



INTER-DISTRICT INFRASTRUCTURAL VARIATION IN ORISSA: AN ANALYTICAL STUDY

UMAKANTA TRIPATHY*; PRAGNYA LAXMI PADHI**

*Lecturer in Economics & Management ,
Silicon Institute of Technology, Sambalpur.

**G.M (Auto) College,
Sambalpur.

ABSTRACT

The present study aims at measuring the inter-district inequalities in infrastructure development in Orissa on the basis of composite index. It has been prepared with the help of Principal Component Analysis for all undivided and divided districts of Orissa at three different periods of time: 1980-81, 1990-91 and 2000-01. Beta distribution has been used in the present study to identify relatively homogeneous groups of the districts. It further examines the relationship between infrastructural facilities and the level of economic development which help us identify suitable infrastructure indicators for determining economic development. For convenience, the paper has three sections. The first section deals with the availability of physical infrastructure in the state and traces its gradual growth. The second section examines the interrelationship among the indicators of infrastructural development and finally the conclusion follows.

KEYWORDS: *inequalities, infrastructure, composite index, Beta distribution, growth.*

INTRODUCTION

The crucial role of infrastructure in economic development is well recognized. Lack of economic development is often found associated with the inadequate availability of infrastructure. The successive five year plans have repetitively stressed the need for reducing regional inequalities. So at the completion of long phases of planning, it is genuine to ask whether we are on a winning streak of reducing regional disparities. Regional disparity in India is now a matter of serious concern. It is well known that in large economy different regions with different resource bases and endowments would have a dissimilar growth path over time. Apart from India's generally low levels of social development, there is acute inter-regional & inter-state disparity in such

development. But India presents a picture of extreme regional disparity even after the five decades of economic planning through five-year plan whose main objective has always been the elimination of the existing imbalances in development of various regions. The findings of many study show that the level of disparity among the states of Indian union increased over the years. The problem of regional development in the national context did not get adequate attention of the policy makers & as a result the development programmes of these countries with glaring regional disparity definitely resulted in lopsided and distributed development. Some of the already developed regions enjoyed the privilege to develop at the cost of backward regions, which continued to stagnate. Regional imbalance started widening because of ill conceived investment programmes affected under the colonial rule and also due to lack of attention paid to the micro level plans, rest this regional unevenness multiply to adversely affect the overall performance of the country. It is essential to devise suitable planning models & policies for the promotion of balanced regional development.

SECTION I

Orissa is one of the most backward states in the Indian Union. The state has high level of income poverty with about 47% of people below the poverty line, in 2000 according to Planning Commission. Thus post-independence Orissa contained regions, which were at varying levels of development in terms of economy, in terms of formation & growth of modern knowledge that practically meant differential level of generation of market forces & economic & social infrastructure. Despite its rich endowment of natural resources, Orissa is considered one of the most backward states in the country. The economy of the state is predominantly characterized by backward agriculture with a very low industrial base. Orissa having the total geographical area 15.57 million hectare & have total population is 36.71million, which is 3.6% of the total population of India. From this about 15% of the population lived in urban areas & the pre-dominant segment 85% live in rural areas. Given the low level of industrialization of the economy & livelihood of state & its people are pre-dominantly agriculture based with 75% of working population involved in it. Out of the total 47% poor, 90% live in rural areas. Independently we visualize regional imbalances through various sectors such as agriculture, industry, infrastructure and human resource development in the state of Orissa.

The infrastructural base & availability of basic services for the state's population are also found to be equally in a poor shape as compared with the major state of India union. Since the beginning of the 90's private investment has become the principal engine growth & private investment has primarily gone to the states that have well developed infrastructure in terms of power, transport, communication, law & order etc. The concept of backward area & class has been well recognized in the state. The fourth five year plan of the state (1969-74) made a reference to the state problems of regional development by visualizing the broad objective of reducing disparities between the backward & advanced districts. In backward areas there was under exploitation of natural resources, low production, high population growth resulting in low per capita income & high level of under employment.

Buddhadev Ghosh and Prabir De (1998) assessed the role of infrastructure in regional development studying over plan period, point out the impact of public investment & physical infrastructure on both private investment behaviour & regional economic development has been found to be highly significant & positive. The later hypothesis is tested on Indian states over the

plan period using ordinary least square regression (OLS). For this purpose a physical infrastructure development indicator is formulated with the help of principal component analysis. With various unavoidable data limitations the results are significantly conclusive: first regional disparity has been rising in recent period & Plan outlay has not played any major role in this regard; Second regional imbalance in physical infrastructure has been found to be responsible for rising income disparity across the states.

Ric Shand & S. Bhide (2000) attempts to study on sources of economic growth and regional dimensions of reforms, examines variation in the size, income & structural characteristics of Indian states. It analyses total & per capita net SDP for the period 1970-71 to 1995-96. Sectoral analysis shows that reform in agriculture will yield the most benefit as growth in this sector is positively & significantly related to overall growth. Infrastructure & human development are other important determinants. In the further study of post reform regional variation by Mahendra Dev, looks at regional disparities on important economic indicators in the importance of balanced regional development & policies were designed to direct more investment to the relatively backward areas. Regional disparity continues to remain a serious problem. In the post reform period, due to deregulation, the degree of the central government declined in many sectors. State Governments can now take more initiatives for economic development than even before. Also the role of private sector is more important as compared to the public sector.

Rajkishore Meher (1995) studying on inter-district disparities in Orissa in development, investment and performance shows that owing to general backwardness of the majority of the districts, Orissa continues to remain one of the most backward state in the country despite 45 years of planned development efforts. Since the beginning of the 4th five year plan although the country has put much more emphasis on the balanced development among the 13 districts of Orissa has not shown any marked declined except in case of industrial sector. Further, the level of industrial development is so low & unbalanced at the inter-district level. N. J. Kurian (2000) explained about increasing economic & social disparities in India have been increasing in spite of various governmental measures to develop backward areas. It assess disparities in terms of demographic indicators, female literacy, state domestic product & poverty, development & non-development expenditure by state government, shares in plan outlay, investments, banking activities & infrastructure development.

OBJECTIVES

- To study and analyze the various indicators of regional variation in infrastructural development in Orissa
- To assess the extent of inter-district inequality in infrastructure facilities and the level of economic development
- To examine the appropriateness of technique for measuring disparity through various indicators of development in the state across major districts so as to understand the position of Orissa.

DATA BASE & METHODOLOGY

The study utilizes the secondary database & indicators of development published by Planning & Co-ordination Department, to analyze pattern of regional development both on the basis of 13 undivided districts & 30 divided districts of the State. The study has also utilized appropriate multivariate techniques to classify the various districts & blocks into different development zones on the basis of indicators of development.

SEMI-LOG MODEL

To find out the growth rate of different indicators of development log-linear function is used. In this model the slope coefficient (constant relative log b) measures the relative change in 'y' for a given absolute change in 't' i.e.

$$\log b = \frac{\text{Relative change in } y}{\text{Absolute change in } t}$$

Now, the growth rate (g) can be found out from the following equation

$$g = [\text{antilog}(\log b) - 1] \times 100$$

The log-linear equation can be written in the following form

$$y = ab^t$$

Taking logarithms both side, it is expressed in the non-linear form as:

$$\log y = \log a + t \log b$$

$$x = A + Bt \text{ (linear form)}$$

$$A = \log a, B = \log b$$

$$a = \text{anti log } A, b = \text{anti log } B$$

The co-efficients a & b are estimated by applying least squares method to the log linear & obtaining the value of log a and log B & then taking anti-logarithms of co-efficients are found as in the case of ordinary regression method.

SUDARSAN IYANGAR METHOD

This method has been used to measure the overall development of a district along with its development at sectoral level. It irons out the variation by adopting two-tier weightage one among the sectors of development & another within the indicator itself among the district by adopting inverse ratio of standard deviation.

Let X_{id} represent the size of value of 'i'th development indicator in the 'd' th district of the State ($i=1,2,3,\dots,m$ & $d=1,2,3,\dots,p$) & let 'm' the development indicators be classified into 'n' sectors with sector subscript 'r' ($r=1,2,\dots,n$)

Within a sector the weighting of an indicators in

$$W^r = \frac{K^r}{\sqrt{\text{var}(Z_{id})}}$$

$$\text{Where } K^r = \left[\sum_{i=1}^q \frac{1}{\sqrt{\text{var}(Z_{id})}} \right]^{-1}$$

Z_{id} is the standardized variable which computed as

$$Z_{id} = \frac{X_{id} - \min X_{id}}{\max X_{id} - \min X_{id}} \quad \text{for +ve indicators}$$

$$Z_{id} = \frac{\max X_{id} - X_{id}}{\max X_{id} - \min X_{id}} \quad \text{for -ve indicators}$$

The measure of level of development for the 'r'th sector for the district 'd' is

$$y_d^r = \sum_{i=1}^m w_i^r Z_{id}$$

In the second stage the 'n' sector level measures of level of development are combined with weight.

$$W^r = \frac{\bar{k}}{\sqrt{\text{var}(y_d^r)}}$$

$$\bar{k} = \left[\sum_{i=1}^n \frac{1}{\sqrt{\text{var}(y_d^r)}} \right]^{-1}$$

The composite measure of overall level of development for the district 'd' is

$$y_d^T = \sum_{r=1}^n W_r y_d^r$$

β -DISTRIBUTION

The indices both at the sectoral as well as over all – are then graduated by using Beta distribution for a meaningful characterization of different stages of development. A random variable, Z has a Beta distribution in the interval $(0, 1)$, if its probability density function (Z) can be written as :

$$f(Z) = \frac{1}{\beta(a,b)} Z^{a-1} (1-Z)^{b-1}, 0 \leq Z \leq 1 \text{ and } a, b > 0.$$

$$\text{Where } \beta(a,b) = \int_0^1 Z^{a-1} (1-Z)^{b-1} dz$$

Let $(0, Z_1)$, (Z_1, Z_2) , (Z_2, Z_3) and $(Z_3, 1)$ be the linear intervals such that each interval has the same probability weight of 25%. These factorial groups are used to characterize various stages of development as follows :

Very backward	if $0 < Y_d \leq Z_1$,
Backward	if $Z_1 < Y_d \leq Z_2$,
Developing	if $Z_2 < Y_d \leq Z_3$,
Developed	if $Z_3 < Y_d \leq 1$.

Since indices- sectoral as well as over all- take values between 0 to 1 the parameters a and b in the assumed beta distribution is estimated as follows:

$$a = \mu_1' \left(\mu_1' - \mu_2' \right) / \left(\mu_2'^2 - \mu_1'^2 \right)$$

$$b = \left(1 - \mu_1' \right) \left(\mu_1' - \mu_2' \right) / \left(\mu_2'^2 - \mu_1'^2 \right)$$

The variation in development across different districts in the State of Orissa is examined in the present chapter through different indicators relating Infrastructure Sector.

SECTION II

INFRASTRUCTURAL DEVELOPMENT

The indicators of infrastructure development considered for examination are percentage of village electrified, surfaced roads per 000 sq.km of area, no. of motor vehicles per lakh of

population, no. of post offices per lakh of population. The indicators along with growth rates during the period 1980-81 and 2000-01 are presented in Table-1.

In case of % villages electrified one finds the State average in 1980-81 is 45.01%. Cuttack is most developed followed by Puri, Balasore, Sundargarh, Sambalpur, which also have higher than state average level. In contrast the districts Phulbani, Kalahandi, Koraput and Mayurbhanj are at lower level in electrification of villages. In the year 2000-01 State average is 76.64%. Puri and Cuttack have more electrified villages almost 97%, but the districts Phulbani, Koraput, Mayurbhanj have less electrified villages. However, in terms of growth over time Kalahandi recorded higher growth rate followed by Phulbani, Keonjhar, Koraput, which are higher than the State average of 4.45% during the period. In contrast the districts Cuttack, Balasore, Puri registered lower growth rates.

TABLE 1:INDICATORS OF INFRASTRUCTURAL DEVELOPMENT

Sl.No.	District	Percentage of village electrified			Surfaced roads per thousand Sq. Km. of area			Number of motor vehicles per lakh of population			Number of post offices per lakh of population		
		1980-81	2000-01	Growth rate	1980-81	2000-01	Growth rate	1980-81	2000-01	Growth rate	1980-81	2000-01	Growth rate
1	BALASORE	58.12	85.35	3.3	115	128.79	-0.75	150	721	15.21	34	29	-1.57
2	BOLANGIR	46.12	80.3	4.88	97	81.34	-2.6	229	856	12.87	22	22	-0.81
3	CUTTACK	70.39	96.55	2.69	135	160.28	1.3	655	1912	9.82	23	21	-1.05
4	DHENKANAL	43.66	79.59	5.47	107	76.8	-2.79	246	1146	13.99	27	24	-1.22
5	GANJAM	49.25	80.36	4.51	158	131.88	-2.44	326	1263	12.63	29	25	-1.55
6	KALAHANDI	19.67	56.21	9.27	61	65.27	-2.42	191	630	12.39	25	25	0.04
7	KEONJHAR	38.04	80.26	6.66	111	77.82	-2.87	440	1241	9.14	33	32	-0.58
8	KORAPUT	23.02	46.08	6.26	53	56.34	-0.45	226	774	11.94	23	23	-0.29
9	MAYURBHANJ	34.7	63.63	5.17	102	83.27	-4.19	208	9513	23.36	40	36	-0.62
10	PHULBANI	15.06	42.83	8.86	82	73.07	-1.88	131	485	11.3	46	37	-1.83
11	PURI	66.37	96.72	3.48	123	155.85	0.56	498	2571	15.56	25	21	-1.6
12	SAMBALPUR	50.12	79.76	4.18	98	75.57	-2.42	595	1490	8.68	21	24	0.05
13	SUNDARGARH	56.22	87.73	3.95	130	77.92	-6.69	1712	5488	11.07	25	25	-0.64
14	ORISSA	45.01	74.64	4.45	100	90.53	-1.98	447	1557	11.69	27	25	-0.79

Source: Indicators of Economic Development of Orissa, 1970-71 to 2000-01, Statistical Abstract of Orissa 1970-71 to 2000-01

Secondly, the state recorded surfaced roads per thousand sq. km. of area of 100 in the year 1980-81. Ganjam occupied the top position followed by Cuttack, Sundargarh, Puri and Balasore. On the other hand, the districts Koraput, Kalahandi, Phulbani belong to backward group. In the year 2000-01 the districts Cuttack, Puri, Ganjam, Balasore witnessed higher than the state average level which is at 90.53. Koraput is at lowest position followed by Kalahandi and Phulbani. In terms of growth rate one observes except Cuttack & Puri all the districts recorded negative growth rate. While the state registered a growth rate of -1.98% , the highest negative growth rate of 6.69% is exhibited by Sundargarh. Koraput and Puri are showing no significant change over the period. The number of motor vehicles per lakh of population in the State in 1980-81 is 447. Sundargarh is placed at the top followed by Cuttack, Sambalpur and Puri. In contrast the districts of Phulbani, Balasore, Kalahandi and Bolangir have less motor vehicle than average level. In the year 2000-01 the districts Mayurbhanj, Sundargarh, Puri, Cuttack have higher than the average level while the districts Phulbani, Kalahandi, Bolangir at lower level thus showing the same trend over the decade. Orissa shows a growth rate of 11.69% . Mayurbhanj shows the highest growth rate of 23.36% followed by Puri, Balasore and Dhenkanal.

Similarly in case of number of post offices per lakh of population one finds State average level is of 27 in the year 1980-81. The districts having more post offices than the state average are Phulbani, Mayurbhanj, Keonjhar and the districts with lower than state average are Sambalpur, Bolangir. Cuttack and Koraput In the year 2000-01 we see the same trend as in 1980-81. In case of this indicator the state recorded a negative growth rate of -0.79% . Almost all the districts have registered negative growth rates with highest negative growth rates recorded by Phulbani, Balasore and Ganjam.

In Orissa Infrastructure facilities are well available in Sundargarh district followed by Cuttack, Puri, Ganjam districts. Koraput, Bolangir, Kalahandi in 1980-81 are most backward in this field. The regions that are found developed or backward in 1980-81 also remained in the same position in 2000-01.

MEASUREMENT OF VARIATION IN DEVELOPMENT:

It was noticed above that, there has been variation across districts in terms of sectoral as well as over all development. One also noticed variation in growth of different indicators of development overtime. Now an attempt has been made to use the Sudarsan Iyengar method to standardize the various indicators of development and we can rank the districts.

Category	Level of Development	Value of Beta distribution
1	Very Backward	0 to 0.25
2	Backward	0.25 to 0.50
3	Developing	0.50 to 0.75
4	Developed	0.75 to 1.0

We can analyze the position of districts in different sectors and in overall by ranking the districts in three points of time 1980-81, 1990-91 and after division of districts in 2000-01. For ranking we use the Sudarsan Iyengar Method. By looking forward the Table-2, Table-3 and Table-4 we observe the following ranking patterns of districts. Further, a Beta Distribution has been fitted to classify the districts into four categories viz., Developed, Developing, Backward and Very Backward on the basis of value of Beta Variate as follows.

SECTORAL DEVELOPMENT IN INFRASTRUCTURAL SECTOR

The Composite Index of infrastructural development is computed by taking the indicators such as percentage of village electrified, surfaced roads per 000' sq. km. of area, number of motor vehicles and number of post offices per lakh population from the period 1980-81. In 1990-91 including the above four indicators we take per-capita consumption of electricity and number of bank offices per lakh of population. In the year 2000-01 we take one more indicator that railway route length per 000'sq. Km. of area and exclude per-capita consumption of electricity.

In infrastructural development the districts Sundargarh, Sambalpur, Cuttack, Puri, Balasore occupy the top position while the districts Kalahandi, Koraput, Dhenkanal, Mayurbhanj and Bolangir are of lowest ranking in 1980-81. Similarly in 1990-91 the districts the districts Sundargarh, Puri, Cuttack and Balasore are highly developed while the districts Kalahandi, Koraput, Bolangir and Phulbani ranking from below. In 2000-01 in divided thirty districts Deogarh, Malkangiri, Nawarangpur, Phulbani, Kalahandi, Nuapada are underdeveloped having the districts Khurda, Sundargarh, Jharsuguda, Cuttack, Keonjhar, Jagarsingpur are the top rankers.

In terms of infrastructural development the most developed districts are Sambalpur and Sundargarh in 1980-81. The developing districts are Balasore, Cuttack, Keonjhar and Puri. The districts Dhenkanal, Ganjam, Mayurbhanj and Phulbani belong to backward category. The very backward districts are Bolangir, Kalahandi and Koraput. After a decade in 1990-91 the developed districts are Sundargarh, Puri and Cuttack. The districts Keonjhar, Sambalpur, Balasore and Dhenkanal & Ganjam come under developing group. Mayurbhanj is only in the backward category district. The very backward category districts are Bolangir, Kalahandi, Koraput and Phulbani.

TABLE 2: COMPOSITE INDICES AND β -VARIATE FOR INFRASTRUCTURE SECTOR

Sl. No.	DISTRICTS	INFRASTRUCTURE					
		1980-81			1990-91		
		INDEX	RANK	β -Dist	INDEX	RANK	β -Dist
1	BALASORE	0.2574	5	0.55665	0.4249	4	0.69042
2	BOLANGIR	0.1338	11	0.20823	0.1799	11	0.12564

3	CUTTACK	0.2987	3	0.65834	0.495	3	0.81793
4	DHENKANAL	0.2344	7	0.49468	0.3856	6	0.60379
5	GANJAM	0.2355	8	0.49772	0.4031	5	0.64351
6	KALAHANDI	0.0549	13	0.03738	0.1299	13	0.0537
7	KEONJHAR	0.2527	6	0.54426	0.3604	8	0.54392
8	KORAPUT	0.0952	12	0.11192	0.1354	12	0.06007
9	MAYURBHANJ	0.2289	9	0.47942	0.3098	9	0.418
10	PHULBANI	0.1937	10	0.3789	0.2296	10	0.22458
11	PURI	0.2733	4	0.59739	0.5299	2	0.8669
12	SAMBALPUR	0.458	2	0.91014	0.364	7	0.55263
13	SUNDARGARH	0.5995	1	0.98445	0.649	1	0.96674

From this it is found that Cuttack and Puri show an improvement over infrastructural development move from developing to developed category in between 1980-81 to 1990-91. The districts Ganjam & Dhenkanal also show an upward mobility from backward to developing group. But the districts Phulbani and Sambalpur show a downward mobility. While the districts Bolangir, Kalahandi, Koraput, Mayurbhanj, Balasore, Keonjhar & Sundargarh remained in the same group, have not shown any change.

TABLE 3: COMPOSITE INDICES AND β -VARIATE FOR INFRASTRUCTURE SECTOR IN 2000-01

Sl. No.	DISTRICTS	INFRASTRUCTURE		
		INDEX	RANK	β -Dist
1	ANGUL	0.379	8	0.6995
2	BOLANGIR	0.2571	22	0.35733
3	BALASORE	0.4062	5	0.76063
4	BARAGARH	0.261	19	0.36885
5	BHADRAK	0.3593	11	0.65053

6	BOUDH	0.2189	23	0.24858
7	CUTTACK	0.5172	4	0.92655
8	DEOGARH	0.0675	30	0.00748
9	DHENKANAL	0.2687	18	0.39171
10	GAJAPATI	0.2879	17	0.44895
11	GANJAM	0.3614	10	0.65592
12	JAGATSINGPUR	0.3805	7	0.70307
13	JAIPUR	0.372	9	0.68253
14	JHARSUGUDA	0.5186	3	0.92785
15	KALAHANDI	0.1905	26	0.17607
16	KANDHAMAL	0.3397	13	0.59836
17	KENDRAPADA	0.383	6	0.70898
18	KEONJHAR	0.6493	1	0.99099
19	KHURDA	0.1999	25	0.19902
20	KORAPUT	0.1299	29	0.06051
21	MALKANGIRI	0.3185	16	0.53878
22	MAYURBHANJ	0.1705	27	0.13132
23	NUAPARA	0.1446	28	0.08283
24	NAWARANGPUR	0.2609	20	0.36856
25	NAYAGARH	0.3182	15	0.53791
26	PURI	0.3279	14	0.56555
27	RAYAGADA	0.2053	24	0.2127
28	SAMBALPUR	0.3457	12	0.61466
29	SONEPUR	0.2599	21	0.3656

30	SUNDARGARH	0.5737	1	0.96655
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In 2000-01 it is found that in the developed group the districts are Jharsuguda, Balasore, Cuttack and Keonjhar & Sundargarh. The developing districts are Angul, Bhadrak, Ganjam, Jagatsingpur, Jaipur, Kandhamal, Kendrapada, Malkangiri, Nayagarh, Puri and Sambalpur. The districts Bolangir, Baragarh, Gajapati, Nawarangpur, Sonapur and Dhenkanal belong to backward group. The very backward districts are Deogarh, Kalahandi, Koraput, Mayurbhanj, Nuapara, Boudh, Khurda and Rayagada.

TABLE 4: COMPARISON OF VERY BACKWARD, BACKWARD, DEVELOPING AND DEVELOPED DISTRICTS

	1980-81	1990-91	2000-01
Very backward	Bolangir, Kalahandi, Koraput	Kalahandi, Bolangir, Koraput, Phulbani	Deogarh, Kalahandi, Koraput, Mayurbhanj, Nuapara, Boudh, Khurda, Rayagada
Backward	Dhenkanal, Ganjam, Mayurbhanj, Phulbani	Mayurbhanj	Bolangir, Baragarh, Gajapati, Nawarangpur, Sonapur, Dhenkanal
Developing	Balasore, Cuttack, Keonjhar, Puri	Keonjhar, Sambalpur, Balasore, Dhenkanal, Ganjam	Angul, Bhadrak, Ganjam, Jagatsingpur, Jaipur, Kandhamal, Kendrapada, Malkangiri, Nayagarh, Puri, Sambalpur
Developed	Sambalpur, Sundargarh	Sundargarh, Puri, Cuttack	Jharsuguda, Balasore, Cuttack, Keonjhar, Sundargarh

The trend of regional disparity during the period under consideration have also been studied through co-efficient variation which implies whether the degree of inequality has been narrowed down or not with the passage of time being still there is presence of regional disparity.

CONCLUSION

There are wide ranging inter district disparities in the availability of infrastructural facilities. The unequal distribution of infrastructure would result in regional imbalances affecting the welfare of the individuals. The variation in Infrastructural development in the state can be visualized with relatively higher level of development in Sundargarh district followed by Cuttack, Puri, Ganjam districts. Koraput, Bolangir, Kalahandi in 1980-81 are most backward in this field. The regions that are found developed or backward in 1980-81 also remained in the same position in 2000-01. In infrastructural development Orissa is far behind all India level. Over the period the undivided districts Sambalpur, Sundargarh, Cuttack and Puri were developed while the districts Kalahandi, Koraput, Bolangir were underdeveloped. This is because the backward regions have been unable to attract any significant private investment flows, experienced decelerated economic growth while forward group experienced accelerated growth. To secure the objective of balanced development in the long run, proper policy would require for infrastructural development and its regular maintenance.

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