



AIRPORT ENVIRONMENTAL MANAGEMENT

04-08 October 2015

Abu Dhabi, UAE

Module 13: Accounting for Airport Carbon Emissions

Module objectives

- To introduce a systematic approach to boundary setting based on areas of responsibility and influence
- To review the guidance available to airports wishing to establish a 'carbon footprint'
- To highlight the implications for carbon management arising from different boundary definitions

The mandate for action

- Environmental, social and political pressures demand that aviation actors take action to combat CC
- Thus it is important that the sector as a whole demonstrates carbon responsibility
- Need to take efficient and effective actions
- Case for growth is getting more difficult – credibility crucial

Carbon account.....

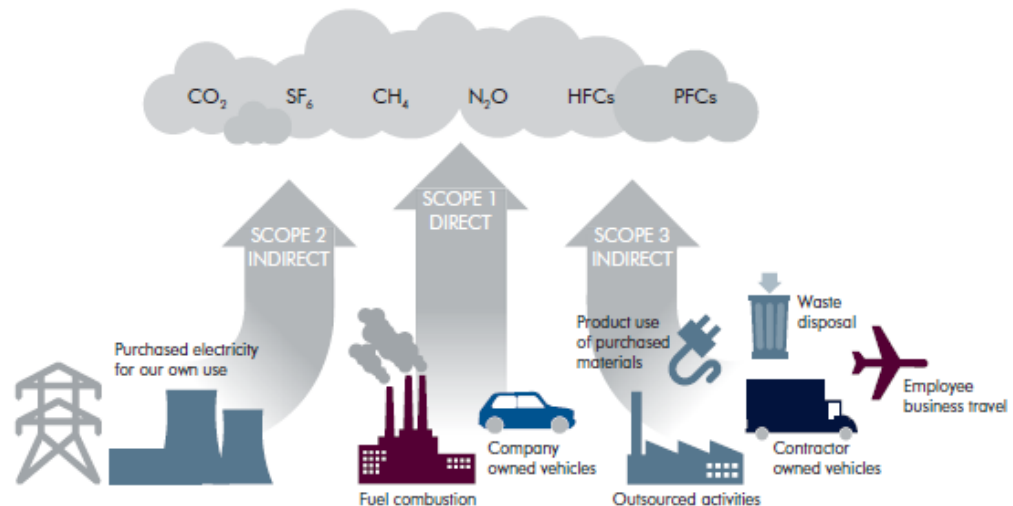
Measuring and managing carbon at airports

- Requires a comprehensive and transparent approach to carbon accounting
- Consistent interpretation and communication of areas of responsibility and influence
- Maintain control over the agenda and enable a robust defence of airport actions and plans

Scope options – Greenhouse Gas Protocol

Defines three scopes (or boundaries) for GHG/carbon emissions accounting

1. Direct GHG emissions from all sources owned by the company (stationary and mobile combustion)
2. Plus indirect GHG emissions from purchase of electricity
3. Optional step – indirect emissions from company's upstream and downstream activities (provides an 'opportunity to be innovative in GHG management')



<http://www.ghgprotocol.org/>

What should a responsible airport do?

- Transparent and accurate carbon inventory following accepted accounting principles
- Rationale for carbon management
- Set targets (e.g. carbon 'neutrality')
- Control carbon liability
- Enhance reputational benefits

ACI carbon accreditation programme

- **Level 1 – Mapping** – A inventory of CO₂ emissions sources and quantities is completed, including sources owned and controlled by an airport operator and airport-related sources belonging to other parties that an airport may be able to guide or influence.
- **Level 2 – Reduction** – After Level 1, a Carbon Management Plan has been implemented for emissions sources under an airport operator's direct control including measurement, reporting and demonstration of emissions reductions.
- **Level 3 – Optimisation** – The mapping inventory has been extended to include other parties such as airlines, tenants and passengers, and the airport operator has worked with them and achieved reductions in those emissions.
- **Level 3+ - Neutrality** – Where airport operator has reduced its own emissions (for Level 2) and has satisfactorily offset its remaining the emissions under its direct ownership and control.

Implications of the ACI programme

- Encourages engagement – carbon responsibility
- Consistent messages – credibility
- Focus on the things you can control – ‘walk the talk’
- Question - How to determine extent of, and exercise influence?

ACI guidance manual (2009)

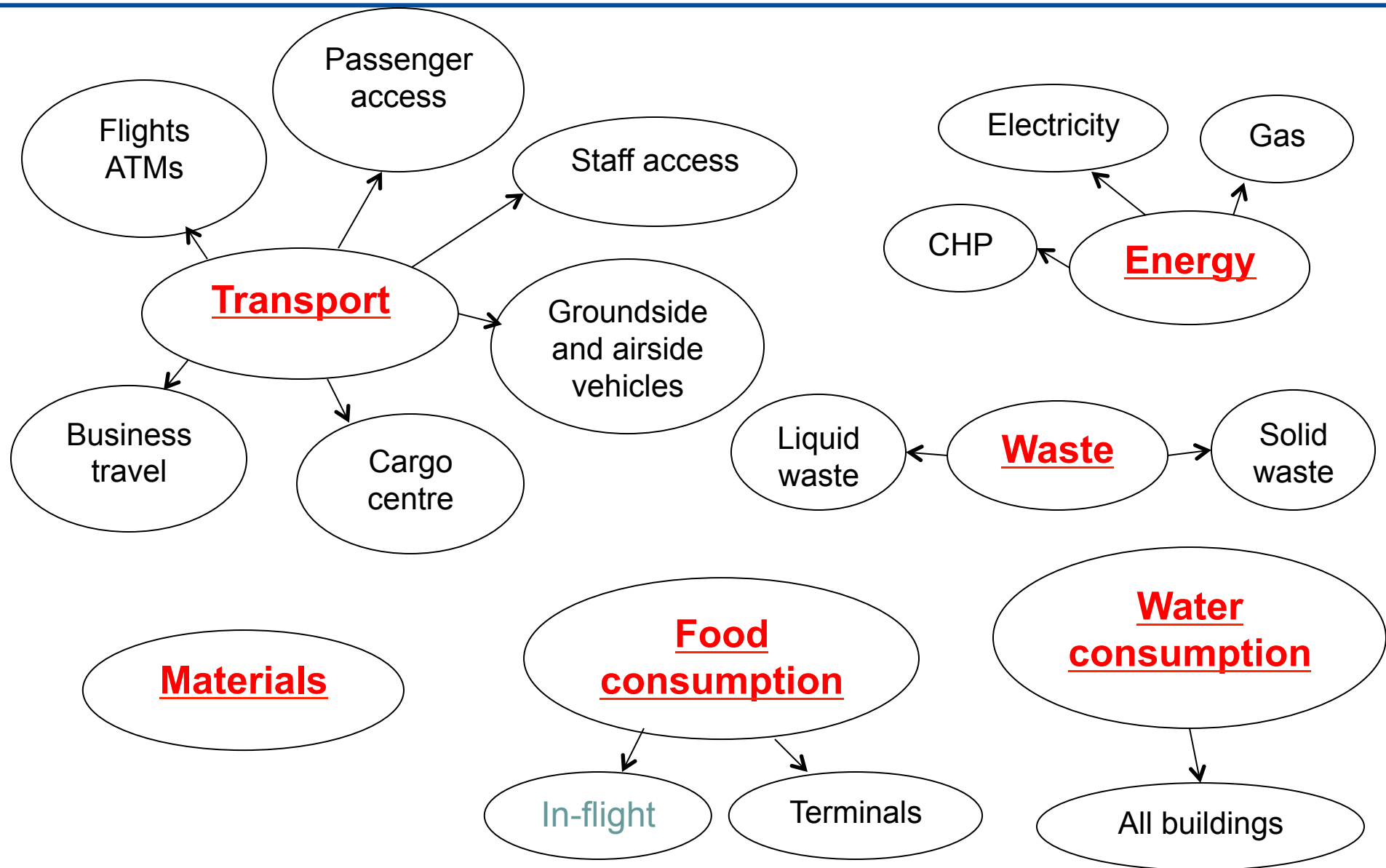
Term	Definition
Airport Operator	<p>An organization with responsibility for owning and/or operating an airport or system of airports. Airport operators can be units of government (city, county, state, national) or a business or private or semi-private company. Depending on the organizational and ownership structure, the terms Airport Company or Airport Authority may be more appropriate. In this document only the term Airport Operator is used.</p>
Aviation Emissions	<p>Aviation emissions include only the emissions from aircraft (both from domestic and international operations) including all phases of flight and APU use.</p> <p>The Kyoto Protocol excludes emissions from “International Aviation,” while ground-based airport emissions are included in national inventories.</p>
Airport Emissions	<p>All emissions from activities associated with the operation and use of an airport, including ground support equipment, power generation and ground transport. Such activities can occur inside and outside the airport perimeter fence and may be the responsibility of the airport operator or other stakeholders. Emissions from aircraft should be included in an airport inventory, although depending on the reason for the inventory, an airport operator may choose to include either the LTO cycle or the whole of departing flight emissions.</p>

Carbon account for an 'Airport System'

Key components:

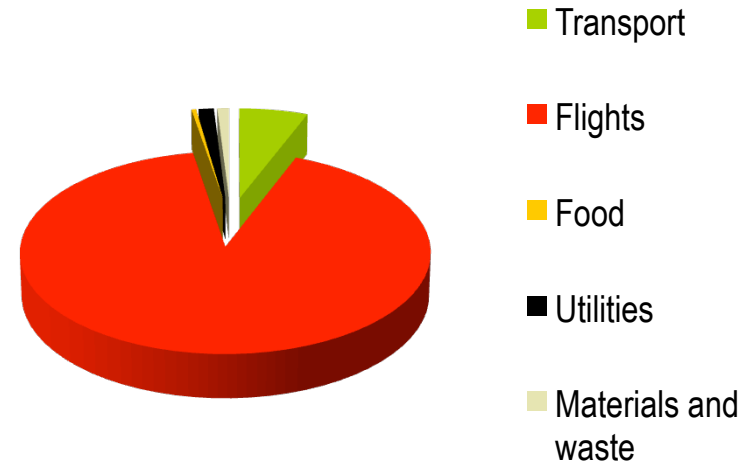
- Transport
- Energy use
- Waste
- Food
- Water
- Materials





Typical baseline footprint for ‘airport system’

	%CO ₂ eq
Flights	90
Transport	6
Food	1
Utilities	2
Materials & Waste	1
Total	100



What should airports do about flights?

- Ignore them? Tends to upset the environmental pressure groups!
- Acknowledge and place responsibility firmly elsewhere – airlines.
- Keep account and seek to exert control and influence to minimise emissions where possible:

Resolution

- Terminal control
- Taxi-ways
- Route development
- Encourage/facilitate fleet efficiency improvements
- ACI Guidance Manual 2009:
 - Aircraft emissions should be included in an airport inventory (p.6)

▪ But....

- **Scope 3A** are the Scope 3 emissions which an airport operator can influence, even though it does not control the sources.
- **Scope 3B** are the Scope 3 emissions which an airport operator cannot influence to any reasonable extent.

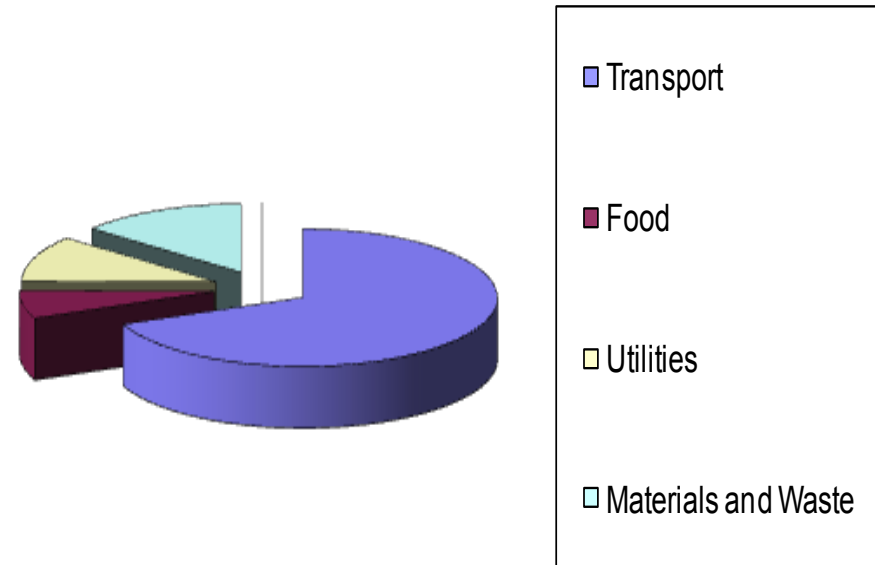
ACI examples of Scope 3 emissions

Scope 3: Other Airport-Related Activities and Sources	
Scope 3A: Scope 3 Sources an Airport Operator Can Influence	
Aircraft main engines	Aircraft main engines during taxiing and queuing
APU	Aircraft Auxiliary Power Units (APU)
Landside Road traffic/Ground Access Vehicles (GAV)	All landside vehicles not owned by airport operator, operating on airport property.
Airside vehicle traffic	All vehicles operated by third parties (tenants, airlines, etc) on airport airside premises
Corporate Travel	Flights taken on airport company business
Ground Support Equipment (GSE)	Tenant or contractor owned GSE for the handling and servicing of aircraft on the ground, if airport could provide alternative fuels or otherwise influence operation.
Construction	All construction activities, usually conducted by contractors.

Scope 3B: Scope 3 Sources an Airport Operator Cannot Influence	
Aircraft main engines	Aircraft main engines in the LTO cycle, excluding taxiing Aircraft emissions during cruise on flights to or from airport
Ground Support Equipment (GSE)	Tenant or contractor owned GSE for the handling and servicing of aircraft on the ground.
Landside Road traffic/Ground Access Vehicles (GAV)	All landside vehicles related to the airport, operating off-site and not owned by airport operator, including private cars, hotel and car rental shuttles, buses, goods delivery trucks, freight trucks.
Electricity and other external energy	Emissions from generation of electricity, heating and cooling purchased by tenants including airlines
Aircraft and engine maintenance	Airline or other tenant activities and infrastructure for aircraft maintenance: washing, cleaning, painting, engine run-ups
Rail traffic	Rail traffic and other ground transport related to the airport
Waste disposed of off-site	Off-site waste incineration or treatment from airport sources.

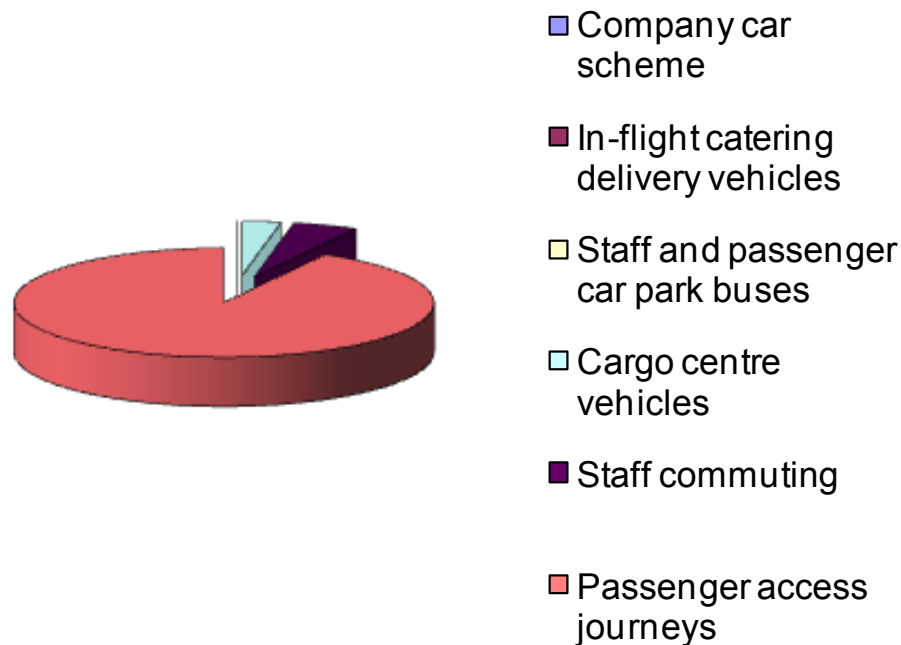
Airport system emissions excluding flights

	%CO ₂ eq
Transport	70
Food	5
Utilities	15
Materials & Waste	10
Total	100



Contribution of ground transport to emissions

	%CO ₂ eq.
Co. car scheme	<1
Catering vehicles	<1
Buses	<1
Cargo vehicles	~3
Staff commuting	~5
Passenger access journeys	~90



Passenger access journeys

- Significant carbon footprint and have implications for LAQ
- Not the responsibility of the airport company; but result from airport provision and generate income
- Capacity to influence? *Resolution*
 - Car park charges
 - 'Kiss and fly'
 - Partnership with other ground transport providers
 - Offset?

Summary

- Need a *comprehensive* account - >95% emissions beyond the direct control of the airport operator
 - Enables effective and efficient decision-making
 - Allows prioritisation – avoid, reduce, alternative sources
 - ACI Manual : Ideally an airport inventory, regardless of its purpose, should be as complete as possible covering all emissions sources at an airport and those associated with airport-related activities. One of the main reasons for covering all of these sources is the concern that an inventory without major sources like aircraft and passenger car trips might seem incomplete, and would thus lack public credibility.
- Sufficient *resolution* to determine the impact of proposed changes (e.g. passenger access journeys and LTO cycle)
- Include *emissions under direct control* to ‘walk the talk’ and have credible influence
- **Questions:** How best to demonstrate impact on *carbon intensity/efficiency* (i.e. /pax, /RPK, /LTO,..)?; Is the ‘carbon neutrality’ goal the most efficient option for reducing the climate change impact of the airport system?

Carbon footprint 'resolution'

Determining carbon emissions requires data on:

- The **activity** generating the carbon emissions (quantity, type, organisation)
- The **carbon output per unit activity**. This is usually expressed as an **emissions factor**

However, the higher the resolution of the account the greater the data collection requirements and the more EFs required (high resolution offers greater clarity on the impact of management interventions and thus the business case for mitigation actions).

There is a range of sources for emission factors and the aim should be to use the most tailor to the specific circumstances (i.e. national CO₂ emission per unit of delivery electricity vary substantially, thus it is important to use country-specific factors for the calculation of Scope 2 emissions).

Increasingly automated Carbon calculators have become available (e.g. ACERT)

Example emissions calculation

Essentially all elements of a carbon footprint are calculated in the same way:

Units of activity A x emission factor (EF) = total CO₂ generated by activity A
(EF = CO₂ output per unit activity)

e.g.

gas heating (15,000 kWh) x CO₂ emitted per kWh (0.18366 kg)
= 2,755 kg CO₂ or 2.8 tonnes CO₂

diesel consumed (1,000 litres) x CO₂ per litre (2.5805 kg)
= 2,581 kg CO₂ or 2.6 tonnes CO₂

Guidance for calculating emissions

The ACRP Guidebook (2009) provides detailed information on how to calculate the emissions from each source at an airport including aircraft, APU, GSE, ground access vehicles, stationary sources, waste management activities, training fires, construction and others. Factors for converting non-CO₂ emissions to a CO₂-equivalent mass are also provided.

The ACI-Europe ACA scheme (2009) provides emissions factors for converting the volume of various fuels used to CO₂ mass as well as for calculating the mass of CO₂ emitted for each kWh of electricity used in a large number of countries.

ICAO Document 9889, developed mainly for the calculation of local air quality emissions, provides detailed methodologies for calculating emissions from a variety of airport sources including aircraft engine start-up.

It is also recommended for airports to refer to any national reporting guidelines, e.g., UK DEFRA Greenhouse Gas Protocol

(<http://www.defra.gov.uk/environment/business/reporting/carbon-report.htm>)

ACERT

- ACERT (Airport Carbon and Emissions Reporting Tool) v3.0
- ACI's Do-it-yourself airport greenhouse gas inventory tool
- Self-contained spreadsheet
- Enables an airport operator to calculate its greenhouse gas emissions (GHGs)
- Consistent with ACI Guidance Manual on Airport GHG Emissions Management (2009)
- Approved for ACI Airport Carbon Accreditation programme (Level 1 Mapping and Level 2 Reduction)
- Calculates scopes 1, 2 and 3

ACERT users

- ACERT will be useful for:
 - Small and medium airports (and large airports)
 - Airports with no dedicated environmental staff or budget for consulting fees; and
 - Airports developing GHG management on a voluntary (non-regulated) basis.

ACERT data requirements

- Total aircraft, passenger and cargo movements
- Fuel use by airport and tenant vehicles, buildings, emergency generators and fire training
- Electricity (and heat) purchased by the airport operator and tenants
- Aircraft movements categorised either by specific aircraft type or by generic aircraft type, or total fuel loaded on to aircraft
- Aircraft taxi and APU usage times and engine run-ups
- Glycol de-icer use
- Either a detailed landside traffic study or estimates of passenger and staff ground access such as use of public transport, and car, taxi, bus and train activity

ACERT Outputs

Airport Carbon and Emissions Reporting Tool

SEA 2011

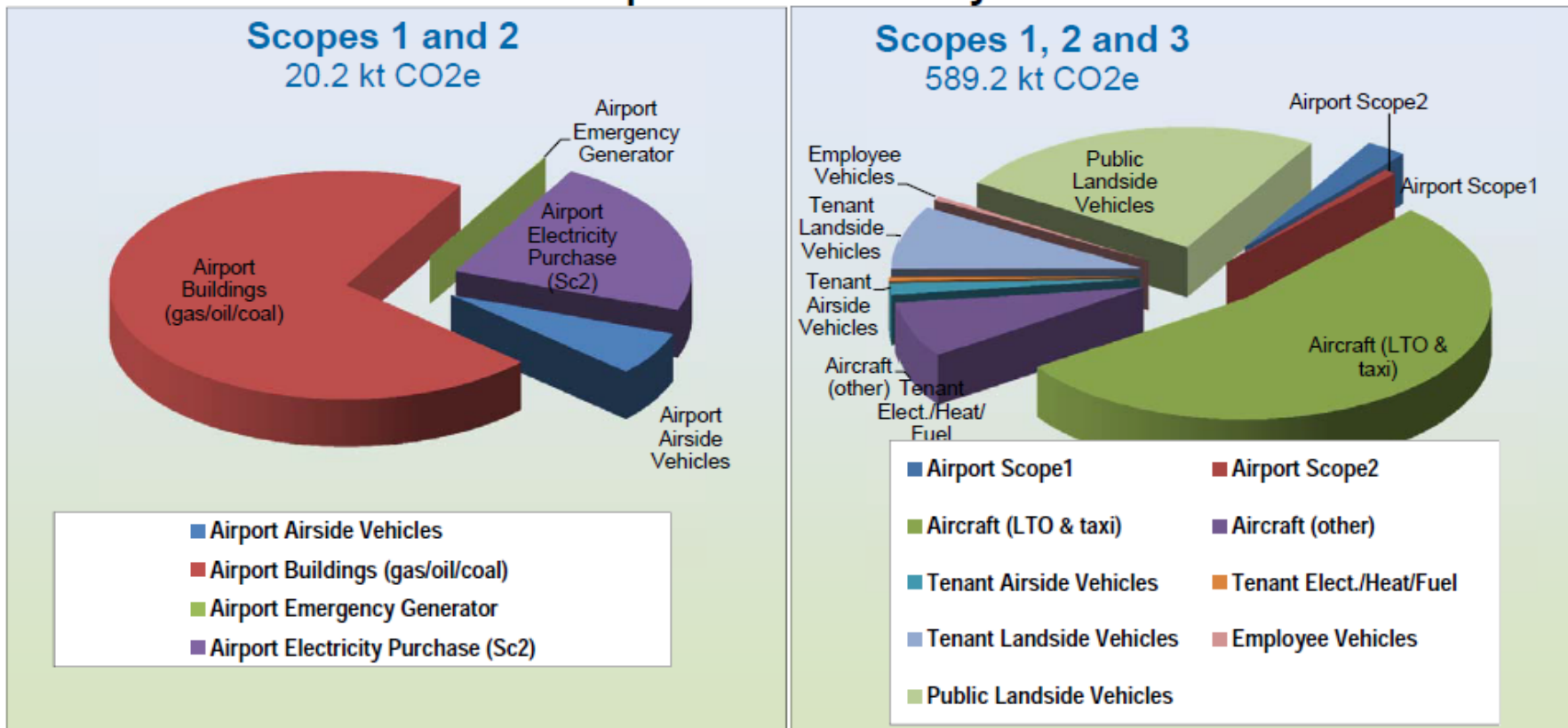
ACERT

Airport: Seattle-Tacoma International Airport Country: United States Aircraft mvmts: 314,947
 Report Date: 18/6/2012 Ems Factor: 31.3 g CO₂/kWh Passengers: 32,819,796

Entity	Source	Scope	Greenhouse Gases (t)				CO _{2e}	CO _{2e} %
			CO ₂	CH ₄	N ₂ O			
Airport Operator	Airport Airside Vehicles	1	1,212	0.25	0.10	1,249	0.2%	
	Airport Buildings (gas/oil/coal)	1	14,421	0.26	0.03	14,435	2.4%	
	Airport Emergency Generator	1	16	0.00	0.00	17	0.0%	
	Airport Electricity Purchase	2	4,537			4,537	0.8%	
Airport Operator Sub-total						20,238	3.4%	
Tenants (including airlines, government, shops etc.) and Employees	Tenant Aircraft (LTO & taxi)	3	307,489	9.66	27.82	316,316	53.7%	
	Tenant Aircraft APU	3	42,149	1.32	3.81	43,359	7.4%	
	Tenant Aircraft Engine Run-ups	3	456	0.01	0.04	469	0.1%	
	Tenant Aircraft De-icing	3	0			0	0.0%	
	Tenant Airside Vehicles	3	8,947	1.73	0.74	9,211	1.6%	
	Tenant Buildings (gas/oil/coal)	3	2,827	0.03	0.03	2,837	0.5%	
	Tenant Electricity Purchase	3	-			-		
	Tenant Fire Training	3	48	0.08	0.39	170	0.0%	
	Tenant Landside Vehicles	3	48,411	17.22	4.04	50,024	8.5%	
Airport Employee Vehicles	3	3,142	1.14	0.26	3,246	0.6%		
Tenant Sub-total						425,634	72.2%	
Public (including Passengers)	Ground Access Vehicles	Cars, taxi	3	126,643	40.71	10.57	130,776	22.2%
		Bus, shuttles	3	12,181	1.05	0.99	12,510	2.1%
		Rail	3	22	-	-	22	0.0%
Public Sub-total						143,308	24.3%	
TOTAL	Total emissions (tonne)		572,502	73.47	48.82	589,180		
Summary	t CO_{2e}	CO_{2e} %	Total CO_{2e} Emissions (t)			589,180	100%	
Airport Scope 1	15,701	2.66%	The aircraft emissions calculations were based on generic aircraft data. The landside traffic calculations were based on estimated traffic data. (* Data for illustration only)					
Airport Scope 2	4,537	0.77%						
Airport Scope 3	568,942	96.57%						

ACERT Outputs II

Airport GHG Inventory



Exercise: Using ACERT

- Produce an airport greenhouse gas emissions inventory using ACERT
- Input sample date (provided) into ACERT
- Produce an output as a table and graph

Any questions?

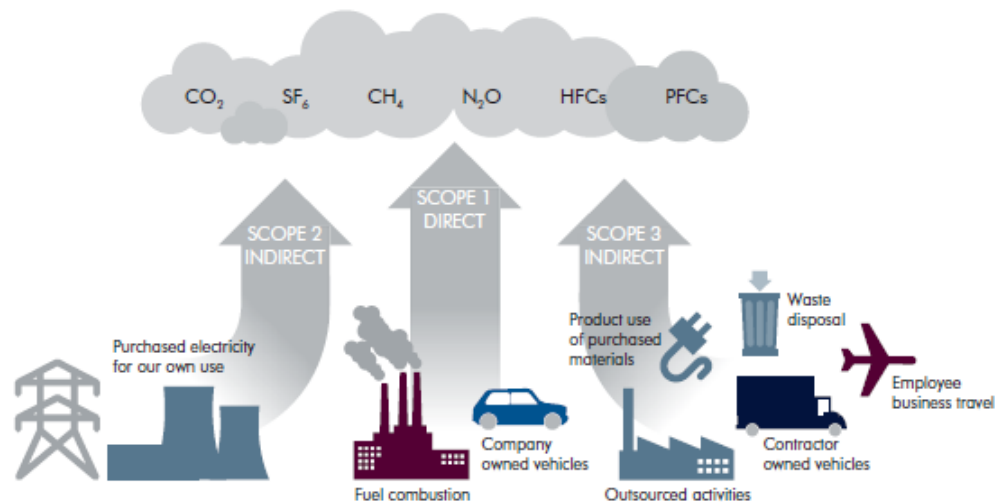


Figure 6: Carbon footprint

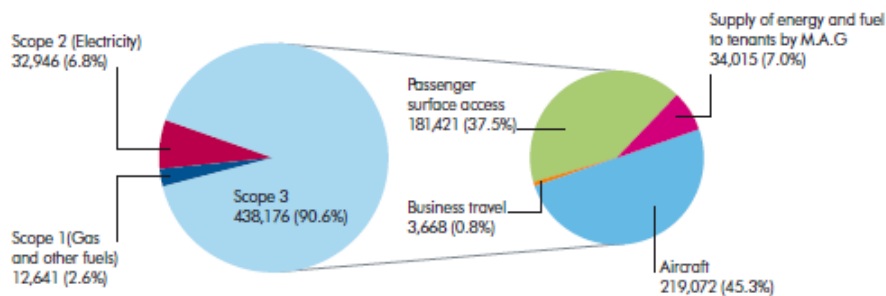


Figure 7: Carbon footprint, Manchester Airport 2013-14 (tonnes CO₂)⁵

⁵ 2013-2014 figures not audited at time of publication.