



**INTERNATIONAL LEGAL REGIME ON REDUCTION
OF AVIATION EMISSION AND ITS
IMPLEMENTATION IN NIGERIA**

BY

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**A thesis submitted in fulfilment of the requirement for the
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ABSTRACT

The issue of ever increasing volume of aviation emission has become a threat to the global environment. As a result of its environmental consequences which include global warming, climate change, acid rain, melting of glaciers, skin cancer, airborne diseases, destruction of lives and animals, the international community has applied regulatory measure such as the United Nations Framework Convention on Climate Change 1992, the Kyoto Protocol to UNFCCC 1997 and the International Civil Aviation Organisation's Annex 16 Vol. II on Standard And Recommended Practices (SARPs) on reduction of aviation emission. Nigeria is also party to these conventions and regulations and she is expected to adopt and implement them nationally. Despite the above regulatory measures, there are still reports about increase in volume of aviation emission with serious global, regional and national impacts. In Nigeria, the impacts of global warming of which aviation emission is a fast contributor have led to abnormal temperature and diseases, flight delays and disruption in the northern part of Nigeria, while flooding has ravaged the coastal states. The above shows that the implementation and effectiveness of the existing legal regime on reduction of aviation emission need to be further investigated. To achieve this, the research applied qualitative research method by utilising the existing literature to critically analyse the contributions of UNFCCC convention, the Kyoto Protocol and ICAO Standards Regulations of Annex 16 Vol. II to reduction of aviation emission while drawing lessons from the practice on reduction of aviation emission in the US and the UK. It also assessed the adequacy of Nigerian legislations on the implementation of international legal regime on reduction of aviation emission and further conducted interviews with aviation practitioners to assess the implementation of ICAO International Standards on reduction of aviation emission in Nigeria. The research finds that both the UNFCCC and Kyoto Protocol contributed their quota to reduction of aviation emission. The research finds that both the UNFCCC and Kyoto Protocol contributed their quota to reduction of aviation emission. The research also finds that the contributions of ICAO as the global regulator of aviation emission is not sufficient and proposes Global Emission Trading as an additional option. In Nigeria, the research finds that though the UNFCCC, Kyoto protocol and ICAO regulations are ratified, there has been a few legislation on reduction of aviation emission. It also finds that there is no compliance with implementation of ICAO regulations on reduction of aviation emission in the Nigerian Civil Aviation Regulations 2012, while the newly revised Nigerian Civil Aviation Regulations 2015 requires more time for meaningful implementation assessment. The research suggests that giving more priority to reduction of aviation, inclusion of aviation emission reduction provision in the NCAA regulations, training of aviation experts, provision of fund and equipment will facilitate implementation of international legal regime and enhance reduction of aviation emission in Nigeria.

ملخص البحث

أصبحت مسألة تزايد الحجم في انبعاثات الطيران خطراً على البيئة العالمية. نظراً لعواقبها البيئية التي تشمل الاحتباس الحراري وتغير المناخ وحمضية الأمطار، وذوبان الأنهار الجليدية، وسرطان الجلد والأمراض المتنقلة عدوها جواً، وتدمير الأرواح والحيوانات، قد استعمل المجتمع الدولي قياساً تنظيمياً مثل اتفاقية الأمم المتحدة بشأن تغير المناخ عام ١٩٩٢، واتفاقية بروتوكول كيوتو للأمم المتحدة ١٩٩٧ م ومنظمة الطيران المدني الدولي في الملحق ١٦ عن المعايير والممارسات الموصى بها والتي تعرف اختصاراً بـ (SARPs) في تخفيض انبعاثات الطيران. وكما أن نيجيريا عضو في هذه الاتفاقيات واللوائح، ويتوقع أن تعتمد عليها وتنفذها على المستوى الوطني. على الرغم من الإجراءات التنظيمية أعلاه، مازالت هناك تقارير عن زيادة حجم انبعاثات الطيران التي لها آثار بارزة على المستوى الوطني والإقليمي والعالمي. في نيجيريا، يؤثر ارتفاع درجة الحرارة في انبعاثات الطيران التي تؤدي بصورة كبيرة إلى زيادة في درجة الحرارة العادية والمرض، وكذلك تأخير الطيران واضطرابه في جزء من شمال، في حين اجتاحت فيضانات الولايات الساحلية. ما تقدم عرضه أعلاه يظهر أن تنفيذ وفعالية نظام القانون الحالي في تخفيض انبعاثات الطيران تحتاج إلى تفعيل القانون. ولإنجاز هذا فقد اعتمد في هذا البحث على المنهج النوعي بإستعمال المستندات الموجودة لتحليل مساهمات اتفاقية (UNFCCC)، ولوائح بروتوكول كيوتو ومعايير منظمة الطيران المدني الدولي الملحق رقم (ICAO Vol. II ١٦) لتخفيض انبعاثات الطيران، في حين تعمل التزامات ممارسة الولايات المتحدة والمملكة المتحدة على خفض انبعاثات الطيران. نوقشت سيطرة انبعاثات الطيران في تشريعات الطيران في نيجيريا، كما أجريت مقابلات مع العاملين في حقول الطيران لتنفيذ معايير ICAO الدولية على تخفيض انبعاثات الطيران في نيجيريا. كشف البحث أن كلا من الاتفاقية الدولية بشأن تغير المناخ (UNFCCC) وبروتوكول كيوتو ساهما في تخفيض انبعاثات الطيران. في حين مساهمات منظمة الطيران المدني الدولي بوصفها جهة رقابية على مستوى دولي في تخفيض انبعاثات الطيران ليست كافية. ولذا تقترح إعطاء الأولوية للانبعاثات الحرارية أن تكون خياراً إضافياً. وفي نيجيريا، اكتشفت أنها صادقت على اتفاقية الأمم المتحدة وبروتوكول كيوتو واللوائح المبرمة المنظمة، ولا يوجد أي تشريع في لوائح الطيران المدني النيجيرية S ولا التزام بتنفيذ لوائح منظمة الطيران المدني الدولي على تخفيض انبعاثات الطيران. وتقترح الدراسة إعطاء الأولوية لتخفيض الطيران، وإدراج الطيران بما يساعد في خفض انبعاثات الطيران في أنظمة NCAA، وأهمية تدريب خبراء الطيران، وتوفير الأموال والأجهزة لتسهيل تطبيق نظام الاتفاقيات الدولية لتساهم في تخفيض انبعاثات الطيران في نيجيريا.

APPROVAL PAGE

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DECLARATION

I hereby declare that this thesis is the result of my own investigation, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any degree at IIUM or other institutions.

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DEDICATION

In ever green memory of the following:

I

Alhaji Murtala Arowolo Aminu - My late father who thought it wise to invest in my education.

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United Nations Framework Convention on Climate Change UNFCCC 1992.
Kyoto Protocol to the United Nations Framework Convention on Climate Change 1997.
International Convention on Civil Aviation (Chicago Convention 1944).

ANNEX TO THE CONVENTION

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The Civil Aviation Act 2006.
The National Environmental Standard Regulations Enforcement Agency (NESREA) Act 2007.
The Nigerian Civil Aviation Regulations 2012.

B. UNITED STATES

Clean Air Act 1970
US Code of Federal Rule (CFR) 1977.
Environmental Protection Agency Regulations.
Federal Aviation Administration Regulations (FAARs) 2004.

C. UNITED KINGDOM

The Civil Aviation Act 2012.
The Civil Aviation Authority Regulations 1991.

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United Nations Document UNDOC ECCCKP/1997 on Kyoto Protocol to the United Nations Framework Convention 1997.

US Document on Federal Programme and Policy to Reduce Aviation Emission by Federal Aviation Administration USA 2004.

RESOLUTIONS

ICAO Assembly Resolution A33-7 (2001) on restraint to states on imposition of charges and taxes.

ICAO Assembly Resolution 35-5 (2004) on adoption of Emission Trading.

ICAO Assembly Resolution 36-2 (2007) on implementation of emission Trading by states.

ICAO Resolution 37 (2010) on emission trading.

LIST OF ABBREVIATIONS

CAA	Clean Air Act.
CAEP	Committee on Aviation Environmental Protection.
CDM	Clean Development Mechanism.
CJEU	Court of Justice of the European Union.
CFR	Code of Federal Rules.
CBDR	Common But Differentiated Responsibilities.
CCO	Continuous Climb Operation
CDO	Continuous Descent Operation
COP	Conference of Parties.
EPA	Environmental Protection Agency.
EU	European Union.
ETS	Emission Trading System.
FAA	Federal Aviation Authority.
GHG	GreenHouse Gas.
IATA	International Air Transport Association.
ICAO	International Civil Aviation Organisation.
IFR	Instrumental Flight Rules
IPCC	Intergovernmental Panel on Climate Change.
KP	Kyoto Protocol.
LTO	Landing and Take Off.
MRV	Monitoring, Reporting and Verification.
NIMET	Nigeria Metereological Agency.
NESREA	National Environmental Standard Regulations and Enforcement Agency
NPR	Non Preferential Routes.
OECD	Organisation for Economic Cooperation and Development.
PBN	Performance Based Navigation.
SARPS	Standard and Recommended Practices.
SDI	Standard Departure Instrument.
UGETS	Upstream Global Emission Trading System.
UNEP	United Nations Environment Programme.
USOAP	Universal Oversight Audit Programme.
UV	Ultra violet.
UNFCCC	United Nations Frame Work Convention on Climate Change.
US	United States.
UK	United Kingdom.
VET	Voluntary Emission Trading System.
VFR	Visual Flight Rules.
VOC	Volatile Organic Compound.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE RESEACH

Aviation emission is the gaseous substance emitted by air craft and aerospace engines as a result of their combustion activities. The earth environment is the totality of the earth surroundings where human animals and non-living things exist to fulfil their desires. It is also the atmospheric surroundings where combustion and emission activities of air craft and aerospace engines take place.¹ In all activities involving aircraft combustion, aircraft releases gaseous substance which contains carbon dioxide CO₂, carbon monoxide CO, water vapour, sulphur dioxide SO_x, nitrogen oxide NO_x, un-burnt hydro carbons, soot and aerosol into the atmosphere,² through the burning of fossil fuels such as jet A for (turbine aircrafts) or AV gas for (piston air craft).³ Accumulation of this carbon emission being released in large quantity by several aircraft on international and domestic flights, over a long period of time, contributes in no small measure to inter-boundary and domestic pollution of the atmospheric environment, which later contribute to global warming and depletion of ozone layer with serious environmental consequences on human lives, animals and plants.

¹ Saadu .I. Hafsar, Mustapha .I. Adua, and Akanbi O. Khairat, "Climate Change: Legal Response to Aviation Emission in Nigeria," in *Law and Climate Change in Nigeria*, ed. Wahab Olasupo Egbewole, Muhtar Adeiza Etudaiye, and Olugbenga Ajani Olatunji (University of Ilorin, 2011),.291.

² Andreas Döpelheuer, "Aircraft Emission Parameter Modelling," *Air & Space Europe* 2, no. 3 (2000): 34–37.

³ Hafsar, Adua, and Khairat, "Climate Change: Legal Response to Aviation Emission in Nigeria," 292.

The primary products of aircraft combustion process whereby aviation fuel or aviation kerosene is sprayed and burnt in the chamber of aircraft, are carbon dioxide and water vapour which constitute salient form of aviation emission. There is also the presence of nitrogen oxide and sulphur oxide, the emission coming out of these gases are characterised as greenhouse gases because when emitted into the atmosphere they trap the infrared radiation from the earth surface and make earth surface become warmer than before. The process of global warming of the earth surface which is equally aided by excessive discharge of aviation emission into the environment, takes place when certain gases which are below the atmosphere absorb the infrared radiation being sent down on the earth through energy from the sun. The direct energy from the sun which appears in form of light and cloud is being absorbed on earth through certain gases called greenhouse gases, which are naturally present below the earth surface. Reasonable quantity of greenhouse gases will keep the atmosphere in normal warm temperature but excessive release of greenhouse gases into the atmosphere through burning of fossil fuel in the aircraft and other sources too much in the air, which cannot be absorbed by the earth surface, will bring too much heat into the atmosphere. The heated earth surface in turn sends the heat energy back into the air space (upper atmosphere) which eventually leads to global warming of the earth environment.⁴ As regards depletion of ozone layer, the release of gaseous substance called aviation emission on the upper atmosphere by aircraft and aerospace engines on domestic and international flights has a direct impact on the depletion of ozone layer in the upper

⁴ C .A. Omeka, Environmental Regulations in Nigeria: Understanding the National Environmental Standards Regulations Enforcement Act 2010, (Lions Unique Concept, Lagos), 23.

atmosphere. The consequences of which lead to acid rain, melting of glaciers skin cancer, air borne diseases, destruction of lives, animals and plants.⁵

Worldwide, aviation transportation has been increasing steadily, largely due to globalisation of world economy and economic growth which have made air transportation affordable for a large number of populations in the world.⁶ The increase in growth of air transportation has led to increase in volume of aviation emission being discharged on the earth surface. This emission however, caused severe consequences on the global environment, in form of pollution of the atmosphere, stratosphere and lithosphere with high level of greenhouse gases like carbon dioxide, carbon monoxide, nitrogen oxide and others.⁷ It has been observed that aviation emission constitutes the fastest growing source of anthropogenic green house emission. This is because aviation emission from annex 1 countries rose by 67% between 1991 and 2005 and is estimated to rise by as much as 90% when aviation emissions from non- annex 1 countries are included for the period.⁸ It has also been observed that about 3% of both the United States and European Union's (EU) total greenhouse gases emissions are from aviation emission. The E.U has forecasted that current growth in trend of emission from international flights using E.U's airports will increase by over 150% over 1990 level.⁹ This prediction is corroborated by the information in the table 1.1.1 below. Further, it has been observed that the share of aviation to total global transportation emission

⁵ David L McCollum, Gregory Gould, and David L Greene, "Greenhouse Gas Emissions from Aviation and Marine Transportation: Mitigation Potential and Policies," *Institute of Transportation Studies*, university of California, 2010, 4.

⁶ Clay Bourne, Fox Clerk, and Thiago Chagas, "Aviation And Climate Change Regulation," in *Legal Aspects of Carbon Trading: Kyoto, Copenhagen, and beyond*, ed. David Freestone and Charlotte Streck (OUP, Oxford, 2009), 27.

⁷ Bourne, Clerk, and Chagas, "Aviation And Climate Change Regulation."

⁸ Ibid., 28.

⁹ McCollum, Gould, and Greene, "Greenhouse Gas Emissions from Aviation and Marine Transportation: Mitigation Potential and Policies," 5.

is larger if non carbon dioxide emissions are added. The overall impact of aviation emission is however; potentially double in the case of aircraft in the air because aircrafts emit greenhouse gases directly into the atmosphere.¹⁰

TABLE 1.1.1 Global Aviation Demand (In billion km)

Year:	1990	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100
Quantity	200	800	1200	2000	3500	4000	5000	6000	7000	8000	9000	10000

Table 1.1.1 shows the increasing trend of global aviation demand (1990-2100) in billion Km¹¹

The impact of aviation emission on the environment is said to be more evident in correlation between increase in carbon dioxide (CO₂) emission and increase in average temperature observed over entire planets. Since 1860, the beginning of industrial era, the average temperature on the surface of the earth has increased by 0.8^{0c}. The sudden rise in average temperature since the start of industrial era, is said to be abnormal compared with trends, its relative amplitude and the speed of change on geological time scale.¹² Therefore, scientific studies have suggested that reducing global emission by 50 to 80 percent below 1990 levels by year 2050 is necessary in order to stabilize the climate and avoid most destructive impacts of climate change.¹³

Nigeria, being one of the countries involved in aviation transportation and a member of the International Aviation Organisation (ICAO), also shares from the impact of aviation emission on her environment. Although, Nigeria claims not to be one the great aviation emitters like the developed countries, reports have shown that Nigeria's national and international air travel markets expanded over the years with

¹⁰ Ibid.

¹¹ A Vendantham and Michael Oppenheimer, "Aircraft Emissions and the Global Atmosphere," *Environmental Defense Fund, New York*, 1994, 5.

¹² Ibid.

¹³ Ibid., 6.

corresponding volume of aviation emission being released. Reports have equally shown that some parts of Nigeria especially the coastal areas have been experiencing the impact of global warming emanating from effect of aviation emission. This has thus brought about the need for Nigeria to join the international legal response to reduction of aviation emission.¹⁴ Besides, the boundless nature of emission and the integrated nature of international civil aviation mean that effective action on global reduction of aviation emission requires committed efforts of all countries in the world. As such, Nigeria should take a serious action on reduction of aviation emission in order to have a clean and sustainable environment.

In realisation of the impact and bad consequences of increasing aviation emission on the environment, the international community responded to the adverse atmospheric effects of aircraft engine emission in two ways: One approach was to control aviation emission through ratification of international conventions and protocols by member states. The notable convention and protocol for this are the United Nations Framework Convention on climate change, UNFCCC (1992) and the Kyoto protocol to the UNFCCC (1997).¹⁵ Under Public International Law principle, such convention and protocol are to be signed, ratified and domesticated by member states to become implemented as part of the domestic Acts of a state.¹⁶ The other approach has been to address reduction in aviation emission directly from aircraft engines through the regulatory regime of International Civil Aviation Organisation (ICAO). The regime include the Standard Recommended Practices on aircraft engines (SARPs) and other regulations contained in annexe 16 volume II of the Chicago

¹⁴ Ikechi Ukoh, "Experts: Nigeria Fastest Air Travel Market In Africa," *Thisday Newspaper*, Nigeria, September 27, 2013.

¹⁵ Yaw Otu Mankata Nyampong, "The Regulation of Aircraft Engine Emissions from International Civil Aviation" (LLM Thesis MCGill University, Canada, 2005), 3.

¹⁶ Abdul Ghafur Hamid @ Khin Maung Sein, *Public International Law: A Practical Approach* (Sweet & Maxwell, Asia, 2011), 78.