**Exploratory Research Report**

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The report focuses on exploring potential avenues for development by defining the domain as a sustainable environment. The resource comes from data.gov.au, using the keyword "sustainable environment." After obtaining a variety of data, the topic of national greenhouse gas emissions was chosen, and then the specific target was moved on to organic waste. The data will include both qualitative and quantitative types. Furthermore, the plan aims to identify patterns, find gaps, and recognize constraints in the data. This report will present assumptions during the analysis of documents, interpret them, and outline potential directions.

Firstly, Greenhouse gas emissions and Local Government Waste Collection Services data from 2022 to 2023 (National Greenhouse Gas Inventory Quarterly Update: December 2021, 2022) have been chosen as quantitative data. Two types of data were researched in the report: qualitative and quantitative. According to the table in the data set, the greenhouse gas emissions data covers emissions by quarter from December 2010 to December 2021 and includes three variables: quarter, actual emissions, and seasonally adjusted and weather-normalized trends.

The variables "seasonally adjusted" and "weather normalized" will be analyzed since they remove the impact of weather. Analyzing greenhouse gas emissions every quarter helps identify seasonal changes, trends, and fluctuations. It prevents annual data from masking short-term anomalies and ensures that carbon markets and international emission reduction policies are more accurate and effective. Regarding the data, Greenhouse gas emissions have continuously declined significantly since 2008. The continuous reduction of greenhouse gases shows that the government has taken some measures to reduce greenhouse gas emissions. However, there are still a large number of sources of emissions, so it is necessary to find out which industries or sectors are still significant sources of emissions.

According to another table in the data set, Figure 16(*National Greenhouse Gas Inventory Quarterly Update: December 2021*, 2022), the waste emissions data recorded quarterly from December 2010 to December 2021 includes solid waste disposal on land, wastewater handling, waste incineration, and biological treatment of solid waste. It shows that solid waste disposal is an essential source of waste discharge. The emission has continued to release a large amount of greenhouse gases caused by the methane emissions from landfilling and the carbon dioxide from incinerators. Among the solid waste organic waste produces a large quantity of methane in landfills, and methane is 23 times more potent as a greenhouse gas than carbon dioxide. These emissions are mainly due to the decomposition of organic waste (Themelis & Ulloa, 2007). The amount of greenhouse gases emitted did not decrease significantly between 2010 and 2021. Further reductions in total greenhouse gas emissions can be achieved by addressing the source of solid waste disposal.

Even though Australia's greenhouse gas emissions have been declining since 2008, the decline in solid waste disposal on land and wastewater handling has not been significant. Therefore, more efforts should be made in waste disposal to help reduce greenhouse gas emissions.

According to the dataset above, the group has decided to find other datasets related to solid waste disposal. From the resource given, there are a variety of datasets, but most are quantitative data. The "Townsville City Council Food Organics Garden Organic" (*Townsville City Council Food Organics Garden Organics*, 2021-2023) was chosen as the second data. The data contains the significant variables: organic waste from households and the FOGO bins provided by the government. The information gives several metrics for the trial including the volume of Food Organics and Garden Organics collected, along with the presentation rate and contamination rate, but it is not enough to be a good dataset because the document does not give information on organic waste from every household.

Based on deficient qualitative data, the group decided to find more databases containing it. The members were looking for the specific data by applying the special words combined with the topic research. The words, are “surveys”, “reports” and “feedback”, are utilized. After the quantitative data was found, it is interpreted that this dataset contains both genres. The first is quantitative data including the area of the survey which has more than 3 suburbs. There are more specific areas and it can solve the bias. Furthermore, the household is divided into business and resident types. Also, the other bar charts display the resident's knowledge of news receiving and the behavior of the residents about the collecting of waste with the GO bin and other types of waste.

In addition to this document, there are qualitative data which is offered in "the public consultation report". It represents the opinion of residents. The collection came from digital feedback which is about the resident's needs regarding a potential Food Organics Garden Organics service (*Food Organics Garden Organics Community Consultation*, 2021-2022).

When it comes to the constraints of two datasets. The metadata of the first dataset does not show greenhouse gas emissions data after 2022, which makes it impossible to understand the latest trends after policy adjustments or the impact of the epidemic since 2022. This may lead to the lack of accurate reflection of the current situation in the analysis. Based on the second data, the selection of the sample group can be identified as a potential bias because the GO bins were only utilized in one area (in the Heatley or Vincent). From the limitation above, the data set cannot be sufficient details to answer the development of the future prototype. The current data should be improved the certain factors being overlooked.

There are assumptions related to the concept of FOGO bin which comes from the data set. For example, using FOGO bins helps reduce the amount of organic waste transferred to landfills compared to residents who have only GO bins. The second assumption is that FOGO bin use will decrease the contaminated waste. The last is, the amount of organic material will decrease in landfills. This means the data set helps to achieve environmental goals such as landfill waste decreasing, lowering contamination levels, and sustainable waste practices because it is the gathered insights.

Four key goals define the success of this project: uncovering valuable insights, ensuring data fairness, proposing actionable solutions, and improving accessibility. Our main focus is on understanding how the analyzed data can truly benefit people, rather than just serving as academic research. First, the project needs to transform environmental data into useful insights that impactpeople's daily lives. Data from environmental reports, policy documents, and scientific studies are good sources. By analyzing these data on air pollution, water quality, and greenhouse gas emissions, we can provide individuals with information to make effective. For example, tracking pollution levels over time can help communities take preventive measures, such as limiting outdoor activities on high-smog days. Second, the project aims to identify and address data gaps and biases to ensure fair and comprehensive analysis. Environmental data is often unevenly distributed. Urban areas tend to have more monitoring stations, while remote or developing regions may lack sufficient data, leading to biased conclusions. To address this, we need to collect additional data through reports, and research institutions. Once data gaps and biases are identified, the next goal is to find ways to address these limitations and propose directions for further research. This involves formulating key questions that can guide future studies and improve data quality. For example, if certain pollutants are increasing in specific regions, future research should focus on identifying their sources and solutions. The final goal of the project is to translate research findings into practical recommendations. Identifying problems is not enough. Solutions should be proposed to address these issues effectively. For example, to develop more user-friendly tools and help make environmental data more accessible to the general public.

In conclusion, due to the aforementioned data above, the member group can get benefit from the detailpresented in thedataby finding out the main problem of greenhouse emissions. Then, formulating simple guidelines that can easily be implemented by the community in the future. Since people consume food every day, the data help track and reduce household organic waste by applying more FOGO bins for every resident. Based on the data, providing advocacy to residents more convincible to achieve the main object: reducing greenhouse gas emission.

Reference:

*Themelis, N. J., & Ulloa, P. A. (2007). Methane generation in landfills. Renewable Energy, 32(7), 1243–1257.*

https://doi.org/10.1016/j.renene.2006.04.020

*National Greenhouse Gas Inventory Quarterly Update: December 2021* ((2022)[Quantitative/Qualitative]. <https://www.dcceew.gov.au/climate-change/publications/national-greenhouse-gas-inventory-quarterly-update-december-2021>

*Food Organics Garden Organics Community Consultation* ((2021-2022). [Qualitative]. <https://haveyoursay.townsville.qld.gov.au/fogo1>

*Townsville City Council Food Organics Garden Organics* ((2021-2023). [Quantitative]. <https://data.gov.au/dataset/ds-dga-419a719e-34c3-4264-816b-de98d4e9dc19/distribution/dist-dga-22a84d7d-b3c5-4d04-8bb7-0bbceaefc53a/details?q=food%20waste>

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