UNITED REPUBLIC OF TANZANIA
MINISTRY OF TRANSPORT
TANZANIA RAILWAYS CORPORATION

ANNUAL GREENHOUSE GAS (GHG) EMISSIONS REPORT FOR STANDARD GAUGE RAILWAY (SGR) OPERATIONS

Reporting Period: July 2024 – June 2025
Prepared by: Tanzania Railways Corporation (TRC)
Project name: SGR Lots 1&2 – Dar es Salaam to Dodoma

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LIST OF ABBREVIATIONS AND ACRONYMS

EF	Emission Factors
GHG	Greenhouse Gases
GoT	Government of Tanzania
IFC	International Finance Corporation
IPPC	Intergovernmental Panel on Climate Change
$KgCO_{2e}$	Kilograms of carbon dioxide equivalent
MoT	Ministry of Transport
NDC	Nationally Determined Contributions
PS	Performance Standards
SGR	Standard Gauge Railways
tCO_{2e}	Tons of carbon dioxide equivalent
TRC	Tanzania Railways Corporation
UNFCCC	United Nation Framework Conversion of Climate Change
TANESCO	Tanzania Electric Supply Company
NEG	National Electricity Grid
GEF	Grid Emissions Fact

EXECUTIVE SUMMARY

This report presents the first annual greenhouse gas (GHG) emissions assessment for the operational phase of Tanzania's Standard Gauge Railway (SGR), covering the period July 2024 to June 2025, in alignment with IFC Performance Standard 3, which requires reporting for projects exceeding 25,000 tCO_2e per year. The primary objective is to provide transparent, accurate, and verifiable emissions data to support both national climate commitments and global climate objectives.

The SGR's operational GHG emissions primarily arise from electricity consumption (Scope 2) for passenger and freight locomotives, station facilities, signaling, and operational support systems. In this reporting, direct emissions from diesel fuel consumption (Scope 1) were negligible during the reporting period, as shunting of locomotives and ancillary diesel-powered equipment was not in use.

During this reporting period, The Electricity consumption data were provided by the Directorate of Signaling and Telecommunications (DST), sourced from TANESCO. The Grid Emission Factor (GEF) of TANESCO electricity is 0.3974 kg CO_2 e/kWh. From the data collected and calculations made, the annual report resulted in total annual emissions of 16,716 tCO_2e/year, remaining below the IFC reporting threshold for external reporting.

This SGR Operational GHG emissions report recognizes international accounting methodologies, including the GHG Protocol and IFC PS3 guidelines to ensure transparency and reputable context in annual GHG Emission reporting. While this first-year assessment focuses on operational emissions from electricity usage, probably the future reporting will incorporate available direct emissions from shunting locomotives and other ancillary sources, as well as an evaluation of avoided emissions achieved through the shift from road-based freight and passenger transport to low-carbon rail.

Apart from project compliance requirement implementations, this report is aligned with key international climate agreements under the UNFCCC (1992). It contributes to transparency in GHG monitoring, reporting, and supporting Tanzania's national climate strategies. Although Tanzania was not required to reduce emissions under the Kyoto Protocol (1997), the report demonstrates adherence to standardized GHG accounting

and capacity building principles, laying the groundwork for future mitigation and participation in carbon market mechanisms. Furthermore, the report supports the Paris Agreement (2015) by providing credible emissions data to strengthen national NDCs, promote low-carbon transport development, and enhance institutional capacity for long-term climate mitigation consistent with the 1.5°C global warming target.

1 INTRODUCTION

The Government of Tanzania (GoT), under the Ministry of Transport (MoT), through Tanzania Railways Corporation (TRC) operates the Standard Gauge Railway (SGR) Project, which represents a transformative initiative to modernize Tanzania's transport infrastructure by providing fast, reliable, and energy-efficient rail services. The SGR operation and maintenance phase for Lot 1&2 has achieved in connecting key economic centers, including Dar es Salaam and Dodoma, while maintaining the primary role towards reducing travel times, improving freight transport, passenger mobility, and supporting the broader national objective of sustainable economic development. The operation and Maintenance phase for Lots 1 and 2 is currently operating from Dar Es Salaam Station to Dodoma Station, while the other part of Lot 2 towards Makutupora is under the final stages of the construction phase. The official launch for SGR operations commenced in July 2024, marking the beginning of the project's operational phase and the transition from construction to transportation service delivery.

The Tanzania Railway Corporation (TRC), as the project owner and operator, is obligated to report greenhouse gas (GHG) emissions in accordance with the IFC's Performance Standard 3 and Equator III principle that defines a reporting threshold for annual GHG emissions of 25,000 tCO_2e per year. This obligation requires measuring, managing, and mitigating the greenhouse gas (GHG) emissions associated with the railway's operations. The significant impact of this compliance obligation is reducing reliance on high-emission road transport by providing a low-carbon alternative, while playing a role in supporting the achievement of National Determined Contributions (NDCs) under the Paris Agreement toward the country's overall climate mitigation objectives.

Therefore, this report serves as a foundation for TRC to integrate sustainability into ongoing operations, identify opportunities for emission reduction, and monitor progress against both corporate sustainability objectives and global climate commitments. By documenting the GHG footprint of the SGR during its initial operational year, TRC not only ensures compliance with reporting requirements but also strengthens its capacity to implement low-carbon strategies, optimize energy efficiency, and contribute meaningfully to Tanzania's transition toward a sustainable and climate-resilient transport sector.

2 PURPOSE, SCOPE, AND OBJECTIVES OF SGR O&M GHG EMISSION REPORT

2.1 Purpose

The purpose of this report is to provide a comprehensive assessment of the first-year GHG emissions resulting from the operational phase of the SGR, covering the period July 2024 to June 2025.

2.2 Scope

This document provides the report for the operational and maintenance phase GHG emissions from the SGR project. The Emission Data for quantifications and calculations have been considered for emissions from both direct sources (Scope 1), such as diesel fuel use in auxiliary equipment, and indirect sources (Scope 2), primarily electricity consumption for locomotives and railway infrastructure. To ensure Standard compliance requirements and effective emission data reporting, the GHG Protocol and the IFC Performance Standard 3 have been used to track transparency, accuracy, and consistency in emissions accounting. The report covers the SGR operation and maintenance phase GHG emission for the first year of operation, covering July 2024 to June 2025.

2.3 Objectives

2.3.1 Main objectives

Through the SGR operation and maintenance phase, experiences demonstrate infrastructure modernization and environmental stewardship that can be pursued simultaneously, creating a benchmark for green, efficient, and socially responsible transport systems in Tanzania and the wider region.

Therefore, the main Objectives of this report are

i. To quantify, monitor, and report the annual greenhouse gas (GHG) emissions generated during the operation and maintenance of the Standard Gauge Railway (SGR), to ensure regulatory compliance, support environmental management decisions, and identify opportunities for emission reduction and improved operational efficiency.
ii. To establish the baseline record for future annual GHG assessments, enabling the tracking of operational performance and identifying initial mitigation strategies that align with both national priorities and international climate context. And,
iii. To provide results from the calculation of GHG emissions generated by SGR operation and maintenance implementations between Dar es Salaam and Dodoma, in compliance with national and international standards for the first year of operation, covering July 2024 to June 2025.

2.3.2 Specific Objectives

Other accompanying objectives for Annual GHG emission reporting are not limited to

i. To assist in the provision of data, records, and strategies during the sectoral national climate change reporting framework;
ii. To promote data for sustainability goals, carbon management strategy, toward future carbon financing and reporting initiatives;

iii. To ensure availability of reliable GHG emission data that can be used in decision/policy making regarding investment planning, technology upgrades, and energy efficiency initiatives concerning low-carbon sustainability approaches.

3 SOURCES OF GHG FROM SGR OPERATIONS

In the SGR project, GHG emissions are generated through the construction and operational phases as summarized below;

3.1 Construction phase emissions

The direct GHG emissions ("Scope 1[1]") from the use of fossil fuels due to the transportation of materials by the contractors to the site, transportation of excavated materials for construction, and the use of construction plant.

3.2 Operational phase emissions

The main GHG emissions associated with the **operational phase** are indirect ("Scope 2[2]") due to the use of electricity in locomotives and other rolling stock in the railway operations.

The direct emissions from the operational phase include the occasional use of diesel fuel for shunting locomotives, road vehicles, or other ancillary functions (Scope 1). For the first year of operations, shunting locomotives have not been used, and other direct emissions are considered negligible compared to electricity use throughout operations.

3.3 Exclusions

Other sources of GHG emissions, such as the MGR construction and operation activities, and overall institutional functions within TRC, have not been included in this estimate, as the focus is on the SGR Project. It is important to note that the exclusion of these sources does not imply they are insignificant. Rather, the current estimate aims to provide a clear and targeted understanding of the emissions directly associated with the first year of SGR operations between Dar es Salaam and Dodoma. By isolating the SGR Project, the assessment ensures that the methodology remains consistent with international

[1] Scope 1 Emissions are direct GHG emissions from the facilities owned or controlled within the physical Project boundary.
[2] Scope 2 Emissions are indirect GHG emissions associated with the off-site production of energy used by the Project.

guidelines for project-specific GHG accounting, facilitating future comparisons and reporting.

4 METHODOLOGY AND CALCULATION APPROACH

In the implementation of the SGR operation and Maintenance project phase, a significant step toward sustainable transport has been achieved by offering environmental benefits through the electrification of freight and passenger operations and the potential future integration of renewable energy sources. To ensure enhancement of the overseen impacts, a baseline annual emissions report is required to track accountability and responsibilities toward promoting low-carbon transport, climate-resilient infrastructure development, as well as national development and global climate objectives.

Therefore, this section outlines the methodology applied to quantify GHG emissions from the SGR operation and maintenance phase for the reporting period of July 2024–June 2025. The methodology follows the GHG Protocol Corporate Standard, IFC Performance Standard 3, and accepted best practices for calculating Scope 1 and Scope 2 emissions in transport infrastructure.

4.1 Calculations of GHG emissions

Greenhouse gas (GHG) emissions were calculated using documented Emission Factors (EFs), which represent standardized ratios that relate GHG emissions to a defined proxy of activity at each emission source. These factors were applied to relevant activity data to calculate emissions associated with project operations.

The calculation approach follows the Intergovernmental Panel on Climate Change (IPCC) Guidelines (IPCC, 1996), which established a hierarchical framework for emissions calculation ranging from the use of generic emission factors to direct measurement and monitoring. Where data gaps or uncertainties were identified, GHG emissions were calculated using reasonable and transparent assumptions, including assumptions related to fuel mix, vegetation type, and average distance travelled per train.

Emission calculations for the operational phase of the Project assume full and normal operational conditions. The scope of the operational GHG emissions assessment covers the SGR mainline corridor from Dar es Salaam to Makutupora (533 km).

Activity data were obtained from the Directorate of Signaling and Telecommunication (DST) and include electricity consumption for:

- Traction Power Supply (TPS) is used for locomotive traction, and
- Station electricity consumption across the SGR network.

These data represent the total electricity supplied by TANESCO to the SGR network for the reporting period July 2024 to June 2025. Diesel fuel consumption was reported as zero, as no diesel shunting locomotives or other diesel-powered railway operations were conducted during the reporting period.

4.2 Key factors for the calculations.

- The SGR line power consumption usage covers passenger Locomotives (freight transport started outside of this reporting period).
- The source of power for SGR operation is mainly Electricity from the National Electricity Grid (NEG) supplied by TANESCO.
- The calculation uses the Grid Emissions factor (GEF) of the Tanzanian national electricity grid as reported by TANESCO[3] at 0.3974 $kgCO_2e/kWh$, assuming the source of energy used is a fuel mix.
- For future calculations, the emission factor for GHG emissions from the use of diesel fuel in shunting locomotives, road vehicles, and other plant/equipment will be taken as 2.7 $kgCO_2e$/litre (ARUP recommendation).

[3] Communication from TANESCO to the TRC Environment Manager in November 2025.

4.3 SCOPE 1: Direct Emissions

This emission factor was recommended by ARUP as part of the project's environmental assessments and represents the full combustion emissions of diesel fuel *(IPCC Guidelines (2006)).* Although diesel use was negligible during the reporting period, this factor is included for consistency and future use (anticipated shunting locomotives from 2026 onward).

Scope 1 emissions; include GHG emissions from the direct combustion from the use of fossil fuels due to the transportation of materials by the contractors to the site, transportation of excavated materials for construction, and the use of construction plant.

Calculating Formula:

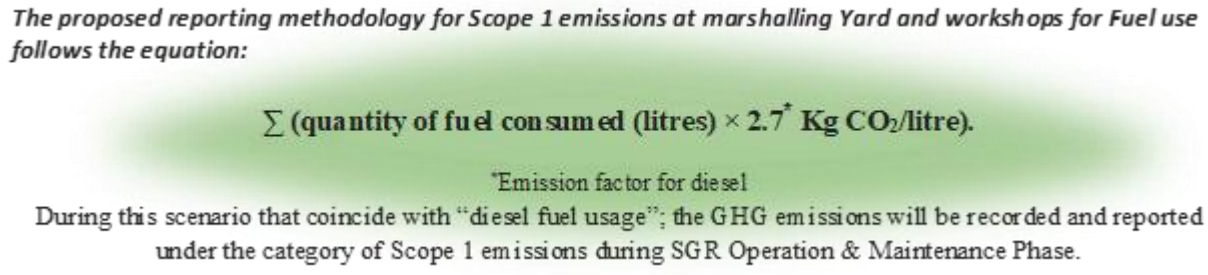

Figure 1: Formula for direct emissions

NOTE: The emissions from diesel use in shunting of locomotives have not been included for this calculation for GHG emissions from the operation phase since no diesel-powered shunting locomotives were used during the reporting period. The above formula has been included for use in future reporting because these locomotives are likely to start being used in 2026.

4.4 SCOPE 2: Indirect Emissions

Scope 2 emissions arise from the consumption of purchased electricity used for: Train traction, Station operations, Signaling and telecommunication systems, Maintenance depots and auxiliary systems.

Electricity consumption is the dominant source of emissions for the SGR.

Calculating Formula:

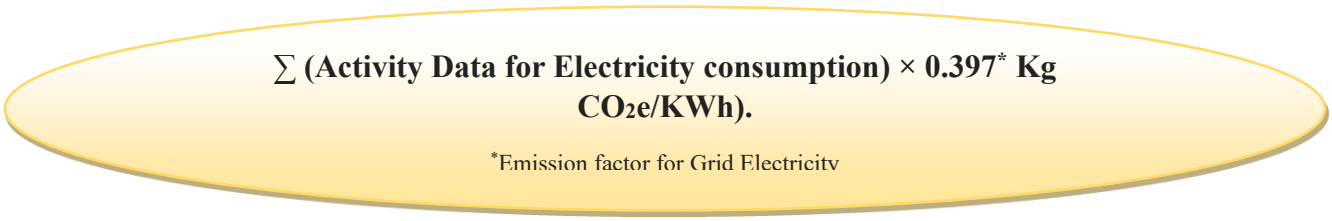

Figure 2: Formular for Indirect emissions

Where:

Electricity Consumption (kWh) = Sum of TPS + station electricity for all SGR facilities

5 RESULTS AND ANALYSIS

This is the first annual assessment of greenhouse gas emissions associated with SGR operations between Dar es Salaam and Dodoma for the period from July 2024 to June 2025. All electricity consumption values were aggregated by month, then multiplied by the grid emission factor, and summed to obtain the annual emissions. The total emissions were reported in tons of carbon dioxide equivalent (tCO_2e) reflecting operational activities over the reporting period. The table below represents Annual GHG Emission from July 2024 to June 2025.

SGR Operation Power Consumptions for TPS and Stations for June, 2024 to JULY, 2025			
Period	**Month**	**Unit (kWh)**	**CO2e=(unit*0.397) (KgCO2e/annum)**
2024	July	2,080,389.13	825,914.48
	August	2,493,816.49	990,045.15
	September	3,186,777.88	1,265,150.82
	October	3,229,164.18	1,281,978.18
	November	2,741,133.00	1,088,229.80
	December	3,277,357.08	1,301,110.76
2025	January	2,682,362.55	1,064,897.93
	February	2,899,919.72	1,151,268.13
	March	3,305,438.72	1,312,259.17
	April	4,009,514.76	1,591,777.36
	May	4,180,455.76	1,659,640.93
	June	2,685,770.44	1,066,250.87
Total power consumption for TPS		**36,772,099.68**	**14,598,523.57**
2024	July	184,955.26	73,427.24
	August	547,275.03	217,268.19
	September	366,304.18	145,422.76
	October	562,098.49	223,153.10
	November	466,387.81	185,155.96
	December	460,953.82	182,998.67
2025	January	476,060.22	188,995.91
	February	474,406.52	188,339.39
	March	623,012.66	247,336.03
	April	438,540.60	174,100.62
	May	364,093.15	144,544.98
	June	369,213.31	146,577.68
Total power consumption for Stations		**5,333,301.07**	**2,117,320.52**
GRAND TOTAL		**42,105,400.75**	**16,715,844.10**

Table 1: Power Consumption Data during SGR operations and GHG calculations

5.1 SGR - GHG emissions

The total greenhouse gas emissions were valued at 16,715,844 $kgCO_2e$ per annum, equivalent to 16,716 tCO_2e per annum, with an average monthly emission of approximately 1,393 tCO_2e. From July to December 2024 total emissions were 7,780 tCO_2e, compared to 8,936 tCO_2e from January to June 2025.These emissions were primarily attributable to electricity consumption, reflecting the electrified nature of SGR operations and the absence of diesel-powered traction or shunting activities during the reporting period.

Although electricity use represents the dominant source of emissions, the overall emissions profile remains well below the International Finance Corporation (IFC) Performance Standard 3 (PS3) threshold of 25,000 tCO_2e per year, which is commonly used to distinguish projects with significant GHG emissions requiring enhanced mitigation and disclosure measures. This indicates that SGR operations fall within a moderate emissions category and do not constitute a high-emitting transport project under international best practice standards. Hence, this analysis establishes a baseline emissions profile to support future monitoring, performance evaluation and mitigation planning. The bar graph below presents the trend of GHG annual emissions per month from July 2024 to June 2025.

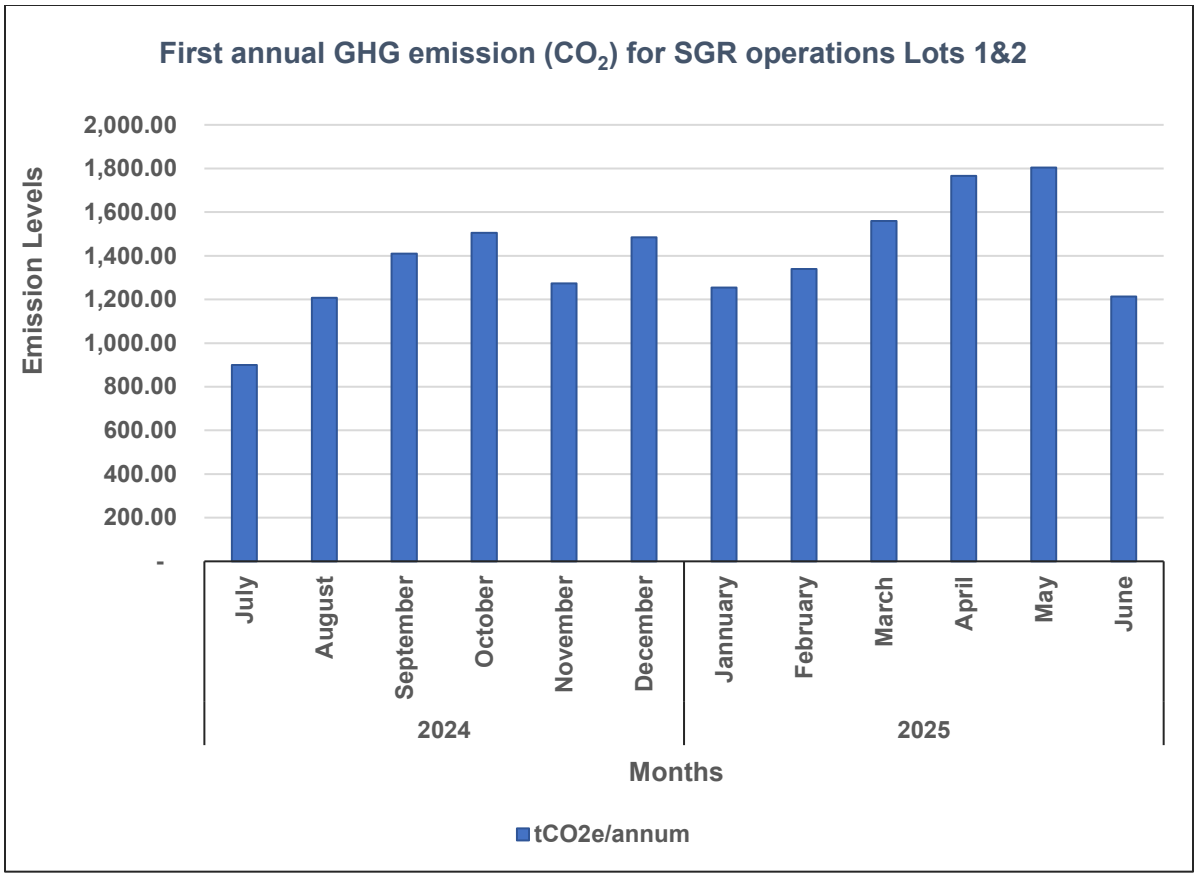

Figure 3: GHG annual emissions per month

The emissions outcome further demonstrates the carbon efficiency of electrified rail transport relative to conventional fossil fuel–based transport modes, particularly road freight and passenger vehicles. Although the number of SGR train journeys will increase (e.g. freight transport), as Tanzania's national electricity grid continues to incorporate a higher share of renewable energy sources, the carbon intensity of SGR operations is expected to decline further over time, enhancing long-term decarbonization benefits.

Overall, the results confirm that TRC's SGR operations are consistent with national low-carbon transport and climate objectives, including those outlined under *Dira ya Taifa ya Maendeleo 2050* and Tanzania's Nationally Determined Contributions (NDCs). Continued monitoring and reporting of electricity consumption, alongside engagement with grid decarbonization efforts and energy efficiency improvements, will further strengthen TRC's contribution to sustainable and climate-resilient transport development.

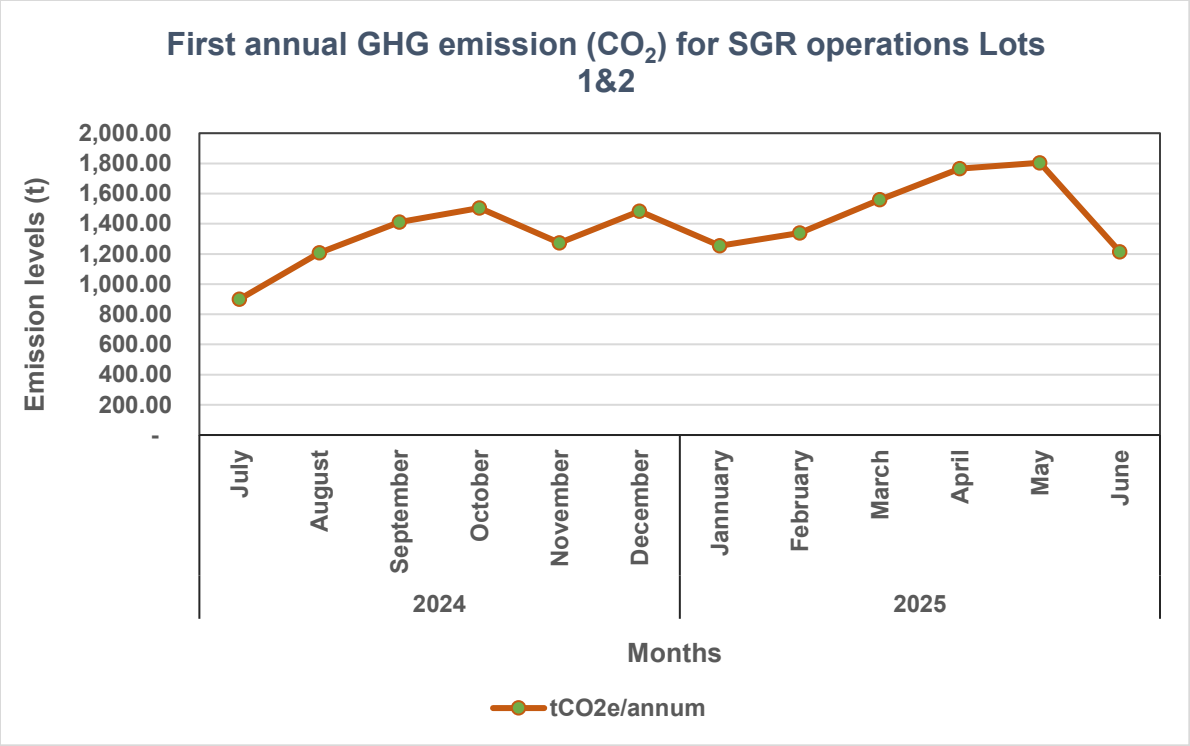

Figure 4: GHG annual emissions per month

6 CONCLUSION.

6.1 Conclusion

Implementation of the following recommendations measures will further reduce SGR's GHG emissions, maintain emissions below the IFC PS3 threshold, and reinforce TRC's role in supporting Tanzania's transition toward a low-carbon, climate-resilient transport sector in line with *Dira ya Taifa ya Maendeleo 2050* and the Paris Agreement regarding Carbon market and opportunities.

6.2 Planned Way Forward

Based on the annual GHG emissions results for SGR operation and maintenance phases, which totaled 16,716 tCO_2e per annum and are primarily driven by electricity consumption, the following are the strategic measures TRC intends to implement during the operation of the SGR to further reduce greenhouse gas (GHG) emissions in the future and strengthen alignment with national and international climate objectives;

i. Enhance energy efficiency of railway operations.
   TRC to enhance optimization of train operations through improved scheduling and regular maintenance of traction and electrical systems. These measures reduce overall electricity consumption while maintaining service reliability.

ii. Increase integration of renewable energy sources
   As electricity consumption is the main source of emissions, TRC will explore more on the use of other renewable energy sources for existing and future operations facilities which will directly lower the carbon intensity of SGR operations.

iii. Engage with National Grid Decarbonization Initiatives
   TRC will coordinate with TANESCO and relevant government institutions to support the gradual decarbonization of the national electricity grid. As the grid's share of renewable energy increases, SGR-related emissions will decline accordingly.

iv. Assess emission avoidance and Modal shift benefits

For future reporting, TRC will quantify emissions avoided through the modal shift from road to rail for both passenger and freight services. This provides a comprehensive view of SGR's net climate benefits and reinforces rail as a low-carbon transport solution.

v. Implement continuous emission monitoring and reporting

As part of ESG reporting, TRC will strengthen internal systems to monitor electricity consumption and emissions annually, improving data accuracy, supporting trend analysis, and enabling early identification of efficiency improvement opportunities. This also ensures compliance with UNFCCC and Paris Agreement transparency requirements.