



FRAMEWORK FOR REDUCTION OF CARBON EMISSIONS IN THE ICT INDUSTRY

Abbreviations and Acronyms

CO ₂	Carbon Dioxide
GHG	Green House Gases
GGOM	Greenhouse Gas Global Overview and Mitigation Project
GeSI	Global eSustainability Initiative's
NFC	Near Field Communication
ICT	Information and Communications Technology
ISO	International Organization for Standardization
ITU	International Telecommunication Union
IoT	Internet of Things
KPIs	Key Performance Indicators
RFID	Radio Frequency Identifier
OSCAR	Online Solution for Carbon Analysis and Reporting
SDGs	Sustainable Development Goals
UPU	Universal Postal Union

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Definitions

Carbon Footprint refers to the total amount of greenhouse gas emissions, primarily carbon dioxide (CO₂) and other carbon compounds emitted directly or indirectly into the atmosphere, caused by a specific action made by an individual, an event, an organization or a product, usually indicated with CO₂e.

Greenhouse Gas (GHG) any of various vaporous state of matter that possess the capacity to absorb infrared radiation, thereby trapping heat in the atmosphere, and contribute to the greenhouse effect, leading to increased temperatures on the planet's surface and subsequent global warming .

Greenhouse Effect refers to the process through which rays from the sun reflected back in the atmosphere are trapped near the earth's surface leading to an increase in temperature, a phenomenon known as global warming

Global Warming refers to the gradual increase in the average air temperatures observed near the Earth's surface as observed since the pre-industrial period, and occasioned primarily by human activities, that eventually lead to climate change

Climate Change refers to long-term shifts in temperatures and weather patterns experienced across various regions of the globe.

1. Introduction

The Communications Authority of Kenya (CA) is the regulatory authority for the communications sector in Kenya. Established in 1999 by the Kenya Information and Communications Act, 1998, the Authority is responsible for facilitating the development of the information and communications sectors including; broadcasting, cybersecurity, multimedia, telecommunications, electronic commerce, postal and courier services.

In execution of its mandate, the Act requires of the Authority to have regard to any policy guidelines of a general nature relating to the provisions of this Act and Kenya's obligations under any international treaty or agreement relating to the provisions of telecommunication, radio and postal services.

2. Background

The landmark 2015 United Nations Climate Change Conference in Paris, saw the adoption of an international treaty addressing climate change mitigation, adaptation, and financing. Kenya, among other members of the United Nations, became a signatory to this pivotal accord.

Upon adoption of the Paris accords in 2015, the International Telecommunications Union (ITU), the United Nations specialized agency for Information and Communication Technologies (ICTs), to which Kenya is a member state, developed the ITU standard – ITU L.1470 “GHG emissions trajectories for the ICT sector compatible with the UNFCCC Paris Agreement”.

In the postal sector, the Universal Postal Union, which is the primary forum for cooperation between postal sector players, during its 24th Universal Postal Congress adopted Recommendation C27/2008 inviting the designated postal operators to promote initiatives aimed at reducing the negative effect of their activities on the environment, in addition to endorsing Resolution C34/2008 recognizing the importance of adopting a programme for the postal sector to reduce greenhouse gas emissions.

In actualising the adopted recommendations, the UPU developed a specific programme, the Greenhouse Gas Global Overview and Mitigation Project (GGOM), designed to measure the postal sector's carbon footprint and encourage initiatives to reduce its impact on climate change, particularly through the exchange of sound environmental practices.

The UPU has consequently developed, OSCAR – the Online Solution for Carbon Analysis and Reporting – a tool provided by the UPU to measure and analyze the postal sector's carbon footprint.

Given its pivotal role as the lead agency for the Information and Communication Technology Sector in Kenya, the Authority spearheads Kenya's representation at ITU and UPU meetings and assumes responsibility for implementing global resolutions affecting the ICT landscape.

Furthermore, at the national level, the National Environmental and Management Coordination Act (EMCA) No. 8 of 1999, mandates the National Environmental and Management Authority (NEMA) to co-ordinate the various environmental management activities, collaborating with lead agencies vested with regulatory functions of control or management or any element of the environment or natural resources.

The law vests the functions of ICT regulation to the Authority. Therefore, the Authority has in place a framework of cooperation between itself and NEMA on matters environment with regards to ICT.

Acknowledging the substantial contribution of carbondioxide (CO₂) to the greenhouse gas effect, which accounts for approximately eighty percent (80%) of the total, the Authority commits to environmental conservation efforts, aiming to curtail the ICT sector's carbon footprint. The other greenhouses gases are Water Vapor(H₂O), Carbon Dioxide(CO₂), Methane(CH₄),and Nitrous Oxide(N₂O), Ozone(O₃).

This framework, therefore, is one of the measures the Authority is taking towards environmental conservation aimed at reducing the ICT carbon footprint.

3. Principles of the Framework

This framework is underpinned by the following foundational guidelines:

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|--------------------------------------|---|
| a) Innovation | ICT sector players are encouraged to be innovative in the way they deploy and provision their services to help in reducing the ICT carbon footprint |
| b) Industry Driven Effort | This framework will as much as possibly encourage the ICT sector players to set their own targets carbon emission reduction targets and aim to achieve them |
| c) Technology Neutrality | This framework will be as neutral as possible with regards to roll out of any technology by service providers |
| d) Progressive attainment of targets | This framework recognized the need for step-by-step attainment of targets by each ICT sector player at their pace towards the UN set target of net zero emission by the year 2050 |

4. Objectives of the Framework

This framework aims to:

- i. Identify sources of Carbon Dioxide(CO₂) emmissions in the ICT sector,
- ii. Explore avenues through which ICTs can be used to mitigate Co₂ emmissions,
- iii. Establish targets for reductions of ICT Co₂ emmissions, and,
- iv. Assign responsibilities for the reduction of Co₂ emmissions to the various stakeholders in the ICT sector.

5. Classical Sources of Carbon Emissions in the ICT sector

The ICT sector contributes significantly to the global carbon emissions, both as part of the problem and as part of the solution, both for the telecom sub sector and the postal sub sector.

a) Telecom Sub Sector

As part of the problem, ICT the sources of carbon emission from the telecom subsector sector are tri-fold; user devices, networks and data centres. This occurs during the production, use and disposal of the said equipment in the listed three use cases.

This is depicted pictorially as in figure 1.

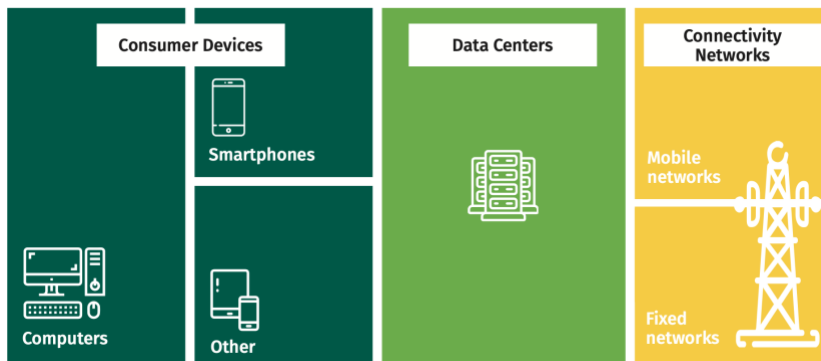


Figure 1 : Sources of ICT carbon emissions

Source : A Joint ITU/WB Report

According to the data from the United Nations Environment Program, Data centres contributed 45% of the ICT carbon footprint , networks 24% and user devices 31%, as in figure 2.

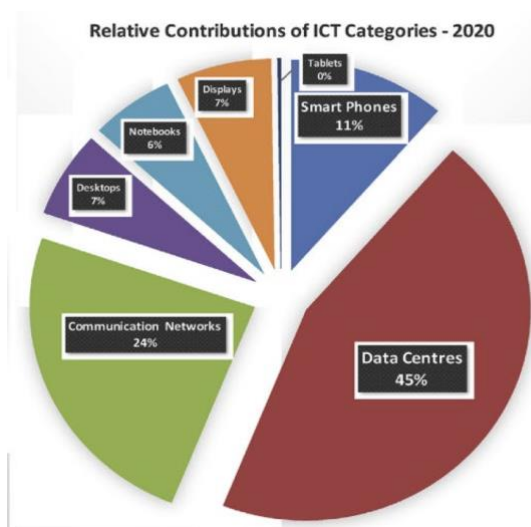


Figure 2: percentage contribution per value chain

Source: Joint ITU/World Bank report 2023

Reports from the International telecommunications Union indicate that the ICT sector contributes about three percent (3%) of the global carbon emissions, equivalent to roughly one (1) metric gigatonne of carbon emission.

There is a growing trend in Carbon emission in the telecom sub sector occasioned by:

- i.) Proliferation of ICT service users
- ii.) The trend in use the of multiple devices by ICT users due to reduced prices,
- iii.) Rising device/equipment processing and transmission power, case in point being third-generation (3G) mobile phones, which operate at higher frequencies and need more power than 2G phones
- iv.) A trend towards “always-on” usage modes
- v.) A tendency to store rather than delete older material

a) Postal Sub Sector

The postal subsector contributes to Carbon emissions through production and disposal of packaging materials , electricity and generator power in postal/courier offices, parcels sorting machines , transportation of parcels , and production of stamps.

The various functions in the postal sub sector that contribute to Co₂ are:

- i.) Transportation of letters and parcels , during combustion of fossil fuels in delivery vehicles and cargo airplanes which emit carbon dioxide.
- ii.) Operational Logistics where power used for lighting in postal/courier facilities , powering of automated sorting machines , conveyor belts, and powering general office electronics contributes to carbon emissions.
- iii.) Procurement of postal consumables like stamps and packaging materials which results in carbon emmissions during extraction and manufacturing of the consumables , and during their transportation to various postal/courier outlets .
- iv.) Waste management through transportation and ultimate burning /destruction of non re-usable postal/courier packaging materials, which emits carbon dioxide

Diagrammatically , this is depicted as in figure 3

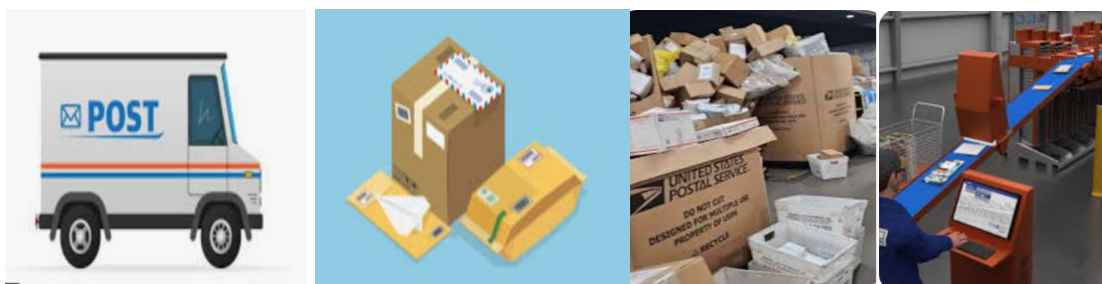


Figure 3: Sources of Co₂ in Postal/Courier sub sector

6. Emerging Sources of Carbon Emissions in the ICT sector

Emerging trends exacerbating carbon emissions in the ICT sector include the proliferation of ICT users, increased use of multiple devices by ICT users due to decreasing prices, escalating processing power and transmission power demands (case in point third-generation (3G) mobile phones operate at higher frequencies and need more power than 2G phones) and a shift towards “always-on” usage modes, and data retention practices.

7. ICT as Part of the Solution to Carbon Emission Reduction

Various ICT enabled activities have contributed to carbon emission reduction, with examples such as:

- a) e-commerce, e-working, e-learning, e-government and e-banking where the online services reduce the fuel consumption needed to travel to the place of service.
- b) Smart cities, Smart buildings and Smart manufacturing that use energy efficient technologies to control energy consumption.
- c) Mechanisation where franking machines are used in place of physical stamps

8. ICT Standards and Guidelines on Carbon Emissions Reduction

Contemporary ICT standards related to carbon emission reduction are shown in table 1.

Table 1: Contemporary ICT standards related to carbon emission reduction.

No.	Standard	Source	Description
1.	ITU-T L.1420 (02/2012)	International Telecommunications Union	Presents a methodology for energy consumption and greenhouse gas emissions impact assessment of ICTs in organizations
2.	ISO/IEC 30134: Information Technology – Data center energy efficiency metrics	International Organization for Standardization	Focuses on energy efficiency metrics for data centers.
3.	OSCAR ISO 14001	Universal Postal Union	Online Solution for Carbon Analysis and Reporting for the postal and courier sector
4.	Guidelines-for-Undertaking-ICT Infrastructure-Works	Communications Authority of Kenya	The guidelines encourage design and implementation for use of energy efficient solutions (smart), use of green power (solar), sharing of power sources, and utilizing the circular economy principles (sharing, leasing, reusing, repairing, refurbishing and recycling)
5.	Guidelines for Network Redundancy, Resilience and Diversity for ICT Networks in Kenya	Communications Authority of Kenya	The Guidelines encourages service providers to make use of, as possible, green power, infrastructure sharing, and utilize commercial data centers

9. ICT Carbon Emission Reduction Efforts

When new ICT projects, e.g., new transmission sites, new cable laying, new equipment type approval, among others are presented to the Authority for approval, the Authority will consider efforts made to reduce carbon emission.

Among the measures encouraged are:

i. Use of Green Power

Design of ICT projects with use of green power integrated in the design e.g., solar and wind; use of energy efficient equipment; will be considered in the approval of new ICT projects.

Postal and courier operators are encouraged to use solar panels as their main source of power in outlets.

ii. Use of Smart Technology

All new ICT projects will be required to embrace smart technology in so far as power consumption is concerned. Smart lighting systems, smart ICT data centers, smart buildings that host ICT equipment and systems, smart ICT sites etc.

iii. Disposal of Obsolete and Damaged ICT equipment

When new ICT projects, e.g., new transmission sites, new cable laying, new equipment type approval, among others are presented to the Authority for approval, the service provider will include a disposal plan that has the least impact on the environment is so far as carbon emission is concerned. This can include re-use, recycle and refurbishment.

Packaging materials used in delivery of postal articles and parcels should be made of easily biodegradable materials and be capable of being recycled for as long as possible , and re-used for other activities beyond delivery and posting of articles.

iv. Use of Cloud Technology, Virtualization and Public Data Centers

Due to the emerging need to store data for longer periods due to legal requirements, the Authority will encourage use of cloud technology to store data for longer periods and use of public data centers as opposed to private acquisition of servers by each and every institution. This will reduce on power consumption, and the carbon emission due to production of new servers, transportation to places of use and during their disposal. Firms with private servers will be encouraged to use virtualization and therefore reduce on the server count.

v. ICT Infrastructure Sharing

New ICT projects will be granted approval on the basis that they are constructed on a shared ICT infrastructure basis, and their design is in full compliance with the Authority's framework for infrastructure sharing.

vi. Postage Stamps Replacement

The postal subsector is encouraged to adopt the use of Franking Machines , as opposed to physical stamps, where posting envelopes are sold at postal outlets pre franked, with different prices based on the sizes of the articles to be posted.

vii. Use of Alternative Modes for Last Mile Postal Articles Delivery

For last mile delivery of postal articles , it is encouraged that electric vehicles /scooters , bicycles, in addition to use of vehicles with emission control technologies like catalytic converters and diesel particulate filters, Exhaust Gas Recirculation, among other technologies.

viii. Optimization of Delivery Routes for postal/Courier Articles

In delivery of postal and courier articles , service providers are encouraged to plan routing of posted articles in a way that reduces the distance travelled between delivery points , to reduce emissions due to transportation.

ix. Use of OSCAR Platform

Postal and courier service providers are encouraged to register on the free Online Solution for Carbon Analysis and Reporting (OSCAR) platform, which uses questionnaires with a set of questions to compute CO₂ contribution of each postal/courier, and then generates the impact by scope, product and source of the service provider. The results can also be used to compare the service provider performance with industry reported averages. The tool also, based on the responses to the questionnaire , highlights the results of the mitigation efforts reported in the questionnaire over the years .

10. Monitoring and Reporting of Reduction of Carbon Emissions

Service providers will on an annual basis report on their efforts to reduce their individual carbon footprint.

The reporting template will be embedded in the quarterly compliance returns form, but will be reported on annual basis. The reporting template for the telecom and postal subsectors will be as shown in table 2 and 3 .

Table 2: Dimensions for evaluation of telecom service provider efforts toward ICT carbon footprint reduction

No	Metric	Total Number	Metric Number	Percentage of Metric to Total Number	percentage for previous year (N/A for first year of reporting)
1.	Green ICT sites				
2.	Shared ICT sites				
3.	Smart ICT sites				
4.	Cloud /Public Data Center hosted Services				

Table 3: Dimensions for evaluation of postal/courier service provider efforts toward ICT carbon foot print reduction

No	Metric	Total Number	Metric Number	Percentage of Metric to Total Number	percentage for previous year <i>(NA for first year of reporting)</i>
1.	Outlets using green power				
2.	Green power Last mile delivery vehicles/scooters/bicycles				
3.	Letters/articles sent using Franked envelopes or non physical stamps				

*The Authority will from time to time verify the reported data on efforts to reduce the ICT carbon footprint