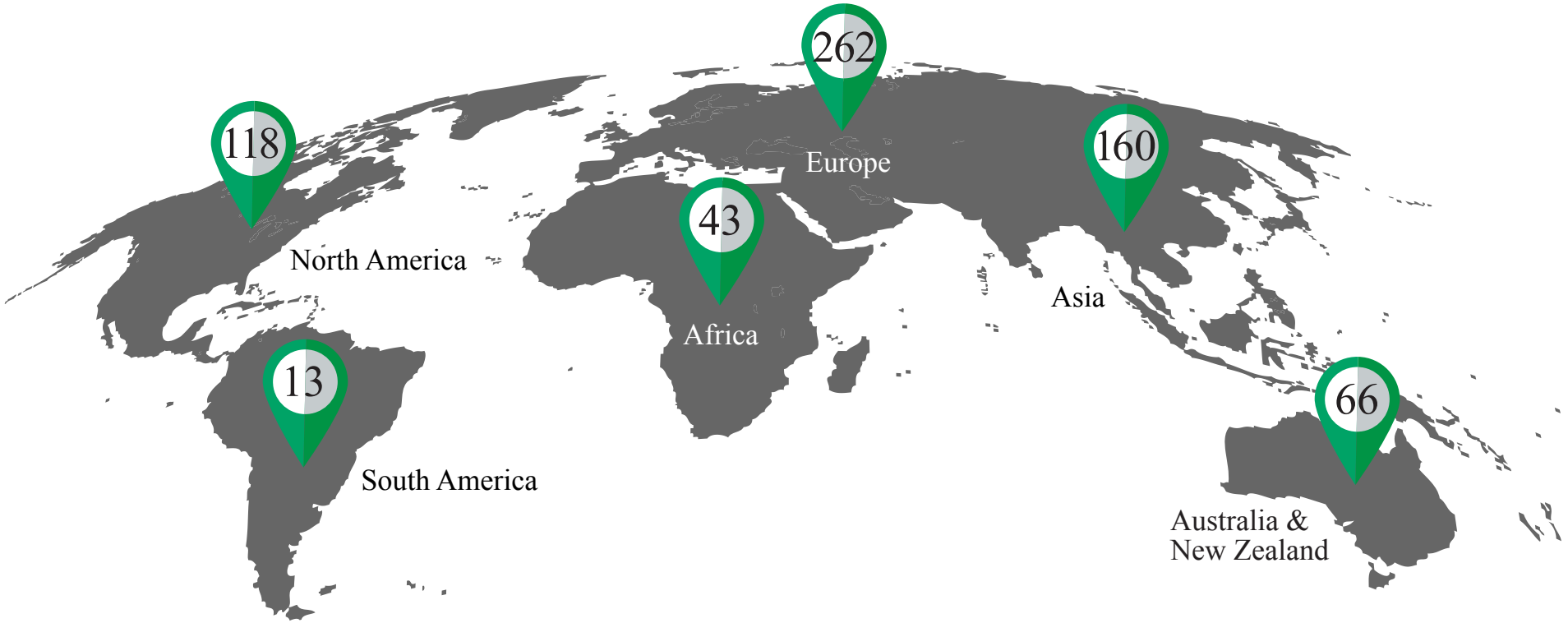
Arup has been involved in aviation for more than 50 years, with experience gained at more than 100 airports worldwide. We have advised the majority of the world's leading airports and are recognised globally as an innovative airport design firm and provider of integrated aviation services and high calibre technical advice.

Our collaborative approach sees airport planners, designers and engineers work in conjunction with technical specialists. Our multidisciplinary firm can draw on a range of skills including fire safety, acoustics, baggage, security, energy, waste, geotechnics, environmental, economic planning, contracting, project management and transport planning.

100+
airports worldwide

50+
years experience

Aviation projects undertaken in each region



Arup's integrated approach

Arup is experienced in all aspects of aviation and we have a breadth of skills covering the whole lifecycle of aviation projects. Our international presence and experience enables us to apply global expertise to suit local context.

We have worked on a range of projects including many of the world's largest international hubs to smaller, regional airports.

We have demonstrated efficient, coordinated delivery of services to produce better outcomes for our clients and improve operational and revenue efficiencies.

Opening + Transition

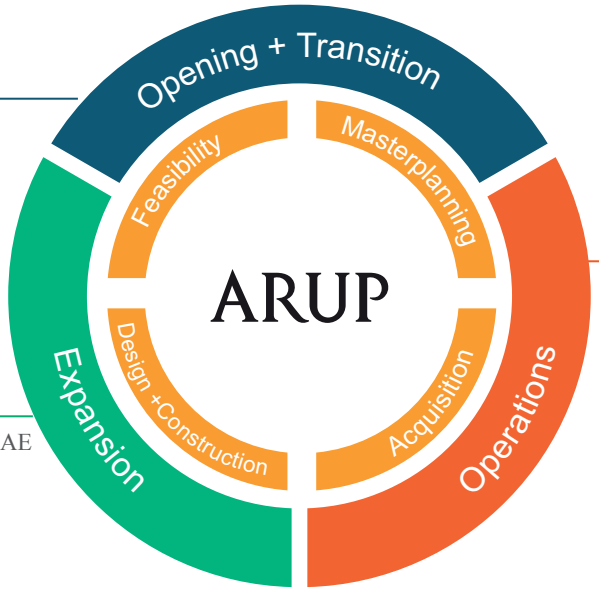
ORAT, Perth Airport, Australia

ORAT, Terminal 3,
Dubai International Airport, UAE

Expansion

Midfield Terminal, Abu Dhabi International Airport, UAE

Terminal 5, London Heathrow, UK



Operations

Energy benchmarking
Terminal 2, Dublin Airport, Ireland

ICT- Sky Plaza, Terminal 2,
Hong Kong International Airport, Hong Kong

Feasibility

Automated Transit Network Feasibility
San Jose, California, USA

New Lisbon International Airport, Portugal

Masterplanning

Sabiha Gökçen International Airport,
Istanbul, Turkey

Hobart International Airport, Australia

Design + Construction

Terminal 3, Beijing Capital
International Airport, China

JetBlue Terminal 5, JFK International Airport,
New York, USA

Acquisition

PPP Advisor, Chicago Midway, USA

PPP Advisor, Lekki Airport, Lagos, Nigeria

Arup's research

This paper builds on related Arup research undertaken in response to trends and lessons learnt from projects around the world. Our research provides evidence-based analysis of key trends and facilitates conversations to shape a better world.

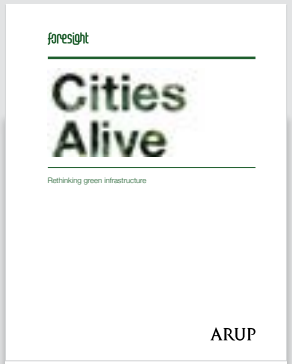
Our research draws on recent precedence and highlights innovative responses and opportunities to address sustainability and climate change in the aviation sector.

City Climate Hazard Taxonomy
+ Read more

Future Urban Mobility + Watch

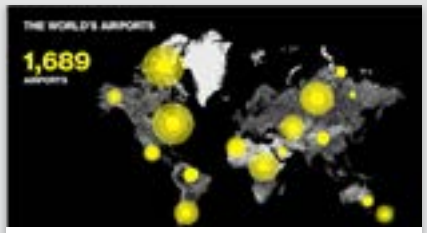
Climate Action in Mega Cities + Read more

City Resilience Framework + Read more



Cities Alive
+ Read more

Future of Air Travel
+ Read more



Aviation and Climate Change + Watch

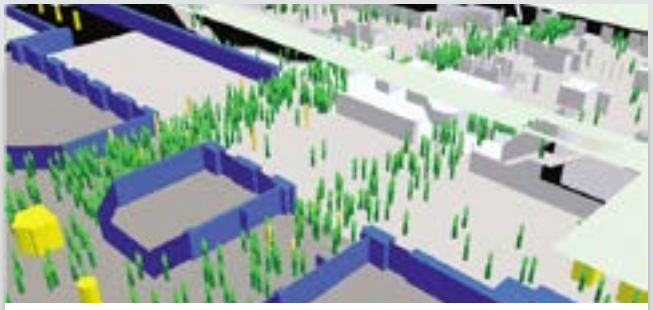
Aviation and Noise + Read more

Arup's innovation

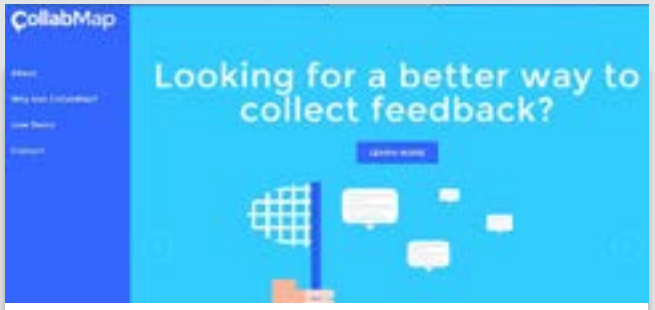
This paper also draws on our experience of delivering innovative ideas and world class solutions to support clients and local communities. We have developed a suite of tailored modelling, visualisation, auralisation and analytical software to predict, simulate and demonstrate different scenarios across a range of projects.

Our solutions are important for high profile, significant projects such as airport developments as it enables stakeholders to gauge outcomes in a transparent manner.

SoundLab® - Provides aural demonstrations of aircraft noise around airports + Read more



MassMotion - Crowd simulation software for analysis and planning + Read more



CollabMap - Provides a platform for streamlined, transparent engagement + Read more

SPeAR® - Enables effective appraisal of project sustainability + Read more

WeatherShift™ - Projects climate models and provides simulations for changing conditions + Read more

Find out more

Aviation
http://arup.com/Markets/Aviation

Research
http://publications.arup.com

Contact us

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