



TRAINING AND ADVISORY ACTIVITIES ON CLIMATE
PROTECTION FOR CHEMICAL INDUSTRIES IN GHANA

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

INTRODUCTION

- Arrival and Registration
- Welcome Remarks – Seth Twum Akwaboah, CEO, AGI
- Remarks - George Johnson, Technical Advisor – CAPCI, GIZ
- Remarks – Baerbel Freyer, CTO - AGI Energy Service Centre
- Final Report Presentation
- Moderated Discussions

OVERVIEW

- **Climate change is one of the most pressing challenges of our time;**
- Long-term commitment and ambitious action towards greenhouse gas (GHG) mitigation is required by practically all sectors of the economy.
- The chemical industry is a fundamental cornerstone of modern life and the manufacturing industry, accounting for 90% on chemicals and chemical products about 90% of chemicals and chemical products
- It also accounts for around 10% of the world's final energy demand and 7.4% of global greenhouse gas emissions

BRIEF BACKGROUND

- Ghana is one of three focus countries of the global CAPCI project (Climate Action Programme for the Chemical Industry), together with Argentina and Thailand. In the first part of the project, CAPCI activities in Ghana included a baseline study and two national stakeholder dialogues on chemistry and climate change. In addition, experts from Ghana participated in a training of trainers and study visit to Germany.
- In this second part, CAPCI activities concentrated on capacity building and training as well as support for companies in designing efficient mitigation measures. The activities of CAPCI Ghana were carried out by the Energy Service Centre of the Association of Ghana Industries and closely coordinated with the GIZ's energy and climate cluster and the Environmental Protection Agency (EPA) as a political partner.
- This final presentation is based on the work carried out under the second part of CAPCI's activities

ASSIGNMENT IMPLEMENTATION PLAN



ASSIGNMENT ACTIVITIES

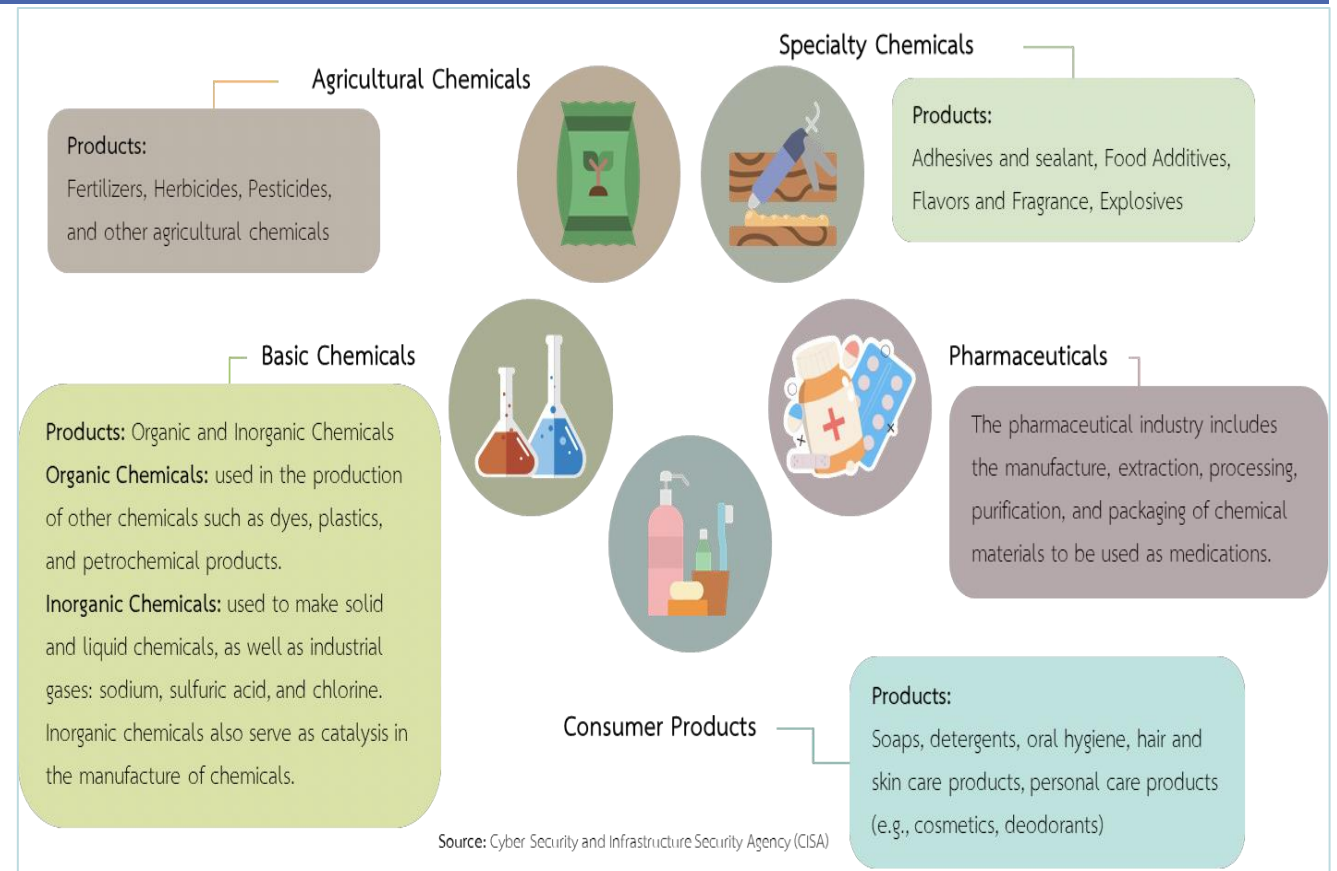
Assignment Activities	Activities Completed	Activities to be Completed By
Interviewing the Companies in the Chemical Industry in Ghana	July 2023	
Preparing Report (1) on Findings of the Survey	August 2023	
Developing Greenhouse Gas Emission Accounting & Reduction Training for the Chemical Industry, geared at addressing findings of the survey	August 2023	
Carrying Out Greenhouse Gas Emission Accounting & Reduction Training for the Chemical Industry	August 2023	
Preparing Report (2) on Training Programme (1)	August 2023	
Undertaking Technical & Advisory Activities: Developing the Forms and approach for the Energy Audit and Resource Use Efficiency Analysis	September 2023	
Carrying Out the Technical & Advisory Activities i.e. Energy Audit (5 Companies) and Resource Use Efficiency Analysis (5 Companies)	September 2023	
Preparing Reports (3) on Technical/Advisory Activities: Energy Audit and Resource Use Efficiency Analysis geared towards process optimization and GHG mitigation	Oct-Nov 2023	
Developing Training Programme and Strategy Session on the Technical and Advisory Activities i.e. Energy Audit and Resource Use Efficiency Analysis	November 2023	
Carrying Out the Developing Training Programme and Strategy Session on the Technical and Advisory Activities i.e. Energy Audit and Resource Use Efficiency Analysis	November 2023	
Preparing Report (4) on Training Programme (2)	November 2023	
Developing the Presentation on the Assignment	November 2023	6
Carrying Out the Presentation on the Assignment		5th Dec 2023
Preparing the Overall Assignment Report (5)		15th Dec 2023

ACTIVITY I: SURVEY OF COMPANIES IN THE CHEMICAL INDUSTRY IN GHANA



GHANA & ITS CHEMICAL INDUSTRY

- Ghana's Green Growth Index is estimated at 51%, or about halfway to its green growth target.
- This indicates that with the right green growth policies and strategies, Ghana could achieve economic growth while reducing vulnerability and building resilience to climate change.
- This requires boosting financing from public and private sources. An estimated \$1.9 billion a year in financing is needed to meet the country's Nationally Determined Contribution.
- The main source of climate finance has been the public sector, which contributed \$100 million, leaving a gap of \$1.8 billion a year for 2020–30.

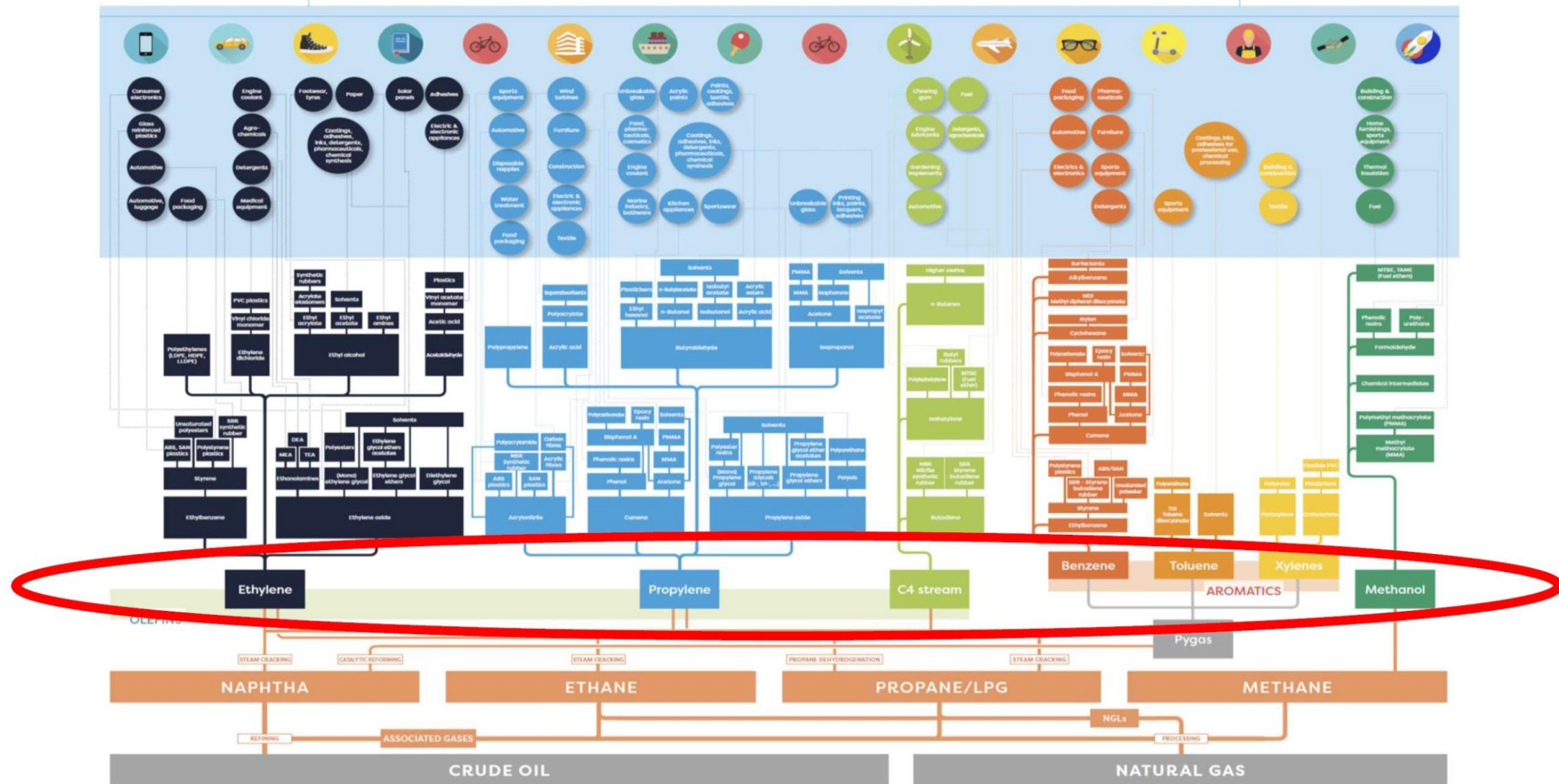


GHANA & ITS CHEMICAL INDUSTRY: THE POTENTIAL

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THE STUDY

- **The Structure and Interview covered:**
 - **PART 1: The Companies**
 - **PART 2: Perspectives on Ghana's Climate Change Policy**
 - Level of Concern about Climate Change
 - Feeling Responsible to tackle Climate Change
 - Knowledge of Greenhouse Protocol
 - Knowledge of the Substances with High Global Warming Potential
 - Knowledge of Guidelines for Sustainable Chemicals
 - Knowledge of Ghana's Climate Change Policy
 - Climate Change Prevention Policy at the Company Level

THE STUDY

■ The Interview covered:

■ PART 3: Status Quo Analysis on tackling GHG Emission Reduction

- GHG Emission Tracking System
- Unit or Staff Responsible for Activities of GHGs Inventory and Ozone Protection
- Activities Targeted at GHGs Inventory & Mitigation, and Ozone Protection
- Training of Employees
- Environmental Policies being Consistent with Management Practices
- Generation of Carbon Dioxide and Methane
- Use of Ozone Depleting Substances
- The Handling of Solid Wastes in General
- The Handling of Used Refrigerant Cylinders and Canisters
- The Handling of Waste Lubricants (Dirty Oils, Break fluids, Etc.)
- The Handling of Waste Paints
- The Handling of Waste/Expired Drugs/Pesticides
- The Handling of Expired and Waste Degreasers, Detergents, Cleaning Chemicals
- The Handling of Waste Fire Extinguishers & Gas Cylinders and Aerosol Cans
- Chemical Use Records

THE STUDY

- **The Interview covered:**
 - **PART 4: Capacity Building for the Low Carbon Chemical Industry & Improving Efficiency**
 - Interest in Building Capacity
 - Belonging to Networks or Groupings
 - Willingness to Use Renewable Energy
 - Preparedness to Improve Resource Use and Process Efficiency
 - Support to Reduce GHG Emission

THE STUDY

- **The Interview covered:**
 - **PART 5: Challenges and Recommendations to Support the Low Carbon Chemical Industry**
 - The Barriers Preventing Companies from implementing GHG Reduction activities
 - The Barriers Preventing Companies from Reducing Wastes
 - Company Level Challenges
 - Other Challenges in General
 - Efforts and Responsibility for Meeting what has to be done at the Company Level
 - Grading the GHG Emission Abatement Opportunity, Going Forward
 - Suggestions and Recommendations

THE STUDY OBSERVATIONS

■ **PART 1: The Companies**

- The survey took place between June 26th and August 1st of 2023. Thirty-Three (33) companies were interviewed. Interviewees were mainly managers. In Person & Filling of Questionnaire

■ **PART 2: Perspectives on Ghana's Climate Change Policy**

- 90.1% of the respondents indicated feeling responsible to do something about tackling greenhouse gas emission and about decarbonisation of their operations and facilities
- 60.6% of the respondents indicated knowledge of the Greenhouse Protocol
- About 75.8% of the interviewees have from fair to high level of knowledge on substances with high global warming potential
- 56.3% of interviewees indicated they had no knowledge of the Guidelines for Sustainable Chemicals

THE STUDY OBSERVATIONS

■ **PART 3: Status Quo Analysis** on tackling GHG Emission Reduction

- Out of the 9 respondents (27.3%) that mentioned that their facilities duly have a Climate Protection Policy, 8 (24.4%) confirmed that their policy was consistent with UNEP's Guidelines of Sustainable Chemicals
- 72.7% (24) of Interviewees indicated that their facilities do not have Climate Change Prevention or Climate Protection Policy
- 78.8% of interviewees (26 out of 33) indicated that their facilities do not have any system in place to track Greenhouse Gas emissions
- 72.7% of interviewees indicated that their facilities do not have a Unit or Staff dedicated to GHGs inventory and mitigation, and ozone protection activities.
- 42.4% of interviewees indicated that they in fact have undertaken activities geared towards GHGs Inventory, Mitigation or Ozone Protection
- 51.1% (17 Interviewees) of the interviewees indicated their employees are not required to detect and report environmental problems during operations.
- About 10-20% of the interviewees use such substances as Nitrous Oxides, CFCs, HFCs, HCFCs, PFCs, Halons, Methyl Bromide, Carbon Tetrachloride, Sulphur hexafluoride, etc. in their factories

THE STUDY OBSERVATIONS

- **PART 4: Capacity Building for the Low Carbon Chemical Industry & Improving Efficiency**
 - **57.6% (19 Interviewees)** suggested that their facilities do not have awareness training programmes for their employees on environmental protection, ozone protection and GHGs inventory and reduction
- **PART 5: Challenges and Recommendations to Support the Low Carbon Chemical Industry**
 - The bulk of them expressed interest in
 - Technologies for Energy Efficiency, Best Practices and Know-how
 - Methods for Emissions Calculations, Monitoring and Abatement
 - Have a Climate Protector Logo on their products
 - Etc.

STUDY CONCLUSIONS

- The study uncovered a good degree of awareness among respondents concerning climate change and its ramifications.
- The majority of participants acknowledged their responsibility in addressing emissions and exhibited a degree of familiarity with fundamental concepts such as the Greenhouse Protocol and Substances contributing to Global Warming. However, the varying levels of awareness and adoption of climate change policies highlight the need for targeted interventions.
- Key findings, as indicated in the above observations, underscore the importance of education and training in facilitating well-informed decision-making within the chemical sector. Notably, there exists a knowledge gap regarding the Guidelines for Chemicals, emphasizing the necessity of comprehensive educational initiatives. The study also identified areas for improvement in aspects related to GHG inventory, mitigation, ozone protection, and waste management, thereby highlighting the potential for heightened awareness, training, and technology adoption.
- Several deficiencies in current management practices were brought to the forefront, including challenges in monitoring GHG emissions, insufficient staffing for inventorying and protection, and the imperative for capacity-building efforts. Notably, companies exhibited a strong willingness to embrace renewable energy, enhance resource utilization, and improve process efficiency to curtail GHG emissions.
- In conclusion, addressing the challenges in the low-carbon chemical industry requires a multi-faceted approach involving policy enhancements, targeted awareness campaigns, collaborative initiatives, technological innovations, and skill development.

STUDY RECOMMENDATIONS

■ Companies

- **Education and Awareness:** Companies should invest in enlightening decision-makers about guidelines and stimulate training programs to enhance comprehension of climate change policies.

■ AGI-GIZ

- **Collaboration and Knowledge Exchange:** Dissemination of practices and knowledge through fora can comprehensively approach climate change mitigation, facilitating policy implementation

■ Government

- **Innovation and Recognition:** Invest in research, innovation, and acknowledge efforts through awards and certifications.
- **Transparency:** Foster candid disclosure of reduction efforts, waste production, and emissions, nurturing accountability.
- **Financial Support/Investment in Green Technologies:** Provide incentives for environmentally friendly practices and energy-efficient technologies.

STUDY RECOMMENDATIONS

- **Government**

- **Capacity Building:** Bridge knowledge gaps through training in GHG inventory, mitigation, and ozone protection.
- **Sustainability Integration:** Integrate climate change policies into sustainability strategies and regularly update practices.
- **Climate Protector Logo:** Inaugurate a logo to signify dedication to climate protection and environmentally friendly practices.

- **All**

- **Policy Advocacy and Development:** Tailor national policy, urge policy establishment, and collaborate with regulatory bodies to ensure compliance i.e Funds to enable companies invest in GHG Reduction and Abatement Options

ACTIVITY 2: GREENHOUSE GAS EMISSION ACCOUNTING & REDUCTION TRAINING



TRAINING #1

- The presentations included the following:
- Introduction
- **MODULE 1: Introductory Information & Definitions**
- **MODULE 2: Scope 1 Emission Accounting**
- **MODULE 3: Scope 2 Emission Accounting**
- **MODULE 4: Scope 3 Emission Accounting**
- **MODULE 5: Emission Reduction**

TRAINING #1

- There were 12 Practical Exercises during the 3 Day Training Programme. These included:
 - Putting several activities under the right GHG Protocol Scopes
 - identifying material sources of emissions associated with your operations, categorizing them as either direct and indirect emissions, and then further categorizing into scope 1, 2 or 3
 - Calculating Scopes 1, 2, and 3 Emissions with sample data
 - Determining ways to reduce Scopes 1, 2, 3 Emissions
 - Obtaining Management Commitment
 - Preparing Road Maps

ACTIVITY 3: TECHNICAL AND ADVISORY ACTIVITIES



ACTIVITY #3: ENERGY AUDIT & EFFICIENCY

- **The analysis was carried out as per ISO 50002:2014 COMPLIANT TYPE I**
- **Forms: Detailed forms for Data Gathering were developed on the ff:**
 - Company Profile
 - Types of Energy and Production
 - Lighting System
 - HVAC System
 - Equipment Inventory
- **The 5 Companies covered are:**
 - Tema Lube Oil
 - DAS Pharmaceuticals
 - FC Cosmetics
 - AZAR Chemicals
 - Accra Compost and Recycling Plant (ACARP)

ACTIVITY #3: ENERGY AUDIT & EFFICIENCY

- **The data gathered was duly analysed for conclusion drawing and recommendations, covering:**
 - Grid Electrical Energy Data
 - Fuel Energy Data
- **The analysis covered:**
 - Specific Energy Consumption
 - Electrical Energy Accounting Simulation
 - The Electric Load and Energy Balance was determined
 - Energy Sources and Q-Factor Correction were determined. In an AC system, the Q factor represents the ratio of energy stored in the capacitor to the energy dissipated as thermal losses in the equivalent series resistance

ACTIVITY #3: ENERGY AUDIT & EFFICIENCY

- **The Recommendations were provided covering:**
 - Specialised & unique recommendations for the site
 - Recommendations specific to the building services
 - Recommendations specific to the production processes
- **The Recommendations were prioritised according to:**
 - Zero capital expenditure (CAPEX) recommendations
 - Low capital expenditure (CAPEX) recommendations
 - Medium capital expenditure (CAPEX) recommendations
- **Suggestions were made towards targeted Recommendations**
- **Translating the Company's Energy Consumption into Greenhouse Gas Emissions (CO₂Eq),** and what could happen should the Company decide to undertake ISO 50002:2014 compliant type 2 energy audit, which is more detailed
- **Conclusions and Next Steps**

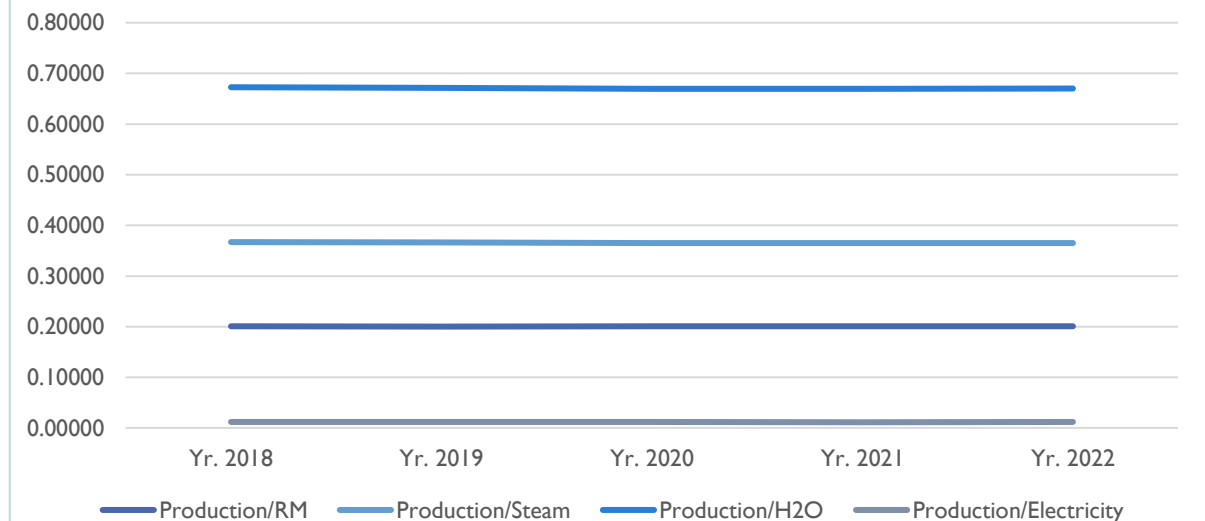
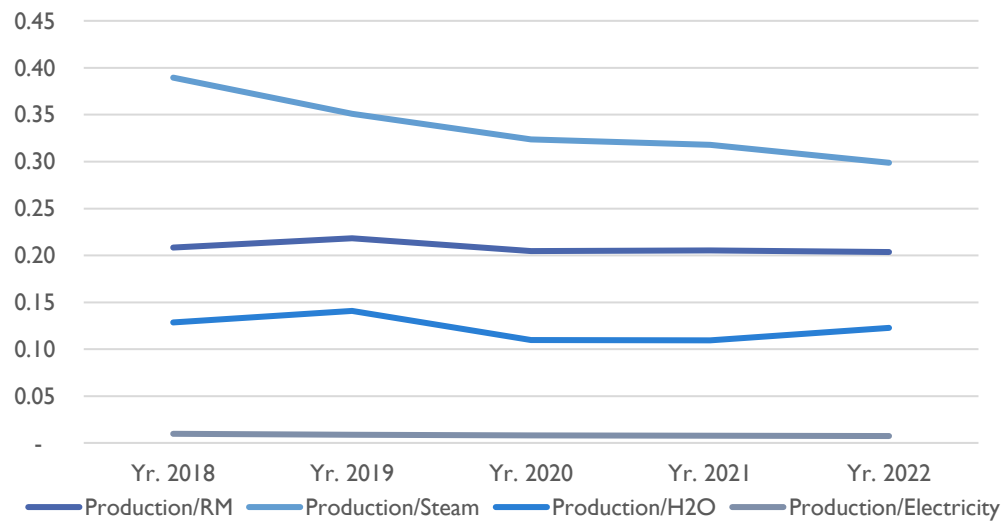
ACTIVITY #3: RESOURCE USE EFFICIENCY ANALYSIS

- **Forms were developed to gather information from the companies. These covered:**
 - Raw Material
 - Operating Supplies i.e. LPG, Electricity, Water, Firewood, Additives, Steam, Etc.
 - Production Details
 - Solid and Liquid Wastes
 - The above can be deepened with:
 - Hours of Machine Breakdown
 - Hours of Machine Idle Time
 - Manpower and Absenteeism, Etc.
- **The 5 Companies covered are:**
 - FC Cosmetics
 - AZAR Chemicals
 - PolyTank Ghana Limited
 - Juaben Oil Mills Limited (Mill, Palm Kernel Plant and Refinery)
 - Benso Oil Palm Plantation (Mill Operation only)

ACTIVITY #3: RESOURCE USE EFFICIENCY ANALYSIS

The premise is **SIMPLE**:

- The output divided by the input should, over the years be the same, or reduce slightly if the factory is efficient
- This information tracked over long periods could be used as industry benchmarks. See samples below:



ACTIVITY #3: RESOURCE USE EFFICIENCY ANALYSIS

- **The idea is to initiate diagnostics into why certain figures deviate from industry benchmarks and certain resources are consumed higher in certain periods with the same level of product**
- **Company specific reports were prepared, with corresponding recommendations provided covering the findings during the assessments**

ACTIVITY 4: TRAINING PROGRAMME ON THE TECHNICAL AND ADVISORY ACTIVITIES



TRAINING #2

- The presentations included the following:
- Introduction
- **MODULE 1: Energy Audit and Its Importance in Reducing Cost & GHG Emissions**
- **MODULE 2: Efficient Resource Use Analysis**
- **MODULE 3: Recap of GHG Emission Reduction Basics**
- **MODULE 4: Preparing an Emission Reduction Plan**
- **MODULE 5: Road Map Preparation**

TRAINING #2

- **MODULE I: Energy Audit and Its Importance in Reducing Cost & GHG Emissions**
 - **Understanding the Concept of Energy**
 - **Why Energy Auditing?**
 - **Energy Audit Objectives**
 - **Energy Audit Process**
 - **Energy Audit Systems**
 - **Energy Efficiency Measures**
 - **Energy Efficiency Opportunities covering** Compressed air systems, Motor Drives, Boiler/Steam Systems, Lighting Systems, Etc.
 - **Benefits of Energy Audits**
 - **Case Studies:** Three (3) Case studies, covering FC Cosmetics, Accra Compost and Recycling Plant (ACARP), and Tema Lube Oil were discussed in terms of Energy Saving Opportunity and Potential Energy Savings in KWH per Year and Cost Saving of Ghana Cedis per Year.

TRAINING #2

- **MODULE 2: Efficient Resource Use Analysis**
 - **Resources**
 - **Measurement of Resource Use Efficiency in a Factory**
 - **Other Efficiency Calculations**

TRAINING #2

- **MODULE 3: Recap of GHG Emission Reduction Basics**

- GHG Emissions and Types of GHGs
- The Ozone Layer and Ozone Depleting Substances
- Sources and Uses of GHGs, and current levels of importance
- The Global Warming Potential (GWP) of different GHGs
- Direct and Indirect Emissions
- Scope 1, 2, and 3 Emissions
- Sources of Scope 1 Emissions
- The Concepts of Stationary Combustion, Mobile Combustion, Fugitive Emissions and Process Emissions
- Sources of Scope 2 Emissions
- Sources of Scope 3 Emissions

TRAINING #2

- **MODULE 4: Preparing an Emission Reduction Plan**
 - The components of how to create a basic emissions reduction plan
 - How to identify the main emissions reduction levers
 - Some common activities that support the different reduction levers
 - The importance of carbon dioxide removals and their defining characteristics, and how to develop a procurement plan
 - Information about the initiatives that can help you achieve your emissions reduction goals

TRAINING #2

■ **MODULE 4: Preparing an Emission Reduction Plan**

■ The discussions included:

- The three levels to setting an Emissions Reduction Plan
- Setting macro-level goals
- Setting intermediate-level targets
- Identifying operational-level actions
- What are the key levers for reducing emissions at your company?
- Actions you can take under the energy efficiency lever; Quick Wins, Long Term
- Actions you can take under the renewable energy lever
- GHG emission reduction and abatement options
- Mitigation Options for Scope 1: Direct GHG emission reduction
- Introduction to Innovative PtX technologies for sustainable H₂ feedstock production from electrolysis of water with renewable energy (base load hydro power) for hydrogenation of CO₂ captured from other processes
- Mitigation Options for Scope 2: Indirect energy-related GHG emission reduction

TRAINING #2

- **MODULE 4: Preparing an Emission Reduction Plan**
- The discussions included:
 - Substitution and phasing down the consumption and production of fluorinated products with high global warming potential
 - Reducing fugitive emissions in gas transmission and distribution pipelines
 - Actions you can take under the mobility lever to address direct emissions (Scope 1 perspective); Quick Wins, Long Term
 - Actions you can take under the mobility lever to address direct emissions (Scope 3 perspective)
 - Actions you can take to drive decarbonisation in your supply chain
 - Using carbon removal to address residual emissions, once you have reduced all but the most difficult emissions
 - Key success factors for delivering your company's emissions reduction plan?

TRAINING #2

■ **MODULE 5: Preparing an Emission Reduction Plan**

This Module covered the preparation of a Realistic Road Map for the participants' factories, considering all the issues concerning Energy Savings, Efficient Resource Use and Emission Abatement Options. Each of the 13 factories present developed and presented an Action Plan. A Sample is found below:

Action	Objective	Timeline
Lighting: Change all bulbs to LED Lamps (50% achieved already)	To reduce cost of electricity by 10%	4 th Quarter 2024
Install 1 MW of Solar Energy in place of power from the grid at the Administration Blocks: Cost about 18,631.95 Euro per month	Reduce over reliance on the Grid, reduce energy cost and emissions	3 years
Convert +5,000 pcs of Diesel fuelled Trucks to Electric. It could cost 30,000 Euros per Truck	Reduce emissions, cost of fuel, improve air quality and reduce the potential of fuel pilferage	2 Years (End of 2025)

TRAINING #2

■ **MODULE 5: Preparing an Emission Reduction Plan**

A Sample is found below:

Action	Objective	Timeline
Increase Plantation within 20km of factory	Increase Raw materials and Decrease Scope 3 Emissions	2027
Change all Fluorescent (80W) to LED Lights (18W): This has been completed. Savings per year is estimated at Ghc 958,490 (Euro 73,190.11)	To reduce cost of energy, energy use, and emissions	Done: 2023

CONCLUSIONS

- It can be concluded that
 - the assignment has been duly executed
 - It is clear where many factories in Ghana stand with regards to GHG Emission Reduction
 - It is clear there is willingness to reduce reduction of GHG Emissions, these can be linked with cost savings
 - There is work to be done in terms of awareness creation and broadcasting the success stories
 - There is work to be done in terms of developing the right incentives to sway management understanding and decisions towards GHG reduction option

CHALLENGES FORSEEN GOING FORWARD

- The main **challenge** foreseen going forward is the potential of factories tackling energy saving and emission reduction on a piece meal approach. It would be more prudent to undertake the necessary diagnostics and then determine the right measures and actions as a blue print going forward, covering:
 - **Complete Energy Audit**
 - **GHG Accounting & Reduction Options covering the 3 Scopes for the factories**
 - **Efficient Resource Use Plan** for the factories

RECOMMENDATIONS

- a programme be instituted to support **partially** the factories that wish to undertake **Complete Energy Audits**, the **GHG Accounting & Reduction Options** and **Efficient Resource Use Plans** (To subsidise the services), in order to determine the actual gains in CO₂Eq each year
- a programme be instituted to **monitor and evaluate the implementation of the factories' road maps and action plans over a period, especially for the ones that Energy Audits were carried out**
- **More advocacy work to be carried out to encourage policy makers to set up funds to facilitate investment by factories in GHG abatement options, with a much reasonable interest rate, working with the banks of the country**
- **The possibility of obtaining a fund from the Climate Fund, UNIDO or a similar organisation to be managed by the banks in Ghana. This fund could be accessed by factories, after due diligence in terms of the viability of the GHG abatement options, payable at reasonable interest rates and repayment terms**

CLOSING REMARKS

