ASSESSING THE IMPACT OF AIRPORT OPERATIONS ON SOME ASPECTS OF THE ENVIRONMENT OF THE KOTOKA INTERNATIONAL AIRPORT, GHANA.

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Outline

1. Introduction
2. Impact of operations at the Kotoka International Airport (KIA) on the environment
3. Action Plan filed with the International Civil Aviation Authority (ICAO) by the Ghana CAA
4. Research on alternative fuels in Ghana

INTRODUCTION

- Aviation sector is growing fast and will continue to grow. The most recent estimates suggest that demand for air transport will increase by an average of 4.3% per annum over the next 20 years. (Credit ICAO)
- Growth in aviation sector is having an increasing environmental impact accounting for 2% of global emissions
- Concerns about climate change are increasing
- Aviation is expected to contain the growth of its carbon footprint in the context of the global efforts to reduce CO2 emissions.
- Aircraft noise, local air quality and water continue to receive growing concerns from the community

INTRODUCTION

- The major challenge we face as operators and regulators is to:

1. Balance the role of transport in promoting development
2. Reduce carbon emissions.
3. Maintain safe and secure networks.

The Ambition – Agenda Setting and Coordination

- Research
- Regulatory Strengthening
- Build the Infrastructure
- Talent and Know-how

Impact of operations at KIA on the environment

KIA Overview

- **STUDY AREA**

✓ KIA is the only International Airport in Ghana.

✓ The airport covers a total area of about 740 hectares.

✓ Shares boundaries with the Air force Base, and industrial and residential areas.

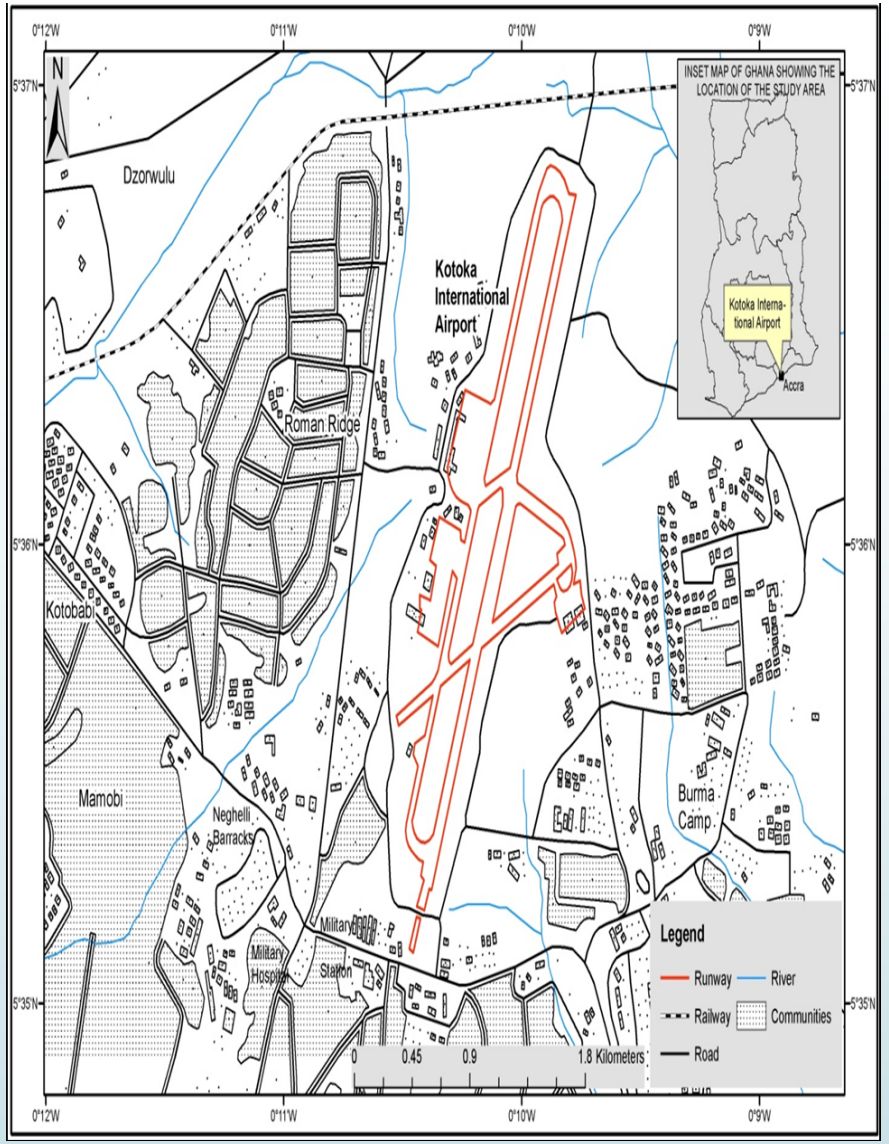
✓ The surface type of the apron is asphalt and the surface of each aircraft stand is concrete, with ground profile of graveled surface.

✓ Runway 03/21, Length - 3400, width – 60m

✓ Airlines/Aircraft types- AWA, AirGh, KLM, United, Delta, Emirate, Ethiopia,

Boeing (737, 747, 767, 747, 777, 787)

Airbus (319, 320), Embraer 145, Dash-8



KIA Overview

Environmental Impact Assessment

- **METRICS USED**

1. Noise levels at two (**2**) different locations within the K.I.A.

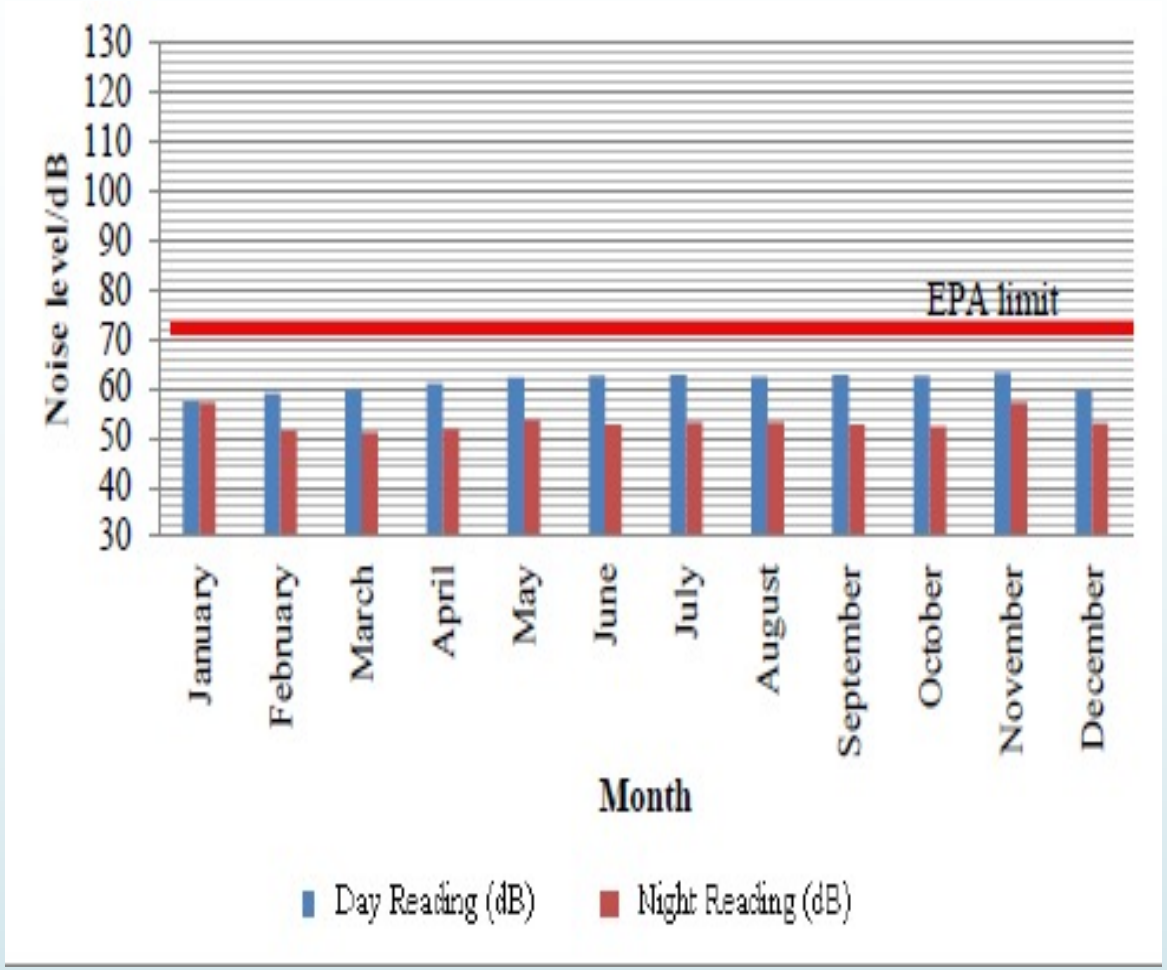
2. Particulate Matter (PM) at three (**3**) different locations within the K.I.A.

3. Physico-chemical (pH, Electrical Conductivity and Hydrocarbons) and microbiological in the water bodies within K.I.A

Ambient Noise Levels (Day and Night)

1. **Fire Station Location**

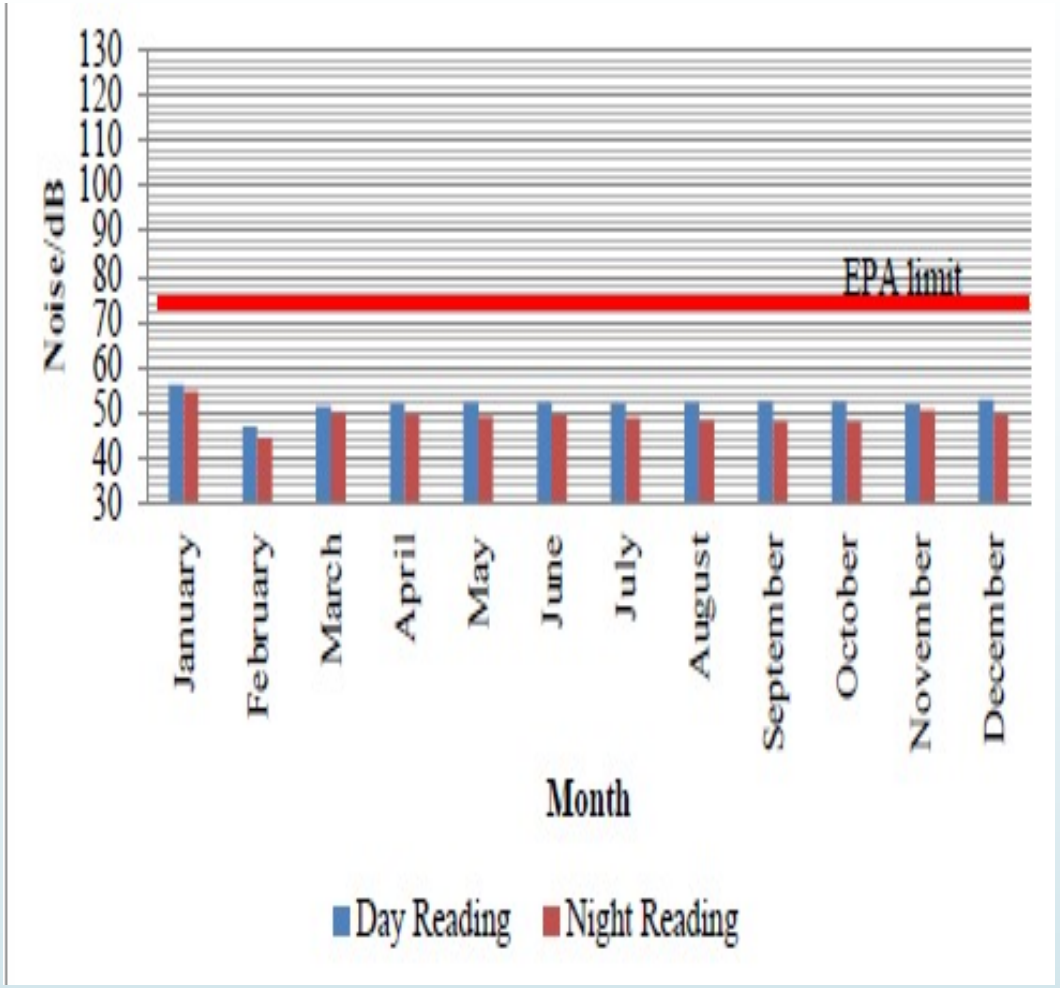
- ✓ An overall average of **52 dB** recorded at day-time.
- ✓ An overall average of 49.2 **dB** recorded at night-time.
- ✓ The EPA limit of **70 dB** was not exceeded in any case.



Ambient Noise Levels (Day and Night)

2. Runway 21 take off Area

- ✓ The overall daytime-nighttime average was **57.3 dB**.
- ✓ The EPA limit of **70dB** was **not** exceeded in any case.



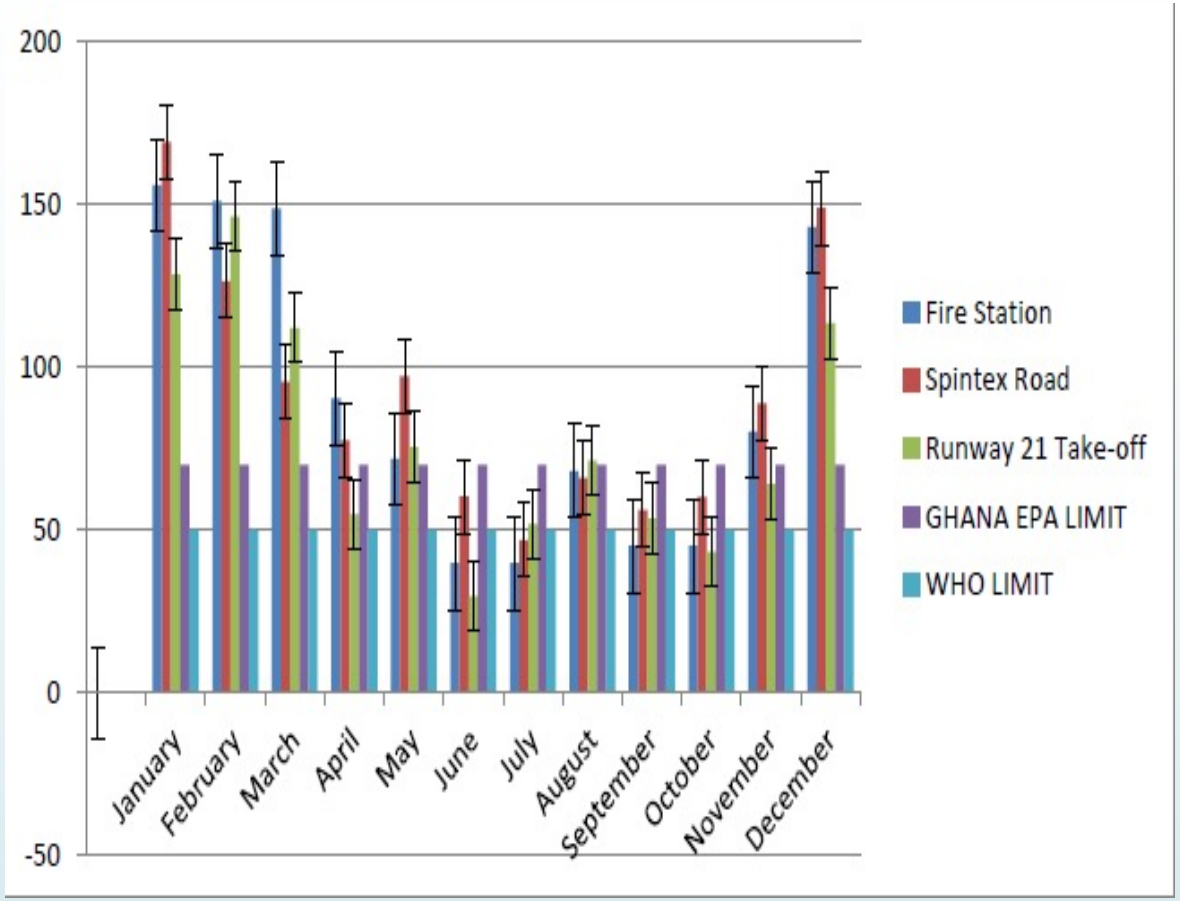
Particulate Matter Levels

- Particulate Matter (PM) levels were measured at each sample location for every 24-hour period of 12 months.
- The following classifications of PM were monitored:

1. **Primary PM** – Created directly by combustion, mechanical abrasion, or erosion processes of jet engines.
2. **Secondary PM** – Formed from chemical reactions involving NOX, SOX, ammonia and other compounds in ambient atmosphere.
3. **Emissions from airport operations** – non-aircraft aviation related sources (e.g. ground support equipment)

Particulate Matter Levels

- ✓ The maximum PM_{10} concentration at the fire station was **155.8 µg/m³** with an average of **80.9 µg/m³** over the 12-month period. The WHO air quality guideline of **50 µg/m³ was exceeded 8 times .**
- ✓ The Spintex Road sampling site recorded the highest average PM_{10} concentration of **91.1 µg/m³**. The WHO air quality guideline of **50 µg/m³ was exceeded 11 times** over the 12-month period.
- ✓ The lowest PM_{10} concentration of **29.8µg/m³** occurred at the Runway 21 sampling site. The WHO air quality guideline of **50 µg/m³ was exceeded 10 times** with an average of **78.7 µg/m³** over the 12-month period.



Particulate Matter Levels - Comments

PARTICULATE MATTER (PM_{10})

- ✓ This study indicates that operations at K.I.A have contributed to high particulate matter concentration(PM10) in the surrounding environment.
- ✓ All the sites recorded dust values above the WHO and Ghana EPA air quality threshold limits of 50µg/m³and 70µg/m³,respectively.
- ✓ Aircraft brakes and tyre emissions during landing could be the main reasons for the high results obtained at the fire station.
- ✓ The high values are also due to wind blowing toward the sampled stations at the time of sampling events.
- ✓ Particulate matter concentrations were highest in the dry season as compared to the wet season.
- ✓ Particulate matter concentrations at runway 21 take-off were generally lower than the Ghana EPA recommended value of 70µg/m³. This could be attributed to reduced performance of aircrafts in taxiing to position for take-off, as well as the decrease in usage of GSE and human activities in the proximity of the Runway 21 take-off.

Surface Water Monitoring

- Water samples collected from 3 sampling sites all located below KIA runway 21 take-off area.
- The following indicators were monitored:

1. **Electrical Conductivity, pH and Hydrocarbon in the surface water samples**
2. **Heavy Metals Concentrations In The Water Samples From The Study Area.**
3. **Microbial Analysis In The Surface Water From The Study Area.**

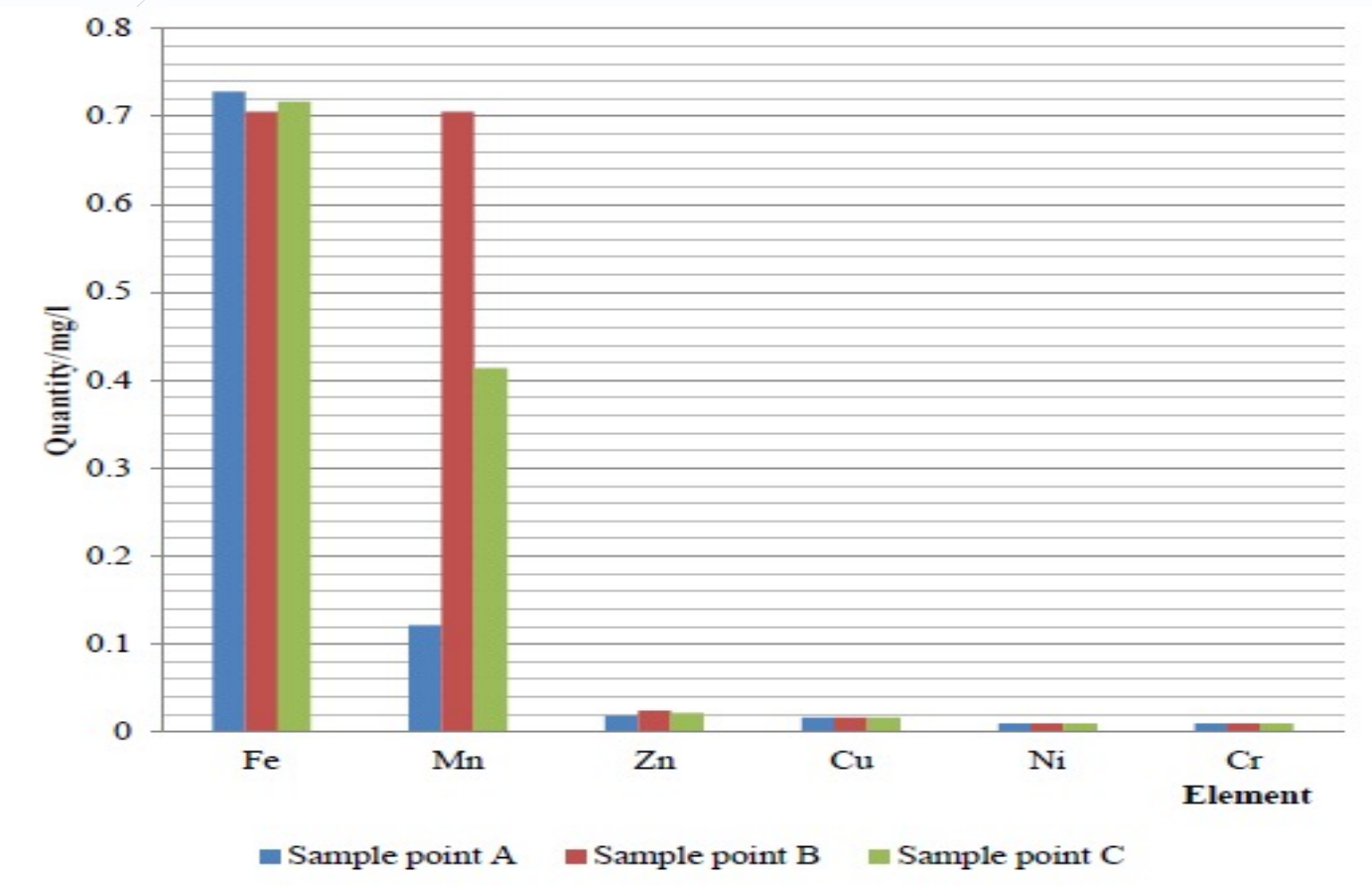
Surface Water Monitoring – Results 1

- **Electrical Conductivity, pH and Hydrocarbon in the surface water samples.**

pH(pH units)			
Parameter	**Mean**	**Std. Deviation**	**EPA limit**
Sample point A	7.566	±0.85	6.0 - 9.0
Sample point B	7.284	0.48	6.0 - 9.0
Sample point C	5.978	--	6.0 - 9.0
EC(µS/m)			
Sample point A	489.4	239.29	1500
Sample point B	537.4	314.77	1500
Sample point C	557.4	322.72	1500
HC(mg/l)			
Sample point A	537.4	314.77	N/A
Sample point B	6.68	4.09	N/A
Sample point C	8.4	2.39	N/A

Surface Water Monitoring – Results 2

- **Heavy Metals Concentrations In The Water Samples From The Study Area.**



Surface Water Monitoring – Results 3

- **Microbial Analysis In The Surface Water From The Study Area.**

Parameter (Coliform counts) Total plate counts (E. coli)	Spintex Road	Runway 21Take - Off	PW Facilities
Mean Coliform forming Unit/100ml	4925.60	5107.80	5471.40
Standard deviation	4236.91	4745.31	4976.91
EPA limit	400.00	400.00	400.00

Surface Water Monitoring – Comments

- **PHYSICO-CHEMICAL ANALYSIS OF SURFACE WATER**

✓ Data obtained for the year from shows that day to day operations at KIA do not have significant effect on surface waters around the airport.

✓ Both conductivity and hydrocarbon content in the surface waters were lower than limits set by Ghana EPA(EPA, 2000).

✓ pH values recorded at the Spintex Road, PW plant yard (runway 21 take – off) and PW batching facility were generally within EPA permissible levels of between 6 to 9, except that water sample from the batching facility recorded a mean pH value that was slightly lower.

✓ Direct or indirect discharges of substances into the aquatic environment mostly come from runoffs from the airport pavements which enter nearby water bodies. There were also recorded trace amounts of iron, manganese, zinc, chromium, nickel and cadmium

✓ The fairly acceptable parameters measured for the surface waters around the airport could be due to highly trained environmental airport waste management staff; proper waste management practices.

Surface Water Monitoring – Comments

- **MICROBIOLOGICAL ANALYSIS OF SURFACE WATER**

✓ The study indicates that coliform counts were higher in all the three sampling sites with all sites recording values higher above the Ghana EPA recommended standards for bathing water.

✓ The high coliform counts in the streams could be due to poor waste management

✓ Within the Kotoka International Airport (KIA), there is only one stream that collects storm water runoff from part of East Legon and is often polluted upstream by people who use this area as a place of convenience.

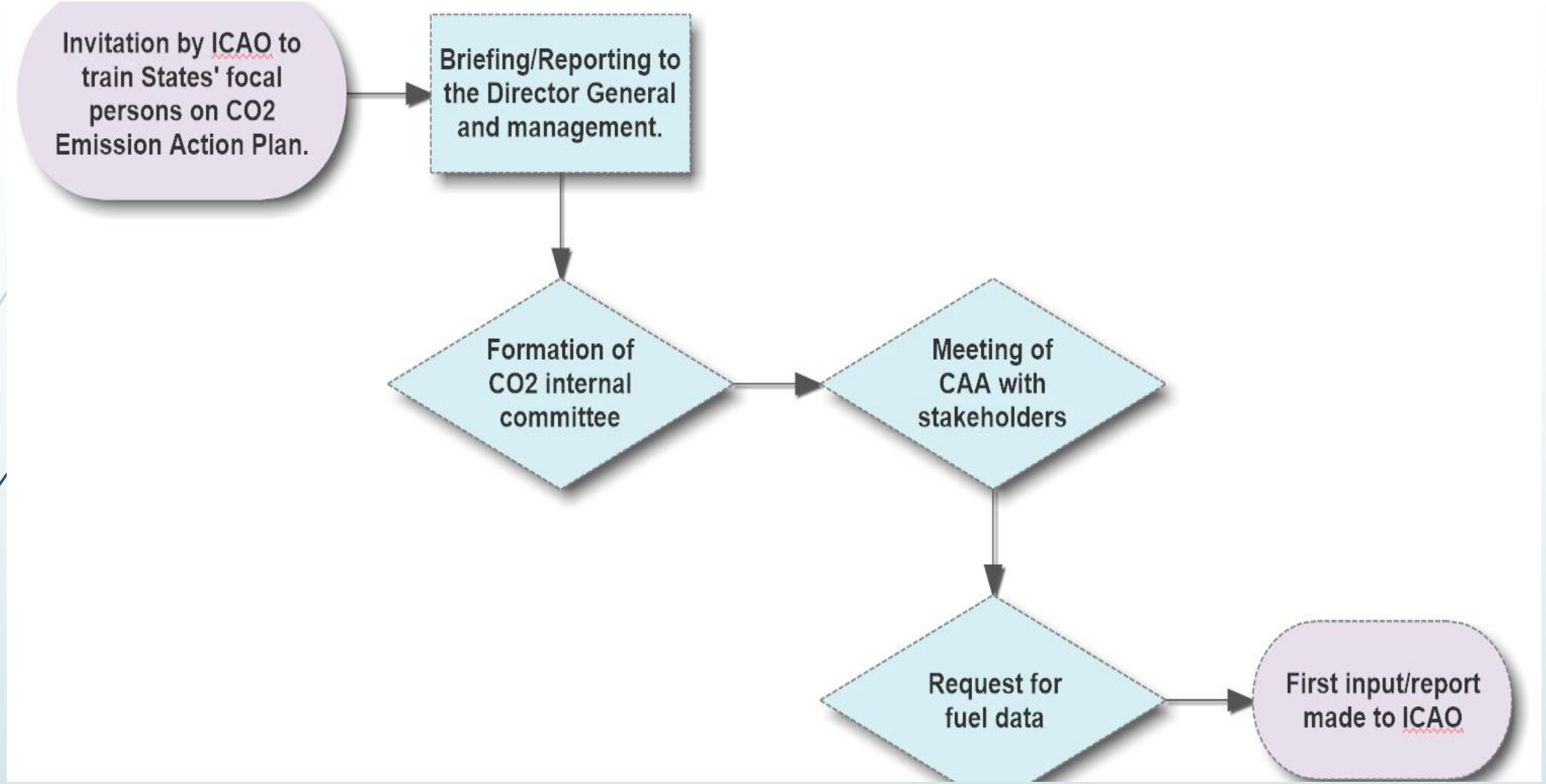
✓ Hence, water samples from sites A, B and C continue to fall outside the EPA limits.

✓ Hydrocarbons and iron content in the stream were also high making it unsuitable for drinking purposes.

Action Plan filed with ICAO by Ghana CAA

Emission Of CO2 From Aircraft Fuel

Road map to State Action Plan (SAF)



Calculation CO2 Emissions of a Flight

- **To calculate of the total amount of CO2 emitted;**

  Emission factor 3.16kgCO2/kgfuel * total fuel consumed.

- **To calculate for the actual CO2 for an aircraft consider;**

  Distance covered by flight

  Quantity of fuel used to cover distance

  Number of passengers

  Number of cargo

- **To calculate for the actual CO2 emissions per passenger consider;**

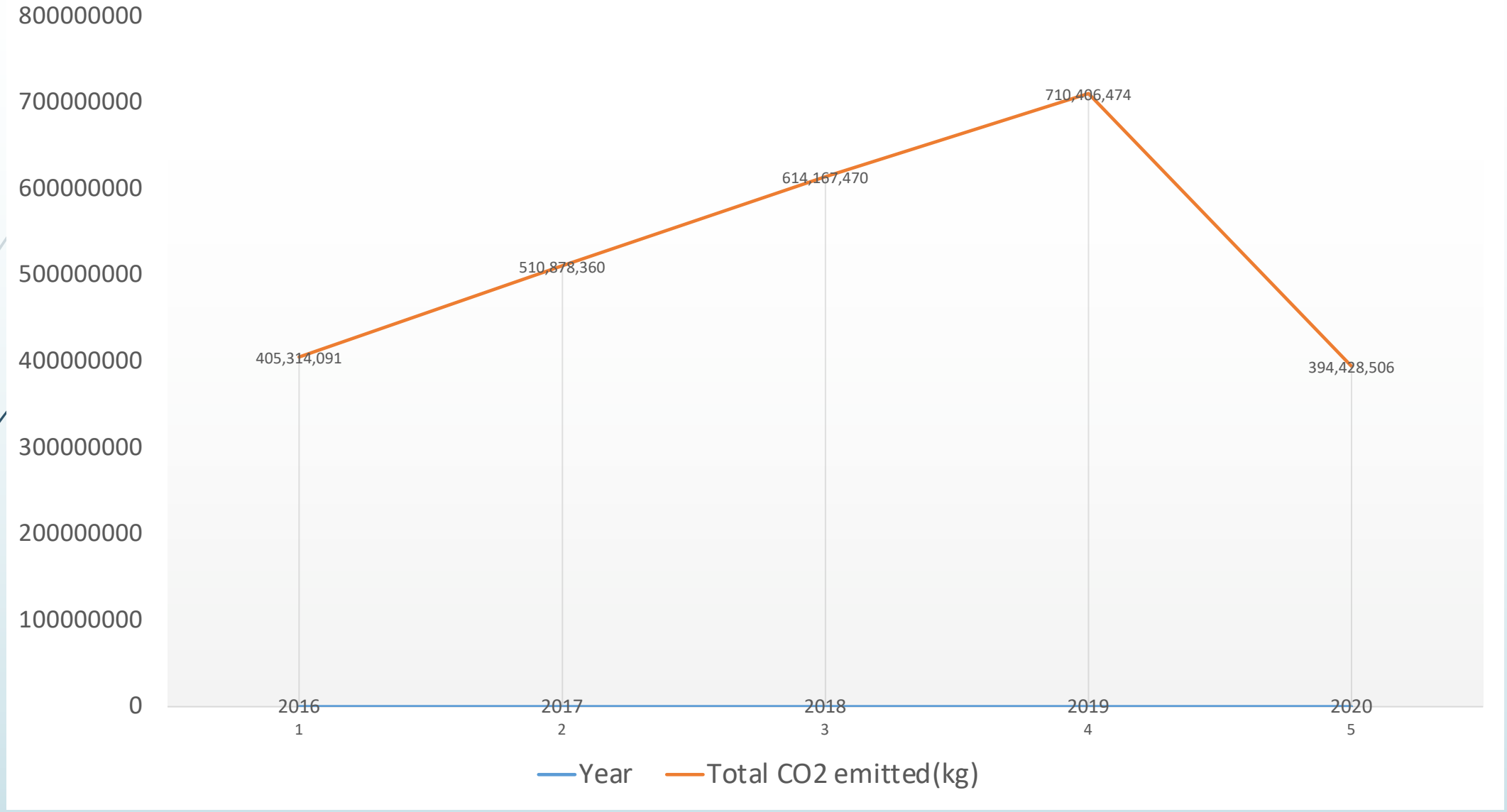
CO2 per pax = 3.16 *(total fuel * pax-to-freight factor)(number of y-seats * pax load factor).

NB: 3.16KgCO2/kgfuel –Constant representing the number of CO2 produced by burning 1kg of aviation fuel.

CONT'D

Year	Total fuel Consumption(lts)	Total fuel Consumption(kg)	Total CO2 emitted(kg)
2016	164,020,400	128,263,953	405,314,091
2017	206,739,600	161,670,367	510,878,360
2018	248,538,100	194,356,794	614,167,470
2019	287,483,600	224,812,175	710,406,474
2020	159,615,300	124,819,165	394,428,506

TREND ANALYSIS



Action Plan

ACTION ITEM	SPECIFIC TASKS
Improved Air Traffic Management (ATM) and infrastructure use	•Introduction of new routes in the Accra Flight Information Region (FIR) •Flexible and direct routing airspace planning within the Accra FIR •Performance Based Navigation (PBN). Continuous decent operations and continuous climb operations. •Airport collaborative decision making to make decision in real time to reduce fuel. •Atlantic Ocean Random Routing Area (AORRA)

Action Plan

ACTION ITEM	SPECIFIC TASKS
Regulatory Measures	• Legislative reform • Part 16 Section 2 (Aircraft Engine Emissions)

ACTION ITEM	SPECIFIC TASKS
Modernisation of Kotoka International Airport (KIA) Facilities	• Use of renewable energy sources in the upgrade of airport facilities • Use of LED/ other energy serving for electrical facilities • Installing equipment at gates to reduce the use of auxiliary power units

Action Plan

ACTION ITEM	SPECIFIC TASKS
Introduction of Newer Aircraft to their Airline fleet and Ground Handling Equipment	• Airline operators are adopting new operational measures to increase their fuel efficiency. • Airline operators have introduced maintenance systems and planning procedures to ensure reduction in CO2 emissions. • Introduction of environmental management practices like ISO14000 by ground handlers is contributing to the reduction in emissions in general.

Research on Alternative Fuels in Ghana

Alternative Fuels

Ghana's position on biofuels:

- Draft Bioenergy Policy 2010
- Not adopted by Cabinet yet.
- Support the development of biofuels industry to:
  - secure energy security,
  - reduce oil import,
  - generate employment; and
  - support climate change mitigation

Alternative Fuels

- Target: 20 pct of fuel consumed to be from biofuels by 2030
- Strategy: Remove institutional barriers to promote private sector participation, ensure development of competitive market, support export and reduce CO2 emissions
- Feedstock: Biofuel produced from biofuel seeds processed into crude oil instead of oil palm and other food crops, and also waste cooking fats and oils
- Govt will give the same kind support like do for other cash crops (cocoa, cassava etc) and tax holidays to encourage investment and development of industry

Summary and Initiatives

- Aviation environmental system(AES) for CO2 emission reduction(monitoring and reporting system)- Air, noise and water quality monitoring
- Submission of Emission Monitoring Plans (EMPs) by aeroplane operators
- Monitoring Reporting and Verification (MRV)
- Development of feasibility for sustainable alternative fuels.
- Installation of solar panels and electrical ground power units that supplies aircraft at the gates with solar energy.

KIA New Terminal and Airside


Thank
you