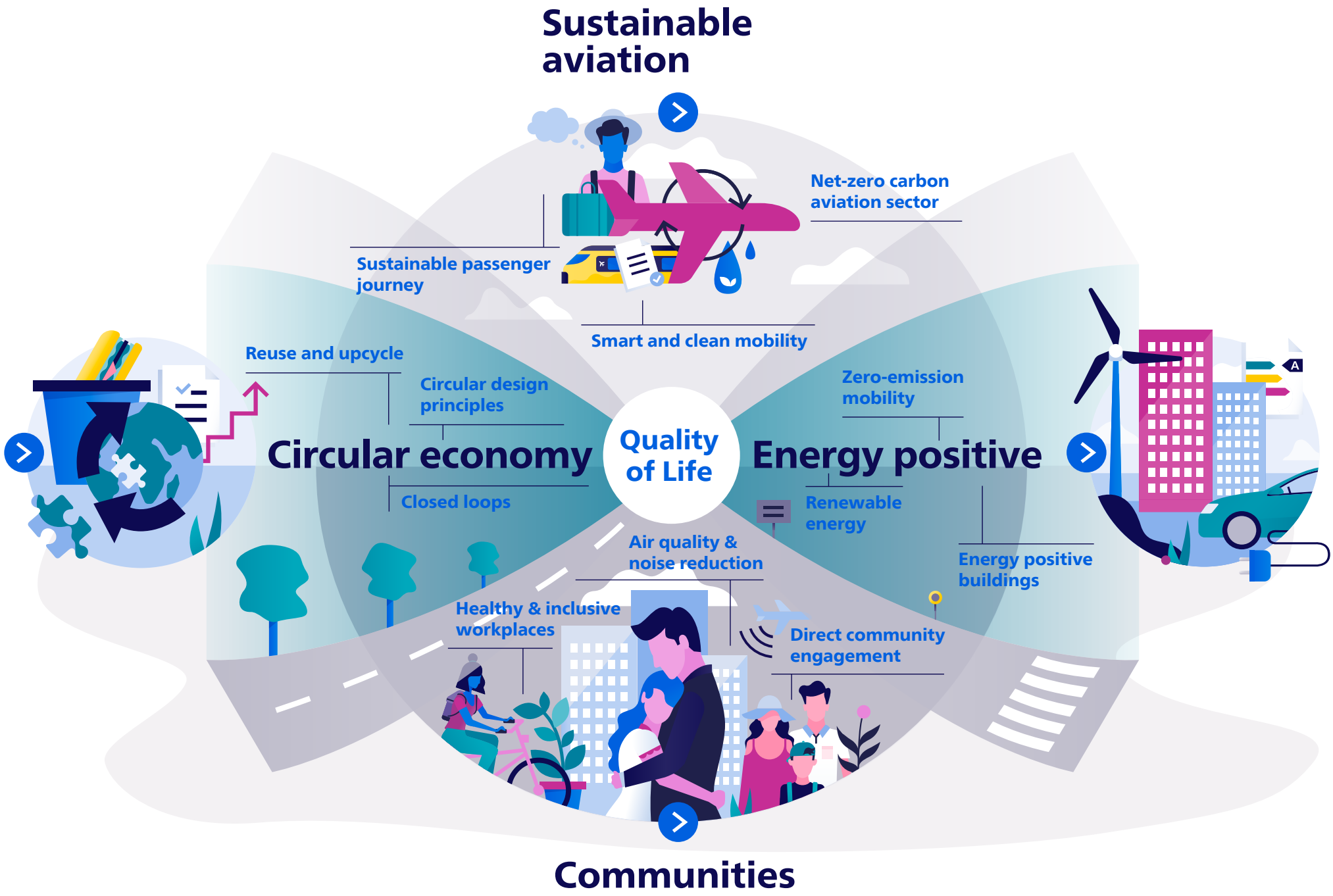
Sustaining your world

Vision and strategy towards the most sustainable airports

Schiphol Group


Sustainable aviation
Net-zero carbon aviation sector
Sustainable passenger journey
Smart and clean mobility
Reuse and upcycle
Circular design principles
Circular economy
Closed loops
Quality of Life
Zero-emission mobility
Energy positive
Renewable energy
Energy positive buildings
Air quality & noise reduction
Healthy & inclusive workplaces
Direct community engagement
Communities

Introduction

Introduction

Royal Schiphol Group is an airport company with an important socio-economic function. The airports in our Group create value for society and for the economy. Our Why is *connecting your world*, and in carrying out our role, we contribute to prosperity and wellbeing in the Netherlands as well as other regions. We facilitate outstanding multimodal connectivity for the benefit of national and regional development, trade and wellbeing.

Vision 2050

Schiphol Group has developed its Vision 2050, which defines our aspirational goals in light of our current environment, the fast-changing world around us and potential long-term developments and scenarios. In a world in which demand for connectivity continues to grow, we want to ensure air travel is managed responsibly – balancing the needs of passengers with those of the planet and society at large. Our ambition is to create the world's most sustainable and high-quality airports.

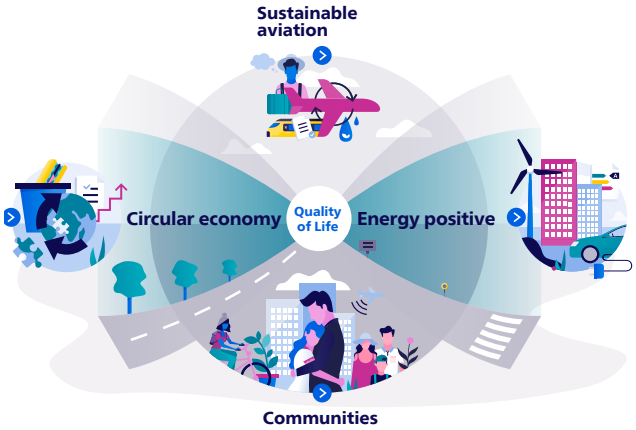
Vision 2050 is structured around three pillars: Quality of Life, Quality of Network and Quality of Service. It is built on the belief that – today and in the future – maximising the societal value of aviation requires Schiphol Group to carefully balance Quality of Life (environment) and Quality of Network (connectivity) while maintaining a high Quality of Service and ensuring safe operations at all times. Sustainability and safety are fundamental principles governing the actions and activities of all aviation and non-aviation activities across the Group. They are also key indicators against which we judge our success and measure our performance.

We care about the wellbeing of our employees, neighbours, passengers and business partners, as well as future generations. We aim to support healthy living and working environments, including restoring natural environment. It is important to our employees that Schiphol Group is socially responsible; by caring about our employees and neighbouring communities, we attract talented people who add value to our company and society as a whole, and who value us as a responsible employer.

Operator of the most sustainable airports in the world

Schiphol Group aims to lead by example when it comes to sustainability in the aviation sector. The ambition of Schiphol Group is to operate the most sustainable airports in the world, by focusing on on four key topics:

1. Communities
2. Sustainable aviation
3. Energy positive
4. Circular economy



The four themes are interlinked. The key topics Communities and Sustainable aviation are outside our direct control, and our influence on these topics is more limited. However, the potential overall impact of these topics is wider than those of Energy positive and Circular economy, where our influence is more likely to be limited to the immediate operations of Schiphol Group. The key topics Energy positive and Circular economy (on the horizontal axis) are in our direct control sphere and we have set ambitious targets. Our ambition is to go beyond 'zero' and create value, and to give this value back to the environment and communities so we can continue *connecting your world.* We believe we have to 'walk the talk' to make Energy positive and Circular economy part of the solution for Communities and Sustainable aviation on the vertical axis.

Delivering improvements within the four key topics – through our work with our partners, suppliers, our business operations and through the engagement of our people in this agenda – will create social, environmental and financial value. We have formulated a long-term goal for each key topic, and our sustainability roadmap outlines how Schiphol Group plans to achieve each of these goals. The roadmap explores solutions that are readily available or will become available in the near future while recognising that new solutions to existing problems are constantly being developed. Given the uncertainty surrounding other GHG emissions, the focus of the roadmap is CO_2, but we do not rule out other emissions, or solutions, emerging in the future.

Ambition: Schiphol Group operates the most sustainable airports in the world

Year	Key topic	Long term goal
2050	Communities	Pleasant living and working environment around airports
	Sustainable aviation	Net-zero-carbon aviation sector
	Energy positive	Energy-positive airports
	Circular economy	Circular airports
2030	Communities	Improved balance between communities and airports
	Sustainable aviation	Reduction of CO_2 emissions to 2005 level
	Energy positive	Zero-emission airports
	Circular economy	Zero-waste airports

Introduced in 2015 by the United Nations (UN), the UN Sustainable Development Goals (SDGs) relate to the 17 most important opportunities and challenges facing the world looking towards 2030. Schiphol Group analysed the SDGs and identified six that are relevant to our activities and our role in the value chain. We will actively support and contribute to these goals in this decade.

External trends and developments

There are 7 billion people living on earth, with the UN's forecasts projecting the world's population to reach 9.7 billion by 2050. All these people need basic facilities such as water, food, housing, energy, clothes, work and transport, and yet we are reaching the limits of our planet. The depletion of the earth's resources is nearing rapidly, while air pollution and other contaminations are a growing global issue. We have to respect our planet's limits; we have to treat our planet properly and act conscientiously and responsibly. However, human activities have brought a significant increase in CO_2 emissions. The resulting rising temperatures are leading to climate change, affecting living conditions for communities around the world.

The Airbus forecast indicates global demand for aviation will double again within the next 15 years. We need natural resources and materials to facilitate this growth. The aviation sector is responsible for 2-3% of CO_2 emissions generated worldwide and 7% of emissions in the Netherlands, and the sector's relative share will increase if it stands still as other sectors reduce their CO_2 output. While efforts have been made to make aircraft more energy-efficient over recent decades, demand for aviation has outpaced the sector's efficiency drive. As a result, CO_2 reduction has not been realised in absolute terms.

The carbon emissions of airport operators are covered in the 2015 Paris Agreement, which states that, to keep the effects of climate change to a manageable level, the rise in temperature should stay well below 2°C and ideally be limited to 1.5°C. For the Netherlands, the following goals have been derived from the Paris

Ambition: Schiphol Group operates the most sustainable airports in the world

Key topic	Sustainable Development Goal
Communities	8, 11, 17
Sustainable aviation	9, 13, 17
Energy positive	9, 13, 17
Circular economy	12, 17

Agreement: a 49% CO_2 reduction by 2030 compared with 1990, and a 95% CO_2 reduction by 2050 compared with 1990. Emissions from domestic flights are part of national emissions and are therefore covered by the Paris Agreement. The 2018 Intergovernmental Panel on Climate Change (IPCC) report states the impact on climate change is significantly smaller if global warming is limited to a 1.5°C increase; hence stressing the importance of net-zero-carbon in 2050.

During the Copenhagen climate summit in 2009, the International Air Transport Association (IATA) set the aspirational goal to reduce aviation-related CO_2 emissions by 50% in 2050 compared with 2005. In the shorter term, the aviation industry aims for carbon-neutral growth from 2020 onwards and a 1.5% energy-efficiency improvement each year. These goals are recognised by the International Civil Aviation Organization (ICAO). As new scientific insight emerges, we expect more ambitious long-term environmental goals to be defined.

Scientists are researching the environmental impact of emissions. There are uncertainties surrounding emissions and their impact, and how to mitigate this given the current state of technology. Besides CO_2, aircraft emit other emissions that contribute to global warming, including contrails such as methane and nitrogen oxide. The environmental impact of these emissions is higher than the impact of CO_2, though the amounts emitted are relatively low. The extent to which these substances influence the atmosphere depends on weather conditions and flight altitude. Emissions of different greenhouse gasses are indicated in terms of CO_2 equivalents to enable the comparison of their respective contribution to global warming. The impact is still subject to research. At present, aviation-related CO_2 emissions are doubled in order to ascertain the overall amount of CO_2-equivalent emissions. Additionally, we focus on emissions that affect air quality, including the possible effects of ultra-fine particles (UFPs). While the impact of UFPs is again still subject to research, and no legal standards exist, Schiphol Group has begun executing measures to mitigate their effects.

Our role

Schiphol Group plays a coordinating role in driving supply chain responsibility. We encourage suppliers within the chain to improve their impact on the environment, and we promote positive working conditions and employment in order to ensure the sustainable development of our airports. Aside from sustainability, we work with our supply chain partners to tackle other important issues, such as the illegal trade of protected flora and fauna species, and safety.

Inspired by the need to think and take action together, we endeavour to go the extra mile in terms of our commitment to supply chain responsibility. We see a shift in our role: rather than simply facilitating, we are increasingly collaborating with our suppliers and business partners and even steering their activities. To be successful in this role, we must 'walk the talk'; we have set ambitious targets for own activities and are prepared to overcome hurdles and challenges on the pathway to becoming more sustainable. We are also consulting with Airports Council International (ACI) and International Civil Aviation Organization (ICAO), as well as international airports, airlines, air traffic control and aircraft manufacturers, on worldwide solutions to make airports and the wider aviation sector more sustainable.

Our profound belief is that sustainability is not a competition. As partners, we must all step up our efforts to support each other as we work towards our wider goals. Schiphol Group strives to embody this approach by collaborating closely with airports across Europe and beyond.

Significant sustainability achievements have already been realised

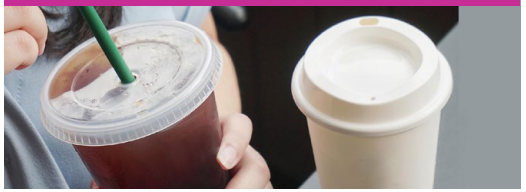
Circular Economy	P1 design for disassembly	Light as a service	Cradle to cradle morgue	Sustainable brands
				
Energy Positive	100% Dutch wind power at all airports	Electric buses airside	New terminal energy neutral	Electric GPU
				
Sustainable Aviation	Joint action agenda	Invest Sustainable Aviation Fuels	Electric buses in the Schiphol region	Zero emission taxis
				
Communities	Landart park Buitenschot	The Polderbaan experience	Projects for young people	Central Business District and healthy offices
				

Significant sustainability achievements have already been realised also at the regional airports

Circular Economy

LA: Sustainable materials & LEED Gold

EA: Reusable cup



LA: Sustainable runway construction

Energy Positive

EA: 100% green gas & ACI ACA 3+

RTHA: Solar park next to runway

LA: Solar-powered parking

EA: Electric GPU

Sustainable Aviation

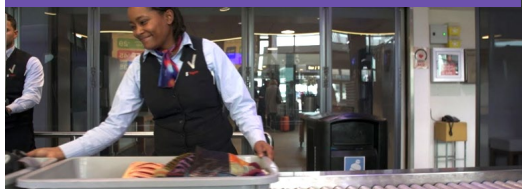
RTHA: Research pilot synthetic kerosene

LA: E-bike route from station to airport

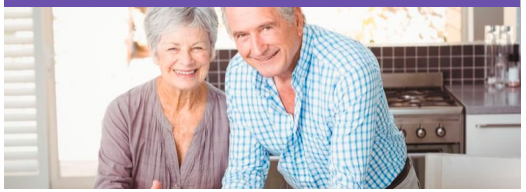
RTHA: 100% zero-emission taxi fleet 2022

Communities

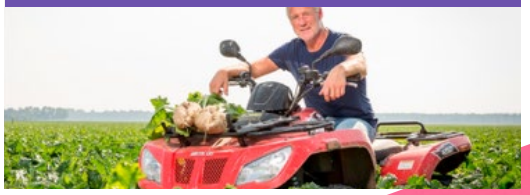
RTHA: stimulates regional employment for young people



EA: neighbour app



LA: Local food from farmers



Communities

Communities

At Schiphol Group, we realise that the success of our Why *connecting your world* will increasingly depend on the wellbeing of the world around us. We pay close attention to the needs of local communities around our airports, as well as our other stakeholders, while striving to maintain a strong local and national support base for our activities. Airports are an important driver of employment, boosting regional development and economic growth. Our midterm goal is to improve the balance between the positive and negative effects of aviation for the communities around our airports. Looking to the longer term, our goal by 2050 is to create a pleasant environment around our airports in which people can live and work.

Air quality and noise reduction

Despite the advantages of aviation, we also recognise the wider impact of aviation on neighbouring communities and the environment. In particular, we note growing calls from governments, local communities and the wider public to reduce emissions and noise pollution, and to mitigate climate change. We strive to be a good and responsible neighbour to our local communities, starting by listening closely to their needs and wishes wherever possible. To continue *connecting your world*, it is more important than ever that our ears are open to the concerns of families, individuals and businesses affected by our activities. And we must continue working hard to ensure a positive impact on our environs and to minimise the negative impact of our operations.

Aircraft noise has a substantial impact on the quality of life of the neighbouring community. We have developed a plan to reduce noise hindrance by further optimising runway usage, routes and incentivising the use of quiet and clean aircraft, both during the day and at night. Through our Quality of Life Foundations, we focus on area-specific projects in the immediate environs of our airports and on mitigation in cases of noise-related distress.

We maintain a constructive dialogue with the surrounding communities, on issues such as the impact of flight paths and runway maintenance projects on the living environment. Meanwhile, daily information on local air traffic, runway use and general aspects of living near Schiphol is provided through the Local Community Contact Centre Schiphol (BAS). BAS registers complaints about noise or any other concern our neighbours may have.

Schiphol Group is dedicated to improving air quality at and around its airports, by reducing NOx and ultra-fine particles (UFPs) emitted by our own activities and those of third parties. Through the electrification of buses, taxis and the wider vehicle fleet, we have already taken important steps towards reducing these emissions. At Schiphol, the switch from diesel to gas-to-liquid (GTL) at airside has improved local air quality and the working environment. Our next step is to go to zero emissions for our own activities and all operations at airside, starting by setting up a measurement pilot together with independent expert organisations as set out in our action plan on UFPs.

Direct community engagement

Balancing the benefits and costs of our activities will therefore be crucial to ensure the wellbeing and support of our neighbours and stakeholders in future years. Besides contact via websites and social media, we engage directly with our neighbours through regular discussions, events and other initiatives. The Schiphol Fund stimulates sport and exercise by donating to non-profit public benefit organisations. Meanwhile, we continue to explore ways to promote dialogue with our neighbours and engage with different stakeholder groups. As a future-looking organisation, we make a special effort to engage with children, students and other young people, with a particular focus on issues such as safety, sustainability and other key aviation topics.

As a front-runner in sustainability, we care deeply about life and health and take our responsibility towards our neighbours and future generations seriously. Many climate solutions go hand in hand with ensuring a healthy living environment, and we engage with regional communities to protect nature and biodiversity across our airport locations and their environs. An important initiative involves the placement of beehives given the crucial role of bees within the ecosystem. The stimulation of biodiversity is bound by certain flight safety constraints, as the presence of birds at airports must be limited. We therefore aim to support diversity in flora without attracting birds; flax and miscanthus have limited attraction for birds, for example, and can also be used in bio-based materials such as concrete and composites. Conservation activities, such as restoring peatlands and local reforestation, are also important as we look to preserve the natural environment around our airports.

Healthy and inclusive workplaces

One of Schiphol Group's strongest assets is our diverse, motivated and loyal workforce. Schiphol supports a wide range of careers, from various transport and retail positions to roles at our head office and with companies located nearby. Schiphol employs individuals of all ages and with varying years of service. Moreover, Schiphol Group operates in an environment that is constantly changing, which requires us to be agile and respond quickly to trends and developments when needed. Because we value people for who they are and their qualities and talents, we work hard to promote an inclusive environment for all employees regardless of their cultural or work background, gender, sexual orientation or physical disability.

Our important role in society means employees value Schiphol Group as an attractive employer. Our aim is for our employees to be a reflection of society. Through close collaboration with Luchtvaart Community Schiphol (LCS), we contribute to education and a stable labour market that stimulates regional employment, and we support individuals with difficulties accessing employment. At the same time, Schiphol Group prioritises the personal development of each employee, ensuring their preparation for the future labour market in the best way possible.

Our commitment to our employees extends to ensuring safe and healthy work environment, and we work side by side with our sector partners to improve conditions for those working in security and baggage-handling areas at our airports, for example. Among other measures, this joint approach has included introducing lifting aids to reduce physical strain on employees, as well as standing supports to provide relief to workers operating security lanes. Schiphol Group is gradually introducing Robotic Process Automation into its day-to-day work process. Covering repetitive tasks through automation enables them to be carried out 24/7, removes the potential for human error and allows employees more time for higher-level tasks such as quality control.

In relation to Schiphol Group's commercial real estate portfolio, we are conscious of the potential impact of new office developments on the environment, as well as our responsibility to ensure the health and wellbeing of the people working in these spaces. To address this, we are developing healthy offices, monitoring air quality in offices, improving public transport and bicycle infrastructure, and paying close attention to external standards such as BREEAM and LEED certification.

We also recognise that organisations based at Schiphol are all part of a community. With the SPOT community initiative, we support employee events and knowledge-sharing platforms aimed at driving networking, collaboration and innovation.

Communities

Air quality and noise reduction

- Implement hindrance plan to mitigate negative impact on neighbouring communities with renewed Schiphol Quality of Life foundation
- Execute Ultra-Fine Particles action plan
- Continue dialogue with local communities

Direct community engagement

- Collaborate with partners to set up constructive governance for future participation and consultation purposes
- Engage with communities and young people and stimulate exercise via the Schiphol Fund
- Participate in local nature conservation, including biodiversity projects

Healthy and inclusive workplaces

- Offer sustainable, smart and healthy offices
- Contribute to education and support people with difficulty accessing employment, through the Luchtvaart Community Schiphol (LCS)
- Appoint employees that reflect the composition of society

Sustainable aviation

Sustainable aviation

Aviation has an important role in connecting people and businesses across the world. Global demand is expected to increase significantly; however, to tackle global warming, net carbon emissions should be reduced to zero to maintain global temperature levels at 1.5ºC above pre-industrial levels. Schiphol Group aims to operate the world's most sustainable airports and takes responsibility by stimulating the sector and customers in achieving global sustainability objectives.

This responsibility is supported by our actions on three themes

1. Net-zero-carbon aviation: stimulate development and use of sustainable fuels and increase the efficiency of aircraft operations – in the air and on the ground. Carbon offsetting is required as an essential interim measure whilst we undertake the actions above to realise Schiphol Group's 2050 objectives as quickly as possible;
2. Smart and clean mobility: invest in infrastructure, stimulate the use of efficient and clean mobility for passengers and commuters as well as logistics companies/airport suppliers;
3. Sustainable passenger journey: inform passengers and support them in making sustainable choices; fight abuse of humans and nature alongside our partners.

Net-zero-carbon aviation

Our long-term vision is that of net-zero-carbon international aviation emissions by 2050. Schiphol Group has partnerships at a national level ('Smart and Sustainable' action agenda, Climate Round Table for Sustainable Aviation) and we have forged strong ties with organisations at a European and global level to discuss new developments and regulations. As our starting point for innovation, we believe stepping up our joint efforts to achieve sustainable aviation at a global level will improve quality of life at a local level.

Sustainable aviation fuels are one of the few available short-term measures for lowering aviation emissions. They have a double positive effect since their use leads to lower emissions of CO_2 and ultrafine particles (UFP), which is better for the climate at a global level and air quality at a local level. Schiphol Group participates in the research and development of sustainable aviation fuels, including feedstock and scale-up opportunities. The Dutch aviation sector is committed to ensuring sustainable aviation fuels comprise 14% of all aviation fuels used at our airport locations by 2030.

Technological innovation, and the investment needed to support this, will be a key driver of a sustainable future for aviation. Working closely, with airlines and other mobility partners, we promote the research and development of sustainable aviation technologies by promoting the trialling, and eventual use, of new innovations at our airports. Radical fleet renewal is another way to reduce emissions and involves using newer aircraft models (which are quieter and more fuel-efficient) and accelerating the development of hybrid and electric propulsion. Electric taxiing is a potential short-term option for reducing aircraft emissions.

Schiphol Group has built a strong sustainability element into the airport charges structure at Amsterdam Airport Schiphol: our take-off and landing fees now give preference to aircraft that are quieter and more environmentally friendly. These incentives will be strengthened further in the future. We plan to discuss our findings with our sector partners to support mutual learning to drive technology to the next stage.

The Single European Sky (SES) initiative advocates a single, unified European airspace free from national borders, to support the region's long-term aviation capacity needs. Schiphol Group and its European partners actively promote the accelerated introduction

of SES, which has the potential to modernise Europe's air traffic control system and drive efficiency across ground processes, aircraft handling and airport use. In all decarbonisation pathways the internalisation of external costs is crucial. That means that the actual environmental impact of per passenger or flight emissions will be taken into account in the ticket prices. Schiphol Group promotes schemes that do so, such as European Union Emissions Trading Scheme (EU ETS) and CORSIA, initiated by ICAO in 2016. CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) is a global market-based measure designed to assist in the achievement of the ICAO's aspirational goal of carbon-neutral growth from 2020 onwards. Schiphol Group actively monitors the development and interaction of these systems, since both schemes require strengthening to stay below 1.5°C global warming, and is involved developing policy frameworks to support the internalising of external costs.

While fossil-free and clean aviation will one day become a reality, this does not mean the aviation sector can be allowed to grow without limits. Going forward, we have to identify, and prioritise, routes and destinations that add the most value to people's wellbeing and to the economy. Passengers also share a responsibility to decide whether taking a flight is strictly necessary; travelling can be avoided with digital solutions such as videoconferencing, for example, while alternative transport modes are often available on certain routes. The further development of landside transport systems such as high-speed trains, autonomous road transport and Hyperloop will increasingly provide an alternative to short-distance journeys. In Europe in particular, train travel offers a potential alternative to flying over shorter distances. Air-rail substitution offers several advantages: it reduces aviation emissions and helps to balance scarce airport capacity. To this end, Schiphol Group is working to improve check-in procedures for train passengers to and from our airports, and participates in partnerships focused on air/rail substitution and Hyperloop. Furthermore, to free up rail capacity the North/South metro line extension is required to facilitate additional room for international trains.

Airports have to be resilient to future changes. As our climate continues to evolve, more extreme weather- and climate-related events are expected. The frequency, intensity, spatial extent, duration and timing of extreme weather events are expected to increase, making flight disruptions and cancellations more likely. Situated in a complex urban area and more than four metres below sea level, Schiphol is especially vulnerable to the impact of climate change, and structural measures are

essential to prevent potentially significant short- and long-term effects on our operations. Given the unique challenge Schiphol faces, particular consideration is given to spatial design elements, such as developing a flood-resilient airport water-management system as well as heat-stress mitigation measures such as green roofs that can also store water.

Smart and clean mobility

This topic aims for clean and reduced road traffic at our airports, and on journeys to and from these locations. This includes movements to and from the airport by passengers, third-party commuters, and suppliers and contractors. While emissions resulting from these activities are not under the direct control of Schiphol Group, we aim to further stimulate clean mobility on landside and reduce CO_2 emissions. This target has been set by the Dutch climate agreement.

Our overall principle is that we prefer collective and clean transport over individual transport based on fossil fuels. This can be achieved by investing in clean transport solutions. Smart improvements in infrastructure are planned to simultaneously improve both accessibility and sustainability. We also discourage people from picking up and dropping off passengers by car, in order to eliminate two unnecessary traffic movements. We also provide or support charging infrastructure for all types of vehicles, including bikes and scooters. A zero-emission fleet as well as a clauses promoting the use of public transport for commuters are increasingly included in contracts with our suppliers and contractors.
At Schiphol, we offer a car-sharing service for our passengers and employees. Shared cars and self-driving cars will have an impact on people's behaviour and choice of transport, as well as on certain occupational groups, such as taxi drivers, and on the use of the road network and the need for parking facilities. Schiphol Group closely monitors these developments since they impact operations and revenues. The extension of Amsterdam's North-South Metro line is another key element to further develop Schiphol as a multimodal hub.

Sustainable passenger journey

Schiphol Group wants to create a sustainable passenger journey, inspired by the need to think and take action together. As part of this approach, we aim to create a sense of place at our airports, so that our customers feel welcome and inspired. We inform passengers about sustainability, including our ambitions and actions and support them in making sustainable choices. Together with our concessionaires, we provide local, organic food, and all coffee served in the terminal buildings is fair trade. Relaxing and de-stressing facilities and activities are a cornerstone of the passenger experience at our airports, resulting in natural daylight and extensive green spaces in the terminal buildings. With a growing number of passengers requiring extra assistance during their journey, we also take care of people with reduced mobility or who need other forms of support.
Schiphol Group recognises the wider impact of aviation in the value chain. For example, we fight human and wildlife trafficking by collaborating with our partners and setting up supply chain management to make these trades as difficult as possible.
As a signatory of the Buckingham Palace Declaration on wildlife trafficking, we participate in measures pertaining to data exchange regarding actual and potential smugglers and the identification of animal and plant materials.

Sustainable aviation

Net-zero-carbon aviation sector

- Make sustainable aviation fuels mainstream
- Reduce emissions via operational excellence of ground procedures and air space management
- Ensure climate resilience

Smart and clean mobility

- Improve infrastructure and extend North/South metro line
- Stimulate use of zero-emission transport modes for passengers and commuters
- Implement low-emission zones for logistics providers

Sustainable passenger journey

- Offer customers sustainable choices
- Create awareness and actively communicate on sustainability
- Strengthen networks to combat human and wildlife trafficking


Energy
positive

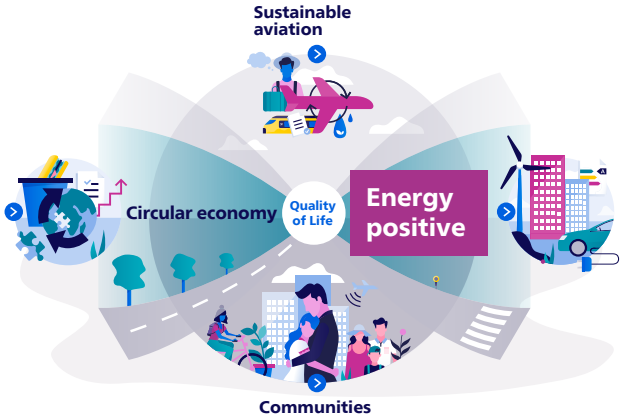
Energy positive

Schiphol Group is climate-neutral in its own activities and is transitioning towards zero emissions. Our efforts reflect the fact that CO_2 emissions cause climate change, directly affecting living conditions on earth and airport operations. Ultimately, we will go beyond zero by realising energy-positive airports. Our surplus renewable energy can also provide solutions for our other key topics, namely Communities and Sustainable aviation; i.e. by supporting the production of sustainable aviation fuel.

One of Schiphol Group's key performance indicators is to reach zero emissions by 2030, meaning no fossil fuels will be emitted during the use of energy and fuel for our own operations as well as ground operations at airside. Our analyses prove that zero CO_2 is achievable. We are confident to reach our goals, because 90% of the emission reduction is already possible through current technology in an economically sensible way. Eliminating the remaining ~10% will be more difficult and will require technological innovation such as hydrogen, though biodiesel and biogas are potential fall-back options.

Our net-zero strategy is based on the Trias Energetica approach:

1. Reduce the use of energy and fossil fuels
2. Use fossil energy as efficiently as possible
3. Produce and use renewable energy



At an airport, many activities are operated by third parties. This situation complicates carbon management, since many of the emission sources are not under the control of the airport operator. Other users of airports, including airlines, concessionaires and ground handlers, play an important role in improving overall emissions at airside and landside.

In 2009, the ACI introduced a CO_2 benchmark for airports, which Schiphol Group helped to develop. The benchmark ranks Schiphol and Eindhoven Airport among the airports most actively pursuing emission reductions, having retained Level 3+ Neutrality status (the highest level attainable) since 2012. A key component of this status is that the airport's own activities are CO_2-neutral. The operations of Rotterdam The Hague Airport and Lelystad Airport have been climate-neutral since 2018.

airport carbon accredited NEUTRALITY

Energy-positive buildings

As buildings and assets fall within our direct scope of influence, we have a strong focus on improving their energy performance. We aim to replace natural gas, which is mostly used for heating and cooling, with renewable energy. We distinguish two main categories: new buildings and renovations.

New buildings delivered from 2025 onwards will be energy positive, with energy-efficient designs and solar power integrated as standard elements. International sustainable building certificates are used as a benchmark and framework during the design and construction of new buildings. We apply LEED certification (gold/platinum) for new terminal buildings and BREEAM certification (excellent/outstanding) for new commercial properties.

Developing new buildings without natural gas is easier than phasing out gas during renovations, since our airports are always in operation. Further difficulties are presented by maintenance planning and deprecation, and the early devaluation of assets. Some buildings are older, which occasionally makes it difficult to implement the newest energy conservation measures. Aquifer thermal energy storage (ATES) is the preferred solution to reduce gas usage with similar electricity needs. Some peak heating with renewable gas may still be required by 2030. We have an energy-efficiency programme in place for existing buildings and assets, and we will continue to execute this to further drive energy efficiency.

Zero-emission mobility

Schiphol Group has a mixed fleet consisting of light and heavy vehicles. All light vehicles will be replaced by electric vehicles in the coming years; in regard to heavy vehicles, we are monitoring developments in the fields of powertrains and clean fuel. In each case, we balance the need for operational performance with environmental and safety concerns. Schiphol Group will introduce and stimulate clean staff commuting. We offer only electric lease cars, encourage commuting by bike and continue compensation of business trips.

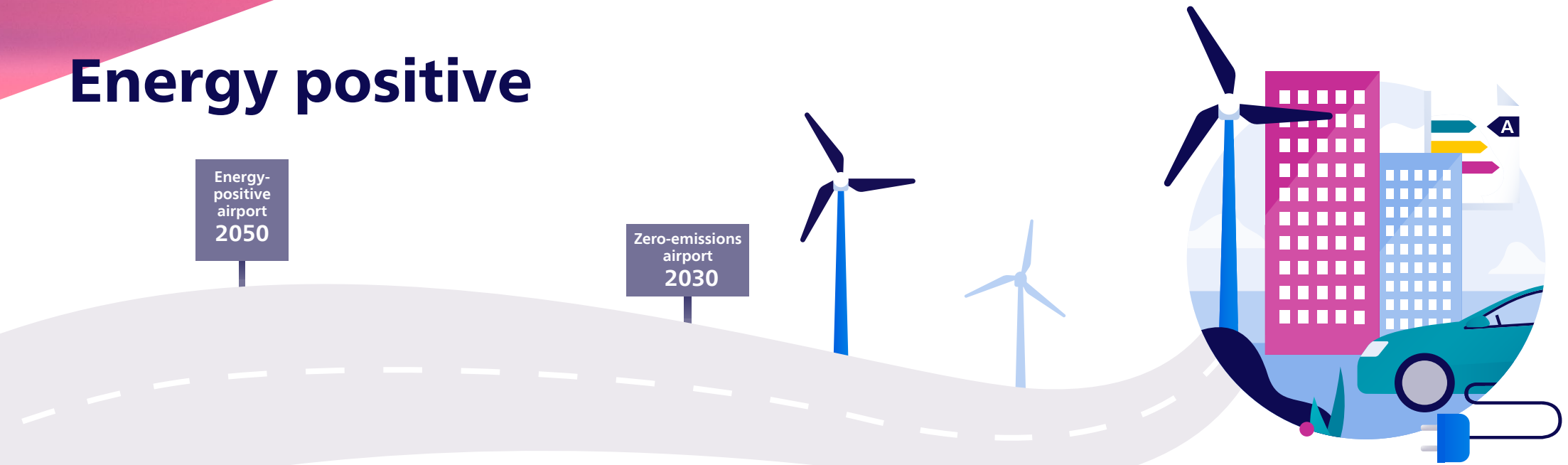
At Amsterdam Airport Schiphol, we operate electric platform buses to transport passengers between aircraft and the gate. Some of our other operational vehicles will be electric in the near future; others will use clean fuel. Currently, gas-to-liquid (GTL) is the standard fuel used at airside, which is better than diesel for local air quality and leads to a better working environment. The installation of electric charging facilities at airside will be key in speeding up the transition to clean mobility, as will the support we offer our partners as they transition away from fossil fuels.

Stationary aircraft normally use their own kerosene-driven auxiliary motors (APU) or a separate diesel-powered generator (GPU) to supply electricity and air conditioning. To reduce this form of fossil fuel use, we have equipped the majority of aircraft stands with installations for fixed electrical ground power (FPU) and pre-conditioned air units and we plan to expand the availability of FPUs in the upcoming years. Furthermore, Schiphol Group is driving innovation by co-developing electric ground power units (e-GPUs), which supply zero-emission power to aircraft docking at remote aircraft stands, offering an alternative to traditional diesel GPUs. By working collaboratively in this way, Schiphol Group aims to be a catalyst for change in our industry as we strive to reach our wider sustainability and carbon-emission objectives.

Renewable energy

Electricity use is the biggest driver of our emission footprint. Since 2018, our airports have been powered by newly built Dutch wind farms (both onshore and offshore). As a further step, we are investing in generating renewable energy on site. Given the limitations of wind and geothermal energy, solar energy is considered the most attractive technology for an airport, and our goal is to generate 21 MWp locally by 2030. Going forward, the shift from fossil fuel and gas to electricity combined with the further development of our airport sites will mean increased demand for electricity, with a smaller difference between winter and summer demand. The electricity grids that supply our airports will need to be strengthened, and we are monitoring developments in clever storage facilities with interest.

Energy positive



Energy-positive buildings

- Design energy-positive buildings
- Execute ATES strategy
- Continue energy-efficiency improvements

Zero-emissions mobility

- Facilitate zero-emission airside
- Shift to zero-emissions fleet
- Stimulate clean commuting

Renewable energy

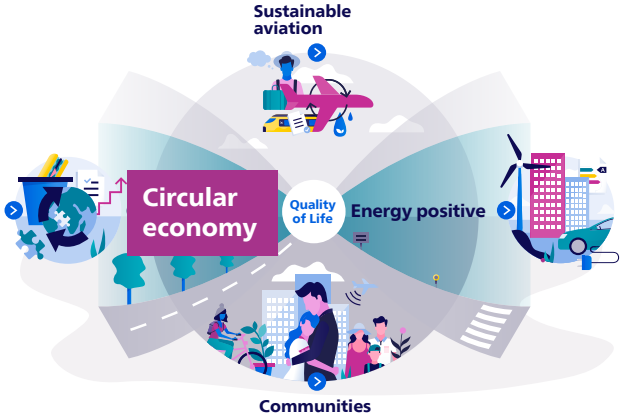
- Increase solar power
- Strengthen energy grid and ensure it remains future-proof
- Sustainable lease concepts and support partners on site

Circular economy

Circular economy

Our current world is based on the linear economy: natural resources are mined to produce goods, which are then transported, used and finally thrown away. Lots of valuable materials and natural resources are disposed during this process. At the same time, a growing global population and rising prosperity levels are driving higher demand for the earth's natural resources, which are in limited supply. For the benefit of future generations, we need to shift from a linear to a circular economy to preserve our natural resources and derivative materials, and to increase their value. Circularity and reducing CO_2 strengthen each other. A non-linear-economy, where resources remain valuable significantly reduces CO_2 emissions.

Schiphol Group aims to operate fully circular airports by 2050. An important milestone in reaching this ambition is to operate zero-waste airports by 2030, meaning all of our raw materials, components and products will be reused or recycled to the maximum extent possible according to the waste hierarchy. This will be achieved at Schiphol Group's own locations or as close to those airports as possible. Following this vision, used materials will now be regarded as the resources of tomorrow, rather than simply useless waste. Each new project brings circular economy principles into practice; even when the final results are not entirely circular, every action provides additional insights, and the goal gets closer.



Schiphol Group has embraced the circular economy concept in our thoughts and actions. We believe circularity offers multiple advantages: it reduces negative environmental impacts, creates opportunities for new business models, and decouples the need for natural resources and materials from economic growth, leading to more stable commodity prices. As detailed in the following paragraph, the application of our zero-waste guiding principles has several benefits. This results in increased speed and flexibility of assets during the construction phase, as well as improved cost control during the life cycle, and improved indoor air quality.

Circular design principles

Schiphol Group has developed zero-waste principles and is gaining experience in applying them during the design and construction of new buildings and the renovation of existing assets. The lifetime of an asset determines the amount of maintenance and renovation needed; Schiphol Group wants to achieve the maximum output from its resources by allowing them to 'circulate' for as long as possible. Durability is also an important aspect regarding embodied carbon, that is the carbon footprint of a material. It considers how many greenhouse gasses are released throughout the supply chain (mine – produce – transport – use – residuals). The design and construction of assets are key elements in achieving our zero-waste goal. Schiphol Group uses material passports as overviews of all materials used in a building, to enable high-value reuse and recycling at the end-of-life stage.

From experience, Schiphol Group has learned the importance of thinking through the design of an asset from the beginning. Likewise, project goals and major requirements should include circular economy principles from the outset, as designing an asset first and trying to add circular economy principles later does not work. We must think several steps ahead, considering the estimated lifespan of the asset, whether it can be disassembled after use and the eventual new purpose of the materials. This last reflection on future use stimulates the designer to use standard sizes and to rethink the way components are assembled; for instance, by using screws instead of glue, increasing the reuse potential of components and

ensuring fewer materials are lost after the use phase. The design must also take into account processes and procedures such as future maintenance impacts. It is also important to focus on the materials used and its specifications. Working with our suppliers, we aim to reduce the environmental impact of materials, starting with high-impact items such as asphalt and concrete (which represent the majority of our residual streams, in terms of weight and embodied impact). Since the principles of circular design are new, we have to develop the circular design knowledge and skills of our staff by creating a broad curriculum of circular economy trainings.

Reuse and upcycle

Schiphol Group uses the 'Lansink's ladder' waste hierarchy and the '9 Rs' guidelines to determine the best option regarding the use of residuals. The waste hierarchy helps in visualising the best future application of a material to reduce its environmental impact and ultimately create value. Schiphol Group minimises, separates and upcycles everyday waste from food and beverage, office and aircraft residuals. We focus on achieving higher separation rates through better registration, technology and the 'polluter pays' principle. These allow higher-value next-life applications. We also stimulate the market to reduce (harmful) residuals and rethink our current linear processes. One of the focus areas is the phase-out of selected single-use products. A big residual stream is glycol, an oil product used for aircraft de-icing which generates substantial CO_2 emissions during its production. Recycling part or all of the glycol used in the de-icing process has the potential to significantly reduce the upstream carbon footprint. Besides operational and infrastructure-related residuals, we also focus on preventing food waste and encouraging the responsible use of electronics' residual flows.

Closed loops

Apart from construction and renovation of fixed assets such as buildings, gaining insight into incoming and outgoing residual flows is key to closing material loops and reusing and recycling residuals to the fullest extent possible. To "reuse" means the component will be used again without changing its basic specifications – that is, a chair will remain a chair – and the component will keep its value. To "recycle" means a material will be broken down and blended, and will subsequently decrease in value. For instance, a platform made of concrete can be recycled as foundation materials for a new road.

The circular economy provides many opportunities for regional and national stakeholders. Schiphol Group strongly believes that an organisation cannot become circular on its own. Regional partners are essential in ensuring materials are reused locally, for example, especially when the value of a residual material (such as concrete) is too low to warrant its transport over long distances. Here, the best option is to recycle locally via a materials hub. Insights into resource characteristics help with the exchange of materials with the communities around Schiphol Group's airports as well as with third parties. Material passports capture information on which materials are used in buildings, including the method of construction used. Our aim is to ensure at least 50% of our infrastructural streams are reused or recycled by 2030, preferably at our airport sites or at least as close by as possible. Suppliers and contractors can contribute by using hubs for prefabrication and recycling residuals. Our ultimate ambition is to step up our efforts towards creating a circular economy by establishing a marketplace for use by Schiphol and its stakeholders.

Circular economy

Circular design principles

- Embed circular design for new buildings
- Apply materials passports for new buildings and assets
- Develop sustainable asphalt and concrete actions plan

Reuse and upcycle

- Phase out selected single-use products
- Improve separation and recycling
- Investigate glycol recycling

Closed loops

- Register and manage construction material flows
- Implement a materials hub for concrete
- Source locally and procure sustainably

Colophon

For further details, please visit the following websites:

- Schiphol Group website
- Schiphol Group sustainability website
- Annual Report Schiphol Group
- Local Community Contact Centre Schiphol (BAS)
- NOMOS
- Schiphol Community Council
- Schiphol Quality of Life Foundation
- Samen op de Hoogte
- Luchtvaart Community Schiphol (LCS)
- Air quality
- Safety in Dutch aviation sector
- ACI Airport Carbon Accreditation
- ACI wildlife trafficking

If you have questions or feedback, please visit
schiphol.nl/nl/contact-schiphol

Royal Schiphol Group, February 2020