

Project Development Phase Model Performance Test

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| Date | 10 February 2025 |
| Team ID | LTVIP2025TMID60817 |
| Project Name | Sustainable smart city assistant using IBM granite LLM |
| Maximum Marks | |

Model Performance Testing:

Performance Testing Template: Sustainable Smart City Assistant (IBM Granite LLM)

| S.No. | Parameter | Screenshot / Values |
|-------|--------------------------------|---|
| 1 | Data Rendered | e.g., live sensor feeds (traffic, air quality, energy usage) displayed on a map or table. Screenshot of raw data input in the assistant. |
| 2 | Data Preprocessing | Describe transformations: e.g., imputation of missing values, timestamp alignment, coordinate normalization. Include screenshot of code or processed preview. |
| 3 | Utilization of Filters | e.g., user-selectable filters by district, time window, pollutant thresholds. Screenshot showing filter UI and filtered metrics. |
| 4 | Calculation Fields Used | e.g., DAX or LLM-generated formulas: <ul style="list-style-type: none"> • AvgEnergyPerCapita = TotalEnergy / Population • EmissionsIndex = WeightedSum(PM2.5, NO2) Screenshot of formula editor or code. |
| 5 | Dashboard Design | No. of Visualizations / Graphs: ____ e.g., 6 visuals: energy trends line chart, AQI map, resource usage gauge, KPIs, alert table, RAG-generated commentary. |
| 6 | Story Design | No. of Visualizations / Graphs: ____ |

| S.No. | Parameter | Screenshot / Values |
|-------|-----------|--|
| | | e.g., 4 visuals: monthly sustainability summary, policy impact analysis, citizen request flow diagram, future outlook narrative. |

Integrating IBM Granite LLM for Smart City Use Cases

1. Data & Preprocessing

- The assistant ingests urban IoT, GIS, and environmental datasets.
- Preprocessing pipelines include normalization, coordinate mapping, and error handling, feeding both visualization and retrieval modules (Granite RAG and vision).
- IBM Granite’s geospatial/time-series models enhance data reliability and contextual consistency
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2. Filtering

- Filters (by region, sensor type, thresholds) dynamically adjust dashboard visuals and RAG responses.
- Granite LLM uses filter-meta context to tailor explanations or alerts based on the filtered subset.

3. Calculation Fields

- Use DAX (e.g., in Power BI) or LLM-generated formula logic to calculate metrics such as “EnergyPerCapita” or “AQI weighted average.”
- Use time-series Granite models for forecasting trends (e.g., next-day energy demand or pollutant peaks) .

4. Dashboard & Story Design

- Dashboards combine data visuals with Granite-generated commentary, explaining patterns or anomalies. Visuals may include maps, charts, KPIs, and alert widgets.
- Story or report pages synthesize key insights—like monthly summaries—combining charts and narrative supported by RAG-enhanced LLM responses.

Example Entry

| S.No. | Parameter | Values |
|-------|-------------------------|--|
| 1 | Data Rendered | Live traffic, energy, and AQI feeds from IoT sensors. |
| 2 | Data Preprocessing | Imputed missing timestamps, converted coordinates to GeoJSON. |
| 3 | Utilization of Filters | Filters by zone and AQI levels (>100). |
| 4 | Calculation Fields Used | - AvgEnergyPerCapita = SUM(Energy)/SUM(Population) - EmissionScore, a weighted average of PM2.5 & NO ₂ |

| S.No. | Parameter | Values |
|-------|------------------|--|
| 5 | Dashboard Design | 6 visuals: line, bar, map, gauge, table, KPI card with commentary. |
| 6 | Story Design | 4 visuals: monthly summary, emissions trend, policy impact, forecast. |
