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Renewable Energy Deployment and other GHG-mitigation for Airports in Africa

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ACI World Environment Standing Committee

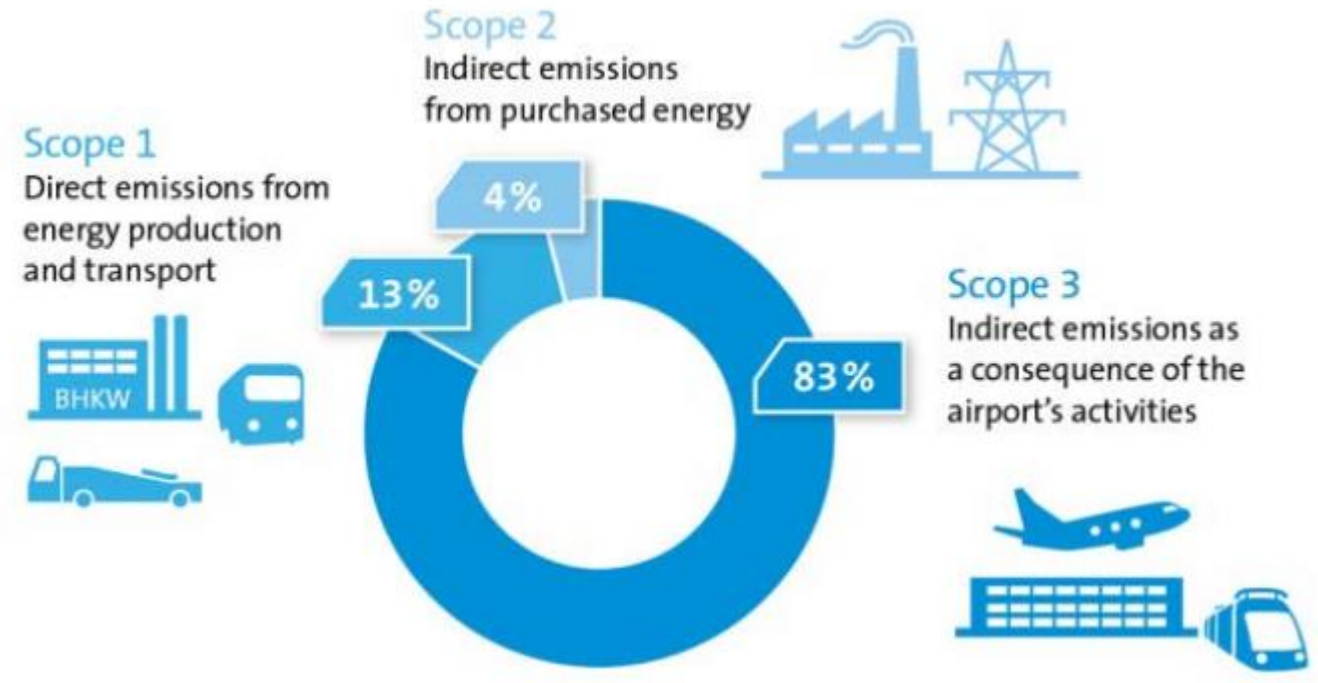
Agenda

- Greenhouse Gas Emissions at the Airport
- Renewable Energy at Airports in Africa
- AGES-Simulation
- Airport Carbon Accreditation in Africa

Greenhouse Gas Emissions at the Airport

Greenhouse Gas Emissions at the Airport

- A majority of the GHG at the airport is not in control of the airport



*Example of Munich Airport

Greenhouse Gas Emissions at the Airport

- ACI's manual on GHG management provides guidance for airports to appropriately measure their emissions

Scope 1

Emissions from airport controlled sources

01 Vehicles/ground support equipment belonging to the airport
02 On-site waste management
03 On-site waste water management
04 On-site power generation
05 Firefighting exercises
06 Boilers, furnaces

Scope 2

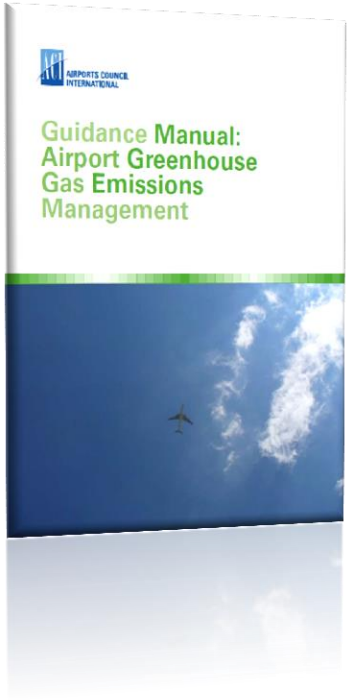
Emissions from purchased electricity

07 Off-site electricity generation
- A Heating
- B Cooling
- C Lighting

Scope 3

Emissions from other sources related to the activities of an airport

08 Aircraft landing
09 Aircraft taking off
10 Aircraft ground movements
11 Auxiliary Power Unit
12 3rd party vehicles/ground support equipment
13 Passenger travel to the airport
14 Staff commute
15 Off-site waste management
16 Off-site water management
17 Staff business travel



** Some examples of possible emissions sources in the airport*

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Airport Carbon Emissions and Reporting Tool (ACERT)

- A simple IT solution designed by airports for airports
- Calculates Greenhouse Gas (GHG) emissions at and around the airport
- Produces a comprehensive emissions inventory and supporting information
- Compatible with all levels of Airport Carbon Accreditation and provides relevant information required

ACERT
AIRPORT CARBON AND EMISSIONS REPORTING TOOL

Renewable Energy at Airports in Africa

ACI's work on renewable energy at airports

- Co-lead of ICAO CAEP WG2 Task O.08 Eco Airport Toolkit E-collection
  - E-publication on renewable energy at airports finalized (to be published soon)

Case: Airports Company South Africa

- Operator of 9 airports in South Africa
- ACSA's 2025 vision on environment
  - Minimize environmental impact and strive to be carbon neutral
  - Target: At minimum, 1 airport certified with *Airport Carbon Accreditation* Level 3: Optimization
  - Achievement so far: 4 airports certified at level 1: Mapping
- Renewable Energy Deployment
  - 3 solar farms generate 1750 kW/day
  - 3 more solar farms planned for 2018 & 2019
- Energy Consumption
  - 22.8% energy reduction in 2017
  - Considering the use of Trigen gas to precool or preheat ventilation systems and provide back-up electricity capacity

Case: Moi International Mombasa, Kenya

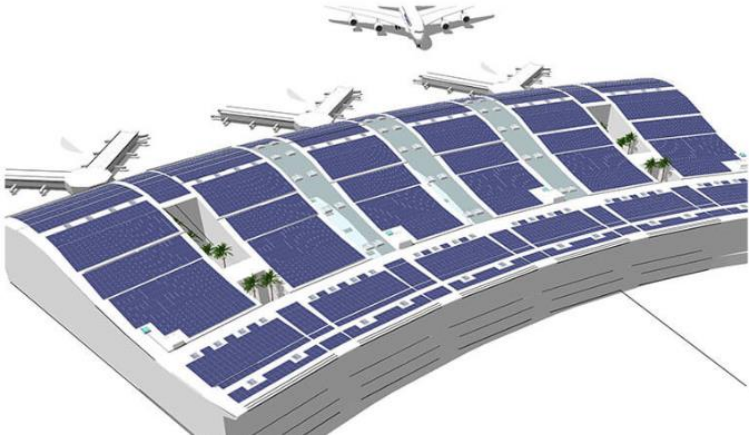
- The ICAO-EU project is a pilot project that will demonstrate the use of solar energy for the provision of ground power and preconditioning air to aircraft at the gate. (1ST of its kind in Africa)
- Solar capacity is 500 kW: a solar facility with airport electric gate equipment
- This equipment will allow aircraft serving international flights to switch off their Auxiliary Power Unit (APU) when parked at the gate, thus reducing carbon dioxide (CO_2) emissions from international aviation activities.

Case: Operated by Office National des Aeroports, Morocco

- Solar panels installed across major airports in Morocco (inc. Casablanca, Oujda, Marrakech, Tangiers, Rabat)
- Boutique solar panels mixing aesthetics and energy saving for the airport

Case: Ahmed Ben Bella (Oran) Airport, Algeria

- Operator (Egsa Oran) in charge of 11 airports in Algeria
- The *NEW* Ahmed Ben Bella (Oran) Airport of Algeria to have solar panel on the roof
- Set to be the second biggest solar installation on roof in Algeria
- 1.39 MW rooftop PV to be installed
- Around 2 million kWh per year thus being able to cover approximately 30% of the power needs of the facility
- In compliance with the environmental requirements of HQE (High Environmental Quality) certification for new buildings



Case: Enfidha-Hammamet International Airport, Tunisia

- Photovoltaic panels along fences, lights, and bird-hazard equipment
- Solar water heaters

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AGES-Simulation

AGES-Simulator (AGES-S)

- A brand-new IT solution developed by Zurich Airport for other airports
- Assess economic and environmental benefit of substituting aircraft APU usage with aircraft ground energy systems
  - Such as the case of Solar@gate project!
- Based on the advanced emissions calculation approach of ICAO Doc 9889 Airport Air Quality Manual

AGES-S
AIRCRAFT GROUND ENERGY SYSTEM – SIMULATOR

ages@aci.aero

AGES-Simulator

- Ground energy systems can lead to up to 90% fuel savings and associated air pollutant emissions such as NOx
- AGES-S is a scenario-based simulation:
  - Baseline – electricity and PCA from APU
  - Scenario 1: Electricity from mobile Ground Power Unit and PCA from APU
  - Scenario 2: Electricity from fixed AGES and PCA from APU
  - Scenario 3: Electricity and PCA from AGES

	NOx (% on total impact relevant emissions)
APU use only	14.1%
ZRH Case	2.5%
All AGES use	0.6%

Zurich Airport, 2016

Scenario	Electricity (115V-400Hz)	Pre-Conditioned Air
Baseline: APU		
GPU / APU		
Stationary / APU (ACU)	 	 
Stationary	 	

AGES-Simulator

- Provide a snapshot information for aircraft and airport operators on:
  - Fuel savings,
  - GHG emissions reduction
  - Expected financial savings

Your Results

Total annual aircraft movements: 227'760 (crosscheck only)

	Fuel (t/a)	Electricity (MWh/a)	CO_2 (t/a)	NOx (t/a)	PM (t/a)	Airline Costs (CHF/a)	Airport Costs (CHF/a)	Airport Costs (CHF invest)
Baseline (APU for 400Hz and PCA)	17'432	-	54'910	159.0	4.2	19'033'974	-	
Your Scenario	183	6'782	787	1.5	0.1	4'744'696	-105'111	20'545'200
Net Savings	-17'249	-	-54'123	-157	-4	-14'289'279	-105'111	
%	-99%	n.a.	-99%	-99%	-99%	-75%		

The CO_2 savings are equivalent to: 200 persons' per capita emissions in Switzerland

n/6,213 mls (annually).

Airlines flying international routes that are part of ICAO CORSIA can benefit from using AGES by reducing their offsetting obligations.

Costs include financial costs, maintenance, electricity. Negative means: airport (or system provider/operator) makes profit.

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Airport Carbon Accreditation in Africa

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Airport Carbon Accreditation: Overview

249 airports in the programme

In over **68** countries across the world

Welcoming **3.5** billion passengers a year

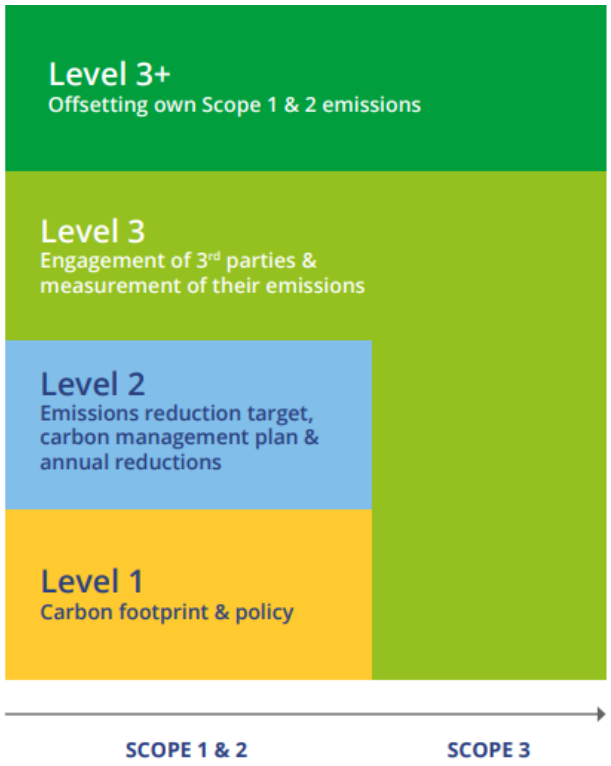
That's **42.9%** of the global air passenger traffic

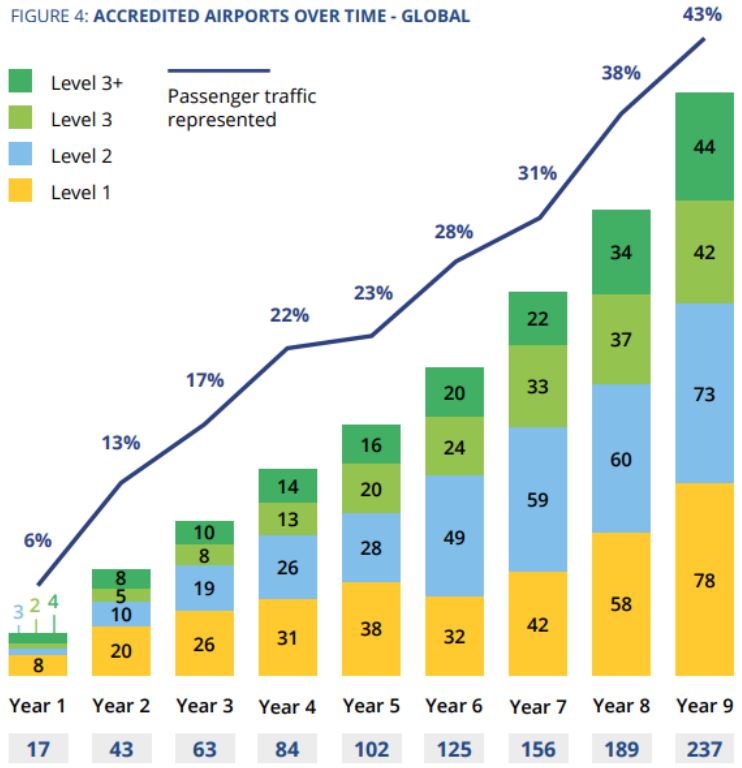
airport carbon accredited NEUTRALITY

airport carbon accredited OPTIMISATION

airport carbon accredited REDUCTION

airport carbon accredited MAPPING





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Airport Carbon Accreditation in Africa

7 airports have mapped their carbon footprints

2 airports actively reduced their CO_2 emissions

1 carbon neutral airport

30.9% of air passenger traffic

AIRPORTS AFRICA 2018

ABIDJAN PORT BOUET (ABJ)	CAPE TOWN (CPT)	CASABLANCA (CMN)	ENIFDHA-HAMMAMET (NBE)
KING SHAKA (DUR)	LIBREVILLE (LBV)	MARRAKECH (RAK)	PORT ELIZABETH (PLZ)
SSR AIRPORT MAURITIUS (MRU)	TAMBO INTERNATIONAL AIRPORT (JNB)		

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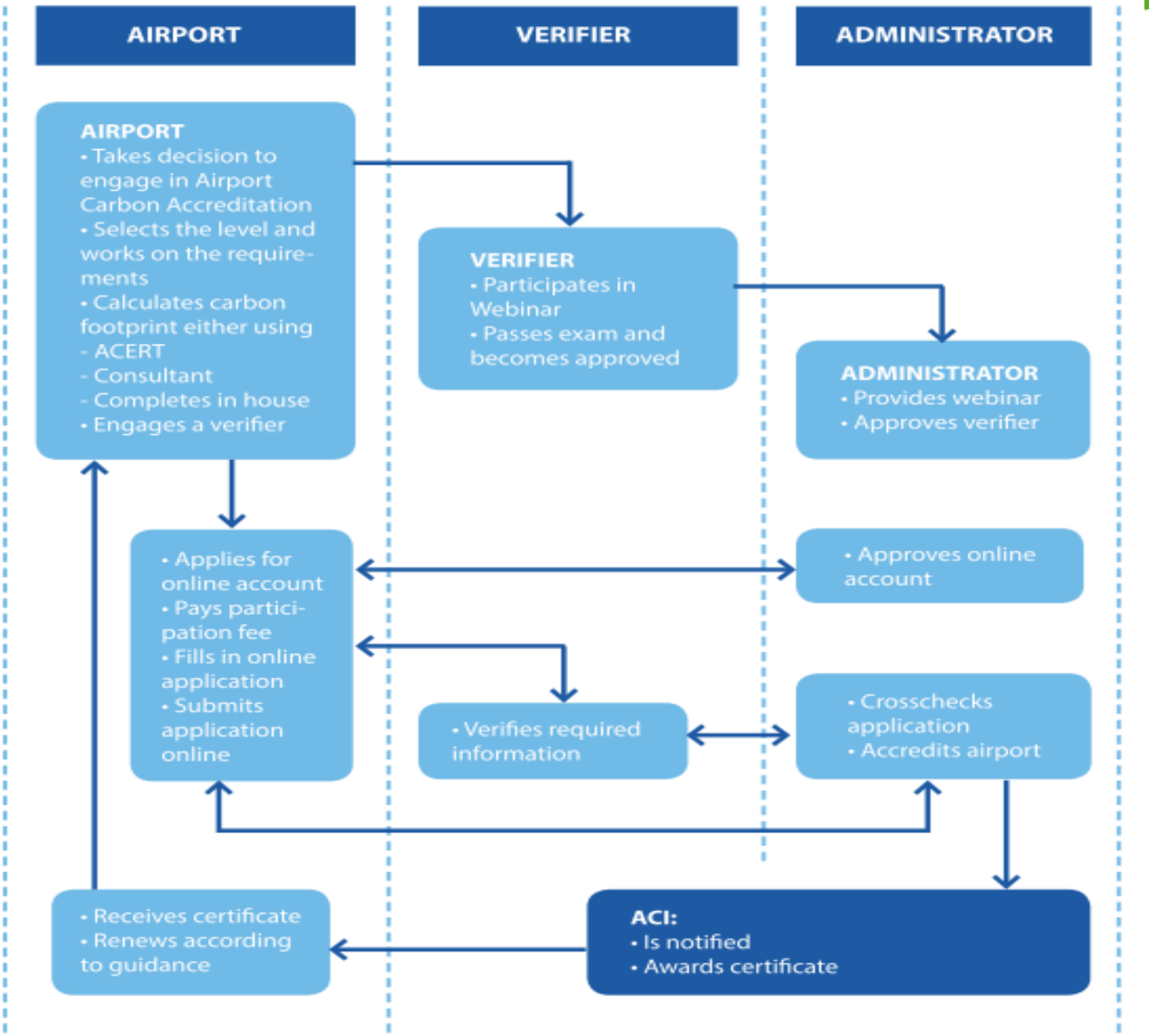
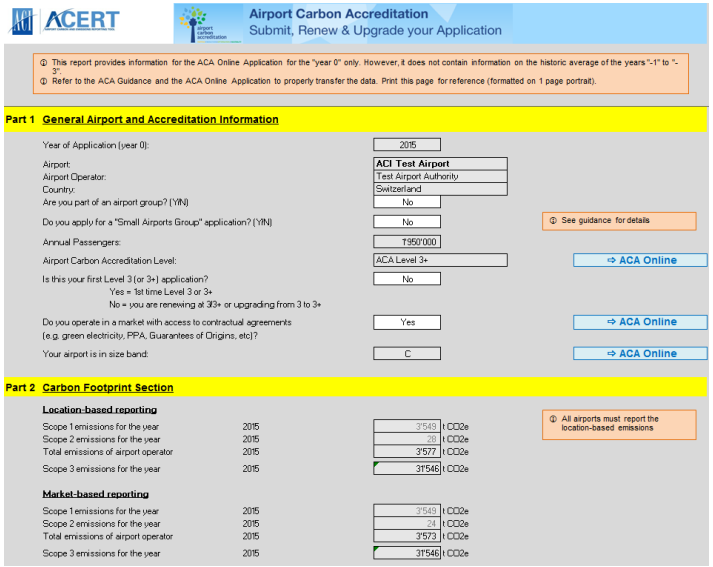


ACERT Output for ACA Online Application

Data and information is automated generated for the ACA Online Application

airport carbon accreditation
MAPPING | REDUCTION | OPTIMISATION | NEUTRALITY


ACERT — Airport Carbon Accreditation
Submit, Renew & Upgrade your Application

① This report provides information for the ACA Online Application for the "year 0" only. However, it does not contain information on the historic average of the years "-1" to "-3".
① Refer to the ACA Guidance and the ACA Online Application to properly transfer the data. Print this page for reference (formatted on 1 page portrait).

Part 1 General Airport and Accreditation Information

Year of Application (year 0):	2015	
Airport:	ACI Test Airport	
Airport Operator:	Test Airport Authority	
Country:	Switzerland	
Are you part of an airport group? (Y/N)	No	
Do you apply for a "Small Airports Group" application? (Y/N)	No	① See guidance for details
Annual Passengers:	7'950'000	
Airport Carbon Accreditation Level:	ACA Level 3+	⇨ ACA Online
Is this your first Level 3 (or 3+) application? Yes = 1st time Level 3 or 3+ No = you are renewing at 3/3+ or upgrading from 3 to 3+	No	
Do you operate in a market with access to contractual agreements (e.g. green electricity, PPA, Guarantees of Origins, etc)?	Yes	⇨ ACA Online
Your airport is in size band:	C	⇨ ACA Online

Part 2 Carbon Footprint Section

Location-based reporting			
Scope 1 emissions for the year	2015	3'549 t CO2e	① All airports must report the location-based emissions
Scope 2 emissions for the year	2015	28 t CO2e	
Total emissions of airport operator	2015	3'577 t CO2e	
Scope 3 emissions for the year	2015	31'546 t CO2e	
Market-based reporting			
Scope 1 emissions for the year	2015	3'549 t CO2e	
Scope 2 emissions for the year	2015	24 t CO2e	
Total emissions of airport operator	2015	3'573 t CO2e	
Scope 3 emissions for the year	2015	31'546 t CO2e	

** Refer to the ACA Guidance Document for further information*

acert@aci.aero

Fees to consider for Accreditation

- Participation fee*
  - Differ by accreditation level (1,2,3, and 3+) and airport size
- Costs for the independent verification
- Internal costs/resources for the preparation
- Implementation cost of:
  - Emissions Reduction measures: for Level 2 and above
  - Offsetting: for Level 3+

** For specific fee, please contact ACI*

airport carbon accreditation
MAPPING | REDUCTION | OPTIMISATION | NEUTRALITY

Level 3+ Case: Félix Houphouet-Boigny Abidjan International Airport, Côte d'Ivoire

- Operated by AERIA (International Airport of Abidjan)
- The only in the African region to ever reach Level 3+: Neutrality (July 2017) and maintained
- AERIA's commitment from the highest strategic level
  - Carbon reduction plan implementation (strategy for reducing energy consumption / creation of a committee with the stakeholders to fight against climate change / construction of a new taxiway parallel to the runway for LTO cycle time reduction)
  - Remaining emissions offset through the purchase carbon credits approved by UNFCCC
- Critical factor to attain Level 3+ accreditation:
  - More commitment from stakeholders (Implementation of their carbon reduction plan)

Level 2 Case: Enfidha-Hammamet International Airport, Tunisia

- Operated by the TAV Tunisia
- The first African airport to participate in the Airport Carbon Accreditation programme
- Achieved Level 1: Mapping and Level 2: Reduction in 2013 from its outset in the region and maintained ever since

CERTIFICATE
of ACCREDITATION

airport carbon accredited
REDUCTION

Valid until the 14th May 2018

This is to certify that **Airport Carbon Accreditation**, under the administration of WSP, confirms that the carbon management processes at

ENFIDHA HAMMAMET INTERNATIONAL AIRPORT
implemented by TAV Airports Holding

have earned the accreditation level of **REDUCTION**, in recognition of their efforts to manage and reduce their CO_2 emissions, as part of the airport industry's response to the challenge of Climate Change.

airport carbon accreditation
MAPPING | REDUCTION | OPTIMISATION | NEUTRALITY
www.airportcarbonaccreditation.org

Ali Tounsi
Secretary General
ACI AFRICA

Simon Clouston
Director
WSP

"Enfidha Hammamet International Airport is proud to be the very first airport in Africa to be certified by Airport Carbon Accreditation. We played an important role in the expansion of the programme into Africa and we encourage other African airports to follow our lead. We made this decision in order to demonstrate our on-going commitment to manage our environmental obligations, as well as to build on a solid framework for our social aspirations and commitments.

Enfidha Hammamet International Airport

TAV Airports

Level 2 Case: Libreville Leon Mba International Airport, Gabon

- Operated by Airport de Libreville (ADL)
- Situated close to the city center of Libreville, the capital of Gabon, serving almost half of the country's population
- Obtained Airport Carbon Accreditation Level 1: Mapping in 2015, and set its objective to pass to Level 2: Reduction in 2016
- ADL elaborated a Carbon Management Plan to better structure emissions reduction efforts and energy man

airport carbon accredited
REDUCTION

"An airport, however big or small, has to take responsibility for its effects on its community, as well as the surrounding environment. Being **Airport Carbon Accredited** gives our environmental efforts a solid framework, which makes it a lot easier for us to set goals for ourselves and that way be a responsible part of our community."

Libreville Airport

ADL
AEROPORT DE LIBREVILLE

Level 1 Case: Operated by Office National des Aeroports, Morocco

- Current accreditation at Level 1: Mapping for Casablanca and Marrakech
- Short term plan to:
  - Move to Level 2 for Casablanca and Marrakech
  - Plan to expand Level 1 accreditation to other airports to Fez, Agadir, Rabat, Oujda, and Tangier
- Mid-term objective to achieve neutrality
- Compliant with national policies to establish strategic priority on environment protection and renewable energy deployment
- Key lessons learned on effective data management

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Thank you!

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