

DISTRICT SUSTAINABLE DEVELOPMENT INDEX IN TAMIL NADU: A DATA-BASED ASSESSMENT OF INTER-DISTRICT DEVELOPMENT DISPARITIES

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Abstract—This study develops a transparent district-level Sustainable Development Index prototype for Tamil Nadu and uses it to examine spatial differences in economic prosperity and service-oriented development. The study uses official district-level data published by the Department of Economics and Statistics, Government of Tamil Nadu. Two comparable dimensions are operationalised for all 38 districts: district net domestic product at current prices (2022–23) as a measure of economic prosperity and total tourist arrivals (2022) as a proxy for the scale of the district service economy. Indicators are normalised using the Min–Max method and equally weighted to form a two-dimension composite index. The results show pronounced spatial concentration. Chennai records the highest composite score (86.45), followed by Tiruchirappalli (61.83) and Coimbatore (58.63), whereas several districts remain below 20. The coefficient of variation of the composite score is 90.35 percent, indicating substantial relative disparity. The correlation between district domestic product and tourist arrivals is positive but moderate ($r = 0.399$), suggesting that economic scale and service activity overlap only partially. The paper argues that state-level SDG performance can conceal important intra-state differences and that district planning requires multidimensional, regularly updated indicators. Because publicly accessible district data are not uniformly available for all 17 SDGs and all 38 districts in a common reference year, the index is explicitly presented as a reproducible DSDI prototype rather than an official Government of Tamil Nadu SDG index. The framework can be expanded when the full district indicator matrix becomes available.

Keywords: Sustainable Development Goals; District Sustainable Development Index; Tamil Nadu; Inter-district disparities; Composite index; Min–Max normalisation; Regional development.

1. Introduction

The Sustainable Development Goals (SDGs) have shifted development policy from a narrow emphasis on aggregate economic growth towards a broader framework combining economic prosperity, social inclusion, environmental protection and institutional capacity. The 2030 Agenda contains 17 goals and associated targets, and India has incorporated SDG monitoring into national and sub-national planning.

Tamil Nadu provides an important setting for district-level SDG research. The state is economically diversified, highly urbanised and characterised by substantial differences in industrial structure, human development, agricultural dependence and service activity. The Department of Economics and Statistics (DoES), Government of Tamil Nadu, is responsible for state-level SDG indicator frameworks, localisation at district, block and city levels, data collection, analysis and maintenance of the SDG dashboard.

At the aggregate level, Tamil Nadu obtained a score of 78 in the SDG India Index 2023–24, placing it among India's highest-performing states. However, an aggregate state score does not reveal whether development outcomes are evenly distributed across districts. This creates a strong rationale for constructing a district-level index.

The present paper therefore develops a transparent and reproducible district index using indicators that are publicly available for all 38 districts in compatible official sources. The analysis is deliberately conservative: it does not manufacture district scores for SDGs for which comparable observations are unavailable. Instead, it identifies an empirically measurable core of district economic and service development and treats it as a prototype that can later be integrated with the full SDG indicator framework.

2. Research Problem

The central research problem is the potential divergence between Tamil Nadu's strong state-level sustainable-development performance and the uneven distribution of development opportunities within the state. A district may have high economic output but weak service activity, or substantial tourism activity without a correspondingly large production base. A composite district index can make such differences visible and provide a basis for targeted regional policy.

3. Research Gap

Existing SDG monitoring in India is highly developed at the national and state levels, while district-level localisation is still dependent on the availability, consistency and periodicity of local data. NITI Aayog publishes the SDG India Index and localisation resources, while Tamil Nadu DoES explicitly undertakes district and block indicator localisation. The research gap addressed here is therefore methodological: to construct a transparent district-level composite measure from a common set of official observations rather than infer district performance from the state aggregate.

4. Objectives

- 1) To construct a transparent district-level sustainable-development prototype for all 38 districts of Tamil Nadu.
- 2) To rank the districts according to the composite index.
- 3) To measure the extent of inter-district disparity using descriptive statistics and the coefficient of variation.
- 4) To examine the association between district economic output and service-sector activity.
- 5) To identify policy implications for district-level SDG localisation.

5. Research Questions

Which districts occupy the leading and lagging positions in the composite index?

How large is the variation in district performance?

Is higher district economic output systematically associated with greater service activity?

Why is a district-level index useful even when the state performs strongly in the SDG India Index?

6. Hypotheses

H1: There are significant inter-district differences in the composite development index of Tamil Nadu.

H2: District economic output is positively associated with service-sector activity as represented by tourist arrivals.

7. Data Sources

The principal source is the Department of Economics and Statistics, Government of Tamil Nadu. The Statistical Handbook provides district income estimates and other district-wise statistics. The published district-income table reports Net District Domestic Product (NDDP) at current prices for 2022–23 (provisional), based on the 2011–12 base year series. The tourism table reports district-wise tourist arrivals for 2022, including domestic and foreign visitors.

Tamil Nadu DoES states that district income estimates are prepared annually using the methodology and guidelines of the National Statistical Office and are available at current and constant prices.

The official SDG system itself is broader than the two indicators used here. Tamil Nadu DoES reports that it has developed state, district, block and city indicator frameworks and maintains an SDG dashboard.

8. Variables and Operational Definitions

Dimension	Indicator	Year	Direction	Rationale
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Economic prosperity	NDDP at current prices (Rs. lakh)	2022–23	Positive	Captures the scale of district economic production.
Service activity	Total tourist arrivals	2022	Positive	Captures the scale of district visitor/service activity.

District Sustainable Development Index in Tamil Nadu: A Data-Based Assessment of Inter-District Development Disparities

Both indicators are positive: a higher value represents greater measured economic/service activity. The use of total rather than per-capita tourism is a limitation because larger districts can mechanically attract more visitors. This is explicitly acknowledged and should be addressed in future versions when consistent population and tourism-capacity denominators are incorporated.

9. Methodology

9.1 Normalisation

The Min–Max transformation converts each indicator to a 0–100 scale:

For a positive indicator: $Z_{ij} = [(X_{ij} - X_{\min}) / (X_{\max} - X_{\min})] \times 100$.

The minimum observation receives 0 and the maximum receives 100. Intermediate observations are proportionally positioned between the two extremes.

9.2 Weighting and Composite Index

Equal weighting is adopted because there is no defensible empirical basis for assigning different weights to the two dimensions. The prototype index is therefore: $DSDI-P_i = (\text{Economic Prosperity Index}_i + \text{Tourism Activity Index}_i) / 2$.

The suffix P denotes 'prototype'. It is important not to confuse this calculated measure with the official NITI Aayog SDG India Index or any official Tamil Nadu SDG score.

9.3 Descriptive Measures

Mean, standard deviation, minimum, maximum, range and coefficient of variation (CV) are used. CV is calculated as $CV = (\text{standard deviation} / \text{mean}) \times 100$. A high CV indicates greater relative spatial dispersion.

9.4 Correlation

Pearson's correlation coefficient is used to examine the linear association between NDDP and tourist arrivals. Correlation is interpreted as association, not causation.

10. District-Level Results

Rank	District	NDDP (Rs lakh)	Tourists	Economic index	Tourism index	DSDI-P
1	Chennai	25,706,732	14,963,954	100.00	72.89	86.45
2	Trichirappalli	6,790,342	20,442,393	23.65	100.00	61.83
3	Coimbatore	13,512,902	13,668,013	50.79	66.48	58.63
4	Madurai	7,835,570	15,856,051	27.87	77.31	52.59
5	Thiruvallur	14,862,887	9,745,954	56.23	47.07	51.65
6	Chengalpattu	17,623,679	7,418,516	67.38	35.56	51.47
7	Ramanathapuram	2,432,278	18,336,272	6.07	89.58	47.82
8	Kanniyakumari	3,959,054	16,631,984	12.23	81.15	46.69
9	Salem	8,426,658	8,945,443	30.26	43.11	36.68
10	Dindigul	5,321,428	10,781,603	17.73	52.20	34.96

Chennai occupies first place with a composite score of 86.45. Its position is driven by very high economic output and exceptionally large visitor activity. Tiruchirappalli ranks second (61.83), while Coimbatore ranks third (58.63). Madurai and Thiruvallur occupy the next two positions. The ranking demonstrates that high economic output does not automatically guarantee a comparable composite position: the index rewards balance between the two measured dimensions.

11. Complete 38-District Ranking

Rank	District	NDDP (Rs lakh)	Tourists	Economic	Tourism	DSDI-P
1	Chennai	25,706,732	14,963,954	100.00	72.89	86.45
2	Trichirappalli	6,790,342	20,442,393	23.65	100.00	61.83
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10	Dindigul	5,321,428	10,781,603	17.73	52.20	34.96
11	Tiruvannamalai	4,705,934	9,805,792	15.24	47.37	31.30
12	The Nilgiris	1,462,162	11,668,884	2.15	56.59	29.37
13	Erode	6,361,128	7,259,416	21.92	34.77	28.35
14	Thoothukudi	4,269,686	8,887,482	13.48	42.82	28.15
15	Thiruppur	10,332,884	2,515,850	37.95	11.30	24.62
16	Thanjavur	4,746,460	6,284,135	15.41	29.94	22.67
17	Namakkal	7,820,627	1,473,260	27.81	6.14	16.97
18	Kancheepuram	8,035,537	1,264,059	28.68	5.10	16.89
19	Thiruvarur	1,992,999	6,116,895	4.29	29.11	16.70
20	Krishnagiri	6,702,838	2,033,528	23.30	8.91	16.11
21	Dharmapuri	3,680,281	4,165,467	11.10	19.46	15.28
22	Theni	2,507,499	3,763,156	6.37	17.47	11.92
23	Cuddalore	4,887,651	1,733,540	15.97	7.43	11.70
24	Virudhunagar	4,540,655	1,286,267	14.57	5.21	9.89
25	Viluppuram	3,300,586	1,833,619	9.57	7.92	8.75
26	Pudukkottai	2,985,046	2,022,019	8.30	8.85	8.57
27	Thirunelveli	3,715,697	1,387,805	11.25	5.71	8.48
28	Tenkasi	3,173,603	1,175,270	9.06	4.66	6.86
29	Vellore	3,666,734	703,984	11.05	2.33	6.69
30	Tirupattur	2,523,444	nan	6.43	nan	6.43
31	Ranipet	2,752,267	1,337,105	7.36	5.46	6.41
32	Karur	2,507,468	1,383,243	6.37	5.69	6.03
33	Sivagangai	2,588,184	881,903	6.69	3.21	4.95

District Sustainable Development Index in Tamil Nadu: A Data-Based Assessment of Inter-District Development Disparities

34	Kallakurichi	2,442,521	276,997	6.11	0.22	3.16
35	Mayiladuthurai	1,515,545	684,253	2.37	2.23	2.30
36	Nagapattinam	1,368,975	696,502	1.77	2.29	2.03
37	Ariyalur	1,267,131	232,921	1.36	0.00	0.68
38	Perambalur	929,486	356,010	0.00	0.61	0.30

12. Descriptive Statistics

Variable	Mean	Median	SD	Min	Max	Range	CV %
DSDI-P	23.17	16.40	20.93	0.30	86.45	86.14	90.35
Economic index	18.90	11.74	20.50	0.00	100.00	100.00	108.47
Tourism index	28.00	11.30	29.31	0.00	100.00	100.00	104.65

The mean DSDI-P score is 23.17, with a standard deviation of 20.93. The coefficient of variation is 90.35 percent, indicating very high relative dispersion across districts. The wide range reflects a strong concentration of measured economic and service activity in a small number of districts.

13. Correlation Analysis

The Pearson correlation between NDDP and tourist arrivals is $r = 0.399$. This is a positive but moderate association. The result suggests that districts with larger economic output tend, on average, to record more tourist arrivals, but the relationship is far from one-to-one. Tourism is influenced by cultural assets, pilgrimage, geography, transport connectivity, heritage and destination-specific characteristics, not only by the size of the local production base.

The correlation should not be interpreted causally. With only 38 cross-sectional observations and no controls, the analysis cannot establish whether higher economic output causes greater tourism or vice versa.

14. Interpretation of District Disparities

The results indicate a highly uneven spatial pattern. Chennai is a clear high-performing outlier in the two-dimensional prototype. The next group includes districts with either strong production bases, strong visitor economies, or both. At the lower end, districts with relatively small measured economic output and modest tourist activity obtain low composite scores.

This pattern is consistent with the broader policy argument behind SDG localisation: aggregate state performance can conceal differences in local opportunities. Tamil Nadu's official SDG system recognises this by developing district, block and city indicator frameworks.

The evidence also illustrates why a multidimensional index should not rely exclusively on income. Chennai's dominance is partly explained by the scale of its economy and visitor activity. A future full DSDI should add health, education, poverty, gender, water, sanitation, energy, environment, employment, inequality and institutional indicators so that districts are not ranked primarily by economic scale.

15. Robustness and Sensitivity Considerations

The equal-weight approach is transparent but not necessarily unique. A journal-quality extension should test whether rankings remain stable under alternative weights, such as equal weights, principal-component weights and expert-derived weights. Spearman rank correlations between alternative rankings can be used to evaluate robustness.

A second sensitivity test should replace total tourist arrivals with tourist arrivals per 1,000 population. This would reduce the mechanical advantage of larger districts. A third test should use constant-price NDDP or per-capita district income where a consistent population denominator is available.

16. Policy Implications

- ❖ District-specific SDG planning: State-level targets should be translated into district outcome targets based on local development gaps.

- ❖ **Balanced regional investment:** Lagging districts require productivity-enhancing infrastructure, skills, health and education investment rather than a uniform allocation formula.
- ❖ **Service-economy diversification:** Districts with low tourism activity should not simply be labelled underdeveloped; they should be assessed for alternative service and productive sectors.
- ❖ **Green growth:** Economic expansion should be accompanied by pollution control, resource efficiency, renewable energy and climate-resilient infrastructure.
- ❖ **Better denominators:** Future SDG dashboards should publish per-capita, gender-disaggregated and age-disaggregated district indicators whenever appropriate.
- ❖ **Open data and reproducibility:** District indicator datasets should be released with metadata, reference years, definitions and revision histories so that independent researchers can reproduce the index.

17. Major Findings

- 1) Tamil Nadu's state-level SDG performance is strong, but district-level analysis reveals substantial spatial dispersion.
- 2) Chennai ranks first in the two-dimension DSDI prototype with a score of 86.45.
- 3) Tiruchirappalli and Coimbatore rank second and third with scores of 61.83 and 58.63 respectively.
- 4) The mean DSDI-P is 23.17 and the coefficient of variation is 90.35 percent.
- 5) The correlation between NDDP and tourist arrivals is positive but moderate ($r = 0.399$).
- 6) The results demonstrate the danger of treating state averages as evidence of uniform district development.
- 7) A full SDG index requires additional comparable district indicators beyond the two dimensions used in this prototype.

18. Limitations

The principal limitation is data availability. Although Tamil Nadu has an official district SDG indicator framework, a complete, simultaneously dated and publicly downloadable 38-district matrix covering all 17 SDGs is not available in a single comparable dataset in the sources used for this manuscript. The present analysis therefore uses two indicators available across all 38 districts in official publications. This makes the calculations reproducible, but it also means that DSDI-P should not be presented as an official or comprehensive 17-goal SDG index.

The tourism indicator is a flow measure and is not adjusted for population or carrying capacity. NDDP is reported at current prices and therefore reflects both real changes and price effects. The analysis is cross-sectional and cannot establish causal relationships. These limitations should be explicitly reported in any journal submission.

19. Conclusion

This paper demonstrates the feasibility and importance of district-level measurement of sustainable development in Tamil Nadu. The evidence shows substantial spatial concentration in the economic and service dimensions represented by the prototype index. Chennai is a clear high performer, while several districts have much lower measured activity. The high coefficient of variation confirms that the state-level average cannot adequately describe the spatial structure of development.

The main contribution of the study is methodological transparency. Rather than fabricate unavailable district SDG scores, the paper constructs a reproducible two-dimension prototype from official district observations and clearly identifies the additional data required for a full DSDI. This approach can be extended to a comprehensive index once a common-year 38-district matrix of social, economic, environmental and institutional indicators is assembled.

For Tamil Nadu's 2030 agenda, the policy objective should therefore shift from simply improving the state aggregate to reducing avoidable differences among districts. A credible district SDG dashboard, linked to annual budgeting and outcome monitoring, would strengthen evidence-based regional planning.

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District Sustainable Development Index in Tamil Nadu: A Data-Based Assessment of Inter-District Development Disparities

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