



ICAO

ENVIRONMENT

**FINAL
PROJECT
REPORT**

CAPACITY BUILDING FOR CO₂ MITIGATION FROM INTERNATIONAL AVIATION

PHASE II



PROJECT FUNDED BY



European Union

CONTENTS

List of Tables	iii
List of Figures	iii
Acronyms and Abbreviations	iv
Project Information	v
1. Executive Summary	1
2. Introduction	1
2.1 Project Fact Sheet	4
2.2 Project Management and coordination	5
2.2.1 Steering Committee	5
2.2.2 Project Coordination Unit	6
2.2.3 Project Resources	6
2.2.4 Participating States	7
2.3 Results-Oriented Monitoring (ROM) reviews	7
2.4 Communications and Outreach	8
3. Project Outcomes	8
3.1 Progress of Activities – Specific Objective 1	13
3.2 Progress of Activities – Specific Objective 2	15
3.3 Progress of Activities – Specific Objective 3	17
3.4 Communication and Visibility	19
3.5 The Unitar Online Course	20
3.6 Project Evaluations	21
3.7 Difficulties and Measures Taken	23
3.8 Project Management Overview	23
3.8.1 Internal Coordination	23
3.8.2 Coordination with the States	23
3.8.3 Coordination with the EU	23
3.8.4 Activities for the Next Reporting Period	24
4. Objective 1: Capacity Building for the Development of State Action Plans on Emissions Reduction	25
4.1 State Action Plans on Emissions Reduction	25
4.1.1 National Action Plan Teams	26
4.1.2 Regional Seminars	27
4.1.3 On-Site Capacity Building	28
4.1.4 E-Learning Course on States Action Plans to Reduce CO ₂ Emissions	29
4.1.5 Online Project Platform	30
4.1.6 Assessment of the quality of Action Plans	30
4.1.7 Overview of Selected Measures	32
5. Objective 2: Establishment of Aviation Environmental Systems	34
5.1 The Aviation Environmental System (AES)	34

5.1.1 Training on the AES	36
5.1.2 Data Collection for the AES	36
5.1.3 Data Visualization Platform.....	36
5.2 Submission of monthly CO ₂ reports	38
5.3 AES Transition plan	38
5.4 AES and CORSIA.....	39
5.5 Aviation Environmental System 2.0 (AES 2.0).....	39
5.5.1 Purpose	39
5.5.2 Structure Overview (AES 2.0).....	39
5.5.3 CORSIA Module (AES 2.0).....	40
5.5.4 Other Modules (AES 2.0).....	41
5.5.5 Deployment.....	42
6. Objective 3: Implementation of Mitigation Measures	43
6.1 Selection of Mitigation Measures	43
6.1.1 ICAO'S Basket Of Measures.....	43
6.1.3 Feasibility Studies For The Development Of Sustainable Aviation Fuels	43
6.2 RESULTS OF THE Feasibility Studies on Sustainable Aviation Fuels	44
6.2.1 Feasibility Study Findings – Zimbabwe	44
6.2.2 Feasibility Study Findings – Rwanda	46
6.2.3 Findings of the Feasibility Study – Cote d'Ivoire	49
7 Lessons Learned	53

LIST OF TABLES

Table 3-1 Work Plan and Progress vis Objectives - 2022 and 2023	9
Table 3-2 Focal Point Nominations	13
Table 3-3 National Action Plan Team Creation	14
Table 3-4 National Action Plan Team Meetings With Participation of ICAO Technical Consultant During Development of SAPs - 2021.....	15
Table 3-5 Overview of Mitigation Measures Selected by Participating States	17
Table 3-6 UN Security Risk Level Assessment in the Participating States.....	18
Table 3-7 Selection of States for the Feasibility Studies	18
Table 3-8 Mid-Project Evaluation of the States	22
Table 3-9 AES training Conducted - 2022	24
Table 4-1 National Action Plan Team Creation	26
Table 4-2 National Action Plan Team Meetings With Online Participation of ICAO Technical Consultant During Development of SAP in 2021.	29
Table 4-3 State Action Plans Submitted and Expected Results.....	31
Table 4-4 State Action Plan Compliance and Evaluation Criteria	31
Table 6-2 Critical Success Factors for Achieving SAF Production in Rwanda.....	47
Table 6-3 Summary of Opportunities and Challenges Facing SAF Production in Rwanda	48

LIST OF FIGURES

Figure 2-1 Project Specific Objectives.....	3
Figure 2-2 Project Management Governance Structure.....	5
Figure 2-3 Participating States – Phase 2	7
Figure 3-4 Extract from the Project Brochure.....	20
Figure 3-5 UNITAR Training Course.....	20
Figure 4-1 E-Learning Course for State Action Plans – Training Modules.....	30
Figure 4-2 Distribution of mitigation measures implemented by category.	33
Figure 5-1 AES Functions.....	34
Figure 5-2 Sample User Interface Between AES and Airline Data System.....	36
Figure 5-3 AES Data Visualization Platform – Sample Screen Shots	37
Figure 5-4 CO ₂ Reports Submitted by Participating States	38
Figure 5-5 AES 2.0 Structure Overview	40
Figure 5-6 CORSIA Module Details	40

ACRONYMS AND ABBREVIATIONS

AES	Aviation Environmental System
AFDB	African Development Bank
AFI	Africa-Indian Ocean
AFPP	African Flight Procedure Programme
ANSP	Air Navigation System Provider
APER	Action Plan Web Interface
APU	Auxiliary Power Unit
ASECNA	Agency for Aerial Navigation Safety in Africa and Madagascar
ATB	ICAO Air Transport Bureau
ATC	Air Traffic Controller
CAA	Civil Aviation Authority
CCO	Continuous Climb Operation
CDM	Clean Development Mechanism
CDO	Continuous Descent Operation
CO₂	Carbon Dioxide
COP	Conference of the Parties
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
D/ATB	Director of Air Transport Bureau
DCI	Development Cooperation Instrument
DG	Director General
DRD	Deputy Regional Director
EBT	Environmental Benefit Tool
ECCAS	Economic Community of Central African States
EC	European Commission
EU	European Union
ESAF	Eastern and Southern African Office
FAFA	Financial and Administrative Framework Agreement
FIN	ICAO Finance Branch
FP	Focal Point
GHG	Green House Gases
GPU	Ground Power Unit
ICAO	International Civil Aviation Organization
ICT	ICAO Information and Communication Technology (ICT) Section
IT	Information Technology
MAC	Marginal Abatement Cost
MBM	Market-Based Measures
MOU	Memorandum of Understanding
MRV	Monitoring, Reporting and Verification
MSW	Municipal Solid Waste
NAPT	National Action Plan Team
PAX	Passenger
PBN	Performance-Based Navigation
PCA	Pre-Conditioned Air
RD	Regional Director
ROM	Results Oriented Marketing
RTK	Revenue Tonne-Kilometer
SAF	Sustainable Aviation Fuels
SAP	State's Action Plan
SAT	Site Acceptance Test
SC	Steering Committee
SDD	System Design Document
SIDS	Small Island Developing States
SO	Specific Objective
UCO	Used Cooking Oil
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
UNITAR	United Nations Institute for Training and Research
UPS	Uninterruptible Power Supply
WACAF	Western and Central African Office

PROJECT INFORMATION

Action Document for Capacity building for mitigation of CO₂ from international aviation (Phase II).

1. Title/basic act/ CRIS number	Capacity Building for CO ₂ Mitigation from International Aviation (Phase II) – ICAO – Preparation and/or update and implementation of ICAO States Action Plans for 10 States in 1 Region CRIS number: ENV/2018/041-086 Financed under the Development Cooperation Instrument			
2. Zone benefiting from the action/location	The action shall be carried out at one location: Africa			
3. Programming document	Global Public Goods and Challenges (GPGC)			
4. Sector of concentration/ thematic area	Climate Change	DEV. Aid: YES		
5. Amounts concerned	Total estimated cost: EUR 1.5 million for the Second Phase of the ICAO Project - Capacity Building for CO ₂ Mitigation from International Aviation - Development of ICAO States' Action Plans for 10 States.			
6. Aid modality(ies) and implementation modality(ies)	Project Modality Indirect management with an international organisation			
7. - DAC code(s)	41010 Environment Policy and administrative management			
- Main Delivery channel	40000 Multilateral organisation 47000 Other Multilateral Institution			
8. Markers (from CRIS DAC form)	General policy objective	Not targeted	Significant objective	Main objective
	Participation development/good governance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Aid to environment	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Gender equality (including Women in Development)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Trade Development	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Reproductive, Maternal, Newborn and child health	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RIO Convention markers	Not targeted	Significant objective	Main objective
	Biological diversity	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Combat desertification	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Climate change mitigation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Climate change adaptation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Global Public Goods and Challenges (GPGC) thematic flagships	Global Climate Change Alliance + Green Economy			
10. SDGs	Goal 13: Take urgent action to combat climate change and its impacts			

Source: Amendment to Annex I, Second Phase of the ICAO Assistance Project with EU Funding: Capacity Building for CO₂ mitigation from International Aviation, Development of ICAO States' Action Plans for 10 States. 15 February 2021, p. 4

1. EXECUTIVE SUMMARY

The ICAO and European Union (EU) Assistance Project on Capacity Building for CO₂ Mitigation from International Aviation was established to assist ICAO Member States in developing their own State action plans. This ICAO Project with funding from the EU was set-up to ensure that all States can participate in their collective efforts to achieve the global aspirational goal on the environment that have been agreed by the ICAO Assembly. Phase 1 of this project involved 14 selected States from Africa and the Caribbean. Funded by the European Union, this 6.5 million Euros initiative was successfully implemented from 2014 to 2019 and achieved all expected results and exceeded initial targets.

Phase 2, which was launched in 2020, involved ten States, five from the Eastern and Southern African (ESAF) Region (Botswana, Madagascar, Rwanda, Seychelles, and Zimbabwe); and five others from the Western and Central African (WACAF) Region (Benin, Cabo Verde, Cote d'Ivoire, Mali, and Senegal).

The first objective of the ICAO Project with funding from the EU, Phase 2, was to create national capacities for the development of action plans. ICAO organized specific training-seminars, directed the establishment of National Action Plan Teams in the selected States, and assisted each Civil Aviation Authority directly in the preparation of their action plans. By June 2022, the 10 selected States had developed action plans fully compliant with ICAO's guidelines, including robust historical data and a reliable baseline scenario. Mitigation measures to reduce fuel consumption and CO₂ emissions were proposed in the action plans covering: Technology and Standards, Sustainable Aviation Fuels, Operational improvements, and Market Based Measures.

A lack of reliable aviation environmental data in developing States, such as the amount of CO₂ emissions produced by the aviation sector, is one of the challenges for assessing the impact of aviation on the global climate change and developing national strategies for environmental sustainability. To assist with this, the ICAO-EU project developed a tool called the Aviation Environmental System (AES). The purpose of the AES is to establish data collection processes and reporting protocols for environmental information in the beneficiary States. The system enables the Civil Aviation Authorities of States to organize and report on data related to the CO₂ emissions generated by international aviation in their sector of operation. To-date, all the beneficiary States have the capacity to use the AES to collect the relevant data from their aviation stakeholders and can generate monthly and yearly CO₂ emissions reports for their aviation sector.

In agreement with the European Union, and based on their carbon reduction potential and replicability, ICAO selected three feasibility studies to be executed in the beneficiary States with project funding.

Capacity building and assistance on Environmental issues will continue to be required for the transformation of policy into concrete actions at the national level. Many States have officially communicated to ICAO their interest in participating in similar assistance initiatives with the hope of and replicating the positive results of the first and second phase of ICAO Project with funding from the EU. The availability of further funding will allow ICAO to extend the benefits of this successful project to other Member States so that "No Country is Left Behind"¹.

2. INTRODUCTION

The International Civil Aviation Organization (ICAO) Assistance Project on Capacity building for CO₂ mitigation from international aviation, Phase 2, with European Union (EU) funding aimed to provide technical assistance to a selected group of 10 States from two regions of Africa. The Project was meant to support the efforts of those States in developing and implementing their Action Plans to reduce CO₂ emissions from international aviation. Those State Action Plans were designed to establish aviation environmental systems for emissions monitoring and to identify and implement mitigation measures in selected States. The selection of the

¹ At the initiative of the ICAO Council, ICAO launched the No Country Left Behind (NCLB) campaign to assist States to effectively implement ICAO Standards and Recommended Practices (SARPs) and policies.

beneficiary States was agreed between ICAO and the European Commission following a pre-determined set of criteria defined in the Contribution Agreement.

The first phase of the ICAO Assistance Project with the European Union (EU) Funding, entitled *Capacity Building for CO₂ Mitigation from International Aviation* was launched in 2013. With 14 participating States in Africa and the Caribbean, that project led to the successful submission of Action Plans, along with the installation of CO₂ emissions monitoring systems and the implementation of mitigation measures.

After completion of Phase I, ICAO and the European Union decided to add a second phase to the ICAO Assistance Project. In 2020, Phase 2 of the Assistance Project was launched with EU Funding, in-line with the ICAO *No Country Left Behind* initiative ². A total of 10 States were chosen to participate in Phase Two.

The 10 States selected include: Benin, Botswana, Cabo Verde, Cote d'Ivoire, Madagascar, Mali, Rwanda, Senegal, Seychelles, and Zimbabwe. They represent States in the ICAO Regions of Eastern and Southern African (ESAF) Office, and the Western and Central African (WACF) Office.

Like Phase I, this second phase sought to contribute to the mitigation of CO₂ emissions from international civil aviation in the selected States by implementing capacity-building activities that will support the development of low carbon air transport and environmental sustainability. The overall specific objectives (Figure 2-1) of the project were as follows:

- To improve the capacity of the beneficiary States to develop, update and implement national Action Plans to reduce CO₂ emissions from international aviation, in accordance with ICAO recommendations (SO1).
- State Action Plans on emissions reduction are to be developed by each of the beneficiary States (SO2).
- Mitigation measures selected by each beneficiary State are to be assessed, and their feasibility evaluated (SO3).

² [No Country Left Behind \(icao.int\)](https://www.icao.int)

PHASE II: CAPACITY BUILDING FOR CO₂ MITIGATION FROM INTERNATIONAL AVIATION

PHASE II OBJECTIVES



Figure 2-1 Project Specific Objectives – Phase II – ICAO Assistance Project

The entire Project Phase 2 was planned to take 36 months from the start date of 1 January 2020. Because COVID-19 lockdown measures affected the early implementation, ICAO and the EU agreed on a 10-month no-cost extension, resulting in a revised end date of 31 October 2023. The kick-off Seminar was held on 4 December 2020, bringing together the Focal Point representatives from all 10 selected States.

2.1 PROJECT FACT SHEET

Project Title	Phase Two – Capacity Building for Mitigation of CO₂ from International Aviation – Development of ICAO State Action Plans for 10 States.
Project Ref. Number	ENV/2019/410-199
Countries	Africa: Participating States: five States from the Eastern and Southern African (ESAF) Region (Botswana, Madagascar, Rwanda, Seychelles, and Zimbabwe), and five States from the Western and Central African (WACAF) Region (Benin, Cabo Verde, Cote d’Ivoire, Mali, and Senegal).
Overall objective	To contribute to the mitigation of CO ₂ emissions from international civil aviation in the selected States by implementing capacity-building activities that will support the development of low-carbon air transport and environmental sustainability.
Specific objectives	<ul style="list-style-type: none"> • To improve the capacity of the beneficiary States to develop, update and implement National Action Plans to reduce CO₂ emissions from international aviation, in accordance with ICAO recommendations (SO1). • State Action Plans on emissions reduction are to be developed by each of the beneficiary States (SO2). • Mitigation measures selected by each beneficiary State are to be assessed, and their feasibility is to be evaluated (SO3).
Expected results	<ol style="list-style-type: none"> 1. National Action Plan Teams (NAPT) are established in the beneficiary States with the participation of relevant stakeholders from the aviation sector. (R1) 2. At least two (2) members of staff in the aviation sector or related authority fully trained to develop and implement Action Plans in each selected State. (R2) 3. State Action Plans on emissions reductions developed by beneficiary States are in full compliance with ICAO Guidance on the Development of State Action Plans on CO₂ Emissions Reduction Activities (Doc 9988). (R3) 4. An Aviation Environmental System (AES) has been installed in each of the selected Member States for collection of historical data for the preparation of the baseline scenario and analysis of expected results. (R4) 5. A total of three (3) feasibility studies on the implementation of selected mitigation measures are conducted in certain selected beneficiary States. (R5)
Project start date	1 January 2020
Initial project duration	36 months
No-cost extension	10 months
Revised project duration	46 months-ending 31 October 2023
Budget	EUR 1.5 million

Source: Amendment to Annex I, second phase of the ICAO EU Project, Capacity Building for mitigation of CO₂ from International Aviation, Development of ICAO States’ Action Plans for 10 States. 15 February 2021, p. 5.

2.2 PROJECT MANAGEMENT AND COORDINATION

The implementation and execution of the ICAO-EU Assistance Project were carried out by ICAO. To do this, a Project Coordination Unit was established in the Environment Bureau of the Air Transport Bureau. It was responsible for project management and coordination with other ICAO Bureaus and Regional Offices.

At the state level, each of the selected beneficiary States designated at least two Focal Points in their Civil Aviation Authorities to: implement project activities, liaise with ICAO, and coordinate the National Action Plan Teams.



Figure 2-2 Project Management Governance Structure

2.2.1 STEERING COMMITTEE

The Steering Committee was the project's inter-institutional strategic decision-making body. It provided the overall political and technical guidance on the implementation of the project and met at least once a year during the project timeframe. Its role was to review the progress of the project and to provide guidance and assistance for the resolution of any difficulties encountered during implementation. The Steering Committee included representatives from ICAO, the European Commission, and the selected States.

Representatives from ICAO

- Director, Air Transport Bureau
- Director, Technical Cooperation Bureau
- Deputy Director, Environment, Air Transport Bureau
- Chief, Finance

Representatives from the European Commission

- DG DECO
- DG CLIMA

Representatives from States and Group of States²

- Mr. Djibril Ahmed Coulibaly, Representative of Cote d'Ivoire on the Council of ICAO.
- Mr. Alain Jerome Charlemagne Pereira, Representative of Senegal to ICAO.
- Mr. Mahmoud Elhassan Mohamed Salih, Representative of Sudan on the Council of ICAO.
- Mr. Vincent Banda, Representative of Zambia on the Council of ICAO.

2.2.2 PROJECT COORDINATION UNIT

ICAO Deputy Director, Environment – Strategic Direction.

The ICAO Deputy Director, Environment, oversaw the project implementation and provided strategic and managerial direction to ensure that all activities were in accordance with ICAO's Strategic Objectives on Environment, with particular focus on environmental protection policies and practices. The Deputy Director, Environment also liaised with the Steering Committee and met regularly with the Permanent Representatives of the selected States. In addition, that office conducted advocacy and outreach to secure political buy-in from the relevant government authorities of the selected States.

ICAO Environment Officers – Technical Expertise and coordination with current ICAO programme.

ICAO Environment Officers provided continuous guidance to the States to ensure the technical quality of project deliverables, and their consistency with the regular environmental protection programme. The Environment Officers also conducted training and capacity-building seminars for the Focal Points of the beneficiary States. They also reviewed and validated the project feasibility studies for the implementation of mitigation measures.

Programme Coordinator Consultant – Project Management.

A Programme Coordinator was recruited to ensure that the project activities were implemented in accordance with the project document and in compliance with the EU/ICAO administrative regulations. The Programme Coordinator worked under the overall guidance of the ICAO Deputy Director, Environment, and in close consultation with ICAO/ENV Officers. The Programme Coordinator was also responsible for the planning, procurement, contracting, financial and reporting activities.

Technical Consultant – Support to the State Focal Points and Local Coordination.

The Technical Project Consultant provided support to the Action Plan Focal Points from each State. The Technical Consultant followed-up closely with the State Action Plan Focal Points on a regular basis. He also performed monitoring visits to the beneficiary countries. These visits were essential to ensure progress and the smooth implementation of the project activities and involved meeting regularly with Government counterparts and providing close support to the national action plan Focal Points across all the project phases.

Consultants – Feasibility Studies

Three experts were recruited to conduct feasibility studies of the mitigation measures included in the State Action Plans for three states: Cote-d'Ivoire, Rwanda and Zimbabwe. These experts were recruited to work on the project on a part-time basis, focused on specific deliverables. They worked mostly remotely, with some on-site missions to the States involved, when required.

2.2.3 PROJECT RESOURCES

The EU and the participating States provided the following inputs for project implementation and management:

- The EU (Donor) funded the Project with a total financial contribution of EUR 1.5 million under the Development Cooperation Instrument (DCI), and the provisions of the Financial and Administrative Framework Agreement (FAFA) between the EU and the United Nations.

- The selected States provided staff resources to implement the project, as well as in-kind contributions including the use of: office equipment, software, licenses, offices, and vehicles during onsite missions of the Technical Consultant. They also furnished interpretation, and translation services, as required. States installed the Aviation Environmental System (AES) on their Office IT equipment. In addition, the beneficiary States were responsible for the maintenance of the Office IT equipment and for the installation/re-installation of the AES software.

2.2.4 PARTICIPATING STATES

Figure 2.3 highlights the 10 States that participated in Phase 2. The Eastern and Southern African (ESAF) Region was represented by five States: Botswana, Madagascar, Rwanda, Seychelles, and Zimbabwe. Five other States represented the Western and Central African (WACAF) Region: Benin, Cabo Verde, Cote d'Ivoire, Mali, and Senegal.

Comoros was originally selected as one of the participating States, but it faced some local challenges which prevented it from participating in this Second Phase. Despite ICAO trying various ways to communicate with the State, including liaison through its ESAF Regional Office, Comoros was not able to confirm its participation within the stipulated timeframe. After consideration of all possibilities, and in-line with the Project selection criteria, Comoros was subsequently replaced by Seychelles.

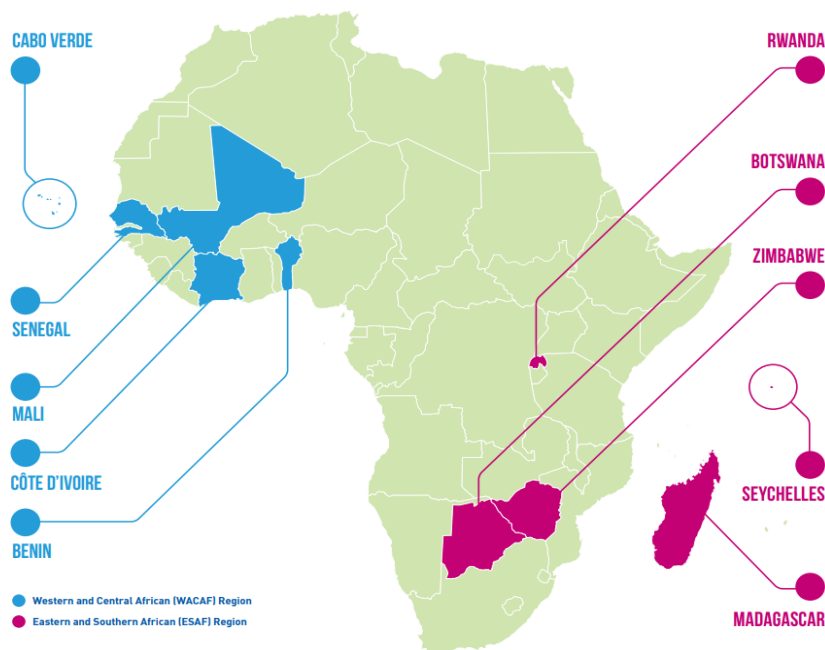


Figure 2-3 Participating States – Phase 2

Some challenges were faced during the interim implementation period January-July 2022, including:

- The changes in Focal Points by some of the States (i.e., Zimbabwe and Madagascar).
- The financial impacts of the pandemic prevented some beneficiary States from participating in-person in the Cabo Verde Regional Seminar.

2.3 RESULTS-ORIENTED MONITORING (ROM) REVIEWS

Phase 2 activities took place in the context of several important ICAO environmental panels including the 2022 Stocktaking Seminar, and the High-level Meeting on the feasibility of a long-term aspirational goal for international

aviation CO₂ emissions reductions. Both panels were held in preparation for the 41st Assembly which took place in late September–early October 2022.

Since 1 January 2022, the following activities and outcomes were achieved:

- Action Plans and AES
 - Installation of the Aviation Environmental System (AES) in all States.
 - Submission of the 10 SAPs to ICAO.
- Meetings, workshops, and seminars
 - High-level Briefing on Sustainable Aviation Fuels (SAF) with the attendance of all the Director Generals (DGs) or Representatives of the participating States (28 January 2022).
 - Third Steering Committee Meeting (28 February 2022).
 - Innovation Seminar (19 & 20 April 2022).
 - Regional Seminar in Praia, Cabo Verde (in person, 28 & 29 July 2022).

2.4 COMMUNICATIONS AND OUTREACH

- Communication and visibility
 - Development of Project brochures, posters, Zoom background, and banners.
 - Printing and distribution of visibility materials to relevant stakeholders and States Focal Points.
 - Project webpage on the ICAO public website under the Capacity building and Assistance webpage.
- Coordination with the EU:
 - Submission of the Annual Report (February 2022).
 - Amendment No.2 to EU Contribution Agreement: Capacity Building for CO₂ Mitigation from International Aviation (ICAO) – DCI/ENV/2019/410-199.

3. PROJECT OUTCOMES

This section presents the implementation of the Project as established in the Project Log-Frame and gives an overview of the resulting achievements. It provides the work plan and presents details on the activities performed to-date.

The Project work plan has been fully implemented with the major achievements being the submission of the State Action Plans (SAPs) by all participating States, the completion of three feasibility studies, and the review of the selected mitigation measures. These SAPs contain quantified mitigation measures in accordance with ICAO's guidelines. Table 3-1 summarizes the work plan and activities achieved to-date following the structure of the Project's Log Frame.

Table 3-1 Work Plan and Progress vis Objectives - 2022 and 2023

SPECIFIC OBJECTIVE 1: Improved capacity of the national civil aviation authorities to develop their Action Plan on CO₂ emissions reduction from international aviation in accordance with ICAO recommendations.		Results
A-1.1. Secure designation of Action Plan Focal Points for each beneficiary State and promote the constitution of National Action Plan Teams that are representative of the aviation sector with clearly assigned roles and responsibilities.	Completed (October 2021 with Seychelles' nomination, updated as States change their Focal Points.)	R1. National Action Plan teams built in selected Member States. R2. At least 2 members of staff in the aviation or related authority trained to develop Action Plans in each selected State.
A-1.2. Assist the beneficiary States in the institutionalization and operationalization of their National Action Plan Teams (official creation at the CAA or Ministry level, integration in the national structure for GHG emissions inventory).	Two (2) Focal Points nominated and trained in the States (by October 2021), still awaiting official signature in one State (by the Cabinet in Rwanda see table 3.) Structure completed in the 10 States	
SPECIFIC OBJECTIVE 2: States Action Plan are developed in the selected Member States and CO₂ emissions from international aviation are identified and monitored		Results
A-2.1. Assess existing skills/capacity on AP development from past communication and trainings and develop a tailored training plan for each selected Member State.	Completed (December 2020, updated in October 2021 with the inclusion of Seychelles) All 10 States have completed their State Action Plans (4 States above the Expected Results indicators).	R3. At least 6 States have submitted a fully quantified State Action Plan.
A-2.2. Kick-off Seminars to enhance national capacities for the initial project activities and to enable regional synergies and interaction between beneficiary States.	<i>Completed (4 December 2020). The Kick-off Seminar was held virtually with the attendance of all participating States, Representatives from the EU, and Representatives from States or groups of States.</i>	
A-2.3. National workshops on the beneficiary States to provide customized assistance on the AP development.	<i>Completed (January 2021 to June 2022). See Table 4 for the workshops in each State.</i>	
A-2.4. Installation of the Aviation Environmental System (AES) to assist States in the data collection of historical data for the preparation of the baseline scenario and expected results for the Action Plans. The installation will be on IT equipment provided by the States.	<i>All States have the AES software installed in their equipment since April 2022.</i>	R4. Aviation Environmental Systems (AES) developed in the selected Member States.

A-2.5. Regional Seminars to provide guidance on the selection of the mitigation measures, calculation of environmental benefits, and prioritization for finalizing the Action Plans.	Completed (Regional Seminar 14 & 15 September 2021, SAF Briefing to DGCAs: 28 January 2022; Innovation Seminar 19 & 20 April 2022).	
A-2.6. Assist the selected States in the submission of the Action Plan on APER website and in the elaboration of a paper version for outreach.	<i>Completed (January 2022 to June 2022).</i> All SAPs have been submitted by the States on the ICAO APER website. All SAPs have been posted on the ICAO public website.	
A-2.7. Review submitted Action Plans for verification and compliance with ICAO Doc 9988	Completed (January 2022 to June 2022).	
A-2.8. Provide guidance and online support for the preparation and submission of CO ₂ emission reports for international aviation using the AES to monitor implementation of the Action Plans	Completed. Meetings held with all beneficiary States.	

SPECIFIC OBJECTIVE 3: Mitigation measures selected by the beneficiary States are identified and assessed; their feasibility is evaluated.		Results
A-3.1. Analysis of mitigation measures included in the States' Action Plans.	Completed: all measures identified in the SAPs have been analyzed (January to June 2022).	R5. A total of three feasibility studies on the implementation of selected mitigation measures are conducted in certain selected beneficiary States.
A-3.2 Conduct three feasibility studies on priority mitigation measures in certain selected the beneficiary States.	Following the Steering Committee work on the feasibility studies for the selected States, the studies will be initiated. The States selected for feasibility Studies are Zimbabwe, Rwanda, and Cote d'Ivoire. Three consultants were chosen and kick off meetings held. State visits with ICAO staff and Focal Points, Government, and Stakeholders conducted. All study reports on schedule were completed by October 31, 2023. Meetings for their final presentation deliverables to States held in October 2023.	
A-3.3 Support selected States with outreach activities to mobilize financial support for the implementation of the results of the feasibility studies.	Completed.	

A-3.4. Support to the beneficiary States in the implementation of their mitigation measures by providing advice, liaison with relevant stakeholders, etc.	Completed. Support provided in the seminars and through outreach to each beneficiary State.	
A-3.5. Regional Seminars to exchange on the implementation of the mitigation measures and to showcase the results of the three feasibility studies.	Three seminars completed.	Next Seminar to showcase the results of the feasibility studies: Q3 2023.
A-3.6. Monitor overall implementation of the Action Plans by the beneficiary States.		

	<i>Supporting Activities</i>									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Steering Committee Meetings									20 Sep 2023 (5 th SC Meeting)	
On-site missions										
Communication plan/ Visibility actions		Development of Project visibility materials; printing and distribution of materials, update of Project webpage on the ICAO public website (banners and posters that were distributed with Focal Points at the Regional Seminar in Cabo Verde (2022) and Zimbabwe (2023)).								For 2023, the visibility activities will continue with the banners, posters, brochures and SAPs. The 3 feasibility studies and a promotion also planned
UNITAR Course Upgrade									UNITAR Package including Sole Source Document TORS, UNITAR – ICAO Proposal, Evaluation	

2023 activities to be implemented

The following Sections (3.1, 3.2, 3.3), provide specific background details on what was summarized in the foregoing table.

3.1 PROGRESS OF ACTIVITIES – SPECIFIC OBJECTIVE 1

Specific Objective 1 (SO1) seeks to ensure the following: Improved national capacity of the beneficiary States to develop/update and implement an Action Plan on CO₂ emissions reduction from international aviation in accordance with ICAO recommendations (SO1). The activities (A-1.1 and 1.2) below indicate the progress made towards achieving this objective.

A-1.1. Secure Designation of Action Plan Focal Points for Each Beneficiary State and Promote the Constitution of National Action Plan Teams that are Representative of the Aviation Sector with Clearly Assigned Roles and Responsibilities.

This activity was completed at an earlier stage. All States have nominated their Focal Points. Table 3-2 below provides a summary of the FPs nominations.

Table 3-2 Focal Point Nominations

State	Number of Focal Points	Nomination decision	Comments
Benin	2	NAP FP: Letter No. 0350/ANAC/MIT/DSV-DAF/SARH/SA dated 4 March 2020	
		Assistant FP: Letter No 0369/ANAC/MIT/DSV/SA dated 22 March 2021	
Botswana	2	NAP FP: Letter Ref: CAAB 13/1/22 I (37) dated 11 March 2020 and Letter No. CAAB 13/1/22 I (45) dated 19 November 2020	First letter identified both as National Focal Points whereas second letter in November 2020 specified main focal point.
		Assistant FP: Letter Ref: CAAB 13/1/22 I (37) dated 11 March 2020	
Cabo Verde	2	NAP FPs: Letter Ref ENV 8/1.1 dated 18 February 2020; Letter N/Ref: 38/ACC-CA/2021 dated 5 January 2021	Alternate was nominated following ICAO's invitation to designate an assistant FP.
		Assistant FP: Letter Ref: 199/AAC-CA/2021 dated 21 April 2021	
Cote d'Ivoire	2	Letter N/Ref 00001352/ANAC/DSV/SDNA/SEN dated 27 February 2020 nominating NAP FP	
		Decision No 008157/ANAC/DSV dated 5 October 2021	
Madagascar	1	NAP FP: Letter No 56 ACM-DGE dated 7 April 2020	Alternate FP departed, awaiting nomination of the new alternate FP.
		Assistant FP: Letter No 56 ACM-DGE dated 7 April 2020	
Mali	2	NAP FP: Letter No 20/000507/ANAC/DG/OQS dated 20 February 2020	
		Assistant FP: Letter No 20/000507/ANAC/DG/OQS dated 20 February 2020	
Rwanda	2	NAP FP and Alternate: Letter No. 1206/02957/2020 dated 31 January 2020	
		Revised NAP FP and Alternate: Letter No 12106/03062/2020 dated 25 February 2020 providing an updated list of NAP FPs	
Senegal	2	NAP FP: Letter No. 00572 ANACIM/DG/DSV dated 2 March 2020	
		Assistant FP: 00418 ANACIM/DG/DSV dated 19 February 2021	
Seychelles	2	FP: SCAA/AT/ICAO/o4 dated 06 October 2021	
		Alternate FP: SCAA/AT/ICAO/o4 dated 06 October 2021	
Zimbabwe	2	NAP FP: Letter Ref: ENV 8/1.1 dated 2 March 2020. New FP letter: IOM dated 24 January 2022 CAAZ	Change in Focal Point in the course of the project.
		Alternate FP; Letter Ref: ENV 8/1.1 dated 2 March 2020	

A-1.2. Assist the Beneficiary States in the Institutionalization and Operationalization of their National Action Plan Teams (official creation at the CAA or Ministry level, integration in the national structure for GHG emissions inventory).

The Project team worked with all beneficiary States to create, institutionalize, and operationalize their NAPT. Table 3-3 summarizes the creation of the NAPT in each State. It shows that all the 10 States have officially institutionalized their NAPT.

Table 3-3 National Action Plan Team Creation

State	Official decision	Authority	Date of signature
Benin	Decision No 006/ANAC/MIT/DSV-DAF/SARH/SA	Directeur General de l'Aviation Civile	29 January 2021
Botswana	Decision No1/CAAB 13/1/22 I of 2021	Acting Chief Executive Officer Civil Aviation Authority of Botswana	5 February 2021
Cabo Verde	Resolucao No 72/2021, Boletim Oficial I Serie, Numero 69, 14 Julho de 2021	Conselho de Ministros	14 July 2021
Côte d'Ivoire	Decision No 005394/ANAC/DSV/DTA	Directeur General de l'Autorite Nationale de l'Aviation Civile	25 September 2018
Madagascar	Decision No 066 DGE/ENV	Directeur General de l'Aviation Civile	9 March 2021
Mali	Lettre circulaire No 2021-00010/ANAC/DG/CQS	Directeur General de l'Agence Nationale de l'Aviation Civile	22 January 2021
Rwanda	Ministerial Instructions No 02/Min/022 of 04/11/2022	Minister of Infrastructure	4 November 2022
Senegal	Decision No 00668/ANACIM/DG	Directeur General de l'Agence Nationale de l'Aviation Civile et de la Meteorologie	19 March 2021
Seychelles	No decision number provided	Board of Directors of the Authority for SCAA	
Zimbabwe	Decision No 1/CAAZ/SAP CO ₂ /18/02/2021	Acting Director-General Civil Aviation Authority	18 February 2021

For the NAPT of Seychelles, it was the decision of the Board of Directors for the Seychelles Civil Aviation Authority (SCAA) to proceed with the development of SAP, which includes, as part of the development, putting in place a NAPT. There was not really a separate decision that was made to certify the formation of the NAPT. Rather, the initial Board decision was effectively the green light for SCAA to develop a SAP which meets ICAO's requirements.

3.2 PROGRESS OF ACTIVITIES – SPECIFIC OBJECTIVE 2

The aim of Specific Objective 2 (SO2) is to ensure that States Action Plans are developed in the selected Member States and CO₂ emissions from international aviation are identified and monitored. The activities listed below indicate progress towards achieving this objective.

A-2.1. Assess Existing Skills/Capacity on SAP Development from Past Communication and Trainings and Develop a Tailored Training Plan for Each Selected Member States.

This activity was undertaken at an early stage of the Project. A preliminary assessment of the aviation sector of each beneficiary State was conducted to analyse their aviation industry, regulatory framework, and data collection capabilities.

A-2.2. Kick-off Seminars to Enhance National Capacities for the Initial Project Activities and to Enable Regional Synergies and Interaction Among Beneficiaries States.

This activity was held virtually with the attendance of all participating States, Representatives from the EU, and Representatives from States or groups of States. The kick-off seminar aimed at strengthening the capacities of the national Focal Points for the preparation of State Action Plans and also at providing an overview of the activities included in the project to ensure the ownership by the Civil Aviation Authorities.

A-2.3. National Workshops on the Beneficiary States to Provide Customized Assistance on the Action Plans Development.

Customized assistance was given to each Beneficiary State for the development of the SAPs. Several national workshops led by the ICAO Project Team were held, and included relevant stakeholders, aviation authorities, and the State Focal Points.

These technical training sessions involved:

- Development of a national work plan with specific deadlines.
- Collection of aviation data.
- Calculation and validation of the baseline.
- Identification and selection of mitigation measures.

An important point is that the communication and training in the States were conducted in the national languages, or in ICAO's language of correspondence for the States. French was used for Benin, Cote d'Ivoire, Mali, Madagascar, Senegal, and English for Botswana, Cabo Verde, Rwanda, Seychelles, and Zimbabwe. These national workshops brought together many national Stakeholders to work collectively and join synergies to develop their National Action Plans. Table 3-4 provides a summary of the first national meetings per State conducted with the support of the ICAO Technical Consultant. Several other NAPT meetings were held in each State.

Table 3-4 National Action Plan Team Meetings With Participation of ICAO Technical Consultant During Development of SAPs - 2021

State	NAPT1	NAPT2	NAPT3	NAPT4	NAPT5
Benin	Feb. 23, 2021	Apr. 4, 2021	May 27, 2021	Jun. 28, 2021	Aug. 16, 2021
Botswana	Mar. 12, 2021	Apr. 16, 2021	May 20, 2021	Jun. 26, 2021	Aug. 30, 2021
Cabo Verde	Aug. 3, 2021	Aug. 18, 2021	Sep. 10, 2021	Dec. 2021	Dec. 2021
Côte d'Ivoire	Jan. 21, 2021	Feb. 4, 2021	Mar. 3, 2021	May 5, 2021	Jun. 18, 2021
Madagascar	Mar. 31, 2021	Apr. 23, 2021	Jun. 3, 2021	Jul. 14, 2021	Dec. 2021
Mali	Mar. 5, 2021	Apr. 6, 2021	May 4, 2021	May 26, 2021	Jun. 29, 2021

Rwanda	Mar. 31, 2021	Apr. 27, 2021	Jun. 7, 2021	Dec. 2021	Dec. 2021
Senegal	Mar. 11, 2021	Apr. 15, 2021	May 13, 2021	Jun. 10, 2021	Jul. 19, 2021
Seychelles	Oct. 25, 2021	Nov. 19, 2021	Dec. 15, 2021	Jan 27, 2022	Feb. 2022
Zimbabwe	Mar. 26, 2021	May 27, 2021	Jun. 24, 2021	Jul. 30, 2021	Aug. 24, 2021

Prior to each meeting, some preparatory training sessions with the Focal Points, or other one-on-one meetings, were held. These sessions are not captured in the summary table.

A-2.4. Installation of the Aviation Environmental System (AES) to Assist States in the Data Collection of Historical Data for the Preparation of the Baseline Scenario and Expected Results for the Action Plans. The Installation to be on IT Equipment Provided by the States.

During this implementation period, and in preparation for the submission of the State Action Plans, the beneficiary States needed to collect their historical data, calculate, and validate their baseline emissions, and select their mitigation measures. The initial presentation of the AES was conducted during the Regional Seminar in September 2021. In the first and second quarters of 2022, with the support of ICAO ICT, the AES was successfully installed in all States remotely since travel was still limited due to Covid-19.

AES Training was carried out for each State as required. The system facilitates the collection of aviation data and enables monitoring and reporting of aviation emissions. The activation of the system further supports Activity A-2.8. *“Provide guidance and online support for the preparation and submission of CO₂ emission reports for international aviation using the AES to monitor implementation of the Action Plans”*. For the Action Plan updates in the coming years, the AES will assist States Focal Points in the collection of data.

A-2.5. Regional Seminars to be Held to Provide Guidance on: Selection of the Mitigation Measures, Calculation of Environmental Benefits, and Prioritization, Aiming at Finalizing the Action Plans.

The following activities were conducted in 2023 to provide guidance on the selection of the mitigation measures:

- The Zimbabwe Regional Seminar held in Harare, Zimbabwe, 3-5 April 2023, brought together the Focal Points and other representatives of the 10 participating ICAO States. The States presented their updates on the implementation of their State Action Plans. Guidance discussions on a number of topics including: Sustainable Aviation Fuels (SAF) and the ACT-SAF program, goals and objectives of the Feasibility Studies on SAF under the project framework, SAF technology and certification, SAF sustainability and reporting under CORSIA, SAF implementation in Africa, and the government role/support and transition to SAF at the airports. The Seminar was held in-person.
- The Third Seminar was held on 25-27 July 2023, and conducted in a virtual format. It provided another opportunity for the 10 ICAO participating States to update each other, but also to update the group on the t3 feasibility studies conducted by Zimbabwe, Rwanda, and Cote d’Ivoire. Important stakeholders presented their initiatives. These included: the International Air Transport Association (IATA), Roundtable on Sustainable Biomaterials, World Wildlife Federation – South Africa, Kenya Airways, and the Agency for Aerial Navigation Safety in Africa and Madagascar (ASECNA). The focus was on planning, implementation, operational, and technical measures.
- A Fourth and final Seminar was held at ICAO Headquarters in Montreal, Canada, 24-26, October 2023. This Seminar included presentations of the final results and achievements of the Phase 2 Project, the findings of the three feasibility studies: Zimbabwe, Rwanda, Cote d’Ivoire, a tour of the sustainable aviation fuels facility SAF+) at Trudeau International Airport in Montreal (Dorval), and an overview of the implementation of SAF.

A-2.6. Assist the Selected States in the Submission of their Action Plan on the APER website, and in the Creation of a Paper Version for Outreach.

All selected States supported the development of the SAPs, and for the submission on the ICAO Action Plan Web Interface (APER) website. As a result, all 10 States have successfully submitted their SAPs which are available on the ICAO public website (www.icao.int/environmental-protection/Pages/ClimateChange_ActionPlan.aspx)

3.3 PROGRESS OF ACTIVITIES – SPECIFIC OBJECTIVE 3

A-3.1. Analysis of Mitigation Measures Included in State Action Plans.

All mitigation measures selected by the NAPT were submitted to ICAO for a thorough review by the Project Team, ICAO Environment Officers, and the SAP Team for final validation. Table 3-5 below provides an overview of mitigation measures. States have requested assistance in implementing and evaluating most of these measures, with particular emphasis on the feasibility of production and/or refining of sustainable aviation fuels (SAF).

Table 3-5 Overview of Mitigation Measures Selected by Participating States

States	Technology Standards	Sustainable Aviation Fuels SAF	Operational improvements	Market-based measures	Airport improvements
Benin	N	Y	Y	Y	Y
Botswana	N	Y	Y	Y	Y
Cabo Verde	N	Y	Y	N	Y
Côte d'Ivoire	Y	Y	Y	Y	Y
Madagascar	Y	Y	Y	Y	Y
Mali	N	Y	Y	Y	Y
Rwanda	Y	Y	Y	Y	Y
Senegal	Y	Y	Y	N	Y
Seychelles	N	Y	Y	N	Y
Zimbabwe	N	Y	Y	Y	Y

(Y=Yes, N=No)

A-3.2 Conduct 3Feasibility Studies on Priority Mitigation Measures in Selected Beneficiary States.

Following the submission of the SAPs, the selection of a shortlist of States for the feasibility studies was conducted. The selection process was based on a transparent and objective review of the participating States in which the team considered a set of core indicators and also considered some additional elements.

The core indicators for the evaluation were:

- The CO₂ savings, as quantified in the States' Action Plans (50%).
- The level of engagement of the State in the Project (50%).
- The security risk level in each State as evaluated by the United Nations Department of Safety and Security,³ as of June 2022. The team estimated that a substantial security risk could be an impediment to the implementation of the feasibility studies in a given State. The UN security risk level assessment at the time of the evaluation is included in Table 3-6 below.

³ [Travel Advisory \(un.org\)](http://www.un.org)

Table 3-6 UN Security Risk Level Assessment in the Participating States

State	Security risk
Benin	Low risk – 2
Botswana	Minimal risk- 1
Cabo Verde	Low risk – 2
Côte d'Ivoire	Moderate risk – 3
Madagascar	Low risk – 2
Mali	Substantial risk – 4
Rwanda	Low risk – 2
Rwanda	Low risk – 2
Senegal	Moderate risk – 3
Seychelles	Minimal risk – 1
Zimbabwe	Low risk – 2

Because of a high security risk level in Mali (4 as evaluated by the United States Department of Safety and Security), the State was unfortunately not considered for the feasibility studies.

After security pre-screening, the additional factors considered were:

- State profiles as defined by the United Nations country group of each State (i.e., Least Developed Country, Small Island Developing States (SIDS)).^{4,5}
- The climate vulnerability risk.⁶
- The information related to the assistance requested by each State and the potential impacts (feasibility studies, airport owned and maintained by the States, additionality, and no competitive distortion).
- Documentation/evidence and/or preliminary work done on the selected mitigation measure as indicated in the State Action Plan, with an ambition of scaling-up.

Table 3-7 below summarizes the final ranking of the States following the review process.

Table 3-7 Selection of States for the Feasibility Studies

Ranking	State
1	Côte d'Ivoire
2	Zimbabwe
3	Cabo Verde
4	Rwanda
5	Senegal
6	Seychelles
7	Benin
8	Madagascar
9	Botswana
N/A	Mali

Based on evaluation of the core criteria factors, Côte d'Ivoire, Zimbabwe and Cabo Verde were ranked as the top three States for the conduct of feasibility studies.

Since 3 feasibility studies were planned to be carried out in the original Project scope, the selection did not allow for any to be carried out in the remaining States. Also, that number did not allow for a regional balance, which would have meant an equal number of States selected in the Eastern and Southern African (ESAF) and the Western and Central African (WACAF) regions. It was therefore suggested that, to the extent possible, consideration be given to additional funding to allow the implementation of feasibility projects in the remaining States.

The selection of the 3 feasibility study States was completed in April. However, due to the privatization of the aviation system in Cabo Verde, that country was not able to participate anymore and was replaced by the next on the list, Rwanda. Following ICAO and the EU's guidelines for recruiting consultants, 3 consultants were selected to conduct the studies in April/May/June 2023.

⁴ <https://sustainabledevelopment.un.org/topics/sids/list>

⁵ https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/ldc_list.pdf

⁶ https://www.climatewatchdata.org/countries/BEN?end_year=2018&start_year=1990

3.4 COMMUNICATION AND VISIBILITY

Annex VI of the Project Contribution Agreement outlines the Communication and Visibility Plan which has an overall objective to assist ICAO in showcasing the main project deliverables, achievements of the project and lessons learned. It also highlights the financial support provided by the EU, which could at some point support the establishment of further partnerships that could allow ICAO to replicate these initiatives and similarly support other groups of States.

The target groups for the Communication and Visibility Plan are in country(ies) where the action is implemented, other States within Africa that may be able to benefit from the feasibility studies on a regional scale (as applicable), the EU (as applicable), and all ICAO Member States.

The specific objectives for each target group, related to the action's objectives, and the phases of the project cycle, are as follows:

- Raise awareness of the population of the beneficiary States, other States in the Region, and in Europe of the roles of ICAO and the EU in delivering aid in a particular context.
- Raise awareness of how ICAO and the EU work together to support environmental initiatives.

The Project Team hired a graphic design company to develop various communication tools, including project brochures, posters, banners, and Zoom backgrounds.

The brochures and posters were printed and shared with the Focal Points of all States in the Project and relevant stakeholders during the 2022 Regional Seminar in Praia, Cabo Verde and at the 2023 Regional Seminar in Harare, Zimbabwe. The Project banners were featured during the Project in-person Seminars, while the Zoom background was used during online meetings for visibility purposes.

Other communication tools chosen included the 10 SAPs and the Project website: https://www.icao.int/environmental-protection/Pages/ICAO_EU_II.aspx

Figure 3.4 shows an excerpt from the Project brochure.

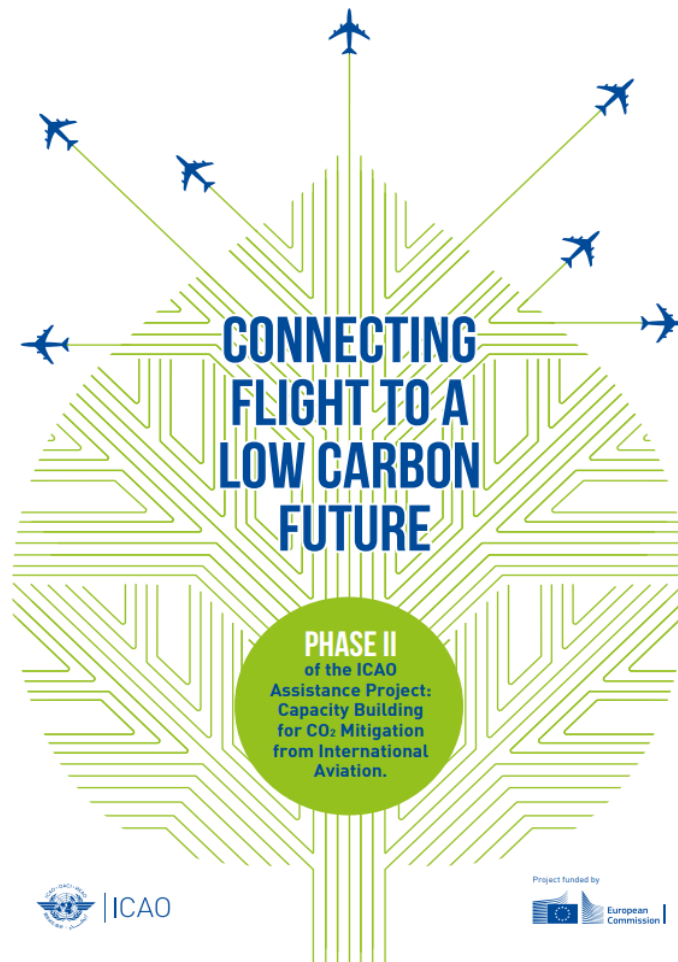


Figure 3-4 Extract from the Project Brochure

3.5 THE UNITAR ONLINE COURSE

The United Nations Institute for Training and Research (UNITAR) training course continues to provide training on SAP to the FPs and all interested learners. The training is free for the SAP FP of the beneficiary States. Funding for the hosting, maintenance, and upgrade of services from UNITAR , with continual improvements of the course modules were planned in the Phase 2 of the project. The objective was also to provide updates on new developments at ICAO on the environment such as CORSIA, LTAG, and others.

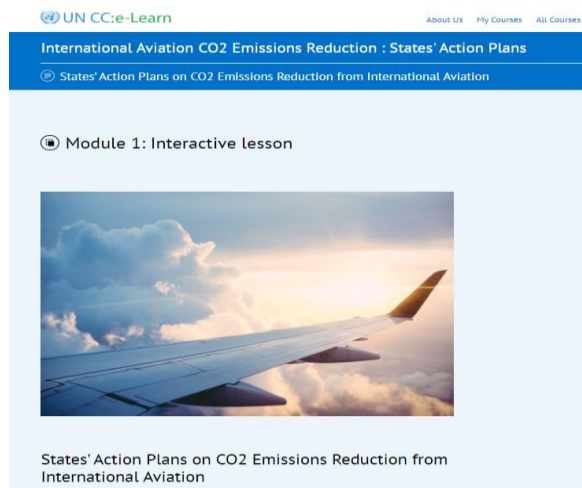


Figure 3-5 UNITAR Training Course

In the frame of the Phase II project, ICAO had planned the update and prolonging the hosting of the UNITAR course (the online training course available to all State Action Plan Focal Points, in order to obtain training on States Action Plan and mitigation measures).

The update of this course, mentioned in the interim report sent to the EU in October 2023 in order to get the last instalment, was subject to the reception of the last financial instalment. While the project ended in October 2023, ICAO received the last instalment in December 2023, and as such the ICAO Purchase Order for UNITAR work could only be signed in 2024, following the closure of the project. Following coordination with the EU, this action is in line with the general conditions of the contract of the project and specifically Article 18.1 (e) on the eligibility of costs, given that the update and maintenance of the UNITAR course was part of the activities foreseen within the project action.

This update, hosting and maintenance of the UNITAR course was part of the activities foreseen within the project action. As mentioned in the interim report in October 2023, this course is crucial for the FPs and this update will provide them with the information on the latest development at ICAO such as CORSIA, the relation with the LTAG, as well as the results of the Conference on Aviation Alternative Fuels, (CAAF/3) that was held in November 2023. The prolongation of the hosting of the course will allow the FPs to continue to access the course for the 4 years to come, which will ensure the continuity of the action.

3.6 PROJECT EVALUATIONS

According to the Contribution Agreement, the evaluations were scheduled and was carried out by the project team, while informing the EC and the Steering Committee of the results:

- Preliminary evaluations (i.e., establishing the baseline of the project, mapping current legislative framework in participating countries, identifying emission baselines where available), to be scheduled when the project starts.
- Mid-project evaluations on the dates associated with activities in each of Specific Objectives.
- Final evaluation.
- Post project evaluation.

The various elements considered during the evaluation process are:

- Was sufficient capacity built in the State(s) to develop action plans and quantify emissions?
- Was the action plan prepared by the State(s) as per ICAO specified guidance?
- Were the measures identified in the action plans suitable for the State(s)?
- Was the feasibility study of each identified measure selected, appropriate for implementation?
- Was the technical implementation and procurement process that was adopted in accordance with the standard methodology required by the EC?

A final project evaluation was conducted after Phase 2 completion - October 31, 2023.

Table 3-8 below, provides the progress of the States with regards to the elements of the evaluations.

Table 3-8 Mid-Project Evaluation of the States

State	No. of Focal Points	Emissions baseline	NAPT Officially Created	Action Plan Training	Knowledge of Doc 9988	UNITAR Course Complete	Was sufficient capacity built in the State(s) to develop action plans and quantify emissions?	Was the action plan prepared by the State(s) as per ICAO guidance?	Were the Measures Identified in the action plans suitable for the State(s)?	Was the Feasibility study of measures appropriate to implement?	Was technical implementation & procurement in accordance with standard EC methodology?
Benin	2	Y	Y	Y	Y	Y	Y	Y	Y		Y
Botswana	2	Y	Y	Y	Y	Y	Y	Y	Y		Y
Cabo Verde	2	Y	Y	Y	Y	Y	Y	Y	Y		Y
Côte d'Ivoire	2	Y	Y	Y	Y	Y	Y	Y	Y	P	Y
Madagascar*	2	Y	Y	Y	Y	P	Y	Y	Y		Y
Mali	2	Y	Y	Y	Y	P	Y	Y	Y		Y
Rwanda	2	Y	Y	Y	Y	Y	Y	Y	Y	P	Y
Senegal	2	Y	Y	Y	Y	P	Y	Y	Y		Y
Seychelles	2	Y	Y	Y	Y	Y	Y	Y	Y		Y
Zimbabwe*	2	Y	Y	Y	Y	P	Y	Y	Y	P	Y

(Y=Yes, P=Pending)

* Training of newly appointed Focal Points is still ongoing in some States.

3.7 DIFFICULTIES AND MEASURES TAKEN

The major challenges encountered during the January – August 2023 period were related to delays caused by the three-year Covid-19 pandemic. The impacts of the pandemic affected work to be conducted on-site through fluctuations to the number of personnel available, and generally, due to the economic impact on the aviation sector globally.

The Project coordinator had to leave the project due to unforeseen circumstances. This impacted the delivery of the project leading into 2023. To ensure the successful delivery of the technical and financial aspects of the project, a new coordinator was recruited in Spring 2023.

Despite these challenges, the Project implemented a set of tools (via online participation in Seminars) and used the online training course developed in the frame of the first project to provide support to the selected States.

3.8 PROJECT MANAGEMENT OVERVIEW

Three party coordination was established when project scope was defined, as follows: internal coordination, coordination with the States, and coordination with the EU.

3.8.1 INTERNAL COORDINATION

Internal coordination at ICAO has been ensured through regular meetings, updates, and feedback to monitor progress of each activity. This was even more important than normal with Covid-19 preventing many in-person interactions, and travel budget restrictions limiting face-to-face interactions. Key coordination tasks were:

- Weekly coordination calls included: ICAO ENV Officers, Regional Officers of project-involved regions (WACAF, ESAF), the Programme Coordinator, the Technical Project Consultant, and the Deputy Director – Environment, when necessary. These meetings kept track of current tasks and evaluated progress to-date according to the project log-frame. Occasionally, these meetings would include designated ICAO staff to discuss specific issues (ICT, Finance, Procurement, etc.).
- Weekly updates were conducted between the Programme Coordinator and the Technical Project Consultant. Since the Technical Project Consultant worked on site with the States, these meetings delved into the details of the progress in each State and identified any potential roadblocks. These meetings also sought to evaluate the Covid-19 risk level in States and planned the on-site missions accordingly.
- Updates were provided to ICAO's Deputy Director - Environment by the Programme Coordinator as needed. Those meetings covered: project progress reviews, sought approvals of official documents, and provided briefings to the DDE on any implementation challenges.
- Monthly reports were prepared to summarize the monthly progress of the implementation.

3.8.2 COORDINATION WITH THE STATES

Regular communication with States was ensured to monitor progress, through the following channels:

- Regular contact with the Technical Project Consultant and the ICAO Regional Officers.
- Official ICAO Correspondence.
- Liaison via ICAO Regional Offices.
- Communications with the Focal Points through online tools (Zoom, WhatsApp, etc.).

3.8.3 COORDINATION WITH THE EU

Coordination activities with the EU during this reporting period included:

- Official correspondence (including invitations to Regional Seminars and Steering Committee meetings, reports).

- Calls between the Project team and the EU’s Programme Manager.
- Invitations to the EU Representation to attend ICAO project events such as the in-person Seminar in Zimbabwe, Third Seminar – Virtual.

3.8.4 ACTIVITIES FOR THE NEXT REPORTING PERIOD

Project activities for the remaining period of 2023 consist primarily of the monitoring of the implementation of the mitigation measures, the feasibility studies, and the upgrade of the UNITAR.

Table 3-9 below provides the schedule for the on-site missions that were conducted in 2022. On-site missions outside of the feasibility study consultations will be provided in the Project Final Report – October 2023.

Table 3-9 AES training Conducted - 2022

Mission Plan Rollout in Africa (Proposal) - 2022																	
Timeline	September				October				November				December				
	Wk1	Wk2	Wk3	Wk4	Wk5	Wk6	Wk7	Wk8	Wk9	Wk10	Wk11	Wk12	Wk13	Wk14	Wk15	Wk16	Wk17
	5.-9.	12.-16.	19.-23.	26.-30.	3.-7.	10.-14.	17.-21.	24.-28.	31.-4.	7.-11.	14.-18.	21.-25.	28.-2.	5.-9.	12.-16.	19.-23.	26.-30.
Benin																	
Botswana																	
Cabo Verde																	
Cote d'Ivoire																	
Madagascar																	
Mali																	
Rwanda																	
Senegal																	
Seychelles																	
Zimbabwe																	

Day1	V	Verification of AES comptability and data collected from stakeholders
Day 2	I	Initial setup of the database with country specific information, existing data (Baseline), etc
Day 3 & 4	T	AES Training given to Focal Points
Day 5	M	Meeting Action Plan Team + Wrap-up + Next Steps

4. OBJECTIVE 1: CAPACITY BUILDING FOR THE DEVELOPMENT OF STATE ACTION PLANS ON EMISSIONS REDUCTION

4.1 STATE ACTION PLANS ON EMISSIONS REDUCTION

A central element of Resolution A41-21 is for States to prepare and submit action plans to ICAO. It also laid out an ambitious work programme for capacity building and assistance to States in the development and implementation of their action plans to reduce emissions. States were initially invited to submit their action plans by the 37th Session of the ICAO Assembly in October 2010.

The State Action Plans on Emissions Reduction are a strategic tool for States to plan their activities designed to address CO₂ emissions from international aviation. States submit their action plans to ICAO on a voluntary basis. The level of detail of the information required for an action plan will ultimately enable ICAO to compile global progress towards meeting the aspirational goals on environment set by ICAO Member States.

States are encouraged to submit a State Action Plan that complies with the provisions established in ICAO Document 9988 *Guidance on the Development of States' Action Plans on CO₂ Emissions Reduction Activities*. States are also encouraged to submit their action plan using the APER website - an online platform on the ICAO secure portal that is dedicated to action plans.

In accordance with Resolution A41-21, action plans should incorporate information on activities that aim to address CO₂ emissions from international aviation. These should include national initiatives, as well as activities implemented regionally, or on a global scale, as the result of bilateral and regional/multilateral agreements.

Every action plan submitted to ICAO should contain, at a minimum, the following information:

1. **Contact information.** Identification of the Focal Point and any other person(s) responsible for the compilation and submission of the action plan.
2. **Baseline** fuel consumption (without action) - CO₂ emissions and traffic (2010 or earlier to 2050) from international aviation.
3. **Measures to mitigate CO₂ emissions.** The measures being proposed to address CO₂ emissions from international aviation, distinguishing between those that are already in place and those that are being considered for future implementation.
4. **Expected results** (fuel consumption, CO₂ emissions and traffic) after implementation of the above-mentioned measures.
5. **Assistance needs.** Description of any specific needs (for example, financial, technological, or capacity building) for the implementation of future actions.

To facilitate the development of their action plan and ensure its inclusiveness, each States is encouraged to establish a National Action Plan Team (NAPT). The team should be comprised of representatives of the main stakeholders of the national aviation sector, such as relevant governmental institutions, airlines, airport operators, Air Navigation Service Providers, fuel suppliers, etc.

By 2022, the ten beneficiary States of the ICAO-EU Phase 2 project, developed and submitted their State Action Plans to ICAO. As described below, the project supported the States by assisting the Civil Aviation Authorities on the establishment of their NAPT. These support activities included: organizing capacity-building seminars with all the Focal Points of the beneficiary States and providing tailored support to each State through periodic

on-site missions conducted by the Technical Project Consultant. All the action plans submitted by the selected States under the project are publicly available at ICAO's website.⁷

4.1.1 NATIONAL ACTION PLAN TEAMS

All ten (10) selected States created a National Action Plan Team that was dedicated to the development of the action plan. These teams were established by the Civil Aviation Authorities through official directive and were recognized as an important coordination mechanism. Their role was crucial because they enabled inclusive stakeholder consultations and fostered the creation of important partnerships for the implementation and sustainability of the action plans in the long term.

In most States, the NAPT enabled the creation of new synergies between the aviation sector and the national institutions for climate change mitigation that already existed in the State. For instance, since the creation of the NAPT, the Civil Aviation Authorities of the beneficiary States started to be recognized as important players in developing the national climate change strategy, and many have been invited to join the national delegation to the Conference of the Parties (COP) of the UNFCCC. Also, several States began to include, for the first time, the data on CO₂ emissions from the aviation sector in their national inventories.

Furthermore, the involvement of representatives from other areas of the government in the NAPT has resulted in the identification of funding opportunities from the national government for the implementation of environmental initiatives such as the mitigation measures included in the action plans.

Table 4-1 describes the regulations that officially created NAPTs in the selected States.

Table 4-1 National Action Plan Team Creation

State	Official decision	Authority	Date of signature
Benin	Decision No 006/ANAC/MIT/DSV-DAF/SARH/SA	Directeur General de l'Aviation Civile	29 January 2021
Botswana	Decision No1/CAAB 13/1/22 I of 2021	Acting Chief Executive Officer Civil Aviation Authority of Botswana	5 February 2021
Cabo Verde	Resolucao No 72/2021, Boletim Oficial I Serie, Numero 69, 14 Julho de 2021	Conselho de Ministros	14 July 2021
Côte d'Ivoire	Decision No 005394/ANAC/DSV/DTA	Directeur General de l'Autorité Nationale de l'Aviation Civile	25 September 2018
Madagascar	Decision No 066 DGE/ENV	Directeur General de l'Aviation Civile	9 March 2021
Mali	Lettre circulaire No 2021-00010/ANAC/DG/CQS	Directeur General de l'Agence Nationale de l'Aviation Civile	22 January 2021
Rwanda	Ministerial Instructions N° 02/Min/022 Of 04/11/2022	The Minister of Infrastructure	4 November 2022
Senegal	Decision No 00668/ANACIM/DG	Directeur General de l'Agence Nationale de l'Aviation Civile et de la Météorologie	19 March 2021
Seychelles	Decision number to be provided ⁸	Board of Directors of the Authority for SCAA	
Zimbabwe	Decision No 1/CAAZ/SAP CO ₂ /18/02/2021	Acting Director-General Civil Aviation Authority	18 February 2021

⁷ https://www.icao.int/environmental-protection/Pages/ClimateChange_ActionPlan.aspx

⁸ For the NAPT, it was the decision of the Board of Directors for the Seychelles Civil Aviation Authority (SCAA) to proceed with the development of the SAP, which includes, as part of the development, putting in place a NAPT. There was not really a separate decision that was made to certify the formation of the NAPT; the initial Board decision was effectively the green light for SCAA to develop a SAP which meets ICAO's requirements.

4.1.2 REGIONAL SEMINARS

The purpose of these seminars was threefold: provide guidance on the selection of the mitigation measures, calculate environmental benefits, and prioritize the finalization of the Action Plans.

The Global Covid-19 pandemic was identified as the major challenge during the first and second years of the implementation of the Phase 2 project. Despite its impacts, substantial progress was made, and the following activities were successfully achieved:

- With the 10 beneficiary States:
 - Creation of the National Action Plan Teams (NAPT) for each State.
 - Regular capacity-building through training for all States on State Action Plan development, in accordance with the steps in ICAO Doc 9988: *Guidance on the Development of States' Action Plans on CO₂ Emissions Reduction Activities*.
 - UNITAR online Training provided to the Focal Points.
 - In-person on-site mission to Cabo Verde conducted.
 - High-level meeting between Deputy Director ENV and Cabo Verde Civil Aviation Authority (CAA) to secure buy-in from national stakeholders.
 - Submission of the 10 SAPs to ICAO. Installation of the AES.
- Training workshops and meetings for the 10 beneficiary States:
 - The kick-off Seminar (4 December 2020).
 - The Regional Seminar on the SAPs (14 & 15 September 2021).
 - High-level Briefing on Sustainable Aviation Fuels (SAF) with attendance of all Directors General (DGs) or Representatives of the participating States (28 January 2022).
 - The Innovation Seminar (19 & 20 April 2022).
- Steering Committee meetings:
 - First Steering Committee meeting (19 February 2021).
 - Second Steering Committee meeting (22 September 2021).
 - Third Steering Committee meeting (28 February 2022).
 - Fourth Steering Committee meeting (16 September 2022).
 - Fifth Steering Committee meeting (20 September 2023).
- Communication and visibility:
 - Development of Project brochures, posters, Zoom background and banners.
 - Printing and distribution of visibility materials to relevant stakeholders.
 - Project website.
- Coordination and contractual obligations with the EU:
 - Submission of the inception Report (January 2021).
 - Approval of Amendment No.1 to the Contribution Agreement (June 2021).
 - Coordination meeting for replacement of Comoros with Seychelles (August 2021).
 - Submission of the interim Report to the EU (September 2021).
 - Submission of the Annual Report (February 2022).
 - Amendment No.2 (awaiting the EU's approval).

Despite all these achievements, the implementation was affected by several challenges:

- Covid-19 prevented most in-person missions.
- The changes in Focal Points by some of the States.
- The need for online tools and adjustments to mitigate the impacts of Covid.

However, as the impacts of the global Covid-19 pandemic lessened, and international travel was safe again, in-person meetings and seminars resumed where possible. In some cases, due to economic impacts on the aviation industry, hybrid events involving both in-person and virtual platforms allowed for maximum participation.

The following activities began the process of resuming in-person, face-to-face meetings again, and provided an opportunity to give guidance on the selection of the mitigation measures:

- The in-person Regional Seminar in Praia, Cabo Verde (28 & 29 July 2022).
- The Zimbabwe Regional Seminar held in Harare, Zimbabwe, 3-5 April 2023, brought together the Focal Points and other representatives of the 10 participating ICAO States. The States presented their updates on the implementation of their State Action Plans. Discussion and guidance took place on topics such as: Sustainable Aviation Fuels (SAF) and the ACT-SAF program, the goals and objectives of the Feasibility Studies on SAF under the project framework, SAF technology and certification, SAF sustainability and reporting under CORSIA, SAF implementation in Africa, and the government role/support and transition to SAF at the airports. The Seminar was held in-person.
- The Third Seminar was held 25-27 July 2023, and conducted in a virtual format. It provided another opportunity for the 10 ICAO participating States to update each other, but also to update the group on the three (3) feasibility studies conducted by: Zimbabwe, Rwanda, and Cote d'Ivoire. Important stakeholders presented their initiatives, including: International Air Transport Association (IATA), Roundtable on Sustainable Biomaterials, World Wildlife Federation – South Africa, Kenya Airways, and the Agency for Aerial Navigation Safety in Africa and Madagascar (ASECNA). The focus of these sessions was on planning, implementation, operational, and technical measures.
- A Fourth and final Seminar was held at ICAO Headquarters in Montreal, Canada, 24-26, October 2023. This Seminar included presentations of the final results and achievements of the Phase 2 Project, the findings of the three feasibility studies: Zimbabwe, Rwanda, Cote d'Ivoire, a tour of the sustainable aviation fuels facility (SAF+) at Trudeau International Airport in Montreal (Dorval), and an overview of the implementation of SAF.

4.1.3 ON-SITE CAPACITY BUILDING

In addition to the capacity-building seminars, the selected States received on-site support through regular on-site missions by the Technical Project Consultant. These missions provided added value in addition to the regional seminars, as they allowed us to train a wider audience of national stakeholders and to address local challenges more efficiently. The missions also supported the Focal Points in raising awareness on the project with the members of their National Action Plan Teams as well as to leverage political support from the senior management.

The on-site missions also allowed ICAO to overcome challenges related to poor internet connectivity in some of the selected States, where remote support had significant technical hurdles. Through these regular on-site missions, the project team was able to ensure progress on the project activities in the selected States and to address any challenges at an early stage.

Table 4-2 indicates the number of missions that took place in the 2020-2023 time-period in each selected State (excluding the second, third and fourth capacity building seminars).

To provide customized assistance on the development of the SAPs, several national workshops led by the ICAO Project Team were held, and participants included relevant stakeholders, aviation authorities, and the State Focal Points.

These technical training sessions consisted of:

- Development of a national work plan with specific deadlines.
- Collection of aviation data.
- Calculation and validation of the baseline.
- Identification and selection of mitigation measures.

A key point is that the communication and training in the States were conducted in the national languages or in ICAO’s language of correspondence with the States. French was used for Benin, Cote d’Ivoire, Mali, Madagascar, and Senegal. English was used with Botswana, Cabo Verde, Rwanda, Seychelles, and Zimbabwe. These national workshops brought together many Stakeholders to work collectively and join synergies to develop their National Action Plans. Table 4-2 provides a summary of the first national meetings per State⁹ conducted with the guidance and online support of the ICAO Technical Consultant. Several other NAPT meetings were held in each State.

Table 4-2 National Action Plan Team Meetings With Online Participation of ICAO Technical Consultant During Development of SAP in 2021.

State	NAPT1	NAPT2	NAPT3	NAPT4	NAPT5
Benin	February 23, 2021	April 4, 2021	May 27, 2021	June 28, 2021	August 16, 2021
Botswana	March 12, 2021	April 16, 2021	May 20, 2021	June 26, 2021	August 30, 2021
Cabo Verde	August 3, 2021	August 18, 2021	September 10, 2021	December 2021	December 2021
Côte d’Ivoire	January 21, 2021	February 4, 2021	March 3, 2021	May 5, 2021	June 18, 2021
Madagascar	March 31, 2021	April 23, 2021	June 3, 2021	July 14, 2021	December 2021
Mali	March 5, 2021	April 6, 2021	May 4, 2021	May 26, 2021	June 29, 2021
Rwanda	March 31, 2021	April 27, 2021	June 7, 2021	December 2021	December 2021
Senegal	March 11, 2021	April 15, 2021	May 13, 2021	June 10, 2021	July 19, 2021
Seychelles	25 October 2021	19 November 2021	15 December 2021	27 January 2022	24 February 2022
Zimbabwe	March 26, 2021	May 27, 2021	June 24, 2021	July 30, 2021	August 24, 2021

4.1.4 E-LEARNING COURSE ON STATES ACTION PLANS TO REDUCE CO₂ EMISSIONS.



To provide further support and training to the Focal Points and stakeholders of the beneficiary States, the project developed an online e-learning course on State Action Plans to reduce CO₂ emissions from aviation. This e-learning course is a self-paced tutorial for training on the preparation and implementation of Action Plans on Emissions Reduction in accordance with ICAO’s guidance documents and best practices. It was launched on 30 November 2017 in a ceremony attended by ICAO and the European Union.

The course was developed in cooperation with the United Nations Institute for Training and Research (UNITAR), as a state-of-the-art learning experience divided into five modules which provide step-by-step direction for the development, update, and implementation of an action plan. (see Figure 4-1). Each module contains an interactive presentation, an e-book that can be downloaded and studied offline. Animated videos are one of the techniques that has been used to increase the audience’s engagement and retention during an e-learning course. Upon completion of the five modules and satisfactory approval of an assessment, the enrolled participant is granted a Certificate of Completion.

⁹ Before each meeting, some preparatory training sessions with the Focal Points or other one-on-one meetings were held. These sessions are not captured in the summary table.

The introductory module, which provides a general overview of the action plan development process, is publicly available at no cost. The introductory module also serves as an advocacy and outreach tool to mobilize the support of key decision-makers at the national level by raising awareness of the importance of environmental protection in aviation.

The remaining four modules of the course are available free-of-charge to all the Focal Points appointed by the States and registered at the Action Plans for Emissions Reduction (APER) portal, which includes the Focal Points of the selected States of the project. In addition, the course includes success stories, best practices, and lessons learned, all drawn from project implementation in the selected States. This facilitates knowledge-sharing, not only within the States under the project, but also amongst all ICAO Member States that can access this course and may benefit as well from these experiences.



Figure 4-1 E-Learning Course for State Action Plans – Training Modules

The course served to reinforce the expertise acquired by the Focal Points through the capacity-building activities and ensured the transfer of knowledge to any newly recruited staff at the Civil Aviation Authorities.

The e-learning course is hosted at the United Nations Climate Change Learning Platform (UN CC: Learn), which is the most recognized UN platform for knowledge-sharing in the climate change field. This was made possible through the project establishing a partnership for the development of the course with UNITAR, which acts as the Secretariat of the UN CC: Learn.

By the end of the project, the Focal Points of the beneficiary States completed the course and received their Certificate of Completion.

4.1.5 ONLINE PROJECT PLATFORM

An online project platform was created within the ICAO secure portal in December 2014. This platform has restricted access to only the official Focal Points appointed by the beneficiary States as well as project team members. This Sharepoint website was used as a document repository and knowledge management platform throughout the implementation of the project. It included in particular:

- Summary of the main objectives of the project.
- All training materials and presentations used during the regional capacity building seminars.
- Specific Country Fiches with detailed information on each beneficiary State and progress on the implementation of the project outcomes.
- List of Focal Points and their contact information.
- Communication material produced to outreach on the project (e.g., project brochures).
- Instructions to register on the e-learning course on State Action Plans and mitigation measures - developed under the project.
- Access to the online version of the AES user manual.

4.1.6 ASSESSMENT OF THE QUALITY OF ACTION PLANS

Table 4-3 below presents an overview of the action plans submitted by the selected States and their expected results.

Table 4-3 State Action Plans Submitted and Expected Results

	States	Submission date	Version	Definition for international flights	Expected results (tCO2 emissions reduction from international aviation) between 2023-2050
1	Benin	Jan-22	V1	IPCC	78,212
2	Botswana	Jan-22	V1	ICAO	77,781
3	Cabo Verde	Jun-22	V1	IPCC	215,746
4	Cote d'Ivoire	Jan-22	V1	ICAO	322,027
5	Madagascar	Jun-22	V1	ICAO	136,774
6	Mali	Jan-22	V1	IPCC	243,763
7	Rwanda	Jun-22	V1	ICAO	258,474
8	Senegal	Apr-22	V1	ICAO	136,774
9	Seychelles	Jun-22	V1	ICAO	216,528
10	Zimbabwe	Jan-22	V1	ICAO	146,792
TOTAL					1,832,871

A set of criteria, detailed in the following Table 4-4, was developed to assess the compliance of the submitted action plan with the recommendations detailed in ICAO Doc 9988.

Table 4-4 State Action Plan Compliance and Evaluation Criteria

ID	CRITERIA	DESCRIPTION
OVERALL ASSESSMENT		
C1	Structure of the AP	The structure of the AP is clear and includes all 5 steps recommended by ICAO in their logical order.
C2	Submission on the APER website	The 5 steps are completed on the APER website, and the results match with the paper version of the AP (if any).
STEP 1: CONTACTS - NATIONAL ACTION PLAN TEAM		
C3	Focal points contact information	The contact information of the Focal Points has been provided on the APER website.
C4	Creation of the NAPPT	The NAPPT has been created.
STEP 2: BASELINE		
C5	Definition for international flights	The choice of definition (ICAO or IPCC) for international flights is clearly stated and the choice justified.
C6	Horizon chosen	The horizon for the baseline encompasses at least 20 years (i.e., 2035 or beyond)
C7	Metrics used	The baseline is calculated in terms of net CO ₂ emissions and/or fuel efficiency, and the metrics chosen, clearly stated.
C8	Completeness of the collected data	The data collected for the selected years is complete (international flights according to the chosen definition).
C9	Accuracy of the collected data	Estimates and assumptions (if any) are clearly stated, justified, and appear appropriate.
C10	Tabular and graphical representation	Results of the baseline are provided both in tabular and graphical form. Any anomaly is commented in the Action Plan.
STEP 3: SELECTED MITIGATION MEASURES		

C11	Complete documentation	Each measure is clearly documented, and the different required fields documented whenever relevant (description, start & end dates, objectives, expected results, costs, assistance needs, stakeholders).
C12	Assistance needs	Assistance needs are well characterized and detailed, and potential providers of this assistance identified. Efforts to capitalize on existing resources (if any) and reduce external dependence are evident.
STEP 4: EXPECTED RESULTS		
C13	Identification	A clear distinction is made between international CO ₂ emissions (expected results) and domestic emissions (co-benefits).
C14	Quantification methodology	The quantification methodology (EBT, IFSET, other) is detailed and applied correctly. Both expected results and co-benefits are quantified.
C15	Horizon chosen	The horizon for expected results and co-benefits correspond to the horizon chosen for the baseline.
C16	Metrics used	The metrics for expected results and co-benefits correspond to the metrics chosen for the baseline.
C17	Tabular and graphical representation	The expected results and co-benefits are provided both in tabular and graphical formats. In addition, a graph illustrates the results compared to the baseline scenario. Any anomaly is commented in the Action Plan.

ICAO reviewed every action plan according to the above criteria. Both assessments revealed that all the ten (10) action plans met the minimum requirements, and included the different sections recommended in ICAO Doc 9988. They showed a balanced selection of mitigation measures and had their baseline, mitigation measures, and expected results fully quantified, including co-benefits. The quantification of environmental benefits is typically quite challenging for States preparing their action plan, and the achievements of the selected States in this regard is particularly remarkable. States who had already submitted an action plan before the start of the project had not included a robust quantification and, therefore, were able to significantly improve their action plans during the project and submit an updated version to ICAO. The action plans of the selected States have now become examples for other States, in particular, States with limited capacity which aim to develop a complete and robust action plan.

4.1.7 OVERVIEW OF SELECTED MEASURES

In their action plans, the 10 States of the project selected a total of 182 mitigation measures within the ICAO's basket of measures and supplemental benefits for the domestic sector:

1. **Technology and Standards:** 9 measures
2. **Sustainable aviation fuels:** 11 measures
3. **Operational improvements:** 92 measures
4. **Market based measures:** 10 measures
5. **Airport improvements:** 60 measures

The highest number of mitigation measures were selected in Category 3 (operational improvements), followed by supplemental benefits for domestic sector (Airport improvements), and Category 2 (sustainable aviation fuels). The figure below illustrates the distribution of mitigation measures per category.

The 182 Mitigation Measures are distributed in:

- Cat 1: Technology and standards
- Cat 2: Sustainable aviation fuels
- Cat 3: Operational improvements
- Cat 4: Market based measures
- Cat 5: Airport improvements

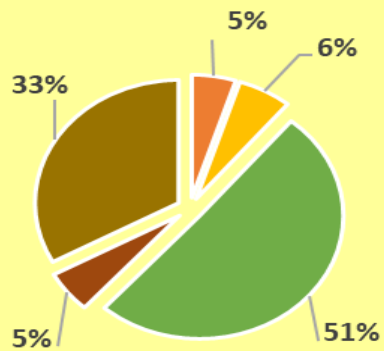


Figure 4-2 Distribution of mitigation measures implemented by category.

Of these 182 mitigation measures, 100 (55%) could be quantified in terms of CO₂ emissions reduced (international emissions and/or co-benefits), and 80 (44%) were quantified in terms of cost.

5. OBJECTIVE 2: ESTABLISHMENT OF AVIATION ENVIRONMENTAL SYSTEMS

5.1 THE AVIATION ENVIRONMENTAL SYSTEM (AES)

The Aviation Environmental System (AES) is a tool that was developed as part of the ICAO Project funded by the EU, Phase 1. It provides Civil Aviation Authorities in participating States with a user-friendly tool to monitor CO₂ emissions from aviation sector at the national level. The system facilitates the preparation of robust emissions inventories and provides periodic reporting to ICAO of CO₂ emissions produced by international aviation activities.

During 2022, the AES was successfully installed in all the ten States of the project, with the support of the ICAO ICT. This was done remotely because travel was limited due to the Covid-19 pandemic. Later, training was carried out through on-site missions and complemented by several capacity-building activities.

The AES is a Windows .NET application, with an embedded SQL database. Considering the limited internet connectivity in many of the project States, it was decided at an early stage to develop the AES in such a way that all its functionalities (apart from the reporting to ICAO) could be used offline, without any dependency on an internet connection.

As illustrated on its main menu the AES has six (6) main functionalities:



Figure 5-1 AES Functions

The following paragraphs briefly summarize each of the six (6) main functions of the AES system.

Import Data

The State can first import into the AES the baseline data and expected results that were calculated during the preparation of the action plan. For example, gather input from the ICAO Environmental Benefits Tool (EBT). This is typically done once, after the first submission of the action plan, and then each time the action plan is updated.

States can import, monthly, flight-by-flight data submitted by the airlines and other stakeholders using a dedicated Excel format called Form ENV1, or through XML.

Export Data

The exporting functionalities of the AES allow the user to export data from the database to tabular and Excel formats such as baseline and expected results, monitored data, and graphical trends on the main indicators

for international aviation. This function can also be used to export monthly and annual CO₂ reports that can then be submitted to ICAO, to stakeholders, or used internally at the Civil Aviation Authority.

Monthly reports are useful to monitor emission levels throughout the year, and to detect problems such as data gaps in an early stage. Annual reports, on the other hand, constitute the traditional level of aggregation for emission levels and are useful, for instance, to compare emission levels to what were expected in the action plan for a given year.

Following a request from the States, the ability to generate airline-specific monthly and annual CO₂ reports was added. This function gives some customized feedback to the airlines who submit their data through Form ENV1. These reports include airline-level indicators such as least fuel-efficient and most fuel-efficient routes. That information can help the airlines define mitigation measures that may be needed to reduce CO₂ emissions from their international operations.

In addition, the AES also supports exporting ICAO Form M¹⁰, automatically filled-in with data from the database. This form is to be used by ICAO Member States to report fuel consumption and traffic statistics by aircraft type for each of their commercial air carriers that operates scheduled and/or non-scheduled flights. This form should be completed on an annual basis and filed with ICAO within two months of the end of the reporting period to which it refers.

Manage Data Providers

Importing and exporting processes constitute the core functionalities of the AES. In addition, the AES allows the user to manage the data providers by defining their data scope. Data providers are the stakeholders who submit flight data, such as airlines. The data scope corresponds to the fields filled-in by a data provider in the Form ENV1 and is especially important if the data provider only submits partially filled forms. For instance, it can happen that a data provider submits information on passengers and freight for a flight but nothing on fuel consumption. The partial information can still be useful for the AES to cross-check the information on passengers and freight submitted by the airline on these flights, provided that both sources of information are independent.

Manage Database

The AES also has the functionality to manage the database, and in particular, to review invalid and inconsistent flights that the system detects during the data importing process. An invalid flight is a flight with incorrect information. For instance, incorrect data such as a negative number of passengers, or a flight with different departure and destination points but zero fuel consumption. An inconsistent flight is one with some information that is different from the same flight route already registered in the database. Such mismatched data is typically submitted by a different source. An example of this would be, a different number of passengers indicated by two sources for the same flight.

A new functionality was added recently to the AES, that allows States to synchronize the data included in the monthly reports directly with ICAO server, which is then showcased in a data visualization platform described in section 5.1.3 below.

Browse Database

This function of the AES allows the user to browse the tables of the database and edit them manually if necessary.

Help button / Help Function

The AES user can get assistance by contacting ICAO through email or by checking the user manual, which is kept fully up to date to reflect the latest version of the system. An online version of the manual is available on the ICAO-EU project online platform, which is accessible to all Focal Points.

¹⁰ <https://www.icao.int/sustainability/pages/eap-sta-excel.aspx>

5.1.1 TRAINING ON THE AES

Focal Points were trained how to use the AES during regional capacity-building seminars, and through on-site missions conducted by the project team. Remote assistance was also available throughout the project for those Focal Points that needed specific support in the use of the AES.

5.1.2 DATA COLLECTION FOR THE AES

The main challenge faced by the Focal Points in the use of the AES was to gather adequate data from the airlines, that could be imported into the AES database. Many national airlines in the selected States did not have a systematic flight data recording and storage system, which made it very challenging for them to report the data to the State through Form ENV1.

Several measures were adopted to address this challenge:

- States were encouraged to raise awareness among their national airlines, especially at the top management level where decisions could be taken to strengthen technical resources assigned to the collection and reporting of flight data.
- Some States adopted a regulation (e.g., Aeronautical Information Circular) to request airlines to periodically report the data required by Form ENV1.
- Three (3) software interfaces were developed by the project team for airlines with significant traffic who already had a data management system, to facilitate the conversion of their internal format into Form ENV1. The figure below illustrates the Graphical User Interface of the interface for Caribbean Airlines.



Figure 5-2 Sample User Interface Between AES and Airline Data System

5.1.3 DATA VISUALIZATION PLATFORM

In 2018, the project developed a data visualization platform on the ICAO system to centralize data submitted from the States through the AES. Reserved to ICAO staff/users, this platform is useful for the monitoring of the data submission process, for reporting of consolidated data to monitor the global emissions reduction from aviation through the action plans. It is also used to report to ICAO Council on progress towards the aspirational goals.

This platform is linked to the new “Synchronize” button in the AES, that allows States to upload data directly to the ICAO server. The screenshots on Figure 5-3 below illustrate some of the functionalities of the AES data visualization platform.

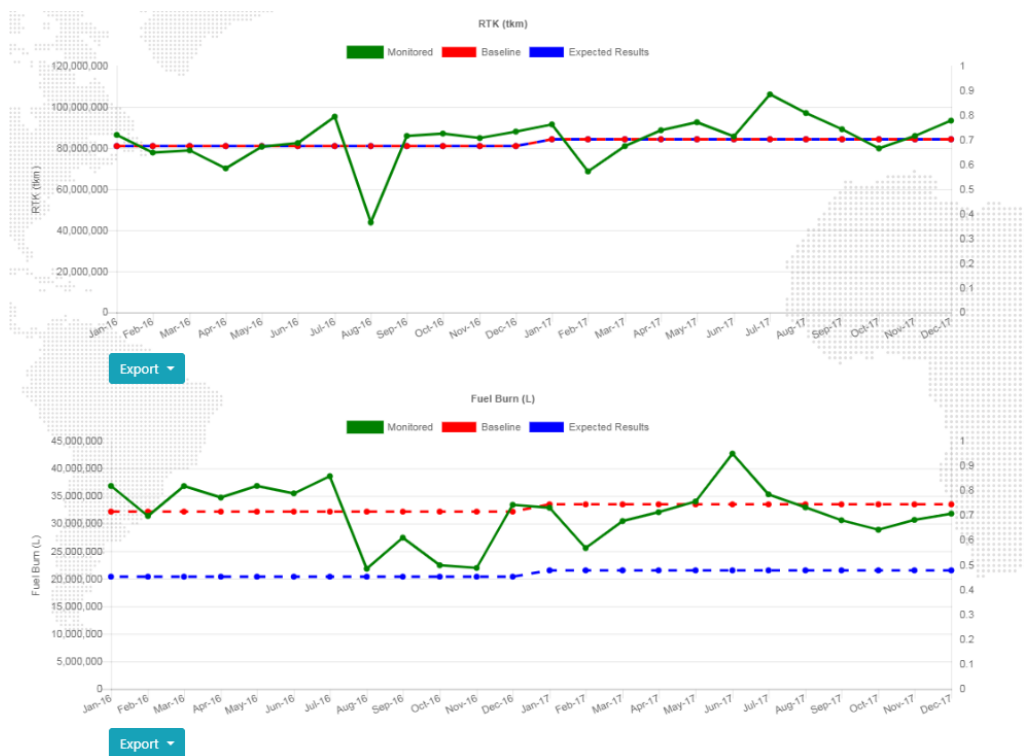


Figure 5-3 AES Data Visualization Platform – Sample Screen Shots

5.2 SUBMISSION OF MONTHLY CO₂ REPORTS

In order to report the main indicators for CO₂ emissions from international aviation to ICAO on a regular basis, participating States were requested to use AES to generate and submit a monthly CO₂ report.

The Figure 5-4 below describes the monthly CO₂ reports received by ICAO by the selected States over the period January to September 2023. Over this period, a total of 53 monthly CO₂ reports were received, which represents 59% of the possible submissions.

	2023												Total report per State	Percentage data gap over 9 months	
	1	2	3	4	5	6	7	8	9	10	11	12			
Benin														2	88%
Botswana														6	33%
Cabo Verde														9	0%
Cote d'Ivoire														3	66%
Madagascar														9	0%
Mali														2	88%
Rwanda														2	88%
Senegal														9	0%
Seychelles														9	0%
Zimbabwe														2	88%
Total													53		

Legend:
 Report submitted
 Report expected

Figure 5-4 CO₂ Reports Submitted by Participating States

As can be seen in Figure 5-4, six (6) States (Benin, Botswana, Cote d'Ivoire, Mali, Rwanda, and Zimbabwe) did not submit all their reports in 2023, with all the missing reports occurring at the end of the year. The focal points will continue to collect traffic and fuel consumption data for the coming months and years in order to generate CO₂ emissions reports for their respective states for submission to ICAO. Cote d'Ivoire and Rwanda met significant challenges in the collection of freight data from their national airlines despite significant efforts made by the project team. In the cases of Benin and Mali, their national airlines did not operate any international flights so they should report the CO₂ emissions from the international flights operated by foreign airlines departing from all airports located in the State.

5.3 AES TRANSITION PLAN

By the end of the project, a transition plan was developed that documented the requirements for the continuous operation of the AES by the States and the ongoing role of ICAO Headquarters after the project's completion.

It was agreed that ICAO ICT would continue operating the AES data visualization database, website, and server, to ensure its operational availability and security. ICAO ICT will also safeguard the AES source code.

On the other hand, the AES workstations in the States will fall under the responsibility of each State. Maintenance, back-ups (system and data), security, and training will be managed by the IT services of the State Civil Aviation Authorities. The only support available from ICAO after project completion will be the provision of the AES application package if a State requires it (e.g., for a replacement installation). States were notified by the end of the project of their responsibilities as specified in the transition plan.

An ICAO Office of Environment staff Focal Point was also nominated to be responsible for receiving emails sent to the project team after the end of the project and to respond to State questions about the use of the AES. (icao-eu-project@icao.int)

5.4 AES AND CORSIA

The adoption of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) at the 39th Session of the ICAO Assembly established new Monitoring, Reporting and Verification (MRV) requirements for States, starting from January 2019.

While the AES already includes the “embryo” of an MRV system, it was not designed for CORSIA. Many States asked about the possibility of using the AES for their reporting requirements for CORSIA. However, this is not possible with the AES because it was developed before the agreement on the CORSIA SARPs and related guidance and therefore does not meet the CORSIA requirements. Nevertheless, the environmental data collected through the AES can be used to complement and cross-check the information required for CORSIA monitoring and reporting.

During the annual project Steering Committee in 2018, many States also asked about the possibility of using the AES for their Monitoring, Reporting and Verification (MRV) requirements as part of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). The ICAO-EU project team then agreed to explore the possibility to enhance the AES to make it CORSIA-compatible, leading to the development of an “AES 2.0”. Accordingly, as part of the ICAO-EU project Phase 2, funds were available to both maintain the original AES and to explore the development of an AES 2.0. The AES 2.0 development is at a preliminary level and would only be completed and implemented with further funding under a potential third phase of the ICAO project with funding from the EU.

5.5 AVIATION ENVIRONMENTAL SYSTEM 2.0 (AES 2.0)

5.5.1 PURPOSE

It is important to note that the AES 2.0 was not developed to replace the CORSIA Central Registry (CCR) process that is used by States to submit to ICAO their international aviation CO₂ emissions. Indeed, in the context of CORSIA, all States need to send their emissions reporting to ICAO via the CCR platform. This process is mandatory and will not be replaced by using the AES 2.0.

In this context, the AES 2.0 is aimed to be a comprehensive tool that will serve two purposes:

1. Overall monitoring of CO₂ emissions from international aviation at the Civil Aviation Authority level for the purpose of monitoring the expected results from the implementation of the SARPs.
2. Undertaking of the tasks required of States for the implementation of the CORSIA, in alignment with the data flows and requirements set by the CORSIA-related SARPs and guidance.

In more detail, the AES 2.0 was developed to:

- Create national emissions registries easily and affordably, with an emissions import tool for Monitoring, Reporting and Verification (MRV), using data export functions compliant with the CORSIA CCR format, and in-line with ICAO and State objectives.
- Organize reports received from Aeroplane Operators (AOs) and Verification Bodies (VBs) for MRV and CORSIA actions; in addition to State Action Plans (SAP) monitoring.
- Assist States with managing CORSIA information collection and reporting to comply with regulations and deadlines related to CORSIA or State Action Plans (SAPs).
- Assist States on communicating with AOs and ICAO by sending reports with relevant data.

5.5.2 STRUCTURE OVERVIEW (AES 2.0)

In addition to the ‘ACTION PLAN’ module in the AES where six (6) main functionalities were originally developed (i.e., Import Data, Export Data, Manage Data Providers, Manage Database, Browse Database, Help). The preliminary AES version 2.0 contains three (3) new modules as shown in Figure 5-5; CORSIA, Calendar, and Settings.

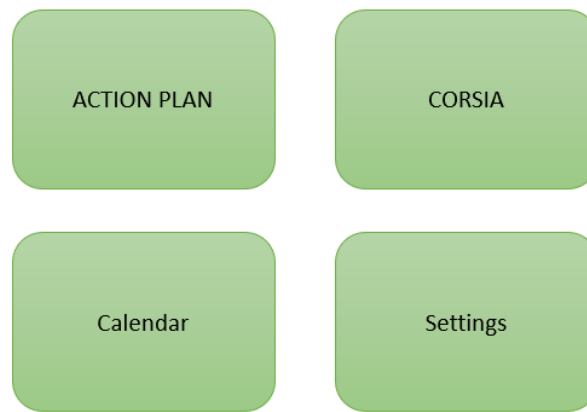


Figure 5-5 Possible AES 2.0 Structure Overview

The preliminary AES 2.0 was developed in such a way that most of the functionalities (apart from the emailing service and the access to CORSIA implementation element website pages) could be used offline, without any dependency on an internet connection. This was done to minimize any possible disruptions from Internet connectivity problems.

5.5.3 CORSIA MODULE (AES 2.0)

As illustrated in Figure 5-6, the CORSIA module in the AES 2.0 has five (5) main functionalities:

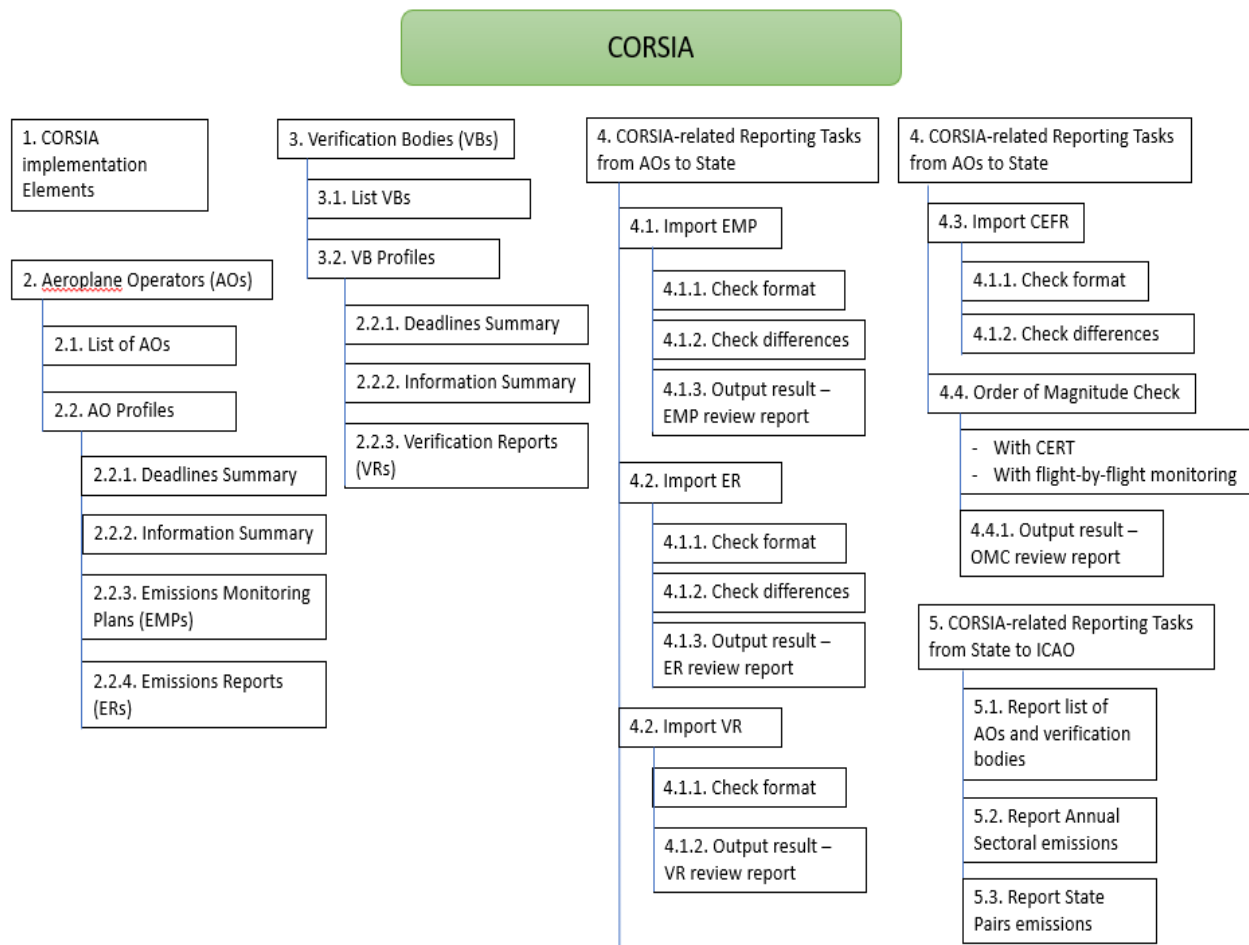


Figure 5-6 CORSIA Module Details

CORSIA Implementation Elements

This module includes a table with website links pointing to all the documentation related to CORSIA implementation elements. The user can now access the CORSIA website by a simple click. This will ensure that the user can easily access the latest version of the documentation at any time. One limitation of this module is that it requires an Internet connection.

Aeroplane Operators (AOs)

This module presents all the information related to the AOs attributed to the State based on the import of CORSIA-related reports such as the Emissions Monitoring Plan (EMP), the Emissions Report (ER), and the CORSIA Eligible Fuel Report (CEFR).

List of AOs

This page presents a table listing all (AOs) attributed to the State with a set of relevant parameters such as: Name, ICAO code, IATA code, the fuel use monitoring method, the annual emissions and the annual offsetting requirements and the annual emissions reduction from the use of CORSIA Eligible Fuels (CEFs) in the last reporting year. It also indicates whether the AO is “in” or “out” of CORSIA with respect to the threshold of 10,000 tCO₂ as defined in the CORSIA-related SARPs and guidance. The table is dynamically generated by the tool, based on the data stored in the database. The name of each AO is a link that leads to the AO Profile.

Verification Bodies (VBs)

This module presents all the information related to the VBs accredited to the State based on the import of CORSIA-related reports such as the ER and the VR.

This would include a table listing all (VBs) attributed to the State with a set of relevant parameters such as:

The VB table is dynamically generated by the tool based on the data stored in the database. The name of each VB is a link leading to the VB Profile.

CORSIA-related Reporting Tasks from the AOs to the State

This module allows users to manage the CORSIA-related reporting tasks from the AOs to the State. It allows the user to import (the data is stored in the database) and analyse all the reports mentioned above (i.e., EMP, ER, VR and CEFR) as provided by an AO or a VB, in the format detailed in the CORSIA-related SARPs and guidance.

CORSIA-related Reporting Tasks from the State to ICAO

This module allows to manage the CORSIA-related reporting tasks from the State to ICAO. It allows the user to check for any approaching deadlines related to data submission from the State to ICAO in the context of CORSIA or the SAPs. At the top of the page, a table summarizes the current year “activities” of the State to help it check if it is compliant with MRV deadlines, for instance if the list of AOs in the State has been submitted on time to ICAO. The user has the options to manually set the “activity” as completed and to create an alert (see Alerting System module) which will automatically send a reminder email.

This module also allows the user to export relevant data to ICAO in the CCR format:

- The list of AOs administered by the State.
- The list of Verification Bodies accredited in the State.
- The State level information on CO₂ emissions.
- The AO Level Information on CO₂ emissions.

5.5.4 OTHER MODULES (AES 2.0)

In addition to the CORSIA and Action Plan Modules discussed above, there are three other Modules that can be accessed in AES 2.0; Action Plan, Calendar, and Settings.

ACTION PLAN

This module includes all the functionalities of the original AES (v1.0) that were detailed in the Phase I report.

CALENDAR

This module allows the user to track the due dates for all activities related to the AOs, the VBs, and the State, in particular:

- Dates when Aeroplane Operators / Verification Bodies are expected to submit data to the State.
- Dates when the State is expected to report data to ICAO.
- Dates when the State should submit data in the CCR and/or ICAO CORSIA website.
- Dates when the State should report back to AOs.

The calendar is aligned with the compliance timeline for the undertaking of activities as requested by the CORSIA-related SARPs and guidance, and the SAPs deadlines.

SETTINGS

User Profile: This page is the same as in the original AES.

Alerting System: This page allows the user to define “Alerts” based on an “activity” stored in the calendar by:

- Selecting an “activity” (stored in the database).
- Set the number of days before the day of the “activity” to send an email and if it is recurring.
- Write and send email(s).

AES 2.0 will then automatically send reminder emails for the selected “Activity”.

5.5.5 DEPLOYMENT

With further funding, potentially as part of a possible Phase III project, ICAO will complete the development and role out of AES 2.0. Then Beneficiary States of the ICAO-EU Project will be able to replace (if desired) their AES version with AES 2.0. As discussed in the previous sections of this Chapter, this would be an augmented version of the original AES. It would cover all the initial functionalities plus additional ones related to or CORSIA implementation.

6. OBJECTIVE 3: IMPLEMENTATION OF MITIGATION MEASURES

6.1 SELECTION OF MITIGATION MEASURES

6.1.1 ICAO'S BASKET OF MEASURES

Assembly Resolution A41.-21: *Consolidated statement of continuing ICAO policies and practices related to environmental protection — Climate change* indicates that “action plans should include information on the basket of measures considered by States, reflecting their respective national capacities and circumstances, and information on any specific assistance needs”. In ICAO Doc 9988, *Guidance on the Development of States' Action Plans on CO2 Emissions Reduction Activities*, a “basket of measures” is presented in which mitigation measures are classified into technology, operations, fuels and CORSIA.

Phase Two of the ICAO-EU Assistance Project was more focused than Phase one and considered only one specific mitigation measure – the possible use of the sustainable aviation fuels (SAF). It initially involved 10 African States. After an initial assessment of the relevant characteristics of all 10 States, three were deemed to be the best overall candidates for the conduct of SAF feasibility studies: Cote d'Ivoire, Rwanda and Zimbabwe. These three were chosen as having the most potential for production and use of socially acceptable, environmentally friendly and economically viable drop-in SAF. A detailed description of exactly how these States were selected is contained in Section 3.3 of this report.

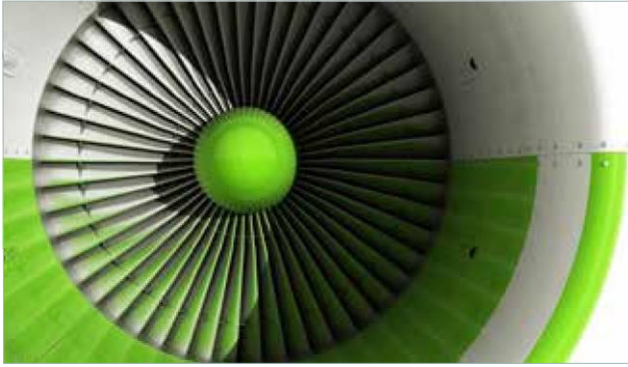
6.1.3 FEASIBILITY STUDIES FOR THE DEVELOPMENT OF SUSTAINABLE AVIATION FUELS

In 2022, the 41st ICAO Assembly adopted a long-term global aspirational goal (LTAG) for international aviation of net-zero carbon emissions by 2050 in support of the Paris Agreement's temperature goal. Each ICAO Member State will contribute to achieving the goal in a socially, economically, and environmentally sustainable manner and in accordance with its national circumstances. The ICAO Assembly also affirmed that specific measures to assist developing countries and States with particular needs, as well as to facilitate access to financial support, technology transfer and capacity building, should be initiated as soon as possible.

In support to these Assembly Resolution provisions, ICAO has launched the ICAO Assistance, Capacity-Building and Training for Sustainable Aviation Fuels ([ICAO ACT-SAF](#)) programme, which aims to provide tailored support for States in various stages of SAF development and deployment. The programme was set-up to facilitate partnerships and cooperation on SAF initiatives under ICAO coordination, and to serve as a platform to facilitate knowledge-sharing and recognition of all SAF initiatives around the globe.

In-line with the ICAO ACT-SAF objectives, ICAO has been actively partnering with the EU to develop assistance projects that support the initiatives of Member States to reduce the climate impacts of international civil aviation. The [first phase](#) of the ICAO Assistance Project with the EU Funding was launched in 2013 and provided support to 14 participating States in Africa and the Caribbean. Among other results, this project led to development of four feasibility studies on the use of Sustainable Aviation Fuels (SAF) in Burkina Faso, Kenya, Dominican Republic, and Trinidad and Tobago. After completion of the first phase, in 2020, ICAO and the EU decided to add a [second phase](#) of the Assistance Project, in order to provide support to 10 African States. Included in Phase 2 of the project was the funding for three SAF feasibility studies in Cote d'Ivoire, Rwanda, and Zimbabwe.

For aviation, sustainable fuels are defined as those fuels that have the potential to be sustainably produced and to generate lower carbon emissions than conventional kerosene on a lifecycle basis. Sustainable aviation fuels (SAF) can be produced from a variety of feedstocks, including renewable biomass (from algae, forest residues, etc.) or waste. The aviation industry is focused on “drop-in” sustainable aviation fuels that have the potential to reduce lifecycle CO₂ emissions. They are referred to as “drop-in” fuels because can be easily blended with conventional aviation fuels without requiring changes to the aircraft or fuel delivery and holding infrastructure.



Drop-in fuels are particularly important in aviation, because unlike other industries, such as road-transportation for example, aviation has no alternatives to liquid fuels for the foreseeable future. In addition, the concentration of aviation fuel distribution to a limited set of locations can facilitate initial deployment. The major potential benefit of introducing sustainable aviation fuels is to reduce aviation's contribution to climate change by limiting carbon emissions.

The use of sustainable aviation fuels is a promising technological solution to contribute to the reduction of aviation emissions and could be beneficial for developing countries. Several States involved in the project had selected feasibility studies for the implementation of sustainable aviation fuels as a mitigation measure in their action plans.

To demonstrate that the aviation fuel is sustainable, the full life cycle of the fuel needs to be considered, including the production of the fuel itself, as that process is likely to produce greenhouse gas emissions. Thus, to assess the emissions reductions from using sustainable aviation fuels, comprehensive accounting must be done of all emissions across all steps of the fuel's life cycle, through production to final delivery. If there are fewer emissions from the full life cycle of the sustainable aviation fuel, in comparison to the full life cycle of fossil fuels, then there is an environmental benefit for climate change. Therefore, it is of high importance to carefully study the potential and constraints for the development of sustainable aviation fuels in each State before engaging in this path.

6.2 RESULTS OF THE FEASIBILITY STUDIES ON SUSTAINABLE AVIATION FUELS

The three feasibility studies described in the following sections assess the potential for production and use of socially acceptable, environmentally friendly, and economically viable drop-in SAF in each of the States, Zimbabwe, Cote d'Ivoire, and Rwanda. These studies followed the general structure and information guided by the *"Template for Feasibility Studies on Sustainable Aviation Fuels"*, which was developed under the ICAO ACT-SAF programme.

Each study covers:

- Information on the specific circumstances of the State, explaining the unique characteristics and factors that could affect the development and deployment of SAF in the State.
- Identification of priority pathways for SAF production.
- Information on implementation support and financing needed for the implementation of the priority pathways identified.
- Recommendation of an action plan aligned with the State's governmental policies related to the SAF development, with a focus on the priority pathways identified.

6.2.1 FEASIBILITY STUDY FINDINGS – ZIMBABWE

In its effort to contribute towards ICAO's aspirational goals, Zimbabwe developed a State Action Plan for CO₂ Emissions Reduction from International Aviation. The country is determined to do its part to contribute towards the sustainable development of its aviation sector. With ICAO's support, Zimbabwe conducted a feasibility study to specifically assess whether the use of sustainable aviation fuels is a viable option to reduce future CO₂ emissions from international civil aviation activity. This study was developed and financed under the aforementioned ICAO–EU project framework, and involved more than 25 relevant stakeholders from government, industry, and academia.

The aviation sector's focus is on "drop-in" sustainable aviation fuels (SAF), as a completely interchangeable substitute for conventional jet fuel that is compatible with the use and handling of the conventional fuel. Drop-in SAF does not require adaptation of the aircraft, engine, fuel system, or the fuel distribution network, and can be used "as-is" on currently flying turbine-powered aircraft blended with conventional jet fuel.

The feasibility study provides an analysis of the development and deployment of SAF in Zimbabwe with the aim to identify opportunities for the establishment of a feasible SAF supply chain. It provides a detailed evaluation along the SAF value chain including the availability of suitable feedstock sources and volumes. It also considers such factors as access to conversion technology, potential demand, implementation keys (policies, challenges, and alternatives), and the environmental, social, and economic development impact. Most importantly, the study intends to raise awareness and set a baseline from which to mobilize industrial and financial support, as well as essential political support from the government of Zimbabwe.

After careful analysis, the study's findings reveal that Zimbabwe holds the technical capacity to deploy the production of SAF and co-products, particularly renewable diesel (RD) in the medium and long term. The country's experience in feedstock production and biofuel processing and promotion provides an excellent level of expertise for the launch and operation of the industry.

A necessary first step is to set up a framework for organizational structuring to enable the readiness level of the value chain. This includes government support to build knowledge and capacity on handling, regulation, and certification (i.e., safety, quality, and sustainability) of SAF and RD in the short term. Just as important is to understand market demand by local users, as well as potential export markets, and to find an effective way to scale-up feedstock volumes to satisfy demand.

There are fourteen potential feedstocks available in Zimbabwe for conversion to SAF. Currently, none of them is being produced in sufficient volumes to satisfy the input needs of a commercial SAF plant. The most promising feedstock is ethanol produced from sugarcane. Depending on the expansion plans by existing ethanol producers Green Fuel and Triangle Limited, over the next three to five years, enough ethanol may be available to secure the production of SAF. Sugar cane bagasse and oil seeds, primarily jatropha and sunflower oil, may also be attractive biofuel feedstocks once a significant increase in production volumes is achieved in the medium to long term.

Currently, there are ten approved feedstocks and conversion processes for SAF production certified for safety and quality by the American Society for Testing and Materials (ASTM), and seven under evaluation for approval. The alcohol-to-jet fuel (ATJ) and hydroprocessed esters and fatty acids (HEFA) conversion processes are most suitable for deployment in Zimbabwe, based on currently available feedstock. Processing technology operating in existing biofuel plants cannot be retrofitted to the ATJ and HEFA conversion processes. Therefore, technology transfer and technical skill development is key to prepare the future workforce of Zimbabweans to lead the SAF industry and avoid dependence on foreign experts.

SAFs are currently more expensive to produce than conventional fuels. The lack of a level playing field in commercial markets makes the deployment of sustainable aviation fuels in Zimbabwe economically unviable without dedicated government support. Existing government policy promoting the production and use of alternative fuels for transport as well as programs under implementation to optimize agricultural outputs offer some support to help unlock the potential of SAF. Yet, to economically deploy SAF in Zimbabwe, the government's support on implementation and mobilization of financing is critical for success. Just as critical will be collaborating with neighboring countries to jointly develop a regional approach to facilitate the production of SAF under harmonized policies and shared markets.

6.2.2 FEASIBILITY STUDY FINDINGS – RWANDA

Background

As part of its mandate to facilitate the civil aviation sector's access to renewable energy across member states, ICAO is supporting the conduct of studies to assess the feasibility of adopting sustainable aviation fuel (SAF), as defined under CORSIA. These feasibility studies aim to assess the capacity to produce SAF, considering feedstock requirements, technology, and infrastructure, along with the corresponding fuel demand.

The Rwandan economy has undergone rapid growth over the past decade, and the country has future ambitions to achieve greater prosperity, reduce poverty, and increase opportunities for all. These goals will be pursued within a long-term Green Growth and Climate Resilient Strategy (Republic of Rwanda, 2015). There is widespread support for the development of the green economy in Rwanda, including planned actions in the agricultural, waste, and energy sectors. These are expected to increase productivity, improve resilience to climate change, mitigate current greenhouse gas (GHG), and other environmental impacts. Green technologies are actively supported, including investment support in newer technologies from the research and development stage through to commercial deployment.

SAF is not specifically considered in existing policy and regulation, nor published sectoral strategies. However, there is strong alignment between the potential benefits of SAF production and use in Rwanda and existing government objectives. For example, the production of SAF from solid wastes is compatible with waste-to-energy plans and has the potential to make significant contributions to Rwanda's GHG emissions reduction commitments by greatly reducing methane emissions from organic waste disposal at dumpsites and landfills. In the agricultural sector, SAF production could provide desired economic diversification, should suitable feedstocks be available without conflicting with food security and other energy applications.

The Rwanda study examines the feasibility of feedstock supply for SAF production, including biomass crops, agricultural and food processing residues, waste oils, and solid wastes. Key factors are considered, including current and projected future availability of feedstock, competition with other uses, technology readiness, environmental and social sustainability effects, and potential for financial viability. Critical success factors for future SAF production are considered, and barriers to capacity-building that need to be overcome are identified. Policy and regulatory recommendations are considered. A forward-looking Action Plan builds on the findings of the study to suggest near- and medium-term actions to support future SAF implementation in Rwanda.

Key Findings

The availability of sufficient quantities of suitable feedstocks is a fundamental challenge for SAF production in Rwanda. Diversion of cropland or crop outputs for SAF is likely to negatively impact food security and so cannot be recommended. It is uncertain if marginal lands unsuitable for staple crop production could be utilised for SAF feedstock cultivation. Agricultural and food processing residues have a high utilisation rate at present in animal feed and energy applications and so are unavailable for SAF production. Should significant gains in crop production be realised in the future it is possible that residual materials could become available, but at present this is highly uncertain. Waste oils are a suitable feedstock for SAF production but are only available in very limited quantities in Rwanda, and so at best can provide a small portion of feedstock supply to a SAF facility.

Solid wastes provide a potential opportunity for SAF production, with potential to provide approximately 15% of aviation fuel use in Rwanda (in 2019). Given Rwanda's current priority to address solid waste management, there is potential for quick implementation of new ways of managing this waste stream, while also addressing methane emissions from dumping or landfilling of solid wastes due to their high organic content. Key challenges for utilising solid wastes for SAF relate to the very limited data available at present about solid waste arisings, its composition, and its current management; technology risk due to the gasification of a highly heterogeneous feedstock; and insufficient supply of solid wastes on their own for the expected scale of a commercially viable facility.

Achieving viable SAF production in Rwanda will require addressing several critical success factors, as follow:

Establishing feedstock supply chains, capable of aggregating sufficient supply of suitable feedstocks, requires first the collection of data related to relevant feedstocks, their current uses, and anticipated future production trends. Further investigation is needed to assess the technical, economic, and environmental factors of relevance to potential feedstock supply chains as a prerequisite for establishing a SAF production industry.

De-risking process technologies and developing skills must address Rwanda’s limited industrial experience with process technologies necessary for SAF production. Smaller-scale technology demonstration and commercialisation projects would develop domestic expertise in key technology areas. Longer-term, a strategy for technology transfer and skills development within the workforce to design, operate and maintain facilities for fuel production, blending and testing/certification is needed.

Demonstrating financial viability and GHG emissions reduction potential through prospective assessments based on high-quality data related to feedstock supply chains in Rwanda, will help to make the strategic case for developing a SAF production industry.

Creating SAF certification capacity is necessary to certify blended fuels produced within Rwanda, a capacity that is currently lacking.

Establishing an appropriate regulatory framework to encourage investment is needed to create a market for SAF given its higher production cost compared with conventional fuels. Long-term certainty of policy and regulatory support for SAF production and use is a necessary precondition to attract private investment in the SAF value chain.

Developing a regional strategy for SAF production and use is needed to address the mismatch of the capacity expected for a commercially viable SAF production facility with the limited availability of domestic feedstocks for SAF production, and with current aviation fuel demand in Rwanda. Regional co-ordination of SAF policies and regulations will also help to ensure that competitiveness is not negatively affected by measures to encourage or mandate the use of SAF.

Table 6-2 Critical Success Factors for Achieving SAF Production in Rwanda

Factor	Requirements
Establish feedstock supply chains capable of aggregating sufficient supply of suitable feedstocks.	Collection of data related to relevant feedstocks, their current uses, and anticipated future production trends. Further investigation of technical, economic, and environmental factors relevant to supply chains.
De-risk process technologies and develop requisite skills.	Smaller-scale technology demonstration and commercialisation to develop expertise in key technology areas. Strategy for technology transfer and skills development within the workforce to design, operate and maintain facilities for fuel production, blending and testing/certification.
Demonstrate financial viability and greenhouse gas reduction potential.	Prospective assessments based on high quality data for Rwanda supply chains and production scenarios.
Create SAF certification capacity.	Develop infrastructure and requisite skills to certify manufactured and blended fuels in-country.
Establish appropriate regulatory framework to encourage investment.	Long term certainty of policy and regulatory support for SAF.

Develop a regional strategy for SAF production and use.	<p>Identify areas for co-operation to achieve required scale for viable SAF production and ensuring adequate demand for finished fuels.</p> <p>Co-ordination of regional SAF policies and regulations to ensure competitiveness is not negatively impacted by measures to mandate the use of SAF.</p>
---	---

Policy Implications

SAF by nature is a cross-sector product and requires consideration of policies that deal with factors such as: feedstock supply (agriculture, waste management); competing uses (energy, transport); and wider economic and environmental drivers. The existing solid waste management strategy is expected to make significant progress in increasing waste collections, establishing infrastructure to aggregate supply, and, in the longer-term, encouraging value-addition to waste streams. While the immediate focus is on safe disposal of solid wastes via sanitary landfilling, deeper GHG emissions reductions will be achieved in future by diverting organic wastes from landfill, including to SAF production. Policies to encourage or mandate landfill diversion will be required.

Action to address data limitations regarding the availability of solid waste, waste oils, and agricultural residues is a necessary first step to improving understanding of the potential viability of SAF production from these feedstocks. Once greater certainty has been achieved regarding current and future availability of feedstocks, it will be necessary to prioritise uses for these limited materials. Such certainty will be needed to deliver the greatest socio-economic benefit, or provide strategic opportunities, and to yield appropriate fiscal and non-fiscal supports to achieve these benefits.

A policy or regulatory driver will be required to incentivise or mandate the use of SAF, given its higher production cost when compared with conventional fuels. Fiscal support for SAF must ensure that the cost to Rwanda is balanced by the wider socio-economic benefits of the SAF production value chain. This is only likely to be achieved where significant value-add takes place within the country (i.e., through production/processing of feedstocks, the manufacture of fuel, fuel blending and certification, and/or export of fuel). Regulatory support, for example through mandating a share of SAF within the Rwanda aviation fuels market or applying a “carbon tax” mechanism to penalise GHG emissions of fuels, would require regional alignment to avoid potential market effects. Mandates without subsidy will increase the cost of fuel, with potential negative implications for regional competitiveness if undertaken unilaterally.

Opportunities and Challenges

Key opportunities and challenges related to SAF production are summarised in Table 6-3 below.

Table 6-3 Summary of Opportunities and Challenges Facing SAF Production in Rwanda

Opportunities	<ul style="list-style-type: none"> • Strong government commitment to developing the Green Economy. • Diversion of solid wastes from dumpsites to fuels production, including SAF, is aligned with climate change mitigation actions and waste management strategy. • Potential for social benefits through adding value and diversification of agriculture and waste management sectors.
Challenges	<ul style="list-style-type: none"> • Limited availability of suitable feedstocks. • Agricultural land is required for food production and cannot be diverted to biomass crops. • Waste collection infrastructure and practices are limited or non-existent in many areas. • Lack of technical expertise in relevant technology areas. • Fuel refining, blending, and testing/certification infrastructure is lacking. • Competition for waste and byproduct streams with animal feed, electricity, and solid fuel applications.

Achieving SAF production in Rwanda would require addressing capacity building needs to be met:

Infrastructure needs:

- Road improvements and a transfer site network capable of efficiently aggregating supply of feedstocks to the scale required for commercially viable SAF production.
- Reliable access to process inputs, including electricity.
- Fuel blending, testing, and certification facilities.

Technology needs:

- Process technologies related to feedstock conversion, SAF production processes, and downstream separations.
- Production, storage, transportation, and handling of hydrogen.

Skills needs:

- Design, construction, operation, and maintenance of systems within the SAF value chain from feedstock collection, storage and transport to fuel production and downstream activities related to fuel blending, testing and certification.
- Training capacity to develop skilled workers in the above areas.

6.2.3 FINDINGS OF THE FEASIBILITY STUDY – COTE D'IVOIRE

Background

The primary objectives of the *ICAO-EU Assistance Projects* to help beneficiary States to develop their capacity to develop and implement Action Plans and mitigation measures to reduce international CO₂ emissions and improve the environmental sustainability of air transport. In December 2021, Côte d'Ivoire's Ministry of Transport, and the Civil Aviation Authority (ANAC) published their State Action plan (Plan d'Action de la Côte d'Ivoire Pour la réduction des émissions de carbone (CO₂) de l'Aviation Civile). This report can be found on the ICAO website under State Action Plans and Assistance: https://www.icao.int/environmental-protection/pages/climatechange_actionplan.aspx.

The report identified twenty CO₂ mitigation initiatives. One of the most promising measures identified in the State Action Plan is the development and deployment of sustainable aviation fuels (SAF) for international aviation. SAF fuels have the potential to reduce life-cycle CO₂ emissions compared with current aviation fuel. As part of Phase II, a study of the feasibility of a commercial SAF supply chain in Côte D'Ivoire was commissioned to be completed in 2023. The report calculated that there were 156,836 metric tons from international aviation need, increasing progressively to 452,217 by 2025.

Key Findings

This study analysed the potential to develop a viable SAF industry in Côte d'Ivoire based on factors such as feedstock availability and sustainability, government policies and strategies, logistics, economics, available technological pathways, financing requirements, socio-economic factors, and sensitivity to climate change. It examined the current situation and infrastructure for both fossil and biofuels in the country and outlined how stakeholders can implement key initiatives. The report proposes a short-, medium- and long-term roadmap. Important opportunities and challenges are discussed, as well as recommendations required for successful implementation, such as government policy, strategy, and financing. This roadmap takes into consideration the unique circumstances and issues that Côte d'Ivoire faces.

Suitable feedstocks are the foundation of SAF production. As more processing pathways are approved, the range of potential feedstocks continues to grow. These have the potential to benefit major agricultural producers, small-scale farmers, industries, and society.

Feedstocks were evaluated based on availability, transportation logistics, and socio-economic impact. While access to low-cost abundant feedstock is important, sustainability was a key criterion. The sustainability evaluation was based on ICAO's CORSIA Sustainability Criteria for CORSIA Eligible Fuels.

Given its agriculture-based economy, Côte d'Ivoire has an ample supply of biomass feedstock that can be converted into SAF. However, sufficient supply alone is not enough. Several neighbouring countries that have already tried to establish commercial scale operations have faced numerous challenges with unintended consequences for rural communities. A good case in point is that of the jatropha based biodiesel industry in which ran into difficulties due to lower than anticipated production yields. Given the risks, identification of suitable biomass sources is a key success factor for any long-term SAF production endeavours and was considered in this report.

The potential impact of feedstock availability was closely scrutinized since it is having a significant impact on sub-Saharan Africa and Côte d'Ivoire. SAF conversion facilities are typically built to operate for decades, so long-term feedstock availability is an essential requirement. Climate change must be considered as it can impact volume and quality.

The relationship between SAF deployment and government policies and strategies was also examined to ensure there is a good fit. Costs, and financing requirements and mechanisms were identified as important success factors.

Finally, technological readiness and logistical considerations were considered in the context of Côte d'Ivoire. Sustainable Aviation Fuel processing know-how is constantly advancing, but not countries are at the same technology readiness levels (TRL). They are constrained by factors such as feedstock types and availability, power requirements, logistics, and construction costs. This study evaluated the various pathways available that are most suitable for implementation in Côte d'Ivoire.

It is hoped that this report will help Côte d'Ivoire develop and implement a SAF industry that can meet the local, regional, and even international aviation decarbonization requirements. It is anticipated that a SAF industry will provide significant economic, social, and environmental benefits and make Côte d'Ivoire a leading SAF player in Africa. This study also aspires to convince key stakeholders about the potential benefits of producing SAF in Côte d'Ivoire so that the necessary financial and technological support can be attained.

The results of the study were very positive and concluded that Côte d'Ivoire has everything required to develop a thriving SAF industry and become a West African leader in sustainable aviation fuels. It has abundant agricultural feedstocks, ample renewable energy, a young and growing population, good universities, excellent infrastructure, and a well-developed petroleum refining industry. The development of the SAF industry will help the country achieve its economic, social and sustainability goals as laid out in national plans and strategies. It will also create synergies with other States in the West African region by providing a market for biomass feedstock and functioning as a SAF exporter and technological leader.

Policy Implications

Côte d'Ivoire has many progressive agricultural, industrial, and environmental policies and strategies but SAF development has not been specifically targeted to-date. A solid SAF policy framework is essential for successful implementation, and it is essential that the Ivorian government develops policies that are feasible, effective, and practical. The ICAO Committee on Aviation Environmental Protection (CAEP) has developed Guidance on potential policies and coordinated approaches for the deployment of SAF, and the WEF Clean Skies for Tomorrow SAF has produced a Policy Toolkit.

In addition to some of the challenges listed above, several other barriers need to be overcome for the SAF industry to become a reality. The construction of SAF facilities and infrastructure is extremely expensive and Côte d'Ivoire will need financial support for that.

The government will need to put in place policies and frameworks that support SAF production and give it priority over other biomass applications. In addition, incentive programs and measures to make SAF more affordable will be required. Efforts will need to be made to encourage airlines to use SAF. This will require partnerships and cooperation among key stakeholders from the government, the oil refinery (SIR), the aviation

industry, academia, agricultural organizations, technology developers, and financial institutions. Social, sustainability, and economic goals will have to be balanced and risks minimized.

Opportunities and Challenges

This report proposes a multi-year roadmap with an action plan to develop a national SAF industry in Côte d'Ivoire. It is important to note that it can take 5 to 10 years to build a SAF facility. Many steps need to be taken as follow:

- Initial feasibility studies.
- Selection of a feedstock and conversion pathway.
- Construction and operation of a pilot plant to demonstrate proof of concept.
- Detailed engineering and techno-economic studies.
- Plant construction and commissioning.

Each step requires substantial policy support as well as financial and technological resources. For this reason, the roadmap is presented in three phases: It should be noted that the single SAF standalone plant that is envisioned will be more than sufficient to mitigate international and domestic aviation emissions, and will allow Côte d'Ivoire's SAF industry to act as both an exporter and a regional supplier. It will also make co-processing and LCAF production at the SIR refinery a viable option.

Short-Term Plan (2023-2025): Quick wins and building the foundation for a SAF industry.

Action is urgently required to decarbonize as soon as possible to minimize the negative effects of climate change. For this reason, the first phase of the proposed roadmap focuses on initiatives that can be deployed at the lowest cost with the least technological risk. It is recommended that priority be given to cassava residues and wastes feedstock for the following reasons:

- It has already been demonstrated that ethanol and isobutanol can be produced from the starch in the residual cassava liquid waste, and small quantities are already being produced.
- The process is scalable, and the alcohol can be converted to SAF via the ATJ pathway which is less capital intensive than some other SAF technologies.
- Multiple ethanol and isobutanol producing feedstocks, such as sorghum and sugar cane molasses, could be used to feed an Alcohol-to-Jet SAF production facility. This would increase feedstock volume, provide more flexibility, and reduce the risk of over-reliance on a single feedstock.
- Cassava is an abundant crop and production is increasing. It can be grown in a wide variety of soil conditions, making it resistant to the effects of climate change.
- Other waste from cassava production can be collected and used as a feedstock, or combined with other agricultural wastes, for gasification via the Fischer-Tropsch pathway.
- Feedstocks that meet ASTM D1655 Annex A1 requirements (i.e., FOGs, hydrocarbons, and biomass) can be co-processed up to 5% in using the existing SIR refinery infrastructure with a limited investment.
- Using cassava residue to produce SAF will have other social and economic co-benefits. It will create jobs for farmers, women, and disadvantaged groups, and can also result in environmental benefits by reducing cassava processing wastes.

Based on the above, the quickest route towards a SAF industry in Côte d'Ivoire would be to finance a pilot plant for the conversion of cassava liquid waste containing starch into ethanol and an ATJ production facility. In parallel, SIR should explore the feasibility of co-processing FOG, especially those classified as wastes and residues. In that regard, it is recommended that data be collected, and a request made to ICAO to assess the life cycle of cassava's wastes and residues for potential inclusion in the CORSIA's positive list of materials classified as co-products, residues, wastes or by-products, in the document CORSIA Methodology for Calculating Actual Life Cycle Emissions Values.

The possibility of using biodiesel (FAME) to replace fossil diesel in ground equipment should also be studied as this would be a low risk and quick way to reduce emissions.

The next most promising SAF pathway consists of using low-cost agricultural wastes and municipal solid waste (MSW) to produce SAF via the Fischer-Tropsch synthesized paraffinic kerosene (FT-SPK) process. Cashew nut

shells and cocoa pods are plentiful in Cote d'Ivoire and provide good candidates for feedstock. These, along with other agricultural waste, are available in significant quantities and are already concentrated in specific regions of the country. This study has shown that enough supply exists, but further in-depth analysis is required to demonstrate economic and logistical feasibility.

The third potential pathway consists of using oil seeds to produce SAF from lipid-based feedstocks such as rubber seeds via the HEFA pathway. As for the case of alcohol producing feedstocks, different oil-based crops, such as palm oil or *Jatropha*, could be pooled to provide volume and reduce supply chain risk. The environmental, social, and economic effects associated with them need to be further assessed along with logistical matters.

Government policy and financial support will be critical in the first phase. The Ivorian government should consider implementing policies and frameworks that incentivize the nascent SAF industry. Financial support is required at the early stages of the industry, so that it can attain a level of maturity that attracts private investment. Examples of support that is needed include the construction of a pilot plant for proof of concept, as well as additional studies. Ivorian universities and academia can also play an important role by conducting research and developing technology.

Medium-term (2026-2030): Planning for success

Upon selection of the most promising feedstock and technical pathway, the second phase should consist of engineering studies and detailed techno-economic studies for the production facilities. The main objective will be to attract investment by building a business case that demonstrates the economic viability of the process. During this period, it will be essential to get financial commitments from airlines and other fuel end-users through mechanisms such as offtake agreements, forward fuel purchases, or direct investment. Other key elements that need to be completed include sourcing and selecting technology partners, securing power and energy contracts, and site selection and permitting.

Long-term (2030 onwards): Launching the SAF industry.

The final phase will be the construction and commissioning of the SAF facility. Once the plant is in operation, the focus will be on improving operational and logistical efficiency to reduce costs. At that point in time, the policy framework should be in place to provide a thriving industry. The success of the first plant should provide the incentive for other SAF and biofuel initiatives, whether it is improvement of the current processes or expansion into other technologies. The experience gained will enable Côte d'Ivoire to export and share their expertise elsewhere in Africa and beyond.

7 LESSONS LEARNED

The following is a list of lessons learned regarding the development of the capacity building of the beneficiary States to develop, update and implement national action plans to reduce CO₂ emissions from international aviation, the use of the AES, and the implementation of mitigation measures.

Nr.crt	Best practices	Description	Lessons learned
Capacity building			
1	Designation of qualified Focal Points and NAPT members	The authorities designated qualified focal points and NAPT members that correspond with the project scope which made easy to advance the project milestones. As result of project team assistance, some States updated their focal points and NAPT members, to include additional members or, in a few cases, make a replacement.	This assistance ensured that qualified staff is appointed and also that the designated staff include expertise from Environment, Air Transport and Statistics.
2	Dedicated preparation time for the in-person capacity building seminars	It was decided to convene the focal points to the location of the seminar one day before the actual start of the seminar. This proved to facilitate the preparation of the focal points to the seminar as they could work more closely with the project team and exchange knowledge and experience with the other focal points of the project.	This activity strengthened the relationship between the project team and the focal points.
3	On-site visit of facility during the regional seminar	During the second and the fourth regional held in person, it was organized the last day a tour of the sustainable aviation fuel facility in Harare and at Trudeau International Airport in Montreal. This activity allowed the participants to exchange on best practices for the implementation of mitigation measures.	This activity was important to show ongoing initiatives, to look for synergies and to strengthen involvement of the Focal Points in the roll-out of the SAP implementation.
4	Seminar exercise	The last day of the final regional seminar was devoted to assess the participants level of knowledge through exercises on the process of developing the SAP and feasibility studies, many steps were taken.	This proved to be much more efficient than limiting to a refreshed presentation by ICAO, and was welcomed by the focal points who felt much more confident with the assessment
State Action Plan			
1	Institutionalization of the NAPT	10 States of the project institutionalized their NAPT by creating it officially through a decision signed by the Director General of the Civil Aviation Authority or by the Ministry of Transport.	Through this process, the NAPT members are more committed to attend and participate to the meetings as they can justify it more easily in their respective institutions and can obtain allocated time to spend for this in the scope of their professional activities. It also increases the chances of sustainability of the NAPT.
2	New linkages between the institutions in charge of the aviation and	As a result of the creation and meetings of the NAPT, and the inclusion of members from the Ministry of Environment and other relevant national institutions in the NAPT, States could create new links between the institutions in charge of the	The establishment of NAPT has changed the way the States work toward environmental objectives. This coordination mechanism has enabled the Civil Aviation Authorities to bring up to the table in inclusive process all the

	the environment sectors	aviation sector and the ones in charge of environment, energy or agriculture. One positive outcome of this process is that the CAA can now report the aggregated CO ₂ emissions from the aviation sector to the national institution in charge of preparing the national inventory for CO ₂ emissions to be submitted to UNFCCC. Another outcome is that in some States personals from the CAA, members of NAPT and national focal points of ICAO-EU Project were selected to be part of the national delegation attending the annual Conference Of the Parties (COP) meeting organized by UNFCCC.	stakeholders that are involved in the international aviation activity and institutions in charge of environment. This consultation process has facilitated the exchange of creative and innovative ideas to reduce fuel consumption and emissions. Indeed, it has speeded up the approval process – lead governmental entities are involved early in the process, and it has created the necessary synergies to ensure political buy-in, and also financial funding in some cases, for the implementation phase of the mitigation measures
4	Rotating meeting venues for the NAPT	In some States, it was decided that the NAPT meetings would be host alternatively by the participating institutions in a rotating manner.	Rotating meeting venues for the NAPT help to increase the commitment of the members and the awareness on the NAPT purpose, mission and activities within their own institutions.
6	Close support and progressive reviews of the Action Plan	As part of the activities included in Objectives 1 and 2 of the ICAO-EU Project Phase 2, the project team provided close support in the form of remote meetings/advice, on-site missions and capacity building seminars to help the focal points to come up with Action Plans that follow ICAO's recommendations in Doc 9988. As a result, all 10 Action Plans eventually submitted to ICAO contain the 5 recommended sections of an Action Plan and follow ICAO's guidelines.	These support activities have been extremely successful for a direct engagement in the implementation of the project at the country level in the selected States.
7	Scope of historical data selected for the baseline calculation	Ten States selected for this Phase 2 were not able to gather more than a year of historical data to calculate the baseline. While it is typically recommended to take as many historical years as possible for reference when calculating the baseline, this does not necessarily provide a consistent and realistic result when the fleet of the national airline is very instable and subject to many changes of number of aircraft and aircraft types from one year to another. In this case, it was therefore decided to base the baseline calculation on the most recent historical year only instead of using all the data collected.	In such situations, the recommended method for the baseline calculation cannot be applied in a straightforward manner. Additional assumptions had to be made and it required validation with ICAO ENV experts. Enhance engagement of the relevant stakeholders (Fuel Suppliers, airlines, airports and government counterparts) to ensure their active contribution on data sharing and improvement on the data collection processes
8	Selecting mitigation measures	Some States have created sub-groups within their NAPT to select and further monitor the mitigation measures and the aspirational goals to be included in their Action Plans: aircraft technology and more efficient operations, SAF, improved air traffic management and related infrastructure use, airport improvements.	These sub-groups enable collaboration with stakeholders (Internal and External) and they designed a framework for the appropriate implementation of the mitigation measures and the support of the cost benefit analysis.

Aviation Environmental System (AES)			
1	AIC for data collection for the Aviation Environmental System (AES)	In ten States, the need for the national air carriers to submit periodically data on traffic and fuel consumption to the CAA should be made mandatory through the adoption of an Aeronautical Information Circular (AIC) signed by the DG. The AIC should contain requirements for monthly data submission as well as the format required by the AES for data collection (Form ENV1) attached as annex to the AIC. The AIC should also mention that the data would be treated confidentially by the CAA, which was one of the barriers of the airlines for data submission, because of the fear of data theft by competitors.	This process will raise awareness of the national stakeholders on the importance of data collection, monitoring and reporting.