**Written analysis for the City of Toronto Budget and Demographic analysis**

**Demographic Impact of Budget Allocation Analysis**

Based on the the 2022 Capital budget plan by Ward data from open Toronto and the Statistics Canada 2021 Census Profile by wards from Statistics Canada, the following analysis were made:

**Population Density per Square Kilometer vs Budget Allocation Analysis**A screen shot of a graph

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* Positive slope with coefficient 2.18 implies for every unit increase in population density, the budget allocation is expected to increase by 2.18 on average.
* Correlation coefficient (r-value) of 0.40585 indicates a weak to moderate positive correlation between the population density and budget allocation.

The relationship between Population Density per Square Kilometer and the Budget Allocation is positive, but not strong, meaning other factors may also influence the budget allocation.

**2020 Income vs Budget allocation analysis**

A graph of income and budget

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Median income regression:

* For every unit increase in median income, budget allocation increases by 0.92 units
* Correlationship coefficient (r-value) of 0.321799 indicates a relatively weak positive correlation

Average income regression:

* For every unit increase in median income, budget allocation increases by 0.12 units
* Correlationship coefficient (r-value) of 0.12275 indicates a very weak positive correlation

The weak correlations suggest that although there is a positive relationship between the income levels and budget allocation, it is not significant in determining the budget allocations, and there may be other factors that could impact the budget.

**Minority share of Each Ward vs Budget Allocation Analysis:**

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* More wards that the lower end of the budget allocation with highest percent minority share as not being a not a visible minority (South Asian, Chinese, Black). However, the percentage is low.
* Indications of wards where “Not a visible minority” has significant % of shares at the lower end of the budget allocation.

The analysis highlights the complexity of budget allocation and suggests that there are many factors other than the visible minority status that determines budget allocation in Toronto’s wards.

**City of Toronto Budget Analysis – Trends**

**Trends - Revenue per Category**

Analysis of the trends of the revenue for each Category of income/outcome throughout the past 5 years:

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From the data above it is possible to notice that not all categories suffer considerable variation of Revenue for the city within the past 5 years.

The abrupt decrease in "Sundry and other Revenues" and the increase on "Other Revenue" between the years of 2020 and 2021 are caused by the change of the category name from one period to another.

A more precise analysis follows.

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By removing the "Other Revenue" category (initially called "Sundry and Other Revenues"), the only category that exceeds the range of 5 billion Dollars, it is possible to analyze the other sources of revenue with more precision.

Provincial Subsidies, the second greater contributor of the city's revenue, suffered a considerable increase from 2020 to 2021, dropping slightly afterwards. Opposite behavior to User fees and donations.

Within the group with the lowest impact on the overall revenue, Federal Subsidies can be highlighted by its increase from 280 million Dollars to 915 million.

**Trends - Revenue per Category**

Analysis of the trends of the expenses for each Category of income/outcome throughout the past 5 years:

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In terms of expenses, the categories tend to be more dynamic. "Salaries and Benefits" suffered a slight decrease from 2019 and 2020, returning to gradual growth between 2020 and 2023 (In 2020 this category was split into Salaries and Benefits separately).

The Categories "Other Expenditures" and "Service and Rent", two categories contributing between 2 and 3 billion per year approximately, show a positive curve in the last period, "Service and Rent" being the most accentuated one.

"Contribution to Reserves/Reserve Funds" suffered an apparent decrease between 2021 and 2022, same period where "Inter-Divisional Charges" increased after a two-year low, coming back to the range of 300 million observed in 2019.

Equipment expenses stand stable throughout the 5-year period.

**Trends – Results per City Program**

Analysis of the trends of the result of each program implemented by the city throughout the past 5 years. Categories classify the ins and outs of the different programs developed by the City of Toronto. The following analysis takes a further step into identifying the contribution of the main programs by their profit and loss.:

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The Non-Program Taxation Tax Levy results show a constant increase from 2019 to 2023. The Non-Program Revenues (Municipal Land Transfer Tax, Provincial Grants & Subsidies, Investment Income, Fines, Hotel and Lodging Tax and others) show, on the other hand, a certain decrease in profitability from 2021 to 2023.

Court Services (program with a slight increase on results from 2022 to 2023) and Toronto Building stand stable with a lower participation in the city's results.

The programs that present the lower profitability for the city also show a higher variation in their results for along the past 5 years. Toronto Transit Commission, for example decreased its results from 2020 to 2021 to a point where it became the least profitable program overall, being close to Toronto Police services with almost 1.2 billion dollars cost over profit in 2023. From a far point of view, all seven programs show a decreasing behavior since 2019.

**Trends - City Revenue Moving Average**

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By using the moving average forecasting method with 3 periods, the analysis above shows the trend in the city's revenue for the next year. The moving average shows a slight augmentation of the average delta, which could indicate a revenue approaching the range of 1.7 billion Dollars.

**City of Toronto Operating Budget: Category and Sub-Category Date Analysis:**

\*Variable Nomenclature

\_exp: stands for all values related to expense.

\_rev: stands for all values related to revenue.

\*Analysing data for 5 years (2014-2023)

\*All the values here in analysis codes are in Millions (10^6) CAD

\*Some special functions used:

* lambda: Used lambda in function, to take a value and if numeric, then return the value divided by 1 million rounded to two decimal places, else return original value as string.
* globals() :multiple time usage, here in code because we are dealing with variables with similar structures but for different time periods.
* corr() : used in seaborn heatmap to draw a co-relation matrix between different categories

**Expense Analysis:**

1. Expenses are majorly divided into eight main categories:

Category with highest budget in last 5 year: “Salaries and Benefits”

(with contribution % share each year: 2019: 44%, 2020: 45%, 2021: 44%, 2022: 46%, 2023: 45%)

Category with lowest budget in last 5 year: “Equipment”

(with contribution % share each year: 2019: 0.46%, 2020: 0.46%, 2021: 0.44%, 2022: 0.49%, 2023: 0.49%)

1. Total budget year wise: there is an increase in trend with two bumps: in year 2021 and 2023.

Following is the total expense in millions along with % change each year.

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1. Analysis of Time series data of expense amount over the years for different categories

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Major Interpretation:

* Salary and benefits: Increasing over the years.
* Service And Rent: Increasing over the years.
* Contribution To Reserves/Reserve Funds: Significantly decreasing after 2021.

The sharp decline after 2021 may reflect a strategic financial decision in response to the uncertainties brought about by the pandemic. Organizations might have redirected funds or altered financial plans to address immediate challenges or to adapt to the changing economic landscape during the pandemic.

1. Seaborn Heatmaps:

* Relation of Expense Amount Across Years with Different Categories
  + Positive relation over the years: Salary and Benefits, Equipment, Services and Rent. As the years progress, there is a positive correlation, indicating an increase in expense amounts for these categories. The heatmap visually demonstrates that the values tend to rise over time.
  + Contribution To Reserves/Reserve Funds: A noticeable drop is observed in the Contribution to Reserves/Reserve Funds category, especially highlighted by the shades becoming darker in the heatmap for the year 2021. This suggests a significant decrease in the allocated funds for reserves during that specific year, possibly reflecting adjustments made in response to specific financial considerations or external factors.

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* Co-relation Analysis of Budget Categories

A red and blue squares with white text

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* As very clearly presented Contribution to Reserve/Reserve Funds, has a negative co-relation with almost all other categories, when the expense amounts in the Contribution to Reserve/Reserve Funds category increase, the expenses in all, other categories tend to decrease, and vice versa.

1. Salary Trend and regression for a decade (a glimpse of one most important contributor in operating expense)

Round R-squared value is 0.97: suggest a very strong model fit with

Linear Regression: 189.24x + -376107.61, suggesting a very strong explanation power.

A graph with blue dots and numbers

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1. Analysing Subcategories:

* Salaries and Benefits emerge as the foremost contributor to expenses. Notably, within Salaries and Benefits, the Permanent Salary subcategory stands out as the highest expense.
* A subcategory labeled "Gapping" exhibits a negative value in the summary. The negative value signals the presence of unaccounted expenses. These unidentified costs are likely incorporated as an adjustment to rectify the total operating budget. This underscores the necessity for a more in-depth study to categorize and understand these expenses, as they do not align with any specific category.

**Revenue Analysis:**

1. Revenue is majorly divided into nine main categories:

Category with highest budget in last 5 year: “Sundry and Other Revenues”

(with contribution % share each year: 2019: 54%, 2020: 56%, 2021: 54%, 2022: 53%, 2023: 51%)

Category with lowest budget in last 5 year: “Licences & Permits Revenue” and “Transfers from Capital.”

(With contribution % share each year:

Licences & Permits Revenue: 2019: 1%, 2020: 1%,

Transfers From Capital :2021: 1.3%, 2022: 1.3%, 2023: 1.4%)

\*\*Since year 2021,2022,2023 has Lic and Permit value: not present

1. Total revenue year wise: there is a continuous increase in trend.

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1. Analysis of Time series data of revenue amount over the years for different categories

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* Sundry and Other Revenues: there is an increase in trend over years.
* Provincial Subsidies: there are two significant fluctuations in year 2021 and 2022.
* User Fees and Donation: there is a drop in 2020.
* Federal Subsidies: there is significant increase in year 2023.

1. Seaborn Heatmaps:

* Relation of Revenue Amount Across Years with Different Categories
  + Positive relation over the years: Sundry and Other Revenues, Federal Subsidies. As the years progress, there is a positive correlation, indicating an increase in revenue amounts for these categories. The heatmap visually demonstrates that the values tend to rise over time.
  + Provincial Subsidies: it is one of the major contributors of revenue in year 2021 and 2022.
* A chart with numbers and text

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* Co-relation Analysis of Budget Categories
* A screen shot of a graph

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* As very clearly represented in heatmap- darker the blue shade, more is negative co-relation with the budget categories. More the red shades, higher is positive co-relation.
* Example- Provincial subsidies has negative co-relation with Transfer from Capital meaning if one increase and other will decrease.

1. Analysing Subcategories:

* Maximum Revenue generating subcategory: “Donations” (from Category User Fees and Donations.
* Minimum Revenue generating subcategory: “Taxation” (from Category Other Revenues)

1. Gapping: Unaccountable budget, this can be counted as data limitation as there is one sub-category:” Gapping” which looks like the unaccountable budget here compensated here, with no future details: below is final breakdown for gapping budget.

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**Total Gain or Loss for Five year**:

Year 2022 and 2023 is profitable comparison to previous below data.

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STANDARD DEVIATION:

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Description automatically generatedBased on the provided financial data for the years 2019 to 2023, here is a detailed analysis of the financial health:

**Expenses Analysis**

1. Trend in Average Expenses:

The mean expenses have generally increased from 2019 to 2023, with a slight dip in 2022. This trend could indicate overall growth in operational or project costs over time.

1. Expense Variability:

The standard deviation is quite high for each year, suggesting significant variability in expenses. This could be due to large, one-off expenditures or inconsistent spending patterns across different categories.

1. Typical Expense Amount:

The median values are considerably lower than the mean values, indicating that most of the yearly expenses are relatively small, but there are some very high expenses that are increasing the mean.

**Revenues Analysis**

1. Trend in Average Revenues:

The mean revenues are increasingly negative from 2019 to 2023, indicating growing revenue generation over the years. Note that revenues are represented as negative values, so more negative means higher revenue.

1. Revenue Variability:

Like expenses, the standard deviation for revenues is also high, indicating significant variability in revenue amounts. This suggests a few very large revenue sources significantly impact the total revenue.

1. Typical Revenue Amount:

The median values, while also negative, show less negative figures compared to the mean, suggesting that while there are some exceptionally high revenue sources, most revenue streams are smaller in magnitude.

**Overall Financial Health Assessment**

1. Growth in Operations:

The increasing trend in both expenses and revenues suggests that the entity is expanding its operations, investments, or initiatives.

1. Risk Assessment:

The high standard deviation in both expenses and revenues suggests a risk due to reliance on a few large transactions or projects. Diversifying revenue sources and managing large expenses could be crucial.

1. Revenue Growth vs Expense Growth:

The rate of increase in revenues appears to be outpacing the rate of increase in expenses, which is a positive sign for financial health. However, the dependency on large transactions (as suggested by the standard deviations) could pose a risk.

1. Financial Stability:
   * The fact that revenues are growing faster than expenses is generally a good indicator of financial stability and potential surplus. However, it’s important to manage the variability and ensure that this trend is sustainable.
2. Recommendations:
   * The entity should investigate the large expenses and revenues to understand their nature and sustainability.
   * Diversifying revenue streams and controlling large expenditures could be beneficial.
   * Continual monitoring of financial trends and variability is recommended to ensure long-term financial stability.

**Expenses Analysis:**

* A graph of a bar chart

  Description automatically generated with medium confidenceThe category with the consistently highest expenses across all years is "Salaries And Benefits." This suggests a significant portion of the budget is allocated to personnel costs, which is typical for many organizations where human resources are a major investment.
* The second-largest category of expenses appears to be "Service And Rent," which may include costs associated with renting facilities, maintenance services, and other service contracts.
* Categories like "Contribution To Capital" and "Inter-Divisional Charges" have relatively lower expenses, indicating these are not the primary expenditure areas.
* Some categories, such as "Materials & Supplies" and "Other Expenditures," show variability across the years. This could be due to changes in procurement strategies, price fluctuations, or shifts in operational needs.

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**Revenues Analysis:**

* The largest revenue source by far is "User Fees & Permit Revenues," which suggests that a significant portion of the revenue is generated from services provided to the public or businesses.
* "Licenses & Permits Revenue" and "Provincial Subsidies" are also notable contributors to the revenue, although to a lesser extent compared to user fees. This indicates a reliance on regulated activities and external funding sources.
* The category "Salaries And Benefits" appears under revenues, which is unusual. This could be due to reimbursements or cost recoveries associated with staff seconded to other programs or entities.
* The categories "Transfer From Capital," "Other Revenues," and "Subsidy and Other Revenues" show negative values, which may indicate returns of funds, adjustments, or accounting corrections.

**Overall Financial Health Assessment:**

* The consistency of the "Salaries And Benefits" category as the leading expense underscores the investment in the workforce but also points to the importance of managing labor costs effectively.
* The significant and consistent revenue from "User Fees & Permit Revenues" could reflect a strong demand for the organization's services, which is a positive indicator for financial sustainability.
* The presence of various revenue sources, including provincial subsidies and permit revenues, suggests a diversified revenue stream, which is beneficial for financial stability.
* Year-to-year fluctuations in certain categories require further investigation to understand the underlying causes and to determine whether they represent financial risks or opportunities.

Overall, these graphs provide a high-level view of the financial situation, showing where resources are being allocated and where income is being generated. For a more detailed analysis, further breakdown of these categories and an understanding of the specific factors influencing these numbers would be essential. Additionally, understanding the context of the data, such as any significant events or policy changes in these years, would be crucial to a full financial analysis.

Analysis: Aggregate Program Expenditure

1. The primary expenditure across all programs was attributed to the Toronto Transit Commission - Conventional, reflecting a considerable dedication to the preservation and improvement of conventional transit services within the city. Following closely, the second-largest expense for each program was associated with Toronto Water in 2019, 2020, and 2021, while the Toronto Police Service claimed this position for 2022 and 2023. Notably, the Toronto Police Service also ranked as the third-highest expenditure in 2019, 2020, and 2021, indicating a substantial commitment to enhancing the overall quality of life. Conversely, the Integrity Commissioner's Office consistently maintained the lowest expenditure across all five years, highlighting a consistent fiscal approach and strategic budgeting.

Analysis - Outliers

1. In the examination of Toronto's budget, we've answered the question of visually understanding and identifying outliers by employing box plots for both revenue and expenses. For revenue, categories like 'Other Revenue,' which includes components such as 'Inter-Divisional Recoveries,' 'Miscellaneous Revenues,' 'Interest & Investment Income,' 'Other Subsidies,' 'Fines & Penalty,' 'Taxation,' and 'Payment In Lieu Of Tax,' exhibit distinctive box plots. These visualizations provide a snapshot of any unusual changes in income. On the expense side, 'Other Expenditures,' which encompasses 'Contributions And Transfers,' and  'Miscellaneous Expenditures,'' showcases significant outliers through their respective box plots. These box plots serve as visual guides, offering a clear and immediate understanding of any anomalies within each category, making the process of identifying and interpreting outliers more accessible and actionable for effective financial decision-making.