

# Rural Transformation in Gujarat: An Empirical Assessment through Multidimensional Indicators

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## Abstract

*Rural transformation is one of the key social and economic changes that lead to the development of rural communities and the overall growth of any country. A country like India has diversity in terms of the availability of natural resources, work culture, race, and religion for each geographical state unit with its own pace of growth and development. Gujarat is one of the high-growth states in the country, with Gross State Domestic Product (GSDP) estimates of USD 253.64 billion in FY22 with a 7% YoY increase (India Brand Equity Foundation, n.d.). However, the rural population in Gujarat fell to 57.4% in 2011 from 62.6% in the 2001 census. This paper tries to assess the rural transformation in Gujarat with multidimensional indices like agriculture, consumption, employment, education, and urbanization that focus on rural transformation with the help of district-level microdata in the broader context of the high economic growth of Gujarat.*

*Keywords: Gujarat, rural transformation, rural economy, regional disparity*

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## 1.0 Introduction

Numerous countries, India included, possess significantly sizable populations in rural regions. According to Census 2011, the rural parts of India house up to 70% of the country's inhabitants (Kumar, 2011). Agriculture and other self-employment activities comprise a significant portion of India's Gross Domestic Product (GDP) (Cagliarini & Rush, 2011). Rural areas in Africa, Asia, and Latin America are home to over 3.3 billion people (United Nations, 2012). Moreover, 1.3 billion people live in provincial towns and small cities. Most are functionally linked to their rural neighbors through their economies, labor markets, social networks, culture, and shared environment (Berdegue & Proctor, 2014). According to The Food and Agriculture Organization (FAO) of the United Nations, these 4.6 billion people (about

two-thirds of the global population) hold roughly 60 percent of the world's land and produce roughly two-thirds of all food and non-food agricultural products in terms of value (Hondo, 2023). India has a large rural market potential with its staggering 833 million rural residents. India has a rural population that is approximately six times larger than that of the Russian Federation (140 million), nearly two and a half times larger than that of the USA (309 million), and six and a half times larger than that of Japan (128 million) (Kumar, 2011; Sekhar & Padjama, 2013). The contradiction of pictures presented by the rural Indian population size is perplexing. There is persistent poverty; however, multinational behemoths place large bets on the expanding potential of the rural market (Sekhar et al., 2013). So India is primarily a rural country where

seven percent of the workforce resides in a rural area. Notwithstanding the rise of urbanization, it is estimated that more than 50 percent of India's population is estimated to be located in rural areas by 2050 (Chand, Srivastava & Singh, 2017). Rural areas and society are considered vital as they constitute 46 percent of national income (Central Statistics Office of India, 2011-2012), accompanied by the most valuable resources indispensable for economic growth (Chand & Srivastava, 2017). Nevertheless, with its mass inhabitants, the rural economy posed several challenges concerning its growth and development. Populations in rural areas across countries are trapped in massive poverty and severe deprivation of social amenities. Abraham (2009) has analyzed the trends and patterns of rural employment to conclude "distress-driven employment" in the Indian economy. He argued how employment growth peaks when the output growth is stagnant. Normal conditions should see a further decline in employment in the rural sector due to this trend. Further investigation reveals that the increase in rural employment growth is likely a reaction to the crisis gripping the farm industry. Distress in the agrarian sector causes the growth of employment, known as "distress-driven employment," because when the income level falls below sustenance, that portion of the normally non-working population is forced to enter the labor market to supplement household income. According to Census 2011, Gujarat has a population of 60.4 million, wherein 57.40 percent belong to rural Gujarat, with a sex ratio of 949 females per 1000 males. Gujarat's growth during the last two decades has been extremely rapid. The state's economy has grown at an annual rate of 12.56 percent since 2011–2012, and according to budget documents presented to the Gujarat Assembly, it will grow at 15.5 percent by 2022–2023. Rainfall is

always uncertain in Gujarat, but Gujarat still leads agriculture without much government support, like Punjab and Haryana. Gujarat's agricultural boom is dominated by cash crops, the milk revolution, fish exports, horticulture, and agricultural productivity. Gujarat's rural areas have also significantly contributed to the state's growth story. The Gujarat growth story is debated and discussed on all major media outlets as the Gujarat Growth Model (The Wire, December 2017). Gujarat grew at an average rate of 5.1% from 1980 to 2013. Gujarat Growth Model became popular from 2002-2003 to 20011-2012 when Gujarat reported a quantum jump in its growth rate largely attributed to the then chief minister Narendra Modi's advanced understanding of neoliberal policies. The growth model was based on three fundamental pillars: corporate investment inflow, governance, and infrastructure development. An important issue raised by critics of the Gujarat Model is the long-run impact on the population's income level with social changes. Can these growth stories improve the lifestyle of the rural population? The major chunk of the population in rural areas considered the country's soul, is also most neglected and ignored by the government. The rural populations faced a problem with their education, health, livelihood, basic amenities, infrastructure, governance, and many more. These problems are severe for rural women as they do not have enough higher education opportunities to get more skills for better employment. Other issues like gender discrimination, social and financial inequality, domestic violence, and lack of basic sanitation facilities are frequently observed in rural parts of the country. Against this backdrop, rural transformation implies the changing aspects of the economic and social dimensions of the rural landscape. It provides direction for sustainable development policy initiatives from state and

central governments. Gujarat government has given thrust for rural transformation in the last decade to bring complete societal change in which rural society diversifies its economic activities, reduces its reliance on agriculture, and becomes dependent on trading goods and services. Therefore, this paper is an attempt to analyze broadly the process of rural transformation via a multidimensional assessment framework with the help of district-level micro-data from Gujarat.

### Review of Literature

Rural transformation is a broad, multifaceted process that affects all aspects of a rural environment, including institutional, political, social, and economic changes that favorably affect the rural area. Different researchers defined rural transformation in different ways. According to Ohlan (2016), rural transformation is a type of development that improves living conditions and provides security. It delivers more in the context of national and global social and economic changes to rural society's backward inhabitants if they seek or desire it. Rural transformation is a proactive rural community reform and growth process to help rural lives (Long et al., 2011). It entails transferring aspects of urban surroundings to rural settings and modifications to systems and processes that improve rural people's living conditions and employment (Wang, Khan, & Zhang, 2013). Typical characteristics of rural transformation include "changes in civic amenities, female literacy, gender ratio, employment structure, agricultural intensity, crop selection pattern, farm income, labor productivity, and major improvements in rural housing and economic and social conditions due to industrialization and urbanization." (Kurien, 1980; Ravallion & Datt, 2002). Majumdar (2020) demarcated rural transformation as a multidimensional concept different from rural

development. Kurien (1980) focused on economic variables to analyze the rural transformation process of Tamil Nadu for the period 1950 to 1975. Rural transformation, according to Amani and Mkumbo (2013), is a complicated, synchronized process split into four components of rural life: "economics," "politics," "administration," and "society." Rural transformation encourages interaction with other factors to help communities meet their developmental needs. Rural transformation, according to Berdegue & Proctor (2014) and Berdegue, Rosada & Bebbington (2013), can be defined as a complex and dynamic cultural shift in which rural communities shift their economies away from agriculture and toward industrial and service sectors to acquire commodities, services, and ideas. Long et al. (2011) used three-dimensional rural transformational development models that included rural development, rural transformation, and urban-rural coordination. Rural transformation is similar to rural development in developing countries. Traditionally, rural development was linked to the future of farming. One of the forces driving rural transformation is the increase in the productivity of human labor, especially in agriculture, resulting from the deployment of knowledge and technology. Developing economies look at these signs of rural transformation and often associate them with more remarkable rural development. Wang et al. (2013) define rural transformation as the transition from agriculture to manufacturing and the service sector due to economic and technological advancements. According to Koppel (1988), rural transformation is characterized as fundamental changes in the content of rural economic life and social structure. Changes are accompanied by greater complexity and widespread links with 'non-rural' economic and social activity. It could be the evolution of conventional social, political, and economic

institutions' structure, composition, and functions. Kumar Ranjit et al. (2015) investigate multiple pieces of literature to understand various dimensions of rural transformation for selected eastern states of India. The pattern and extent of rural transformation are measured using three multidimensional indices: the rural development index, rural transformation index, and rural-urban coordination index (Ohlan, 2016). The transformation index revealed that rural India had undergone a comprehensive transformation during harsh economic growth. Rural transformation is accompanied by rural development in the case of the Indian economy. Majumdar (2020) examined various aspects of rural transformation in the Indian context that experienced a shift from the farm to non-farm sectors and the de-agrarianization of the economy.

A review of the literature on Rural Transformation pointed out that previous studies have used the model indicator approach with either large-scale secondary data at the state level or household/individual field survey data. None of the studies have used district-level data and indicator approaches to evaluate the rural transformation status of districts associated with the Gujarat state. The present study bridges this research gap by measuring the rural transformation at the district level for Gujarat state using multidimensional indicators with census 2001 and 2011 data and National Sample Survey Office (NSSO) data. Further, quantifying indicators at the disaggregated level is also the prerequisite to understanding the regional dimensions of rural transformation. Hence, rational indicators are first identified (i.e., changes in the rural area's consumption and employment structure, changes in the literacy of rural women, and changes in agriculture indicators). Then, districts are categorized into low, medium, and high based on the Rural Transformation Index Score using the stated methodology.

## 2.0 Methodology

The objective of this paper is an empirical assessment of rural transformation in Gujarat via multidimensional indicators (i.e., changes in the rural area's consumption and employment structure, changes in the literacy of rural women, and changes in agriculture indicators) using indices suggested by Wang et al. (2016) and Long et al. (2011). Gujarat was established in May 1960 with a total of 33 districts as of today. Data availability at the district level was a major challenge; hence, the choices of indicators were influenced by the availability of accurate data for the study period. Out of 33 districts, 25 districts' data are available with consistency and accuracy. Data are transformed into comparable standard units by normalizing all measures. This paper is based mainly on the secondary data gathered from the Census Bureau, National Statistics Service, Land Use Statistics Reports, Directorate of Economics and Statistics, and Department of Agriculture and Cooperation. Data covering the Census period 2001–2011 for the major district of Gujarat State are collected to assess multidimensional indices of rural transformation as stated in the objective. Essentially, changes in the rural area's consumption and employment structure, as well as changes in the rural population data, literacy of rural women, food croplands, and cropping intensity, are used to assess the level of rural transformation. As a result, six indicators have been identified to evaluate the level of rural transformation. Ohlan (2016) has provided a comprehensive framework for Rural Transformation Index (RTI) indicators. Rural transformation level assessment can be done through agriculture, consumption, employment, education, and urbanization changes. These changes are observed at the micro level to study the pattern of development and policy framework. RTI indicators are presented in Table 1 with their operational definitions.

**Table 1. Indicators for Rural Transformation Level Assessment**

Name of Indicator	Formula	Description
Urbanisation Level Change	$\frac{URL(lp)-URL(ep)}{URL(ep)}$	<i>URL(lp)</i> = the proportion of the urban population in the total population for the later period; <i>URL(ep)</i> = URL for the early period. A positive indicator: the higher the value, the higher the Rural Transformation Index RTI.
Rural Female Literacy Rate Change	$\frac{RFL(lp)-RFL(ep)}{RFL(ep)}$	<i>RFL(lp)</i> = the proportion of the literate rural female in the total rural female population for the later period; <i>RFL(ep)</i> = RFL for the early period. A positive indicator: the higher the value, the higher the RTI.
Employment Structure Change	$\frac{EMS(lp)-EMS(ep)}{EMS(ep)}$	<i>EMS(lp)</i> = the proportion of rural labor employed in the primary sector among the total rural main working population for the later period; <i>EMS(ep)</i> = EMS for the early period. A negative indicator; the lower the value, the higher the RTI.
Cropping Intensity Index change	$\frac{CII(lp)-CII(ep)}{CII(ep)}$	<i>CII(lp)</i> = the proportion of area sown more than once in the net area sown for the later period; <i>CII(ep)</i> = CII for the early period." A positive indicator; the higher the value, the higher the RTI.
Food Crop Farmland Index Change	$\frac{FCI(lp)-FCI(ep)}{FCI(ep)}$	<i>FCI(lp)</i> = the proportion of food crops area in the total cropped area for the later period; <i>FCI(ep)</i> = FCI for the early period. A positive indicator; the higher the value, the higher the RTI.
Rural Consumption Structure change	$\frac{RCS(lp)-RCS(ep)}{RCS(ep)}$	<i>RCS(lp)</i> = ratio of food to non-food consumption for rural residents for the later period; <i>RCS(ep)</i> = RCS for the early period. A negative indicator; the lower the value, the higher the RTI.

All the indicators are given appropriate weights, while the Rural Transformation Index (RTI) is calculated for the holistic picture. Past literature has used subjective and objective methods for assigning weight to each indicator. "Subjective methods require some inputs from the experts based on their knowledge or experience before weight determination" (Deng, Yeh & Willis, 2000). Although subjective methods use inputs from experts, such inputs sometimes have personal biases of experts (Odu, 2019). Objective methods rely on the qualities of data acquired for each indicator, whereas subjective approaches are based on expert judgment. (Alemi-Ardakani et al.

2016). Objective methods are popular for removing potential bias and improving objectiveness. (Krishnan, Mat Kasim & Hamid, 2020). In this study, the following two objective methods are applied to calculate the weight of each of the indicators. 1: Entropy-based Method and 2: CRITIC (CRiteria Importance Through Inter-criteria Correlation) Method. According to the literature, entropy-based methods (Hwang & Yoon, 1981) and CRITIC (Diakoulaki, Mavrotas, Papayannakis, 1995) methods are the most widely applied objective methods for calculating the weights of the multiple decision criteria. In the Entropy Weight Method, *m* indicators and *n* samples are

set in the evaluation, and the measured value of the  $i$ th indicator in the  $j$ th sample is recorded as  $x_{ij}$ . The first step is the standardization of measured values. The standardized value of the  $i$ th index in the  $j$ th sample is denoted as  $p_{ij}$ , and its calculation method is as follows:

$$P_{ij} = \frac{X_{ij}}{\sum_{j=1}^n X_{ij}}$$

In the EWM, the entropy value  $E_i$  of the  $i$ th index is defined as:

$$E_i = \frac{\sum_{j=1}^n P_{ij} * \ln P_{ij}}{\ln n}$$

The range of entropy value  $E_i$  is  $[0, 1]$ . The larger the  $E_i$  is, the greater the differentiation degree of index  $i$  is, and more information can be derived. Hence, a higher weight should be given to the index. Therefore, in the EWM, the calculation

method of weight is:

$$W_i = \frac{1 - E_i}{\sum_{j=1}^m (1 - E_i)}$$

CRITIC (CRiteria Importance Through Inter-criteria Correlation) Method has calculated weights by formulating an indicators matrix, converting it into a normalization matrix, and estimating the standard deviation for the normalized matrix. After this, the Symmetric matrix-linear correlation coefficient between the Criteria and the measure of the conflict created by the criterion is prepared for the final weight calculation. The weights derived incorporate contrast intensity and conflict, which are contained in the structure of the decision problem. After doing the required calculations of multiple indicators of "Rural Transformation" with both these objective methods, the weights of each indicator are determined in Table 2.

**Table 2. Objective Weights for Indicators of Rural Transformation Level Assessment**

Name of Indicator	Weights as per Entropy Method	Weights as per CRITIC Method
Urbanization Level Change	0.1299	0.1129
Rural Female Literacy Rate Change	0.0233	0.2102
Employment Structure Change	0.1244	0.2227
Cropping Intensity Index change	0.2630	0.1451
Food Crop Farmland Index Change	0.3899	0.1364
Rural Consumption Structure change	0.0695	0.1726

Indicators listed in Table 1 are calculated with the help of the stated formula in the second column of Table 1. All such calculated values of indicators are relative without dimension; hence, these indicators were normalized with the below equation to make them geographically and temporally similar.

$$X'_i = \frac{X_i}{X_{i \max}}$$

Where,

- $X'_i$  = Standardised value of the indicator  $i$ ;  
 $X_i$  = Value of the indicator  $i$ ; and

$X_{i \max}$  = Maximum value of the absolute value of the indicator  $i$  for all districts.

Using the below equation, The RTI scores for each district are calculated.

$$RTI = \sum_{k=1}^t X'_k \times W_k \quad -1 \leq RTI \leq 1$$

Where,

- $X'_k$  = Standardized value of RTI indicator  $k$ ;  
 $W_k$  = Corresponding weight of the RTI indicator; and  
 $t$  = Number of RTI indicators.

Higher RTI numbers indicate higher levels of transformation. This work is similar to Long et al. (2011) and Wang et al. (2016) in the context of the methodology framework; however, we have used indicators that are more relevant in explaining rural Gujarat's social and economic transformation. After calculating the scores on each of these indices, various grades of RTI are calculated as follows:

1. Low = (−1) to (Mean − 0.5 Standard Deviation)
2. Intermediate–low = (Mean − 0.5 Standard Deviation) to (Mean)
3. Medium = (Mean) to (Mean + 0.5 Standard Deviation)
4. Intermediate–high = (Mean + 0.5 Standard Deviation) to (Mean + Standard Deviation)
5. High = (Mean + Standard Deviation) to (+1)

In order to differentiate the inherent mechanism of rural transformation at a regional level from assorted evaluative outcomes, the RTI scores are categorized into the five grades, as mentioned earlier, guided by their statistical characteristics. All the above calculations are shared separately as supplementary material in the form of [Excel files](#).

### 3.0 Results and Discussion

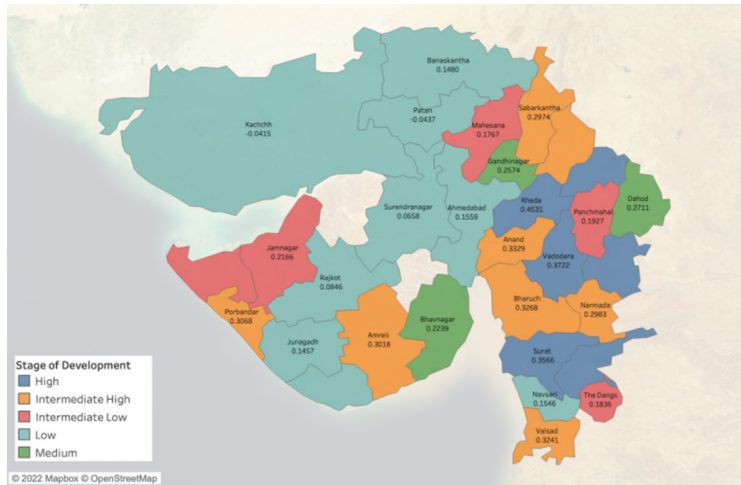
District-wise RTI scores presented in supplementary [Excel files](#) depict the status of rural transformation in Gujarat from 2001–2011. It is evident from Table 3 that rural Gujarat has undergone a very slow transformation with a mean value of the RTI at 0.2188 according to the CRITIC weight method and 0.1523 as per the entropy weight method during the study period. The classification of districts in terms of Rural Transformation Index (RTI) scores based on two different criteria weight methods does not matter much in the overall conclusion, as the broad idea is to understand the extent of rural transformation. The use of two different weight methods is to avoid biases in overall calculations and conclusions.

**Table 3.** Classification of District for Rural Transformational Level Assessment

Stages of Transformation	According to CRITIC Method Weights	According to Entropy Methods Weights
Low	8	6
Intermediate Low	4	10
Medium	3	4
Intermediate High	7	1
High	3	4
Total Districts	25	25
Mean RTI score	0.2188	0.1536
SD of RTI Score	0.1222	0.1478
CV of RTI Score	0.5582	0.9626

The RTI is observed through changes in the rural area's consumption and employment structure and corresponding changes in the rural population pattern, literacy rate of women, and food crop farmland and cropping intensity in various districts of Gujarat. It is evident from Table 3 that overall, Gujarat has shown a shallow stage of rural transformation during the decade 2001 to 2011, as more than 50 percent of the districts are categorized as a low or intermediate low category. A supplementary [Excel file](#) shows the district-wise RTI values for all 25 districts. As noted above, Gujarat has yet to bring change in socio-economic structure to influence rapid developments that affect the transformation at the state level. In this context, significant positive changes are expected from government policies and programs to improve the urbanization level, the rural female literacy rate, cropping intensity, and the adoption of high-value crops and other food crops. Figures 1 and 2 represent the spatial pattern and characteristics of Gujarat's rural transformation more accurately and visibly using five stages of development in the transformation process. With the minute analysis of data presented in Table 3 and Figures 1 and 2, it is evident that higher levels of inter-district disparities in RTI values show a coefficient of variation of 0.5582 (CRITIC) and 0.9626 (Entropy).





**Figure 1.** Spatial Representation of RTI score using CRITIC weights in Gujarat

There are apparent disparities in rural transformation across the Gujarat state as the physical conditions and socio-economic environment are different for different districts of Gujarat. The transition process is different in all the districts despite the government's efforts to implement all the rural development programs with the same intensity and dedication. According to CRITIC weights, Kheda has performed best during the last decade with an RTI value of 0.4531, while Patan and Kachchh have shown poor performance of RTI with negative values. According to CRITIC methods, only three districts, Surat, Vadodara, and Kheda, were classified under the High stage of rural transformation. In comparison, Entropy weights classify four districts, namely Surat, Vadodara Valsad, and Bharuch, under the high stage of rural transformation. Surat and Vadodara have been classified in a high stage of transformation in both methods. Entropy weights rank highest with the RTI value of 0.6291 in Bharuch district, followed by Valsad and Vadodara with RTI values of 0.4049 and 0.3757, respectively. These districts show the high stage of rural transformation because of the better performances in urbanization level, change in rural female literacy level, change in cropping intensity, change in food crop farmland index, change in rural

consumption structure, and change in employment structure observed during the decade of 2001 to 2011. Apart from this, seven more south, north, and Saurashtra districts are classified under the Intermediate-High category as per CRITIC weights. As per Entropy weights, only the Kheda district is in the Intermediate High rural transformation range. The high and intermediate stage of development is more concentrated in the eastern and central parts of Gujarat because of its unique advantages of location and physical conditions that are conducive to agricultural and industrial development. This region has more cities with far better educational infrastructure, which requires lots of socio-economic change for adequate rural transformation. These districts are more linked with urban areas. Rural-urban linkage is critical for rural development, poverty reduction, and transformation (Akkoyunlu, 2015; Tacoli & Vorley, 2015). The essential role that rural-urban linkage plays has now gained the attention of policymakers in Gujarat. According to CRITIC weights, Patan has the lowest RTI (-0.0437), while Ahmadabad has a slightly higher RTI (0.1559) among the low category of Rural Transformation during the study period. The eight districts of Gujarat fall under the low stage of rural transformation according to RTI



classification with the RTI value between these two districts. Patan, Banaskantha, Ahmadabad (North Gujarat), Kachchh, Surendranagar, Rajkot, and Junagadh (Saurashtra) are classified in low-stage transformation brackets, showing wide disparities among the districts. The low rural transformation is due to uncertain rain conditions resulting in lower agricultural yield and output with lower disposable income of the rural population with prolonged socio-economic development. This also hampered the growth in agriculture infrastructural development, which is crucial to transforming rural Gujarat. The RTI values reveal that the

transformation stage is unequal in different districts of Gujarat. Rural backwardness is concentrated more in the north and Saurashtra region of Gujarat. It is indeed a challenge for policymakers to bring rapid change in rural areas of these regions with new policy initiatives that result in non-farm employment and urbanization with a specific focus on harm to the environment (Yang et al., 2022). Rural transformation at the cost of ecological imbalances must be dealt with seriously. The only sustainable solution is preserving the culture and bringing social change that leads to fundamental transformation.



**Figure 2.** Spatial Representation of RTI score using Entropy weights in Gujarat

In the Intermediate-Low stage of rural transformation, four districts were classified according to CRITIC weights, and ten districts were classified according to Entropy weights. These districts have yet to observe rural transformation as there is considerable scope for improvements in many parameters discussed earlier for judging transformation. In this category, Mahesana (RTI 0.1767), The Dang (RTI 0.1836), Panchmahal (RTI 0.1927), and Jamnagar (RTI 0.2166) are commonly observed districts as per CRITIC weights method. In the Medium stage of the rural transformation category, three districts, namely Bhavnagar,

Gandhinagar, and Dahod, were classified according to CRITIC weight methods. These districts' RTI is in the Medium range, around 0.22 to 0.27 (CRITIC Method) and 0.16 to 0.19 (Entropy Method). The rural transformation is reasonably good in these districts compared to the Low categories, and it also promises to be shifted to high categories soon. Rural transformation can also be explained through Rural Consumption Structure change during the evaluation period. Consumption structure depicts the change in lifestyle of people living in rural areas. In a nutshell, South Gujarat districts like Surat, Valsad, and Bharuch have

observed a significant transformation in rural areas as these districts interact more with urban areas. The interaction between rural and urban areas is essential for the social and economic development of both rural and urban communities. Rural-urban linkages can be viewed from two perspectives: spatial linkages that link people, goods, money, and information, and sectoral linkages that link agriculture, manufacturing industries, and services.

#### 4.0 Conclusion

Rural transformation is measured and analyzed to understand the pattern and depth at the district level for Gujarat state from 2001 to 2011. The indicators are developed for analyzing the different dimensions of rural transformation to get a multidimensional assessment. A comprehensive assessment was carried out at the micro-level for each district in the form of Rural Transformation using multi-dimensions. The analysis shows that Rural Gujarat has observed a notable transformation during the impressive economic growth decade after the Modi Government election in 2001. In addition, the rural transformation of Gujarat is accompanied by rural development on the social, economic, and infrastructure front; however, improvement in rural transformation has yet to keep pace with rapid urbanization. Hence, the policy implications are towards greater scope for improvement in the majority of the indicators of Rural Transformation in Gujarat at the micro-level by looking into the strengths and weaknesses of each district and focusing on rural areas to bridge the gap between urban and rural transformation. Strong support for commercial and technological aspects of agriculture and allied services with a more focused development of agro-based industries to generate employment opportunities will cease the urban-rural divide. This paper gives enough justification for future research to monitor and evaluate the success of any rural transformation program

initiated by either the government or any private agency in the specific region of Gujarat. The rural population should be given policy attention to the ecosystem services the rural areas provide for the integrated development of the urban economy. The rural regional system is a complex and open multidimensional space involving many aspects; hence, future researchers can study the Rural Transformation Index with the new framework of the rural production-living-ecological evaluation index with the optimal functional clustering in any specific region by combining the Self Organizing Feature Map network, Geodetector model, and Mann-Kendall test method.

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