

Inter-district disparity in infrastructure of Odisha with special reference to Western Odisha Development Council Region –An empirical study.

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ABSTRACT

The present study attempts to analyse inter-regional disparity in infrastructure in the state of Odisha. Composite Infrastructure Index have been developed for infrastructure with help of the Principal Component Analysis and Sudarshan Iyengar Methodology. The study observes that there exists severe inequality in the spread of different categories of infrastructure in the state. The study analyses underdevelopment of districts of Western Odisha Development Council; Koraput and other left out districts of KBK belt and Mayurbhanj and Keonjhar district in North Odisha. The analysis lauds the formation of special plans such as the KBK plan and formation of Western Odisha Council by the government. Further, it calls for formation of similar council in North Odisha Region. The need of the hour is assured system of time-bound delivery and mission mode of activity like pulse polio mission incorporating Public Private Partnership.

Keywords: Composite infrastructure index, Principal component analysis, Sudarshan Iyengar Methodology Odisha, Regional Disparity.

Introduction

Infrastructure is the stepping stone for development of any region. Backward region lack infrastructure hence could not attract private investment in the region and enabling the people of the region to participate in the process of development and share the fruit of development. Education and healthcare facilities are enabling provision and irrigation, transport and communication, energy, banking and tourism facility are income augmenting provision for the people of the region. Disparity in infrastructure leads to disparity in economic development and if the situation persist the disparity widen. As there is cause and effect relationship exist between the infrastructure and development. Vicious circle of backwardness act as a shackle for the backward region and private sector are less interested in backward areas hence public provision of infrastructure is much needed to break the shackle.

Galaxy of studies are available explaining relationship between infrastructure and income output and employment or in one word economic development of a region and ultimately affecting the quality of life of the people. Looney and Frederiksen (1981), Ebert et al (1991); Queiroz and Gautam (1992) in international scenario. Balanced regional development being the path of national planning practice baring few initial years after independence. Chelliah (1996), Das (1993), Planning Commission (1979) and many more explain about government role in balanced regional development. Rao (1977), Das (1993), Tendulkar and Jain (1995), Das and Barua (1996), Ghosh and De (1998, 2004), Sahoo and Saxena (1999), Lall (1999) Majumdar (2004) explain inter regional infrastructure disparities and their impact on development in India Nair (1993), Pal (1995), Tiwari (2008), Nayak (2014) and many other made intra state study. Sarkar (1994) Nagar and Basu (2002), Nayak (2014), Tiwari (2008) computed the Infrastructure Development Index adopts principal components method. Very few studies are available for inter district study of Odisha in current scenario.

Selection of Indicators

Following indicators of infrastructure has been selected on the basis of reference

1. Road length per hundred sq. km(I₁).
2. Net Area Irrigated as a percentage of Net Area Sown(I₂)
3. No of Hospital per hundred sq. km. (I₃)
4. No of primary School per hundred Sq Km (I₄)
5. No of Secondary School per hundred sq Km (I₅)
6. Percentage of village electrified.(I₆)
7. Road length per hundred sq. km (I₇)
8. Railway length per hundred sq. Km. (I₈)
9. No of vehicle per lakhs of population. (I₉)
10. Commercial banks per lakhs of population. (I₁₀)
11. Per capita bank credit. (I₁₁)

Table –1
Indicators of Infrastructure

	District	Road length/hundred sq. km.	NAI	No of Hospital per hundred Sq km.	Pry Sch per hundred sq km	Sec Sch per hundred sq km	Vet h. and LS Aid centre per hundred sq km	% of Villages electrified,	Railways length per hundred sq. Kms	Com Bank per lakhs of population	Per capita Bank Credit	Panthi vas bed available per th sq km
	Year	2014-15	2013-14	2015-16	2014-15	2014-15	2014-15	2014	2014-15	2014-15	2011	2012
	Indicator	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈	I ₉	I ₁₀	I ₁₁
1	Angul	132.24	28.53	0.72	25.80	4.41	2.09	97.40	1.66	13.00	10072.06	0.00
2	Balasore	206.52	66.85	2.34	74.30	14.79	4.83	99.10	2.99	9.00	9540.93	66.21
3	Baragarh	135.32	46.19	1.15	30.80	5.86	2.93	100.00	0.93	10.00	6521.50	0.00
4	Bhadrak	282.50	71.92	2.48	76.10	13.97	5.67	99.50	1.43	8.00	5496.78	15.17
5	Bolangir	52.51	20.64	1.17	34.80	5.51	2.71	100.00	2.69	8.00	5603.41	0.00
6	Boudh	187.49	37.15	0.65	27.00	2.55	1.48	90.00	0.00	10.00	3876.13	0.00
7	Cuttack	171.33	64.80	2.24	65.80	14.09	6.36	99.60	2.94	14.00	17020.58	18.82
8	Deogarh	155.47	37.77	0.48	21.40	2.93	1.26	100.00	0.00	12.00	3935.75	0.00
9	Dhenkanal	123.14	58.81	1.21	35.90	6.20	2.92	97.80	1.14	10.00	6011.01	4.49
10	Gajapati	157.23	36.54	0.88	32.20	3.82	1.87	87.60	1.09	10.00	2976.72	6.47
11	Ganjam	167.86	41.99	1.51	46.10	7.88	4.19	93.40	1.04	11.00	7296.62	9.99
12	Jagatshingpur	220.01	66.96	2.88	97.20	28.48	7.97	98.90	4.08	13.00	6710.81	10.79
13	Jajpur	221.13	50.73	2.52	81.60	10.83	5.90	97.10	4.54	10.00	6512.73	0.00
14	Jharsuguda	230.14	25.16	1.14	35.40	6.58	2.51	100.00	3.15	13.00	11958.48	0.00
15	Kalahandi	185.61	34.74	1.04	30.70	4.26	2.18	100.00	1.17	9.00	5701.17	0.00
16	Kandhamal	115.84	26.56	0.91	24.60	2.48	1.57	77.60	0.00	9.00	3846.63	0.00
17	Kendrapara	187.11	67.27	2.12	76.80	14.18	4.92	98.20	0.00	9.00	4297.53	0.00
18	Keonjhar	77.20	33.63	1.19	34.00	6.12	2.13	98.10	1.90	11.00	9440.91	2.17
19	Khurda	229.22	51.81	2.88	66.80	13.51	5.30	98.90	4.17	25.00	99028.59	65.41
20	Koraput	104.66	33.16	0.92	28.00	3.33	2.09	62.70	3.10	8.00	5537.65	0.00
21	Malkangiri	89.51	46.06	0.81	22.40	2.12	1.59	72.00	0.00	6.00	2103.75	0.00
22	Mayurbhanj	133.38	34.45	1.32	42.00	5.89	2.54	96.10	1.39	10.00	5611.69	1.92
23	Nawarangpur	115.44	23.35	1.19	34.80	3.97	2.10	86.20	0.00	5.00	2792.92	0.00
24	Nayagarh	130.84	37.00	1.31	31.70	6.35	2.90	94.40	0.00	12.00	5536.00	0.00
25	Nuapara	171.89	25.56	0.80	27.90	3.89	1.82	100.00	0.82	9.00	4521.76	0.00
26	Puri	321.34	80.79	1.95	62.80	10.75	5.58	99.10	1.22	12.00	6940.48	62.09
27	Rayagada	115.65	26.98	0.96	30.40	3.01	1.95	79.10	2.50	9.00	4804.16	0.00
28	Sambalpur	163.40	38.46	0.75	22.50	3.55	2.45	100.00	2.67	15.00	13034.30	10.27
29	Sonepur	176.89	66.65	1.45	42.40	5.99	2.52	100.00	0.52	10.00	4801.84	0.00
30	Sundargarh	141.58	27.62	1.01	28.50	4.74	1.89	100.00	2.80	12.00	20363.64	6.80

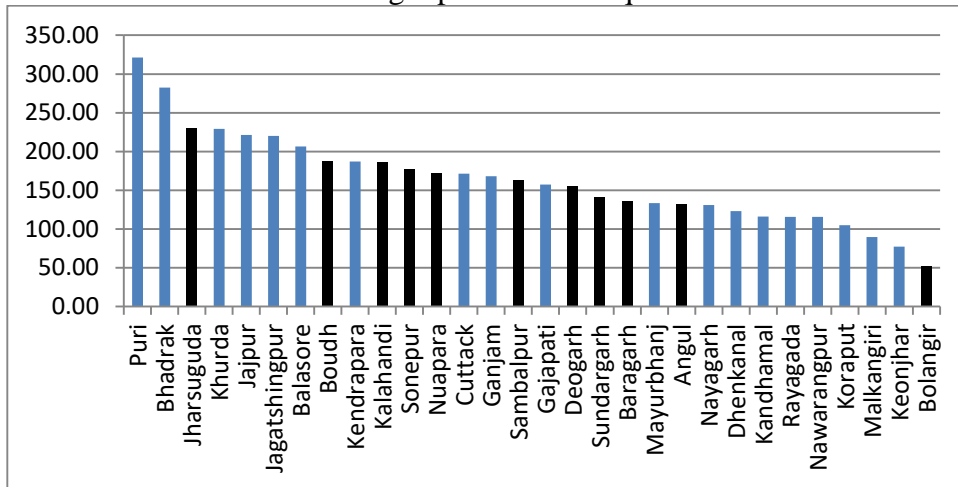
Source: Statistical Abstract of Odisha 2012,

Census of India 2011 ,
 Economic Survey of Odisha ,2014-15,
 District Statistical Handbook,2015

Graphical representation of selected indicators:

Some Indicator of Infrastructural Sector specially agricultural, transport , health and education infrastructure are presented graphically to show the level of disparity and show the levels of the WODC district in the state against other district of the state.

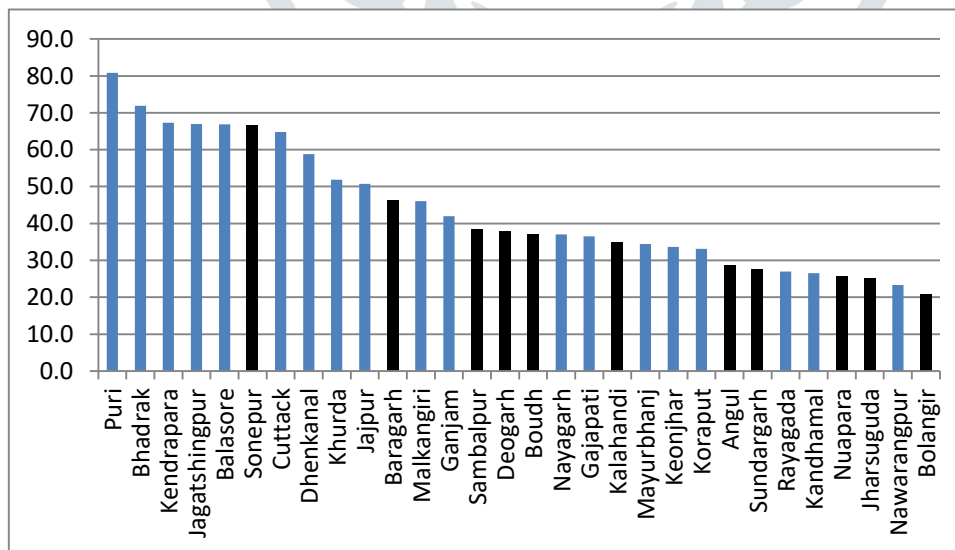
Graph-1
 Road length per hundred Sq Km Districts of Odisha.



Note: Black colour bars represent WODC District

The road per hundred sq km district state the top most district has a indicator value of about 350 seven times than the bottom most district has a indicator value of 50. The highest value is 700% of the lowest value.

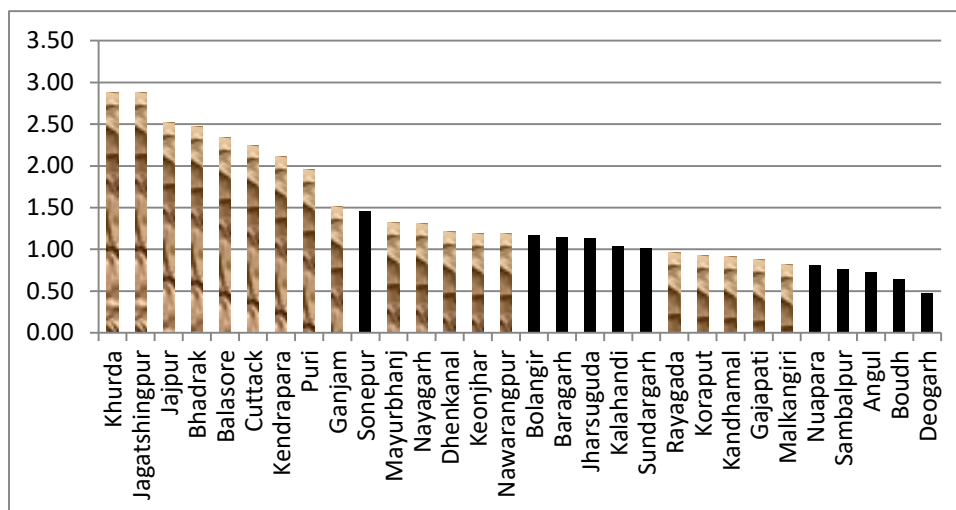
Graph-2



Note: Black colour bars represent WODC District

Percentage of Net Area Irrigated compared to Net Sown Area

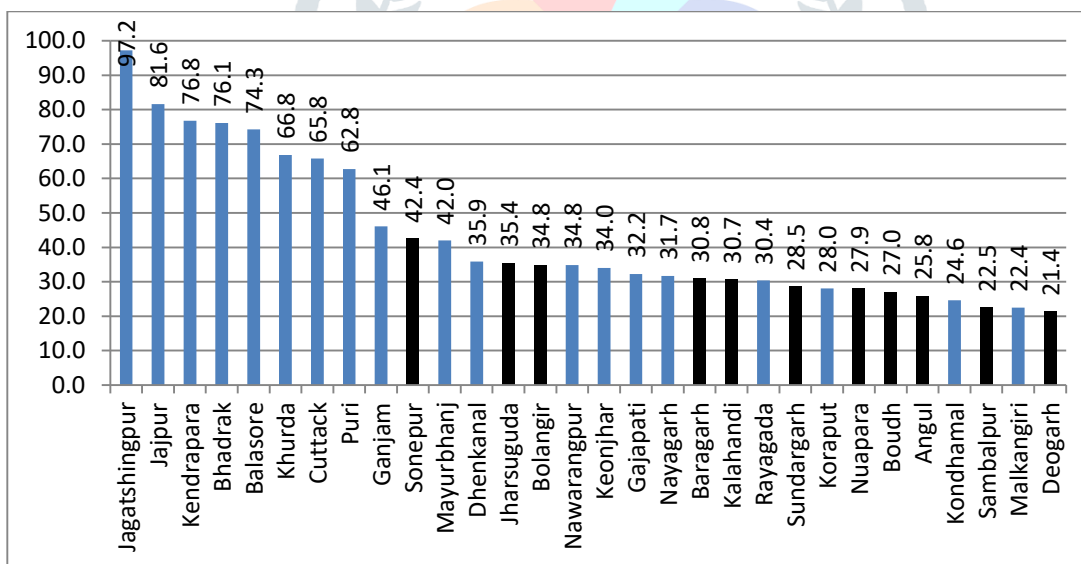
Graph-3
No of Hospital per hundred Sq km, 2015-16



Note: Black colour bars represent WODC District

This shows the disparity in government provision of allopathic hospital per hundred sq Km though there is plethora of private hospital in the core capital region of Bhubaneswar and Cuttack

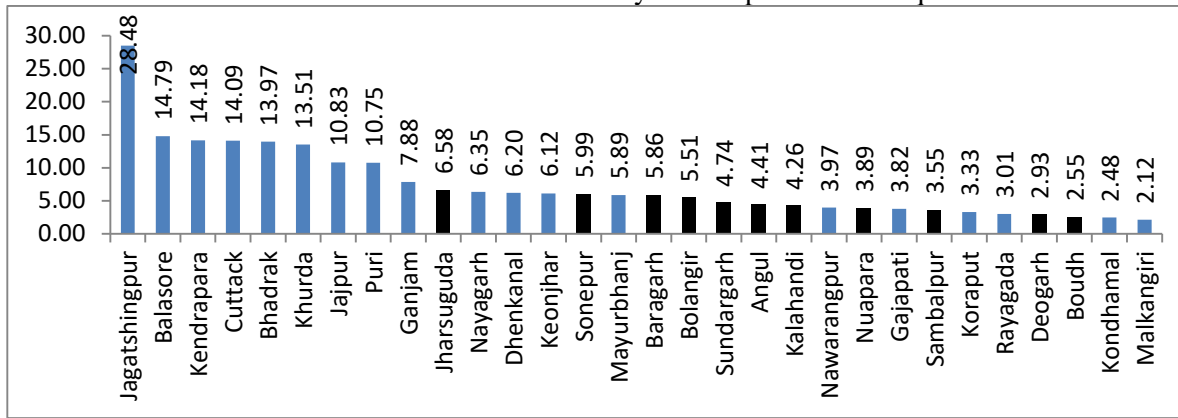
Graph –4
Primary School per hundred Sq. Km



Note: Black colour bars represent WODC District

The districts around the Bhubaneswar and Cuttack are at a considerable higher position where as the district of the rest of Odisha are with poor provision. Surprisingly twenty two district could not provide 50 primary school in hundred sq km. Some district like Deogarh Malkangiri, Sambalpur and Kandhamal could not provide 25 primary school per hundred sq km. where as some coastal district have more than 75 school per hundred sq km It shows there exist severe disparity in provision of primary school across the state.

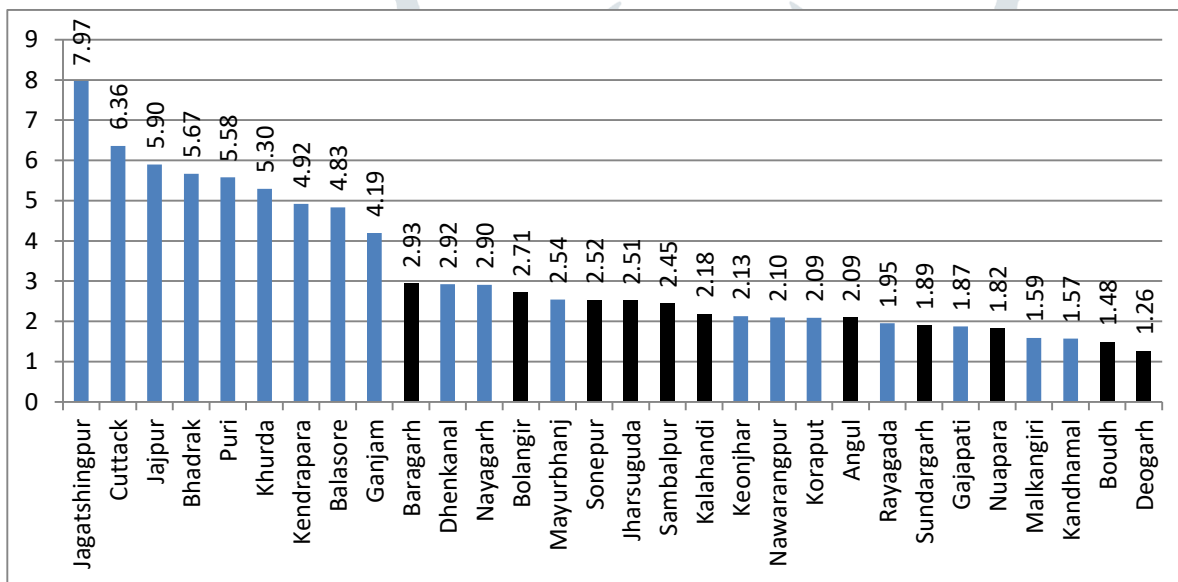
Graph -5
Secondary School per hundred Sq. km



Note: Black colour bars represent WODC District

Here also the highest value of the indicator is 28.48 which is 14 times of the district with lowest value of indicator representing Malkangiri comes with 2.12. In case of WODC district the highest value among the WODC district is only one fourth of the topmost district.

Graph-6



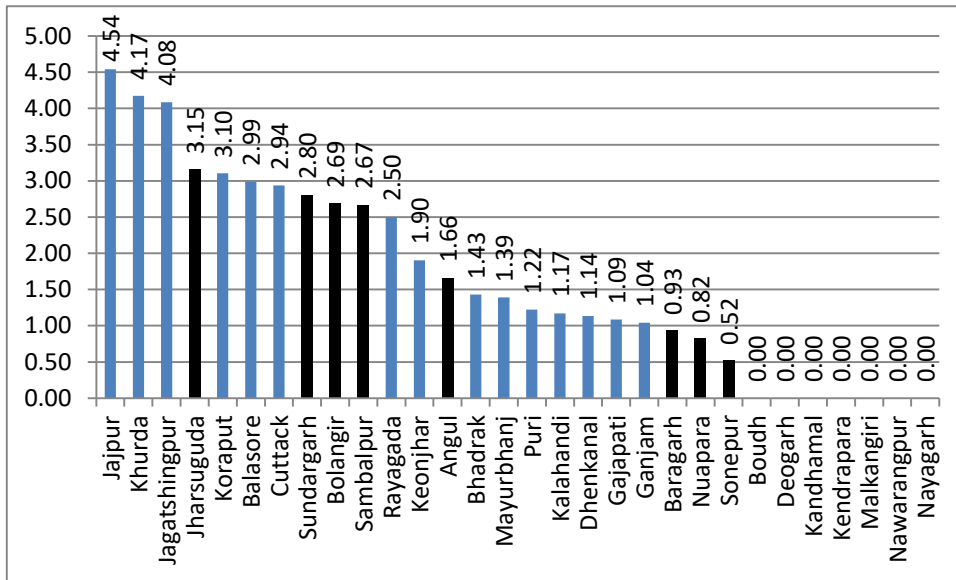
No of Vet. Hospital and Livestock aid centre

Note: Black colour bars represent WODC District

The highest value of the indicator is 632% of the lowest value of the indicator. The lowest value represent a district which has larger share of forest area and less net irrigated area conducive for animal husbandry but neglected in provision for veterinary hospital and Livestock aid centre.

Graph-7

Railway length per hundred Sq Km Districts of Odisha.

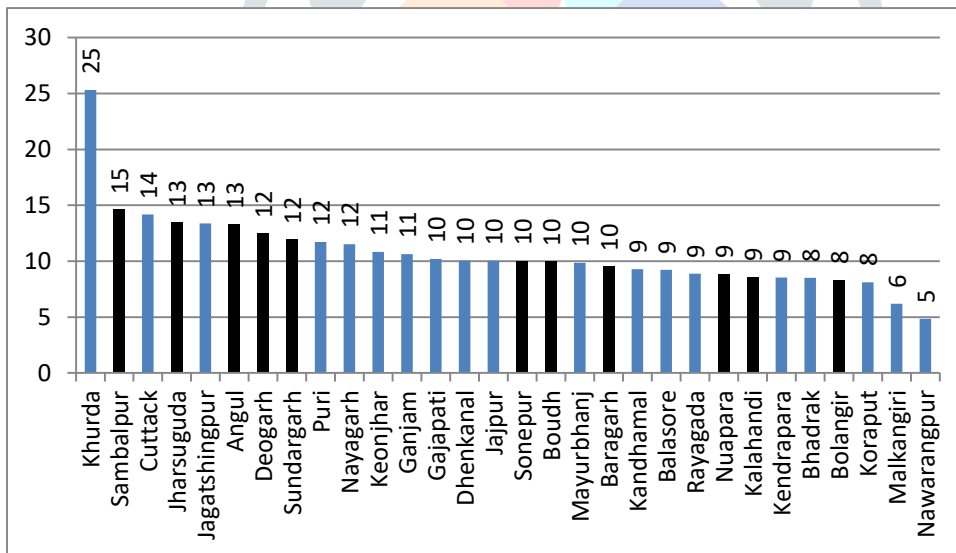


Note: Black colour bars represent WODC District

Disparity in railway can be easily visible from the above graph. Seven district has no coverage and among the top seven district Jharsuguda only find a place.

Graph-8

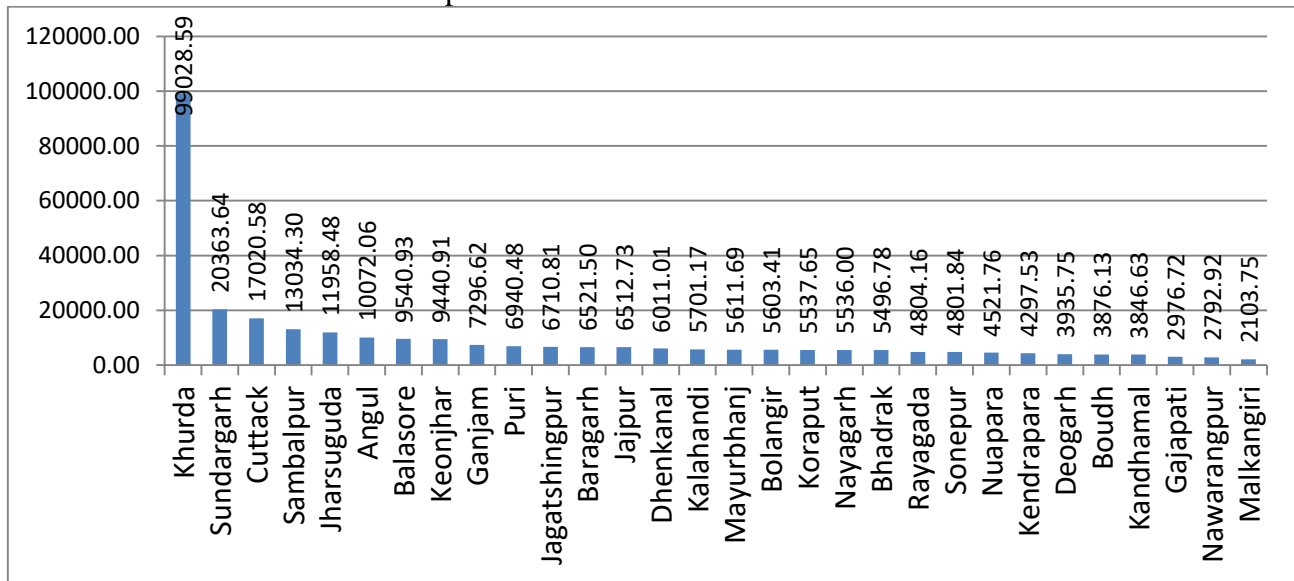
Commercial Bank per Lakhs of Population of Districts of Odisha



Note: Black colour bars represent WODC District

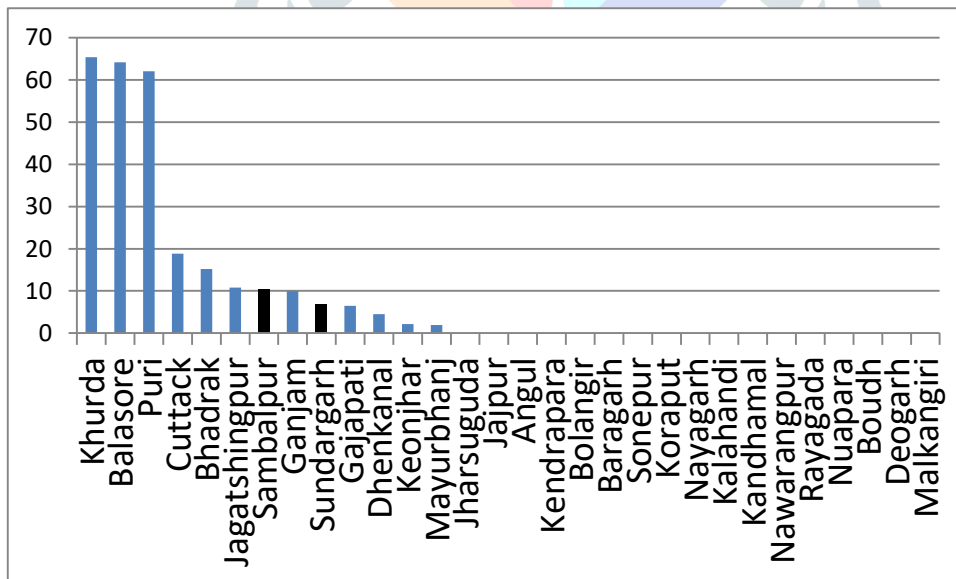
Bolangir , Nuapada and kalahandi are among the bottom ten district . Sambalpur Jharsuguda , Angul ,Deogarh and Sundargahr are top five district among the WODC district figures in top ten . Though there is disparity between the top and the bottom but WODC are spread through the rank.

Graph-9
Per capita bank credit of Districts of Odisha.



Highlighting of WODC district has no meaning as except the capital none other could get a reasonable share of bank credit. The topmost district not only drain human resources but all the savings from all over the district. The value of the indicator of the top most district is about 50 times or 5000% of the value of the same indicator for lowest district.

Graph-10
Number of Panthanivas bed provided per thousand Sq Km for Districts of Odisha.



The level of disparity can better be explained by the fact that only thirteen district have Panthanivas bed available. The potentiality of ecotourism has not been explored. Only recently government could realise the need of a amusement park near Hirakud dam. Puri and Khurda with abundance of hotel industry government funds are utilised in Panthanivas where as with less developed hotel industry in Kalahandi, Koraput Bolangir Boudh Kandhamal and many more places neither tourism potentialities are explored nor facilitation is being done.

The above indicators shows a severe disparity among the district of Odisha and the position of WODC district is not encouraging by any means baring financial indicator i.e. presence of bank and per

capita credit where Sambalpur Jharsuguda and Sundargarh due to presence of other activity of industrialisation, higher education and similar factors. But the position of the other WODC district are disgraceful.

A composite indicator/index is required for overall view of the situation of infrastructure in all the districts of the states. Though indicators are in different unit , integration of all indicators pose a problem. Thereafter a standardised value of the Indicator is calculated to neutralise the unit of indicators and the high value or low value of the indicators.

$$Y_{ij} = \frac{I_{ij} - \text{Min}I_{ij}}{\text{Max}I_{ij} - \text{Min}I_{ij}}$$

Table –2

Standardised value of the indicators for infrastructure

		Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11
1	Angul	0.2966	0.1310	0.1021	0.0580	0.0869	0.1233	0.9303	0.3656	0.4000	0.0822	0.0000
2	Balasore	0.5729	0.7683	0.7749	0.6979	0.4807	0.5325	0.9759	0.6586	0.2000	0.0767	1.0000
3	Baragarh	0.3080	0.4247	0.2795	0.1240	0.1419	0.2489	1.0000	0.2048	0.2500	0.0456	0.0000
4	Bhadrak	0.8555	0.8525	0.8317	0.7216	0.4495	0.6568	0.9866	0.3150	0.1500	0.0350	0.2291
5	Bolangir	0.0000	0.0000	0.2891	0.1768	0.1286	0.2157	1.0000	0.5925	0.1500	0.0361	0.0000
6	Boudh	0.5021	0.2745	0.0705	0.0739	0.0163	0.0337	0.7319	0.0000	0.2500	0.0183	0.0000
7	Cuttack	0.4420	0.7342	0.7331	0.5858	0.4541	0.7594	0.9893	0.6476	0.4500	0.1539	0.2842
8	Deogarh	0.3830	0.2848	0.0000	0.0000	0.0307	0.0000	1.0000	0.0000	0.3500	0.0189	0.0000
9	Dhenkanal	0.2627	0.6345	0.3066	0.1913	0.1548	0.2474	0.9410	0.2511	0.2500	0.0403	0.0678
10	Gajapati	0.3895	0.2643	0.1674	0.1425	0.0645	0.0915	0.6676	0.2401	0.2500	0.0090	0.0978
11	Ganjam	0.4291	0.3549	0.4306	0.3259	0.2185	0.4369	0.8231	0.2291	0.3000	0.0536	0.1509
12	Jagatshingpur	0.6231	0.7700	0.9993	1.0000	1.0000	1.0000	0.9705	0.8987	0.4000	0.0475	0.1630
13	Jajpur	0.6272	0.5002	0.8496	0.7942	0.3304	0.6910	0.9223	1.0000	0.2500	0.0455	0.0000
14	Jharsuguda	0.6608	0.0752	0.2742	0.1847	0.1692	0.1859	1.0000	0.6938	0.4000	0.1017	0.0000
15	Kalahandi	0.4951	0.2343	0.2327	0.1227	0.0812	0.1379	1.0000	0.2577	0.2000	0.0371	0.0000
16	Kandhamal	0.2356	0.0984	0.1806	0.0422	0.0137	0.0465	0.3995	0.0000	0.2000	0.0180	0.0000
17	Kendrapara	0.5007	0.7753	0.6831	0.7309	0.4575	0.5448	0.9517	0.0000	0.2000	0.0226	0.0000
18	Keonjhar	0.0918	0.2160	0.2980	0.1662	0.1517	0.1300	0.9491	0.4185	0.3000	0.0757	0.0327
19	Khurda	0.6573	0.5182	1.0000	0.5989	0.4321	0.6014	0.9705	0.9185	1.0000	1.0000	0.9879
20	Koraput	0.1940	0.2081	0.1846	0.0871	0.0459	0.1237	0.0000	0.6828	0.1500	0.0354	0.0000
21	Malkangiri	0.1376	0.4225	0.1396	0.0132	0.0000	0.0492	0.2493	0.0000	0.0500	0.0000	0.0000
22	Mayurbhanj	0.3008	0.2296	0.3530	0.2718	0.1430	0.1914	0.8954	0.3062	0.2500	0.0362	0.0290
23	Nawarangpur	0.2341	0.0450	0.2973	0.1768	0.0702	0.1250	0.6300	0.0000	0.0000	0.0071	0.0000
24	Nayagarh	0.2914	0.2719	0.3474	0.1359	0.1605	0.2452	0.8499	0.0000	0.3500	0.0354	0.0000
25	Nuapara	0.4441	0.0817	0.1367	0.0858	0.0671	0.0832	1.0000	0.1806	0.2000	0.0249	0.0000
26	Puri	1.0000	1.0000	0.6152	0.5462	0.3274	0.6430	0.9759	0.2687	0.3500	0.0499	0.9377
27	Rayagada	0.2349	0.1054	0.2019	0.1187	0.0338	0.1031	0.4397	0.5507	0.2000	0.0279	0.0000
28	Sambalpur	0.4125	0.2962	0.1159	0.0145	0.0542	0.1768	1.0000	0.5881	0.5000	0.1128	0.1550
29	Sonepur	0.4627	0.7649	0.4072	0.2770	0.1468	0.1885	1.0000	0.1145	0.2500	0.0278	0.0000
30	Sundargarh	0.3313	0.1160	0.2217	0.0937	0.0994	0.0947	1.0000	0.6167	0.3500	0.1884	0.1026

Source : Computed Value,2019

Sudarshan Iyengar Methodology

Then based on the above data a weight is fixed and multiplying with corresponding value of the standardised indicator the Composite Agricultural Indicator is calculated

$$W_i = \frac{[\sum 1/STDV_i]^{-1}}{STDV_i}$$

The weight is assigned and after assigning weight to the corresponding indicators the Composite Indicator is prepared for comparison

$$Y_i = W_1Y_1 + W_2Y_2 + W_3Y_3 + \dots + W_mY_m$$

Table-3

Weight of Indicators of infrastructure for 2015

	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11
STDV	0.2181	0.283	0.2864	0.2796	0.213	0.2623	0.2554	0.305	0.1747	0.17843	0.293
1/STDV	4.5853	3.535	3.4913	3.5765	4.686	3.8126	3.9147	3.277	5.7254	5.60454	3.4128
Wi	0.1005	0.077	0.0765	0.0784	0.103	0.0836	0.0858	0.072	0.1255	0.12285	0.0748

Source : Computed Value ,2019

Principal Component Analysis(PCA) using Factor analysis of SPSS package.

Weights are calculated on the basis of PCA

	Principal Component			Factor Loading	Weight
	1	2	3		
W1	0.506	0.142	0.668	0.668	0.0767
W2	0.706	-0.088	0.548	0.706	0.08107
W3	0.902	0.288	0.215	0.902	0.10357
W4	0.951	0.107	0.226	0.951	0.1092
W5	0.909	0.166	0.2	0.909	0.10437
W6	0.93	0.183	0.24	0.93	0.10679
W7	0.147	0.206	0.682	0.682	0.07831
W8	0.528	0.63	-0.311	0.63	0.07234
W9	0.066	0.893	0.298	0.893	0.10254
W10	0.078	0.925	0.134	0.925	0.10621
W11	0.394	0.513	0.448	0.513	0.0589
				8.709	1

Findings and conclusion

Four fold Classification of the composite index are made using Quartiles and ranking as per PCA weight then analysed with index calculated through Sudarshan Iyengar.

Table
Four fold Classification of the composite index using Quartiles

		PCA	RPCA	SI	RSI
Absolutely Deprived	Malkangiri	0.0906	30	0.0901	30
	Kandhamal	0.1094	29	0.1153	29
	Nawarangpur	0.1425	28	0.1362	28
	Koraput	0.1469	27	0.1438	27
	Boudh	0.1663	26	0.1838	25
	Deogarh	0.1719	25	0.1958	24
	Rayagada	0.1727	24	0.1744	26
	Nuapara	0.1946	23	0.2089	23
	Q1	0.1967		0.2098	
Backward	Gajapati	0.2027	22	0.2122	22
	Angul	0.2216	21	0.2379	20
	Bolangir	0.2261	20	0.2189	21
	Kalahandi	0.2391	19	0.2492	17
	Nayagarh	0.2443	18	0.2458	19
	Keonjhar	0.2486	17	0.2492	18
	Baragarh	0.2655	16	0.2678	15
	Q2	0.2661		0.2658	
Continuity to Development	Mayurbhanj	0.2667	15	0.2638	16
	Sundargarh	0.2734	14	0.2896	14
	Sambalpur	0.287	13	0.311	12
	Dhenkanal	0.2926	12	0.2908	13
	Sonepur	0.3206	11	0.3183	11
	Jharsuguda	0.3232	10	0.339	9
	Ganjam	0.3377	9	0.3307	10
	Q3	0.4258		0.4013	
Developed Most	Kendrapara	0.4552	8	0.422	8
	Jajpur	0.5467	7	0.5087	7
	Bhadrak	0.5494	6	0.5209	6
	Cuttack	0.5653	5	0.5415	5
	Puri	0.5762	4	0.5785	3
	Balasore	0.5813	3	0.5654	4
	Jagatshingpur	0.7307	2	0.6795	2
	Khurda	0.7801	1	0.7958	1

Source: Computed Value,2019

The district of Khurda is with highest index value of 0.78 and 0.79 which is about 866 % of the index value of the district of Malkangiri with lowest index value of .09 . Boudh, Nuapara and Deogarh are figuring in the 'Absolutely deprived' category which require mission mode of action for those districts. The districts of Angul , Kalahandi, Bolangir and Baragarh are termed as 'backward' district which also need improvement of infrastructure which is the precursor for development. Sundargarh, Sambalpur, Sonepur and

Jharsuguda figures in the group 'Continuity to Development' and are at a reasonable state of development with respect to infrastructure, however the index value of these district are less than the half of the index value of the highest performing district. None of the district from WODC region or KBK region could come under the 'Developed most' category only district of core capital coastal region of Bhubaneswar –Cuttack and its surrounding district figure in the develop most district. It implies all the development funds are siphoned by these districts and all other districts are left in lark. The Government should intervene in the matter to find backwardness of the backward region and each pockets of deprivation should be tackled in a systematic manner and irrigation should be given highest priority which can develop agriculture which is the mainstay of a major portion of population and other income augmenting activities like animal husbandry and eco-tourism should be facilitated and advertised to attract tourist and establishment of tourist facilitation centre be established. Constitution of WODC has been appreciated along with other similar backward region development strategy Further, it calls for formation of similar council in North Odisha Region with Mayurbhanj and Keonjhar. The need of the hour is assured system of time-bound delivery and mission mode of activity like polio mission incorporating Public Private Partnership.

References:

- Chelliah, R J (1996): Towards Sustainable Growth: Essays in Fiscal and Financial Sector Reforms in India , Oxford University Press, Delhi.
- Das, K (1993): 'Planning and Regional Differentiation in India: Strategies and Practices', Journal of Indian School of Political Economy , 5, October-December, pp 603-32.
- Elhance.A.P and T.R. Lakshamana (1988) : 'Infrastructure-Production System Dynamics in National and Regional Systems: An Economic Study of the Indian Economy', Regional Science and Urban Economies, Vol 18, No 2,
- Ghosh.B. and P.De, (1998): ' Role of Infrastructure in Regional Development: A Study of India over the Plan period', Economic and Political Weekly, Vol 33 No 47 and 48
- Ghosh.B. and P.De {2004}: 'How do Different Categories of Infrastructure Affect Development? Evidence from Indian States', Economic and Political Weekly, October 16.
- Iyengar.N.S. and P.Sudarshan(1982): A Method of Classifying Regions from Multivariate Data, Economic and Political Weekly, December 18.
- Lall, Somik V (1999): The Role of Public Infrastructure Investments in Regional Development. Economic and Political Weekly. 34 (12): 717-725.
- Looney.R and P.Frederickson (1981): The Regional Impact of Infrastructure Investment in Mexico, Regional Studies, Vol 15, No 4.
- Nagar.A.L. and S.R.Basu (2002): Infrastructure Development Index: An Analysis for 17 Major Indian States (1990-91 to 1996-97), Journal of Combinatorics, Information & System Sciences, Vol 27, No 1-4.

Nair, K R G (1993): 'New Economic Policy and Development of Backward Regions – A Note on Orissa', Economic and Political Weekly , May 8

Nayak, C.R.(2008) : 'Physical Infrastructure and Land Productivity: A District Level Analysis of Rural Orissa', ICFAI Journal of Infrastructure. 6 (3): 7-21.

Pal, G K (1995): 'Regional Disparities in Economic Development: An Inter-District Empirical Study of the State of West Bengal', Artha Vijnana , no 3, pp 276-96.

Querioz.C. and S. Gautam (1992): 'Road Infrastructure and Economic Development: Some Diagnostics Indicators', Policy Research Working Paper 921, World Bank.

Rao.H. (1977): 'Identification of Backward Regions and the Trends in Regional Disparities in India', Artha Vijana, Vol 9, No 2.

Sahoo, Satyananda & Saxena, K K (1999): 'Infrastructure and Economic Development: Some Empirical Evidence', The Indian Economic Journal. 47 (2):54-66 .

Sarkar.P.C.(1994): 'Regional Imbalances in Indian Economy over Plan Periods,, Economic and Political Weekly, Vol 29, No 11.

Tendulkar, S D and L R Jain (1995): 'Economic Growth, Relative Inequality and Equity: The Case of India', Asian Development Review , vol 13, no 2, pp 138-68.

