National Inventory Report

Greenhouse Gases Emission in Tanzania

The United Republic of Tanzania

2025-02-26

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# Executive Summary

This is the National Inventory Report (NIR) of the United Republic of Tanzania for 2024, submitted to the United Nations Framework Convention on Climate Change (UNFCCC) as part of its reporting obligations. The NIR contains national greenhouse gas emission inventory estimates for the period 1990–2021, compiled under the UNFCCC rules for reporting. This report and the associated tables are submitted to fulfil Tanzania’s obligations under the enhanced national communication reporting requirements (Article 12, paragraph 1(a) of the Convention, and decisions 1/CP.16 para 60(a–b)). The NIR also supports compliance with the reporting requirements in the preparation of Tanzania’s first biennial update report (BUR) consistent with decision 1/CP.16 para 60(c). This is the second time Tanzania has prepared its NIR, but the first submission under the “BUR” reporting mechanism.

The NIR has been prepared in accordance with the UNFCCC guidelines for the preparation of national communications from non-Annex I Parties (decision 17/CP.8) and the UNFCCC biennial update reporting guidelines for Parties not included in Annex I to the Convention (decision 2/CP.17, paragraph 40, and annex III of decision 2/CP.17). The compilation of the NIR followed the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Where applicable, references have been made to earlier IPCC guidelines and guidance documents from 1996 and updated methodologies from the 2019 refinement. The methodologies used to estimate Tanzania’s greenhouse gas inventories have improved over time and will continue to be refined as new data, methodologies, and international practices evolve. The impacts of refinements to methodologies and revisions of datasets are reported in a dedicated recalculations section for each sector.

The preparation of the NIR not only fulfils Tanzania’s international reporting obligations but also offers significant benefits to national development and capacity building, particularly in the following ways: continuous capacity development among major stakeholders; provision of critical data to inform policy on GHG mitigation options; support for the evaluation of low-carbon development pathways; establishment of a foundation for setting national emission reduction targets; and feedback on progress toward achieving GHG reduction goals, including the volume of emissions reductions achieved, the sectors responsible, and the policies driving these reductions. The inventory includes key productive sectors that contribute to Tanzania’s economic development. Emission levels and removals across sectors are influenced by:

1. Sector-specific mitigation policies,
2. The deployment of environmentally sound technologies, and
3. The degree of sustainability integrated into productivity.

Emissions and removals are classified under the four sectors defined by the 2006 IPCC guidelines: (1) Energy, (2) Industrial Processes and Product Use (IPPU), (3) Agriculture, Forestry, and Other Land Use (AFOLU) and (4) Waste. These sectors encompass the main economic activities that emit or remove greenhouse gases from the atmosphere. National emissions have been estimated by characterizing emissions/removal sources into the following hierarchical categories: (a) activities, (b) sub-categories, (c) categories, and (d) sectors. These classifications have been aggregated to provide economy-wide estimates of emissions and removals. Over the past three decades the greenhouse gas inventory of Tanzania has shown significant transformations across all sectors, the analysis of this inventory reveals both challenges and achievements across different economic sectors.

These include the energy sector, Waste sector, Industrial Processes and Product Use (IPPU), and Agriculture, Forestry, and Other Land Use (AFOLU) sector which have shown a drastic transformation. Most notably, the AFOLU (Agriculture, Forestry, and Other Land Use) sector has transformed dramatically, with carbon sequestration capacity increasing by 135429 Gg CO2 equivalent (from a 188593 Gg CO2 in 1996 to a substantial carbon sink of 324,021.68 Gg CO2 in 2021). Within the same sector (AFOLU), methane emissions have increased by 3,269.69 Gg CO2 equivalent (from 2,359.87 to 5,629.56 Gg CO2 equivalent in 1990 to 2021).

The energy sector shows a net increase of 4,725.95 Gg CO2 equivalent (from 85.72 to 4,811.68 Gg CO2 equivalent in 1990 to 2021). This can be attributed to Tanzania’s economic development and urbanization. In the Industrial Processes and Product Use (IPPU) sector, HFC emissions have increased by 16,894.16 Gg CO2 equivalent (from -4,072.68 to 12,821.48 Gg CO2 equivalent). Meanwhile CO2 emissions have increase by 42164.07 Gg which shows a significant industrial growth and expansion within the country possibly due to government policy (Tanzania ya Viwanda). For the waste sector Methane emissions has increased by 37.38 Gg CO2 equivalent (from 1.63 to 39.01 Gg CO2 equivalent). This is attributed to increased population growth and significant urbanization.

The combined effect of these sectoral changes has contributed to Tanzania’s overall sequestration by at least 135089 Gg CO2 equivalent (from positive emissions of 71,039.30 Gg CO2 equivalent in 1990 to net absorption of -206,128.34 Gg CO2 equivalent in 2021), primarily due to increased carbon sequestration capacity in the AFOLU sector specifically in the LULUCF subsector. Methane emission has increased from 2361.495 in 1990 to 5668.567 in 2021, this is attributed to an increase in cattle population which have increased drastically during that period. Nitrous Oxide have also increased from 8.356541 Gg CO2 equivalent in 1990 to 28.31175 Gg CO2 equivalent in 2021.

Being a net absorber of carbon dioxide uniquely positions the United Republic of Tanzania among developing nations, showing that development and economic growth that have occurred in the country coexist with environmental stewardship. The data suggests a critical need to maintain forest conservation efforts while managing the increasing emissions from energy, industrial, and waste sectors, particularly as the country continues with its developmental plans.

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# Introduction

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# Overview of source and sink estimates and trends by gas

# 1. Introduction

## 1.1 Outline of the National Inventory Report

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## 1.3 Institutional Arrangements

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# 2. Trends in GHG emissions and removals

## 2.1 Overview

Tanzania’s greenhouse gas (GHG) emissions profile presents a critical overview of its contributions to global climate change. As of the latest assessments, Tanzania is classified as a low emitter on the global stage, with its emissions accounting for a small fraction of the total GHG emissions worldwide. This positioning is largely due to its development status and reliance on subsistence agriculture, which is a predominant activity in the region. The country’s emissions are primarily derived from a few key sectors, including agriculture, forestry, and land use change, which contribute significantly to methane and carbon dioxide emissions. Agricultural practices, especially livestock farming and rice cultivation, are major sources of methane emissions. Deforestation and land degradation, driven by agricultural expansion and logging, also exacerbate carbon dioxide releases into the atmosphere.

Despite these emissions, Tanzania has made notable strides in enhancing its renewable energy portfolio, focusing on sustainable practices to mitigate future emissions. The government actively promotes initiatives aimed at improving forest management, adopting cleaner agricultural technologies, and increasing the share of renewable energy sources such as hydropower, solar, and wind energy in its energy mix. Analyzing emissions by sector and gas helps identify the largest sources of emissions, prioritize mitigation actions, and track progress over time. This chapter presents the annual trends in greenhouse gas (GHG) emissions and removals in Tanzania by sector and gas from 1990 to 2021. It examines key sectors like agriculture, energy, industry, and transport, along with major GHGs such as carbon dioxide (CO2), methane (CH4), hydroflorcarbons (HFCs), and nitrous oxides (N2O). The chapter further explores and discusses the drivers of emission changes and highlights government and organizational efforts to address these challenges. The goal is to provide insights into Tanzania’s GHG emissions and their environmental and societal impacts.

## 2.2 Global Warming Potential

To obtain CO2 equivalent emissions, each greenhouse gas is multiplied by its **Global Warming Potential (GWP-100)**, which represents its warming effect relative to CO2 over a 100-year period ([Table 2.1](#tbl-gwp)). Carbon dioxide (CO2) has a GWP of **1**, serving as the baseline. Methane (CH4) has a GWP of **28**, meaning it is **28 times more effective** at trapping heat than CO2. Nitrous oxide (N2O) has GWP of **273**, indicating its substantial contribution to climate change despite its lower concentration in the atmosphere. Hydrofluorocarbons (HFCs), a group of synthetic gases, have a wide range of GWP values, from **12 to 14,800**, depending on the specific compound.

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| Table 2.1: Global warming potential (GWP) of greenhouse gases   | Greenhouse gas (GHG) | Global warming potentia (GWP) | | --- | --- | | CO<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r> | 1 | | CH<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">4</w:t></w:r> | 28 | | N<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r>O | 273 | | HFCs (Range) | 12–14,800 | |

## 2.3 Total GHG Emissions and Removal

Tanzania’s total greenhouse gas emissions in 2021 were equivalent to 475,598 GgCO2eq including the Land Use, Land Use Change and Forestry (LULUCF) Sector. The total greenhouse gas emissions have increased by 186 percent since 2000 ([Table 2.2](#tbl-total-emRem)). Likewiae, the estimated CO2equ removal for 2021 were 324,022 GgCO2eq most from LULUCF, which represent about 54% increase compared to 210,536 GgCO2eq in 2000 ([Table 2.2](#tbl-total-emRem)).

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| Table 2.2: Total emissions of CO2equivalent for 2000 and 2021 and the percentage change   |  | CO2 equivalnet (Gg) | |  | | --- | --- | --- | --- | | GHG | 2000 | 2021 | % change | | Emissions | 166,423 | 475,598 | 186 | | Removals | 210,536 | 324,022 | 54 | |

While in 2021 the removed CO2 equivalent of 324,022 ([Table 2.2](#tbl-total-emRem)) came from AFOLU ([Table 2.3](#tbl-piedo)), the emitted CO2 equivalent of 475,598 ([Table 2.2](#tbl-total-emRem)) is shared among key sectors ([Table 2.3](#tbl-piedo)) with IPPU emission contributes about 64 percent, followed with AFOLu that contributes 34.77 percent ([Figure 2.1](#fig-piedo2)). The removed CO2 equivalent was from AFOLU ([Figure 2.1](#fig-piedo2))

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| Table 2.3: The total estimated CO2 equivalent emissions and and removal by sector in 2021   |  | CO2 equivalnet (Gg) | | | --- | --- | --- | | Sector | Emissions | Removals | | AFOLU | 165,357 | 324,022 | | ENERGY | 4,812 | - | | IPPU | 304,337 | - | | WASTE | 1,092 | - | |

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| Figure 2.1: The nested pie and dnout with pie for removal or emission and donut for sector |

## 2.4 Total CO2 Removal and Emission Trends

Tanzania’s GHG emissions have increased steadily between 1990 and 2021 ([Figure 2.2](#fig-total-emission-sectors))over, driven by population growth, agricultural expansion, and energy demand. The total CO2 equivalent emissions was estimated at approximately 13,166 Gg annually over 32 years ([Figure 2.2](#fig-total-emission-sectors)). This value represents the combined impact of carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) emissions, adjusted for their Global Warming Potential (GWP).

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| Figure 2.2: Total CO2 equivalent emission for all sectors combined from 1990 to 2021 |

[Figure 2.3](#fig-total-removal-afolu) shows significant decreasing trend in total CO2 removals from AFOLU between 1996 and 2021. With an average removal of CO2 of 5,485 Gg per year suggests that AFOLU sector is playing an important role of removing CO2 from the atmophere. The removals prior to 1996 are omitted due to the lack of Land Use and Land Cover (LULC) data, which would lead to an underestimation of total removals. This omission arises because LULC data is crucial for accurately quantifying land-based carbon sequestration, including forest regrowth, afforestation, and soil carbon storage.

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| Figure 2.3: Total CO2 removal from AFOLU from 1996 to 2021. |

## 2.5 Total CO2 Emission Trends by Sectors

CO2-equivalent emissions from the **waste sector** have increased significantly from 1990 to 2021 ([Figure 2.4](#fig-total-emission-waste)), with an average rate of **20.7 Gg per year**. This upward trend is statistically significant (**z = 8.03, p < 0.001**), confirming that the increase is not due to random variation. The 95% confidence interval (**15.3 to 27.6 Gg per year**) suggests a consistent growth rate, likely driven by increased waste generation and decomposition-related emissions.

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| Figure 2.4: Total CO2 equivalent emission from **WASTE** between 1990 and 2021 |

[Figure 2.5](#fig-total-emission-energy) show that there is a strong and statistically significant upward trend in the emission of CO21-equivalent emissions from the energy sector. The Sen’s slope indicates that CO21-equivalent emissions increase by rate of 163.13 Gg per year, which is significant.

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| Figure 2.5: Total CO2 equivalent emission from **ENERGY** between 1990 and 2021 |

[Figure 2.6](#fig-total-emission-AFOLU) shows that emissions in the AFOLU sector are increasing each year. On average, AFOLU emit CO2 equivalent of around 3,117 Gg per year.

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| Figure 2.6: Total CO2 equivalent emission from **AFOLU** between 1990 and 2021 |

CO2 equivalent Emissions in the IPPU sector have been rising steadily over time ([Figure 2.7](#fig-total-emission-IPPU)). On average, IPPU emit about 10,039 Gg per year of CO2 equivalent into the atmosphre. The increasing trend of CO2 equivalent is highly significant ([Figure 2.7](#fig-total-emission-IPPU))

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| Figure 2.7: Total CO2 equivalent emission from **IPPU** between 1990 and 2021 |

Over the 32-year period from 1990 to 2021, emissions of CO2 equivalent have shown consistent and significant increases across four major sectors – AFOLU (Agriculture, Forestry, and Other Land Use), IPPU (Industrial Processes and Product Use), WASTE, and ENERGY. Across all sectors, the increases in emissions are statistically significant, indicating that these trends are not due to random fluctuations but rather reflect real, sustained changes. In the AFOLU sector, emissions increased at an average rate of 3117.26 Gg/year ([Figure 2.8](#fig-total-emission-all)). This continueal rising of CO2 equivalent from AFOLU reflects the increasing impact of agricultural practices, land use changes, and forestry on greenhouse gas emissions, which is crucial given the sector’s role in global carbon cycles.

Similarly, the IPPU sector experienced a positive trend of CO2 emission with an average of 10039.19 Gg per year, representing a substantial contribution of GHG to the atmosphre linked to industrial processes and product use over time. This trend highlights the growing emissions associated with industrial activities, manufacturing processes, and the use of certain products, including those involving chemicals and materials. Meanwhile, the ENERGY sector saw a more moderate increase of 163.13 units per year on average. While this rate is smaller compared to the others, the trend still points to an ongoing rise in emissions, primarily driven by the combustion of fossil fuels for energy production.

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| Figure 2.8: Total CO2 equivalent emission by sectors between 1990 and 2021 |

## 2.6 Total CO2 Emission Trends by Gas

[Table 2.4](#tbl-ghg-ghg) provides a detailed breakdown of greenhouse gas (GHG) emissions and removals across various sectors. In 2021, the estimated CO2 equivalent of Methane (CH4) emissions were around 157,628 Gg, primarily attributed to the Agriculture, Forestry, and Other Land Use (AFOLU) sector, with a minor contribution of 1,092 Gg from the Waste sector ([Figure 2.9](#fig-ghg-ghg)). The estimated CO2 equivalent of Nitrous oxide (N2O) emissions are significantly low with 7,729 Gg in 2021, attributed from the AFOLU sector alone.

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| Table 2.4: Total emission and Removal of GHGs by sector in 2021   |  | CO2 equivalent (Gg) | | | | | --- | --- | --- | --- | --- | | GHG | AFOLU | ENERGY | IPPU | WASTE | | Emissions | | | | | | CH<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">4</w:t></w:r> | 157,627.6 | - | - | 1,092.3 | | N<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r>O | 7,729.1 | - | - | 0.0 | | CO<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r> | - | 4,811.7 | 113,081.7 | 0.0 | | HFC | - | - | 191,255.5 | - | | Removals | | | | | | CO<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r> | -324,021.7 | - | - | - | |

Carbon dioxide (CO2) emissions in 2021 were around 48,120 Gg from Energy sector and 113,082 Gg from the IPPU sector, with no emissions from AFOLU or Waste ([Table 2.4](#tbl-ghg-ghg)). Conversely, CO2 removals are substantial that AFOLU alone removed around 324,022 Gg in 2021. Hydrofluorocarbons (HFCs), which are synthetic gases, emitted an estimated CO2 equivalent of 191,256 Gg from the IPPU sector. These finings highlights the varying contributions of different sectors to GHG emissions and underscores the importance of AFOLU in both emissions and removals ([Figure 2.9](#fig-ghg-ghg)).

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| Figure 2.9: Share of emission and Removal of GHGs by sector in 2021 |

### 2.6.1 METHANE (CH4)

[Table 2.4](#tbl-ghg-ghg) indicates that CH4 is contributed by AFOLU in large portion and small portion from WASTE.

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| Figure 2.10: Trend of CO2 equivalent emission from **WASTE** between 1990 and 2021 |

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| Table 2.5: CO22 equivalent of Methance (CH4) emissions by Key categories in WASTE sector, detailing annual rate of emissions, Percentage Contribution, and Cumulative Share. A shades of red gradient indicate contribution levels, with dark red representing highe emissions and lighter shades denoting lower contributions.   | Code | Key category | Total CH{4} (Gg) | Percentage | Cumulative | | --- | --- | --- | --- | --- | | 3.A.1.a.ii | Other Cattle | 2634761.07 | 80.52 | 80.52 | | 3.A.1.d | Goats | 245524.38 | 7.50 | 88.03 | | 3.A.1.a.i | Dairy Cows | 120916.88 | 3.70 | 91.72 | | 3.A.2.a.ii | Other cattle | 84992.29 | 2.60 | 94.32 | | 3.A.1.c | Sheep | 80258.97 | 2.45 | 96.77 | | 3.C | Aggregate sources and non | 38819.92 | 1.19 | 97.96 | | 3.C.7 | Rice cultivation | 20482.59 | 0.63 | 98.59 | | 3.C.1.c | Burning in Grassland | 11630.04 | 0.36 | 98.94 | | 3.A.2.d | Goats | 10803.07 | 0.33 | 99.27 | | 4.A.2 | Unmanaged Waste Disposal Sites | 8641.41 | 0.26 | 99.54 | | 3.C.1.a | Burning in Forest Land | 6649.18 | 0.20 | 99.74 | | 3.A.2.c | Sheep | 3210.36 | 0.10 | 99.84 | | 3.A.2.a.i | Dairy cows | 2628.63 | 0.08 | 99.92 | | 4.A.1 | Managed Waste Disposal Sites | 841.41 | 0.03 | 99.94 | | 3.A.2.i | Poultry | 605.46 | 0.02 | 99.96 | | 3.A.1.i | Poultry | 413.96 | 0.01 | 99.97 | | 3.A.1.h | Swine | 399.85 | 0.01 | 99.99 | |

### 2.6.2 Hydrochlorocarbons (HFCs)

[Table 2.4](#tbl-ghg-ghg) indicates that HFC4 is mainly emitted with IPPU

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| Figure 2.11: Trend of CO2 equivalent emission from **IPPU** between 1990 and 2021 |

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| Table 2.6: CO22 equivalent of HFCs emissions by Key categories in IPPU sector, detailing annual rate of emissions, Percentage Contribution, and Cumulative Share. A shades of red gradient indicate contribution levels, with dark red representing highe emissions and lighter shades denoting lower contributions.   | Code | Key category | Total CH{4} (Gg) | Percentage | Cumulative | | --- | --- | --- | --- | --- | | 2.F | Product Uses as Substitutes for Ozone Depleting Substances | 3232353.8 | 31.78 | 31.78 | | 2 | Industrial Processes and Product Use | 3135937.5 | 30.84 | 62.62 | | 2.F.3 | Fire Protection | 1989711.3 | 19.57 | 82.19 | | 2.F.1 | Refrigeration and Air Conditioning | 665328.1 | 6.54 | 88.73 | | 2.F.1.a | Refrigeration and Stationary Air Conditioning | 665328.1 | 6.54 | 95.27 | | 2.F.5 | Solvents | 473560.1 | 4.66 | 99.93 | |

### 2.6.3 Carbondioxide Emission (CO2)

[Table 2.4](#tbl-ghg-ghg) indicates that CO2 is mainly emitted with IPPU

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| Figure 2.12: Trend of CO2 emission from **IPPU** between 1990 and 2021 |

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| Table 2.7: CO22 by Key categories in IPPU sector, detailing annual rate of emissions, Percentage Contribution, and Cumulative Share. A shades of red gradient indicate contribution levels, with dark red representing highe emissions and lighter shades denoting lower contributions.   | Code | Key category | Total CH{4} (Gg) | Percentage | Cumulative | | --- | --- | --- | --- | --- | | 2 | Industrial Processes and Product Use | 2384311.46 | 31.37 | 31.37 | | 2.H | Other | 2346658.38 | 30.88 | 62.25 | | 2.H.1 | Pulp and Paper Industry | 2258481.50 | 29.72 | 91.97 | | 3.B.2.a | Cropland Remaining Cropland | 264722.50 | 3.48 | 95.46 | | 2.H.2 | Food and Beverages Industry | 88176.88 | 1.16 | 96.62 | | 3.B.2.b.i | Forest Land converted to Cropland | 78576.58 | 1.03 | 97.65 | | Natural Gas Liquids | NA | 44440.98 | 0.58 | 98.24 | | 2.A | Mineral Industry | 27086.99 | 0.36 | 98.59 | | 2.A.1 | Cement production | 25842.00 | 0.34 | 98.93 | | 3.B.2.b.ii | Grassland converted to Cropland | 13955.37 | 0.18 | 99.12 | | 3.B.5.b.ii | Cropland converted to Settlements | 12283.12 | 0.16 | 99.28 | | 3.B.6.b.iii | Grassland converted to Other Land | 10093.52 | 0.13 | 99.41 | | 2.C | Metal Industry | 5658.63 | 0.07 | 99.48 | |

### 2.6.4 Carbondioxide Removals (CO2)

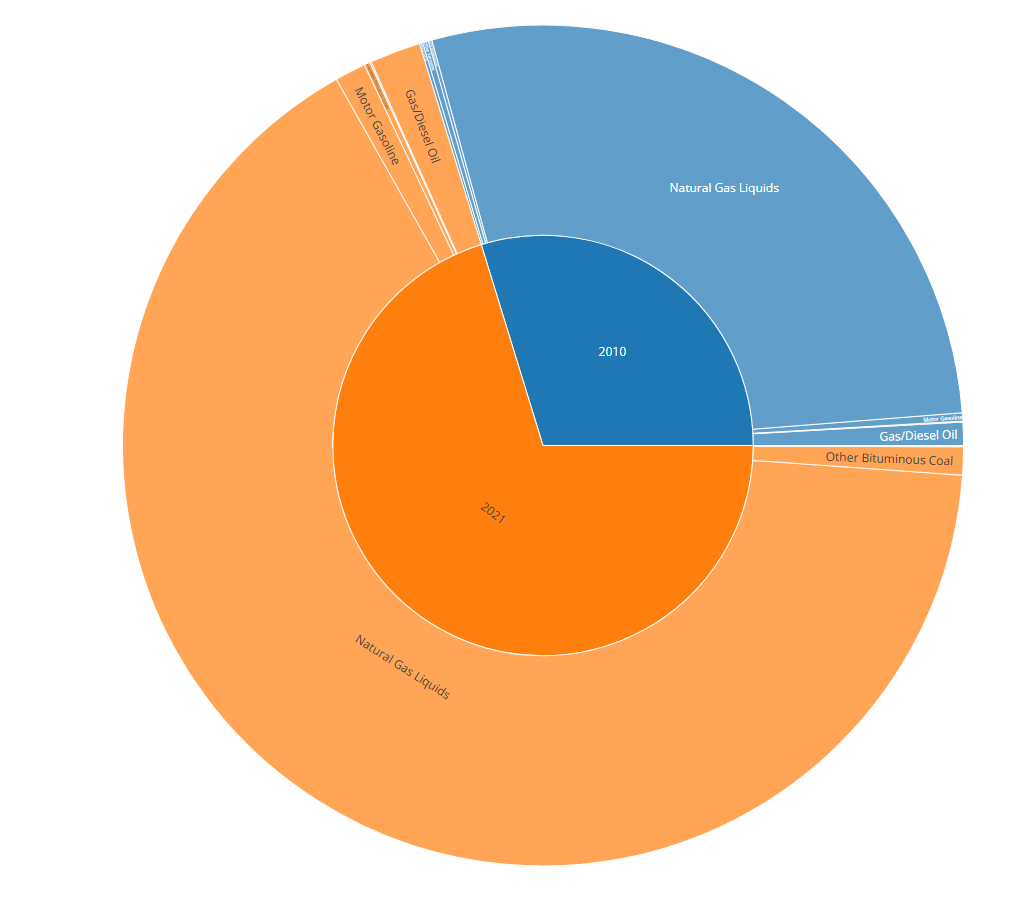
[Table 2.4](#tbl-ghg-ghg) indicates that CO2 is mainly emitted with IPPU

|  |
| --- |
| Figure 2.13: Trend of CO2 emission from **IPPU** between 1990 and 2021 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 2.8: CO2 removal by Key categories in AFOLU sector, detailing annual rate of emissions, Percentage Contribution, and Cumulative Share. A shades of red gradient indicate contribution levels, with dark red representing highe emissions and lighter shades denoting lower contributions.   | Code | Key category | Total CH{4} (Gg) | Percentage | Cumulative | | --- | --- | --- | --- | --- | | 3.B.1.a | Forest land Remaining Forest land | -4085089.68 | 59.66 | 59.66 | | 3.B.1.b.i | Cropland converted to Forest Land | -988904.44 | 14.44 | 74.10 | | 3.B.3.b.ii | Cropland converted to Grassland | -627872.39 | 9.17 | 83.27 | | 3.B.3.b.i | Forest Land converted to Grassland | -523980.96 | 7.65 | 90.93 | | 3.B.3.a | Grassland Remaining Grassland | -479576.49 | 7.00 | 97.93 | | 3.B.1.b.ii | Grassland converted to Forest Land | -83424.97 | 1.22 | 99.15 | | 3.B.1.b.v | Other Land converted to Forest Land | -26942.60 | 0.39 | 99.54 | | 3.B.3.b.v | Other Land converted to Grassland | -10843.51 | 0.16 | 99.70 | | 3.B.2.a | Cropland Remaining Cropland | -10713.77 | 0.16 | 99.86 | | 3.B.1.b.iv | Settlements converted to Forest Land | -3653.59 | 0.05 | 99.91 | | 3.B.2.b.v | Other Land converted to Cropland | -2983.42 | 0.04 | 99.95 | | 3.B.3.b.iv | Settlements converted to Grassland | -2028.23 | 0.03 | 99.98 | | 3.D.1 | Harvested Wood Products | -913.34 | 0.01 | 100.00 | | 3.B.5.b.v | Other Land converted to Settlements | -227.33 | 0.00 | 100.00 | |

## 2.7 Precursors

# 3. ENERGY



## 3.1 Sector overview

The IPCC (2006) categorize the Energy Sector for greenhouse gas (GHG) reporting into three distinct subsectors – Fuel Combustion Activities (1.A); Fugitive Emissions from Fuels (1.B), and Carbon Dioxide Transport and Storage (1.C). In Tanzania’s GHG inventory, emissions have been estimated exclusively for the Fuel Combustion Activities (1.A) subsector. This includes emissions generated from Energy Industries, Manufacturing Industries and Construction, Transport, and Other Sectors, as detailed in [Table 3.1](#tbl-cat). Fugitive Emissions from Fuels (1.B) and Carbon Dioxide Transport and Storage (1.C) have not been included in the current inventory. This focus on fuel combustion activities reflects the primary sources of energy-related emissions in Tanzania, while highlighting areas for potential expansion in future reporting efforts.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 3.1: Fuel combustion activities data and the time period   | Sub-category | GHG | Inventory period | | --- | --- | --- | | Aviation Gasoline | CO<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r> | 1990-2021 | | Crude Oil | CO<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r> | 1990-2021 | | Gas/Diesel Oil | CO<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r> | 1990-2021 | | Jet Kerosene | CO<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r> | 1990-2021 | | Liquefied Petroleum Gases | CO<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r> | 1990-2021 | | Motor Gasoline | CO<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r> | 1990-2021 | | Natural Gas Liquids | CO<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r> | 1990-2021 | | Other Kerosene | CO<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r> | 1990-2021 | | Residual Fuel Oil | CO<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r> | 1990-2021 | | Other Bituminous Coal | CO<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r> | 1990-2021 | |

# A tibble: 9 × 5  
 code category total pct pctcum  
 <chr> <chr> <dbl> <dbl> <dbl>  
1 Gas/Diesel Oil <NA> 1941. 42.4 42.4  
2 Motor Gasoline <NA> 823. 18.0 60.3  
3 Residual Fuel Oil <NA> 607. 13.2 73.6  
4 Other Bituminous Coal <NA> 449. 9.79 83.4  
5 Crude Oil <NA> 402. 8.76 92.1  
6 Other Kerosene <NA> 207. 4.51 96.6  
7 Liquefied Petroleum Gases <NA> 88.2 1.92 98.6  
8 Jet Kerosene <NA> 62.5 1.36 99.9  
9 Aviation Gasoline <NA> 3.15 0.07 100

## 3.2 Methods, data sources and assumptions

### 3.2.1 Coal

### 3.2.2 Petroleum Products

### 3.2.3 Biomass

### 3.2.4 Electricity

### 3.2.5 Category 1A1 – Energy Industries

### 3.2.6 Category 1A2 – Manufacturing and Construction Industries

### 3.2.7 Category 1A3a – Aviation

### 3.2.8 Category 1A3b – Road Transport

### 3.2.9 Category 1A3c – Railways

### 3.2.10 Category 1A4 – Other Sectors

### 3.2.11 Category 1B1 – Fugitive Emissions from Solid Fuels

### 3.2.12 Category 1B2 – Fugitive Emissions from Oil and Natural Gas

## 3.3 Quality assurance and quality control

## 3.4 Description of uncertainties

## 3.5 Time series consistency issues

## 3.6 Recalculations

## 3.7 Improvements

# 4. Industrial Process and Product Use Sector (IPPU)

## 4.1 Summary of IPPU Sector Activities

This chapter presents the results of the greenhouse gas (GHG) emissions from Industrial Processes and Product Use (IPPU) sector, covering the period from 1990 to 2021. IPPU contributes to the country’s total greenhouse gas emissions from CO2, CH4, N2O and fluorinated gases (F-gases) which are mainly from industrial processes that do not involve direct fuel combustion ([Table 4.1](#tbl-ippu)). Emissions are reported in CO2 equivalents (Gg) and analyzed across key categories.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 4.1: Industrial Processes and Product Use major categories and the greenhouse gases   |  | Greenhouse Gases | | | --- | --- | --- | | IPPU Category | CO<w:r><w:rPr><w:vertAlign w:val="subscript"></w:vertAlign></w:rPr><w:t xml:space="default">2</w:t></w:r>*1* | HFCs*1* | | 2.A - Mineral Industry | YES | - | | 2.B - Chemical Industry | - | - | | 2.C - Metal Industry | YES | - | | 2.D - Non-Energy Products from Fuels and Solvent Use (6) | YES | - | | 2.E - Electronics Industry | - | - | | 2.F - Product Uses as Substitutes for Ozone Depleting Substances | - | YES | | 2.G - Other Product Manufacture and Use | - | - | | 2.H - Other | YES | - | | *1*Activity data to estimate CO~2~ and HFCs were available. | | | |

Emission trends for several categories within the Industrial Processes and Product Use (IPPU) sector were assessed, including 2.A - Mineral Industry, 2.C - Metal Industry, 2.D - Non-Energy Products from Fuels and Solvent Use (6), 2.F - Product Uses as Substitutes for Ozone-Depleting Substances, and 2.H - Other Categories. However, due to insufficient data availability, emission trends for 2.C - Metal Industry, 2.E - Electronics Industry, and 2.G - Other Product Manufacture could not be evaluated (see [Table 4.2](#tbl-ippu-nonplots)).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 4.2: Trends of CO2eq emission by major categories in Industrial Processes and Product Use   |  | Trends CO~2~ equ*1* | | --- | --- | | 2.A - Mineral Industry | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <path class="area-closed" 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stroke="transparent" stroke-width="2" fill="url(#area\_pattern)" fill-opacity="0.7"></path> <path d="M 50,115 C 65,115 65.9677419354839,114.719833859405 80.9677419354839,114.719833859405 C 95.9677419354839,114.719833859405 96.9354838709677,114.432086616805 111.935483870968,114.432086616805 C 126.935483870968,114.432086616805 127.903225806452,114.136573278543 142.903225806452,114.136573278543 C 157.903225806452,114.136573278543 158.870967741935,113.956937075978 173.870967741935,113.956937075978 C 188.870967741935,113.956937075978 189.838709677419,113.089518921885 204.838709677419,113.089518921885 C 219.838709677419,113.089518921885 220.806451612903,113.271215886932 235.806451612903,113.271215886932 C 250.806451612903,113.271215886932 251.774193548387,114.905084752831 266.774193548387,114.905084752831 C 281.774193548387,114.905084752831 282.741935483871,112.393205876502 297.741935483871,112.393205876502 C 312.741935483871,112.393205876502 313.709677419355,111.493204459046 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623.387096774194,92.7917660787647 638.387096774194,92.7917660787647 C 653.387096774194,92.7917660787647 654.354838709677,86.9294944996863 669.354838709677,86.9294944996863 C 684.354838709677,86.9294944996863 685.322580645161,85.4768070004126 700.322580645161,85.4768070004126 C 715.322580645161,85.4768070004126 716.290322580645,82.7296370539785 731.290322580645,82.7296370539785 C 746.290322580645,82.7296370539785 747.258064516129,87.4948636681444 762.258064516129,87.4948636681444 C 777.258064516129,87.4948636681444 778.225806451613,80.2860563408721 793.225806451613,80.2860563408721 C 808.225806451613,80.2860563408721 809.193548387097,72.6802996058904 824.193548387097,72.6802996058904 C 839.193548387097,72.6802996058904 840.161290322581,57.7418383492812 855.161290322581,57.7418383492812 C 870.161290322581,57.7418383492812 871.129032258065,52.8952892573469 886.129032258065,52.8952892573469 C 901.129032258065,52.8952892573469 902.096774193548,49.5361597117094 917.096774193548,49.5361597117094 C 932.096774193548,49.5361597117094 933.064516129032,36.0130599112467 948.064516129032,36.0130599112467 C 963.064516129032,36.0130599112467 964.032258064516,32.4401347167571 979.032258064516,32.4401347167571 C 994.032258064516,32.4401347167571 995,15 1010,15" stroke="#4682B4" stroke-width="8" fill="none"></path> <circle cx="50" cy="115" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="80.9677419354839" cy="114.719833859405" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="111.935483870968" cy="114.432086616805" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="142.903225806452" cy="114.136573278543" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="173.870967741935" cy="113.956937075978" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="204.838709677419" cy="113.089518921885" r="10" stroke="#FFFFFF" 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fill="#FF0000" ></circle> <circle cx="1010" cy="15" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <g class="y-axis-line"> <rect x="0" y="0" width="65" height="130" stroke="transparent" stroke-width="0" fill="transparent"></rect> <text x="0" y="19" fill="transparent" stroke="transparent" font-size="25">2.72K</text> <text x="0" y="126" fill="transparent" stroke="transparent" font-size="25">255</text></g> <g class="vert-line"> <rect x="40" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="60" y="20" fill="transparent" stroke="transparent" font-size="30px">255</text></g> <g class="vert-line"> <rect x="70.9677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="90.9677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">262</text></g> <g class="vert-line"> <rect x="101.935483870968" y="0" width="20" height="130" stroke="transparent" 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x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">1.05K</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">932</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">1.11K</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">1.30K</text></g> <g 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font-size="30px">2.20K</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">2.29K</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">2.72K</text></g> </svg> </div> | | 2.B - Chemical Industry | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <path class="area-closed" 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width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="90.9677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="101.935483870968" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="121.935483870968" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="132.903225806452" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="152.903225806452" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="163.870967741935" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="183.870967741935" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="194.838709677419" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="214.838709677419" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="225.806451612903" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="245.806451612903" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="256.774193548387" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="276.774193548387" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="287.741935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="307.741935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="318.709677419355" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="338.709677419355" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="349.677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="400.645161290323" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="493.548387096774" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="504.516129032258" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="524.516129032258" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="535.483870967742" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="555.483870967742" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="566.451612903226" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="586.451612903226" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="597.41935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="617.41935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="628.387096774194" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="648.387096774194" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="659.354838709677" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="679.354838709677" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="690.322580645161" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="710.322580645161" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="938.064516129032" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> </svg> </div> | | 2.C - Metal Industry | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <path class="area-closed" 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stroke="transparent" stroke-width="2" fill="url(#area\_pattern)" fill-opacity="0.7"></path> <path d="M 50,115 C 65,115 65.9677419354839,114.360606813178 80.9677419354839,114.360606813178 C 95.9677419354839,114.360606813178 96.9354838709677,113.704376412747 111.935483870968,113.704376412747 C 126.935483870968,113.704376412747 127.903225806452,113.030466938026 142.903225806452,113.030466938026 C 157.903225806452,113.030466938026 158.870967741935,112.338457458675 173.870967741935,112.338457458675 C 188.870967741935,112.338457458675 189.838709677419,111.627506114013 204.838709677419,111.627506114013 C 219.838709677419,111.627506114013 220.806451612903,110.8971919737 235.806451612903,110.8971919737 C 250.806451612903,110.8971919737 251.774193548387,110.147515037736 266.774193548387,110.147515037736 C 281.774193548387,110.147515037736 282.741935483871,109.377212515101 297.741935483871,109.377212515101 C 312.741935483871,109.377212515101 313.709677419355,108.586705336134 328.709677419355,108.586705336134 C 343.709677419355,108.586705336134 344.677419354839,107.774309779475 359.677419354839,107.774309779475 C 374.677419354839,107.774309779475 375.645161290323,106.940025845123 390.645161290323,106.940025845123 C 405.645161290323,106.940025845123 406.612903225806,106.083432602739 421.612903225806,106.083432602739 C 436.612903225806,106.083432602739 437.58064516129,105.203688191641 452.58064516129,105.203688191641 C 467.58064516129,105.203688191641 468.548387096774,109.255563646772 483.548387096774,109.255563646772 C 498.548387096774,109.255563646772 499.516129032258,105.96178373441 514.516129032258,105.96178373441 C 529.516129032258,105.96178373441 530.483870967742,101.625359369278 545.483870967742,101.625359369278 C 560.483870967742,101.625359369278 561.451612903226,95.8518788225737 576.451612903226,95.8518788225737 C 591.451612903226,95.8518788225737 592.41935483871,81.2001355395695 607.41935483871,81.2001355395695 C 622.41935483871,81.2001355395695 623.387096774194,77.2042438196903 638.387096774194,77.2042438196903 C 653.387096774194,77.2042438196903 654.354838709677,71.533470276004 669.354838709677,71.533470276004 C 684.354838709677,71.533470276004 685.322580645161,73.5838219633033 700.322580645161,73.5838219633033 C 715.322580645161,73.5838219633033 716.290322580645,62.9347052856223 731.290322580645,62.9347052856223 C 746.290322580645,62.9347052856223 747.258064516129,65.0970244434249 762.258064516129,65.0970244434249 C 777.258064516129,65.0970244434249 778.225806451613,59.8703324086897 793.225806451613,59.8703324086897 C 808.225806451613,59.8703324086897 809.193548387097,52.1353164764763 824.193548387097,52.1353164764763 C 839.193548387097,52.1353164764763 840.161290322581,46.1623149484992 855.161290322581,46.1623149484992 C 870.161290322581,46.1623149484992 871.129032258065,41.1843927448447 886.129032258065,41.1843927448447 C 901.129032258065,41.1843927448447 902.096774193548,22.79983920461 917.096774193548,22.79983920461 C 932.096774193548,22.79983920461 933.064516129032,26.5684285407608 948.064516129032,26.5684285407608 C 963.064516129032,26.5684285407608 964.032258064516,19.9749756912729 979.032258064516,19.9749756912729 C 994.032258064516,19.9749756912729 995,15 1010,15" stroke="#4682B4" stroke-width="8" fill="none"></path> <circle cx="50" cy="115" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="80.9677419354839" cy="114.360606813178" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="111.935483870968" cy="113.704376412747" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="142.903225806452" cy="113.030466938026" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="173.870967741935" cy="112.338457458675" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="204.838709677419" cy="111.627506114013" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> 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fill="transparent"></rect> <text x="121.935483870968" y="20" fill="transparent" stroke="transparent" font-size="30px">80.1</text></g> <g class="vert-line"> <rect x="132.903225806452" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="152.903225806452" y="20" fill="transparent" stroke="transparent" font-size="30px">82.2</text></g> <g class="vert-line"> <rect x="163.870967741935" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="183.870967741935" y="20" fill="transparent" stroke="transparent" font-size="30px">84.4</text></g> <g class="vert-line"> <rect x="194.838709677419" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="214.838709677419" y="20" fill="transparent" stroke="transparent" font-size="30px">86.7</text></g> <g class="vert-line"> <rect x="225.806451612903" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="245.806451612903" y="20" fill="transparent" stroke="transparent" font-size="30px">89.1</text></g> <g class="vert-line"> <rect x="256.774193548387" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="276.774193548387" y="20" fill="transparent" stroke="transparent" font-size="30px">91.5</text></g> <g class="vert-line"> <rect x="287.741935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="307.741935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">93.9</text></g> <g class="vert-line"> <rect x="318.709677419355" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="338.709677419355" y="20" fill="transparent" stroke="transparent" font-size="30px">96.5</text></g> <g class="vert-line"> <rect x="349.677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">99.1</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="400.645161290323" y="20" fill="transparent" stroke="transparent" font-size="30px">102</text></g> <g class="vert-line"> <rect x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">105</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">107</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="493.548387096774" y="20" fill="transparent" stroke="transparent" font-size="30px">94.3</text></g> <g class="vert-line"> <rect x="504.516129032258" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="524.516129032258" y="20" fill="transparent" stroke="transparent" font-size="30px">105</text></g> <g class="vert-line"> <rect x="535.483870967742" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="555.483870967742" y="20" fill="transparent" stroke="transparent" font-size="30px">119</text></g> <g class="vert-line"> <rect x="566.451612903226" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="586.451612903226" y="20" fill="transparent" stroke="transparent" font-size="30px">137</text></g> <g class="vert-line"> <rect x="597.41935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="617.41935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">184</text></g> <g class="vert-line"> <rect x="628.387096774194" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="648.387096774194" y="20" fill="transparent" stroke="transparent" font-size="30px">197</text></g> <g class="vert-line"> <rect x="659.354838709677" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="679.354838709677" y="20" fill="transparent" stroke="transparent" font-size="30px">215</text></g> <g class="vert-line"> <rect x="690.322580645161" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="710.322580645161" y="20" fill="transparent" stroke="transparent" font-size="30px">209</text></g> <g class="vert-line"> <rect x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">243</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">236</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">253</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">278</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">297</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">313</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" fill="transparent" stroke="transparent" font-size="30px">372</text></g> <g class="vert-line"> <rect x="938.064516129032" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">360</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">381</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">397</text></g> </svg> </div> | | 2.D - Non-Energy Products from Fuels and Solvent Use (6) | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <path class="area-closed" 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623.387096774194,71.1121702105442 638.387096774194,71.1121702105442 C 653.387096774194,71.1121702105442 654.354838709677,48.9150087952083 669.354838709677,48.9150087952083 C 684.354838709677,48.9150087952083 685.322580645161,18.6344115370626 700.322580645161,18.6344115370626 C 715.322580645161,18.6344115370626 716.290322580645,17.1067465710644 731.290322580645,17.1067465710644 C 746.290322580645,17.1067465710644 747.258064516129,15 762.258064516129,15 C 777.258064516129,15 778.225806451613,55.38058292459 793.225806451613,55.38058292459 C 808.225806451613,55.38058292459 809.193548387097,74.4903841225856 824.193548387097,74.4903841225856 C 839.193548387097,74.4903841225856 840.161290322581,64.4309016822639 855.161290322581,64.4309016822639 C 870.161290322581,64.4309016822639 871.129032258065,64.7127066945197 886.129032258065,64.7127066945197 C 901.129032258065,64.7127066945197 902.096774193548,88.0908498880172 917.096774193548,88.0908498880172 C 932.096774193548,88.0908498880172 933.064516129032,79.9694392002867 948.064516129032,79.9694392002867 C 963.064516129032,79.9694392002867 964.032258064516,71.1988855524861 979.032258064516,71.1988855524861 C 994.032258064516,71.1988855524861 995,81.3633150220851 1010,81.3633150220851" stroke="#4682B4" stroke-width="8" fill="none"></path> <circle cx="50" cy="112.414356664147" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="80.9677419354839" cy="112.451300371463" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="111.935483870968" cy="115" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="142.903225806452" cy="112.468541595734" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="173.870967741935" cy="109.081453777257" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="204.838709677419" cy="109.292295503712" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle 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fill="transparent"></rect> <text x="245.806451612903" y="20" fill="transparent" stroke="transparent" font-size="30px">90.9</text></g> <g class="vert-line"> <rect x="256.774193548387" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="276.774193548387" y="20" fill="transparent" stroke="transparent" font-size="30px">110</text></g> <g class="vert-line"> <rect x="287.741935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="307.741935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">103</text></g> <g class="vert-line"> <rect x="318.709677419355" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="338.709677419355" y="20" fill="transparent" stroke="transparent" font-size="30px">96.9</text></g> <g class="vert-line"> <rect x="349.677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">101</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="400.645161290323" y="20" fill="transparent" stroke="transparent" font-size="30px">123</text></g> <g class="vert-line"> <rect x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">113</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">119</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" height="130" 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x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">188</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">161</text></g> </svg> </div> | | 2.E - Electronics Industry | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <path class="area-closed" 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499.516129032258,65 514.516129032258,65 C 529.516129032258,65 530.483870967742,65 545.483870967742,65 C 560.483870967742,65 561.451612903226,65 576.451612903226,65 C 591.451612903226,65 592.41935483871,65 607.41935483871,65 C 622.41935483871,65 623.387096774194,65 638.387096774194,65 C 653.387096774194,65 654.354838709677,65 669.354838709677,65 C 684.354838709677,65 685.322580645161,65 700.322580645161,65 C 715.322580645161,65 716.290322580645,65 731.290322580645,65 C 746.290322580645,65 747.258064516129,65 762.258064516129,65 C 777.258064516129,65 778.225806451613,65 793.225806451613,65 C 808.225806451613,65 809.193548387097,65 824.193548387097,65 C 839.193548387097,65 840.161290322581,65 855.161290322581,65 C 870.161290322581,65 871.129032258065,65 886.129032258065,65 C 901.129032258065,65 902.096774193548,65 917.096774193548,65 C 932.096774193548,65 933.064516129032,65 948.064516129032,65 C 963.064516129032,65 964.032258064516,65 979.032258064516,65 C 994.032258064516,65 995,65 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width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="214.838709677419" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="225.806451612903" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="245.806451612903" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="256.774193548387" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="276.774193548387" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="287.741935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="307.741935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="318.709677419355" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="338.709677419355" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="349.677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="400.645161290323" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="493.548387096774" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="504.516129032258" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="524.516129032258" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="535.483870967742" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="555.483870967742" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="566.451612903226" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="586.451612903226" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="597.41935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="617.41935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="628.387096774194" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="648.387096774194" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="659.354838709677" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="679.354838709677" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="690.322580645161" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="710.322580645161" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="938.064516129032" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> </svg> </div> | | 2.F - Product Uses as Substitutes for Ozone Depleting Substances | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <path class="area-closed" 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933.064516129032,51.3995145569553 948.064516129032,51.3995145569553 C 963.064516129032,51.3995145569553 964.032258064516,46.980745931265 979.032258064516,46.980745931265 C 994.032258064516,46.980745931265 995,31.161885747012 1010,31.161885747012" stroke="#4682B4" stroke-width="8" fill="none"></path> <circle cx="50" cy="102.288326280703" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="80.9677419354839" cy="111.013270981988" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="111.935483870968" cy="115" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="142.903225806452" cy="114.756475801393" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="173.870967741935" cy="111.590812265309" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="204.838709677419" cy="108.678161692685" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle 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stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <g class="y-axis-line"> <rect x="0" y="0" width="65" height="130" stroke="transparent" stroke-width="0" fill="transparent"></rect> <text x="0" y="19" fill="transparent" stroke="transparent" font-size="25">19.0K</text> <text x="0" y="126" fill="transparent" stroke="transparent" font-size="25">301</text></g> <g class="vert-line"> <rect x="40" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="60" y="20" fill="transparent" stroke="transparent" font-size="30px">2.67K</text></g> <g class="vert-line"> <rect x="70.9677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="90.9677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">1.04K</text></g> <g class="vert-line"> <rect x="101.935483870968" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="121.935483870968" y="20" fill="transparent" stroke="transparent" font-size="30px">301</text></g> <g class="vert-line"> <rect x="132.903225806452" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="152.903225806452" y="20" fill="transparent" stroke="transparent" font-size="30px">346</text></g> <g class="vert-line"> <rect x="163.870967741935" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="183.870967741935" y="20" fill="transparent" stroke="transparent" font-size="30px">937</text></g> <g class="vert-line"> <rect x="194.838709677419" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="214.838709677419" y="20" fill="transparent" stroke="transparent" font-size="30px">1.48K</text></g> <g class="vert-line"> <rect x="225.806451612903" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="245.806451612903" y="20" fill="transparent" stroke="transparent" font-size="30px">1.98K</text></g> <g class="vert-line"> <rect x="256.774193548387" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="276.774193548387" y="20" fill="transparent" stroke="transparent" font-size="30px">2.45K</text></g> <g class="vert-line"> <rect x="287.741935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="307.741935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">2.89K</text></g> <g class="vert-line"> <rect x="318.709677419355" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="338.709677419355" y="20" fill="transparent" stroke="transparent" font-size="30px">3.31K</text></g> <g class="vert-line"> <rect x="349.677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">3.70K</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="400.645161290323" y="20" fill="transparent" stroke="transparent" font-size="30px">4.08K</text></g> <g class="vert-line"> <rect x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">4.45K</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">4.81K</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="493.548387096774" y="20" fill="transparent" stroke="transparent" font-size="30px">5.15K</text></g> <g class="vert-line"> <rect x="504.516129032258" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="524.516129032258" y="20" fill="transparent" stroke="transparent" font-size="30px">10.5K</text></g> <g class="vert-line"> <rect x="535.483870967742" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="555.483870967742" y="20" fill="transparent" stroke="transparent" font-size="30px">9.30K</text></g> <g class="vert-line"> <rect x="566.451612903226" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="586.451612903226" y="20" fill="transparent" stroke="transparent" font-size="30px">14.2K</text></g> <g class="vert-line"> <rect x="597.41935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="617.41935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">13.7K</text></g> <g class="vert-line"> <rect x="628.387096774194" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="648.387096774194" y="20" fill="transparent" stroke="transparent" font-size="30px">13.6K</text></g> <g class="vert-line"> <rect x="659.354838709677" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="679.354838709677" y="20" fill="transparent" stroke="transparent" font-size="30px">13.7K</text></g> <g class="vert-line"> <rect x="690.322580645161" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="710.322580645161" y="20" fill="transparent" stroke="transparent" font-size="30px">13.9K</text></g> <g class="vert-line"> <rect x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">13.7K</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">19.0K</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">17.7K</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">13.3K</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">12.1K</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">12.1K</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" fill="transparent" stroke="transparent" font-size="30px">12.0K</text></g> <g class="vert-line"> <rect x="938.064516129032" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">12.2K</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">13.0K</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">15.9K</text></g> </svg> </div> | | 2.G - Other Product Manufacture and Use | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <path class="area-closed" 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stroke="transparent" stroke-width="2" fill="url(#area\_pattern)" fill-opacity="0.7"></path> <path d="M 50,65 C 65,65 65.9677419354839,65 80.9677419354839,65 C 95.9677419354839,65 96.9354838709677,65 111.935483870968,65 C 126.935483870968,65 127.903225806452,65 142.903225806452,65 C 157.903225806452,65 158.870967741935,65 173.870967741935,65 C 188.870967741935,65 189.838709677419,65 204.838709677419,65 C 219.838709677419,65 220.806451612903,65 235.806451612903,65 C 250.806451612903,65 251.774193548387,65 266.774193548387,65 C 281.774193548387,65 282.741935483871,65 297.741935483871,65 C 312.741935483871,65 313.709677419355,65 328.709677419355,65 C 343.709677419355,65 344.677419354839,65 359.677419354839,65 C 374.677419354839,65 375.645161290323,65 390.645161290323,65 C 405.645161290323,65 406.612903225806,65 421.612903225806,65 C 436.612903225806,65 437.58064516129,65 452.58064516129,65 C 467.58064516129,65 468.548387096774,65 483.548387096774,65 C 498.548387096774,65 499.516129032258,65 514.516129032258,65 C 529.516129032258,65 530.483870967742,65 545.483870967742,65 C 560.483870967742,65 561.451612903226,65 576.451612903226,65 C 591.451612903226,65 592.41935483871,65 607.41935483871,65 C 622.41935483871,65 623.387096774194,65 638.387096774194,65 C 653.387096774194,65 654.354838709677,65 669.354838709677,65 C 684.354838709677,65 685.322580645161,65 700.322580645161,65 C 715.322580645161,65 716.290322580645,65 731.290322580645,65 C 746.290322580645,65 747.258064516129,65 762.258064516129,65 C 777.258064516129,65 778.225806451613,65 793.225806451613,65 C 808.225806451613,65 809.193548387097,65 824.193548387097,65 C 839.193548387097,65 840.161290322581,65 855.161290322581,65 C 870.161290322581,65 871.129032258065,65 886.129032258065,65 C 901.129032258065,65 902.096774193548,65 917.096774193548,65 C 932.096774193548,65 933.064516129032,65 948.064516129032,65 C 963.064516129032,65 964.032258064516,65 979.032258064516,65 C 994.032258064516,65 995,65 1010,65" stroke="#4682B4" stroke-width="8" fill="none"></path> <circle cx="50" cy="65" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="80.9677419354839" cy="65" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="111.935483870968" cy="65" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="142.903225806452" cy="65" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="173.870967741935" cy="65" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="204.838709677419" cy="65" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="235.806451612903" cy="65" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="266.774193548387" cy="65" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="297.741935483871" cy="65" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> 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width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="90.9677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="101.935483870968" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="121.935483870968" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="132.903225806452" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="152.903225806452" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="163.870967741935" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="183.870967741935" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="194.838709677419" y="0" 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width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="338.709677419355" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="349.677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="400.645161290323" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="493.548387096774" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="504.516129032258" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="524.516129032258" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="535.483870967742" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="555.483870967742" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="566.451612903226" y="0" 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width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="710.322580645161" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" 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width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> </svg> </div> | | 2.H - Other | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <path class="area-closed" 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stroke="transparent" stroke-width="2" fill="url(#area\_pattern)" fill-opacity="0.7"></path> <path d="M 50,78.1390701705693 C 65,78.1390701705693 65.9677419354839,76.9394272133039 80.9677419354839,76.9394272133039 C 95.9677419354839,76.9394272133039 96.9354838709677,76.1755881682854 111.935483870968,76.1755881682854 C 126.935483870968,76.1755881682854 127.903225806452,95.0169188297994 142.903225806452,95.0169188297994 C 157.903225806452,95.0169188297994 158.870967741935,85.8943702081501 173.870967741935,85.8943702081501 C 188.870967741935,85.8943702081501 189.838709677419,84.6609958136686 204.838709677419,84.6609958136686 C 219.838709677419,84.6609958136686 220.806451612903,103.696642016979 235.806451612903,103.696642016979 C 250.806451612903,103.696642016979 251.774193548387,115 266.774193548387,115 C 281.774193548387,115 282.741935483871,110.488282445133 297.741935483871,110.488282445133 C 312.741935483871,110.488282445133 313.709677419355,105.986419818803 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623.387096774194,70.0099735287567 638.387096774194,70.0099735287567 C 653.387096774194,70.0099735287567 654.354838709677,69.0442343312128 669.354838709677,69.0442343312128 C 684.354838709677,69.0442343312128 685.322580645161,74.0163655385153 700.322580645161,74.0163655385153 C 715.322580645161,74.0163655385153 716.290322580645,69.0474239166463 731.290322580645,69.0474239166463 C 746.290322580645,69.0474239166463 747.258064516129,73.026788744384 762.258064516129,73.026788744384 C 777.258064516129,73.026788744384 778.225806451613,61.4963997390016 793.225806451613,61.4963997390016 C 808.225806451613,61.4963997390016 809.193548387097,57.5114447199249 824.193548387097,57.5114447199249 C 839.193548387097,57.5114447199249 840.161290322581,21.7022547270363 855.161290322581,21.7022547270363 C 870.161290322581,21.7022547270363 871.129032258065,15 886.129032258065,15 C 901.129032258065,15 902.096774193548,41.2391054064737 917.096774193548,41.2391054064737 C 932.096774193548,41.2391054064737 933.064516129032,50.8277301779777 948.064516129032,50.8277301779777 C 963.064516129032,50.8277301779777 964.032258064516,72.7648006585847 979.032258064516,72.7648006585847 C 994.032258064516,72.7648006585847 995,53.407178250088 1010,53.407178250088" stroke="#4682B4" stroke-width="8" fill="none"></path> <circle cx="50" cy="78.1390701705693" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="80.9677419354839" cy="76.9394272133039" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="111.935483870968" cy="76.1755881682854" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="142.903225806452" cy="95.0169188297994" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="173.870967741935" cy="85.8943702081501" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="204.838709677419" cy="84.6609958136686" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" 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fill="#FF0000" ></circle> <circle cx="762.258064516129" cy="73.026788744384" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="793.225806451613" cy="61.4963997390016" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="824.193548387097" cy="57.5114447199249" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="855.161290322581" cy="21.7022547270363" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="886.129032258065" cy="15" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="917.096774193548" cy="41.2391054064737" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="948.064516129032" cy="50.8277301779777" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="979.032258064516" cy="72.7648006585847" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <circle cx="1010" cy="53.407178250088" r="10" stroke="#FFFFFF" stroke-width="4" fill="#FF0000" ></circle> <g class="y-axis-line"> <rect x="0" y="0" width="65" height="130" stroke="transparent" stroke-width="0" fill="transparent"></rect> <text x="0" y="19" fill="transparent" stroke="transparent" font-size="25">171K</text> <text x="0" y="126" fill="transparent" stroke="transparent" font-size="25">11.9K</text></g> <g class="vert-line"> <rect x="40" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="60" y="20" fill="transparent" stroke="transparent" font-size="30px">70.5K</text></g> <g class="vert-line"> <rect x="70.9677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="90.9677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">72.4K</text></g> <g class="vert-line"> <rect x="101.935483870968" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="121.935483870968" y="20" fill="transparent" stroke="transparent" font-size="30px">73.6K</text></g> <g class="vert-line"> <rect x="132.903225806452" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="152.903225806452" y="20" fill="transparent" stroke="transparent" font-size="30px">43.7K</text></g> <g class="vert-line"> <rect x="163.870967741935" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="183.870967741935" y="20" fill="transparent" stroke="transparent" font-size="30px">58.2K</text></g> <g class="vert-line"> <rect x="194.838709677419" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="214.838709677419" y="20" fill="transparent" stroke="transparent" font-size="30px">60.1K</text></g> <g class="vert-line"> <rect x="225.806451612903" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="245.806451612903" y="20" fill="transparent" stroke="transparent" font-size="30px">29.9K</text></g> <g class="vert-line"> <rect x="256.774193548387" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="276.774193548387" y="20" fill="transparent" stroke="transparent" font-size="30px">11.9K</text></g> <g class="vert-line"> <rect x="287.741935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="307.741935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">19.1K</text></g> <g class="vert-line"> <rect x="318.709677419355" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="338.709677419355" y="20" fill="transparent" stroke="transparent" font-size="30px">26.3K</text></g> <g class="vert-line"> <rect x="349.677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">33.4K</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="400.645161290323" y="20" fill="transparent" stroke="transparent" font-size="30px">40.6K</text></g> <g class="vert-line"> <rect x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">47.8K</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">55.0K</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="493.548387096774" y="20" fill="transparent" stroke="transparent" font-size="30px">62.1K</text></g> <g class="vert-line"> <rect x="504.516129032258" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="524.516129032258" y="20" fill="transparent" stroke="transparent" font-size="30px">63.0K</text></g> <g class="vert-line"> <rect x="535.483870967742" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="555.483870967742" y="20" fill="transparent" stroke="transparent" font-size="30px">61.3K</text></g> <g class="vert-line"> <rect x="566.451612903226" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="586.451612903226" y="20" fill="transparent" stroke="transparent" font-size="30px">65.1K</text></g> <g class="vert-line"> <rect x="597.41935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="617.41935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">80.4K</text></g> <g class="vert-line"> <rect x="628.387096774194" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="648.387096774194" y="20" fill="transparent" stroke="transparent" font-size="30px">83.4K</text></g> <g class="vert-line"> <rect x="659.354838709677" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="679.354838709677" y="20" fill="transparent" stroke="transparent" font-size="30px">85.0K</text></g> <g class="vert-line"> <rect x="690.322580645161" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="710.322580645161" y="20" fill="transparent" stroke="transparent" font-size="30px">77.1K</text></g> <g class="vert-line"> <rect x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">85.0K</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">78.6K</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">97.0K</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">103K</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">160K</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">171K</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" fill="transparent" stroke="transparent" font-size="30px">129K</text></g> <g class="vert-line"> <rect x="938.064516129032" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">114K</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">79.0K</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">110K</text></g> </svg> </div> | | *1*Emission from 1990 through 2021. | | |

## 4.2 Methods, data sources and assumptions

### 4.2.1 Cement Production

Cement manufacturing is one of the largest contributors to CO₂ emissions in Tanzania’s IPPU sector. The production process in cement releases a large amount of CO2 due to the decomposition of limestone (calcium carbonate) to form clinker. Tanzania’s cement industry is growing to meet rising domestic and regional demand which results in increasing GHG emissions. However, some producers are exploring efficiency improvements and alternative fuels to reduce emissions. Tanzania’s cement industry has grown significantly, supported by both local and international investments. The industry is led by several key players:

* **Tanzania Portland Cement Company (TPCC)** - Operating under the brand name **Twiga Cement** is one of the largest cement manufacturers in Tanzania. TPCC operates a major plant at Wazo Hill, Dar es Salaam and has a significant market share, producing around 1.9 million tons annually. The company is part of HeidelbergCement Group.
* **Dangote Cement** - A Nigerian company, Dangote entered the Tanzanian market in 2015, establishing a $500 million cement plant in Mtwara. This plant, with an annual capacity of 3 million tons is powered by a 30-MW gas-fired power plant and has access to significant limestone reserves. Dangote’s entry increased competition and lowered cement prices which has significantly impacted the industry.
* **Tanga Cement** - Known for its Simba brand, Tanga Cement operates in the northeastern region and expanded its capacity to 1.25 million tons per year by adding a second production line in 2016. Despite competition pressures, Tanga remains a key player in the market.
* Other notable contributors include subsidiaries of international groups like LafargeHolcim and AfriSam.

These companies collectively contribute to an installed cement production capacity of approximately 7 million tons annually in Tanzania thus positioning the country as a leading cement producer in East Africa. However, The industry has faced various challenges including the shortage of fuel and electricity which have impacted and reduced production costs and profit margins.

The demand for cement remains robust mainly driven by infrastructure and construction projects throughout the country.

### 4.2.2 Lime Production

Lime production contributes CO2 emissions through the calcination process. Although it does not contribute CO2 as large as cement, the lime industry is growing with uses in construction, water treatment and agriculture. Emissions from lime production are less significant than from cement but still contribute to the IPPU sector’s GHG output. Lime production in Tanzania is significant because it is largely driven by small-scale and traditional methods, often involving coral limestone as the raw material. The lime industry in Tanzania includes both artisanal operations and more structured small to medium enterprises. Key areas for lime production include regions along the coast particularly in places like Mtwara where lime is produced from coral mining. This traditional method involves burning coral boulders collected from shallow reefs, especially in the Mnazi Bay-Ruvuma Estuary Marine Park region which has led to environmental concerns such as reef degradation and coral depletion.

Artisans use live coral from areas like Shangani and Msangamkuu highlighting the reliance on natural marine resources in coastal lime production. Due to its accessibility and quality, coral limestone remains a popular choice for producing “*white lime*” or “chokaa,” primarily used in building and agricultural sectors. While some improvements are underway in methods and environmental management, lime production still faces challenges. Many producers rely on rudimentary kilns with limited capacity therefore affecting production efficiency and environmental sustainability. Initiatives to regulate coral mining, enforce sustainable practices and introduce modern lime kilns have been recommended to balance production needs with environmental conservation in Tanzania’s lime industry.

### 4.2.3 Metal Production and Mining

Iron and steel production in Tanzania is limited but small-scale metal production and mining contribute to GHG emissions through fuel combustion and chemical reactions in the processes. As Tanzania seeks to grow its industrial base, emissions from metal production are likely to rise unless cleaner technologies are adopted. The metal production sector in Tanzania is focused on various metals including iron, steel, nickel and gemstones with significant industrial and investment developments in recent years. The country possesses notable iron ore reserves primarily at the Liganga site in Njombe Region.

The Liganga Iron and Steel Complex is an extensive USD 1.8 billion investment by Tanzania China International Mineral Resources Ltd (TCI MRL) which aims to produce up to one million tonnes of iron and steel annually along with vanadium pentoxide and titanium dioxide. This facility is designed to not only meet local demand but also export products therefore diversifying Tanzania’s economy. Tanzania’s nickel resources are primarily located in the Kabanga Nickel Deposit in the northwest, one of the world’s largest undeveloped nickel sulfide deposits with an estimated 58 million tonnes. Efforts are underway to develop this deposit to support global demand especially as nickel is critical for battery production in electric vehicles.

The Kabanga Nickel Project is expected to generate a significant amount of nickel with plans to reach production levels that could place Tanzania among the top producers worldwide. Additionally, Tanzania is known for its unique gemstone, tanzanite which is exclusively found in the Mererani Hills in the Manyara Region. This gemstone along with diamonds from the Williamson mine near Mwanza contributes significantly to Tanzania’s mining revenues. Gold production is also substantial, with Tanzania ranking as one of Africa’s leading gold producers.

### 4.2.4 Manufacturing of Other Mineral Products

In addition to cement and lime, other mineral products including glass and ceramics also release CO₂ emissions during production. The expansion of these industries to meet local and regional demands is contributing to emissions though to a lesser extent than cement. In Tanzania, the glass and ceramics sector are experiencing notable expansion with several significant investments aimed at meeting both domestic and regional demand. One major project is the Sapphire Float Glass plant in Mkuranga which is expected to start production soon. This $311 million investment is expected to produce up to 1,200 tonnes of float glass daily therefore making it the first of its kind in the country. Located in the Kusini Gateway Industrial Park, the plant aims to reduce Tanzania’s dependence on imported glass products and support the growing construction industry. Another notable player is Keda Industrial Group from China which announced an $87 million investment in an architectural glass plant in Tanzania. This facility will produce approximately 600 tonnes of glass annually, focusing on materials used in building windows and external wall applications.

### 4.2.5 Use of Hydrofluorocarbons (HFCs) in Refrigeration and Air Conditioning

HFCs are potent greenhouse gases used as refrigerants in air conditioning, refrigeration and other cooling systems. In Tanzania, hydrofluorocarbons (HFCs) are primarily used in refrigeration, air conditioning, foam production and fire suppression. The main types of HFCs include HFC-134a, HFC-32, HFC-125, and HFC-143a, with HFC-134a and HFC-32 being the most used in Tanzania’s growing air conditioning and refrigeration sector. As these sectors expand to meet the needs of urbanization and rising living standards, HFC demand is expected to increase despite global pressures to phase down HFC usage.

Projections suggest that demand for HFCs in Tanzania will grow in the short term but with international agreements encouraging a shift to low-global-warming-potential (GWP) alternatives, the country may start transitioning towards less harmful refrigerants. Currently, Tanzania relies on imports for HFCs primarily sourcing them from Asian countries with China being a major supplier. The Tanzanian government is aware of the need to mitigate HFC emissions and is working on policies to align with the Kigali Amendment’s goals, which mandates gradual reductions in HFC use. By 2040, it is anticipated that Tanzania’s reliance on high-GWP HFCs will significantly decrease as alternatives become more accessible and policy measures are implemented to encourage the shift to environmentally friendly options.

### 4.2.6 Other Product Use

Other products such as aerosols, fire extinguishers, and foam-blowing agents also contain greenhouse gases and contribute to Tanzania’s IPPU sector emissions. These sources are relatively small but contribute to the overall emissions profile.

## 4.3 Overview of Emissions for the IPPU sector

The IPPU sector has experienced significant growth in GHG emissions over the past two decades, with the most dramatic increases observed in the Mineral Industry (2.A) and Product Uses as Substitutes for Ozone-Depleting Substances (2.F). In 2021, emissions from the IPPU sector were equivalent to 304,337 Gg-CO2eq, an increase of 78,405 Gg-CO2eq (288 percent) compared to 2000 ([Table 4.3](#tbl-ippu-cat)). The Mineral Industry (2.A) experienced a notable rise in emissions, escalating from 343 Gg in 2000 to 2,716 Gg in 2021, which translates to a 693% increase. In a similar vein, the Metal Industry (2.C) saw a 300% uptick, with emissions climbing from 99 Gg to 397 Gg ([Table 4.3](#tbl-ippu-cat)).

The Non-Energy Products from Fuels and Solvent Use (2.D) sector recorded a more modest elevation, advancing from 101 Gg to 161 Gg, indicating a 60% change ([Table 4.3](#tbl-ippu-cat)). The most pronounced growth was observed in the Product Uses as Substitutes for Ozone-Depleting Substances (2.F), where emissions skyrocketed from 44,430 Gg to 191,256 Gg, reflecting a 330% increase ([Table 4.3](#tbl-ippu-cat)). This category makes the largest absolute contribution to emissions within the IPPU sectors. Finally, the Other (2.H) category also marked a significant increase, with emissions rising from 33,433 Gg to 109,808 Gg, representing a 228% change ([Table 4.3](#tbl-ippu-cat)).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 4.3: Emissions from Industrial Processes and Product Use (IPPU) by categories   |  | CO~2~eq (Gg) | |  |  | | --- | --- | --- | --- | --- | | IPPU categories | 2000 | 2021 | Change (%) |  | | 2.A - Mineral Industry | 343 | 2,716 | 693 | <svg aria-hidden="true" role="img" viewBox="0 0 384 512" style="height:1em;width:0.75em;vertical-align:-0.125em;margin-left:auto;margin-right:auto;font-size:inherit;fill:currentColor;overflow:visible;position:relative;"><path d="M214.6 41.4c-12.5-12.5-32.8-12.5-45.3 0l-160 160c-12.5 12.5-12.5 32.8 0 45.3s32.8 12.5 45.3 0L160 141.2V448c0 17.7 14.3 32 32 32s32-14.3 32-32V141.2L329.4 246.6c12.5 12.5 32.8 12.5 45.3 0s12.5-32.8 0-45.3l-160-160z"/></svg> | | 2.C - Metal Industry | 99 | 397 | 300 | <svg aria-hidden="true" role="img" viewBox="0 0 384 512" style="height:1em;width:0.75em;vertical-align:-0.125em;margin-left:auto;margin-right:auto;font-size:inherit;fill:currentColor;overflow:visible;position:relative;"><path d="M214.6 41.4c-12.5-12.5-32.8-12.5-45.3 0l-160 160c-12.5 12.5-12.5 32.8 0 45.3s32.8 12.5 45.3 0L160 141.2V448c0 17.7 14.3 32 32 32s32-14.3 32-32V141.2L329.4 246.6c12.5 12.5 32.8 12.5 45.3 0s12.5-32.8 0-45.3l-160-160z"/></svg> | | 2.D - Non-Energy Products from Fuels and Solvent Use (6) | 101 | 161 | 60 | <svg aria-hidden="true" role="img" viewBox="0 0 384 512" style="height:1em;width:0.75em;vertical-align:-0.125em;margin-left:auto;margin-right:auto;font-size:inherit;fill:currentColor;overflow:visible;position:relative;"><path d="M214.6 41.4c-12.5-12.5-32.8-12.5-45.3 0l-160 160c-12.5 12.5-12.5 32.8 0 45.3s32.8 12.5 45.3 0L160 141.2V448c0 17.7 14.3 32 32 32s32-14.3 32-32V141.2L329.4 246.6c12.5 12.5 32.8 12.5 45.3 0s12.5-32.8 0-45.3l-160-160z"/></svg> | | 2.F - Product Uses as Substitutes for Ozone Depleting Substances | 3,702 | 15,938 | 330 | <svg aria-hidden="true" role="img" viewBox="0 0 384 512" style="height:1em;width:0.75em;vertical-align:-0.125em;margin-left:auto;margin-right:auto;font-size:inherit;fill:currentColor;overflow:visible;position:relative;"><path d="M214.6 41.4c-12.5-12.5-32.8-12.5-45.3 0l-160 160c-12.5 12.5-12.5 32.8 0 45.3s32.8 12.5 45.3 0L160 141.2V448c0 17.7 14.3 32 32 32s32-14.3 32-32V141.2L329.4 246.6c12.5 12.5 32.8 12.5 45.3 0s12.5-32.8 0-45.3l-160-160z"/></svg> | | 2.H - Other | 33,433 | 109,808 | 228 | <svg aria-hidden="true" role="img" viewBox="0 0 384 512" style="height:1em;width:0.75em;vertical-align:-0.125em;margin-left:auto;margin-right:auto;font-size:inherit;fill:currentColor;overflow:visible;position:relative;"><path d="M214.6 41.4c-12.5-12.5-32.8-12.5-45.3 0l-160 160c-12.5 12.5-12.5 32.8 0 45.3s32.8 12.5 45.3 0L160 141.2V448c0 17.7 14.3 32 32 32s32-14.3 32-32V141.2L329.4 246.6c12.5 12.5 32.8 12.5 45.3 0s12.5-32.8 0-45.3l-160-160z"/></svg> | | **TOTAL** | **37,678** | **129,020** | **242** | <svg aria-hidden="true" role="img" viewBox="0 0 384 512" style="height:1em;width:0.75em;vertical-align:-0.125em;margin-left:auto;margin-right:auto;font-size:inherit;fill:currentColor;overflow:visible;position:relative;"><path d="M214.6 41.4c-12.5-12.5-32.8-12.5-45.3 0l-160 160c-12.5 12.5-12.5 32.8 0 45.3s32.8 12.5 45.3 0L160 141.2V448c0 17.7 14.3 32 32 32s32-14.3 32-32V141.2L329.4 246.6c12.5 12.5 32.8 12.5 45.3 0s12.5-32.8 0-45.3l-160-160z"/></svg> | |

## 4.4 2.A - Mineral Industry

The Mineral Industry is a major source of emissions due to its reliance on energy-intensive processes and carbonate-based raw materials (Wang et al. 2024; Segal 2024). This section presents an overview of emissions from the Mineral Industry, focusing on key processes and activities that contribute to greenhouse gas emissions ([Table 4.4](#tbl-mining)). The main categories include cement production (Griffiths et al. 2023), which generates significant CO2 emissions due to the chemical breakdown of limestone and the burning of fossil fuels; lime production, where emissions result from heating limestone to high temperatures; and glass production, which releases emissions during the melting of raw materials like silica and soda ash (Segal 2024). The category other uses of soda ash, which is commonly used in detergents and chemicals; and non-metallurgical magnesia production, where magnesia is produced from magnesium carbonate, releasing CO2 in the process.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 4.4: subcategories in mineral industry category of the IPPU   |  | Trends CO~2~ equ*1* | | --- | --- | | 2.A.1 - Cement production | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <line x1="22.5" y1="115" x2="1037.5" y2="115" stroke="#BFBFBF" stroke-width="2" ></line> <rect x="40" y="105.571482436922" width="20" height="9.42851756307755" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect 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stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="90.9677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">250</text></g> <g class="vert-line"> <rect x="101.935483870968" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="121.935483870968" y="20" fill="transparent" stroke="transparent" font-size="30px">257</text></g> <g class="vert-line"> <rect x="132.903225806452" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="152.903225806452" y="20" fill="transparent" stroke="transparent" font-size="30px">264</text></g> <g class="vert-line"> <rect x="163.870967741935" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="183.870967741935" y="20" fill="transparent" stroke="transparent" font-size="30px">268</text></g> <g class="vert-line"> <rect x="194.838709677419" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="214.838709677419" y="20" fill="transparent" stroke="transparent" font-size="30px">288</text></g> <g class="vert-line"> <rect x="225.806451612903" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="245.806451612903" y="20" fill="transparent" stroke="transparent" font-size="30px">283</text></g> <g class="vert-line"> <rect x="256.774193548387" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="276.774193548387" y="20" fill="transparent" stroke="transparent" font-size="30px">242</text></g> <g class="vert-line"> <rect x="287.741935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="307.741935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">304</text></g> <g class="vert-line"> <rect x="318.709677419355" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="338.709677419355" y="20" fill="transparent" stroke="transparent" font-size="30px">325</text></g> <g class="vert-line"> <rect x="349.677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">325</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="400.645161290323" y="20" fill="transparent" stroke="transparent" font-size="30px">351</text></g> <g class="vert-line"> <rect x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">400</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">400</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="493.548387096774" y="20" fill="transparent" stroke="transparent" font-size="30px">500</text></g> <g class="vert-line"> <rect x="504.516129032258" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="524.516129032258" y="20" fill="transparent" stroke="transparent" font-size="30px">533</text></g> <g class="vert-line"> <rect x="535.483870967742" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="555.483870967742" y="20" fill="transparent" stroke="transparent" font-size="30px">555</text></g> <g class="vert-line"> <rect 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class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">1.22K</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">1.58K</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">1.72K</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" fill="transparent" stroke="transparent" font-size="30px">1.77K</text></g> <g class="vert-line"> <rect x="938.064516129032" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">2.06K</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">2.19K</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">2.58K</text></g> </svg> </div> | | 2.A.2 - Lime production | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <line x1="22.5" y1="115" x2="1037.5" y2="115" stroke="#BFBFBF" stroke-width="2" ></line> <rect x="40" y="114.256992664078" width="20" height="0.743007335922485" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="70.9677419354839" y="114.237377898082" width="20" height="0.762622101918325" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="101.935483870968" y="114.216193950806" width="20" height="0.783806049193842" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="132.903225806452" y="114.195010003531" 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y="101.889490408379" width="20" height="13.1105095916206" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="814.193548387097" y="45.47193126986" width="20" height="69.52806873014" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="845.161290322581" y="41.8902749990193" width="20" height="73.1097250009807" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="876.129032258065" y="64.6057432034836" width="20" height="50.3942567965164" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="907.096774193548" y="46.2118002432231" width="20" height="68.7881997567769" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="938.064516129032" y="15" width="20" height="100" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="969.032258064516" y="37.4714605154761" width="20" height="77.5285394845239" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="1000" y="20.947981640579" width="20" height="94.052018359421" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <g class="y-axis-line"> <rect x="0" y="0" width="65" height="130" stroke="transparent" stroke-width="0" fill="transparent"></rect> <text x="0" y="19" fill="transparent" stroke="transparent" font-size="25">95.6</text> <text x="0" y="126" fill="transparent" stroke="transparent" font-size="25">0</text></g> <g class="vert-line"> <rect x="40" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="60" y="20" fill="transparent" stroke="transparent" font-size="30px">0.71</text></g> <g class="vert-line"> <rect x="70.9677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="90.9677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">0.73</text></g> <g class="vert-line"> <rect x="101.935483870968" y="0" width="20" height="130" stroke="transparent" stroke-width="12" 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stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">1.12</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="400.645161290323" y="20" fill="transparent" stroke="transparent" font-size="30px">2.57</text></g> <g class="vert-line"> <rect x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">2.43</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">3.14</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" 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width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="617.41935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">15.8</text></g> <g class="vert-line"> <rect x="628.387096774194" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="648.387096774194" y="20" fill="transparent" stroke="transparent" font-size="30px">23.3</text></g> <g class="vert-line"> <rect x="659.354838709677" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="679.354838709677" y="20" fill="transparent" stroke="transparent" font-size="30px">23.5</text></g> <g class="vert-line"> <rect x="690.322580645161" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="710.322580645161" y="20" fill="transparent" stroke="transparent" font-size="30px">22.2</text></g> <g class="vert-line"> <rect x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">22.0</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">11.0</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">12.5</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">66.5</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">69.9</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">48.2</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" fill="transparent" stroke="transparent" font-size="30px">65.8</text></g> <g class="vert-line"> <rect x="938.064516129032" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">95.6</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">74.1</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">89.9</text></g> </svg> </div> | | 2.A.3 - Glass Production | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <line x1="22.5" y1="115" x2="1037.5" y2="115" stroke="#BFBFBF" stroke-width="2" ></line> <rect x="40" y="96.3813488082002" width="20" height="18.6186511917998" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="70.9677419354839" y="95.8769693847113" width="20" height="19.1230306152887" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="101.935483870968" y="95.3617430919001" width="20" height="19.6382569080999" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="132.903225806452" y="94.8302464951054" width="20" height="20.1697535048946" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="163.870967741935" y="94.518399002088" width="20" height="20.481600997912" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="194.838709677419" y="86.7113648073325" width="20" 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fill="transparent" stroke="transparent" font-size="30px">1.62</text></g> <g class="vert-line"> <rect x="287.741935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="307.741935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">1.91</text></g> <g class="vert-line"> <rect x="318.709677419355" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="338.709677419355" y="20" fill="transparent" stroke="transparent" font-size="30px">2.19</text></g> <g class="vert-line"> <rect x="349.677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">2.48</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="400.645161290323" y="20" fill="transparent" stroke="transparent" font-size="30px">2.77</text></g> <g class="vert-line"> <rect x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">2.97</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">2.68</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="493.548387096774" y="20" fill="transparent" stroke="transparent" font-size="30px">1.26</text></g> <g class="vert-line"> <rect x="504.516129032258" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text 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<text x="648.387096774194" y="20" fill="transparent" stroke="transparent" font-size="30px">3.69</text></g> <g class="vert-line"> <rect x="659.354838709677" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="679.354838709677" y="20" fill="transparent" stroke="transparent" font-size="30px">2.38</text></g> <g class="vert-line"> <rect x="690.322580645161" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="710.322580645161" y="20" fill="transparent" stroke="transparent" font-size="30px">1.21</text></g> <g class="vert-line"> <rect x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">1.18</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">1.33</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">1.29</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">1.33</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">1.39</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">1.35</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" fill="transparent" stroke="transparent" font-size="30px">1.59</text></g> <g class="vert-line"> <rect x="938.064516129032" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">1.76</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">1.81</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">1.83</text></g> </svg> </div> | | 2.A.4 - Other Process Uses of Carbonates | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <line x1="22.5" y1="115" x2="1037.5" y2="115" stroke="#BFBFBF" stroke-width="2" ></line> <rect x="40" y="90.7090908506519" width="20" height="24.2909091493481" 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stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="287.741935483871" y="84.9386941808287" width="20" height="30.0613058191713" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="318.709677419355" y="84.1261178699693" width="20" height="30.8738821300307" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="349.677419354839" y="83.2934531459861" width="20" height="31.7065468540139" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="380.645161290323" y="82.4366823262543" width="20" height="32.5633176737457" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="411.612903225806" y="81.5578142520863" width="20" height="33.4421857479137" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="442.58064516129" y="80.6548400821696" width="20" height="34.3451599178304" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="473.548387096774" y="79.7277598165044" width="20" height="35.2722401834956" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="504.516129032258" y="78.7755690344344" width="20" height="36.2244309655656" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="535.483870967742" y="77.7972633153033" width="20" height="37.2027366846967" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="566.451612903226" y="76.7928426591113" width="20" height="38.2071573408887" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="597.41935483871" y="75.7613026452021" width="20" height="39.2386973547979" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="628.387096774194" y="74.7016388529195" width="20" height="40.2983611470805" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="659.354838709677" y="73.6138512822635" width="20" height="41.3861487177365" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="690.322580645161" y="72.4959310919218" width="20" height="42.5040689080782" 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stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="938.064516129032" y="29.4926651177161" width="20" height="85.5073348822839" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="969.032258064516" y="60.2024450009381" width="20" height="54.7975549990619" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="1000" y="15" width="20" height="100" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <g class="y-axis-line"> <rect x="0" y="0" width="65" height="130" stroke="transparent" stroke-width="0" fill="transparent"></rect> <text x="0" y="19" fill="transparent" stroke="transparent" font-size="25">43.8</text> <text x="0" y="126" fill="transparent" stroke="transparent" font-size="25">0</text></g> <g class="vert-line"> <rect x="40" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="60" y="20" fill="transparent" stroke="transparent" font-size="30px">10.6</text></g> <g class="vert-line"> <rect x="70.9677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="90.9677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">10.9</text></g> <g class="vert-line"> <rect x="101.935483870968" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="121.935483870968" y="20" fill="transparent" stroke="transparent" font-size="30px">11.2</text></g> <g class="vert-line"> <rect x="132.903225806452" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="152.903225806452" y="20" fill="transparent" stroke="transparent" font-size="30px">11.5</text></g> <g class="vert-line"> <rect x="163.870967741935" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="183.870967741935" y="20" fill="transparent" stroke="transparent" font-size="30px">11.8</text></g> <g class="vert-line"> <rect x="194.838709677419" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="214.838709677419" y="20" fill="transparent" stroke="transparent" font-size="30px">12.1</text></g> <g class="vert-line"> <rect x="225.806451612903" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="245.806451612903" y="20" fill="transparent" stroke="transparent" font-size="30px">12.5</text></g> <g class="vert-line"> <rect x="256.774193548387" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="276.774193548387" y="20" fill="transparent" stroke="transparent" font-size="30px">12.8</text></g> <g class="vert-line"> <rect x="287.741935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="307.741935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">13.2</text></g> <g class="vert-line"> <rect x="318.709677419355" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="338.709677419355" y="20" fill="transparent" stroke="transparent" font-size="30px">13.5</text></g> <g class="vert-line"> <rect x="349.677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">13.9</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="400.645161290323" y="20" fill="transparent" stroke="transparent" font-size="30px">14.3</text></g> <g class="vert-line"> <rect x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">14.6</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">15.0</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="493.548387096774" y="20" fill="transparent" stroke="transparent" font-size="30px">15.4</text></g> <g class="vert-line"> <rect x="504.516129032258" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="524.516129032258" y="20" fill="transparent" stroke="transparent" font-size="30px">15.9</text></g> <g class="vert-line"> <rect x="535.483870967742" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="555.483870967742" y="20" fill="transparent" stroke="transparent" font-size="30px">16.3</text></g> <g class="vert-line"> <rect x="566.451612903226" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="586.451612903226" y="20" fill="transparent" stroke="transparent" font-size="30px">16.7</text></g> <g class="vert-line"> <rect x="597.41935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="617.41935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">17.2</text></g> <g class="vert-line"> <rect x="628.387096774194" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="648.387096774194" y="20" fill="transparent" stroke="transparent" font-size="30px">17.6</text></g> <g class="vert-line"> <rect x="659.354838709677" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="679.354838709677" y="20" fill="transparent" stroke="transparent" font-size="30px">18.1</text></g> <g class="vert-line"> <rect x="690.322580645161" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="710.322580645161" y="20" fill="transparent" stroke="transparent" font-size="30px">18.6</text></g> <g class="vert-line"> <rect x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">19.1</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">4.73</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">5.01</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">5.85</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">13.8</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">18.3</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" fill="transparent" stroke="transparent" font-size="30px">27.5</text></g> <g class="vert-line"> <rect x="938.064516129032" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">37.4</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">24.0</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">43.8</text></g> </svg> </div> | | 2.A.4.a - Ceramics | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <line x1="22.5" y1="65" x2="1037.5" y2="65" stroke="#BFBFBF" stroke-width="2" ></line> <rect x="40" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="70.9677419354839" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="101.935483870968" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="132.903225806452" y="64" 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stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="969.032258064516" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="1000" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <g class="y-axis-line"> <rect x="0" y="0" width="65" height="130" stroke="transparent" stroke-width="0" fill="transparent"></rect> <text x="0" y="19" fill="transparent" stroke="transparent" font-size="25">5</text> <text x="0" y="126" fill="transparent" stroke="transparent" font-size="25">−5</text></g> <g class="vert-line"> <rect x="40" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="60" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="70.9677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="90.9677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="101.935483870968" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="121.935483870968" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="132.903225806452" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="152.903225806452" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="163.870967741935" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="183.870967741935" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="194.838709677419" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="214.838709677419" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="225.806451612903" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="245.806451612903" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="256.774193548387" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="276.774193548387" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="287.741935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="307.741935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="318.709677419355" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="338.709677419355" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="349.677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="400.645161290323" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="493.548387096774" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="504.516129032258" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="524.516129032258" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="535.483870967742" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="555.483870967742" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="566.451612903226" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="586.451612903226" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="597.41935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="617.41935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="628.387096774194" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="648.387096774194" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="659.354838709677" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="679.354838709677" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="690.322580645161" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="710.322580645161" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="938.064516129032" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> </svg> </div> | | 2.A.4.b - Other Uses of Soda Ash | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <line x1="22.5" y1="115" x2="1037.5" y2="115" stroke="#BFBFBF" stroke-width="2" ></line> <rect x="40" y="90.7090908506519" width="20" height="24.2909091493481" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="70.9677419354839" y="90.0532041621585" width="20" height="24.9467958378415" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="101.935483870968" y="89.3792379018536" width="20" height="25.6207620981464" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="132.903225806452" y="88.6871920697373" width="20" height="26.3128079302627" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="163.870967741935" y="87.9770666658096" width="20" height="27.0229333341904" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="194.838709677419" y="87.2478572694142" width="20" height="27.7521427305858" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="225.806451612903" y="86.4985594598949" width="20" height="28.5014405401051" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="256.774193548387" y="85.7281688165956" width="20" height="29.2718311834044" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="287.741935483871" y="84.9386941808287" width="20" height="30.0613058191713" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="318.709677419355" y="84.1261178699693" width="20" height="30.8738821300307" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="349.677419354839" y="83.2934531459861" width="20" height="31.7065468540139" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="380.645161290323" y="82.4366823262543" width="20" height="32.5633176737457" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="411.612903225806" y="81.5578142520863" width="20" height="33.4421857479137" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="442.58064516129" y="80.6548400821696" width="20" height="34.3451599178304" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="473.548387096774" y="79.7277598165044" width="20" height="35.2722401834956" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="504.516129032258" y="78.7755690344344" width="20" height="36.2244309655656" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="535.483870967742" y="77.7972633153033" width="20" height="37.2027366846967" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="566.451612903226" y="76.7928426591113" width="20" height="38.2071573408887" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="597.41935483871" y="75.7613026452021" width="20" height="39.2386973547979" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="628.387096774194" y="74.7016388529195" width="20" height="40.2983611470805" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="659.354838709677" y="73.6138512822635" width="20" height="41.3861487177365" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="690.322580645161" y="72.4959310919218" width="20" height="42.5040689080782" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="721.290322580645" y="71.3729887982991" width="20" height="43.6270112017009" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="752.258064516129" y="104.205491207904" width="20" height="10.7945087920958" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="783.225806451613" y="103.56567524991" width="20" height="11.4343247500901" stroke="#3290CC" stroke-width="4" fill="#3FB5FF" ></rect> <rect x="814.193548387097" y="101.628147804115" width="20" height="13.3718521958845" stroke="#3290CC" stroke-width="4" 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fill="transparent" stroke="transparent" font-size="25">43.8</text> <text x="0" y="126" fill="transparent" stroke="transparent" font-size="25">0</text></g> <g class="vert-line"> <rect x="40" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="60" y="20" fill="transparent" stroke="transparent" font-size="30px">10.6</text></g> <g class="vert-line"> <rect x="70.9677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="90.9677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">10.9</text></g> <g class="vert-line"> <rect x="101.935483870968" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="121.935483870968" y="20" fill="transparent" stroke="transparent" font-size="30px">11.2</text></g> <g class="vert-line"> <rect x="132.903225806452" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="152.903225806452" y="20" fill="transparent" stroke="transparent" font-size="30px">11.5</text></g> <g class="vert-line"> <rect x="163.870967741935" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="183.870967741935" y="20" fill="transparent" stroke="transparent" font-size="30px">11.8</text></g> <g class="vert-line"> <rect x="194.838709677419" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="214.838709677419" y="20" fill="transparent" stroke="transparent" font-size="30px">12.1</text></g> <g class="vert-line"> <rect x="225.806451612903" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="245.806451612903" y="20" fill="transparent" stroke="transparent" font-size="30px">12.5</text></g> <g class="vert-line"> <rect x="256.774193548387" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="276.774193548387" y="20" fill="transparent" stroke="transparent" font-size="30px">12.8</text></g> <g class="vert-line"> <rect x="287.741935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="307.741935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">13.2</text></g> <g class="vert-line"> <rect x="318.709677419355" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="338.709677419355" y="20" fill="transparent" stroke="transparent" font-size="30px">13.5</text></g> <g class="vert-line"> <rect x="349.677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">13.9</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="400.645161290323" y="20" fill="transparent" stroke="transparent" font-size="30px">14.3</text></g> <g class="vert-line"> <rect x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">14.6</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">15.0</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="493.548387096774" y="20" fill="transparent" stroke="transparent" font-size="30px">15.4</text></g> <g class="vert-line"> <rect x="504.516129032258" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="524.516129032258" y="20" fill="transparent" stroke="transparent" font-size="30px">15.9</text></g> <g class="vert-line"> <rect x="535.483870967742" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="555.483870967742" y="20" fill="transparent" stroke="transparent" font-size="30px">16.3</text></g> <g class="vert-line"> <rect x="566.451612903226" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="586.451612903226" y="20" fill="transparent" stroke="transparent" font-size="30px">16.7</text></g> <g class="vert-line"> <rect x="597.41935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="617.41935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">17.2</text></g> <g class="vert-line"> <rect x="628.387096774194" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="648.387096774194" y="20" fill="transparent" stroke="transparent" font-size="30px">17.6</text></g> <g class="vert-line"> <rect x="659.354838709677" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="679.354838709677" y="20" fill="transparent" stroke="transparent" font-size="30px">18.1</text></g> <g class="vert-line"> <rect x="690.322580645161" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="710.322580645161" y="20" fill="transparent" stroke="transparent" font-size="30px">18.6</text></g> <g class="vert-line"> <rect x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">19.1</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">4.73</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">5.01</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">5.85</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">13.8</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">18.3</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" fill="transparent" stroke="transparent" font-size="30px">27.5</text></g> <g class="vert-line"> <rect x="938.064516129032" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">37.4</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">24.0</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">43.8</text></g> </svg> </div> | | 2.A.4.c - Non Metallurgical Magnesia Production | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <line x1="22.5" y1="65" x2="1037.5" 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fill="#808080" ></rect> <rect x="845.161290322581" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="876.129032258065" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="907.096774193548" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="938.064516129032" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="969.032258064516" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="1000" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <g class="y-axis-line"> <rect x="0" y="0" width="65" height="130" stroke="transparent" stroke-width="0" fill="transparent"></rect> <text x="0" y="19" fill="transparent" stroke="transparent" font-size="25">5</text> <text x="0" y="126" fill="transparent" stroke="transparent" font-size="25">−5</text></g> 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x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="493.548387096774" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="504.516129032258" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="524.516129032258" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect 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x="659.354838709677" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="679.354838709677" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="690.322580645161" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="710.322580645161" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="938.064516129032" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> </svg> </div> | | *1*Emission from 1990 through 2021. | 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### 4.4.1 2.A.1 - Cement production

Emissions from cement production steadily increased with time from the 1990s ([Figure 4.1](#fig-cement)). In 2021, CO2 from cement production was 2,580Gg, an increas of around seven folds (694%) compared to 325Gg emitted in 2000 ([Figure 4.1](#fig-cement)). The increasing trend of emission from cement production is attributted with major growth occurred in the 2000s as new plants opened and existing ones expanded capacity to meet demand. By the mid-2010s, Tanzania became a regional cement exporter. Production reached over 6 million tons by 2020, supported by local and foreign investment.

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| Figure 4.1: CO2 equivalent emission from Cement production |

### 4.4.2 2.A.2 - Lime production

Lime production in Tanzania grew moderately from the 1990s through 2009, largely due to demand from construction, agriculture, and mining sectors. The industry remained mostly small-scale and informal in the earlier years, with production concentrated in a few regions. As infrastructure projects expanded in the 2000s, lime production rose, prompting some modernization efforts. By 2020, production was influenced by increased cement production and industrial demand. However, the sector continued facing challenges, including inconsistent quality standards and limited access to advanced production technology.

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| Figure 4.2: CO2 equivalent emission from lime production |

### 4.4.3 2.A.3 - Glass Production

The emissions generated from glass production increased from 1994 to2010, then later decreased in 2011 and rose again at a moderate rate until 2021. The yearly variations in glass production in Tanzania can be influenced by several factors. Fluctuations in demand from construction and packaging industries can lead to production adjustments. Additionally, changes in raw material availability and costs, particularly silica sand, can impact output levels. Economic conditions, including inflation and currency exchange rates, also affect production costs. Lastly, regulatory changes and environmental policies may impose constraints or incentives that influence production capabilities.

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| Figure 4.3: CO2 equivalent emission from glass production |

### 4.4.4 Category 2A4 - Other Process Uses of Carbonates

This category emission of CO2 equivalent is interely from Uses of Soda Ash ([Table 4.4](#tbl-mining)), which has been influenced by demand from industries like glass manufacturing, detergents, and mining. Since Tanzania does not produce soda ash domestically, the use of imported Soda Ash have been the main source emission ([Table 4.4](#tbl-mining)).

In 2021 the use of Soda Ash alone in Other Process Uses of Carbonates category emitted about 43.8Gg of CO2, which is more than two folds (215.4%) rise compared to 13.9Gg emitted in 2000 ([Figure 4.4](#fig-2a4)). The sharp increase in CO2 emission from 2013 (*See* subplot [Figure 4.4](#fig-2a4)) is mainly contributed with exponential increase of Soda Ash ([Table 4.4](#tbl-mining)). The increase of CO2 from 1990 to 2012 relatively steady as there was no data during this period and were refilled through interpolation ([Figure 4.4](#fig-2a4)).

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| Figure 4.4: CO2 equivalent emission from Other Process Uses of Carbonates |

### 4.4.5 Category 2D1 & 2D2 - Lubricant and paraffin wax use

The emission trend of lubricant use followed the stable use patterns until 2013, where it rapidly decreased in 2014 and thereafter lubricant use was observed to increase from 2015 onwards. Since 2015, rising vehicle numbers and industrial machinery have bolstered demand, with a notable rise in imports during the mid-2000s as these sectors expanded. Economic fluctuations and oil price changes affected volumes, but demand increased due to industrial needs.

Emissions from paraffin wax, generally increasing with time. This was attributed to paraffin wax imports in Tanzania which have generally followed demand from sectors such as candle making, packaging, and cosmetics. Since the 1990s, imports have shown gradual growth, with peaks during periods of industrial and artisanal production expansion. Demand for paraffin wax increased in the early 2000s as small and medium enterprises, especially in candle production, grew. By 2020, imports remained essential.

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| Figure 4.5: CO2 equivalent emission from Lubricant and paraffin wax use |

### 4.4.6 Category 2.F.3 - Fire Protection

Emissions from fire protection systems display an abrupt shift ([Figure 4.6](#fig-fire)). Negative values from 1990 to 2006, indicating potential data discrepancies, accounting conventions, or net removals during that period. From 2007 onward, a substantial increase is observed, peaking at 6657.4 in 2021. In Tanzania, the import and use of fire protection gases have grown as safety standards improve across commercial, industrial, and public spaces. From the 2000s onward, demand increased particularly in sectors like data centers, manufacturing, and large buildings. In recent years, environmental awareness has influenced a shift towards eco-friendly alternatives, aligning with global standards on fire suppression. By 2020, Tanzania continued to import fire protection gases, with an emphasis on sustainable and effective fire safety solutions compliant with international environmental protocols.

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| Figure 4.6: CO2 equivalent emission from fire protection |

### 4.4.7 Category 2.F.4 - Aerosols

In Tanzania, aerosol imports have steadily increased, driven by demand in personal care, household products, and industrial applications. The usage rose with urbanization and the growth of consumer goods products like sprays and deodorants. In recent years, environmental considerations have influenced a shift towards eco-friendly propellants as regulations on ozone-depleting substances have tightened. The significant jump in emissions in 2020 and 2021 is unusual and could result from changes in production methods and increased aerosol use. However, aerosol imports remained vital, with a focus on more sustainable and compliant formulations to meet both consumer demand and environmental standards.

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| Figure 4.7: CO2 equivalent emission from Aerosols |

### 4.4.8 Category 2.F.5 - Solvents

Tanzania’s import trends for solvents have generally been tied to demand in industries such as manufacturing, paint production, and pharmaceuticals. This contributed to a general increase in emissions with time ([Figure 4.8](#fig-solvents)). Imports of solvents saw gradual growth as these sectors expanded, especially in urban areas. Increased industrialization and the use of volatile organic compounds (VOCs) in manufacturing in the early 2000s spurred more demand, and import volumes continued to rise steadily.

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| Figure 4.8: CO2 equivalent emission from Solvents |

### 4.4.9 Category 2F1 - Refrigeration and Air Conditioning

Generally the emission trend from the refrigerant uses increased consistently with time. Refrigerant imports in Tanzania have generally increased alongside rising demand for air conditioning and refrigeration, driven by economic growth and rising temperatures. From the 1990s, imports rose steadily as commercial and residential cooling needs expanded. In the 2010s, efforts to phase out ozone-depleting refrigerants aligned with global environmental agreements, leading to a gradual shift toward more eco-friendly refrigerants. By 2020, Tanzania’s imports continued to support cooling needs, though there was growing attention to sustainable alternatives and compliance with environmental standards.

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| Figure 4.9: CO2 equivalent emission from Refrigeration and Air Conditioning |

### 4.4.10 Category 2G1 - Electrical Equipment

### 4.4.11 Iron and Steel Production

The emissions from iron and steel production generally increased with time ([Figure 4.10](#fig-iron)) showing a significant upward trend in emissions. This growth reflects an increased production capacity and demand for iron and steel over the years, driven by industrialization and infrastructure development. Rising infrastructure projects and economic growth often demand more steel for construction, machinery, and transportation. Developing countries like Tanzania may experience rapid growth in this sector due to industrial expansion.

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| Figure 4.10: CO2 equivalent emission from Iron and Steel Production |

## 4.5 Others

### 4.5.1 Category 2H1 - Pulp and Paper Industry

Generally the trend of emissions generated from pulp and paper production was increasing with time as pulp and paper production has been driven primarily by demand for packaging, newspapers, and office supplies. From the 1990s, production grew slowly, supported by government and private investments, though constrained by limited raw material availability and outdated machinery. The early 2000s saw slight improvements as Tanzania aimed for self-sufficiency in paper production. By 2020, environmental concerns and competition from imported products posed challenges, but the growing demand for packaging materials and sustainable paper alternatives continued to support the industry’s relevance.

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| Figure 4.11: CO2 equivalent emission from Pulp and Paper Industry |

### 4.5.2 Category 2H2 - Food and Beverages Industry

Food and beverages industry included emissions from biscuit and cake production, sugar production, fish production, animal feed production, bottled beer production, chibuku production, spirits production and coffee beans production

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| Figure 4.12: CO2 equivalent emission from Food and Beverages Industry |

## 4.6 Other food

This section provides an overview of CO₂ emissions associated with the production of various food and beverage categories over the inventory years. [Table 4.5](#tbl-otherfoods) highlights significant trends and variations across different products, reflecting changes in production levels, energy use, and industrial practices. While some categories, such as sugar and spirits, show substantial increases in emissions due to their energy-intensive processes, others, like fish and Chibuku, show more stable trends. Notably, biscuits and bottle production have seen dramatic growth in emissions in recent years, underscoring the environmental impact of expanding production scales. These trends and descriptive statistics are further described in [Section 4.6.1](#sec-feed) through [Section 4.6.7](#sec-spirit).

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| Table 4.5: Heatmap of CO2 emission from production of various food and beverage categories   |  | Emission from Food Production (CO2e (Gg)) | | | | | | |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | category | 1990 | 2000 | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | | Chibuku | 4.4 | 6.0 | 7.4 | 8.1 | 9.3 | 7.8 | 7.3 | 7.1 | 7.6 | 8.1 | | Fish | 9.3 | 12.1 | 9.9 | 9.4 | 10.5 | 13.8 | 13.1 | 12.0 | 12.4 | 9.6 | | Feed | 2.6 | 4.6 | 1.9 | 2.3 | 6.4 | 5.3 | 1.5 | 2.3 | 3.2 | 13.8 | | Biscuits | 0.5 | 0.9 | 7.0 | 15.3 | 15.6 | 16.5 | 16.9 | 18.1 | 22.4 | 30.4 | | Bottle | 16.6 | 64.1 | 84.8 | 137.1 | 137.7 | 138.9 | 144.4 | 137.0 | 135.0 | 133.2 | | Spirits | 27.0 | 33.2 | 197.8 | 442.4 | 431.3 | 342.3 | 440.0 | 485.5 | 499.3 | 331.0 | | Sugar | 1465.5 | 1912.9 | 3740.0 | 2510.7 | 2867.1 | 3203.3 | 3159.0 | 4410.7 | 4507.5 | 4330.6 | |

### 4.6.1 Animal feed production

Emissions from animal feed production started at 2.579 in 1990, showing a gradual increase over the years, with a significant spike in 2021 (13.781). The trend of emissions from animal feed production has been increasing due to the growth of the livestock sector and rising demand for poultry and dairy products. Local production facilities have expanded, focusing on improving quality and accessibility. However, imports remain necessary, particularly for specialized feeds and raw materials not produced domestically. By 2020, the trend showed a combination of local production efforts to meet the growing needs of the agricultural sector, balancing between self-sufficiency and reliance on foreign sources.

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| Figure 4.13: CO2 equivalent emission from Animal feed production |

### 4.6.2 Biscuit and cake production

Biscuit and cake production has grown alongside demand from urban populations and the expanding retail sector. Since the 2000s, local production increased as both small bakeries and larger manufacturers scaled operations to meet consumer demand for affordable snacks. However, imports of biscuits and premium cakes continue to fill gaps in supply, especially for specialty products. By 2020, production remained strong, with a focus on local sourcing and variety, while imports supplemented market needs for diverse and premium options.

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| Figure 4.14: CO2 equivalent emission from Biscuits and cakes production |

### 4.6.3 Fish products

Emissions increased from 9.2649 in 1990 to 13.7598 in 2017, showing slight fluctuations in recent years. The fishing industry has grown steadily, driven by domestic and export demand for fish products. Peaks and troughs in emissions may correspond to variations in fish harvests, regulatory changes, or shifts in processing methods. The decline in fish production is often due to overfishing, which depletes fish populations and affects sustainability. Environmental degradation, such as pollution and habitat loss, particularly in breeding areas, further reduces fish stocks. Climate change also impacts fish habitats by altering water temperatures and conditions, disrupting breeding cycles. Additionally, inadequate management and enforcement contribute to unregulated fishing, while limited investment in aquaculture keeps the industry heavily reliant on natural stocks. Together, these factors pose significant challenges to maintaining fish production levels.

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| Figure 4.15: CO2 equivalent emission from fish products |

### 4.6.4 Sugar production

Sugar is a staple product with high demand in both domestic and export markets. Sugar production in Tanzania has grown steadily over the years, though it hasn’t fully met domestic demand. Local production is primarily from sugarcane plantations, but factors like outdated technology and weather variability limit output. Industrial expansion and improved production capacities have contributed to higher emissions. The significant growth reflects the sector’s importance to Tanzania’s economy, with emissions likely driven by increased use of fossil fuels in production.

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| Figure 4.16: CO2 equivalent emission from sugar production |

### 4.6.5 Bottled beer production

Emissions have consistently risen, starting at 16.6 in 1990 and peaking at 144 in 2018. A slight decline follows, stabilizing around 133 in 2021. The growth of Tanzania’s beverage industry, along with increased beer consumption driven by urbanization and changing consumer lifestyles, contributed to this trend. Declines post-2018 could result from market saturation, policy changes, or shifts toward alternative beverages.

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| Figure 4.17: CO2 equivalent emission from bottled beer production |

### 4.6.6 Chibuku production {sec-chibuku}

Generally, emissions from chibuku production show a steady increase from 4.45 in 1990 to a peak of 9.28 in 2016, followed by fluctuations. The observed decline in chibuku production can be attributed to several factors including, an increase in competition from commercial beers and other alcoholic beverages, changing consumer preferences towards more diverse and premium options, and potential regulatory challenges. Additionally, economic factors such as rising production costs and changes in taxation may have impacted profitability. As a result, chibuku, traditionally a popular sorghum beer, faces challenges in maintaining its market share amid a shifting beverage landscape. Chibuku, a traditional African beer, remains popular in rural areas. The moderate growth trend reflects its niche market compared to bottled beer. Emissions from chibuku production are relatively stable compared to bottled beer, possibly due to limited production scalability.

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| Figure 4.18: CO2 equivalent emission from chibuku production |

### 4.6.7 Spirits production

Increased demand for spirits, particularly in urban areas, has fueled the expansion of production facilities and outputs. The rapid increase post-2000 aligns with broader trends in beverage industrialization and consumption patterns. The observed increase in the emissions trend generated from spirits production is attributed to an experienced growth in spirits production due to rising consumer demand and the emergence of local distilleries. The industry has seen a mix of traditional and modern production methods, reflecting both cultural practices and changing preferences. While local production has expanded, imports of premium spirits have also increased, catering to a more affluent market.

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| Figure 4.19: CO2 equivalent emission from spirit production |

## 4.7 Key categories and recalculations in the IPPU sector

### 4.7.1 Key categories in the IPPU sector

The IPCC Guidelines provide a framework for identifying and reporting key categories in greenhouse gas (GHG) inventories. Key categories are those that have a significant impact on a country’s total emissions or removals and are prioritized for more accurate estimation and reporting (IPCC 2006). Based on [Table 4.6](#tbl-key-categories), the primary categories responsible for 95% of emissions in the IPPU sector include: Pulp and Paper Industry (82.4%), Fire Protection (6.3%), Food and Beverages Industry (3.2%), Sugar Production (2.9%), and Refrigeration and Stationary Air Conditioning (2.0%). These categories are the leading sources of emissions. The remaining categories have minimal contributions (≤ 0.2% each) and together account for the last 5% of emissions.

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| Table 4.6: Key categories of activity in emission of CO2 in the IPPU Sector   |  |  | Percentage | | | --- | --- | --- | --- | | CO~2~e(Gg) | Contribution | Cumulative | | Pulp and Paper Industry | 2,258,481.5 | 82.4 | 82.4 | | Fire Protection | 171,656.2 | 6.3 | 88.7 | | Food and Beverages Industry | 88,176.9 | 3.2 | 91.9 | | Sugar Production | 79,130.9 | 2.9 | 94.8 | | Refrigeration and Stationary Air Conditioning | 55,444.0 | 2.0 | 96.8 | | Solvents | 39,492.6 | 1.4 | 98.3 | | Cement production | 25,842.0 | 0.9 | 99.2 | | Iron and Steel Production | 5,658.6 | 0.2 | 99.4 | | Spirits production | 5,401.4 | 0.2 | 99.6 | | Lubricant Use | 3,208.9 | 0.1 | 99.7 | | Bottled beer production | 2,680.7 | 0.1 | 99.8 | | Paraffin Wax Use | 1,698.5 | 0.1 | 99.9 | | Aerosols | 1,076.4 | 0.0 | 99.9 | | Lime production | 672.9 | 0.0 | 99.9 | | Other Uses of Soda Ash | 513.4 | 0.0 | 100.0 | | Fish products | 359.2 | 0.0 | 100.0 | | Biscuits and cakes production | 283.8 | 0.0 | 100.0 | | Chibuku Production | 186.2 | 0.0 | 100.0 | | Animal feed production | 134.6 | 0.0 | 100.0 | | Glass Production | 58.7 | 0.0 | 100.0 | |

### 4.7.2 Description of recalculation

The recalculation of emissions in the **Industrial Processes and Product Use (IPPU) sector** involved a systematic approach to address data gaps and improve the accuracy of greenhouse gas (GHG) emission estimates. The process began with the collection of key data types, including **production volumes**, **import and export data**, and **economic or population indicators**, which are critical for estimating emissions from various industrial activities. These data were used to assess emissions across multiple subcategories within the IPPU sector.

To address missing or incomplete data, three primary techniques were employed: **interpolation**, **extrapolation**, and **surrogate methods**. For six subcategories—**lime production**, **pulp and paper production**, **biscuits and cakes production**, **bottled beer production**, **chibuku production**, and **spirit production**—the **interpolation technique** was applied. This method estimated missing activity data using a linear interpolation equation, as outlined in the IPCC 2006 Guidelines (IPCC 2006). The mathematical formula used known data points before and after the missing period to estimate the values for the gaps is illustrated in [Equation 4.1](#eq-interp).

Whereby:

= missing activity data for relevant time period; = Missing activity data for relevant time period; = Activity data value prior to the relevant missing data; = Activity data value after the missing data; = Year of the relevant missing data; = Year prior to the relevant missing data; = Year after the relevant missing data

For subcategories where interpolation was not feasible, the **extrapolation technique** was used. This approach relied on **population growth rates** as a proxy for production trends, based on the assumption that production levels are proportional to population growth. Population data from various sources, including national censuses and projections, were used to establish growth rates, which were then applied to estimate missing activity data. The mathematical formula for extrapolation is presented in [Equation 4.2](#eq-extra)

Whereby:

= missing activity data for relevant time period; = population in year of the relevant missing data; = Population in year after the relevant missing data; and = Sum of all available activity data

The **surrogate technique** was applied to six subcategories where related activity data were available. This method used strongly correlated surrogate data to estimate missing values, following the procedures outlined in the IPCC 2006 Guidelines. The mathematical formula for surrogate technique is presented in [Equation 4.3](#eq-surro);

Whereby:

= missing activity data for relevant time period; = Activity data after the relevant missing data; = Surrogate data in a year of the relevant missing data; and = Surrogate data in a year after the relevant missing data

These recalculation methods ensured the consistency and completeness of the IPPU sector’s emission inventory, aligning it with the IPCC’s best practices.

## 4.8 Quality assurance/ quality control

General Quality Control (QC)) procedures involved standard quality checks associated with calculations, data processing, completeness, and documentation. These checks applied to all categories of inventory sources and sinks. As specified in the IPCC Guidelines, general inventory-level QC procedures present a set of standard checks that inventory compilers should consistently employ during the inventory preparation process (IPCC 2006). The checks enumerated in Table 11 should be carried out irrespective of the data type used for developing the inventory estimates. These checks were also pertinent for categories where default values or national data were used as the foundation for the estimates.

## 4.9 Description of uncertainties

## 4.10 Time series consistency issues

## 4.11 Improvements

The Industrial Processes and Product Use (IPPU) sector is a significant contributor to greenhouse gas (GHG) emissions in Tanzania due to its reliance on energy-intensive processes and high-emission product manufacturing, such as cement, steel and chemicals. To mitigate these challenges and align with international climate commitments, several improvements are planned to modernize and decarbonize the sector.

One key area of focus is technological upgrades. Industries are encouraged to adopt energy-efficient innovations such as waste heat recovery systems in cement and steel production in order to reduce energy consumption and emissions intensity. Transitioning to low-carbon technologies like carbon capture and storage for processes such as clinker production is also being prioritized. Additionally, the use of alternative raw materials such as fly ash and slag in cement production or recycled steel can significantly minimize the environmental footprint of industrial activities.

The transition to renewable energy is a cornerstone of the sector’s decarbonization strategy. Integrating solar, wind and hydropower into industrial processes will reduce reliance on fossil fuels. Investments in energy storage solutions will ensure a reliable energy supply for industries adopting renewable energy sources. Enhanced data collection systems will provide accurate emissions data while the planned periodic reviews shall allow for updates to strategies based on technological advancements and international climate goals. These planned improvements are expected to reduce GHG emissions significantly therefore contributing to Tanzania’s Nationally Determined Contributions (NDCs) under the Paris Agreement.

# 5. AFOLU

## 5.1 Sector Overview

### 5.1.1 AFOLU sector description

### 5.1.2 Overview of methodology and completeness for the AFOLU Sector

## 5.2 Emissions and removals from Livestock category (3A)

### 5.2.1 Enteric Fermentation (3A1)

Methane (CH4) is a key greenhouse gas produced as a result of digestion in ruminant animals like cattle, as well as in some non-ruminants, such as pigs and camels. Ruminants account for the majority of CH4 emissions due to their capacity to decompose fibrous feed via anaerobic fermentation (Scoones 2023). The amount of CH4 emitted is affected by various factors including species, age, weight, feed quality and amount, as well as the energy expenditure of the animal (Moumen et al. 2016).

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| Table 5.1: Methane emission from enteric fermentation by livestock for 2000 and 2021   |  | CO2eq (Gg) | |  | | --- | --- | --- | --- | | Livestock | 2000 | 2021 | Change (%) | | 3.A.1.a.ii - Other Cattle | 69,654.8 | 129,471.0 | 85.9 | | 3.A.1.d - Goats | 6,591.2 | 11,940.8 | 81.2 | | 3.A.1.a.i - Dairy Cows | 3,196.7 | 5,941.8 | 85.9 | | 3.A.1.c - Sheep | 1,941.1 | 3,400.3 | 75.2 | | 3.A.1.i - Poultry | 10.4 | 17.7 | 70.3 | | 3.A.1.h - Swine | 12.5 | 14.7 | 17.6 | | **TOTAL** | **81,406.7** | **150,786.3** | **85.2** | |

In 2021, methane emissions (represented as CO2eq) from enteric fermentation was **150,786.3** CO2eq (Gg) an increase of about **85.2%** compared to **81,406.66** CO2eq (Gg) in 2000 ([Table 5.1](#tbl-livestock-cat)) with other cattle contributing 85.9 percent () of the **150,786.3** CO2eq (Gg) in 2021 ([Figure 5.1](#fig-share-livestock)).

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| Figure 5.1: Percentage share of CH4 emissions from Enteric Fermentation by livestock for 2021 |

### 5.2.2 Manure Management (3A2)

Livestock manure is primarily composed of organic matter. Under anaerobic conditions (i.e., in the absence of oxygen), the decomposition of manure by methanogenic bacteria results in the production of methane (CH4) ([Figure 5.2](#fig-share-manure-gases)). Such conditions are prevalent in intensive livestock management systems, such as dairy farms, beef feedlots, and swine and poultry operations, where manure is often stored in large piles or disposed of in lagoons. Manure management also contribute to nitrous oxide (N~2`O) emissions ([Figure 5.2](#fig-share-manure-gases)) during the handling and storage phases prior to soil application. Direct N2O emissions arise from the nitrification and denitrification processes of ammoniacal nitrogen present in the waste.

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| Figure 5.2: Percentage share of N2 and CH4 emission from manure managment by livestock for 2021 |

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| Table 5.2: CO2eq emission from manure managment by livestock for 2000 and 2021   |  | CO2eq (Gg) | |  | | --- | --- | --- | --- | | Livestock | 2000 | 2021 | Change (%) | | 3.A.2.a - Cattle | 2,713.2 | 5,043.2 | 85.9 | | 3.A.2.a.ii - Other cattle | 2,563.6 | 4,765.1 | 85.9 | | 3.A.2.d - Goats | 593.0 | 1,074.3 | 81.2 | | 3.A.2.a.i - Dairy cows | 149.6 | 278.2 | 85.9 | | 3.A.2.c - Sheep | 148.8 | 260.6 | 75.2 | | 3.A.2.i - Poultry | 62.6 | 78.6 | 25.5 | | 3.A.2.h - Swine | 65.8 | 77.4 | 17.6 | | **TOTAL** | **6,296.7** | **11,577.3** | **83.9** | |

In 2021, CO2eq emission from manure management was **11,577.3** CO2eq (Gg) an increase of about **83.9%** compared to **6,296.7** CO2eq (Gg) in 2000 ([Table 5.2](#tbl-manure-cat)) with cattle contributing **85.1** percent () of the **11,577.3** CO2eq (Gg) in 2021 ([Figure 5.3](#fig-share-manure)).

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| Figure 5.3: Percentage share of CO2eq emission from manure managment by livestock for 2021 |

## 5.3 Emissions and removals from Land category (3B)

This section presents anthropogenic emissions and removals of CO~2 ~from the loss and gain of carbon (C), associated with land use and with land-use and land-cover change. Emissions and removals of CO2 from Harvested Wood Products (HWP), i.e., products that are manufactured/processed after the harvesting of wood from planted forests, such as paper, sawnwood and wood panels, are also taken into account.

### 5.3.1 Category overview

The Land category encompasses emissions and removals of greenhouse gases from land use and land-use change. This category is crucial for understanding the impact of land management practices on the carbon cycle and overall GHG emissions. Summary information on method and emission factor selection is provided in Table xx, with key categories identified.

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| Table 5.3: Summary of methodologies and emission factors – land category   | Land use and land cover |  | | --- | --- | | Category | Description | | A. Forest Land | Forest land that remains forest land over time. | | A. Forest Land | Land converted from other categories to forest land. | | B. Cropland | Cropland that remains cropland over time. | | B. Cropland | Land converted from other categories to cropland. | | B. Cropland | Forest land converted to cropland. | | B. Cropland | Wetlands converted to cropland. | | C. Grassland | Grassland that remains grassland over time. | | C. Grassland | Land converted from other categories to grassland. | | C. Grassland | Forest land converted to grassland. | | C. Grassland | Wetlands converted to grassland. | | D. Wetlands | Wetlands that remain wetlands over time. | | D. Wetlands | Land converted from other categories to wetlands. | | E. Settlements | Settlements that remain settlements over time. | | E. Settlements | Land converted from other categories to settlements. | | E. Settlements | Forest land converted to settlements. | | F. Other Lands | Land that does not fall into the other categories. | |

### 5.3.2 Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

This inventory employed Approach 2 for land-use identification, as outlined in Climate Change (IPCC) (2006). This approach facilitated the assessment of total land-use area extents and tracked transitions between land-use categories over time. Specifically, it enabled the quantification of conversions between different land-use types within the study period. The primary monitoring system used was remote sensing, which was instrumental in identifying forest land and detecting changes in forest cover.

To construct land-use transition matrices, data were sourced from national land use cover maps and the European Space Agency (ESA) Climate Change Initiative (CCI) Land Cover Maps for the years 1995, 2015, 2016, and 2021. A comparative classification analysis was conducted based on IPCC Guidelines (IPCC 2006) to ensure consistency between different data sources used for Activity Data. It is noteworthy that land-use classifications derived from ESA Land Cover Maps were reclassified to align with the national land-use mapping categories in accordance with the IPCC reporting framework.

### 5.3.3 Land-use definitions and the classification systems used and their correspondence to the Land categories

To ensure consistency across all land-based estimates, standardized working definitions for land categories were developed and adopted during the preparation of the estimates. These land-use categories align with the guidelines outlined in IPCC (Climate Change (IPCC) 2006). The following definitions are used for the different land-use categories, consistent with national land-use classifications:

1. **Forest Land** – is defined in accordance with the domestic definition as land that (i) is under forestry land-use and (ii) covers an area of at least 0.5 hectares, with a minimum tree crown cover of 10% or the potential to achieve such cover through natural or planted tree species. Additionally, the trees must have the potential to reach or have already attained a minimum height of 3 meters at maturity in situ. This category includes forest plantations and mangroves.
2. **Cropland** – refers to areas actively cultivated for the production of harvested crops. This includes tilled land, recently harvested fields, fallow land within crop rotation systems, and areas prepared for planting. In Tanzania, cropland encompasses both annual cropland, used for food crops such as maize, rice, cassava, sorghum, and beans, and perennial cropland, used for crops like coffee, cashew, tea, and sisal. Cultivation practices vary depending on regional climate and soil conditions.
3. **Grassland** – is defined as land where the vegetation is predominantly composed of grasses, with minimal tree cover. These areas are often characterized by open plains and serve as habitats for grazing animals. Grassland includes areas with tree cover below the thresholds specified for forest land (which may also be used for grazing) and set-aside grasslands (i.e., unmanaged grasslands not utilized for agricultural purposes).
4. **Wetland** – are areas of land that are saturated with water, either naturally or artificially. They can be temporary or permanent and include marshes, swamps, and peatlands. In Tanzania, wetlands are categorized into three main types:
   1. *Coastal wetlands* – formed by tidal influence and wave action, these include mudflats, mangroves, estuaries, and deltas;
   2. *Rift system wetlands* –found in rift depressions, these include salt lakes, swamps, and playas; and
   3. *Highland drainage basin wetlands* – formed by rivers originating in the highlands, these include lakes, swamps, and floodplains.
5. **Settlements** – refer to areas of human habitation, such as villages, towns, and cities, governed by the National Human Settlements Development Policy. This category encompasses all structured communities where people reside, categorized by population density and type of activity (urban, rural, or pastoral). Settlements are further classified based on population size, with “villages” having smaller populations compared to “minor towns” and “urban settlements.”
6. **Other Land** – includes areas not covered by the above classifications, such as bare land, rock outcrops, coastal bare lands, and ice caps or snow-covered areas. Essentially, it encompasses all land that does not fall into the defined categories of forest land, cropland, grassland, wetland, or settlements.

### 5.3.4 Information on land areas for biomass burning

Information on biomass burning in Tanzania was specifically considered for the following categories: Burning in Forest Land, Burning in Cropland, and Burning in Grassland. For these categories, emissions of methane (CH~4`) and nitrous oxide (N2O) were estimated. However, emissions of carbon monoxide (CO) and nitrogen oxides (NOx) were not estimated due to limited data availability. Additionally, burning of woody biomass in Wetlands, Settlements, and Other Land does not occur, and thus these categories were excluded from the analysis.

Given the limited availability of in-country data for all categories, biomass burning data were sourced from the Global Wildfire Information System (GWIS), accessible at https://gwis.jrc.ec.europa.eu/apps/gwis.statistics/. This dataset is a satellite-based burning information covering the period from 2002 to 2023.

### 5.3.5 Data and data sources for Land emission factors

The assessment explored multiple datasets, including land use and land cover (LULC) maps generated for the years 1995, 2010, 2016, and 2021 (*see* [Table 5.4](#tbl-data)). These datasets were selected based on their relevance and accuracy in representing changes in land cover and land use over time. To ensure consistency and compatibility across the different data sources, a forest types layer was integrated into the analysis. This layer provided additional detail on forest classifications, enabling a more comprehensive understanding of land-use dynamics.

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| Table 5.4: Datasets used for analysis of land use and land cover changes in Tanzania Mainland, from 1995 - 2021   | Name | Type | Description | Year | Source | | --- | --- | --- | --- | --- | | Basemaps | Vector | Provides essential geographic context including administrative boundaries, water bodies, and infrastructure. | - | Several | | Forest Types map | Raster | Classifies diverse forest types across Tanzania with high spatial resolution. | 2020 | John, E.; Bunting, P.; Hardy, A.; Silayo, D.S.; Masunga, E. A Forest Monitoring System for Tanzania. Remote Sens. 2021, 13, 3081. | | Hunting Technical Services Ltd (HTSL) | Vector | Historical land cover classifications including freshwater, bushland, and woodlands. | 1995 | The HTSL map was produced at a scale of 1:250,000 (Hunting Technical Services Ltd 1997); | | NAFORMA LULC map | Vector | Offers updated insights into forest and non-forest land cover in Tanzania. | 2015 | National Forest Resources Monitoring and Assessment (NAFORMA) 2015 | | ESA LULC map 2016 | Raster | Captures Tanzania’s land cover as of 2016, revealing shifts in land use. | 2016 | European Space Agency (ESA) Copernicus Global Land Service (CGLS) Land Cover | | ESA LULC map 2021 | Raster | Extends LULC observations to 2021, allowing analysis of recent trends. | 2021 | European Space Agency (ESA) Copernicus Global Land Service (CGLS) Land Cover | |

### 5.3.6 Map processing (generation of change maps)

Land use categories were classified according to IPCC land use types as per section 5.3.3. To align the IPCC land use classes, reclassification was done for the 1995 map. This involved categorizing the land use types according to the standard classification used in IPCC guidelines, followed by joining the reclassified table to the shapefile. Reclassification can be represented as a mapping function shown in Equation XX:

Where is a function that maps the old land use classes to new classes according to the IPCC guidelines.

The analysis focused on the epochs defined by the datasets. The Hunting layer data (Table xx) was used to establish the land use conditions between 1995 to 2010. This historical comparison enabled the calculation of the annual rate of change. The data from ESA 2021 were also used in this analysis, allowing for a detailed understanding of LULC transitions over time. The equation below was used to calculate changes of each land use and land cover between the two epochal years.

Where: $\omeaga$ - Land use and land cover area at the end of the period, Land use and land cover area at the start of the period, and Number of years between the start and end periods.

### 5.3.7 Land use transition matrix

#### 5.3.7.1 Tanzania Mainland

The land use matrix was developed to consistently quantify land use and land-use conversions, facilitating the identification of areas undergoing land-use transition for various initial and final land use combinations. A land-use change matrix for the period 1995 to 2021 has been developed, using national land use information for the categories of Forest Land, Cropland (subdivided into Annual Cropland and Perennial Cropland), Grassland, Wetlands, Settlements, and Other land ([Figure 5.4](#fig-lulc-class-mainland)).

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| Figure 5.4: Land Use and Land Cover in Mainland Tanzania for 2021. The inset bar plot represents the area by class and inset treemap represents the percentage area cover by class. Source European Space Agency (ESA) 2021 |

The missing years for the land cover required interpolation or extrapolation to complete the series. The values for the land use transition matrix were initially formulated by the Expert Review Team during the in-country assessment of the GHG Inventory to establish a more comprehensive time series of area data for each reported land use change category, while also resolving issues related to inconsistencies in area measurements. Furthermore, this was executed to demonstrate the dependability and precision of the matrix, along with alterations in the aggregated 26-year areas. The areas were used to formulate a two-phase computation for the yearly areas remaining in the same category and for the annual change. This was conducted to confirm that the conversions and total area remained stable across the whole period. The total loss and gain of each land use categories over the study period is presented [Table 5.5](#tbl-lulc-matrix-tz) and the annual rate of change in [Table 5.6](#tbl-lulc-rate-tz).

The land conversion from major categories to sub-categories of land use and land cover classes for mainland Tanzania is shown in [Figure 5.5](#fig-lulc-transition). For instance, loss of annual crop over the inventory period is attributed by gain of forestland, grassland and settlement. The loss of forestland is contributed by gain in annual crops and grassland. The large gain of forest land, annual crop and grassland has reduced the size of forest plantations over the same period. It was also observed that the areas for settlement has shrunk in 2021 compared to 1995 due to gain in grassland, forestland and agriculture land for annual crop cultivation. However, it should be noted that the loss of settlement in the settlement category is small compared to the gain of forest in other land use classes such as annual crop, forest, forest plantation, and grassland, where settlement gains are significant high.

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| Figure 5.5: Main category of Land Use and Land Cover conversion in Mainland Tanzania between 1995 and 2021 |

The alluvial plot in [Figure 5.5](#fig-lulc-transition) illustrates the transitions of land cover types across three distinct epochs: 1995-2010, 2010-2016, and 2016-2021. Each colored flow (or “stream”) represents a transition of land cover classes over time ([Figure 5.5](#fig-lulc-transition)). Widening flows of grassland and shrinking of wetland and annual crop from 2010 toward 2021 are evident (Figure 25), illustrating shifts due to agricultural expansion and settlement.

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| Table 5.5: Annual rate of change matrix of land use and land cover classes between 1995 and 2021 in Tanzania Mainland   |  | Area (Ha) | | | | | | | | | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | major | Annual crop | Forest | Forest plantation | Grassland | Others | Perrenial crop | Settlement | Wetland | TOTAL | | Annual crop | 11,847,006.0 | 10,244,249.4 | 405,168.9 | 6,260,048.4 | 48,062.0 | 430.7 | 201,904.6 | 74,455.6 | 29,081,325.6 | | Forest | 2,333,244.1 | 35,666,302.0 | 144,887.6 | 7,855,755.6 | 61,166.2 | 2,061.4 | 22,494.8 | 53,369.8 | 46,139,281.5 | | Forest plantation | 4,373.5 | 49,995.0 | 77,815.3 | 14,602.8 | 171.4 | 2.6 | 369.4 | 242.8 | 147,572.8 | | Grassland | 291,250.3 | 1,859,760.7 | 59,634.8 | 3,756,038.0 | 40,211.2 | 107.8 | 4,485.6 | 13,820.7 | 6,025,309.1 | | Others | 58,773.4 | 195,274.9 | 831.3 | 109,805.0 | 5,724,778.2 | 65.7 | 2,693.1 | 67,796.1 | 6,160,017.7 | | Perrenial crop | 135.2 | 1,774.9 | 3,334.9 | 861.0 | 9.2 | 2,958,212.2 | 33.6 | 9.4 | 2,964,370.4 | | Settlement | 27,090.3 | 66,505.9 | 776.4 | 30,464.6 | 1,360.3 | 122.0 | 97,090.3 | 141.1 | 223,550.9 | | Wetland | 245,719.4 | 729,580.9 | 626.0 | 1,462,908.3 | 265,131.2 | 45.8 | 1,269.4 | 445,426.7 | 3,150,707.7 | | TOTAL | 14,807,592.2 | 48,813,443.7 | 693,075.2 | 19,490,483.7 | 6,140,889.7 | 2,961,048.2 | 330,340.8 | 655,262.2 | 93,892,135.7 | |

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| Table 5.6: Annual rate of change matrix of land use and land cover classes between 1995 and 2021 in Tanzania Mainland   |  | Area (Ha) | | | | | | |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | major | Annual crop | Forest | Forest plantation | Grassland | Others | Perrenial crop | Settlement | Wetland | | Annual crop | 455,654.1 | 394,009.6 | 15,583.4 | 240,771.1 | 1,848.5 | 16.6 | 7,765.6 | 2,863.7 | | Forest | 89,740.2 | 1,371,780.8 | 5,572.6 | 302,144.4 | 2,352.5 | 79.3 | 865.2 | 2,052.7 | | Forest plantation | 168.2 | 1,922.9 | 2,992.9 | 561.6 | 6.6 | 0.1 | 14.2 | 9.3 | | Grassland | 11,201.9 | 71,529.3 | 2,293.6 | 144,463.0 | 1,546.6 | 4.1 | 172.5 | 531.6 | | Others | 2,260.5 | 7,510.6 | 32.0 | 4,223.3 | 220,183.8 | 2.5 | 103.6 | 2,607.5 | | Perrenial crop | 5.2 | 68.3 | 128.3 | 33.1 | 0.4 | 113,777.4 | 1.3 | 0.4 | | Settlement | 1,041.9 | 2,557.9 | 29.9 | 1,171.7 | 52.3 | 4.7 | 3,734.2 | 5.4 | | Wetland | 9,450.7 | 28,060.8 | 24.1 | 56,265.7 | 10,197.4 | 1.8 | 48.8 | 17,131.8 | |

#### 5.3.7.2 Zanzibar

Unlike the Tanzania mainland, the land use and land cover of Zanzibar is divided into five main categories including forestland, grassland, annual cropland, settlement, and others ([Figure 5.6](#fig-lulc-zenji)). The remaining classes including perennial crops, forest plantations, and wetland were missing because of the nature of the island. Based on the 2021 layers, forestland was the dominant land use category consisting of over 70 percent of the total area of Unguja and Pemba Island. Forestland was followed by grassland, which account for more than 19 percent of the total land area. Therefore, forestland and grassland combined account for more than 90% of the total area in Zanzibar, while the remaining class share only less than 9 percent.

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| Figure 5.6: Land Use and Land Cover in Zanzibar for 2021. The inset bar plot represents the area by class and inset tree map represent the percentage area cover by class. Source European Space Agency (ESA) 2021 |

Despite lack of the same categories, it was found that the land use categories experienced significant changes over the inventory period contributed by socio-economic development and environmental factors. The rapid increase of human population the Zanzibar has demanded more areas for settlements and agriculture, leading to loss forest in the Pemba and Unguja Islands. Similar to [Figure 5.6](#fig-lulc-zenji), the land conversion from major categories to sub-categories of land use and land cover classes for Zanzibar is shown in [Figure 5.7](#fig-lulconver-zenji). It was found that the loss of annual crop over the inventory period was mainly contributed by gain of forestland, grassland and settlement. The loss of forestland is contributed by gain in annual crops and grassland. The large gain of forest land, annual crop and grassland has reduced the size of forest plantations over the same period. It was also observed that the areas for settlement have shrunk in 2021 compared to 1995 due to gain in grassland, forestland and agriculture land for annual crop cultivation. However, it should be noted that the loss of settlement in the settlement category is small compared to the gain of forest in other land use classes such as annual crop, forest, forest plantation, perennial crop, and grassland, where settlement gains are significant high.

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| Figure 5.7: Main category of Land Use and Land Cover conversion in Zanzibar between 1995 and 2021. |

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| Table 5.7: Total area matrix of land use and land cover classes between 1995 and 2021 in Zanzibar   |  | Area (Ha) | | | | | | | | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1995/2021 | Annual crop | Forest | Forest plantation | Grassland | Others | Perrenial crop | Settlement | Total | | Annual crop | 2,249.1 | 74,373.3 | 61.4 | 28,367.8 | 613.2 | 130.3 | 3,742.1 | 109,537.2 | | Forest | 30.0 | 18,605.2 | - | 3,427.3 | 818.7 | 42.4 | 70.3 | 22,993.9 | | Grassland | 85.7 | 12,621.3 | - | 5,532.7 | 227.2 | - | 402.7 | 18,869.6 | | Others | - | 20.5 | - | 2.9 | 2.7 | - | - | 26.1 | | Perenial crop | 772.7 | 74,007.0 | 2.4 | 10,679.9 | 377.7 | 326.3 | 3,715.5 | 89,881.5 | | Settlement | 4.5 | 314.2 | - | 135.4 | 37.1 | - | 2,293.4 | 2,784.6 | | total | 3,142.0 | 179,941.5 | 63.8 | 48,146.0 | 2,076.6 | 499.0 | 10,224.0 | 244,092.9 | |

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| Table 5.8: Annual rate of change matrix of land use and land cover classes between 1995 and 2021 in Zanzibar   |  | Area (Ha) | | | | | | | | --- | --- | --- | --- | --- | --- | --- | --- | | 1995/2021 | Annual crop | Forest | Forest plantation | Grassland | Others | Perrenial crop | Settlement | | Annual crop | - | 2,860.5 | 2.4 | 1,091.1 | 11.8 | 5.0 | 143.9 | | Forest | 1.2 | - | - | 131.8 | 15.8 | 1.6 | 2.7 | | Grassland | 3.3 | 485.4 | - | - | 4.4 | - | 15.5 | | Others | 0.0 | 0.8 | - | 0.1 | - | - | - | | Perenial crop | 29.7 | 2,846.4 | 0.1 | 410.8 | 7.2 | - | 142.9 | | Settlement | 0.2 | 12.1 | - | 5.2 | 0.7 | - | - | |

### 5.3.8 Forest land (3B1)

Tanzania’s forests between 1995 and 2021, forestland remained a net carbon sink ([Figure 5.8](#fig-forest)), though have contributed to land-use conversions. On average, forestland remaining forestland (FL-FL) accounted for 2,986,583 ha of carbon sinks annually. Land converted to forestland also has played an important role, with cropland-to-forestland conversions contributing 122,195 ha and grassland-to-forestland conversions adding 202,173 ha annually. Conversions from settlements and other lands to forestland covered 7,996 ha and 59,046 ha, respectively.

Over the 26-year period from (1996 to 2021), reforestation efforts significantly expanded forest cover: cropland-to-forestland increased by 2.59 million ha, and grassland-to-forest land grew by 2.42 million ha. These gains reflect the impacts of government policies such as the ban on raw timber exports, large-scale reforestation programs, and increased private sector participation. Moreover, the implementation of initiatives like the AFR100 (African Forest Landscape Restoration) has further boost efforts to restore degraded lands and increase carbon removals; these solidify Tanzania’s forests as a critical carbon sink for climate change mitigation.

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| Figure 5.8: Trend of CO2 sink by sub-categories in the forest category |

### 5.3.9 Cropland (3B2)

Between 1995 and 2021, the trend of land conversion to cropland in the United Republic of Tanzania exhibits diverse contributions from various land types (Figure xx). In 1996, the conversion of forest land to agriculture accounted for 0.92%, grassland conversion for 0.04%, settlement conversion for 0.01%, and other land had a negative contribution of -0.03%. In 1997, forest land accounted for 1.93%, grassland for 0.34%, settlements for 0.02%, and other land for -0.07%. By 1998, forest land constituted 3.05%, grassland stayed at 0.54%, settlements at 0.03%, and other land decreased by 0.12%.

Over time, forest land remained the principal factor in farmland growth, achieving 287.75% by 2016 and 312.67% by 2021. Conversely, grassland conversion contributed markedly less, with 51.14% in 2016 and 55.56% in 2021. Settlements consistently represented a minor proportion, with values of 3.29% in 2016 and 3.57% in 2021. Other land also exhibited negative contributions, with a decline in farmland of -10.95% in 2016 and -11.88% in 2021.

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| Figure 5.9: Trend of CO2 emission by sub-categories in the cropland category |

### 5.3.10 Grassland (3B3)

From 1995 to 2021, Tanzania has experienced a significant trend of grassland being converted into other land uses ([Figure 5.10](#fig-grassland)). This transformation became noticeable starting in 1996, with a steady decline in the remaining grassland area as it was increasingly converted to various other land types. The conversion of forest land to grassland showed a consistent upward trend, starting at -1,529.88 hectares in 1996 and increasing to -39,834.98 hectares by 2021, indicating a gradual decline in forest cover in favor of grassland expansion.

Similarly, cropland converted to grassland followed an increasing pattern, beginning with -1,835.87 hectares in 1996 and reaching -47,732.68 hectares by 2021, this shows the growing conversion of agricultural land to grassland. The conversion of settlements to grassland also rose steadily, from -5.93 hectares in 1996 to -154.19 hectares in 2021, although this category contributed less to the overall conversion compared to forest and cropland. Additionally, other land uses were converted to grassland, increasing from -31.71 hectares in 1996 to -824.36 hectares in 2021.

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| Figure 5.10: Trend of CO2 emission by sub-categories in the grassland category |

### 5.3.11 Wetland (3B4)

Tanzania does not report any emissions under wetland. Wetlands are highly variable ecosystems, with fluctuating water levels, seasonal changes, and diverse vegetation types. These factors contribute to significant spatial and temporal variability in greenhouse gas emissions, CO2 from conversion to wetlands by flooding, leading to methane (CH4) attributed by the complex interactions between hydrology, vegetation, and microbial processes. Moreover, human activities such as land use changes, drainage, and water management practices significantly affect wetland areas and their emissions.

### 5.3.12 Settlements (3B5)

Between 1995 and 2021, land-use changes from other land use to settlements in the United Republic of Tanzania has shown that conversions of forest land, cropland, and grassland into settlements has increased ([Figure 5.11](#fig-settlement)). Over the 25-year period, a total of 384.14 ha of forestland were converted to settlements, with an annual average conversion rate of 15.37 ha/year. Cropland experienced the highest level of conversion, contributing 897.89 ha to settlements at an average rate of 35.92 ha/year, making it the largest contributor to settlement expansion—approximately 2.34 times more than forestland. Grassland conversions were minimal, with only 4.70 ha converted in total, averaging 0.19 ha/year over the same period. Contrary, other land categories showed a total change of -16.59 ha, which may reflect adjustments in land classifications or methodological factors.

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| Figure 5.11: Trend of CO2 emission by sub-categories in the settlement category in AFOLU sector |

### 5.3.13 Other land (3B6)

Other Land includes areas such as barren land; rock-outcrops, which have limited vegetation and organic matter, leading to relatively, lower emissions. Therefore, starting at 47.86 units in 1996 and steadily increasing to 393.58 units by 2021, indicating ongoing deforestation pressure. Cropland conversion follows a similar pattern but at a lower magnitude, rising from 50.59 units to 185.28 units ([Figure 5.12](#fig-otherland)).

Grassland conversion presents a unique pattern with initially high emissions of 431.10 units in 1996, stabilizing at 477.69 units from 2000 to 2015, before dropping sharply to 243.83 units in 2016 and gradually increasing to 301.89 units by 2021 ([Figure 5.12](#fig-otherland)). This suggests significant policy changes or land use modifications in 2016. Settlements conversion shows the lowest overall emissions, starting at 3.79 units in 1996, peaking at 19.05 units in 2001, maintaining stability at 15.88 units for several years, then decreasing to 7.05 units in 2016 before slight increases to 8.73 units by 2021 ([Figure 5.12](#fig-otherland)).

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| Figure 5.12: Trend of CO2 emission by sub-categories in the other land category in AFOLU sector |

## 5.4 Emissions and removals from Aggregated and non-CO2 emissions on land (3C)

### 5.4.1 Category overview

The CO2 equ emission from Aggregated and non-CO2 emissions on land (3C) fall under three categories – Burning in Forest Land, Burning in Cropland, and Burning in Grassland ([Table 5.9](#tbl-aggr)). These categories emitted ammonia (CH4) and nitrogen dioxide (N2O). In 2021, the equivalent CO2 emitted from burning in forest land was 322.3 Gg which has increased by 6.2% compared to 303.5 in 2002. The equivalent CO2 emitted from burning in cropland was 1.7 Gg in 2021, which has declined by 70.8% compared to 5.8 Gg in 2002. Similarly, the equivalent CO2 emitted from burning of grassland decreased from 1,433.8 Gg in 2002 to 794.1 Gg in 2021, a decrease of about 44.6 percent ([Table 5.9](#tbl-aggr))

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| Table 5.9: Level assessment of CO2equ removal from from Aggregated and non-CO2 emissions on land   |  | CO2eq (Gg) | |  | | --- | --- | --- | --- | | Non-CO2 emissions category | 2002 | 2021 | Change (%) | | 3.C.1.a - Burning in Forest Land | 303.55 | 322.28 | 6.17 | | 3.C.1.b - Burning in Cropland | 5.84 | 1.71 | -70.82 | | 3.C.1.c - Burning in Grassland | 1,433.84 | 794.08 | -44.62 | |

### 5.4.2 Biomass burning (3C1)

#### 5.4.2.1 *Burning in Forest land*

This category involves the combustion of trees and other vegetation in forest areas. It includes emissions from activities like deforestation, forest degradation, and wildfires. The primary gases released are CO2, CH4, and N2O ([Figure 5.13](#fig-burning-forest)). This category is significant because it often leads to large-scale carbon emissions due to the high biomass density in forests.

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| Figure 5.13: Trend of CO2equ emission from burning in forest land |

#### 5.4.2.2 *Burning in cropland*

Burning in cropland refers to the combustion of agricultural residues left on fields after harvest. Farmers often burn crop residues to clear fields for the next planting season. This practice releases CO2, CH4, and N2O ([Figure 5.14](#fig-burning-cropland)). While emissions from this category are typically lower than those from forest burning, they still contribute to the overall GHG inventory.

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| Figure 5.14: Trend of CO2equ emission from burning in cropland |

#### 5.4.2.3 *Burning in Grassland*

This category includes the burning of grasses and shrubs in grassland areas, which is common in savanna regions. It is often used as a land management practice to promote new growth or reduce the risk of uncontrolled wildfires. Emissions from grassland burning primarily include CO2, CH4, and N2O ([Figure 5.15](#fig-burning-grassland)). This category can exhibit significant fluctuations in emissions depending on land management practices and climatic conditions.

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| Figure 5.15: Trend of CO2equ emission from burning in grassland |

### 5.4.3 Lime application (3C2)

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| Figure 5.16: Trend of CO2equ emission from lime |

### 5.4.4 Urea application (3C3)

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| Figure 5.17: Trend of CO2equ emission from application of urea |

### 5.4.5 Direct N2O emissions from managed soils (3C4)

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| Figure 5.18: Trend of CO2equ emission from managed soils |

### 5.4.6 Indirect N2O from manure management (3C6)

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| Figure 5.19: Trend of CO2equ emission from manure management |

### 5.4.7 Rice Production (3C7)

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| Figure 5.20: Trend of CO2equ emission from rice production |

## 5.5 Emissions and removals from Harvested wood products (3D1)

### 5.5.1 Category Description

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| Table 5.10: Level assessment of CO2equ removal from Harvested wood products for 2000 and 2021   |  | CO2equ (Gg) | |  | | --- | --- | --- | --- | | HWP category | 2000 | 2021 | Change (%) | | 3.D.1 - Harvested Wood Products | -10.28112 | -161.2791 | 1468.693 | |

### 5.5.2 Emissions and removals from HWP

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| Figure 5.21: Trend of CO2equ removal from Harvested wood products |

### 5.5.3 Methodological issues

### 5.5.4 Category specific QA/QC and verification

## 5.6 Description of uncertainties

## 5.7 Time series consistency issues

## 5.8 Recalculations

## 5.9 Improvements

## 5.10 References

# 6. WASTE

This chapter focuses on the waste sector, a critical component of national greenhouse gas (GHG) inventories, encompassing a range of activities that contribute to emissions through the management and treatment of waste materials. The waste sector is broadly categorized into four primary sources: solid waste disposal, biological treatment of solid waste, incineration and open burning of waste, and wastewater treatment and discharge ([Table 6.1](#tbl-waste-categories)). Each of these categories represents distinct processes that generate emissions of key GHGs, including methane (CH4), carbon dioxide (CO2), and nitrous oxide (N2O), depending on the nature of the waste and the management practices employed.

## 6.1 Sector overview

The **IPCC Guidelines** classify waste activities into four primary categories – solid waste disposal; biological treatement of solid waste; incineration and open buring of waste; and wastewater treatement and discharge (IPCC 2006). **Solid Waste Disposal** is a significant source of methane (CH₄) emissions, resulting from the anaerobic decomposition of organic matter in landfills and dumpsites. IPCC (2006) guideline differentiates between *managed landfills* – often include gas collection and control systems, and *unmanaged or open dumps* – lack such measures. **Biological Treatment of Solid Waste** include biological processes, such as composting and anaerobic digestion, which play a vital role in reducing waste volumes and recovering resources. However, these processes can emit CH4 and N2O. **Incineration and Open Burning of Waste** contribute primarily to carbon dioxide (CO2) emissions, though incomplete combustion can also generate methane (CH4) and nitrous oxide (N2O).

**Wastewater Treatment and Discharge** emission arise primarily from the biological degradation of organic matter in domestic and industrial wastewater. Anaerobic conditions in lagoons, septic tanks, and sludge handling facilities can lead to methane (CH4) production, while nitrous oxide (N2O) is generated through nitrification and denitrification processes in wastewater treatment plants. The IPCC guideline categorizing these waste activities enable comprehensive and consistent reporting of emissions, facilitating targeted mitigation efforts and enhancing the accuracy of national GHG inventories. However, for this inventory only category **4.A - Solid Waste Disposal** had data for estimation. The remaining were not estimated due to a lack of available data or methodological constraints ([Table 6.1](#tbl-waste-categories)). As a result, the assessment in this report primarily present emissions from Solid Waste Disposal, while acknowledging the need for improved data collection and methodologies to evaluate the other categories in future inventories.

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| Table 6.1: Trends of CO2e emission by major categories in the waste sector   |  | Trends CO~2~ equ*1* | | --- | --- | | 4.A - Solid Waste Disposal | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover 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x="566.451612903226" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="586.451612903226" y="20" fill="transparent" stroke="transparent" font-size="30px">205</text></g> <g class="vert-line"> <rect x="597.41935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="617.41935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">226</text></g> <g class="vert-line"> <rect x="628.387096774194" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="648.387096774194" y="20" fill="transparent" stroke="transparent" font-size="30px">250</text></g> <g class="vert-line"> <rect x="659.354838709677" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="679.354838709677" y="20" fill="transparent" stroke="transparent" font-size="30px">278</text></g> <g class="vert-line"> <rect x="690.322580645161" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="710.322580645161" y="20" fill="transparent" stroke="transparent" font-size="30px">309</text></g> <g class="vert-line"> <rect x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">344</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">389</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">440</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">500</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">569</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">650</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" fill="transparent" stroke="transparent" font-size="30px">741</text></g> <g class="vert-line"> <rect x="938.064516129032" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">839</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">944</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">1.09K</text></g> </svg> </div> | | 4.B - Biological Treatment of Solid Waste | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <line x1="22.5" y1="65" x2="1037.5" y2="65" stroke="#BFBFBF" stroke-width="2" ></line> <rect x="40" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="70.9677419354839" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="101.935483870968" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="132.903225806452" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="163.870967741935" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="194.838709677419" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="225.806451612903" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="256.774193548387" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="287.741935483871" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="318.709677419355" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="349.677419354839" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="380.645161290323" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="411.612903225806" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="442.58064516129" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="473.548387096774" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="504.516129032258" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="535.483870967742" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="566.451612903226" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="597.41935483871" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="628.387096774194" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="659.354838709677" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="690.322580645161" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="721.290322580645" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="752.258064516129" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="783.225806451613" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="814.193548387097" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="845.161290322581" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="876.129032258065" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="907.096774193548" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="938.064516129032" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="969.032258064516" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="1000" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <g class="y-axis-line"> <rect x="0" y="0" width="65" height="130" stroke="transparent" stroke-width="0" fill="transparent"></rect> <text x="0" y="19" fill="transparent" stroke="transparent" font-size="25">5</text> <text x="0" y="126" fill="transparent" stroke="transparent" font-size="25">−5</text></g> <g class="vert-line"> <rect x="40" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="60" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="70.9677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="90.9677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="101.935483870968" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="121.935483870968" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="132.903225806452" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="152.903225806452" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="163.870967741935" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="183.870967741935" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="194.838709677419" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="214.838709677419" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="225.806451612903" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="245.806451612903" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="256.774193548387" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="276.774193548387" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="287.741935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="307.741935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="318.709677419355" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="338.709677419355" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="349.677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="400.645161290323" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="411.612903225806" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="431.612903225806" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="442.58064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="462.58064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="473.548387096774" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="493.548387096774" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="504.516129032258" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="524.516129032258" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="535.483870967742" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="555.483870967742" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="566.451612903226" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="586.451612903226" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="597.41935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="617.41935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="628.387096774194" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="648.387096774194" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="659.354838709677" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="679.354838709677" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="690.322580645161" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="710.322580645161" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="721.290322580645" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="741.290322580645" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="752.258064516129" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="772.258064516129" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="783.225806451613" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="803.225806451613" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="938.064516129032" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="958.064516129032" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="969.032258064516" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="989.032258064516" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="1000" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> </svg> </div> | | 4.C - Incineration and Open Burning of Waste | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <line x1="22.5" y1="65" x2="1037.5" y2="65" stroke="#BFBFBF" stroke-width="2" ></line> <rect x="40" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="70.9677419354839" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="101.935483870968" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="132.903225806452" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="163.870967741935" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="194.838709677419" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect x="225.806451612903" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> <rect 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fill="transparent" stroke="transparent" font-size="25">5</text> <text x="0" y="126" fill="transparent" stroke="transparent" font-size="25">−5</text></g> <g class="vert-line"> <rect x="40" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="60" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="70.9677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="90.9677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="101.935483870968" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="121.935483870968" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="132.903225806452" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="152.903225806452" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="163.870967741935" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="183.870967741935" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="194.838709677419" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="214.838709677419" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="225.806451612903" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="245.806451612903" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="256.774193548387" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="276.774193548387" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="287.741935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="307.741935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="318.709677419355" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="338.709677419355" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="349.677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="369.677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="380.645161290323" y="0" width="20" height="130" stroke="transparent" stroke-width="12" 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fill="transparent"></rect> <text x="524.516129032258" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="535.483870967742" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="555.483870967742" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="566.451612903226" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="586.451612903226" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="597.41935483871" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="617.41935483871" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="628.387096774194" y="0" width="20" height="130" stroke="transparent" stroke-width="12" 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fill="transparent"></rect> <text x="1020" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> </svg> </div> | | 4.D - Wastewater Treatment and Discharge | <div> <svg role="img" viewBox="0 0 1060 130" style=" height:2em; margin-left:auto; margin-right:auto; font-size:inherit; overflow:visible; vertical-align:middle; position:relative;" > <defs> <pattern id="area\_pattern" width="8" height="8" patternUnits="userSpaceOnUse"> <path class="pattern-line" d="M 0,8 l 8,-8 M -1,1 l 4,-4 M 6,10 l 4,-4" stroke="#FF0000" stroke-width="1.5" stroke-linecap="round" shape-rendering="geometricPrecision"> </path> </pattern> </defs> <style>text { font-family: ui-monospace, 'Cascadia Code', 'Source Code Pro', Menlo, Consolas, 'DejaVu Sans Mono', monospace; stroke-width: 0.15em; paint-order: stroke; stroke-linejoin: round; cursor: default; } .vert-line:hover rect { fill: #911EB4; fill-opacity: 40%; stroke: #FFFFFF60; color: red; } .vert-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover text { stroke: white; fill: #212427; } .horizontal-line:hover rect { fill: transparent; stroke: transparent; color: blue; } .boxplot-line:hover text { stroke: white; fill: #212427; } .boxplot-line:hover rect { fill: transparent; stroke: transparent; } .horizontal-line:hover text { stroke: white; fill: #212427; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; } .y-axis-line:hover rect { fill: #EDEDED; fill-opacity: 60%; stroke: #FFFFFF60; color: red; } .y-axis-line:hover text { stroke: white; stroke-width: 0.20em; fill: #1A1C1F; } .ref-line:hover rect { stroke: #FFFFFF60; } .ref-line:hover line { stroke: #FF0000; } .ref-line:hover text { stroke: white; fill: #212427; }</style> <line x1="22.5" y1="65" x2="1037.5" y2="65" stroke="#BFBFBF" stroke-width="2" ></line> <rect x="40" y="64" width="20" height="2" stroke="#808080" stroke-width="4" fill="#808080" ></rect> 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y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="70.9677419354839" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="90.9677419354839" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="101.935483870968" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="121.935483870968" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="132.903225806452" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="152.903225806452" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="163.870967741935" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="183.870967741935" 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fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="814.193548387097" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="834.193548387097" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="845.161290322581" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="865.161290322581" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="876.129032258065" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="896.129032258065" y="20" fill="transparent" stroke="transparent" font-size="30px">0</text></g> <g class="vert-line"> <rect x="907.096774193548" y="0" width="20" height="130" stroke="transparent" stroke-width="12" fill="transparent"></rect> <text x="927.096774193548" y="20" 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### 6.1.1 Category 4.A.1 - Managed Waste Disposal Sites

In 2021, emissions from the managed waste disposal sites category was 97 Gg CO₂e, representing a nearly ninefold increase (898%) compared to the 10 Gg CO₂e recorded in 2000 ([Figure 6.1](#fig-managed)). This significant rise in emissions highlights the growing impact of waste management practices on greenhouse gas (GHG) emissions over the past two decades. The increase can be attributed to several factors, including rapid urbanization, population growth, and the expansion of waste generation in tandem with economic development. While managed disposal sites are designed to mitigate environmental impacts through measures such as methane recovery and flaring, the substantial growth in emissions underscores the need for enhanced waste management strategies, including improved gas capture technologies, waste reduction initiatives, and the promotion of alternative waste treatment methods such as composting and recycling.

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| Figure 6.1: CO2e emission from Managed Waste Disposal Sites |

### 6.1.2 Category 4.A.2 - Unmanaged Waste Disposal Sites

Similar to the trend observed in managed waste disposal sites ([Figure 6.1](#fig-managed)), emissions from unmanaged waste disposal sites have also shown a steady increase over the inventory period ([Figure 6.2](#fig-unmanaged)), albeit at a significantly higher magnitude. In 2021, emissions from unmanaged waste disposal sites was 996 Gg CO2e, representing an increase of more than ninefold (907%) compared to the 99 Gg CO2e recorded in 2000 ([Figure 6.2](#fig-unmanaged)). This substantial rise in emissions underscores the environmental challenges posed by unmanaged waste disposal practices, which are often characterized by open dumpsites lacking gas collection or control systems. The increase can be attributed to factors such as rapid urbanization, population growth, and insufficient waste management infrastructure, which have led to higher volumes of waste being disposed of in unregulated sites.

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| Figure 6.2: CO2e emission from 4.A.2 - Unmanaged Waste Disposal Sites |

## 6.2 Methods – data sources and assumptions

### 6.2.1 Population Data

Population data is a critical input for estimating municipal solid waste (MSW) generation, as there is a strong correlation between population size and waste production (Mapunda et al., 2023). Studies indicate that as populations grow, the volume of waste generated increases proportionally. The First Order Decay (FOD) Model, as outlined in IPCC Volume 5, Chapter 3, was used to estimate emissions from solid waste disposal sites (SWDS). This model relies on population data and per capita waste generation rates to calculate total MSW. Population data for Tanzania Mainland for the years 1957, 1967, 1978, 1988, and 1994–2021 were obtained from the National Bureau of Statistics (NBS) and the Office of the Chief Government Statistician (OCGS), sourced from national population and housing census reports and population projections. For Zanzibar, population data for 1978, 1988, 1990–2003, 2002, and 2002–2021 were collected from the OCGS through similar reports.

However, there were gaps in population data for the years 1950–1956, 1958–1966, 1968–1977, 1979–1987, and 1989–1993, as population censuses are conducted every 10 years, and no projections were available for these periods. To address these gaps, missing data for 1958–1966, 1968–1977, 1979–1987, and 1989–1993 were estimated using the interpolation method described in IPCC (2006) and detailed in [Section 4.7.2](#sec-recalculation) with mathematical formula presented in [Equation 4.1](#eq-interp). Data for 1950–1956 were generated using backward extrapolation as guided in IPCC (2006). The extrapolation technique used is described in (**#sec-recalculation?**) with a mathematical formula in [Equation 4.2](#eq-extra)

## 6.3 Gross Domestic Product (GDP)

The FOD model also requires GDP data and industrial waste generation rates to estimate total industrial waste. UNECE (2006) described that GDP reflects societal production and consumption patterns, which influence resource use and waste generation. GDP data for 1966–1986 and 1992–2021 were obtained from NBS. However, these data had gaps with missing for 1950–1965 and 1987–1991. To address these gaps, missing GDP data for 1950–1965 were estimated using backward extrapolation, following the IPCC guideline (IPCC (2006); Climate Change (IPCC) (2006)). Similarly, data for 1987–1991 were also interpolated (*See* [Section 4.7.2](#sec-recalculation)).

### 6.3.1 Per Capita Waste Generation

Per capita waste generation, measured in kg/capita/year, varies across regions in Tanzania. For Zanzibar, the average per capita waste generation is 4.75 kg/capita/year, while for Tanzania Mainland ranges from 0.55 kg/capita/year (2017) to 0.66–0.95 kg/capita/year (2020). The value of 0.66 kg/capita/year was selected as the representative average for Tanzania Mainland, as it reflects the waste generation patterns of the majority of the population. Available data for Tanzania Mainland and Zanzibar were limited to 2017, 2018, and 2021. To convert daily waste generation rates to annual rates, the values were multiplied by 365 days. Missing data for Tanzania Mainland (1950–2016, 2018, 2019, and 2021) and Zanzibar (1950–2017 and 2019–2021) were filled using surrogate ([Equation 4.3](#eq-surro)), extrapolation ([Equation 4.2](#eq-extra)) and interpolation ([Equation 4.1](#eq-interp)) techniques described in [Section 4.7.2](#sec-recalculation).

### 6.3.2 Percent of Waste Disposed to Solid Waste Disposal Sites (SWDS)

Waste disposed of in SWDS generates greenhouse gases such as methane (CH4), biogenic carbon dioxide (CO2), and non-methane volatile organic compounds (NMVOCs), as well as smaller amounts of nitrous oxide (N~2`O), nitrogen oxides (NOx), and carbon monoxide (CO). CH4 emissions from SWDS contribute approximately 3–4% of global anthropogenic GHG emissions (IPCC, 2001). Data on the percentage of waste disposed of in SWDS were available only for 2021 (Tanzania Mainland) and 2018 (Zanzibar), sourced from the National Environmental Master Plan for Strategic Interventions and the Solid Waste Management Strategy, respectively. Missing data for Tanzania Mainland (1950–2020) and Zanzibar (1950–2017 and 2019–2021) were addressed using Surrogate Method ([Equation 4.3](#eq-surro)) where population data were used as a surrogate to estimate the percentage of waste disposed of in SWDS for 1950–2020 (Tanzania Mainland) and 1950–2017 (Zanzibar). Data for 2019–2021 (Zanzibar) were estimated using extrapolation ([Equation 4.2](#eq-extra)) as guided in IPCC (2006) and Climate Change (IPCC) (2006).

### 6.3.3 Category-Specific Activity Data Inputs

For the Solid Waste Disposal category, activity data were based on the weight of wet waste collected in 2010, sourced from the United Republic of Tanzania. The emission factor value of 0.09% was used, as specified in the 2019 Refinement to the 2006 IPCC Guidelines (IPCC (2006)) Emission factors for specific waste types were also applied:

* **Food Waste**: An emission factor of 57% was used, sourced from the 2019 Refinement to the 2006 IPCC Guidelines, Volume 5, Chapter 2, Pages 2.28–2.33.
* **Paper and Cardboard**: An emission factor of 10.9% was applied, based on the same guidelines.
* **Wood Waste**: An emission factor of 2.4% was used.
* **Textile Waste**: An emission factor of 6.7% was applied.
* **Metal Waste**: An emission factor of 1.9% was used.

These emission factors were selected because they are IPCC default values specific to Tanzania, ensuring consistency and alignment with international reporting standards.

### 6.3.4 Category-Specific Activity Data Inputs

Category: Solid Waste Disposal data are based on weight of wet waste collected in 2010. The regional condition is from the United Republic of Tanzania, this value was chosen because it is IPCC default value specific for Tanzania. The emission factor value is 0.09 % with reference to 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 2, page 2.15-2.27. According to IPCC solid waste emission is categorized as follows:

* **Food waste:** The emission factor value of 57% was used which was sourced from the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 2, page 2.28-2.33. The value was chosen because it was the IPCC default value specific for Tanzania.
* **Paper and Cardboard:** The emission factor value used was 10.9% from the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 2, page 2.28-2.33. The value was chosen because it is IPPC default value specific for Tanzania.
* **Wood waste:** The emission factor value of 2.4% was used. The value was sourced from the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 2, page 2.28-2.33. The value was chosen because it is IPCC default value specific for Tanzania.
* **Textile waste:** The emission factor value of 6.7% was used as per the 2019 Refinement of the 2006 IPCC Guidelines for the National Greenhouse Gas Inventories, Volume 5, Chapter 2, page 2.28-2.33. The value was chosen because it is IPCC default value specific for Tanzania.
* **Metal:** The used emission factor value was 1.9% as outlined in the 2019 Refinement to the 2006 IPCC Guidelines for the National Greenhouse Gas Inventories, Volume 5, Chapter 2, page 2.28-2.33. The value was chosen because it is IPCC default value specific for Tanzania.

## 6.4 Quality assurance and quality control

The national greenhouse gas (GHG) inventory was compiled by a team of experts drawn from various government and non-governmental institutions in Tanzania. The team was composed of wide range of expertize in the taskforcewith extensive experience in waste management and GHG inventory development. The compilation process adhered strictly to the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines, ensuring compliance with internationally recognized methodologies and robust quality assurance and quality control (QA/QC) practices.

The data and information used to compile the inventory were sourced from a variety of reliable channels, public datasets that are found online, hard copies of reports, and expert judgments obtained through discussions with national experts. These diverse data sources were carefully reviewed and verified to ensure their accuracy, relevance, and applicability to the subject matter. To further enhance the reliability of the inventory, experts from various waste sectors applied the IPCC Good Practice Guidance, which provided a structured framework for reviewing, integrating, and harmonizing data from different sources in a consistent and accurate manner.

Data and information used to compile the National Inventory Report were accessed from various source including data from online datasets, data from hard copies of reports and expert judgement information from discussions with national experts. All data were verified and reviewed to ensure its accuracy and relevance for the subject matter.

## 6.5 Description of uncertainties

## 6.6 Time series consistency issues

## 6.7 Recalculations

## 6.8 improvements measures for the Waste Sector

The current greenhouse gas emission inventory for Tanzania’s waste sector faced significant challenges, primarily due to the unavailability of data across various sub sectors outlined in the IPCC software and inconsistencies in records for certain years. Addressing these issues is crucial for enhancing the accuracy and completeness of future inventories, ensuring Tanzania meets its reporting obligations under UNFCCC. Below are proposed measures to enhance the accuracy, reliability and completeness of the inventory.

### 6.8.1 Development of a Centralized Data Collection and Management System

A key barrier to accurate inventories is the fragmented nature of data collection across different institutions and local governments. Establishing a centralized data management system would streamline this process by consolidating information from various waste management entities. This system would serve as a repository for data on municipal solid waste, industrial waste and wastewater thus allowing for easier access, monitoring and updates. Proposed Approach:

1. To develop a national waste data management platform that aggregates inputs from municipal councils, private waste companies and industrial facilities.
2. To standardize data submission templates to ensure consistency across all reporting bodies.
3. To enable real-time data entry through digital platforms accessible by local authorities and operators.

### 6.8.2 Comprehensive National Waste Sector Baseline Studies

The absence of comprehensive baseline data hinders the ability to estimate emissions accurately. Conducting national baseline studies will help quantify waste generation rates, characterize waste streams and assess treatment and disposal practices across Tanzania. These studies will also provide insights into sector-specific emission factors. Proposed Approach:

1. To partner with academic institutions, research organizations and environmental agencies to conduct sector-wide baseline assessments.
2. To collect data from representative regions to ensure variability between urban, peri-urban and rural areas is reflected.
3. To focus on waste composition analysis, landfill operations and wastewater treatment facilities to develop localized emission factors.

### 6.8.3 Capacity Building and Technical Training

Enhancing the technical skills of personnel involved in waste data collection and GHG inventory preparation is essential for improving data quality. There is a need for targeted training on IPCC guidelines, data extrapolation methods and the use of inventory software. Proposed Approach:

1. To conduct national and regional training workshops on IPCC 2006 methodologies for waste sector emissions.
2. To provide practical training sessions on the use of IPCC inventory tools and emissions modelling software.
3. To establish a dedicated team within the National Environmental Management Council (NEMC) responsible for coordinating training programs and offering ongoing technical support.

### 6.8.4 Strengthening Institutional Coordination and Governance

Lack of clear institutional roles and responsibilities contributes to data gaps and inconsistencies. Strengthening the institutional framework by designating a lead agency to oversee data collection and inventory preparation will improve accountability and coordination. Proposed Approach:

1. To assign NEMC or a similar institution the responsibility for leading data collection, validation and inventory preparation.
2. To establish a national waste emissions task force involving representatives from local governments, ministries and private sector actors.
3. To develop inter-agency data-sharing agreements to facilitate information flow between institutions.

### 6.8.5 Leveraging Technology for Data Collection and Monitoring

Technological advancements offer innovative solutions to enhance data collection and emission monitoring. Remote sensing, geographic information systems (GIS) and mobile data collection platforms can bridge data gaps and ensure comprehensive coverage. Proposed Approach:

1. To utilize GIS to map landfill sites, track waste flows and monitor illegal dumping activities.
2. To use drone technology and satellite imagery to estimate the size and operational status of landfill sites.
3. To develop mobile applications for municipal and industrial operators to report waste generation, treatment and disposal activities.

### 6.8.6 Establishing a Review and Updating Framework

A regular review mechanism will ensure that the inventory process evolves in response to new data and emerging best practices. This will enhance transparency, accountability and the overall quality of the inventory. Proposed Approach:

1. To establish a timeline for reviewing and updating the waste sector inventory every one to two years.
2. To form an advisory committee comprising experts, stakeholders and policymakers to provide guidance on inventory improvements.
3. To publish inventory updates and progress reports thereby fostering greater public awareness and engagement in the GHG reporting process.

# 7. OTHERS

## 7.1 Overview

# 8. RECALCULATIONS

## 8.1 Overivew

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