



ACRP WebResource 21: Environmental Stewardship and Compliance Training for Airport Employees

Air Quality Training Course

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PROGRAM

Course Objectives and Overview

This course will provide a high-level overview of air quality, air quality regulations, and how these regulations apply to airports.

In this course you will learn:

- The importance of air quality at airports and potential impacts
- Air quality statutes and regulations relevant to airports and airport projects
- Greenhouse gas (GHG) emissions at airports
- Typical airport air pollutants and their sources

Links to federal references may be modified over time. Please search FAA and other federal websites to find the most current reference material.

Key Definitions and Terms

- **Attainment Area** – a geographical area where the levels of all criteria pollutants meet the National Ambient Air Quality Standards (NAAQS)
- **Clean Air Act (CAA)** – the United States’ primary federal air quality law, intended to reduce and control air pollution nationwide
- **Criteria Air Pollutants** – air pollutants for which the Environmental Protection Agency (EPA) has established a set of air quality standards. The six “criteria” air pollutants are: carbon monoxide (CO); lead (Pb); nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM) for both PM₁₀ and PM_{2.5}, and sulfur dioxide (SO₂)
- **Emissions** – gases and particles which are put into the air or emitted by various sources
- **Greenhouse Gases (GHGs)** – certain types of gaseous emissions that may contribute to increases in the earth’s average temperature through a phenomenon called the “greenhouse effect”

Source: EPA. n.d. Home page. <https://www.epa.gov/>

Key Definitions and Terms (cont'd)

- **Hazardous Air Pollutants (HAPs)** – toxic gases known to have impacts on human health
- **Maintenance Area** – a geographical area previously designated “nonattainment” but re-designated as a “maintenance area” because air pollution levels have improved above levels that would place the area in nonattainment status
- **National Ambient Air Quality Standards (NAAQS)** – Standards set by the EPA as required by the CAA for the six criteria air pollutants
- **Non-attainment Area** – a geographical area where the concentration of one or more criteria air pollutants is higher than NAAQS
- **State Implementation Plan (SIP)** – an EPA-approved plan developed by a state to achieve or maintain the NAAQS within timeframes set under CAA
- **Ultrafine Particulate Matter** – Particulate matter (PM) with an aerodynamic diameter of less than 0.1 μm (a particle small enough to penetrate the lower respiratory tract)

Source: EPA. n.d. Home page. <https://www.epa.gov/>

Impacts of Air Quality

Humans can be impacted by air quality every day:

- Air pollution reduces the quality of the air we breathe daily
- Poor air quality from air pollution has been linked to a variety of health problems
- Older adults, children, and people with heart and respiratory diseases have greater risk for air pollution-related health effects
- Air pollutants such as greenhouse gases (GHGs) contribute to climate change

For additional information on air quality, see the EPA's website [Our Nation's Air](#).

Aviation Contributions to Air Quality

Primary air pollutants of interest from airport operations include:

- Greenhouse gases (GHGs)
- Criteria pollutants
- Hazardous air pollutants (HAPs)
- Ultrafine particulate matter
- Lead from aviation gasoline (AvGas)



Airport Greenhouse Gas Emissions

Greenhouse gas (GHG) emissions are often associated with climate change:

- GHGs refer to certain types of gaseous emissions that may contribute to increases in the earth's average temperature through a phenomenon called the “greenhouse effect”
- Primary GHGs include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF₆)
- The GHG most relevant to aviation is CO₂
- According to the Intergovernmental Panel on Climate Change, aviation is responsible for between 2-3% of total current global human-induced carbon emissions, with airports accounting for approximately “2% of total global share”

Source: Airport Carbon Accreditation. n.d. Home page. <https://www.airportcarbonaccreditation.org/>

Airport Greenhouse Gas Emissions – Progress as Promised!

The aviation industry is taking action to reduce its impacts on climate, including a net zero carbon goal by 2050 (by reducing and offsetting carbon emissions). The aviation industry is making progress:

- Aviation carbon reduction July 2009 to June 2010
 - 56,633 tons of CO₂ – the equivalent of carbon sequestered by 399 acres of forest
- Aviation carbon reduction July 2018 to June 2019
 - 322,297 tons of CO₂ – the equivalent of emissions from 767 million hours of video streaming in high definition

Additional information on airport CO₂ reduction and airport carbon accreditation can be found on the About pages for the [Airport Carbon Accreditation program](#).

The FAA published the *United States Aviation Climate Action Plan* on November 9, 2021. The plan describes the government's path toward achieving net-zero emissions by 2050. For additional information, visit [Aviation Climate Action Plan](#).

Source: Airport Carbon Accreditation. n.d. Home page. <https://www.airportcarbonaccreditation.org/>

Greenhouse Gas Emissions Sources

Greenhouse gas sources at airports are typically divided into three categories, or “scopes,” based on the amount of control an airport has in reducing the emissions:

- **Scope 1** – emissions from airport-owned or controlled sources. Examples include airport-owned power plants that burn fossil fuels, conventional vehicles that use gasoline, or conventional ground support equipment (GSE) that uses diesel fuel.
- **Scope 2** – indirect emissions from the consumption of purchased energy (electricity, heat, steam, cooling, etc.).
- **Scope 3** – indirect emissions that the airport does not control but can influence. Examples include tenant emissions, on-airport aircraft emissions (typically after an aircraft is parked on the apron), emissions from passenger vehicles arriving or departing the airport, and emissions from waste disposal and processing.

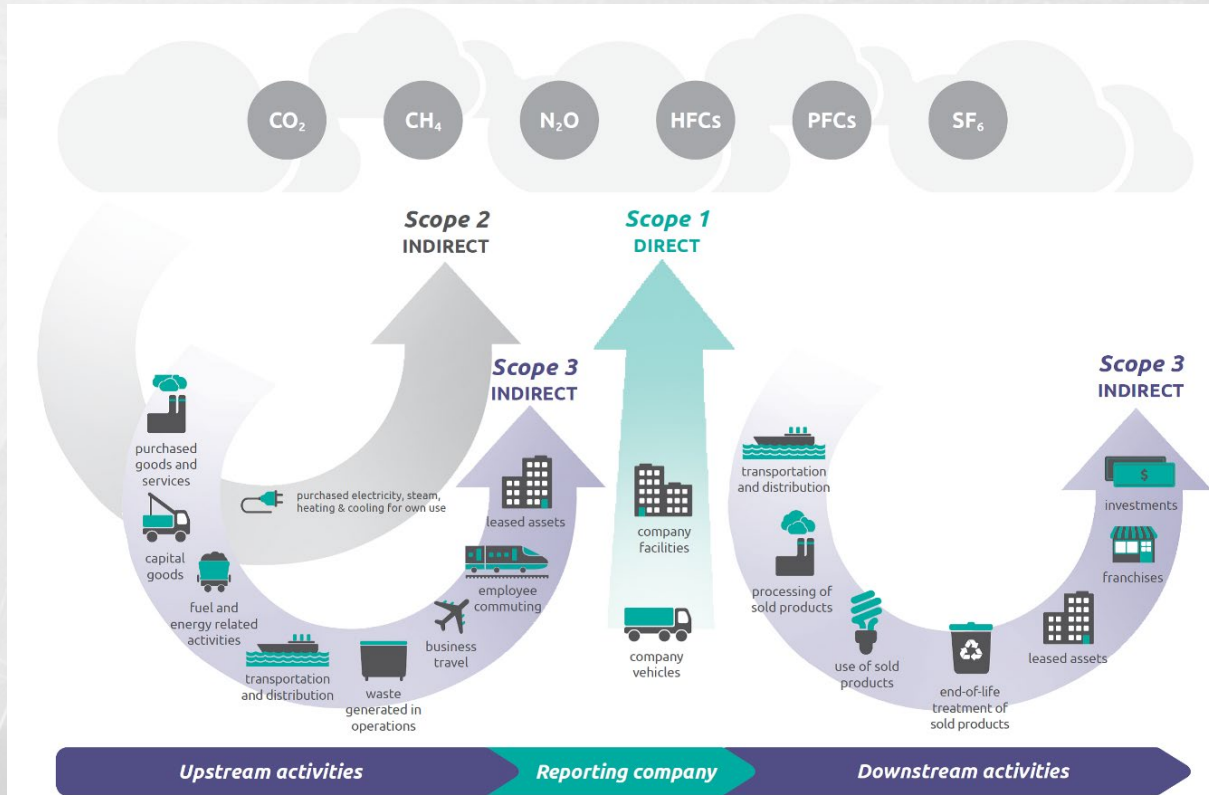
When considering pollutant emission impacts, be sure to consider areas that will be directly and indirectly impacted. Indirect areas may be outside the project area but still impacted by emissions.

Source: FAA. 2023, November. Airport Carbon Emissions Reduction.
https://www.faa.gov/airports/environmental/air_quality/carbon_emissions_reduction

Greenhouse Gas Resources

Additional information on greenhouse gases (GHGs) can be found on the EPA website pages provided below or by searching for “GHG Inventory Development Process and Guidance” at www.epa.gov.

- [Scopes 1, 2 and 3 Emissions Inventorying and Guidance](#)
- [Scope 1 and Scope 2 Inventory Guidance](#)
- [Scope 3 Inventory Guidance](#)



Source: WRI/WBCSD. n.d. *Corporate Value Chain (Scope 3) Accounting and Reporting Standard*, page 5.

Scope 1 Emissions

Scope 1 – emissions from airport-controlled sources include:

- Vehicles/GSE belonging to the airport
- On-site waste management
- On-site wastewater management
- On-site power generation
- Firefighting exercises
- Boilers and furnaces
- De-icing substances
- Refrigerant losses



Text Source: Airport Carbon Accreditation. n.d. Home page. <https://www.airportcarbonaccreditation.org/>

Scope 2 Emissions

Scope 2 – emissions from electricity purchased by airports include off-site electricity generation for:

- Heating
- Cooling
- Lighting



Text Source: Airport Carbon Accreditation. n.d. Home page. <https://www.airportcarbonaccreditation.org/>

Scope 3 Emissions

Scope 3 – emissions from other sources for airport-related activities include:

- Flights
- Aircraft ground movements
- Auxiliary power unit
- Third-party vehicles/GSE
- Passenger travel to the airport
- Staff commutes
- Off-site waste management
- Off-site water management
- Staff business travel
- Non-road construction vehicles and equipment
- De-icing substances
- Refrigeration losses

Source: Airport Carbon Accreditation. n.d. Home page. <https://www.airportcarbonaccreditation.org/>

Airport GHG Emissions Reduction Techniques

Multiple techniques can be used to reduce GHG emissions at airports:

- Map out and identify emissions sources and scopes
- Inventory existing airport carbon emissions using Airports Council International's free Airport Carbon and Emissions Reporting Tool (ACERT)
- Pursue cost-effective energy efficiency measures, like improving building insulation to reduce GHG emissions and lower operating costs
- Purchase renewable energy
- Install renewable energy systems at the airport (provided they are compatible with airport operations)
- Reduce energy consumption
- Monitor the efficiency of heating, ventilation, and cooling systems
- Purchase low- or zero-emissions vehicles and ground support equipment (GSE)

More information on GHG emissions reduction and ACERT can be found on FAA's website under [Airport Carbon Emissions Reduction](https://www.faa.gov/airports/environmental/air_quality/carbon_emissions_reduction).

Source: FAA. 2023, November. Airport Carbon Emissions Reduction.
https://www.faa.gov/airports/environmental/air_quality/carbon_emissions_reduction

AvGas and Lead Emissions Reduction

Aviation gas (AvGas) is a source of lead emissions at airports:

- AvGas contains tetraethyl lead (TEL), which is toxic and can affect human health if inhaled or ingested
- The U.S. has a goal to eliminate the use of leaded aviation fuels for piston-engine aircraft by 2030

Ways to reduce lead emissions at airports include:

- Working to offer additional unleaded fuel types to facilitate the transition
- Minimizing engine idling time and run-up times of piston-engine aircraft
- Promote airport and pilot awareness
- Increase distance between pre-flight/maintenance run-up locations and people on/off airport by relocating run-up locations or distributing run-ups to multiple locations

For more information from the FAA on lead emissions reduction, visit their [EAGLE initiative page](#).

Source: FAA. 2022. Environment & Airports. https://www.faa.gov/about/initiatives/avgas/env_airports

Air Quality Regulations

The Clean Air Act (CAA) is the federal regulation for protecting air quality:

- CAA regulates air pollutant emissions from stationary and mobile sources
- CAA authorizes the EPA to establish National Ambient Air Quality Standards (NAAQS) for criteria pollutants
- CAA authorizes EPA to regulate hazardous air pollutants (HAPs)



Text Source: FAA. 2023, October. 1050.1 Desk Reference (v3).
https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref

Clean Air Act and Airport Construction and Development

CAA governs air quality impacts from airport actions, including construction and development projects. The FAA must evaluate proposed airport landside and airside projects and their potential for impacting air quality.

- Example landside projects include:
 - Construction, relocation and repair of airport access roads
 - Repair and maintenance of remote parking facilities
 - Repair and maintenance of rental car lots
- Example airside projects include:
 - Building or expanding terminals and hangars
 - Building new or extending runways and taxiways
 - Installing navigational aids

The environmental review for proposed development projects that may impact air quality often requires an emissions and GHG analysis. These are most often required if the airport is in a non-attainment area for NAAQS.

Source: FAA. 2023, October. 1050.1 Desk Reference (v3).
https://www.faa.gov/about/office_org/headquarters_offices/apl/enviro_n_policy_guidance/policy/faa_nepa_order/desk_ref

National Ambient Air Quality Standards

Under the CAA, the EPA has established National Ambient Air Quality Standards (NAAQS) for the six criteria pollutants. Counties and air pollution districts may be in attainment, in nonattainment, or in maintenance for the criteria pollutants as designated by a state's EPA-approved State Implementation Plan (SIP):

- Attainment area – a geographical area where the levels of all criteria pollutants meet NAAQS
- Nonattainment area – a geographical area where the concentration of one or more of the criteria air pollutants is higher than NAAQS
- Maintenance area – a geographical area previously designated “nonattainment” but re-designated as a “maintenance area” because air pollution levels have improved above levels that would place the area in nonattainment status

[EPA's Green Book](#) has county-level data showing whether a county is in attainment. To access the *Green Book*, visit www.epa.gov/green-book.

Source: FAA. 2023, October. 1050.1 Desk Reference (v3). https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref

Actions Normally Requiring an Air Quality Analysis

An air quality analysis (emissions inventory) may be required in the following scenarios since they can change aircraft operations:

- New airport location
- A new runway
- A major runway extension
- Runway strengthening
- Aviation actions where:
 - The proposed airport action would occur at a general aviation (GA) airport with a total of 180,000 GA and air taxi annual operations
 - The proposed airport action would occur at a commercial service airport with more than 1.3 million enplanements (2.6 million passengers) or more than 180,000 GA and air taxi annual operations
 - The proposed airport action serves a combination of operations and passengers
 - The proposed airport action would increase traffic coming to the airport and increase congestion at off-airport highway intersections

Be sure to consider the entire project, landside and airside, when analyzing air quality emissions.

Source: FAA. 2023, October. 1050.1 Desk Reference (v3). https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref

Air Quality Analysis Significance Threshold

The FAA must consider if an action is significant and has potential impacts:

- Considered significant if an action would exceed one or more NAAQS
- Impacts are determined by comparing base case (no action/existing condition) to proposed alternatives

More information on NAAQS can be found in the [NAAQS Table](#) on the EPA's website, under Criteria Air Pollutants.

Source: FAA. 2023, October. 1050.1 Desk Reference (v3). https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref

Air Quality Permits

Permits may be required for air quality impact actions:

- Permitting under CAA differs by EPA region, state and Tribe
- Specific permitting information for each area can be found on the [EPA's website under CAA Permitting](https://www.epa.gov/caa-permitting) at www.epa.gov/caa-permitting



Text Source: FAA. 2023, October. 1050.1 Desk Reference (v3).
https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref

Best Management Practices

Dust and other airborne particles can be controlled during construction using Best Management Practices (BMPs):

- Expose the minimum area of erodible earth
- Apply temporary mulch with or without seeding
- Use water sprinkler trucks
- Use covered haul trucks
- Use dust palliatives or penetration asphalt on haul roads
- Use plastic sheet coverings

BMPs can be employed in day-to-day construction and development activities to reduce air quality impacts.

Source: FAA. 2023, October. 1050.1 Desk Reference (v3).
https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref

Airport Air Quality Management Plan

An Air Quality Management Plan is a distinct document that provides data on airport emissions and outlines the actions to be taken to reduce airport emissions. The goal of the plan is to improve efficiency and effectiveness in airport operations.

The plan:

- Can be part of the Airport Master Plan
- Includes an inventory of existing emissions
- Provides a systematic plan for managing air quality issues
- Includes mitigation plans
- Can be utilized by airport tenants to further reduce emissions

Maintaining vehicles and GSE—including replacing old equipment with new, fuel-efficient equipment—is a good first step in reducing overall airport emissions under mitigation plans.

Source: ICAO. n.d. Air Quality Management at Airports: Eco Airport Toolkit. <https://www.icao.int/environmental-protection/Documents/ecoairports/AIR%20QUALITY%20MANAGEMENT%20AT%20AIRPORTS.pdf>

Funding for Airports to Improve Air Quality

The FAA offers two programs to aid airports in funding air quality improvements:

- **Zero Emissions Vehicle (ZEV) Program:** The FAA's Airport Zero Emissions Vehicle and Infrastructure Pilot Program boosts air quality and the use of new zero-emissions technologies at airports across the country. The program lets airports use Airport Improvement Program (AIP) funding to purchase zero-emissions vehicles.
- **Voluntary Airport Low Emissions (VALE) Program:** Similar to ZEV, the VALE program allows the use of AIP funding and Passenger Facility Charges (PFCs) to purchase low-emissions vehicles and related infrastructure and air quality improvements. This program helps airports meet their state-related requirements under the Clean Air Act.
- More information on the two FAA programs can be found at www.faa.gov by searching for the [Zero Emissions Vehicle Program](#) and [VALE Program](#)

These programs are only available to select airports in non-attainment areas.

Source: FAA. 2023, November. Airport Carbon Emissions Reduction.
https://www.faa.gov/airports/environmental/air_quality/carbon_emissions_reduction

What Does this Mean to Your Airport?

What are the sources of emissions at your airport?

- Provide a list of Scope 1, 2, and 3 emission sources at your airport

Based on the previous training slides, how can your airport reduce greenhouse gas (GHG) emissions?

- Consider developing an action plan to reduce GHG emissions

What are the construction-related emissions at your airport?

- Determine whether your airport is in a nonattainment area

Course Wrap-Up

Some key takeaways:

- Emissions from aircraft, surface transportation and construction vehicles all contribute to an airport's emissions footprint, including direct and indirect emissions
- FAA conducts air quality analysis for airport improvements to reduce emissions-related impacts and ensure compatibility with the local State Implementation Plan (SIP).
- Airports need to understand their emission scopes and footprint when making key decisions that may change future operations and emission sources potentially affecting surrounding communities

References

Airport Carbon Accreditation. n.d. Home page. <https://www.airportcarbonaccreditation.org/>

EPA. n.d. Home page. <https://www.epa.gov/>

FAA. 2022. Environment & Airports. https://www.faa.gov/about/initiatives/avgas/env_airports

FAA. 2023, October. 1050.1 Desk Reference (v3).

https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref

FAA. 2023, November. Airport Carbon Emissions Reduction. https://www.faa.gov/airports/environmental/air_quality/carbon_emissions_reduction

ICAO. n.d. *Air Quality Management at Airports: Eco Airport Toolkit*. <https://www.icao.int/environmental-protection/Documents/ecairports/AIR%20QUALITY%20MANAGEMENT%20AT%20AIRPORTS.pdf>

WRI/WBCSD. n.d. *Corporate Value Chain (Scope 3) Accounting and Reporting Standard*, page 5.

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