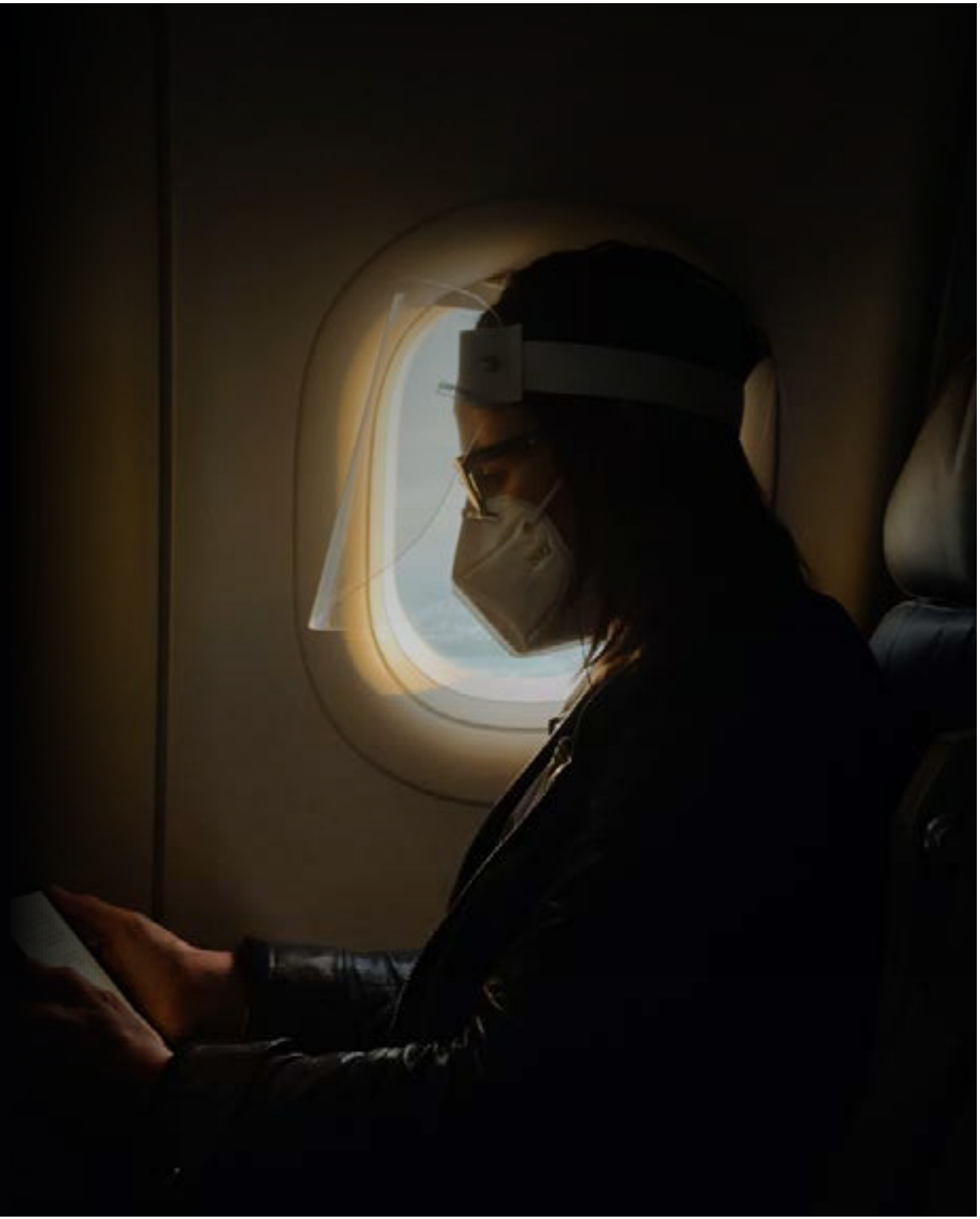
AIRPORTS WHITEPAPER

Exploring the Aviation industry in the “new era”

Environmental Intelligence for Airport Operations

August 2020



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Every facet of our daily lives has drastically changed due to the COVID-19 outbreak as have the industries that play their parts in supporting them. However, it's difficult to think of an industry that has been affected as much as the Aviation industry...

90% fall in European airport traffic

Daily carbon emissions down by 17%

50% reduction in measured aircraft noise

The pandemic has resulted in the collapse of major airline carriers within weeks of international border closures. Eurocontrol had shown a 90% fall in European airport traffic at the lowest point in the pandemic during April 2020 in comparison to the same period last year. While globally the impact to airports is expected to be around $97 billion USD for 2020[1]

According to the first definitive study of global carbon output in 2020, lack of mobility plunged daily carbon emissions by 17% in early April 2020 compared with 2019 levels. Our internal research shows that the Aviation industry witnessed a 50% reduction in measured aircraft noise around the world.

For the first time in several decades, society has looked upwards to a sky with very few planes while not hearing the familiar sound of aircraft engines as a routine part of our daily lives. Furthermore, we have seen countless news stories on the visibility of marine wildlife in the previously murky canals of Venice, or the ability to see the Himalayas for the first time in regions of India where it was once previously impossible to do so due to air pollution.

The global population has been treated to a preview of a world with lower carbon emissions, less intrusive noises and transparent bodies of water. As the Aviation industry begins to relaunch, the collective belief system of the society it serves has shifted.

The pre-COVID era of high annoyance and tolerance levels

The pre-COVID era saw the Aviation industry experiencing high rates of operational changes due to rapid industry growth from higher volumes of lower cost flights while runways at major airports were reaching maximum capacity. More specifically, there was general disconnect between noise reduction programs aimed at offsetting the growth and annoyance which continued to grow at most airports around the world.

Various international studies had started to identify that whilst society's annoyance was connected to noise, it was actually driven by a wide range of factors, some of which had no connection to noise at all[2]. Known as the non-acoustical factors they include topics such as noise sensitivity, age, living standards, social grade, attitudes towards noise and the industry, trust, fear and expectations for the future. Whilst these factors are diverse, they are important in the noise annoyance relationship and can account for around 80% of the noise annoyance driver, far higher than the acoustical component.

Whilst a complex set of factors has been linked to non-acoustic annoyance, at a high level it is possible to describe these factors and create a descriptive soundscape, creating an environment where human perception can be related to acoustical inputs.

Hear

The acoustical element of the noise, it includes the noise level, tonality, duration and frequency.

See

Non-acoustic and includes spatial and temporal factors such as time of day, week, year, privacy expectations, aircraft altitude and number of aircraft flyovers.

Feel

Non-acoustic and linked to an instantaneous response to what we have heard and saw. It is influenced by noise sensitivity, coping ability, state of listening and transient moods.

Believe

Non-acoustic and is based on application of logic, informed by our long term understanding and attitudes towards what we have heard, seen and felt. Socio-economic factors such as income, home ownership, length of residence can all have an effect.

The power of the non-acoustical beliefs was quantified in a study around Frankfurt Airport[3]. By asking a sample set of the population if they believed Aviation decision making was fair or not, a 14dB variation in noise sensitivity was visible between those who thought it was very fair, to those who thought it was very unfair. Similar studies have also explored this trend and found similarly large variations in noise sensitivity. These factors are also not static and can dynamically change over time, often in response to a change program.

Alongside expected industry growth, the pre-COVID era saw the inclusion of environmental factors within non-acoustical annoyance. In some cases, it became the dominant factor above noise. Opposition to expansion at London Heathrow has evolved from initially primarily noise to now focusing on environmental concerns including carbon and nitrous oxides[4]. Separately, Flygskam or flight shame was an emerging trend in Sweden that resulted in reduced air traffic over the country as individuals sought to reduce their carbon footprint. Fears were growing that this trend could also expand into new regions with the CEO of Jetblue quoted as saying "This issue presents a clear and present danger, if we don't get on top of it.... We've seen that in other geographies and we should not assume that those sentiments won't come to the U.S."[5]

Entering the new era with a shifted belief system

The new era has delivered a new global environment, one with lower noise and an overall 'cleaner world' - shifting our society's beliefs. It is likely that we will see an increase in grass roots community movements on the back of healthy air quality levels, improved noise and cleaner water. This creates a new challenge for the Aviation industry as any noise coming back will effectively be a 'new noise' while traffic smog and the all too familiar oily water film, that is often attributed to Aviation, will likely be negatively perceived by society.

The pandemic has also caused a shift in collective beliefs regarding the global economy. Organisations all over the world such as Twitter[6] and Google[7] have implemented mandatory 'work from home' policies at all their office locations. Prior to COVID-19, there was already a growing trend, however, as a result of the pandemic, this trend has exponentially accelerated and is increasingly likely to continue well into the future. The pandemic is changing how we live, our working lives and how we experience our environment. At the same time, we are all under more economic stress as a result of lockdowns and restrictions with forecasts envisioning a 5.2 percent contraction in global GDP in 2020[8].

Aircraft noise or traffic may be seen by some members of the public as the economy restarting and providing job security, especially within certain sectors and regions that rely on tourism, while others may see increased aircrafts overflying as a virus-spreading risk.

Whilst some factors are linked, others differ and diverge, and society's response will change. Strength of opposing beliefs will likely create new 'tribalistic' and smaller groups that campaign against single causes potentially with new protest or lobbying groups forming (e.g. anti-noise, pro-economy, anti-climate change).

Whilst our societies change, so does our regulatory framework with governments utilising stimulus to re-start economies post-COVID. This is providing a unique window of opportunity to dramatically accelerate progress toward achieving global sustainability targets, such as the UN's Sustainable Development Goals. The European Commission made this step early by linking economic stimulus packages to environmental commitments[9].

In order to relaunch, the Aviation industry will need to focus efforts into addressing these new beliefs in our society by understanding which of the beliefs or viewpoints exist in the local community and

identifying what can be changed. If addressed in the right way, this could result in acceptance of the airport's right to grow sustainably in this new era.

Modifiable beliefs

- Trust
- Expectations of the future
- Recognition of concern
- Transparency and information accessibility
- Perceived control
- Perceived fairness
- Choice of personal compensation/insulation
- Attitude towards the source

Non-modifiable beliefs

- Individual sensitivity to noise
- Past experience with noise
- Fear related to noise source
- Fear of property devaluation
- Social-economic standing

The COVID-19 pandemic has provided clear proof that the beliefs, perceptions and opinions held by the local community are non-tangible, dynamic and subject to change, often very quickly. As a result, approaches to shift community beliefs need to consider the long game and will continue be a 'marathon' rather than a 'sprint'.

We knew this prior to the pandemic with some leading international airports focusing on this strategy. Whilst they had made early gains, the starting point has now shifted backwards and has done for the entire industry.

New sustainability approaches based on shifted beliefs in the community

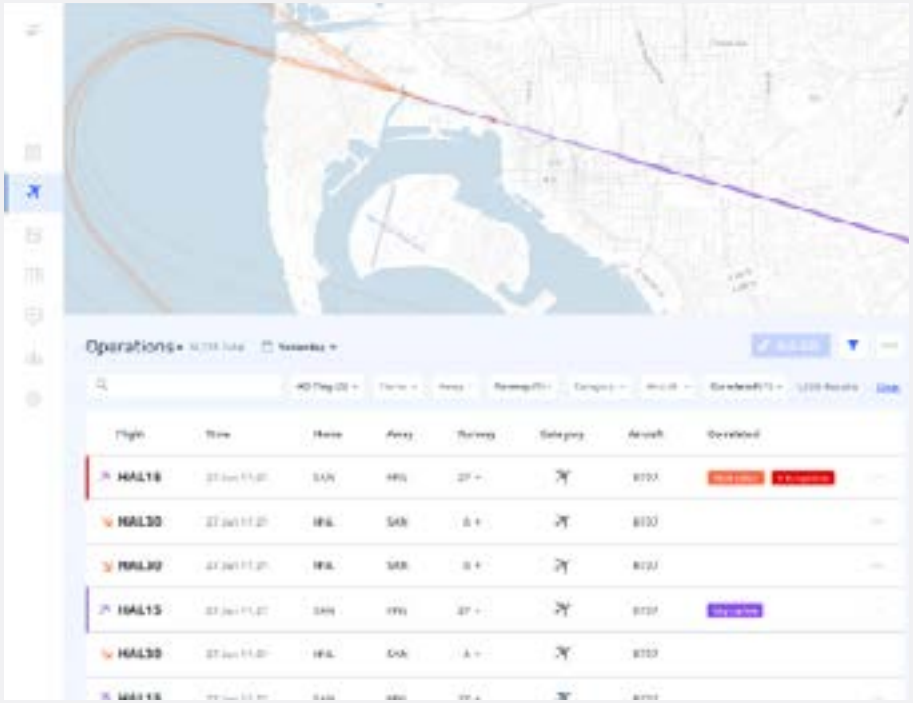
A plane flies over an Envirosuite designed, engineered and operated Environmental Monitoring Unit (EMU).

Using environmental data and sustainability initiatives to strengthen social license to operate

Prior to COVID-19 and over the last decade, airports committed to long-term sustainability goals have made large investments in noise management technology, enabling a greater emphasis on local community and leveraging environmental data to compare past performance, predict future noise contours, whilst managing and improving operations to enable continuous growth.

This approach enabled airports to work with communities on the modifiable beliefs. For example, 'trust' was gained through 'transparency and information accessibility', providing information about the future growth of the airport provides an expectation of the future, whilst engaging with the community and adapting

plans and programs to provides an element of 'perceived control'. Collectively these seek to gain the ongoing community acceptance of the airport's operations and growth, otherwise known as social licence.



Envirosuite ANOMS airport analytics being used to investigate inbound and outbound aircraft flight paths, noise, compliance with rules and community noise complaints.

The process was often assisted by an increasing trend towards collecting real-time data and centralising storage in systems where solutions such as analytics, automation and data visualisation tools were applied to the data to provide deep insights. These insights were then provided to the community to streamline airport workflows, allowing staff to focus on delivering sustainability goals.

These goals and ambitions have only been strengthened by COVID-19 and there is a growing trend of major airports addressing the challenges of relaunching in this new era, by committing to new goals such as becoming the most 'environmentally friendly airport, airline or industry partner'. Luton, Birmingham, Schiphol and KLM have all made similar large announcements.

Delivering on these goals and commitments is challenging. As an industry we need to adequately address the shift in society's beliefs and one way would be to expand existing noise and environmental management programs. However, we are in a new era, one which is likely to be cost sensitive for several years and thus there is a clear need to 'do more with less'.

Envirosuite's technology solutions can help, with cloud-based systems which can be remotely managed to provide specialist services such as predictive environmental management to greatly assist airports. These solutions enable staff to maintain crucial business activities such as environmental compliance, planning of operational activities and responding to community concerns with minimum disruption. Insights from automating environmental data acquisition and data visualisation both enable social licence to be secured whilst improving operational efficiency.

These solutions can also help address the broader challenge of holistic environmental management, combining the airport's strong pedigree with air and water monitoring and management strategies. As a leader in the field, Envirosuite knows this to be true based on first-hand experience collaborating with open-pit mining operations, wastewater treatment plants and terminal ports where implementing predictive environmental management systems have delivered operational efficiencies, with minimal impact to staffing, whilst successfully securing the social licence to operate and grow.

Air quality monitoring initiatives to strengthen social licence to operate

Due to public health initiatives in the past decade, society is becoming increasingly aware of negative health effects of poor air quality. Whilst most air quality issues at airports come from off-airport such as vehicle traffic, concern is growing around the contribution from aircraft on fine particulates which can disperse over wide areas far from the airport itself.

With the growing interest from both local communities and governments alike, it's becoming imperative to show management of air quality as part of the overall environmental initiatives in the new era.

Airports have traditionally had limited reference monitoring devices close to their perimeters. The high-cost of these units has typically precluded the expansion of a monitoring network. However, significant reductions in the cost of air quality monitoring sensors now enable airports to deploy additional sensors in parallel with the traditional networks to provide better coverage at a lower cost.

As leaders in the field of applied air quality solutions, Envirosuite has witnessed the success of similar implementations in collecting data using this arrangement in transport operations such as shipping ports and industrial facilities. In all cases this has allowed operators to act on unfolding air quality issues and supply accurate, hyperlocal data to stakeholders and strengthen their social licence to operate.

There is also a growing trend of air quality sensor use in the community. Often these sensors are easily installed and only require an internet connection, but once in-place they can stream data to a large interactive map for public access.

Envirosuite's city-wide motioning solutions showing the status of Air quality sensors across the City of Brisbane.

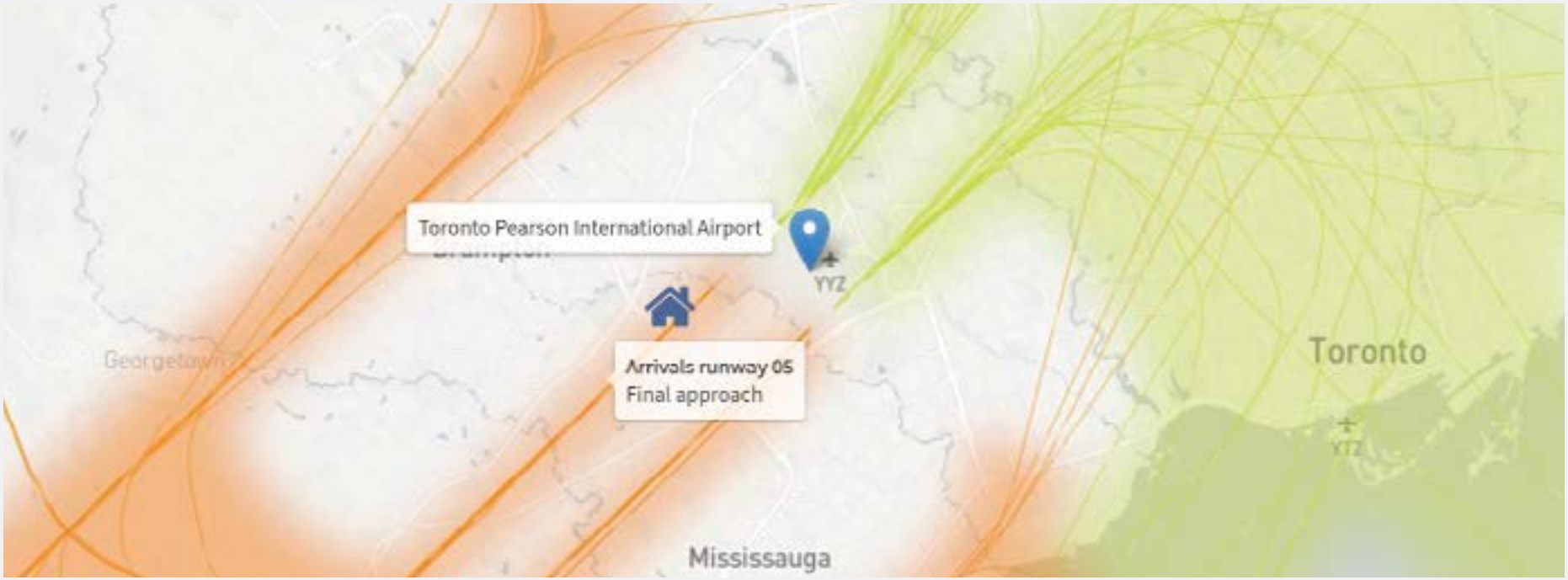
Envirosuite is currently incorporating this public data into solutions for airports to understand what is occurring on airport grounds and how it affects surrounding communities.

This is now leading an evolution in the relationship between business and the community, with new data sets being created and used to challenge the airport's own data and environmental management. Whether or not businesses respect the quality of devices used by

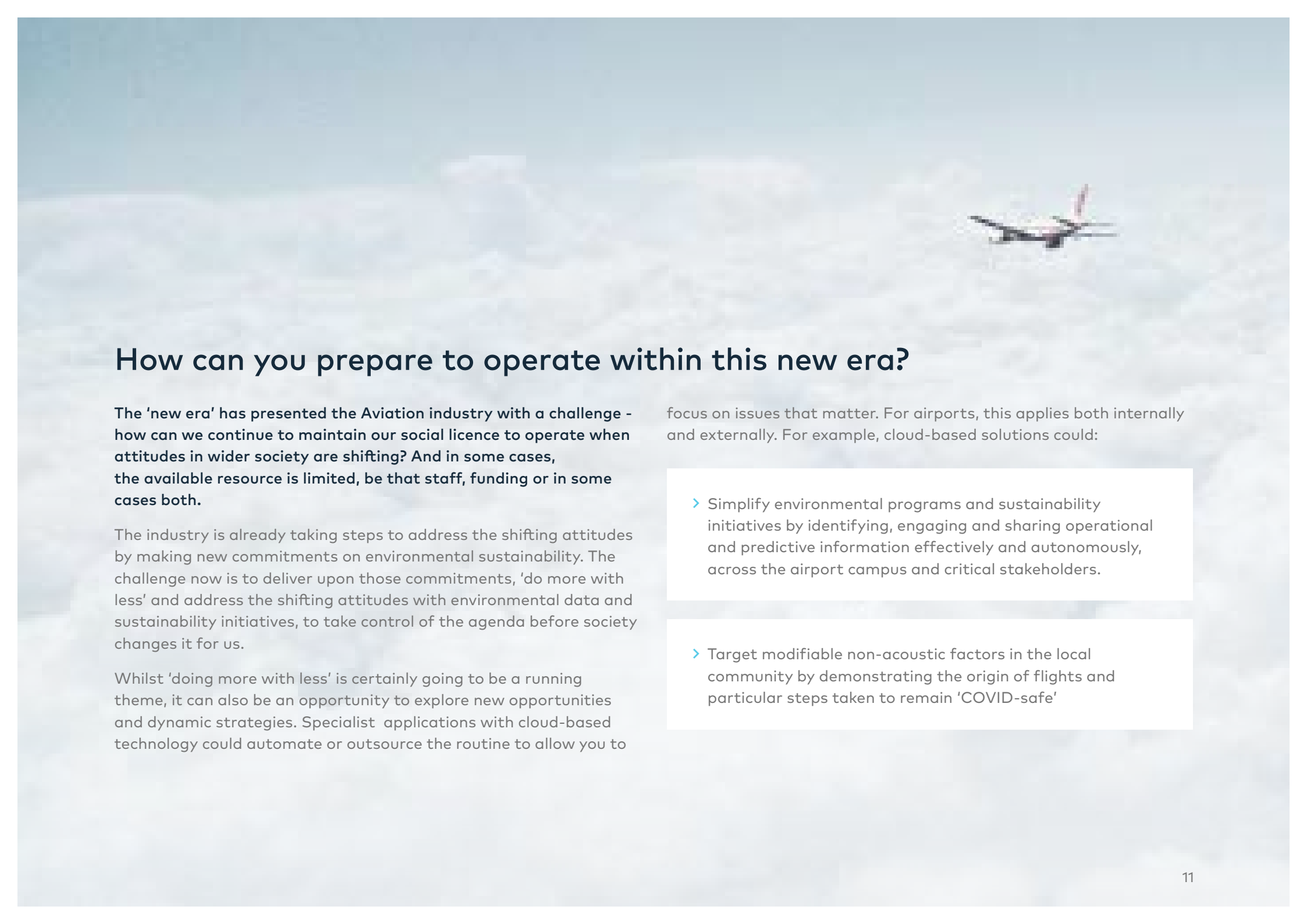
community groups or private citizens, the usage of these devices is likely to increase in the short-term. Strengthening social licence with surrounding communities will rely on airports leading the way and avoiding a 'tailspin discussion' around which party has the most correct data. The foundations of these discussions will need to be based on the understanding of the value data sensors like these provide alongside reference data sets.

Unattended water monitoring

Continuous, unattended water monitoring networks are now being used by airports to measure different variables at key sampling points, allowing for the real-time observation of current conditions around locations such as water holding tanks and pondages. This enables decision-makers to gauge the possible causes of variations in water quality. Airports can monitor water levels and quality to ensure operational activities that interact with water comply with regulations on discharges and do not impact the quality or the uses of water downstream of operations, such as community water reserves. This further strengthens the airport's ability to minimise its environmental impact and improve its social licence to operate.



Envirosuite's online interactive community engagement tools demonstrating the location of the community member alongside typical flight paths to and from the airport.



How can you prepare to operate within this new era?

The 'new era' has presented the Aviation industry with a challenge - how can we continue to maintain our social licence to operate when attitudes in wider society are shifting? And in some cases, the available resource is limited, be that staff, funding or in some cases both.

The industry is already taking steps to address the shifting attitudes by making new commitments on environmental sustainability. The challenge now is to deliver upon those commitments, 'do more with less' and address the shifting attitudes with environmental data and sustainability initiatives, to take control of the agenda before society changes it for us.

Whilst 'doing more with less' is certainly going to be a running theme, it can also be an opportunity to explore new opportunities and dynamic strategies. Specialist applications with cloud-based technology could automate or outsource the routine to allow you to focus on issues that matter. For airports, this applies both internally and externally. For example, cloud-based solutions could:

- Simplify environmental programs and sustainability initiatives by identifying, engaging and sharing operational and predictive information effectively and autonomously, across the airport campus and critical stakeholders.

- Target modifiable non-acoustic factors in the local community by demonstrating the origin of flights and particular steps taken to remain 'COVID-safe'

All of these solutions form what we call Environmental Intelligence

Pro-actively lead the discussion

Understand your local factors

Strategise your response across the airport campus

Use online platforms to effectively and pro-actively engage

Analyse your efforts and adapt your approach

Both are related, and cross-overs should be supported

Find opportunities to work smarter

Assist teams to return to site or remote operations

Identify opportunities to be a good neighbour

Automate your processes, analytics & reporting

Use Environmental Intelligence to align and simplify your programs

Leverage new technologies to optimise your infrastructure

Utilise flexible outsourced expertise

Introducing Environmental Intelligence

Environmental Intelligence harnesses the power of big data, artificial intelligence and analytics to produce real-time visualisations, predictive modelling and actionable insights that enable companies, governments and communities to make fast, confident decisions that optimise operational and environmental outcomes.

How Environmental Intelligence can assist airports in the new era

Airports have traditionally managed environmental and sustainability challenges by viewing retrospective data from monitoring networks to confirm the success of operating procedures and alignment with policy. Many airports and industrial operations have had difficulty acting quickly on historical information or recommendations included in environmental management plans. Perhaps the most difficult aspect of this is having employees integrate sustainability into their everyday operational activities.

Environmental Intelligence offers the ability to engage in 'predictive environmental management'. Advanced algorithms and high-resolution weather forecasting allow teams to predict environmental risk to take pre-emptive action, putting sustainability at the heart of the operation. Sources of environmental issues, including potential annoyance, could also be identified in real-time and presented in a manner that anyone within the airport campus boundary (or outside of it) can understand and act upon. Even if that act is a simple process of information sharing with the local community to explain that, for example, there is likely to be a thunderstorm in the area and flights may fly off their typical routes.

Integrating easy-to-action insights from complex environmental data into operations allows airports to move beyond standard environmental management practices, to consider how environmental data could be used to optimise their operation across the campus. This would effectively 'close the management loop' across teams and companies on the airport campus allowing effective communication and preparation.

Airport operators can use Environmental Intelligence to assist with maintaining responsible operations in the new era but also retain their "good neighbour" status. With advanced and automated communication of highly accurate data used to address society's modified beliefs in this 'new era', airports can improve overall stakeholder engagement and secure their social licence to operate.

Even after the peaks of the pandemic have passed and more planes begin to take off from runways, society's modifiable beliefs have shifted and so has policy. We are in a new era and one which we need to address. The Aviation industry now has the opportunity to prepare itself. Insights from Environmental Intelligence can provide a window into the future, while tactical datasets allow for agile shifts in approaches to sustainability and community engagement.

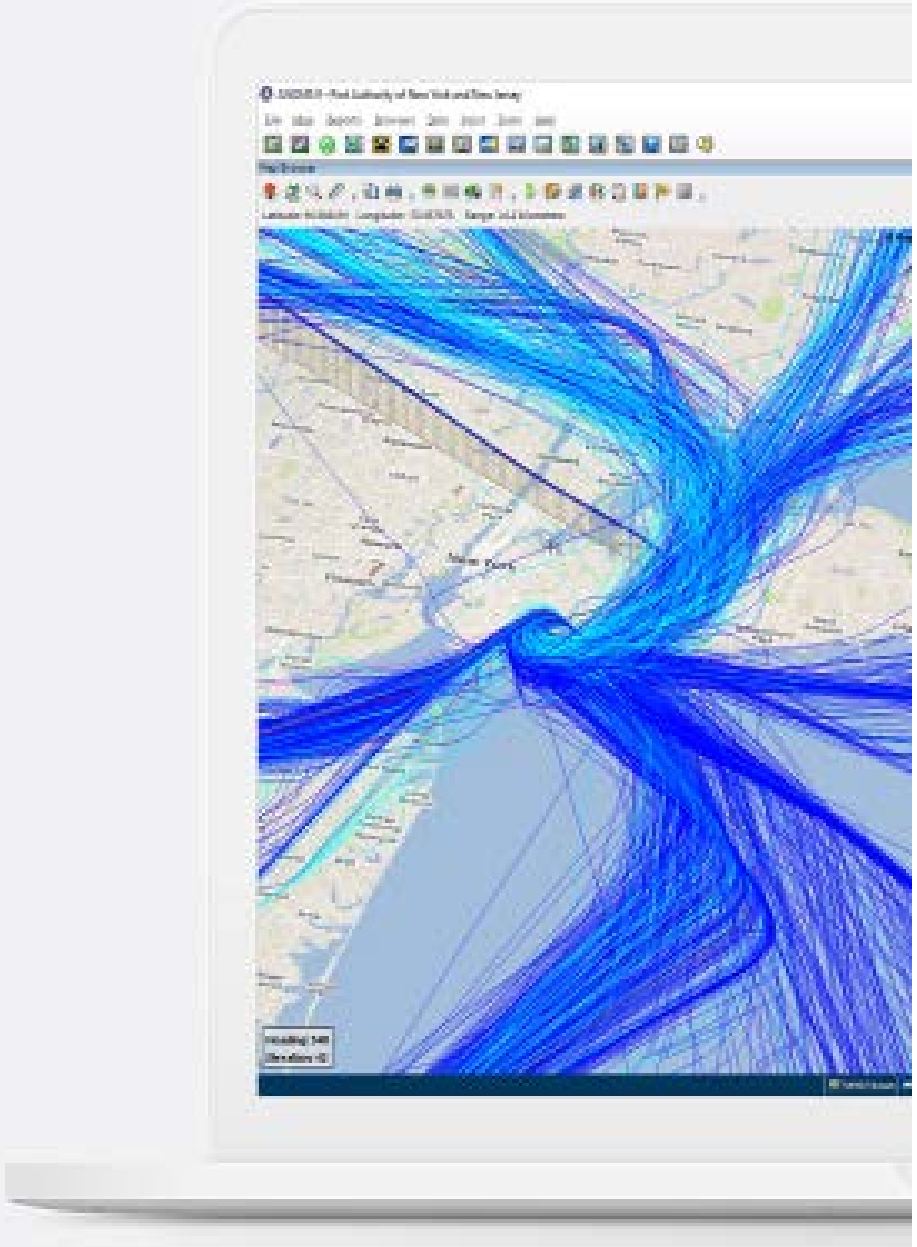
INTRODUCING ENVIROSUITE...

Design your future with Envirosuite

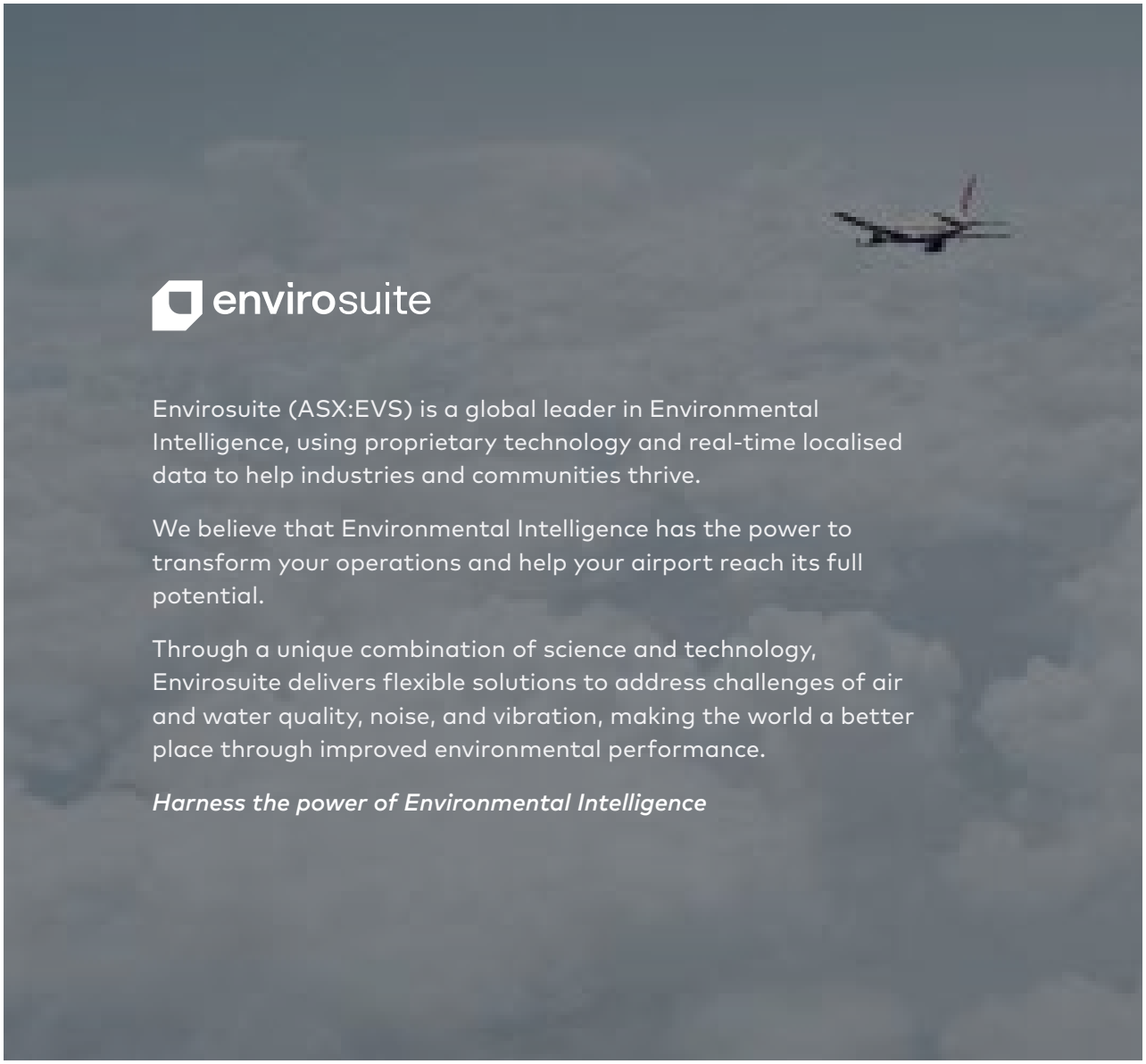
Envirosuite is Aviation's most trusted environmental intelligence partner, with proven expertise in noise monitoring and abatement, community annoyance and engagement, flight tracking and procedure performance, and airport optimisation and expansion planning.

Over 200 of the world's major airports are now harnessing Environmental Intelligence with Envirosuite solutions to:

- Monitor and manage the broadest range of parameters in real-time including noise, water quality, air quality, and odour
- Ensure social licence to operate with highly accurate data that can be transparently shared with communities
- Support growth and expansion methods with credible and trusted environmental data
- Achieve environmental compliance with noise abatement procedures to reduce community annoyance and noise complaints
- Accurately monitor flight tracks and procedures to increase compliance rates and develop future policies
- Prove environmental obligations are met with automated regulatory compliance reporting
- Apply best practice and emerging research to support airport optimisation and expansion planning



Powerful 3D visualisations available within the Envirosuite ANOMS packages



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Envirosuite (ASX:EVS) is a global leader in Environmental Intelligence, using proprietary technology and real-time localised data to help industries and communities thrive.

We believe that Environmental Intelligence has the power to transform your operations and help your airport reach its full potential.

Through a unique combination of science and technology, Envirosuite delivers flexible solutions to address challenges of air and water quality, noise, and vibration, making the world a better place through improved environmental performance.

Harness the power of Environmental Intelligence

REQUEST A DEMO

Learn more about how Environmental Intelligence can improve your airport operation at envirosuite.com/contact

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