

## Methodology: Data Extrapolation for Cities without Data

Certain Urban Local Governments (ULGs) had incomplete data records for some fiscal years, which posed challenges in conducting a comprehensive analysis. To address this, a systematic extrapolation methodology was applied to estimate missing values and ensure a complete and consistent dataset for all years under analysis. For cities where direct expenditure data was not available, figures were extrapolated using the average expenditure per capita of the population category to which the city belongs.

### Illustrative Example:

In the one million to four million (1M - 4M) population category, there are 36 cities in total. For the financial year 2020-21, expenditure data was available for 31 cities, while 5 cities had no reported data. To ensure full coverage, extrapolation was performed as follows:

#### Step 1 - Base Data

*Total Expenditure = Revenue Expenditure + Capital Expenditure.*

*Revenue Expenditure = Total Establishment Expenses + Administrative Expenses + Operations & Management Expenses + Interest & Finance Charges + Revenue Grants, Contributions & Subsidies + Programme Expenses + Miscellaneous Expenses*

*Capital Expenditure = (Gross Block + Capital Work in Progress) of Current Year - (Gross Block + Capital Work in Progress) of Previous Year*

We used the existing expenditure data of the 31 cities in the 1M - 4M category. These 31 cities have:

- Combined population: 5 crores (5,00,00,000)
- Total Revenue Expenditure: ₹52,500 crores
- Total Capital Expenditure: ₹17,500 crores
- Total Expenditure = ₹52,500 + ₹17,500 = ₹70,000 crores

#### Step 2 - Per Capita Calculation

Total expenditure per capita = Total revenue expenditure per capita + Total capital expenditure per capita.

- Per Capita Revenue Expenditure: ₹52,500 crores ÷ 5 crores = ₹10,500 per person
- Per Capita Capital Expenditure: ₹17,500 crores ÷ 5 crores = ₹3,500 per person
- So the total per capita expenditure would be ₹10,500 + ₹3,500 = ₹14,000 per person

#### Step 3 - Extrapolation

For each of the 5 cities without data, total expenditure was estimated by:-

Total Expenditure = Total Revenue Expenditure + Total Capital Expenditure.

Total revenue expenditure = Total revenue expenditure per capita (calculated in step 2) \* combined population of these 5 cities.

Total capital expenditure = Total capital expenditure per capita (calculated in step 2) \* combined population of these 5 cities.

The 5 missing cities have:

- Combined population: 1 crore
- Estimated Revenue Expenditure = ₹10,500 × 1 crore = ₹10,500 crores
- Estimated Capital Expenditure = ₹3,500 × 1 crore = ₹3,500 crores
- Estimated Total Expenditure = ₹10,500 + ₹3,500 = ₹14,000 crores

This total expenditure for 5 cities with missing data is then added to the total expenditure of 31 cities with available data, giving us the total expenditure for the population category 1M - 4M.

Total Expenditure for all 36 cities = ₹70,000 crores (31 cities) + ₹14,000 crores (5 cities) = ₹84,000 crores.

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