

Airbus Defence and Space

Airbus Aerial is an image and data analytics services company that was launched in 2017. It integrates data from a broad array of aerospace assets including satellites and unmanned aerial vehicles. At the end of 2017, it employed 22 people.

c. Environmental Matters

The industry faces a variety of environmental challenges, including climate change, and Airbus invests and cooperates with stakeholders across the value-chain in researching and implementing innovative ways to meet them.

As aviation represents around 2% of global man-made CO₂ emissions, Airbus recognises its role in reducing the global environmental footprint of the sector and the importance of staying in line with the global 2°C trajectory. This is done through continually seeking to reduce the carbon intensity of Airbus' industrial operations and working together with Airbus' suppliers, industry and government stakeholders in its aim to find sustainable solutions to reduce the environmental impact of its products, deliver its ambitious sectorial emission reduction goals, as well as preparing adaptation to the effects of climate change on its operations.

One of these challenges is the elimination of substances from its products and processes that may pose a risk to human health or the environment, which will be addressed later in this section.

1. Environmental Management at Airbus

"Shaping our future" means that Airbus develops products and services taking into consideration current and foreseeable future environmental challenges for future generations and with long-term value creation in mind. Incorporating environmental values into its core policy not only improves the management of operational business risks and opportunities but also enhances the long-term sustainability of its business.

Alongside the Company's environmental policy in pursuit of eco-efficiency, Airbus has developed an aspirational long-term ambition for 2050 setting the direction for the Company regarding environmental matters, providing a framework to set up concrete environmental objectives for the short- and mid-term.

The Company's **2050 Ambition** covers the three following complementary directions:

- operating Airbus sites without impact on climate change by eliminating greenhouse gas emissions, with zero air and water emissions, zero waste to landfill and minimal natural resources consumption;
- delivering products which provide maximised value to customers whilst meeting expectations of society through minimised impact on climate, air emissions and noise, management of substances of concern aiming at their elimination and maximised reliability, throughout the product lifecycle;

- engaging the supply chain in the Company's ambitious objectives.

In 2015, an Environment Steering Committee was created to manage all matters related to the environment. The Steering Committee meets four times a year and is composed of the heads of Environment for Airbus Commercial Aircraft, Helicopters and Defence and Space, as well as a representative from the R&S department. Its role is to develop and define the environmental policy and associated objectives and agree on a common approach for the management of the environment throughout the Company.

Airbus has put in place a robust **Environmental Management System (EMS)** centrally and within its Divisions. One of the functions of the Airbus EMS is to track the enhancement of its environmental performance as it includes identifying, managing, monitoring and controlling an organisation's environmental issues. Airbus' EMS is guided by the latest version of the international environmental standard, ISO 14001: 2015 version. The 2015 version has a broader scope than previous standards, and Airbus was among the first aerospace companies to adopt it.

Environmental risks and opportunities are managed following the Company's ERM process. Risks and Opportunities are reported quarterly to the Executive Committee of each Division and top risks are consolidated at Company level to be brought to the attention of Airbus' top management.

On an annual basis, Airbus undertakes an extensive exercise to collect, consolidate and report the Company's environmental performance data. Quantitative data is gathered – energy and water consumption, CO₂ and VOC emissions and waste generation – as well as qualitative data – certification, incidents, activities on site. This enables Airbus to measure its environmental impact, follow its performance and communicate information on environmental matters to internal and external stakeholders. The Company's commitment to eco-efficiency is demonstrated through its transparent reporting.

In the future, the reporting of environmental indicators will include relevant categories of Scope 3 emissions for Airbus' operations. This will provide greater understanding of the impact on the environment of activities under Airbus' control.

Working in Cooperation

Airbus understands the importance of working together with other stakeholders to find solutions.

Engagement within the International Aerospace Environmental Group (IAEG). Airbus is a Founding Member of IAEG and participates in different areas of IAEG, such as greenhouse gas emissions, substances management, substitution technologies and supply chain to share practises and promote development of global standards for implementation of environmental requirements in the aerospace industry.

Airbus is an active board member of the Air Transport Action Group (ATAG) which sets goals and mobilises action on strategic aviation issues such as climate change through involvement throughout the industry (*i.e.* with other manufacturers, airlines, airports, air traffic management).

Aviation is a global industry and requires global solutions. ICAO, a specialised agency of the UN, has a proven track record of delivering robust aviation environmental standards and guidance (*i.e.* air quality, noise, CO₂). Airbus has shown a long-term commitment to support the need for global civil aviation governance, with ICAO as its corner-stone, working together with stakeholders across the aviation industry and with the relevant governmental agencies.

Airbus, with the rest of the aviation industry, has supported the ICAO agreements in 2016 on the CO₂ standard and Carbon Offsetting & Reduction Scheme for Aviation (CORSA), the new international carbon offsetting scheme for aviation.

Airbus continues to proactively support emissions and noise reduction once its aircraft go into service. This could be through fuel efficiency services, weight saving projects, retrofits (*i.e.* sharklets) and ground operations (*i.e.* eTaxi). In 2015, Airbus launched the Sustainable Aviation Engagement Programme, establishing long-term cooperations with various Airbus operators to offer ways to reduce their environmental footprint.

Clean Sky was at the time of its launch the largest European research programme funded by the EU, developing innovative, cutting-edge technology aimed at reducing CO₂, gas emissions and noise levels produced by aircraft. As part of this programme, Airbus developed the Bluecopter concept, which demonstrates a number of fuel saving and noise reduction technologies. It is already the quietest helicopter worldwide in its category, and also the first to reach the noise category A+. The demonstrator underwent a stringent flight test campaign until April 2017 in order to validate the effectiveness of the technologies developed in the frame of the CleanSky programme.

In September 2017, the Company used a modified A340 aircraft to test the laminar flow concept developed by Clean Sky. The BLADE project aims to reduce wing friction by 50% and reduce CO₂ emissions by up to 5%.

2. Environmental Concerns

Regulated substances across its products' lifecycles

Aerospace manufacturing, operations and maintenance rely on certain regulated substances to achieve a high level of quality, safety and reliability accounting for lengthy product lifecycles. Some of these substances are or may in the future be classified as substances that may pose a risk to human health or the environment. These type of risks depend on many factors such as the category of classification, but also the operational use of these substances under applicable laws/regulations laying down occupational exposure limits, and the lifecycle stage of the products.

If a substance not yet identified is classified in the future as one that may pose a risk to human health or the environment, this may give rise to substantial costs for Airbus to manage it, including, for example, research and development (whether alone or in cooperation with other stakeholders) of suitable alternatives, testing, qualification and certification costs. Any reputational risk and potential claim against Airbus that may result will also need to be managed.

Airbus continues in its activity (also in cooperation with industry stakeholders) to identify new technologies and solutions that avoid use of substances classified as posing a risk to human health or the environment, whilst satisfying airworthiness, certification and performance requirements. Airbus also engages with suppliers to promote the adoption of a similar approach through regular communication and, more widely, by working together with the aerospace industry to promote worldwide harmonisation of regulations and ways of working, taking into account the sector's safety and lifecycle specificities.

Airbus identifies, tracks and declares regulated substances. The Company has already substituted certain substances of concern or developed replacement technology where suitable alternatives have been found, such as some ozone-depleting substances (ODS), fluorinated gases, or substances of very high concern (SVHCs) under the European regulation REACH. On top of all applicable regulatory requirements, more than 100 substances have been targeted by Airbus for substitution and the Company is always looking for new solutions. For example, Airbus Commercial Aircraft launched the Airbus chromate free project in 2006. The project has so far delivered substitution solutions for a considerable number of usages and continues efforts to substitute the remaining ones. One of the first steps was to deploy chromate-free surface protection systems, with among others, operational changes and replacement within Airbus' production lines. Over 100 suppliers are now "qualified" to use chromate-free pickling before anodisation.

Within IAEG, Airbus contributed to the creation of the IAEG "Aerospace and Defence Declarable Substances List" (AD-DSL) and the associated declaration standard (IPC-1754). The AD-DSL provides an initial common list of chemicals/substances identified and reviewed by IAEG as used within the aerospace and defence supply chain and thus will make it easier to work with regulatory agencies to appropriately manage regulated substances and chemicals used in manufacturing.

Surface modification by laser is a new technology developed by Defence and Space to replace the use of substances for some processes, notably for pre-treatment before bonding. This technology is now available for some Space Systems applications and is planned to be implemented into the serial production of flight hardware for New Generation Synthetic Aperture Radar satellites (NGSAR).

Environmental impact of Airbus Operations

Airbus is engaged in an industrial transformation to anticipate and prepare itself for mid-term evolutions of its industrial systems as well as the longer term solutions to build its “factories of the future”. This Company-wide initiative will support the reduction of Airbus’ environmental footprint on air, soil and water quality, climate change, biodiversity and resource availability. An evaluation of hotspots is ongoing to help focus on appropriate topics.

Analysis of the current trends shows that the regulatory pressure on the international scene to reduce the environmental footprint of the aerospace industry is steadily growing (circular economy and resources efficiency, energy transition and climate change engagement, air and water quality improvement). In addition, the expectations of stakeholders (including citizens, investors) are also elements that increase pressure towards low carbon and sustainable production patterns. Since 2015, Airbus has been developing its plan for the next decade to prepare for upcoming regulatory developments, maintaining employee engagement and proposing solutions to stakeholders’ expectations.

Airbus has committed and continues to commit to setting up ambitious short-, mid- and long-term environmental targets. In 2006, Airbus set up the environmental vision for 2020 with goals for reduction of energy consumption, CO₂ emissions, water consumption, VOC emissions and waste production. To fulfil its commitments, Airbus developed innovative projects, continuous improvement mind-set and practices sharing and participates in projects with other stakeholders.

Airbus has also set an extended 2030 Vision, with operational objectives on Airbus manufacturing activities but also encompassing suppliers. Airbus wants to engage in ambitious environmental objectives in its aim to:

- enhance the use of environmental risk evaluation for consideration as a quantitative input during supplier selection, contracting and auditing phases;
- divert waste from landfilling and incineration;
- comply with air emissions regulations and absorb ramp up production impacts;
- comply with GHG emissions regulations (and compatible with the global 2°C trajectory) and absorb ramp up production energy impacts;
- develop strong maintenance and rehabilitation programs to improve reliability and lower water costs.

To highlight the importance of CO₂ impact in design and operation of plants, an initiative is being developed to set an internal “Carbon Price” to be used in the trade-off between different solutions. This may be used for industrial projects and 2030 Vision would integrate a progressive increase in the Carbon Price as a further carbon-reduction incentive and to bring greater appreciation of the CO₂ impact in the near future.

Airbus monitors and makes available data verified by external auditors, and publishes transparently its industrial performance. The performance linked to 2020 Vision results shows good progress (by reference to a baseline of 2006 at constant revenue and production) in different areas: energy consumption (stationary sources) has decreased by 37%, CO₂ emissions by 42% (scope 1 stationary sources + scope 2 total), while water consumption has been cut by 48% and waste by 41%.

Environmental data has been externally audited since 2010. Below is a selection of externally reviewed environmental indicators. The current reporting covers Scope 1 and Scope 2 emissions.

Environmental performance	GRI	KPI	Unit	2017	2016
Energy		Total energy consumption (excluded electricity generated by CHP on site for own use) ✓	MWh	4,098,475	3,893,111
		Energy consumption from stationary sources ✓	MWh	1,357,724	1,395,192
		<i>of which</i>			
		natural gas consumption	MWh	1,298,639	1,335,263
		distillate fuel oil consumption (Gas oil, Diesel, FOD)	MWh	13,782	12,170
		liquefied petroleum gas consumption	MWh	357	360
		propane consumption	MWh	1,356	3,883
		biomass consumption	MWh	43,117	43,517
	EN3	Energy consumption from mobile sources ✓	MWh	1,206,689	1,045,159
		<i>of which</i>			
		gasoline consumption	MWh	2,749	2,769
		distillate fuel oil consumption (Gas oil, Diesel, FOD)	MWh	26,020	27,166
		liquefied petroleum gas consumption	MWh	5	118
		propane consumption	MWh	1,736	1,700
		jet fuel aircraft / kerosene consumption	MWh	1,172,453	1,010,647
		▪ flight tests	MWh	687,071	559,106
		▪ Beluga	MWh	485,382	451,540
		aviation gasoline consumption	MWh	3,448	2,760
		Total electricity consumption ✓	MWh	1,534,062	1,452,760
		<i>of which</i>			
	purchased electricity consumption	MWh	1,405,920	1,371,842	
	purchased heat/steam	MWh	127,899	80,671	
EN4	generated electricity from photovoltaic on-site for own use	MWh	242	247	
	generated electricity from other renewable source on-site for own use	MWh	0	0	
	Generated electricity from CHP on-site for own use ✓	MWh	190,127	188,144	
Air emissions		Total CO₂ emissions	tonnes CO₂	1,013,101	935,402
		Total direct CO₂ emissions (Scope 1) ✓	tonnes CO₂	591,002	557,447
		<i>of which</i>			
	EN16	CO ₂ emissions from stationary sources	tonnes CO ₂	265,350	272,679
		CO ₂ emissions from mobile sources	tonnes CO ₂	311,036	269,493
		CO ₂ emissions from fugitive sources	tonnes CO ₂	14,579	15,203
		CO ₂ emissions from processes on site	tonnes CO ₂	37	72
		Total indirect CO₂ emissions (Scope 2) ✓	tonnes CO₂	422,099	377,955
	EN20	Total VOC emissions*	tonnes	1,565	1,539
		Total SO_x emissions	tonnes	15	15
	Total NO_x emissions	tonnes	314	241	

Environmental performance	GRI	KPI	Unit	2017	2016
Water	EN8	Total water consumption ✓	m ³	4,011,897	3,834,265
		<i>of which</i>			
		purchased water	%	76,5%	76,4%
		abstracted ground water	%	19,3%	20,0%
		withdrawn surface water	%	4,0%	3,5%
		rainwater collected used	%	0,2%	0,1%
Waste	EN21	Total water discharge	m ³	3,416,506	3,464,179
		of which water discharged via an internal pre-treatment plant	m ³	214,200	228,428
	EN22	Total waste production, excluding exceptional waste ✓	tonnes	105,839	104,505
		<i>of which</i>			
		non-hazardous waste	tonnes	77,073	77,835
	EN24	hazardous waste	tonnes	28,766	26,670
		waste going to material recovery	tonnes	61,933	62,344
		waste going to energy recovery	tonnes	21,844	21,954
		Material recovery rate ✓	%	58,5%	59,7%
		Energy recovery rate	%	20,6%	21,0%
EMS certification		Number of sites with ISO 14001 /EMAS certification**	unit	61	61
		Percentage of workforce covered by ISO 14001 & environmental reporting	%	90%	86%

✓ Data audited by Ernst & Young et Associés. Limited assurance report is available on www.airbus.com
2017 data covers 89% of total Company employees.

2016 data correspond to the data validated by the external third party in 2016, without any recalculation to take into account perimeters movements, which can explain some of the observed variances.

* 2017 VOC emissions data is estimated. The consolidated 2017 data will only be available following publication of the Registration Document.

** Number of sites covered by the environmental reporting which are certified ISO 14001.

Only 100% consolidated entities are taken into account. The data here results from Airbus' worldwide reporting campaign, carried out by the Environmental network. Airbus environmental reporting includes all 100% consolidated companies with more than 50 employees, which represent 99% of Airbus' total workforce. Among these companies, 90% had reporting contributors and tools. Note that some entities with less than 50 employees are taken into account in the reporting, as they are included in bigger entities which report their environmental data.

Environmental Impact of its Products in Operation

In the last 50 years, the aviation industry has cut fuel burn and CO₂ emissions per seat / kilometre by more than 80%, NO_x emissions by 90% and noise by 75%. Whilst this performance is impressive, high predicted traffic growth (5% *per annum*), aviation's short to medium-term reliance on fossil-based fuels and the potential impacts of non-CO₂ factors, the aviation industry faces a significant challenge in reducing its impact on climate change.

To address the CO₂ challenge, Airbus, along with airlines, airports, air traffic management and other manufacturers, committed in 2008 to the ATAG CO₂ emission goals:

- improve fleet fuel efficiency of 1.5% per year by 2020;
- stabilise: from 2020, net carbon emissions from aviation will be capped through carbon neutral growth (CNG);
- by 2050, net aviation carbon emissions will be half of what they were in 2005.

Meeting these goals will require a truly collaborative approach across the industry, focused on a combination of improvement measures including technology (including sustainable fuels), operational improvements, infrastructure (including air traffic management) and global market based measures (MBMs).

Progress has been made on the first two of ATAG emission targets:

- by delivering aircraft such as the A350 XWB, 25% more efficient than the previous generation aircraft and the A320neo with -15% to -20% fuel burn compared to A320ceo, the average increase in global fleet fuel efficiency has been over 2% *per annum* over the last five years;
- alongside reducing CO₂ emissions, Airbus aircraft also offer significant improvements in both noise and NO_x emissions reduction: A350 XWB with up to 21 dB lower noise and 27% lower NO_x emission compared to current industry standards, A320neo with up to 20dB lower noise and 50% lower NO_x emission compared to current industry standards. The new H160 helicopter brings noise levels down by 50% compared to previous generation helicopters;

Information on Airbus Activities

1.1 Presentation of the Company

- the recently agreed ICAO CORSIA will also play an important role in achieving CNG from 2020.

For the ambitious long-term 2050 target, clearly Airbus and the wider industry do not have all the answers today. Such significant reductions will require disruptive approaches in technology (*i.e.* hybrid electric), significant quantities of low carbon fuels, innovative ways of operating the aircraft (eTaxi, formation flight) and sustainable ways to offset emissions.

In reaching this ambition Airbus is working on a wide range of innovative technologies that have the potential for significant environmental benefits:

- propulsion integration: from advanced turbofans to hybrid distributed propulsion (*i.e.* electrification);
- aerodynamics: from advanced wingtip devices to natural and hybrid laminar flow;
- structures: from innovative materials to bionic structures;
- systems & cabin: from paperless/wireless to more electrical systems;
- operations: from noise to climate-optimised trajectories;
- manufacturing: from direct printing to 3-D printing;
- aircraft configuration: from integrated airplanes to disruptive configurations.

Electrification and hybridisation can bring significant benefits in addressing CO₂, noise and NO_x emissions. Airbus is driving a step change in air vehicle performance, first through small, short-range vertical take-off and landing (VTOL) urban air mobility demonstrator projects like Vahana and CityAirbus. In the longer term Airbus will also look at larger commercial aircraft.

Airbus' engagement also extends to promoting the commercialisation of sustainable aviation fuels. For example, in order to make a step towards regular distribution of BioJet, Airbus and Total are working in cooperation to use sustainable fuels on ferry flights from Toulouse to Hong Kong. A biofuel delivery platform has been set-up and is in service in Toulouse.

Recyclability and waste management are important topics that Airbus is tackling in cooperation with other entities. With TARMAC Aerosave, a joint venture between Airbus, SNECMA and Suez, more than 90% of an aircraft weight is today recycled or reused through a selective dismantling (reverse manufacturing) process. As airplanes manufactured with large volumes of composites start retiring in the next few decades, Airbus is working in cooperation with several specialist companies involved in carbon fibre recycling, as part of an industry goal to determine the best processes and uses for recycled and reused carbon fibre materials. Airbus is also investigating with certain operators innovative solutions to improve the in-flight cabin waste management.

d. Responsible Defence and Space Products

Airbus works together with states, international organisations and customers to create better defence solutions for a safer and more prosperous world. Its military aircraft, Earth observation satellites and security technologies help protect freedom and democratic values by enabling governments to guarantee their sovereignty and combat changing terrorism threats and cybercrime.

It is one of Airbus' aims to support the EU/NATO governments in their efforts to make the world a safer place. To fulfil their mission to guarantee sovereignty, security and human rights, these nations require equipment and defence systems that they themselves define. Airbus supports the EU/NATO governments – which constitute the majority of Airbus' customer base – in this task by supplying the necessary equipment.

Airbus defence technologies can also be used to solve societal challenges. More ways are being explored for observation or communication satellites to contribute to solving some global challenges such as climate change, fast and reliable internet connection or security. Recent projects include:

- Sentinel-5 Precursor, which is part of the joint European Commission–European Space Agency global monitoring programme Copernicus, aims to acquire continuous and accurate Earth observation data and provide services to improve the management of the environment, understand and mitigate the effects of climate change, and ensure civil security;
- Spationav is the coastal protection project of Signalis France, ensuring maritime security in France. Its mission is to protect human life, the coastal environment and French national interests while covering 6,000 kilometres of coastline with 5,000 ships tracked each minute. Spationav is counteracting illegal activities such as smuggling and terrorism;
- the Global Earth Observation Challenge organised by Defence and Space rewarded in October 2017, six start-ups that innovate and develop new applications primarily based on Airbus' satellite data. Among them, two projects were linked to monitor environmental impacts: Ozium (Australia) creates new landscape intelligence by fusing a variety of remote sensing data to identify where the environmental risks and opportunities occurred in the past, where they are today, and project where they will occur in the future; Kermap (France) uses satellite imagery to support the ecological transition of cities;
- TeSeR is the next EU project to clean up space, which is led by Airbus. Technology for Self-Removal of Spacecraft (TeSeR) aims to reduce the risk of spacecraft colliding with debris in space and provide a sustainable space environment for future generations;
- the OneWeb Satellites JV is building a communications network with a constellation of low Earth orbit (LEO) satellites, with a goal of enabling access to billions of people around the world. With more than 7 terabits per second of new capacity, it aims to transparently extend the networks of mobile operators and ISP's to serve new coverage areas, bringing voice and data access to consumers, businesses, schools, healthcare institutions and other end users.

Finally, the Airbus Foundation, which will be discussed later in this chapter, is multiplying partnerships in order to leverage Airbus' know-how and technologies to be applied to the humanitarian sector, with UAVs, satellite imagery and decontamination projects in particular.