CHAPTER - II

Human Resources, Infrastructure Facilities and The Level of Economic Activities in Orissa State.

1. Selection of Indicators

Need for Indicators :

Economic development is a multidimensional phenomenon, and no single indicator can capture the result, the process, and the pre-conditions and concurrent conditions of development.[1] Even the G.N.P. per capita, though widely accepted measure of general economic performances and highly correlated with many indicators within and among the countries, it is not equally significant with respect to different indicators.[2] However, when we move from the state level down to district, taluka or community development block level in determining the relative level of development, obtaining a single measure like the G.N.P. per capita is nearly an impossible as well as difficult task especially in developing countries. Thus, in spite of the inherent difficulties in estimation[3] the G.N.P. per capita does not appear to represent the level of development over regions and sectors. In order to resolve the problem, the recent trend is to select some suitable indicators by giving balanced coverage to the different sectors of the economy, and to combine them through appropriate technique of composite index into a single unit to represent the relative level of development of

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1. Govt. of Gujarat, Op. Cit., P. 34.
2. Morriss, D.M. and Mc Alpin, B.V., Measuring the Condition of India's Poor," Pramilla and Co., New Delhi, 1982, P.2.
3. Ibid. P. 3.

different regions. It is also asserted that in selecting indicators "emphasis should shift from exclusively physical criteria to a balance of physical and human criteria."[4]

It appears relevant in this connection, to give a brief account of some studies made recently to determine the level of development as between the regions.[5] These studies, in their attempt in identifying the relative level of development of different regions, have concentrated on selecting suitable indicators of development pertaining to different sectors of the economy in conformity with the decision taken by the Planning Commission of India in August-Sept., 1962.[6] In most of the studies, the selected indicators are divided into 4 sub-groups, such as, indicators relating to agriculture, manufacturing, transport and commerce, and public sectors. In identifying the relative level of development of different talukas, the Committee for the Development of Backward areas, Government of Gujarat, has made a path breaking approach. The 25 indicators selected by The Committee, relate to three main groups, viz., economic activities, infrastructure

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4. Kothari, V.N. "A Note to the Identificiation of Backward Areas". A Paper presented to "The Backward Area Development Committee", Govt. of Gujarat, Feb., 1984. (unpublished)

5. i) Govt. of Gujarat, The Committee for the Development of backward Areas, Draft Report Vol.I, 1982, p.27-38.
   ii) Pal, M.N. "Quantitative Technique for Regional Planning", Indian Journal of Regional Science, Vol.III(1), 1981.
   iii) Pal, M.N. "Regional Disparties in the level of Development in India, IJRS, Vol.VII(I), 1975, p. 36-45.
   iv) Verma, P.C, "Measurement of Regional Development levels in Bangladesh." I.J.R.S., Vol.VI(I), 1974, p. 1-11.
   v) Mishra, S.K., Mahanti, T.K., Pathak, C.R., "Micro level Planning for Agricultural Development: A case study of East Champara District:Bihar," I.J.R.S., Vol.X(I), 1978, p.24-31.
   vi) Padibhavi, R.V., "An Analysis of Inter Taluka Disparity and Backwardness in Karnatak State:1975-76"., I.J.R.S., Vol.XIV(2), 1982, p. 166-173.

6. Cited by Pal, M.N., Op. cit. p. 36-45.

facilities and quality of life indicators.However, in all the cases the selected indicators, in the final analysis are combined with the help of composite index to generate a single measure in order to represent the level of development.

The indicators selected in those studies can broadly be included in three sectors, viz., a sector relating to economic activities, another relating to infrastructure and the last relating to human resource development. The first sector involving economic activities which pertain to the primary, secondary and tertiary sectors, determines the level of economic performances, the second examines the level of available infrastructure facilities and the third assesses, the level of human resource development. The present study has, however, made a notable departure, in that it explores the hypothesis that human resource development and adequacy of infrastructure facilities are preconditions for economic development. In persuing the broad objective, we have, therefore, selected indicators relating to the three aspects, i.e. human resource development, available infrastructure facilities and economic development; and three composite indices are computed one each for the level of human resource development, infrastructure facilities and economic development. The indicators thus selected embracing the three different aspects are given below. In selecting the indicators special attention has been attached to the rural economy of Orissa State since the present Study is concerned with the problem of rural development.

Selected Indicators :

(a) Human Resource Development.

i) Number of literate persons as per cent of total population.

ii) Number of students in Primary and Middle Schools enrolled per 1000 population.+

iii) Number of teachers in primary and Middle schools per lakh population.

iv) Number of doctors per lakh population as well as per 1000 Sq. Km. of area.

v) Number of nurses per lakh population as well as per 1000 Sq. Km. of area.

vi) Number of village agricultural workers per 10,000 cultivators as well as per 100 Sq. Km. of area

vii) Number of veterinary personnel per 1000 Sq. Km. of area.

(b) Infrastructure :

i) Net irrigated area as percentage of net area sown- a proxy indicator for irrigation infrastructure.

ii) Road length per 100 Sq. Km. of area.

iii) Road length per lakh population.

iv) Villages electrified as percentage of total inhabited villages.

+ The number of students enrolled in primary and middle schools per 1000 population rather than per 1000 population of respective age group is taken as a proxy variable for rate of human resource development. Such a measure is expected to reflect the relative positions of the districts or any other spatial unit in regard to rate of human capital formation.

v) *Primary and middle schools per 100 Sq. Km. of area.

vi) *Primary and middle Schools per lakh population.

vii) *Hospitals, dispensaries and P.H.Cs. per 1000 Sq. Km. of area.

viii) Hospitals, dispensaries and P.H.Cs. per lakh population.

ix) Veterinary hospitals, dispensaries and livestock inspecton centres per 1000 sq. Km. of area.

x) Bank offices per 1000 Sq. Km. of area.

xi) Bank offices per lakh population.

xii) Members of primary agricultural credit societies as percentage of total cultivators-a proxy measure for co-operative infrastructure.

xiii) Post offices per 100 Sq. Km. of area.

xiv) Post offices per lakh population.

xv) Fertilizer depots per 1000 Sq. Km. of area.

xvi) Number of passenger vehicles registered per lakh population.

xvii) Number of broadcasting receiver licences per lakh population.

(c) Economic Development

i) Workers in non-agricultural activities as per cent of total workers.

ii) Number of factory workers per lakh population.

iii) Area under H.Y.V. paddy as per cent of total area under paddy.

iv) Area under crops other than food crops as per cent of total cropped area.

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* (i) Primary and Middle School include junior basic and senior basic schools, and Sevashram, Ashram and Kanyashram
(ii) Hospitals, dispensaries, and P.H.Cs. are public health institutions covering allopathic, homeopathic and Ayurvedic institutions.

v) Gross cropped area as proportion to net area sown.

vi) Gross value* of agricultural product per farm worker.

vii) Gross Value* of agricultural product per hectare of net area sown.

viii) Fertilizer consumption (In Kg.) per hectare of gross cropped area.

Rationale for the selection of Indicators:

Discussing the logic of selection of these indicators appears to be appropriate. The present study is concerned with the problem of rural development in Orissa-State. In consideration with the present level of development in the state, literate population will constitute the single and the most important stock indicator of developed human resources. General literacy has been taken in the present study, as the proxy for the level of education. Education and learning processes involve a change in human behaviour pattern and are, therefore, crutial to economic growth.[7] Education promotes economic development in two ways: i) "through changing the attributes relevant to economic development and ii) as an economic input".[8] While the former makes the people more adaptable

*The gross value of agricultural products is worked out in Rs. by including the products of major crops at 1971 whole-sale prices. The gross value of agricultural products is obtained by summing up the products of the agricultural product of the selected crops and their respective 1971 whole-sale prices. The data for the agriculture product of each of the different crops and whole-sale prices for 1971 are obtained from the Directorate of agriculture and Food Production, Orissa and the Bureau of Statistics and Economics, Orissa respectively. The gross value of agricultural product per farm workers and per hectare for district are obtained by dividing the gross value of agricultural product in the district by the total agricultural workers and net cropped area of the district respectively.

7. i) Bowman, M.J."Education and Income" in The World Bank Staff Working Paper, No.402, Education and Income, July 1980, p.6-9.
   ii) Wharton, R.Clifton, Jr. O.P., Cit., p.202.
   iii) Mydal Gurner, Asian Drama, Vol.II Penguin Books, 1968, p.15-37.

8. Kothari V.N. and Panchamukhi, P.R., Economics of Education-A Survey in Research in Economics, ICSSR, Allied Publishers, Bombay, 1980, p.172.

to change, more rational economically, more innovative and the likes, the latter increases the skills and knowledge which influence efficiency and hence, productivity. Added to this, education exposes the educated persons to broader communication process and thereby, enabling them to participate more effectively in the process of development. It is further argued that a high level of literacy in a given region is associated with a high level of per capita income.[9] The rate of human capital formation is asserted to be an important precondition for economic growth.[10] The rate of human capital formation in the rural areas will largely be accounted for by the students enrolled in the primary and middle schools. The number of teachers in primary and middle schools-an important part of the strategic stock of human capital,[11] occupy a central place in rural mileu by influencing the quality and quantity of developed human resources, besides assisting in dissemination of new knowledge in farming and other activities, since they combine those activities as subsidiary occupations along with teaching. Public medical care measures which are reflected in the availability of doctors and nurses, keep the people free from diseases, and maintain their health standard

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9. Shah Maya- "Economic Factors Explaining Variations in Literacy Rate in Rural Areas: A Case study of Gujarat, M.S. Univ., Press, Baroda, 1981, p.1.
10. Mehta, M.M. Op. Cit., p. 1-2.
11. Harbison, F.H., and Myers, C.A. Op. Cit., p. 27.

and thereby, raising the productive efficiency of the people. Myrdal has pointed out that "input and efficiency of labour and consequently, the volume of output depends on the state of nation's health".[12] Modernization of agriculture is the imperative need for rural transformation. Village agricultural workers are the key extension agents in the villages who disseminate the relevant innovational informations to the farmers for adoption of new farm technology and thereby, assisting in the process of modernization of agriculture.[13] Optimum utilization of land resources depends on the availability of farm power for conducting agricultural operations. Draught animals are the most important source of such power available in the rural areas in our country. Availability of this power for farm operations depends on the general health standard of these animals. Veterinary personnel shoulder the responsibility of maintaining the health standard of these animals. Besides, they assist in promoting the growth of dairy farming, poultry farming, sheep and goat rearing, etc., which are intended to uplift the economy of the poorer sections of society along with providing milk and meat necessary for maintaining health standard of the people. Thus, the availability of these indicators in a large number is expected to have a favourable effect on the level of economic activities in a given region.

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12. Myrdal G., Op. Cit., p. 1537.
13. i) Mosher, A.T., Creating a Progressive Structure, Op. Cit., 1969, p.8.
    ii) Crivel, F., The Impact of Agricultural Extension: A Review of Literature in Basic Education and Agricultural Extension The World Bank Staff Working Paper, No.564, The World Bank, Washington, D.C., 1983, p.20-21.

Irrigation is the most vital form of land infrastructure which facilitates technological break through in agriculture,[14] besides being land augmenting in character. Assured and dependable irrigation raises multiple cropping and thereby, reducing unemployment and underemployment in agriculture.[15] Economic Development depends largely upon a well-thought-out and comprehensive net work of transport and communication facilities. Such facilities enlarges the market for the products and bring reasonable prices for them, besides, delivering needed inputs in time. Thus, the direct and indirect effects of the development of transport and communication facilities on the process of development cannot be overemphasized. Indicators like, roads, post-offices, passenger vehicles and broad-casting receivers stand for transport and communication infrastructure. Power supply in the form of rural electrification is considered to be significant for rural transformation.[16] Owing to lack of data for purpose-specific supply of electricity, the percentage of villages electrified from total inhabited villages is used as proxy for power supply in the rural areas. Electricity in the rural areas is expected to bring about far reaching changes being used for lifting waters , processing and preserving agricultural products, organising small, medium

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14. Hayami, Y., A Century of Agricultural Growth in Japan, University of Tokyo Press, Japan, 1975, p.171-176.
15. Myrdal, G. Asian Drama, Vol.III, Penguin Books, 1968, p.1281.
16. Kothari, V.N., and Padi, M.M., Economic Benefits of Rural Electrification in Gujarat, M.S.University Press, Baroda, 1977, p.194-196.

and cottage industries, providing amenities like lighting, spreading education and disseminating new knowledge.[17] Bank offices are important for mobilization of savings and channelizing investible funds to the needy sectors. Since the nationalization of scheduled banks and opening up of Regional Rural Banks, rural areas are gradually witnessing expansion of bank branches providing much needed credit for rural transformation. The credit need of rural sector is substantial. The credit requirement of agriculture alone has been estimated to be in the order of Rs.9400 crores by 1985.[18] Co-operative credit is the most convenient and cheapest institutional source of finance available to the farmers. Higher is the percentage of cultivators enlisted as the member of primary credit cooperatives, the larger is the utilization of credit from this source expected and thereby, leading to a rise of agricultural production. The adoption and diffusion of H.Y.V. seed technology would be largely affected by adequate and timely supply of chemical fertilizer, pesticides and insecticides. Fertilizer depots in adequate number in a region are expected to ensure the supply of these materials and further the process of agricultural modernization. Primary and middle schools represent the level of educational infrastructure in the rural areas. They produce developed human resources which are expected to settle in rural areas and participate in the development activities. Public health facilities are necessary to keep the people free from diseases and sufferings and maintain

17. Govt. of India, Ministry of Agriculture and Irrigation, National Commission on Agriculture, Report, 1976, p.228.
18. Ibid, p. 15.

an optimum state of health of the people and thereby, raising productivity.[19] Draught animals are the principal source of energy for carrying out farming operations. Apart from this, there is a growing realisation of the importance of dairy farming, poultry farming, pig, sheep, and goat rearing for creating additional employment opportunities and improving the economy of the weaker sections of the people. Veterinary hospitals, dispensaries and livestock inspection centres provide infrastructure for protecting these animals and birds. Thus, the selected indicators together are considered to represent the level of infrastructure facilities in the region adequately and are expected to influence the level of economic activities favourably and significantly.

It has been argued that the process of economic development will gradually result in the expansion of secondary and teriary sectors, and thereby, diverting the labour from the already over-crowded agriculture to these sectors.[20] In addition, non-agricultural activities have larger productivities than agricultural activities.[21] The percentage of nonagricultural workers from total workers is likely to represent such phenomenon. The number of factory workers per lakh population reflects the level of industrial development.[22] A large number of factory workers in a given region indicate a high degree of industrialization and vice-versa. Industrialization is also expected to bring about agricultural development.,[23] and to promote supplementary and complementary activities in the rural

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19. Panchamukhi, P.R., "Economic of Health", in a Survey of Research in Economics, ICSSR, Allied Publications, Bombay 1980, p. 242.
20. Clark Collin, Conditions of Economic Progress, Macmillan, London, 1975, p.406.
21. Verma, P.C. - Op. Cit., p.3.
22. Ibid. p.3.
23. Myrdal G. Prospect for an International Economy, as cited by Higgins, B., in Economic Development, Op. Cit., p. 15-16.

areas. The area under H.Y.V. paddy (as % of total area under paddy) reflects the degree of technological breakthrough in agriculture which is the recent yield raising and land augmenting innovation. Application of these seeds along with complementary factors like biochemical fertilizer, irrigation, pesticides, etc., raises the marginal yield of the cultivated land. Paddy is the single most important crop grown in the region and H.Y.V. seed technology, so far introduced in the state, is mostly in paddy crop. The area under crops other than food crops (as % of total cropped area) is taken as proxy for cropping pattern. The gross value of agricultural income is influenced by the type of the corn grown, their acreage, per acre yield of each crop and prices of agricultural products. In other words, cropping pattern also affects a regions agricultural income. The area under high valued crops is likely to raise the level of agricultural income. The level of agricultural development is also reflected in the intensity of multiple cropping, i.e., the percentage of gross cropped area to the net area sown. High cropping intensity is an index of a high level of agricultural development. Agriculture is the main stay of life of the people in the state economy which accounts for more than 60% of the state domestic product. A rise in the agricultural productivity either per farm worker or per hectare of cropped area will reflect the level of economic development not only of the rural economy, but also to a large extent of the economy of the state as a whole. Fertilizer consumption is an index of agricultural development, in that the use of chemical

fertilizer in prescribed doses ensures enormous prospects for raising agricultural yeild,[24] besides being an index for technological progress in agriculture. The selected indicators embarce almost all the important forms of economic activities undertaken in the rural areas, and therefore, are expected to adequately represent the level of economic activities in the rural sector of the state economy.

These selected indicators are intended to be combined through appropriate technique of composite index to represent their respective level of development. Developed human resources along with available infrastructure facilities related to the world of work would result in better economic performance in a given region.

2. Orissa State in the National Economy

Orissa State:

A brief account of the relative position of the state in the national economy in relation of its level of development appears to be necessary to justify its selection for present study. Before doing that, attempt is made to introduce the state in a few words. Orissa is one of the Eastern States of the country bounded by West Bengal and Bihar in the North, Bihar and Madhya-Pradesh in the West, Andhra Pradesh in the South and the Bay of Bengal in the East. The main stay of life of the people in the state is agriculture which absorb 70% of the working population and contributes 66% of the state income. Paddy is the single

24. Millikan, F.M. and Hapgood, D., Op. Cit. p.29

most important crop accounting for 56% of the cropped area.[25] The hilly regions of the state are rich in forest and mineral resources. Its forest produces valuable timbers and other forest products. Minerals include coal, iron-ore, manganese ore, chromite, limestone, dolomite, copper, lead, etc.[26] Amidst its plenty of natural resources the state is one of the poorest states of the country - a land of paradox. The analysis given below is indicative of the said position of the state, apart from indicating its low level of human resource development and available infrastructure facilities, which are assumed to be the causative factors of the above phenomenon in the present study.

Selected Indicators and Level of Development of the State:

The present study assesses the phenomenon from three different aspects, viz., the level of economic activities, the level of human resource development and available infrastructure facilities, of which the first is determined and the latter two are determinants. Attempt is made to determine the relative position of Orissa-State in keeping to the above three aspects and accordingly the indicators are selected. We have included only 13 States of our country owing to lack of comparable data availability. Besides, our analysis is subject to another limitation, since the data relating to the selected indicators do not pertain to a given year. The indicators are selected in three sets - the first set belongs to human resource development, the second, to available

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25. Government of Orissa, Bureau of Statistics and Economics, Economic Survey of Orissa, 1980-81, p. 11-14.

26. Ibid, p. 36.

infrastructure facilities, and the third, to economic development.

The human resource development indicators include the number of literate persons as percentage of total population in 1981, enrolment ratio of the students in the first (from class I to V in the age group of 6 to below 11 years) and the second (from Class VI to VIII in the age group of 11 to below 14 years) level of education in 1978, the number* of teacher per lakh population in 1978 and the number of doctors separately per lakh population and 1000 square K.M. of area in 1974. Literacy is the most important stock variable of human capital. Similarly teachers and doctors are the other important stock variables, of which the former accounts for quantity and quality of human capital formation and the latter maintains the health standard of the people. Enrolment ratio is the flow variable reflecting the rate of human resource development.

The selected indicators of available infrastructure facilities are detailed below. Net irrigated area as percentage of net area sown represents the most important land infrastructure. The villages electrified as percentage of total inhabited villages is a proxy variable for the infrastructure of rural power supply, while per capita consumption of electricity stands for infrastructure representing actual power supply in a given region. Roads, motor vehicles and daily news paper circulation

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* Teachers in primary, middle and Secondary Schools, as given in the Fourth Educational Survey of India, N.C.E.R.T., 1983 (p.68), are included.

accounts for transport and communication facilities. While hospitals and dispensaries, and hospitals beds represent public health measure facilities, scheduled commercial banks provide facilities for mobilisation of savings and allocation of investible funds. schools* stand for the facilities for human capital formation. However, the notable exclusion of railway, post offices, telephone offices, etc., are due to non-availability of data.

The last group of selected indicators is intended to represent the level of economic development. The G.N.P. per capita indicates the general level of economic performance in the economy. Cropping intensity accounts for multiple cropping and hence, agricultural productivity. Fertilizer consumption stands for degree of technological change in agriculture. The number of persons employed in public sector represents the level of sectoral development of the economy. While per capita value added by manufacturing industries measures the degree of industrialisation, the percentage of urban population indicates the degree of urbanization. The percentage of population living above poverty line is a measure of economic well-being of the people in the economy

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* Primary, middle and secondary schools are included.

These above three sets of selected indicators are expected to represent their respective levels of development in a broad sense. Attempt is made to construct composite index separately for each of the three sets of selected indicators for each of the states by following simple average technique. The selected indicators of each group are converted into relatives on the basis of their respective all India averages and the horizontal sum of the relatives of each group of indicators in respect to each state is divided by the number of indicators of a given group to give the composite index for that group. Thus, we have obtained three composite indices representing the level of human resource development, available infrastructure facilities and economic development separately.

Tables II-1, II-2, and II-3, present the selected indicators, their relatives and composite indices for human resources development, available infrastructure facilities and economic development respectively, for each of the 13 states. The tables indicate that the states viz., the Punjab, Maharashtra, Gujarat, West Bengal, Tamilnadu, Karnataka and Kerala are the advanced states in the country in regard to human resource and infrastructure development. Further, almost all of the above mentioned states are found to have high level of economic development. One may see from the tables that Orissa State is relatively backward in all three respects in the country. The State occupies the 13th, 11th and 8th position in regard to the level of economic development, available infrastructure facilities and human resource development respectively.

Thus, the foregoing analysis is conclusively indicative of the relative backwardness of the state. The selection of the state to examine the basic premise of the present study that human resource development and provision of infrastructure facilities will initiate the process of economic development appears to be more appropriate. A State, abounding in rich natural resources, grovels in poverty. What are the probably reasons? Will human resource development and provision of infrastructure facilities in which the less, provide an answer ?

3. District-wise Analysis

Population Growth:

Having obtained the general characteristics of the state in the national context, we proceed to the district-wise analysis. Table II-4, shows the population characteristics of the districts of Orissa. It is interesting to note that population growth rate during 1971-81 ranges all the way from a low figure of 10.3% for Mayurbhanja to as high as 29.8% for Sunganarh, while the state average is 20.1%. That is to say, even within a relatively backward state, there are wide variations in the population growth rate of different districts and if growth of population is taken as one of the indicators of economic growth (as Kuznets said that economic growth is characterized by three developments-namely growth of population, growth of total output and increase in per capita income) then we can say as a starting point that different districts are at widely differing stages of development in this backward state.

In order to examine the above proposition a little bit deeply, the following rank correlations derived from table - II-4, are of interest in this regard:

Rank correlation between:

Population growth and literacy +.75**

Population growth and Scheduled Caste and Scheduled tribe population - .28

Population growth and non-agricultural workers +.77**

Population growth and fertility aproximation rate +.03

Population growth and absolute population +.30

Population growth and density of population +.22.

(* Significant at 5% level)

(** Significant at 1% level)

The population growth in the districts according to rank correlation is positively and significantly associated with each of literacy level and proportion of non-agricultural workers - two indicators representing economic growth. Moreover, population growth rate is negatively associated with the population of Scheduled Castes and Scheduled Tribes. Although the coefficient is nonsignificant, the associative relationship indicates that districts with high percentage of S.C. and S.T. population are probably less developed.

Human Resource Development in Orissa State:

Human resource development as asserted earlier, is the process of acquiring and increasing the number of persons who have the skills, aptitude and enterprise essential for economic, social and political development of the country.[27] To understand the functioning of the process of development, it is necessary to have a knowledge about the level of human resource development in a given region. Thus, attempt is made here, to assess the level of human resource development in each of the districts of Orissa state with special emphasis on rural area. The selected indicators of developed human resource are given below.

i) Literate persons as percentage of total population.
ii) Number of students enrolled per 1000 population.
iii) *Number of teachers per lakh population.
iv) Number of primary and middle schools per lakh population.
v) Number of primary and middle schools per 100 Sq.K.M. of area.
vi) Number of hospitals, dispensaries and P.H.Cs., per lakh population,
vii) Number of hospitals, dispensaries and P.H.Cs. per 1000 Sq. K.M. of area.

Although all the indicators of human resource development mentioned in the section-'Selection of Indicators' are intended to be included for examining the level of human resource development for each of the district separately for 1971 and 1981, the above

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27. Harbison, F.H. and Myres, C.A. Op. Cit., p.4.
* Teachers include both trained and untrained teachers.

indicators are finally selected owing to the lack of availability of data. Further, the data constraints compel us to take schools and public health institutions as proxy variable for developed human resource. While the number of schools act as a proxy variable for other type of developed human resource not included due to non-availability of data, public health institutions are taken as proxy for public medical care measures which keep the people free from diseases, and maintain their health standard, and thereby, raising the productive efficiency of the people.

The indicators, thus selected, are presented in Table II-5, for each of the districts in Orissa State separately for the years, 1971 and 1981.* It can be observed from the table that almost all the indicators of human resource development have registered an increase from 1971 to 1981, except the proxy variable - public health institutions per lakh population. The increase in respect to literacy, students enrolment, teachers and schools is not less encouraging. Public health institutions do not register much increase, since their increase is more costly. The decline in coefficient of variation in most of cases of the indicators, especially literacy and enrolment of students indicates that the disparities existing among the districts in these respects have declined. It indicates that people have developed a sense of realisation about the anticipated benefits from developing human resource. Such trend of convergence is also indicative of bridging the gap existing in the level of economic activities among the districts.

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* The data for the nearest year are used as proxy owing to non-availability of data for a given year.

1.	Balasore	33.7	41.8	137	149	363	397	153	143	45	49	3
2.	Bolangir	19.4	25.8	80	112	323	407	151	185	22	30	3
3.	Cuttack	36.4	45.3	115	141	343	397	147	140	51	56	3
4.	Dhenkanal	27.8	36.7	91	120	354	407	147	146	18	21	4
5.	Ganjam	23.4	30.8	88	114	294	353	151	136	25	28	4
6.	Kalahandi	13.9	19.4	71	97	275	349	137	161	14	18	3
7.	Keonjhar	21.3	29.9	75	121	324	410	136	160	16	21	5
8.	Koraput	10.6	15.8	74	96	239	324	139	179	11	16	4
9.	Mayurbhanja	18.0	24.5	69	113	335	433	143	173	20	26	3
10.	Phulabani	19.8	26.6	93	120	379	447	211	259	12	16	5
11.	Puri	35.3	45.7	108	130	374	361	119	115	28	32	4
12.	Sambalpur	27.1	34.1	94	115	328	375	139	145	15	18	4
13.	Sundargarh	26.5	36.2	132	128	344	431	150	144	16	19	7
14.	State	26.2	34.1	105	122	328	387	143	152	21	25	4
15.	C.V.(%)	31.8	26.9	23	12	12	9	14	21	52	44	28

SOURCES:- Bureau of Statistics and Economics, Orissa, Statistical Abstract of Orissa, 1971 and 1979.
Census of India, 1981, Series 5 Orissa Part I of 1981, supplement.

Index for Human Resource Development:

On the basis of the above indicators, composite index is constructed to determine the level of human resource development in each of the districts separately for the year 1971 and 1981, following the simple average technique mentioned earlier. The technique of composite index is commonly adopted in several earlier studies[28] involving the problem of measuring developed human resources. Some of them have used enrolment ratio at different levels of education and others, different levels of education as indicators of human resource development in constructing the composite index, either using weights on the basis of years of education, earning differential, cost of education or not using weights. The composite index constructed in the present Chapter is rather a simple one which assigns equal weight to each of the selected indicators of human resource development. It is obtained by dividing the sum total of the relatives of all the selected indicators of human resource development, which are worked out on the basis of state average of each respective indicator, by the total number of indicators. Table II-6 presents the composite indices along with the relatives of the indicators of human resource development for 1971 and 1981. While each of

28. i) Harbison, F.H. and Myres, C.A. Op. Cit., p. 32-48
ii) Goel, S.C. "Education and Economic Growth, Macmillan, Delhi, 1975, p.32.
iii) Rudholph, S.H. and Rudholph, L.I., "Regional Pattern of Education", The Economic and Political Weekly, Vol.10 (26), June, p. 1039-48.
iv) Panchamukhi, P.R., "Measurement of Educational out-puts" in Indian Economics Association Conference papers, Bombay. Popular Prakashan, 1966, p. 71-85.
v) Manocha, L. and Sharma, H. "The Level of Human Resource Development in the States of India" Manpower Journal, Vol. 15(3): Oct.-Dec. 1970, p. 41

Sl. No.	District	Literacy (Relatives	
		1971	19
1	2	3	
1.	Balasore	129 (3)	12 (3
2.	Bolangir	74 (10)	76 (1
3.	Cuttack	139 (1)	13 (2
4.	Dhenkanal	106 (4)	10 (4
5.	Ganjam	93 (7)	90 (7
6.	Kalahandi	53 (12)	57 (1
7.	Keonjhar	82 (8)	88 (8
8.	Koraput	40 (13)	46 (1
9.	Mayurbhanja	68 (11)	72 (1
10.	Phulabani	76 (9)	78 (9
11.	Puri	138 (2)	134 (2
12.	Sambalpur	103 (5)	100 (6
13.	Sundargarh	101 (6)	106 (5
14.	State	100	100

N.B.:- (i) Calculated on

(ii)Figures in par

the relatives for human resource development indicators indicates the relative level of development of a district in regard to a specific indicator, the composite index shows the relative level of each of the districts in regard to overall human resource development, in a given year. The table shows that the relative position of each of the districts with respect to overall development of human resources and to each of its specific indicators remain more or less the same for both the years, 1971 and 1981. The rank correlation coefficient calculated for composite indices for 1971 and 1981, is found to be +.86 which is significant at at one per cent level. The rank orders assigned to the composite index and each indicator reflect that the districts, viz., Cuttack, Puri, Balasore and Sundargarh are ranking high in human resource development and the districts Kalahandi, Koraput and Mayurbhanja are ranking low in that regard. The coefficients of variation worked out for the composite index for 1971 and 1981 are 20% and 16% respectively. This implies that the districts are gradually converging in regard to human resource development. Economic implication of such tendency has already been discussed earlier. Further, it is to be noted that the variation existing among the districts in the level of human resource development is likely to be reflected in the variation in the level of available infrastructure facilities. Thus, this leads us to make further investigation into the level of infrastructure facilities available in each of the districts in Orissa-State and to determine its relationship with the level of developed human resources.

Available Infrastructure Facilities:

Infrastructure facilities available in a country assume different forms with marked degree of quality difference. Therefore, a single indicator of infrastructure cannot reflect the level of overall infrastructure development in a region. To determine the level of infrastructure development, attempt is made to construct a composite index by taking into account the available infrastructure facilities in each of the districts in Orissa State.

Indicators of Infrastructure Facilities:

In selecting the indicators of the available infrastructure facilities, efforts are made to give special attention to the rural economy, depending upon the data availability. The indicators selected are given below:

i) Road length in K.M. per 100 Sq. K.M. of area.
ii) Road length in K.M. per 100,000 population.
iii) Villages electrified in percentage of total inhabited villages.
iv) Net irrigated area as percentage of net area sown.
v) Post offices per lakh population.
vi) Post offices per 100 Sq. K.M. of area.
vii) Bank offices per lakh population.
viii) Bank offices per 1000 Sq. K.M. of area.
ix) Veterinary hospitals and dispensaries per 1000 Sq. K.M. of area.

x) Number of passenger vehicles registered per lakh population.

xi) Number of broadcasting receivers licences per lakh population.

In selecting the indicators emphasis has been given on the three vital forms of infrastructure facilities such as transport and communication, land infrastructure and rural electrification (power) which are very important in influencing rural economic activities. Thus, the selected indicators are likely to represent the level of rural infrastructure. The indicators selected for the years 1971 and 1981,* separately for each of the districts in Orissa State are presented in Table II-7.

One can see from the table that almost all the indicators of available infrastructure facilities have registered an increase from 1971 to 1981, in each of the districts. Although road length has shown appreciable increase from 1971 to 1981, this does not ensure an all-weather transport facilities.[29] In respect to the other two important rural infrastructure, namely, rural electrification (power) and irrigation, the state's performance is almost disappointing. While the percentage of electrified villages has increased from 7 in 1973 to 37 in 1979, the percentage of net irrigated area has risen from 11 to 20 from 1971 to 1981. It can also be noticed from the table that the figures

*The data for nearest year are used in case of non-availability of the data for a particular year.

29. Unsurfaced roads account for 87% of the total roadlength. And existing rural roads are more or less cart tracts crossed by innumerable unbridged nullas, streams and rivers. See: Bureau of Statistics and Economics, Economic Survey of Orissa 1980-81, p.48.

relating to bank offices and veterinary hospitals and dispensaries, etc., are also not encouraging. Thus, it can be observed that infrastructure facilities are not adequately available in the state and consequently, its pace of economic development is likely to be slow. The table also indicates the existence of inter-district variations in the availability of infrastructure facilities. The coefficients of variation show that the disparties in regard to the rural electrification, irrigation, bank offices, passenger vehicles and broadcasting receivers are still quite wide. However, in most of the cases, the disparities are declining. The existing disparities in the available infrastructure facilities may cause uneven performance in economic activities among the districts.

Composite Indix of Infrastructure Facilities:

To determine the level of available infrastructure facilities for each of the districts in Orissa-State, the above indicators are combined to a single unit with the help of a composite index. It assigns equal weight to each specified indicator and is constructed by following the procedure mentioned earlier. The composite index, thus constructed, is presented in Table II-8, for each of the districts for the year 1971 and 1981 separately. The table also provides the relative of each indicator for 1971 and 1981 for each district.

Sl. No.	DISTRICT	Road per 100 sq.km. Relatives		Road per lakh population. Relatives		Villages Electrified in % Relatives		Area irrigated in % Relatives		Post Offices per lakh population Relatives.		Post Offices per 100 sq. km. Relatives		Bank offices Scheduled bank per lakh population Relatives	
		1973	1979	1973	1979	1973	1979	1962	1981	1973	1979	1973	1979	1973	1979
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	Balasore	117 (5.5)	136 (3)	57 (12)	65 (13)	86 (9)	127 (5)	55 (7)	98 (5)	135 (2)	113 (4)	275 (1)	240 (1)	100	100
2.	Bolangir	94 (8)	92 (9)	94 (10)	93 (8)	100 (8)	100 (8)	127 (4)	95 (6)	88 (9)	85 (11)	75 (9)	80 (7)	100	150
3.	Cuttack	138 (2)	174 (1)	54 (13)	70 (12)	157 (2)	165 (2)	227 (1)	160 (2)	85 (10.5)	85 (11)	200 (2)	180 (2)	100	150
3.	Dhenkanal	91 (9)	105 (5)	107 (7)	123 (4)	114 (6.5)	144 (3)	63 (6)	55 (8.5)	100 (6.5)	96 (6.5)	75 (9)	80 (7)	100	100
4.	Ganjam	123 (4)	99 (6)	95 (9)	86 (9)	129 (4.5)	116 (7)	218 (2)	150 (3)	108 (5)	107 (5)	125 (4)	120 (4.5)	100	100
6.	Kalahandi	89 (10)	81 (11)	127 (4)	120 (5.5)	42 (11.5)	35 (11)	27 (11)	40 (10.5)	77 (12)	88 (8.5)	50 (11.5)	60 (10.5)	100	50
7.	Keonjhar	83 (11)	86 (10)	101 (8)	107 (7)	143 (3)	97 (9)	18 (13)	40 (10.5)	116 (3.5)	115 (3)	75 (9)	80 (7)	100	100
8.	Koraput	65 (13)	41 (13)	122 (5)	76 (11)	57 (10)	46 (12)	27 (11)	25 (13)	69 (13)	78 (13)	25 (13)	40 (13)	100	100
9.	Mayurbhanja	117 (5.5)	123 (4)	120 (6)	135 (3)	42 (11.5)	72 (10)	45 (8.5)	55 (8.5)	116 (3.5)	137 (2)	100 (5)	180 (4.5)	100	50
10.	Phulabani	80 (12)	72 (12)	202 (1)	187 (1)	14 (13)	19 (13)	90 (5)	60 (7)	176 (1)	170 (1)	75 (9)	60 (10.5)	100	100
11.	Puri	137 (1)	142 (2)	83 (11)	83 (10)	129 (4.5)	157 (2)	45 (8.5)	175 (1)	100 (6.5)	96 (6.5)	150 (3)	140 (3)	100	150
12.	Sambalpur	109 (7)	93 (8)	143 (3)	120 (5.5)	114 (6.5)	119 (6)	146 (3)	145 (4)	96 (8)	85 (11)	75 (9)	60 (10.5)	100	100
13.	Sundargarh	126 (3)	95 (7)	164 (2)	149 (2)	243 (1)	143 (4)	27 (11)	35 (12)	85 (10.5)	89 (8.5)	50 (11.5)	60 (10.5)	200	200
14.	State	100	100	100	100	100	100	100	100	100	100	100	100	100	100

From the table, it appears that there is almost no change in the relative position of each district in regard to the level of infrastructure development from 1971 to 1981. The calculated rank correlation coefficient between the infrastructure index of 1971 and of 1981 is +.85 which is statistically at a high level of significance. Although the districts, viz., Cuttack, Puri, Balasore, Sundergarh, Sambalpur and Ganjam rank high in the level of infrastructure development, some of them among themselves are found to change their relative positions from 1971 to 1981. The low ranking districts in the level of infrastructure development are Kalahandi, Koraput, Keonjhar, Mayurbhanja and Phulabani. Apart from this, the districts are observed to indicate a tendency of divergence in this regard, since the coefficient of variation of the composite infrastructure index has increased marginally from 23% in 1971 to 25% in 1981.

It will be interesting to observe the associationship between the level of infrastructure facilities and human resource development in a given region. It is expected that a high level of human resource development in a given region is directly related to a high level of infrastructure facilities. Both these factors together, are likely to influence economic activities positively. Therefore, a further study into the relationship between the level of human resource development and available infrastructure facilities among the districts appears to be essential.

Relationship between Human Resource Development and Infrastructure Facilities:

It has been pointed out earlier that the growing consciousness among the developed human resources to bring about a change in their economic well-being will be reflected in their increasing demand for providing necessary infrastructure facilities, so that they will accelerate the pace of economic activities. In the present section, therefore, attempt is made to examine the hypothesis that the higher is the level of human resource development in a region, the higher is the level of available infrastructure facilities. To test the above hypothesis, correlation between human resource development index and each of its indicators on the one hand, and infrastructure index and each of its indicators on the other, are calculated and are presented in a matrix form for the years 1971 and 1981 in Table II-9.

The table indicates that coefficients of correlation between human resource development index and infrastructure index for both the years, 1971 and 1981, are not only positive but satistically significant at very high level. Further, the coefficient has increased from .79 in 1971 to .84 in 1981. This implies that the concentration of developed human resource and the further expansion of infrastructure facilities in a given region are moving together in the same direction. It is also noticed from the table that human resource development index and almost all the indicators of developed human resources are positively and significantly correlated with almost all the important indicators of available infrastructure facilities. The correlation coefficient of each

of the human resource development index, literacy, enrolment of students and proxy variables like schools and hospitals (in terms of area) on the one hand, and each of road length (in terms of area) villages electrified, net irrigated area, and post offices, bank offices and veterinary institutions (in terms of area) on the other, is positive and significant either in one or both the years. Further, when the indicators are taken in terms of area rather than population, the coefficients of correlation are positive and statistically more significant. This, further, asserts the direct associationship between the level of developed human resource and available infrastructure facilities in a given area.

This close associationship between human resource development and expansion of infrastructure facilities will have important bearing on the level of economic activities. Therefore, it is necessary to make further enquiry into their influence on the level of economic activities.

Level of Economic Activities in Orissa State:

Economic development as asserted earlier is a complex process and it is difficult to represent perfectly the level of economic development in a single unit of measurement. However attempt has been made, in the present section, to resolve the problem of measuring economic performance in each of the districts in Orissa State with an emphasis on the rural area, by constructing a composite index on the basis of some selected indicators of development. The indicators selected for constructing the composite index of development are given as follows:

i) workers in non-agricultural activities as percentage of total workers;

ii) number of factory workers per lakh population;

iii) area under H.Y.V. Paddy as percentage of total area under paddy;

iv) area under crops other than food crops as percentage of total cropped area;

v) gross cropped area as proportion to net area sown;

vi) gross* value of agricultural product per farm worker;

vii) gross* value of agricultural product per hectare of net area sown.

Thus, the selected indicators, together, are expected to represent the level of economic activities particularly in the rural sector of the State. Table II-10. provides the selected indicators for each of the districts separately for the years, 1971* and 1981*. The table shows that almost all the indicator have registered increase from 1971 to 1981. It can be observed from the table that rural economic activities are at a low level and the pace of rural development appears to be slow. To cite a few examples, the percentage of non-farm workers has increased from 22.5 in 1971 to 25.4 in 1981, cropping intensity has increased from 1.21 in 1971 to 1.43 in 1981 and the area under H.Y.V. paddy has risen from 8% to 29% from 1971 to 1981. Inter-district variations in regard to the selected indicators of development can also be observed from the table. However, all these indicators,

*In some cases the data for the nearest year is used in the absence of data for the particular year.

separately, are not able to reflect the level of economic at activities among the districts. Therefore, the need for preparing a composite index on the basis of these indicators appears to be essential.

Composite Index for Development:

Following method adopted in the previous sections, the composite index for development has been constructed for the years, 1971 and 1981, separately for each of the districts. The composite indices and the relatives of the indicators are presented in Table II-11, for the years 1971 and 1981.

It can be observed from the table that the relative position of the districts in regard to the level of development does not appear to alter from 1971 to 1981. This is supported by the calculated rank correlation coefficient which is +.82 and is statistically at a high level of significance. The districts like Sundargarh, Sambalpur, Puri, Cuttack and Ganjam are lying above in the rank order of the level of development. Although the district, Sundargarh ranks first in the level of development it appears to be more advanced industrially rather than agriculturally. While the districts, viz., Puri and Sambalpur, indicate a trend of balanced development in agriculture and industry, the development of the districts like Cuttack and Ganjam is lopsided towards agricultural sector. The rest of the districts are less developed and the districts, viz., Mayurbhanja, Balasore, Keonjhar, Koraput and Kalahandi are the backward districts in the State. The present

1	2	3											
1. Balasore	68 (12)	8 (8)	33 (7)	1 10.5)	63 (9)	(12)	50 (13)	(6.5)	93 (9)	94 (6)	(9.5)	99 (7)
2. Balangir	76 (9)	72 (10)	17 (10)	15 (10.5)	162 (2)	96 (7)	125 (5)	67 (11.5)	97 (5.5)	93 (7)	88 (7.5)	100 (4.
3. Cuttack	114 (4)	124 (3)	92 (4)	92 (4)	125 (3.5)	114 (4)	100 (7.5)	111 (4)	117 (1)	123 (1)	111 (4)	118 (1)
4. Dhenkanal	95 (7)	106 (5)	7 (12)	9 (12)	63 (9)	97 (6)	138 (4)	106 (5)	95 (8)	91 (9)	181 (1)	97 (9)
5. Ganjam	118 (3)	100 (7)	34 (6)	39 (5)	125 (3.5)	186 (1)	100 (7.5)	83 (8.5)	115 (3)	119 (3)	83 (7.5)	99 (7)
6. Kalahandi	63 (13)	54 (13)	30 (8)	7 (13)	86 (6)	103 (5)	150 (2.5)	122 (3)	95 (7)	104 (4)	110 (5)	99 (7)
7. Keonjhar	109 (5)	105 (6)	25 (9)	24 (8)	50 (11.5)	41 (13)	137 (3)	78 (10)	88 (12)	83 (12)	86 (9.5)	74 (13)
8, Koraput	78 (8)	70 (11)	48 (5)	70 (5)	50 (11.5)	86 (8)	150 (2.5)	127 (2)	89 (10)	88 (10)	84 (11)	90 (1
9. Mayurbhanja	72 (10)	76 (9)	11 (11)	18 (9)	25 (13)	72 (10.5)	87 (9)	94 (6.5)	88 (12)	82 (13)	79 (12)	78 (1
10. Phulbani	71 (11)	68 (12)	4 (13)	44 (6)	100 (5)	124 (3)	175 (1)	183 (1)	97 (5.5)	102 (5)	65 (13)	1 (4
11. Puri	124 (2)	128 (2)	163 (3)	240 (2)	75 (7)	79 (9)	63 (11.5)	67 (11.5)	116 (2)	120 (2)	121 (3)	1 (3
12. Sambalpur	108 (6)	107 (4)	206 (2)	160 (3)	225 (1)	138 (2)	75 (10)	83 (8.5)	98 (4)	92 (8)	126 (2)	11 (2
13. Sundargarh	178 (1)	173 (1)	679 (1)	565 (1)	63 (9)	72 (10.5)	63 (11.5)	56 (13)	88 (12)	87 (11)	92 (6)	90 (1
14. State	100	100	100	100	100	100	100	100	100	100	100	

N.B.:-(i) Calculated on the basis of the Table II.10.
(ii) Figures in parentheses are the ranks assigned to the Varieties.

study assumes that the disparities existing among the districts in the level of development are due to their uneven development in human resources and availability of infrastructure facilities. Therefore, an investigation into the influences of the latters on the former appears to be essential.

4. Human Resource Development Infrastructure and Economic Development.

Attempt is made, in the present section, to understand the effect of each of human resource development and available infrastructure facilities separately on level of economic activities in the districts of Orissa. It has been earlier hypothesised that development of human resources along with the adequacy of infrastructure facilities will be associated positively with the level of economic activities in a region. The present section, at first, examines the effects of the formers separately on the latter. Since the formers are shown to associate directly, each of them, separately, is expected to have positive correlation with the latter. Thus, the hypotheses that each of the human resource development and the level of available infrastructure facilities are positively associated with the level of economic activities are pursued in the present section through the method of corelation analysis. Efforts are also made to ascertain the relation between each of the indicators of the two explanatory variables separately with each of the indicators of development index. Lastly, attempt is made to determine the joint impact of human resource development and available infrastructure facilities on the level of economic activities.

Human Resource Development and the level of Economic Activities:

Table II-12 provides the correlation matrix which indicates the relationship between the human resource development index and each of its indicators on the one hand, and development index and each of its indicators on the other, for the years 1971 and 1981. The table indicates that human resource development index is positively associated with the index of development and each of its indicators except area under H.Y.V. Paddy in 1981 and the area under nonfood crops for both the years. Its correlation with each of non-agricultural workers (in 1981), cropping intensity (in 1971) and agricultural product per hectare (in both the years) are significant. It can also be noticed from the table that most of the indicators of human resource development viz., literacy student enrolment, and the proxy variables like schools and public health institutions in terms of area are positively correlated with the development index and most of its indicators. The correlation in many cases with agricultural productivity per hectare, cropping intensity and workers in non-agricultural activities are found to be significant. The indicators taken in terms of population like teachers and proxy indicators like schools and public health institutions show non singificant (in most cases, negative) correlation with development index and many of its indicators. However, public health institutions per lakh of population bears positive and significant correlation with development index, factory workers and non agricultural workers, and negative nonsignificant correlation with the rest of the indicators. Almost all the

indicators of developed human resource show a negative (and in many cases significant) correlation with the area under nonfood crops.

The contragt in the relationship between the area under nonfood crops, and developed human resource and each of its indicators appears to be unusual. However, the reason for such phenomenon is as follows. During the Kharrif season, owing to the climatic conditions, paddy is the only suitable crop grown in the region. During the Rabi season, the inadequate irrigation facilities compel the farmers to allocate land to rabi pulses and wherever irrigation is available, land is allocated to summer H.Y.V. paddy which is more promising before the farmers. Further, yield raising seed technology for cash crop is yet to be suitably developed and demonstrated in the region. Besides, fluctuation of market prices, inadequacy of marketing and ware-housing facilities and lack of proper transport and communication are the factors to account for.

Although, nonsignificant coefficient does need no comments, assigning some probable reasons for such findings will not be inappropriate. The state is almost in the early stage in the process of developmental activities and is, therefore, featured by an inadequacy of developed human resource which have resulted in the widespread application of traditional technology in productive activities. Therefore, the impact of developed human resource is noticed to be non-significant. Economic development needs a

threshold level of human resouce development, the short of which will be bottlenecking in the very process. The threshold level of adult literacy or enrolment in primary education for economic development, for example, is asserted to be 40%.[30] But even the general literacy level in the state is far short of that level. Thus, the inadequately available developed human resource fails to bring about significant impact on economic activities.

Infrastructure Facilities and the level of Economic Activities:

In order to examine the effects of available infrastructure facilities on the level of economic activities a correlation matrix is presented in Table II-13. It shows the correlation of the infrastructure index and each of its indicators separately with the development index and each of its indicators for the years, 1971 and 1981. The infrastructure index is observed to be positively associated with development index and each of its indicators except the area under nonfood crops, for both the years. But it is significantly correlated with development index, workers in non-agricultural activities, cropping intensity and agricultural productivity per hectare for both the years, and per worker agricultural productivity for 1981. Thus, infrastructure development is found to have influenced the development of agriculture and nonfarm activities rather than industrial expansion. The state is industrially backward; and available infrastructure facilities may not be adequate to have an impact on industrialisation. Further,

30. Anderson, C.A. "Literacy and Schooling on the Development Threshold", in C.A. Anderson and M.J. Bowman (ed.) Education and Economic Development, Op. Cit., p. 347

...a under ...Y.V. paddy % of total ...a under 1971	1981	Area under crop other than food crops in % of total cropped area. 1971	1981	Cropping intensity 1971	1981	Agricultural productivity per worker 1971	1981	Agricultural productivity per hectare. 1971	1981
	10	11	12	13	14	15	16	17	18
.40	+.10	-.93++	-.47	+.59+	+.56+	+.10	+.61++	+.57+	+.66++
.12	-.10	-.84++	-.44	+.58+	+.51	+.02	+.37	+.67++	+.65++
.08	+.07	+.39	+.38	-.44	-.35	-.24	-.24	-.56+	-.44
.11	+.16	-.484++	-.71++	+.20	+.34	+.24	+.35	+.33	+.53+
.68++	+.49	+.01	-.28	+.73++	+.34	+.05	+.69++	+.56+	+.90++
.08	-.08	+.12	+.50	-.06	-.11	-.34	-.29	-.21	-.02
.01	-.18	-.57+	-.18	+.44	+.40	+.03	+.26	+.48	+.62+
16	-.09	-.35	-.48	-.25	+.19	-.09	+.26	-.27	+.21
15	+.01	-.62+	-.40	+.67++	+.65++	+.34	+.53+	+.76++	+.74++
19	+.05	-.61+	-.60+	+.75++	+.55+	-.06	+.56+	+.66++	+.78++
43	+.49	-.12	-.50	+.49	+.35	-.05	+.23	+.44	+.57+
14	-.05	-.57+	-.40	-.05	-.12	-.05	+.02	+.03	-.04

Tables II-7, II-8, II-10 and II-11.

the question of time lag required for the expansion of industrial activities may be taken into account. The non-significant influence of infrastructure development on H.Y.V. paddy may be due to insufficient and unassured source of irrigation facilities. It is interesting to note that the gradual rise of infrastructure facilities is able to explain a rise in per farm worker agricultural productivity in 1981. Similarly, one can notice the influence of the different indicators of infrastructure facilities on the level of economic development as well as on its different indicators. Mentioning a few interesting observations regarding the influence of some individual indicators of infrastructure facilities on the economic activities appears to be appropriate. Although the impact of rural electrification is observed to be positive on the level of economic activities, its influence is significantly felt on the expansion of non-agricultural activities rather than agricultural activities. Probably, rural electrification is yet to encourage private source of irrigation in the state, since its impact on H.Y.V. paddy is found to be nonsignificant. Bringing more land under H.Y.V. paddy needs assured and dependable source of irrigation - the requirements which private source of irrigation can meet. However, its impact is seen to be rising gradually as per hectare agricultural productivity is significantly correlated in 1981. Irrigation is positively associated with the level of economic activities and its impact is observed to be significant on agriculture as expected. But interestingly its impact on the area under H.Y.V. paddy and cropping intensity turn out to be nonsignificant in the terminal year, while they were significant in t

initial year. Irrigation facilities as available in the state at present, are from public sources consisting of flow system. Uncertainty of rainfall makes such sources less assured and dependable which, probably regulates the farmers behaviour in allocation of land under H.Y.V. paddy and in multiple cropping. Similarly, road length, bank offices, and veterinary hospitals and dispensaries in terms of area are more or less positively correlated with economic activities, but their association with the activities in agricultural sector is significant. It can further be noticed that when the indicators are taken in terms of population, their association with the indicators of development in most of the cases, is negative but nonsignificant. Thus, space factor in the provision of infrastructure facilities is probably more effective in influencing economic activities. However, population specific infrastructure indicators like bank offices and broadcasting receivers are positively as well as significantly associated with the activities in non-agricultural and industrial sectors. But our observation indicates that provision of infrastructure facilities on the basis of population will give more weightage on the activities biased towards urban sector in disregard to rural secotor. The correlation matrix also indicates that the increase in the infrastructure facilities raises labour productivity in agriculture. The increase in the availability of infrastructure facilitates technological break-through in agriculture and thereby, raises labour productivity. This is indicated by the associateship of each of irrigation, and bank offices and veterinary hospitals and dispensaries in terms of

area with the labour productivity in agriculture. Finally, one can see from the table that the correlation of infrastructure index and each of its indicators with area under nonfood crops, in most cases, are negative and significant. Earlier, it has been observed that human resource development is not able to make a positive impact on the expansion of area under nonfood crops due to inadequate availability of infrastructure facilities, specially land infrastructure. Added to this, probably there is still a gap in the agricultural extension information responsible for changing the cropping pattern in the region. Agricultural extension system is, at present, engaged in giving extension information mainly for introduction of H.Y.V. paddy rather than for suitable cash crops to be grown in the region. Moreover, the inadequacy of warehousing, marketing and transport facilities may act as deterrent in this respect.

Human Resource Development Infrastructure and the Level of Economic Activities:

Attempt is made, finally, to determine the impact of human resource development and available infrastructure facilities jointly on the level of economic activities. In doing so, the indices prepared for determining the level of human resource development, available infrastructure facilities and economic activities are used. Table II-14 presents the above three composite indices for the years 1971 and 1981, separately for each of the district.

The table shows that the districts, viz., Cuttack Ganjam, Puri, Sundargarh and Sambalpur are economically advanced districts in the State in both the years. These districts are also noticed to be developed in regard to human resource and available infrastructure facilities, with the exception of Sambalpur (in both the years) and Ganjam (in 1981) which are trailing a little behind in respect to human resource development. However, it appears that this does not affect their level of economic activities possibly due to the spread effects of developed human resource. It is interesting to note that the district - Balasore, being developed in respect to human resource and available infrastructural facilities, is a laggard one in economic activities. The district is noticed to be deficient in both the critical rural infrastructure, viz., irrigation (in both the years) and rural electrification (in 1971) which may be the probable reasons for its backwardness. Development of agriculture without irrigation and expansion of other activities without power cannot simply be conceived. Although, during the decade, a lot of improvement is seen in both the respect, the problem of time lag probably deters their effects to be seen on the level of economic activities. The backwardness of other districts in all respects may also be observed from the table. The above analysis indicates that the level of economic activities is directly associated with the level of human resource development and available infrastructure facilities. Further, out of the seven districts with high percentage of population of

Table II-14:

Composite Indices for Human Resource Development, Available Infrastructure Facilities and Level of Economic Activities.

Sl No.	District	1971 - Index			1981 - Index		
		Human Resource Development	Infrastructure	Economic Activities	Human Resource	Infrastructure	Economic Activities
1.	2.	3.	4.	5.	6.	7.	8.
1.	Balasore	135	113	69	126	121	77
2.	Bolangir	91	94	92	96	98	76
3.	Cuttack	139	143	112	132	153	117
4.	Dhenkanal	98	87	98	96	94	84
5.	Ganjam	106	131	100	95	118	108
6.	Kalahandi	72	68	88	76	60	80
7.	Keonjhar	92	91	82	97	88	67
8.	Koraput	70	66	81	79	67	87
9.	Mayurbhanja	86	83	63	93	90	72
10.	Phulabani	95	89	83	102	80	102
11.	Puri	118	106	114	115	139	122
12.	Sambalpur	94	116	136	91	108	115
13.	Sundargarh	115	132	177	109	119	159
14.	State	100	100	100	100	100	100

backward communities*, Sambalpur and Sundergarh are found to be advanced districts in both the years, and the district-Phulabani appears to be progressing fast. It appears that caste factor may not, reasonably be an obstacle in the path of economic progress, given sufficient attention.

To determine the joint impact of human resource development and available infrastructure facilities on the level of economic activities, the Analysis of Variance test is pursued. Analysis of Variance Method presupposes that the explanatory variable should be divided into subsamples on the basis of the dependent variable. The dependent variable i.e., the development index is divided into three subsamples according to the classification of the districts into three categories, which are obtained on the basis of averages of the explanatory variables, viz., Human resource development index and infrastructure index. The districts with values of the two composite indices, either equal to or above the averages are included in Class I, and the districts with one of the values of the two composite indices being either equal to or above the respective averages and the other remaining below, are clubbed in Class II, and the remaining districts with below average value of the two composite indices are put into Class III. This has been done for the years, 1971 and 1981 separately for pursuing the analysis of variance test.

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* Kalahandi, Keonjhar, Koraput, Mayurbhanja, Phulabani, Sambalpur and Sundargarh.

The results of analysis of variance are presented Table II.15. for the years, 1971 and 1981. The observed F-value for 1981 is 5.96 which is statistically significant at 5% level, while that for 1971 is not statistically significant. The finding for 1971 does not appear to be unreasonable. It has been observed that human resource development does not significantly affect the overall level of economic activities, while index of infrastructure facilities does. The inadequqcy in the developed human resource has resulted in the widespread prevalence of traditional technology. Under such situation the productive efficiency of the developed human resource has been asserted not to be significantly different from its undeveloped counterpart in economic activities. In contrast, the expansion of infrastructure facilities can positively and significantly influence productive activities even in the traditional technology. Because of the inadequacy in the availability in developed human resource, the joint impact of human resource development and available infrastructure facilities was not probably observed to be significant in 1971. During the decade from 1971 to 1981, there is an improvement in the level of developed human resource available in the region. Thus, the joint impact of the explanatory variables on the level of economic activities is observed to be significant in 1981.

The above analysis indicates that human resource development and availability of infrastructure facilities are

Table II-15:

Result of Analysis of Variance for the Impact of Human Resource Development and Infrastructure Facilities on the Economic Activities.

Year	Sources of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F-value
1	2	3	4	5	6
1971	Between the means	4066	(3-1) = 2	$\frac{4066}{2}$ = 2033	
	Within the samples	6924	(13-3)=10	$\frac{6924}{10}$ = 692.4	$F^{*}=\frac{2039}{692.4}$ = 2.94
	Total Variation	10990	(13-1)=12		$F_{0.05}=4.10$ with $V_1 = 2$, $V_2 = 10$
1981	Between the means	4466	(3-1) = 2	$\frac{4466}{2}$ =2233	$F^{*}=\frac{2233}{374.3}$ =5.96
	Within the samples	3743	(13-3)=10	$\frac{3743}{10}$=374.3	
	Total Variation	8209	(13-1)=12		$F_{0.05}=4.10$ with $V_1 = 2$, $V_2 = 10$

*Significant at at 5% level.

positively affecting the level of economic activities, in the State. Their impact appears to be concerned more with rural sector, since a large number of indicators pertaining to rural economic activities are positively and significantly affected by the explanatory variables. However, before drawing any final conclusion, it appears to be essential to make an indepth investigation into the impact of the above explanatory variables on the process of rural development.