Population and Per Capita Income Estimation

A living, India-wide economic view from state to pincode level

See where people live, where local economies are moving and how income differs below the district level. Historical and official data provide the anchor; built-up area, school enrollment, GDP, bank-credit growth and VIIRS nightlight keep the local picture current.

The method in one view

Model Stage	Population	Income
Baseline	Census history + official state projections	Prosperity Index 2011 + district per capita income
Recent correction	Built-up area + school enrollment + household-size change	District GDP + urban/rural split + 3-year bank-credit growth
Fine allocation	Town / village / ward population, normalized upward	VIIRS for wards only when validated; all estimates normalized

Key principle

History gives the anchor; current local signals move the estimate. The model does not blindly extend old census or GDP trends, and every micro estimate is reconciled back to district and state totals.

1. Why this method is needed

- India has had no new full population census after 2011, while local markets have continued to change.
- National population growth is slowing, but migration can push job centres such as Bengaluru, Pune and Gurugram far above their old historical path.
- Built-up area, school enrollment and household-size change provide current signals that a census-only extrapolation cannot see.

2. Population estimation model

- **Inputs:** Census 1951-2011, official state projections 2012-2036, 30 m satellite built-up area since 1991, and school enrollment since 2012.
- **States:** official projected population provides the top-level control total.
- **Districts:** a logistic curve gives the census baseline. A second estimate comes from the school-enrollment trajectory. The two are blended and normalized to the state total.
- **Towns and villages:** the census path is re-anchored using built-up growth and changing household size. A 2021 population estimate derived from newer signals is added before refitting the curve.
- **Wards:** historical ward population and built-up imagery distribute population inside cities while preserving city and district totals.
- **Pincodes:** town, village and ward estimates are summarized to pincode level.

Why newer signals matter: Bengaluru

Bengaluru shows why the model does not rely on census extrapolation alone. The census-only curve fits 1951-2011 well, but adding a 2021 population estimate derived from built-up area and school enrollment materially shifts the trajectory toward the city's post-2011 reality.

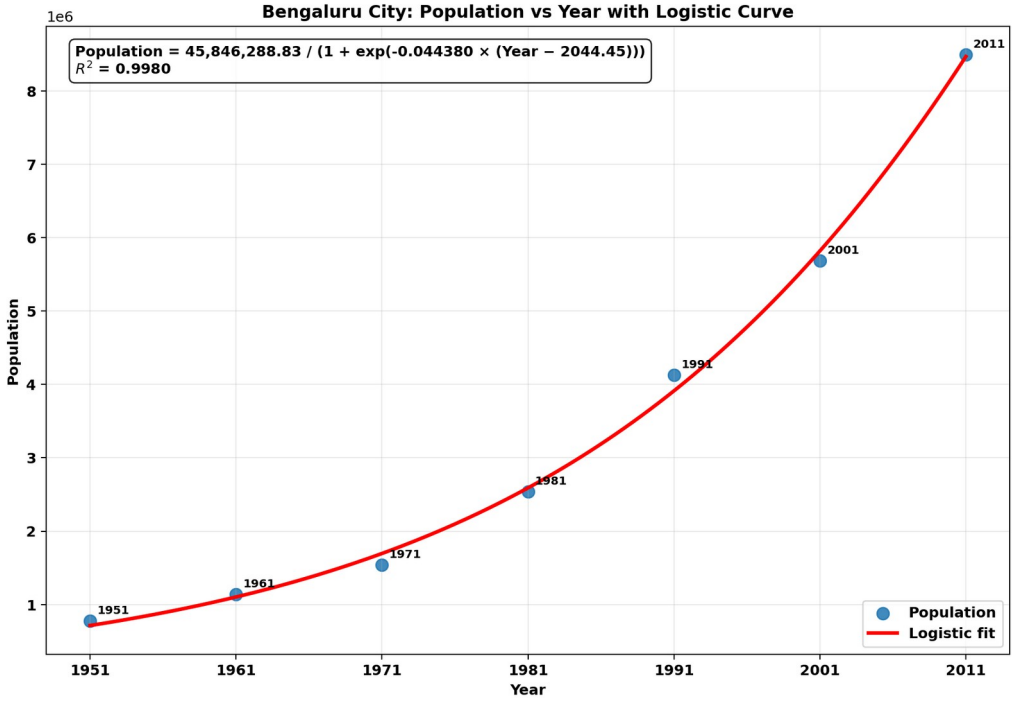

Figure 1. Census-only Bengaluru (1951-2011). The fit is strong, but the curve sees only historical census growth and pushes the long-run asymptote to about 45.8 million.

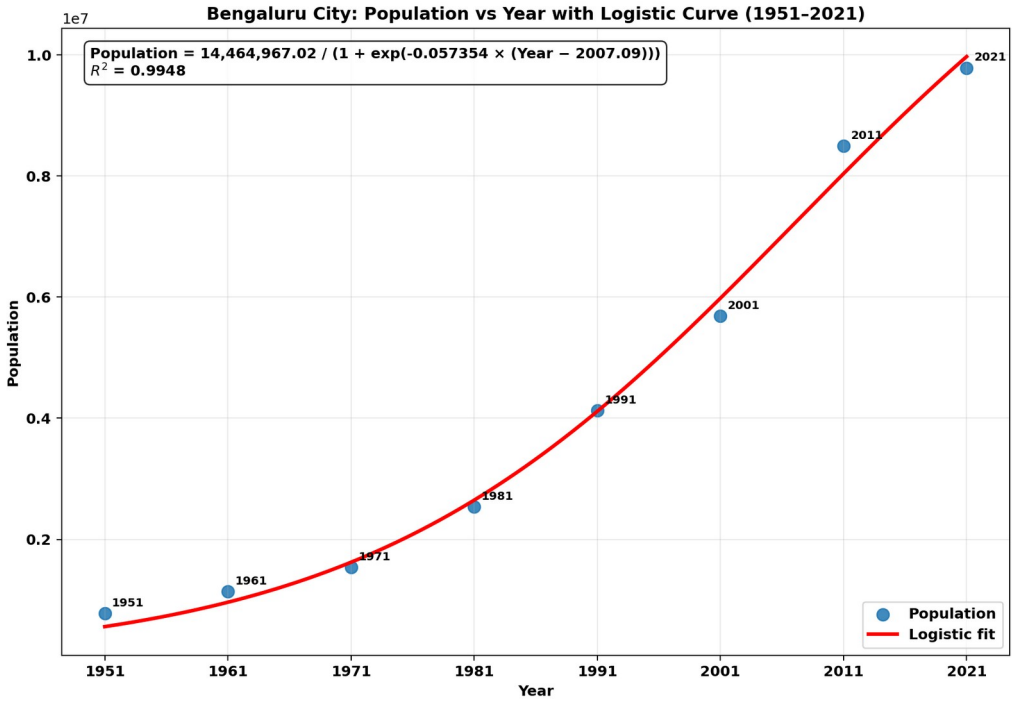

Figure 2. Bengaluru re-anchored with a 2021 population estimate derived from built-up area and school enrollment. The trajectory changes materially and becomes far more responsive to post-2011 reality.

Why this is a better way to estimate population

A high R^2 does not make a census-only curve a good forecast. The production model uses census history as the starting point, then re-anchors the trajectory with newer evidence. This lets it capture inflection, stagnation and acceleration instead of blindly extending history.

3. Per capita income estimation: from 2011 anchor to 2030

- **Inputs:** India GDP, state GDP, district GDP, Prosperity Index 2011, district/town bank-credit time series and VIIRS nightlight imagery.
- **2011 anchor:** Prosperity Index closely mimics per capita income and is available at state, district, town, village and ward level. It creates the micro-level income baseline for 2011.
- The 2011 distribution is not frozen. Each district follows its own GDP path; growth inside the district is then differentiated using urbanization, last-three-year bank-credit growth and - where reliable - VIIRS nightlight.
- District GDP is compiled directly from state Budget / Economic Survey sources. The latest observed series is extended only to 2030, keeping the projection horizon short.
- **Base GDP trajectory:** blend the fixed-growth curve fitted from 2012 to the latest year with a second fit based on the latest 2-3 years. This keeps the path anchored to history while responding to recent momentum.

What the GDP projection means

The 2026-2030 series is a short-horizon base trajectory. Long-run history keeps the model stable; the latest 2-3 years keep it responsive. One-off shocks are not allowed to dominate the path.

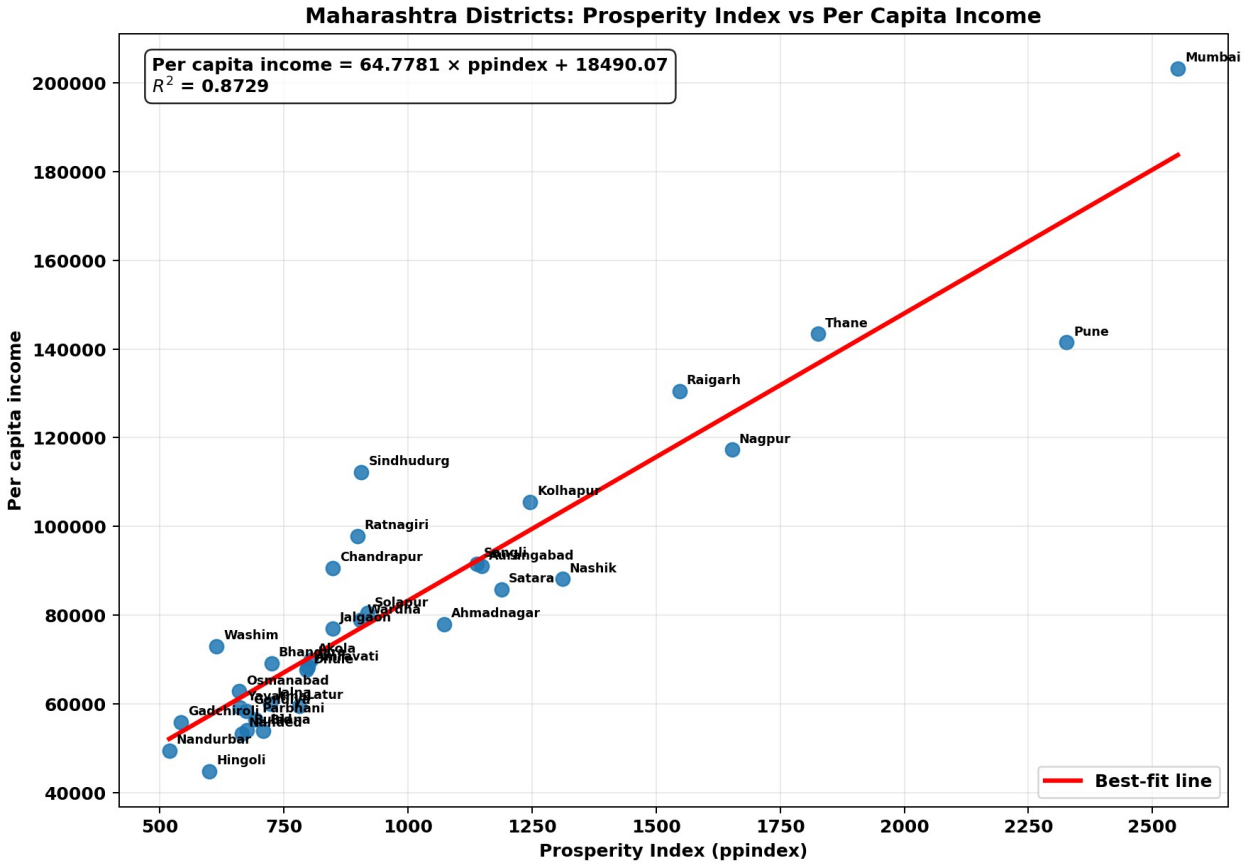

Figure 3. Prosperity Index has a strong linear relationship with per capita income across Maharashtra districts, supporting its use as the 2011 micro-level anchor.

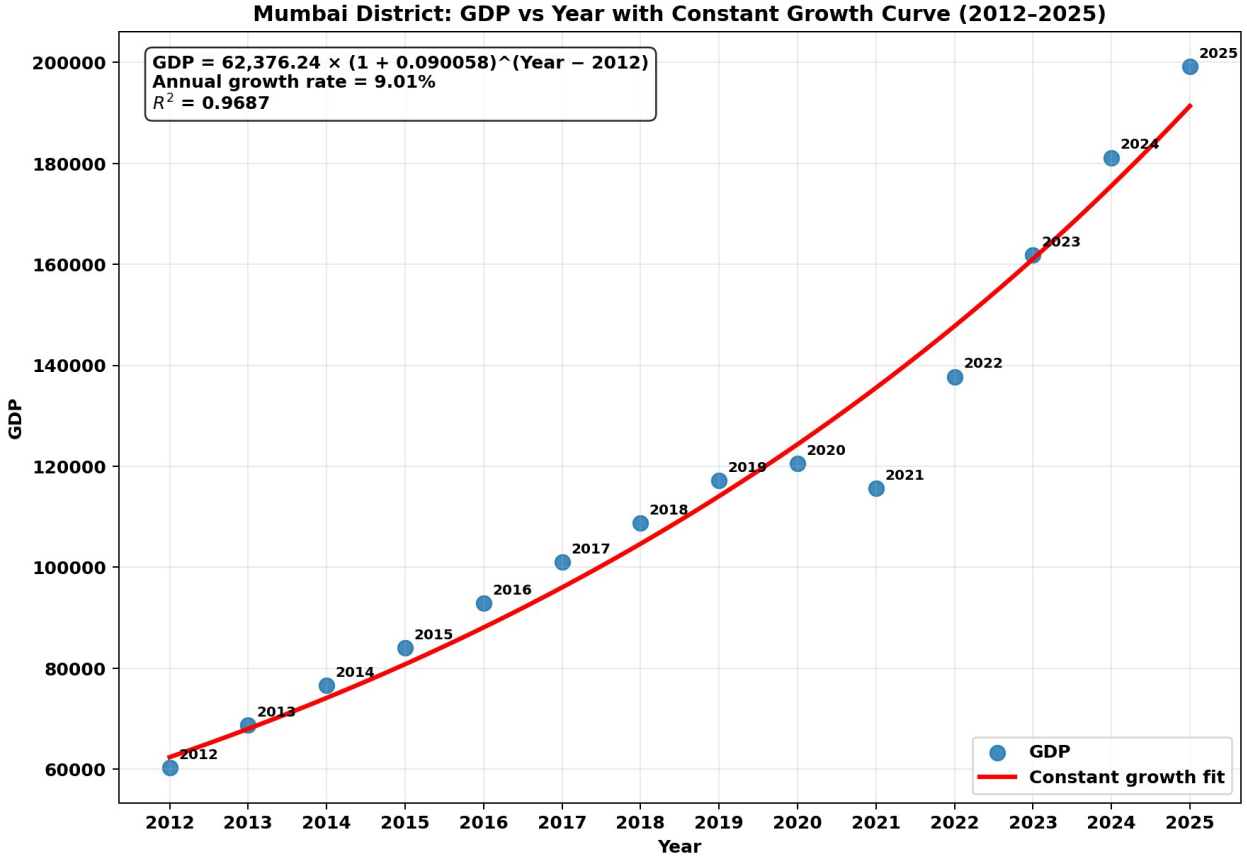

Figure 4. Mumbai district GDP and the fitted long-run growth path. The production model uses this together with a recent-growth fit for the short projection to 2030.

4. Turning district growth into local growth

- **Urban-rural split:** for each state and each year, district urbanization is plotted against district GDP growth. The intercept gives rural growth; the slope gives urban growth minus rural growth.
- **Towns:** the urban-minus-rural growth component is apportioned using each town's bank-credit growth over the last three years. Credit growth is used - not the level of credit.
- **Villages:** the rural growth rate is applied consistently across villages within the district framework.
- **Wards:** population comes from ward history and built-up area; income is differentiated with VIIRS only when the town GDP-versus-VIIRS relationship is strong enough.

Why bank-credit growth - not bank credit

Credit levels can be distorted by branch size or head-office bookings. We use the last three years of bank-credit growth only as a relative signal to apportion the urban-minus-rural growth component, and then normalize back to district totals.

5. VIIRS earns its role - it is not forced into the model

- VIIRS can be affected by saturation, highways / industrial lighting and atmospheric pollution.
- Ward-level income allocation therefore uses VIIRS only when town GDP and VIIRS track each other well across years (R^2 above 0.85 in the current rule).
- Where the relationship is weak, VIIRS is not used to force a ward-level income split.

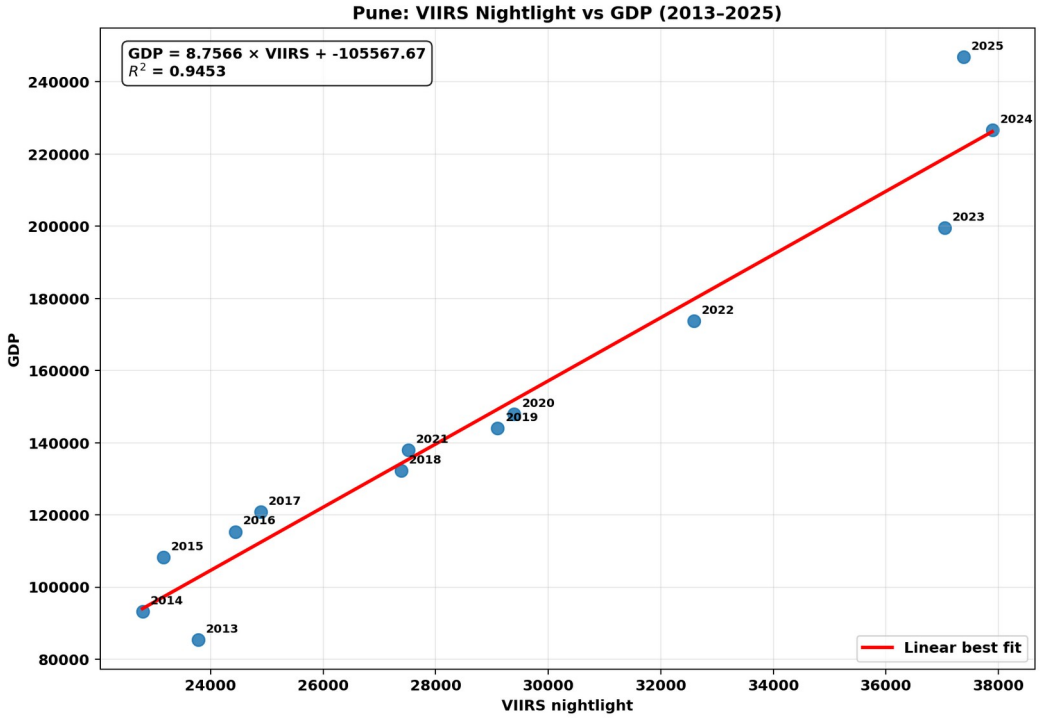

Figure 5. Pune illustrates a strong town GDP-versus-VIIRS relationship. This is the type of fit required before VIIRS is used for ward allocation.

6. Production quality controls

- **Normalization:** micro estimates are repeatedly reconciled to district and state control totals.
- **Multiple signals:** confidence is highest when census history, built-up area, school enrollment, GDP, bank-credit growth and VIIRS point in the same direction.
- **Short forecast horizon:** district GDP is extended only to 2030 rather than mechanically projecting recent growth for decades.
- **State-year recalibration:** the urban-rural differential is re-estimated for every state and every year from district data.
- **Data revisions:** boundary changes, revised GDP series and new satellite datasets are incorporated on refresh.

7. One India-wide micro-market view

- Population, GDP and per capita income are available at state, district, town, village and ward level.
- The same estimates are summarized at pincode level.
- Retail sales data can be superimposed on these layers to reveal territory potential, distributor performance and product-mix patterns.

What this unlocks

One consistent economic layer across India - from state to ward and pincode. Compare local markets on the same scale, see where growth is diverging, and combine the map with sales data to make sharper territory and distribution decisions.