KFUPM

KING FAHD UNIVERSITY OF PETROLEUM

KFUPM GREENHOUSE GAS EMISSIONS INVENTORY FOR 2024

INTRODUCTION

This report presents a preliminary inventory of anthropogenic greenhouse gas (GHG) emissions and removals for King Fahd University of Petroleum & Minerals (KFUPM), following established guidelines, including the GHG Protocol for Project Accounting (WBCSD & WRI, 2004) and the 2019 refinement to the 2006 IPCC Guidelines (IPCC, 2019).

The inventory covers emissions and removals of key greenhouse gases—carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O)—for Scope 1 and Scope 2. Scope 1 includes direct emissions from sources owned or controlled by the university, such as fuel combustion. Scope 2 accounts for indirect emissions from purchased electricity, steam, heating, and cooling. Indirect emissions from the university's value chain, categorized as Scope 3, are beyond the scope of this report.

OBJECTIVE

This study aims to develop a preliminary inventory of anthropogenic GHG emissions and removals for KFUPM, providing a foundation for future mitigation strategies and reporting improvements. The findings are expected to support further studies, including time-series GHG emissions tracking, key category analysis, and mitigation opportunity assessments.

METHODOLOGY

GHG emissions are estimated following established guidelines, including the GHG Protocol for Project Accounting (WBCSD & WRI, 2004) and the 2019 refinement to the 2006 IPCC Guidelines (IPCC, 2019). These frameworks provide a systematic approach to quantifying and reporting emissions.

EMISSION CALCULATION APPROACH

GHG emissions from electricity use are calculated using national grid emission factors for Saudi Arabia. The Designated National Authority (DNA) established an official grid emission factor (GEF) of 0.568 tons of CO_2 per megawatt-hour (ton CO_2/MWh) based on Clean Development Mechanism (CDM) regulations (DNA, 2021). The International Energy Agency (IEA) also provides grid emission factors for the country.

Saudi Arabia is developing methodologies for estimating GHG emission avoidance through economic diversification and adaptation initiatives, in line with Nationally Determined Contributions (NDC). Renewable energy projects contribute to GHG emission reduction. If specific avoidance estimates are unavailable, the national electricity generation emissions rate is used as a proxy. For other initiatives, appropriate methodologies should be applied.

DATA DESCRIPTION

The data required for this study includes fuel combustion, fugitive emissions, and electricity consumption. Due to time constraints, a comprehensive survey could not be conducted to gather all the necessary activity data. The activity data utilized in this study includes fuel consumption from

road transportation, generator use, natural gas consumption in the central kitchen, and electricity consumption in both academic and housing facilities (Table 1).

Table 1: Data Description

Source Category	Fuel type	Quantity	Unit
Bus	Diesel	317176	Liter
Passenger car	Gasoline	270715	Liter
Generator	Diesel	22000	Liter
Central kitchen	Natural Gas	182500	Liter
Electricity	Electricity	276177369	Kilowatt-Hour

RESULTS

Using the available data, the GHG emissions inventory for KFUPM was compiled (Table 2). The emissions are expressed in terms of carbon dioxide equivalent (CO2e) by applying the 100-year Global Warming Potential (GWP) values for methane (CH4) and nitrous oxide (N2O), which are 21 and 310, respectively. The total GHG emissions (Scope 1 and Scope 2) for KFUPM in 2024 is 158,668 tons of CO2 equivalent. Scope 1 emissions total 1,799 tons of CO2 equivalent, while Scope 2 emissions are 156,869 tons of CO2 equivalent.

Table 2: GHG emissions inventory of KFUPM for the year 2024

Source Category	Greenhouse Gas Emissions			
	CO2 (Ton)	CH4 (Ton)	N20 (Ton)	Total (Ton of CO2 Equivalent)
Bus	846.86	0.02	0.02	853
Passenger car	617.23	0.03	0.01	620
Generator	58.74	0.00	0.00	59
Central kitchen	265.90	0.01	0.00	267
Electricity	156868.75	-	-	156869
Total Greenhouse Gas Emissions of KFUPM				158668

Note: CH4 and N2O emissions are not estimated for electricity due to the unavailability of the national grid emission factors.

CONCLUSION

This report presents the preliminary greenhouse gas (GHG) emissions inventory for KFUPM for 2024, focusing on Scope 1 and Scope 2 emissions. The total GHG emissions for KFUPM in 2024 amount to 158,668 tons of CO2 equivalent, with the majority of emissions coming from electricity consumption (Scope 2), followed by fuel combustion from transportation and generator use (Scope 1). The findings demonstrate KFUPM's efforts to

measure and report its GHG emissions as part of its commitment to environmental sustainability. While based on available data, this preliminary inventory provides an important foundation for KFUPM's future emissions reporting and GHG reduction strategies. It also highlights areas where data collection and tracking improvements will enhance future accuracy. As KFUPM continues to prioritize sustainability, this inventory serves as a key step in monitoring and reducing its carbon footprint. Future efforts will include expanding emissions reporting and refining methodologies to align with global sustainability practices and climate action goals.

REFERENCES

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