

REPORT
OF THE TEAM FOR
TECHNO - ECONOMIC APPRAISAL
OF THE
INDRAVATI AND SABRI BASIN



धनमेव ज्ञानं

GOVERNMENT OF INDIA
MINISTRY OF REHABILITATION

(October, 1965)

R E P O R T
O F T H E T E A M
F O R
T E C H N O - E C O N O M I C A P P R A I S A L
O F T H E
I N D R A V A T I A N D S A B R I B A S I N

GOVERNMENT OF INDIA
MINISTRY OF REHABILITATION
(AUGUST, 1965)

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CHAPTER I - I PROCEEDINGS

SECTION I - SETTING UP OF THE TEAM

The Ministry of Rehabilitation vide their O.M.No. 20(5)/64 - DNK dated the 21st July, 1964, set up a Techno-economic Appraisal Team for the Indravati basin with the following composition and terms of reference.

COMPOSITION

1. Dr. A. Nagaraja Rao, Chairman
Adviser (Industry & Minerals)
and ex-officio Additional Secretary,
Planning Commission,
New Delhi.
2. Shri K.N. Butani, Member-Secretary
Deputy Secretary,
Ministry of Rehabilitation,
New Delhi.
3. Dr. A. Seetharamiah, Member
Industrial Adviser,
Directorate General of Technical
Development,
New Delhi.
4. Dr. S.P. Verma, Member
Industrial Adviser,
Directorate General of Technical
Development,
New Delhi.
5. Shri D.H. Kulkarni, Member
Dy. Inspector General of Forests,
Ministry of Food and Agriculture,
New Delhi.
6. Shri P.V. Rao, Member
Superintending Geologist,
Madhya Pradesh Circle,
Bhopal.

S/Shri T.M. Thomas, Joint Director, Railway Board
and S.C. Roy, Chief Administrator, D.D.A. were co-opted as
members, after the first meeting of the Team.

TERMS OF REFERENCE:

3. The Team was required to undertake a "techno-economic appraisal of the Indravati Basin which include an assessment of the potential for development in field of forest resources, minerals and industry, with special reference to

possibilities of large scale rehabilitation of "displaced persons in the area". Later, the area was extended to cover the Sabri basin also.

4. For the appraisal of hydro-electric and irrigation potential in the area and in particular for the assessment of the economic possibilities of the Chitrakut Hydro-electric Project a separate team under the Chairmanship of Shri Gobaliengar, Chief (Power), Planning Commission, was set up. The preliminary report of this team was made available to the Techno-economic Appraisal Team in the 1st week of January, 1965.

PROGRAMME

5. The first meeting of the team was held on July 27, 1964 under the Chairmanship of Shri K.P. Mathrani, Secretary, Ministry of Rehabilitation. It was decided at this meeting that as the rehabilitation of migrants was to be kept under most in mind, the team should keep in view both the immediate as well as the long term objectives in drawing up the development programme. The former category would include those industries where the requirements of capital and skilled manpower were comparatively less and they could, therefore, be set up more expeditiously. The latter should also include wherever possible medium/large scale industries to exploit the vast natural resources of the area as known already.

6. The team considered the available material, published as well as un-published, and which had a bearing on the development potential of the area. In addition, Shri D.H. Kulkarni was requested to prepare a detailed paper on the forest resources of the area. For this, the preliminary

data was obtained from the local forest officer. Shri P.V. Rao, was likewise requested to prepare a detailed paper on the mineral resources of the area. This and Shri Kulkarni's paper appear as ~~Appendices (i) & (ii)~~ ^{Annex. I & II} to this report. These indicated the resource base on which Dr. Seetharamiah and Dr. Varma have made their recommendations for the industrial development of the area.

7. In addition to the first meeting, the local members of the Team held five meetings in the room of the Chairman in Rajna Bhavan, New Delhi on November 11, December 1, and 4, 1964, January 11 and ^{March 25} 1965.

FIELD VISITS

8. The Chairman and some members of the team undertook a tour of the area in the 2nd week of December. The places visited by the team included Bailadilla, Dantowara, Balimela, Kalimela towards Malkangiri, Chitrakut-falls (Dam Site), Tirthagarh, Kutamsar and Sunki.

9. The team held discussions with the local officers and state level officers of Madhya Pradesh and Orissa at Jagdalpur and Koraput respectively.

10. The team held discussions with officers of the Madhya Pradesh Government at Bhopal on 17-4-65 and with officers of the Orissa Government at Bhubaneswar on 26.6.65. The record of these discussions is given in Annexure IV and V respectively.

Acknowledgement.

11. The Team is grateful to the authorities of the Madhya Pradesh and Orissa Governments and to the officers of the Inspector General of Forests and the Geological Survey of India who have assisted in the collection of necessary data and given their unstinted co-operation. The Team wishes to record also its thanks to the officers of the Ministry of Rehabilitation and in particular to Shri K.N. Bhutani Member/Secretary for the co-operation they have all uniformly extended. The Team wishes also to thank Shri S.P. Bansal Senior/Officer of the Industry Division, Planning Commission for his kind assistance to the Chairman during the course of this work.

SECTION II- DESCRIPTION OF THE REGION.THE REGION.

12. The Indravati-Sabri basin constitutes roughly the Dandakaranya region. The area covers parts of Kalahandi and Koraput Districts of Orissa and Bastar Districts of Madhya Pradesh.

13. The Indravati river rises in the high land on Kalahandi on the Eastern Ghats, flows South-West and Westwards as it enters the Koraput Districts. It continues to flow down West and enters the Bastar District near Kotpad. It then cuts across the Bastar District, turns South to become the border of Madhya Pradesh and Maharashtra and then joins the Godawari river, South of Bhopal-Patnam.

14. The main tributaries of the Indravati river in this region are Kolab, Warangi, Phwardig, Nebra, Mendki, Kangar, Jalmer and Motri in Madhya Pradesh and Machkund, Piteru and the Sabri in Orissa. Most of these tributaries contain water almost throughout the year. The area thus forms to a great extent the catchment area of Godavari river.

SECTION III - DEVELOPMENT POTENTIAL OF THE REGION

15. This vast expanse of wild land with inadequate communications is abundantly rich in forest and mineral resources. The Indravati river and its tributaries offer ample scope for irrigation and power. The region is sparsely populated and almost the entire population consists of Adiyasis. Most of the natural resources are yet unexploited. A very brief description of the natural resources is given below:-

FORESTS

16. The area covered by forests is about 1,600 sq. miles. Teak and Sal exist in abundance, Bamboe, soft and hard woods of commercial value are also to be found in several localities. Minor forest products which also have considerable commercial value include mypobalan, Sabai and broom grasses, mohua flower, lac, cane etc.

MINERALS

17. Out of 22 minerals reported to occur in the three districts of the area, Iron-ore, Limestone quartz and Quartzite, Manganese and Bauxite occur in abundance. A map of Dandakaranya showing mineral resources is appended to the report.

Water

13. The region lies within fairly high rainfall zone. Water yield of both the rivers viz. Indravati and Sabri and their tributaries is far more than adequate to meet the requirements of the area in terms of irrigation and power. There is many a suitable site on the rivers in the area for dam construction for harnessing the irrigation and power potentials of these rivers. Feasibility of constructing various projects viz. Upper Indravati, Bodhghat, Bhopalpatnam, Chitrakut, Upper Kolab Scheme and Upper Sileru Hydro-electric scheme, etc. has already been examined by the Gopaliengar Team.

CHAPTER II

INDUSTRIAL POSSIBILITIES

The scope and size of industrial development of the Dandakaranya Project area comprising the Indravati-Sabri Basin and extending to regions both in the Madhya Pradesh and Orissa States needs to be tackled from a number of angles.

2. Apart from the vast potentials of the still unexplored region for industrial and economic development and possessing rich forest and mineral resources, there is a large tribal population whose living standards have to be improved as soon as possible. In the Bastar District alone, of a total population of 1.67 millions, the Adivasis constitute 77%. Besides providing improved agricultural facilities, it is also essential to provide alternative as well as additional occupations. Added to this, is the problem of finding employment and means of livelihood for a large number of displaced persons who are being rehabilitation from East Pakistan. In addition to the efforts in hand for developing agricultural lands wherever feasible in this vast area and settling the displaced persons, it is essential to provide additional employment opportunities both at the rehabilitation centres as well as through development of suitable industries wherever feasible. The problem of opening up the area by constructing roads and additional railway communications is already receiving attention. Synchronizing with these developments and wherever possible integrating them with industrial possibilities, there exists abundant scope not only for economic development of this region and finding employment for large numbers but also to its helping to contribute to overall national development.

3. The scale of the project is of a magnitude and

3. Any industrial development programme of a virgin area of this magnitude and complexity has to follow a variety of patterns. Besides exploring the utilisation of mineral and forest resources for establishing large-scale capital intensive industries, some of which will materialise only after long gestation periods, simultaneous attempts are necessary to establish medium and small-scale industries as well as cottage and rural industries which are labour intensive and will help to contribute to increased employment and development of skills. In this context, after carefully going through the N.C.A.E.R. Report on the Development of Dandakaranya as well as the draft report prepared by the Small-Scale Industries Organisation, our team has endeavoured to set out in this report, the several directions in which a simultaneous effort needs to be attempted.

The industries holding scope for development have been broadly divided into the following groups:

- (i) Cottage and rural industries.
- (ii) Small-Scale Industries through industrial estates.
- (iii) Medium industries and factory units through industrial townships.
- (iv) Large-scale industries.

4. The cottage industries can be developed in the several settlement colonies through education and propaganda on interesting the population to carry on their programme in the rural homes or at suitable centres established in each resettlement area in close proximity to their homes. The specific quantum and types of manufacture to be encouraged in each area needs to be followed up closely by the technical-cum-administrative Officers on the staff of the Dandakaranya Project area and detailing them specifically for this purpose.

It is necessary for such staff to live and function in close proximity to the workers themselves. In some of the large villages and small towns also, encouragement could be given to the population to integrate themselves in some of these branches. The main point to be remembered, however, should be that the products manufactured are such as to meet the immediate requirements of the villages and towns in close proximity to centres of production rather than to develop markets at distance away and distribute them over extensive areas. This aspect is of considerable importance particularly in initial stage of development. The rural and cottage industries that deserve consideration on the above lines are:-

- (1) Bidi making
- (2) Rope making
- (3) Hand-operated spinning units.
- (4) Bamboo and cane work
- (5) Decentralised cottage match making.
- (6) Weaving on handlooms
- (7) Hand-made footwear such as chappals and shoes.
- (8) Tailoring.
- (9) Durry & carpet weaving.
- (10) Preparation of fishing nets.
- (11) Manufacture of dolls & other decorative articles from soft wood.

5. Addition to this list have to be made based on local demand for product and the extent to which they could be produced from local raw materials through decentralised operations. A careful assessment of the position from time to time will help to enlarge the list as necessary. It must, however, be pointed out that these developments will not generally lead to full-time employment, as much as to provide subsidiary employment to augment their otherwise meagre income.

6. In regard to small-scale industries, listed below, they should develop through the establishment of industrial

estates in reasonable proximity to large settlement centres (these should be permanent settlement centres and not transit camps) or in the vicinity of small towns. Some of these holding prospects, as pointed out also by the small Industries Service Institute, are:-

- (1) Paralkote
- (2) Umerkote
- (3) Kondagaon
- (4) Jagdalpur
- (5) Koraput
- (6) Ambaguda
- (7) Jeypore
- (8) Malkangiri etc.

7. Suitable resettlement colonies of large sizes should be picked out for establishment of industrial estates in their proximity also in due course. From the list of industries given, selection should be made for each industrial centre. There should be no objection, depending on demand, to repeat items at more than one centre. In fact in some cases it may ultimately be necessary to produce some of these items almost at each centre:-

- (1) Washing soap
- (2) Aluminium utensils
- (3) Aerated water
- (4) Bakery unit
- (5) Storage battery
- (6) Tyre retreading and vulcanising
- (7) General engineering workshops
- (8) Tubular steel structures
- (9) Hosiery
- (10) Textile processing
- (11) Tool handles
- (12) Electrical and domestic plasticware
- (13) Umbrella
- (14) Cycle manufacture small scale unit
- (15) Drawing & Survey instruments
- (16) Footwear
- (17) Canvas weaving

The Team was informed that the Orissa Small Industries Corporation has already programmed to take up some small industries (e.g. manufacture of aluminium utensils, general

engineering workshop, cast iron foundry, carpentry unit and raw mill etc.) in the displaced persons camps at Sunabeda and Theruvelli in Koraput District. It is suggested that the small industries programmes of the D.D.A., and the Orissa Small Industries Corporation for Koraput and Kalahandi should be so co-ordinated as to avoid duplication of effort.

8. As specialised skill has to be developed with reference to each type of industrial operation, it may be necessary to start with a few industries only in the initial stages and guide the workers to specialise in them before launching on an extensive programme covering all industries. Simultaneously to undertaking construction of industrial estates and deciding on the industries to be developed from time to time, suitable centres should be established to train the workers in the skills involved so that, as soon as industrial estates and facilities are ready, the workers could be encouraged for actual production operation. In regard to the organisational pattern, the industrial estates should be established as a part of D.D.A. operations. The standard pattern of buildings and facilities already in vogue at other centres should be adequate. The units could be developed either by attracting small entrepreneurs or by the DDA engaging in the development directly. The workers could, in due course, be attracted to own the units themselves and work as a cooperative effort. The estimated cost furnished in the draft report of the Small Industries Service Institute for each of these centres could serve as a broad guide.

Medium Industries & Factory Units.

9. The several industries which could be developed through independent factory units located in specially demarcated industrial township areas, are indicated below at suitable centres in the Indravati-Sabri Basin area and located within reasonable distance of some of the major towns which could be provided with reasonable water, power, transport, and the affluent disposal facilities. Area extending to 500 to 1000 acres should be selected and laid out for integrated industrial township development. These should be used as centres of growth of medium as well as some large-scale industries. The industries indicated in these two categories should be notified for wide circulation and entrepreneurs invited to develop them in the selected areas. In close proximity to these industrial areas, residential colony should also be developed providing all necessary living facilities. The development of industries in these townships could follow a dual pattern. Besides private entrepreneurs who may show interest and undertake development, Government should also establish units and train and find employment to the workers in different fields. The latter arrangement could help particularly in selected industries to develop cooperative units of workers to come into being gradually as the workers accumulate savings and would be in a position to own the unit as a cooperative effort. The medium industries which hold prospect are:-

- (1) Aluminium utensils
- (2) Improved Agricultural implements
- (3) Low tension insulator

- (4) Rice bran oil
- (5) Spinning unit
- (6) Power loom
- (7) Saw mills and wood working shops (packing cases)
- (8) Wood seasoning and chemical treatment (sleepers)
- (9) Bolt & Nut plant
- (10) Rice Mills
- (11) Oil Mills
- (12) Small Flour Mills
- (13) Small Khandhari and Gur Units
- (14) Fruit Juice Unit

The team was informed that the Orissa Small Industries Corporation has already taken up the following industries to provide employment to displaced persons at Sunabeda and Theruvelli:-

- (1) Aluminium utensils
- (2) Improved Agricultural implements
- (3) Low tension insulator
- (4) Rice bran oil
- (5) Spinning unit
- (6) Power loom
- (7) Saw mills and wood working shops (packing cases)
- (8) Wood seasoning and chemical treatment (sleepers)
- (9) Bolt & Nut plant
- (10) Rice Mills
- (11) Oil Mills
- (12) Small Flour Mills.

10. For these developments also this team has not endeavoured to indicate the details of capacity and investment requirements as these have been adequately covered in the draft report of the Small Scale Industries Organisation. For broad planning purposes and estimates of financial requirements, the information given in their report should be reasonably adequate. The sites recommended by them for development of the specific industries should also be useful as a first guide and it is not proposed to repeat the same here in this report. A statement indicating the Capital investment and the employment potential per unit of small scale and medium industries is appended to this Chapter.

As more units of the same industry are set up at one or different Centres depending upon the availability of raw-materials, demand for the products and development of training and organisational facilities, there would be a corresponding increase in the requirements of capital and the employment potential.

LARGE SCALE INDUSTRIES.

11. In this report, we are endeavouring to concentrate on the scope for large-scale industries and setting out those which may deserve development both immediately as well as after some further studies and examination. These industries involve comparatively heavier investments and offer wider opportunity for economic development based on the raw material resources of the region. It is, however, recognised that many of them will take several years to fructify. It seems, however, most essential to give a good start to at least some of the major developments for which raw-materials and other data are reasonably adequate. In regard to others, further action necessary to be taken for assessing, in clearer terms, the raw materials and other availabilities have been recommended. The large-scale industries listed below may be grouped into four major categories and are dealt with in the subsequent chapters:-

- (a) Industries based on forest resources;
- (b) Industries based on mineral resources;
- (c) Engineering and other industries.

12. It is necessary, however, to add that in this report no effort has been made to cover the question of

development of the Bailadilla Iron Ore Project nor the establishment of a Pig Iron or Steel Plant based on these resources. The Bailadilla Iron Ore Project is already well in hand and several facilities in the form of road, railway connection for exploration of these deposits, said to be one of the best in the world both in quality and quantity, are under implementation. Apart from the size of operation already decided, the question of expanding the operations further is also under consideration. These will, no doubt, be taken up and implemented from time to time in the context of supplying these rich resources of iron ore for export as well as for local developments. The question of establishing an integrated iron and steel project based on these resources and the selection of a suitable site for such development is also under active consideration of Government. It is clear, therefore, that whether the integrated plant is put up immediately or only a start is made with a large pig iron project to function as a nucleus for an integrated plant some years later, there is an abundant scope for the establishment of iron and steel manufacture in this area. This will require several other developments ancillary to it both to precede it as well as to follow. This would be coupled with several other potentialities of this area for industrial development, dealt with in the other chapters, indicates the desirability of establishing some engineering industries also both for meeting immediate needs for certain types of items as well as to form a base for further developments. These are dealt with in the chapter under other miscellaneous industries.

Investment and Employment potential per unit in medium and small scale industries

Sl. No.	Name of the Industry	Capital Investment	Capacity	Employment potential
1.	2.	3.	4.	5.
1.	Washing Soap	98,400	625 maunds per month	18
2.	Phenyle	20,400	2500 gallons per month	6
3.	Insecticides	3,22,600	100 tons per month	14
4.	Tent and Tarpaulin	23,75,900	Rs. 9,37,500 per month	69
5.	Sheet metal (G.I.-Buc Bucket)	1,02,400	9000 pieces per month	39
6.	Lead Acid storage Battery	35,200	125 batteries per month	9
7.	Industrial hand gloves	2,62,000	22500 pairs per month	105
8.	Aluminium utensils	1,02,400	130 maunds per month	18
9.	Wood screws	96,000	12500 gross no. per month	42
10.	Wire nail and Panel pins	3,50,400	68 tons per month	17
11.	Vitreous enamel ware	2,80,000	9 tons per month	49
12.	C.I. foundry	1,98,000	75 tons per month	64
13.	Paint and varnish	2,07,500	44 tons per month	44
14.	Bakery & confectionery	2,48,800	60,000 lbs. per month	26
15.	Steel trunk and suitcase	52,500	2600 no. per month	24
16.	Industrial fasteners	1,80,000	10,000 gross per month	24
17.	Low tension porcelain insulators	4,88,000	50 tons per month	98
18.	Agricultural and cutlery implements (forging and processing)	74,200	Rs 10,000 per month	33
19.	General Engineering Workshop (General job work)	46,900	Rs. 5000 per month	6

1.	2.	3.	4.	5.
20.	Conduit pipe	1,55,500	1,20,000 ft. per month	20
21.	Pipe fittings	1,08,000	30 tons per month	32
22.	Tubular steel furniture & hospital appliances	2,36,800	Rs. 55000 per month	28
23.	Building hardware	5,19,000	Rs. 84000 per month	56
24.	Rice bran oil	3,97,900	15 tons of refined oil per month	37
25.	Tyre retreading and vulcanising	2,46,200	375 tyres per month	25
26.	Hosiery	1,19,000	Rs. 18,800 per month	28
27.	Ammunition boots	2,85,700	2500 pairs per month	51
28.	Saw-mill cum-wood- working unit	78,500	Rs. 11,200 per month	34
29.	Rope-making	1,89,300	50 tons per month	18
30.	Wooden electrical accessaries	52,300	Rs. 6250 per month	14
31.	Hand tools	4,50,000	Rs. 33000 per month	80
32.	Spinning mill	1,50,00,000	25000 spindles	500
33.	Power loom	2,00,000	20 looms	50

ON FILE III

LARGE SCALE INDUSTRIES BASED ON FOREST RESOURCES

RAW MATERIALS
RESOURCES OF
THE REGION

As mentioned earlier the Inravati-Sabri basin covers the district of Bastar in Madhya-Pradesh, the southern portion of Koraput District and parts of Melanandi District in Orissa. The Deputy Inspector General of Forests in his report (Appendix I) has stated that the total forest area in the two river basins is approximately 11,740 sq. miles. He has also estimated that it would be fairly safe to assume that 60% of the total forest areas, i.e. about 7,000 sq. miles would be available for exploitation.

2. The Deputy Inspector-General of Forests, after detailed discussions with various Forest Officers in charge of the Forest Divisions in this area, has come to the conclusion that the average existing growing stock of all kinds of trees per acre is roughly as follows:-

(a) Timber..	4 tons
Fuel wood..	12 "

Total	16 "

Total growing stock of timber in 7,000 sq. miles of forest (4,48,000 acres) ..	17.92 million tons
Total growing stock of fuel wood in 7,000 sq. miles (4,48,000 acres)	53.76

	71.68

- (b) Mean annual increment @ 2% (i) 0.3584 m.tons of timber,
 on growing stocks. (ii) 1.0752 m.tons of fuel wood.

3. The quantity which is being extracted now is given below:

	Timber	Fuel Wood	Total
(a) Recorded annual out-turn.	87,300	43,190	1,30,490
(b) Unrecorded annual	24000	1,70,000	1,94,000
Total	1,11,300	2,13,190	3,24,490

4.

(a) Surplus Timber	3,58,400 tons	.. 2(b) (i)
	(-) 1,11,300 "	.. 3(a)+3(b)
	<u>2,47,100 tons</u>	Timber
(b) Surplus Fuel wood	10,75,200 tons	.. 2(b) (ii)
	(-) 2,13,190 "	.. 3(a) +(b) Fuel Wood
	<u>8,62,010 tons</u>	

5. The removal of surplus timber and surplus fuel wood

referred to above would not in any way affect the growing stocks of timber and fuel wood in the forests. These large surpluses would justify the setting up of wood-based industries, such as commercial plywood,

particle board and hard-board. It is stated that data regarding the availability of different species of hard-woods is not available. It would be necessary to collect the relevant information in order to remove this lacuna.

6. Apart from timber and fuel wood, considerable quantities of bamboo are also available from the forests in this region.

It has been estimated that out of 1,676 sq. miles of forests in the Bastar Division (including Bastar Kanker), an area of 754 sq. miles would be available for commercial exploitation.

(This figure has been arrived at after making allowance for bamboo needed for 'Nistar') This area, on the basis of a four-year cycle and an out-turn of one ton per acre per annum,

would yield air-dry bamboo to the extent of about 1,20,000 tons per year. It has been estimated that bamboo resources of Malkangiri, Kalimela and Ramgiri ranges which fall within the Sabri basin in the South Jeypore circle along the Bastar border would yield about 96,000 tons of air-dry bamboo per year. The Team visited bamboo forests in the Malkangiri range and had detailed discussions with the Forest Officers in-charge of the Jeypore Circle. These discussions revealed that apart from the 96,000 tons of bamboo from the three forests ranges referred to above, an additional 30,000 tons could be made available from the forests in the Jeypore Division. Thus, the total availability of bamboo from the Bastar and Jeypore areas would amount to approximately 2,46,000 tons per year. For a pulp mill having a capacity of 100,000 tons of pulp per year, bamboo to the extent of 280,000 tons would be needed. The availability of bamboo falls short of the requirements of the mill to the extent of about 34,000 tons. It was stated that the bamboo forests of Bastar and Jeypore were rich in bamboo resources and the prospects of finding additional bamboo for meeting the full requirements of the pulp mill were bright. It is necessary to carry out a systematic survey of the forest resources of this region and in case there is any shortfall between the availability and demand, it would be necessary to take up plantations of bamboo and long fibre pulp in this region on an immediate basis so that additional bamboo ~~ix kixkx kxgkxk ox xx kxmedkxk~~ ~~basix ox kixk xdkkixkxk kxmbxk~~ might become available after about 8 to 12 years. The availability of such a large quantity of bamboo in a fairly compact area could be taken advantage of for setting up a large pulp mill. In the "Feasibility on dissolving pulp, paper and paper-board making in Madhya Pradesh

(1964)" issued by the Government of Madhya Pradesh, Directorate of Industries, it is stated at pages 13-14.

"Bastar offers very good opportunity for industrial development. According to an estimate made by the Forest Department of Madhya Pradesh about 1,30,000 tons of surplus bamboo would be available in the following regions after meeting the commercial requirements of Bastar etc. :-

<u>Name of the region</u>	<u>Quantity available</u>
1. Bastar (east, west and North)	28,200 tons per annum
2. Kanker	27,000 " "
3. Raipore (east, south and north)	16,150 " "

	1,30,350 tons per annum

This figure of bamboo is on a very conservative side and it is estimated that if a detailed and systematic survey of the area was done, the total availability will be more than 3,00,000 tons per annum. Further, as stated earlier, under the scheme of 'Plantation of quick-growing species' sponsored by the Government of India, plantation of species is also being done in Bastar District during the Third Five-Year Plan, which will provide substantial raw material for the development of pulp and paper industry."

7. The possibilities of establishing the following wood and bamboo based industries in this region are examined below. A statement indicating the capital investment and the employment potential per unit is given at the end of the Chapter.

- (1) Bamboo-Kraft Pulp,
- (2) Newsprint,
- (3) Hard-board,
- (4) Commercial Plywood-cum-Flush Doors
- (5) Particle Board (Chip-board),
- (6) Matches and Misc. wood-based industries.

Since the demand for caustic soda and chlorine of the pulp and newsprint mills is large, the setting up of a captive caustic soda/chlorine plant has also been suggested.

ESTABLISHMENT OF A CENTRAL PULP MILL

1. INTRODUCTION : All the paper mills now in operation in India

are integrated mills producing pulp and converting it into paper in the same premises. None of them has a surplus of pulp for commercial sale. Till recently, there was no unit producing only pulp for sale to other consuming units.

8. The first unit for the production of rayon-grade pulp from bamboo with a capacity of 54,000 tons came into operation towards the middle of 1963. This unit is located near Kozhikode (Kerala). After some initial trouble they have been able to manufacture pulp of satisfactory quality for use in the production of viscose staple fibre in admixture with certain proportion of imported pulp. This unit produces small quantities of paper-grade pulp for sale to consuming units located in various parts of the country. As they pick up experience in standardizing the quality of rayon-grade pulp, there may not be any surplus capacity left over for production of paper-grade pulp.

9. Efforts to develop the production of pulp in large-scale units intended for commercial sale have been made for the last several years. As far back as 1954, a 100 tons per day pulp mill was licensed in Assam with the intention of meeting the demand of pulp of paper mills in West Bengal. Unfortunately due to flowering of bamboo and certain financial difficulties, the proposal for the setting up of this unit was dropped by the sponsors. Early in 1960, another licence for the establishment of a 50 tons per day bamboo-based pulp mill was issued to M/s Central Pulp Mills, Pooná. This scheme was jointly sponsored by a few paper mills in the Western region, who have no pulping capacity and have always been dependent on supplies of imported pulp. After close scrutiny of the economics of the proposal,

The sponsors found that a 50-ton unit would not be conducive to profitable operation and, therefore, they requested the Government to enhance the capacity to 100 tons per day. But for the limitations of raw materials' availability, this capacity could have been larger. This unit has recently obtained an Export-Import Bank loan for financing the import of plant and machinery from U.S.A. It is expected that it would be possible for this unit to start production within the next 3 years. The entire production is almost fully booked for supply to the existing small paper units in the western region.

II. FUTURE DEMAND 10. The target of production for paper and paper-boards envisaged for the Third Plan is 700,000 tons per year. It has been tentatively suggested that in the Fourth Plan a production target of 1.2 million tons of paper and paperboards may be fixed. At present, bamboo is the principal raw material used for paper making in the country. It is expected that the known available resources of bamboo in the country, which are estimated at about 2 million tons, would be adequate to sustain a production of about 0.8 million tons of paper and paper-boards. In order to achieve the production targets for paper envisaged in the Fourth Plan, it would therefore be necessary to harness tropical hardwoods and other fibrous raw materials like bagasse, cereal straws, jute-sticks, etc. which are available in the country. Most of these are short-fibred materials and it will not be technically feasible to manufacture good quality paper from pulps derived from these materials without admixture of small quantities of long-fibred pulps. The traditional sources of long-fibred pulp are conifers like fir, spruce and pine. Unfortunately the resources of these species of timber are restricted to the lower Himalayan regions and the problems connected with tapping and utilizing

these resources have still not been completely solved. It would, therefore, be necessary to utilize bamboo, which is a long-fibred material for blending with short-fibred pulps from bagasse, straw, hardwoods, etc. The development of the paper industry beyond the Fourth Plan would have to depend substantially on plantation species of timber like eucalyptus, which again are short-fibred materials. The Development Council for paper and the planning Group on the Chemical Industries have recommended that over the next 15 years the production of paper and paper-boards in the country should be stepped up to at least 3 million tons in order to give us a modest per capita consumption of 7 kgs. (as against about 200 kgs. in the United States and over 120 kgs. in U.K.). Such an ambitious programme would be possible only if sufficient long-fibred pulp could be made available for blending. The total demand for such long-fibred pulp for admixture during the Fourth Plan has been roughly estimated at about 200,000 tons per year.

III. ECONOMIC 11. SIZE OF THE
UNIT

In industrially advanced countries like Canada, U.S.A. and Scandinavia, the sizes of pulp mills normally vary from 600 to 800 tons per day. In the case of pulp and paper industry economies are achieved primarily by the increased sizes of units. Studies carried out reveal that under the present Indian conditions it would be necessary to put up a pulp mill with a capacity of about 300 tons per day in order to market pulp at prices comparable with international pulp prices. The prices of pulp are normally subject to fluctuations depending on the supply position. During 1962-63, there was a slump and the prices of bleached sulphite/sulphate pulps. Currently, the prices had fallen down to around £50 per long ton, but have increased and range around 65 to 68 per long ton, c.i.f. Indian ports. This includes a freight and insurance charges amounting to about £20. It is, therefore, obvious that the overseas manufacturers are in a position to supply pulp on

board at around £ 45 per ton (about Rs. 600/-). The object of setting up a large unit for the manufacture of pulp in the country should be to market pulp at a price comparable with international prices so as to enable the pulp mills to utilize such pulp in the manufacture of common grades of paper and paper-boards. The planning Group on Chemical Industries has suggested that in the Fourth Plan two central pulp units each with a capacity of about 300 tons per day should be established in the public sector.

IV REQUIREMENTS 12. A unit producing 300 tons per day (100,000 tons per year) OF RAIPUR MAT

11. of kraft pulp based wholly on bamboo would require assured supply of about 280,000 tons per year of air-dry bamboo. According to the indications given by the various State Forest Departments it appears that there are only a few possible locations in the country where bamboo supplies of this order could be expected. One of them is in the Bastar area of Madhya Pradesh supplemented to some extent from the adjacent bamboo forest Divisions of Kanker District of Orissa. The data in respect of availability of bamboo, which has been furnished, is only of a preliminary nature and requires very careful assessment.

A systematic survey of the availability of bamboo in this region is, therefore, a very important pre-requisite to the establishment of this project.

The Team was informed by the officers of the Madhya Pradesh Government that the Kanker region should be excluded when taking into account the bamboo resources for the proposed pulp and paper industries in the Bastar area since Kanker resources had already been earmarked for the setting up of pulp plant in the Bilaspur area. In order to assess the resources available, the Madhya Pradesh Government was requested by the team to indicate other areas which may have been similarly earmarked for other units.

V. PROCESS TO
BE ADOPTED

13. The Sulphite and the Kraft (Sulphate) processes are two of the well-known chemical pulping processes which are almost universally adopted for the pulping of various species of cellulosic raw materials. Besides these two, in recent years semi-chemical pulping processes, like the cold-soda and neutral-sulphite processes, have been developed particularly for the utilization of agricultural residues. The adoption of the Sulphite process involves use of sulphur which has to be imported in our country. There is also the technical problem of absorption of sulphur-dioxide in water, which, under normal climatic conditions prevailing in our country, would be low. Because of these two disadvantages and also the problem of recovery of chemicals, which is technically not feasible in this case, the Sulphite process has found only a limited application in our country; there is only one integrated pulp and paper mill in our country which adopts this process. All other units adopt the Kraft (Sulphate) process for the pulping of bamboo. In recent years, the technology of increasing yields of pulp by this process has been fairly well-developed and it is now possible to get easily about 40% bleached pulp yield. The principal chemicals required in this process are caustic soda, sodium sulphate and lime. Although there was a temporary shortage of sodium sulphate a couple of years ago, the supply position has now become easy due to increased and more efficient recovery of this chemical by the manufacturers of viscose rayon.

No serious problems may, therefore be encountered in the procurement of this chemical. Caustic soda could be easily manufactured wherever the demand is fairly large and there is a possibility of utilizing all the chlorine produced. It is also possible to instal modern chemicals and heat-recovery system to recover about 85% of the Caustic soda used in the process. Keeping all these advantages in view, it is suggested that the proposed central pulp unit should adopt the Kraft pulping process with suitable provision for high yield pulping.

VI. REQUIREMENTS OF PROCESSED CHEMICALS

14. A bleached Kraft pulp mill with a daily capacity of 300 tons would require the following chemicals:-

(a) Caustic Soda	..	15 tons/day
(b) Chlorine	..	25 " "
(c) Sodium Sulphate	..	30 " "
(d) Limestone	..	100 " "

It would be advantageous to plan for the installation of an electrolytic caustic soda/chlorine plant of sufficient capacity as an ancillary unit to meet this requirement of the pulp mill and also of the proposed newsprint mill to be located nearby.

VII. REQUIREMENTS OF WATER

15. It is common knowledge that a pulp and paper mill requires a copious supply of clean, fresh water. The water requirements of a pulp mill of the size envisaged is about 18 million gallons per day. The pulp mill, therefore, should be located near a river or stream with sufficient flow of

water all around the year. While selecting the site for the pulp mill, the scope for getting such a large water supply should be carefully examined. It is understood that the minimum flow of water in the Indravati and Sabri rivers is of the order of 300 cusecs (150 million gallons) each. This has to be confirmed. The water flow is sufficiently large in these two rivers to bring about the necessary dilution to provide biological oxygen demand.

VIII. REQUIREMENTS
OF COAL AND
POWER

16. Provision has to be made for the generation of adequate steam for digestion, washing, bleaching and drying of the pulp produced. Considerable amount of power is also required for the operation of various pumps and motors in the pulp mill. The total requirements of power of a 300 ton per day pulp mill would be of the order of 16,000 KW. The steam generated for the process and also recovered from the Chemical Recovery Section could be passed through turbines for generation of power to the maximum extent possible and the pass-out steam could be utilized for the process. It may be roughly estimated that about 75 to 80% of the power required could be generated from the steam which has to be raised for the unit. It would, therefore, be necessary only to purchase about 20 to 25% of the power requirements from the National Grid. In the case of this pulp mill about 4,000 KW of power should have to be obtained

from outside sources and possibilities of procurement from Machkund and/or Korba have to be examined carefully. The annual requirements of coal for raising the steam in this pulp mill would be about 180,000 tons, which could be drawn from Korba.

IX. LOCATION

17. It is important to choose a proper location for the pulp plant having regard to various factors such as the transport of bamboo and other raw materials and finished products and proximity to a town in order to reduce the need for creating a separate colony for the workers. Various possible locations have been carefully examined and some of them had to be ruled out on one account or the other. Two locations, one near Sukma on the banks of river Sabri and another near Jagdalpur on the banks of river Indravati, satisfy the various factors enumerated above. It would be necessary to construct a bridge across Sabri near Sukma to enable easy transport of bamboo from the forests in the Jaipur division. Sukma is already connected to Jagdalpur and Konta by a State road. It is understood that the survey for the railway-line connecting Dantewara with Bhadrachalam via Sukma and Konta has already been authorised. It is expected that this rail connection would be in operation by the time the pulp factory goes into production. Jagdalpur has all the facilities but the chief raw material, namely bamboo, would have to be moved over a longer distance. A detailed investigation should be undertaken in order to determine whether the choice should ultimately be near

Sukma or near Jagdalpur.

In contrast to the approach of the Team to endeavour to utilise the bamboo resources of the region covering a reasonable area to establish a large economic pulp plant, as indicated already in para 12 on page 25, the Madhya Pradesh Government have suggested that the resources of Kanger Kanher region should be excluded from the purview of the unit to be developed in the Bastar area. The necessary resources of bamboo for a large unit have, therefore, still to emerge from the revised picture of availability which may be given by the Madhya Pradesh Government. On the issue of assembling these resources from the contemplated area as a whole, there is again the question of drawing the requirements from both the Orissa and Madhya Pradesh States.

The Madhya Pradesh Government has suggested that they would prefer to locate the pulp plant near Sukma instead of near Jagdalpur as the latter site is likely to present certain difficulties in respect of water in addition to the difficulty likely to be involved in the long haulages of bamboo to feed this unit. During discussions with officers of the Orissa Government it has been pointed out that substantial power will soon be available in the Balimela area and this area is known to be rich in bamboo and other forest resources some of which also may have to be secured to meet the needs of a central economic pulp plant unit - the most suitable location would be in the vicinity of Balimela.

Against the above background the Team feels that the final decision about the actual siting of the pulp plant and other large industries based on such forest

resources should be determined after further and more detailed locational studies with reference to each of the alternative sites. These studies should cover all aspects precisely, such as availability of bamboo and its most economical transport to specific sites, other transport facilities, water, power and effluent disposal facilities. While making out these comparative studies the advantages of the Balimela region as well as Sukma indicated by the two Governments should be taken into account. In the meantime both the Orissa the the Madhya Pradesh Governments should organise immediate and detailed surveys of the bamboo and other forest resources of this area to enable the technical team making site studies to formulate their proposals with precision.

X. BRIEF
DESCRIPTION
OF EQUIP-
MENT
REQUIRED.

18. The following are the major items of plant and machinery required for the pulp mill:-

- (a) Bamboo chippers, conveyors and re-chippers;
- (b) Continuous Digester (KANYAR or DEFIBRATOR);
- (c) Three-stage Bleaching equipment;
- (d) Three-stage Washing equipment;
- (e) Fibro-Flash Pulp Drying equipment, Wet-lapping and hydraulic baling equipment;
- (f) Transport equipment, like Fork lift trucks, shunting engine etc.
- (g) Power Plant (two steam turbines);
- (h) Steam boilers (two high pressure boilers);
- (i) Chemical Recovery Section consisting of evaporators, recovery furnace and waste-heat boilers;

- (j) Lime burning, causticizing and hypo-chlorite preparation equipment;
- (k) Pumps and Electric Motors;
- (l) Machine Tools and maintenance;
- (m) Piping and Cables;
- (n) Laboratory testing and process control instruments.

Detailed specifications of the above equipment and capacity of individual items have to be drawn up. It is possible that a part of the plant & machinery could be procured from licensed manufacturers (e.g. Tata Johnson, Jamshedpur, the Utkal Machinery Corporation, Rourkela, Dor Oliver Ltd., Bombay; A.V.B., Durgapur, etc.). Their delivery periods are, however, likely to be protracted.

XL ESTIMATES OF PROJECT COSTS AND PHASED PROGRAMME OF INVESTMENT

19. The cost of plant & machinery required for the project would approximately be Rs. 12 crores. Land, building, erection charges, working capital, etc. could be estimated to cost around Rs. 4 crores. The total project cost might therefore, work out to Rs. 16 crores. This does not include the expenditure on workers' colony that might have to be provided.

20. The phased programme of investment would be as follows:-

		(Rs. in lakhs)
1st Year	...	20.00
2nd Year	...	300.00
3rd Year	...	900.00
4th Year	...	380.00
Total:		1600.00

XII. UTILIZATION OF PULP. 21. About 20,000 tons of pulp could be supplied in slush form to a newsprint mill located adjacent to this pulp mill.

The balance of 80,000 tons of dry pulp could be utilised for supply to the existing and new paper mills in various parts of the country. Provision for wet-lapping and hydraulic baling equipment may also be made in the pulp mill so as to supply the pulp in semi-dried form (with about 30% moisture) to paper mills which are not very far off.

XIII. EMPLOYMENT POTENTIAL 22. The total employment potential would be of the order of

2,500 persons. The break-up is given below :-

(1) Supervisory	50
(2) <u>LABOUR</u>	
(i) Direct	200
(ii) <u>Indirect:</u>	
(a) for other ancillary services & facilities	200
(b) for extraction and transport of bamboo.	2,000
Total	2,450

XIV. TRANSPORT REQUIREMENTS

23. Bamboo and coal could be moved almost entirely by road. About 2,000 wagons per year would be required for the transport of processed chemical and other raw materials. In addition to this, about 8,000 wagons per year would be required for the transport of the finished material, namely pulp.

XV. LINES ON WHICH FURTHER ACTION HAS TO BE TAKEN 24.

(a) A systematic survey of the bamboo resources of the region has to be carried out on a priority basis

In case the availability falls short of the demand, immediate steps will have to be taken for plantation of Bamboo.

(b) The availability of water to the extent required for this project from Sabri and Indravati rivers should be closely examined. Data regarding the flow of water in these rivers during various seasons of the year should be compiled in order to study the pollution problems arising out of effluent disposal.

(c) The need for construction of a bund for storage of water for supply to the mill during dry months should also be studied.

(d) It might be desirable to associate the Napa Mills in this project from the beginning with a view to eventually taking up this project as No. 2 Mill of Napa Mills in the Public Sector.

(e) Detailed investigations should have to be carried out to ascertain the relative merits of Sukna and Jagdalour areas for final selection of a site for the pulp mill.

(f) The Madhya Pradesh and Orissa Governments might be advised to reserve the bamboo resources of this region for the proposed pulp mill and not to allocate the bamboo of this region to any other mill.

I. INTRODUCTION 25. WESPRINT Newsprint is characterised by its low selling price and, therefore, the most important consideration in its manufacture is low production cost. At the same time, the paper must be strong enough to withstand running on a high-speed paper machine and on rotary printing presses. It must have good ink absorbency colour and surface texture. It must have sufficient capacity to permit comparatively thin sheets to

be printed on both sides. In countries like Scandinavia and North America, where conifers of light colours are available in very large quantities, no difficulties are experienced in meeting these requirements of the paper. Conventional newsprint is, therefore, defined as "a printing paper consisting of not less than 70 % mechanical wood pulp and weighing about 52 to 54 GSM". However, in countries like India, where soft woods are not readily available, the need for harnessing alternate raw materials like tropical hard-woods, bagasse etc. arises.

II. DEMAND FOR NEWS-PRINT

26. In the Third Plan a target capacity of 150,000 tons per year had been fixed for newsprint in order to meet the estimated consumption of 120,000 tons by 1965-66. This demand is based on the actual consumption of newsprint under the restrictive policy adopted by the Government. If curbs on consumption were to be removed, the free demand for newsprint would be very much higher. With the spread of literacy and rise in living standards, the demand for newsprint is steadily increasing. But, unfortunately, due to the tight foreign exchange position, it has not been possible so far to meet this demand in full. It has been estimated that during the Fourth Plan the demand for newsprint would continue to rise and by 1970-71 the free unrestricted demand may be of the order of 3,00,000 tons per year. In order to meet this demand, at least by the end of the Fourth Plan it would be necessary to create a capacity of the order of 3,30,000 tons per year.

III. PRESENT POSITION

27. In India, there is only one newsprint mill in the public sector, namely the National Newsprint & Paper Mills

Ltd., Nepsa Nagar (Madhya Pradesh). This unit has a capacity of 30,000 tons and was established in 1955. Ground wood pulp from Salai (Eoswellia serrata) in admixture with about 35 to 40 % of kraft pulp from bamboo is used for the manufacture of newsprint in this mill. Due to the inherent characteristics of salai fibre, the paper does not compare in brightness with the conventional newsprint manufactured from conifers. There has, therefore, been considerable criticism about the quality of the indigenous newsprint. This is the first venture of its kind in the world and, therefore, considerable technical difficulties have been experienced. In recent years, substantial improvements have been made in the quality of the paper as well as in the economics of operation. Newsprint mills in Scandinavia and North America have generally capacities ranging from 600 to 1,000 tons per day and the production is undertaken on a single fast-running machine. Compared to such units, the Indian newsprint mill is naturally at a disadvantage. However, encouraged by the results so far achieved, this mill has taken up a programme of expansion of its capacity to about 75,000 tons per year. Orders for plant and machinery have been placed and it is expected that the increased production would be available in the early part of the Fourth Plan. For their expansion the Nepsa Mills propose to modify the pulping process for salai and instal a semi-chemical pulping system which, while giving the same yield as ground wood-pulping at almost the same cost, would result in a pulp of better quality.

28. Besides this scheme, licences have also been granted for the establishment of two newsprint mills in the private

sector with a total capacity of 90,000 tons. Of these, the project of M/s. Shri Gopal Paper Mills for a soft-wood based 60,000 tons per year newsprint mill in Punjab is still in the preliminary stages and is not likely to be completed before the latter part of the Fourth Plan. In the other project of M/s. Birla Gwalior Private Ltd for a bagasse-based unit, with a capacity of 30,000 tons per year in U.P., not even preliminary negotiations have been started and it is very unlikely to be implemented during the Fourth Plan. The manufacture of newsprint presents many technological problems and at the same time this is a low-profit item. There seems, therefore, an obvious reluctance on the part of the private entrepreneurs to take up such scheme. Presumably, much of the production of newsprint in the future years also should have to be undertaken in the public sector. The suggestion for the establishment of a second newsprint mill also in the public sector has already been accepted in principle by the Government. The stage has now come to work out the details of the project more closely. Although the possibilities of harnessing bagasse for the manufacture of newsprint are being explored, it might be desirable to base the second newsprint unit also on a combination of hard-wood and bamboo pulps, as has been done in the case of the Nepa Mills.

IV. CAPACITY.

29. As already stated earlier in this Note, the capacity of newsprint mills in advanced countries like North America and Scandinavia is of the order of 600 to 1,000 tons per day, such production is normally undertaken on one fast-running machine. In our country too, it would be most advantageous to undertake production in very large units,

but unfortunately, the availability of raw materials places a restriction on the capacity of such units. Based on the experience of some of the units in Australia and Japan, and also taking into consideration the conditions obtaining in our country, it is felt that a newsprint mill should have a capacity of at least 200 tons per day, if not more.

This figure is also indicated from the point of view of the output of a paper machine with a width of about 240 inches operating at the speed of about 1,500 feet per minute.

V. REQUIREMENTS OF RAW MATERIALS AND LOCATION.

30. This unit could be based on utilizing semi-chemical pulp from hard-woods to the extent of about 70% of the fibre composition and the balance being made up of bamboo craft pulp. A unit of this size would require about 60,000 tons per year of hard-woods and 20,000 tons of bamboo craft pulp.

31. The availability of hardwoods to this extent in the Dandakaranya region should not pose any serious problems in view of the large unutilized surplus of hardwoods referred to in para 4 page 2. No data regarding the sustained availability of various species appears to have been collected. It would be necessary to undertake a quick survey of the forest divisions in the two river basins with a view to ascertaining the position. Adequate quantities of mixed hardwoods should be sent to the Nepa Mills for conducting pulping tests. At the initial stages, the Newsprint Mill could be based on the existing natural resources of hardwoods.

32. — It would be highly desirable to locate the proposed central pulp mill and the newsprint mill at the same site (near Sukma or Jagdalpur) in order to have common facilities (such as water supply, steam, power, effluent disposal, etc.) and draw bamboo pulp in slush form for newsprint production.

VI. PROCESS TO BE ADOPTED AND REQUIREMENTS OF CHEMICALS.

33. Normally, newsprint is manufactured from ground wood-pulp, the process being eminently suited for long-fibred conifers. In the case of short-fibred tropical hard-woods, adoption of the ground wood pulping process results in damage to the fibres and shortening of the fibres almost to a powdery stage. In recent years, considerable experience has been gained in Australia and in Japan in the pulping of such hard-woods adopting the cold-soda semi-chemical pulping process. In this process, the cost of chemicals used is almost equal to the power consumed in the conventional ground-wood process, but the quality of the pulp is much better. It would, therefore, be desirable for the proposed newsprint mill to adopt this semi-chemical process.

34. The requirements of various chemicals for this unit would be as follows:-

- | | |
|------------------|---------------|
| (a) Caustic Soda | .. 7 tons/day |
| (b) Chlorine | .. 7 tons/day |

In addition, small quantities of clay, alum and rosin might also have to be used. If the newsprint and the pulp mill were located at the same place, a captive caustic soda-chlorine plant with a capacity of about 35 tons per day of chlorine might be installed.

VII. WATER REQUIREMENTS.

35. A mill of this size would require daily supplies of about 16 million gallons of water. There would appear to no difficulty in obtaining a perennial supply of water to this extent from Sabri or Indrawati rivers but the position has to be checked, as already indicated in para 18(b) page 12.

VIII. REQUIREMENTS OF POWER AND COAL.

36. This newsprint mill would need about 16,000 Kw of power. In the interest of best utilization of fuel, it would be desirable to use high-pressure steam for generation of power and utilize the pass-out steam for the process. About 50% of the power requirements of the mill could be produced internally, and the possibility of obtaining the balance from Korba or Machkund has to be ensured. The coal requirements of about 120,000 tons per year could be obtained from Korba.

IX. PROJECT COST AND PHASED PROGRAMME OF INVESTMENT.

37. The total cost of the project may be roughly estimated at Rs. 14 crores, of which plant & machinery would be about Rs. 10 crores with a foreign exchange component of Rs. 7.5 crores and the balance would be needed for land, building, erection, working capital and other miscellaneous elements. This does not include the requirements for the building of workers' colony.

38. The phased programme of investment would be as follows:-

		(Rs. in lakhs)
1st year	.....	20.0
2nd year	.....	250.00
3rd Year	.....	750.00
4th Year	.....	430.00
5th Year	.....	.....
Total	.....	1,450.00

39. It might be possible to procure plant & machinery to some extent within the country. The details of this have to be worked out after discussions with various indigenous manufacturers of pulp and paper mill machinery. It is, however, doubtful whether any high percentage of indigenous content would be possible in this instance, because the proposal involves installation of semi-chemical pulping equipment and a wide and fast-running paper machine. One of the world's leading manufacturers of paper machinery, namely M/s. Beloit Corporation, Beloit (U.S.A.) who have manufacturing facilities in several countries and who produce the largest number of paper machines, have recently been allowed to fabricate paper mill plant and machinery in India in collaboration with M/s. Birla Brothers. They might be ready for accepting orders within the next 18 to 24 months, and the possibilities of utilizing their fabricational facilities for procurement of plant & machinery to this newsprint mill could be looked into. In this case, the only difficulty would be that the equipment cannot be delivered before 1969, and as such the starting up of the unit would be delayed. On the contrary, if the preliminary studies could be completed quickly and Government sanction for the import of plant & machinery is obtained before the end of 1965, it might be possible to import the machinery within 18 months and to have the plant in operation by early 1968. This again is another aspect which has to be carefully examined.

X. TRANSPORT REQUIREMENTS.

40. It is expected that the mixed hard-woods and coal would be moved almost entirely by road. About 1,000 wagons

per year would be required for the transport of chemicals and sizing materials. In addition to these, about 7,000 wagons per year would be needed for the distribution of the finished product, namely newsprint, all over the country.

XI. EMPLOYMENT POTENTIAL.

41. The newsprint project would provide employment in all to about 1200 persons. The break-up would be as follows:

(1) Supervisory	50
(2) LABOUR	
(i) Direct ...	200
(ii) Indirect ...	
(a) for other ancillary services and facilities	200
(b) for extraction and transport of hard-woods.	750
Total	<u>1,250</u>

XII. LINES ON WHICH FURTHER ACTION HAS TO BE TAKEN.

42. (a) Suitability of different species of hard-woods for conversion to pulp and a proper assessment of the sustained annual availability to feed this mill at least for a period of 20 years should be carried out.

(b) The results of the above assessment would indicate whether it would be necessary to select suitable compact areas within reasonable distance of the location of the mill for plantation purpose. The species of pulp/timber best suited for these areas should be selected after the necessary experimental work.

(c) In view of the very large anticipated demands for paper and newsprint, as indicated in paras 19 and 26, and also taking into consideration the possible difficulties of natural regeneration of existing hard-woods, it would be necessary to undertake large-scale plantations of suitable fast-growing species. In this connection, it is stated at

page 5 of the "Feasibility Report on Dissolving Pulp, paper and paper-board making in Madhya Pradesh (1964)" issued by the Government of Madhya Pradesh, Directorate of Industries, as follows:-

"It will be worth-while to mention here that under the scheme of 'Plantation of quick growing species' sponsored by the Government of India for meeting the increased raw material requirement of the pulp and paper industry in the country, Madhya Pradesh has been allocated a substantial sum of Rs. 68.20 lakhs for raising plantations over 34,100 acres during Third Plan period. The allocation made is being utilized for raising of fast-growing species suitable for pulp and paper manufacture in the districts of Bastar, Bilaspur, Shahdol and Sidhi. This scheme will generate additional raw material for the pulp and paper industry and thus create more scope for the development of the industry in the State."

While the Team was in Dandakeranya, it was given to understand that as against a Third Plan target of plantations of over 34,100 acres, so far eucalyptus hybrid plantations to the extent of about 3,200 acres only have been raised as per details given below:-

(1) Bhambhede in Kenkar	...	700 acres
(2) near Dantewara	...	500 "
(3) near Bijapur	...	1,100 "
(4) near Sukma	...	500 "
(5) near Konta	...	400
Total		----- 3200 acres -----

It is noticed from the above that out of a sum of Rs. 68.2 lakhs allocated for raising plantations, a very small amount has been utilized so far. Moreover, the plantations have been over a scattered area in small patches. It would be desirable to take up plantation in large compact blocks, as far as possible. The plantation should be industry ori-

ented , i.e. the plantation should be taken up in and round-
about the proposed location of factories which are to uti-
lize the plantation timber.

The Government of Orissa has indicated that Koraput
has substantial resources of hardwoods which are at present
not being utilised effectively and in this context scope
for development of paper and other industries based on such
hardwoods should be favourably considered. The Team suggests
that following a detailed survey to assess the precise
availability of hardwoods and their suitability for pulp
for use in a mixture with bamboo pulp for the manufacture
of paper, the question of establishing a paper unit in
this area may also be examined further. This will enable
manufacture of paper based on hardwoods being undertaken
in this area, utilising also thereby some part of the bamboo
pulp from the large economic unit developed separately in
the Indravati Basin at .

HARD BOARDI. SCOPE OF THE
INDUSTRY.

43. Hard-board is produced from wood-waste, saw-mill waste and forest management waste. Hard-board is used in building and construction industries for false ceilings, partitions, panelling, in passenger railcoaches and in buses.

44. A production target of 33,000 tons for hard-board was fixed for the Third plan. As against this, licensed capacity is about 40,000 tons per annum and the installed capacity in the two units which are in operation at present is about 16,000 tons per annum. The production and consumption of hard-board have shown a spectacular increase during the past few years, the production figures increasing from a few hundred tons in 1960 to 11,000 tons in 1964. In view of the great scope for increased use of hard-board in the country, a tentative target of 75,000 tons has been suggested for the Fourth Plan.

II. ECONOMIC
SIZE OF THE
UNIT

45. In advanced countries like Scandinavia, hard-board plants of the capacities of well over 50,000 tons per annum, are established. As already indicated, the production of hard-board in the country started about 4 years ago and initially plants having capacities of the order of 6,000 tons per annum were established. A third unit with a capacity of 15,000 tons per annum is expected to go into production by the middle of 1965. From the experience so far gained it is considered desirable to establish a hard-board plant in the Dandakaranya region having a capacity of the order of 20,000 tons per annum.

III. REQUIREMENTS OF RAW MATERIALS.

46. The chief raw materials to the extent of 40,000 tons per annum in the shape of forest management waste, saw-mill waste, pulpwood waste and fuel woods would be required for establishment of the unit. Wax and alum to the extent of about 300 tons would also be needed. In view of the large wood resources of the two river basins and as the specifications for raw materials for this industry are not as critical as for the plywood industry, it should be possible to meet the demand for wood easily.

IV. LOCATION.

47. The demand for power, water and coal for this factory, would be much higher than in the case of plywood factory. However, the demand for these would be small in comparison with the pulp and newsprint units. It would be advantageous to set up a hard-board factory in the vicinity of the newsprint unit, because wood which may not be suitable for pulping could be conveniently utilized in the hard-board factory and there would be obvious advantages in the extraction and transport of wood required for the newsprint mill and the hard-board factory. A further advantage would be with regard to the setting up of common facilities for water, steam and power. It has already been suggested in para 8, page 22, that the pulp mill and the newsprint mill should be set up in the vicinity of each other either near Sukma or near Jagdalpur. After the final choice between

these two sites has been made, the hard-board factory could be set up at the selected site.

V. TRANSPORT REQUIREMENTS.

48. The transport of wood from the forests in the Bastar and Jeypore regions would be mainly by road. The finished material, however, would have to be transported by rail and for this purpose about 1,000 wagons would be required annually and an additional 500 wagons would be required for the transport of coal.

VI. PROJECT COST AND PHASE D PROGRAMME OF INVESTMENT

49. The total investment in this project would be of the order of Rs. 150 lakhs and the break-up is given below:-

(a) Plant & equipment

(i) Imported	...	Rs. 85 lakhs
(ii) Indigenous	....	Rs. 25 "
(iii) Land & Building	..	Rs. 10 lakhs
(c) Miscellaneous	...	Rs. 10 lakhs
(d) Working capital	...	Rs. 20 lakhs
Total		<u>Rs. 150 lakhs.</u>

50. The phased programme of investment, would be as follows:-

1st Year	...	Rs. 25 lakhs
2nd Year	...	Rs. 50 lakhs
3rd year	-----	Rs. 75 lakhs
Total		<u>Rs. 150 lakhs</u>

VII. EMPLOYMENT POTENTIAL.

51. The total employment potential would be of the order of about 300. The approximate break-up is given below:-

(a) Supervisory	.....	30
(b) Labour		Contd 48.

(b) Labour:

(i) Direct

(ii) Indirect

... 200 (considerable indirect labour would be required in the forests for extraction of timber, its collection and transport to the factory site. This may reach up to 500 labourers)

VIII. REQUIREMENTS OF WATER, POWER AND COAL

52. Water requirements for the hard-board factory would be in the region of one million gallons per day. Water would be needed not only for raising steam but also for processing. Since alum-pentachloro-phenol and a few other chemicals in very small quantities are used in the manufacturing process, there would be no serious problem connected with the disposal of the effluent. Power and coal requirements are large in comparison with those required for a plywood factory. Power to the extent of 4,000 KW would have to be obtained from Machkund or Korbe. Steam requirements are fairly large and steam at high pressure is needed and for raising the steam about 10,000 tons of coal per annum would be needed.

IX. MARKET FOR THE PRODUCT

53. As already indicated, hard-board finds many important uses. It is a material complementary in use pattern to plywood and particle-board. In view of this, the market for hard-board would be the same as for plywood and particle-board.

X. LINES ON WHICH FURTHER ACTION HAS TO BE TAKEN

54. Since this factory would be located in the vicinity of the newsprint and pulp factories, it would be necessary to undertake the construction of a bridge across the river Sabri near Sukma.

COMMERCIAL PLYWOOD-CUM-FLUSH DOORS

- I. SCOPE OF INDUSTRY 55. The demand for commercial plywood and flush doors has been increasing at a fast pace. The production of commercial plywood has increased from 60 million sq. feet in 1960 to about 110 million sq. ft. in 1964. The target of 110 million sq. ft. of fixed for commercial plywood has already been achieved. A tentative target of 150 million sq. ft. of commercial plywood has been suggested for the Fourth Plan. With the increased tempo of building activity in the country the demand for commercial plywood and for flush doors is expected to rise steeply during the next several years. There is thus a considerable scope for setting up of commercial plywood-cum-flush doors factory, particularly since there is no unit producing either plywood or flush doors in the whole of Madhya Pradesh.
- II. ECONOMIC SIZE OF THE UNIT 56. It would be desirable to establish a factory having a capacity of 20 million sq. ft. per annum of commercial plywood and about 60,000 flush doors per year. However, in this industry economies of scale are not very significant and even a plant with a smaller capacity would be economically /viable/.
- III. REQUIREMENTS OF RAW MATERIALS 57. Timber (ply logs) of species suitable for plywood manufacture and urea-formaldehyde resin are the two important raw materials required for this industry. Ply-logs to the extent of 14,000 tons per year and urea-formaldehyde resin to the extent of 350 tons per year would be required. While the ply-logs would have to be drawn from the forests of Bastar and Jeypore, urea-formaldehyde resin would have to be obtained from the factories located at Madras, Calcutta or Bulsar.
- IV. LOCATION 58. In choosing a location for the factory, the important factors that have to be taken into consider

ation are the availability of adequate quantity of ply-logs near the location and availability of rail-road communication for transport of raw materials and finished products. Since the need of this industry of water, power and coal are small, these factors do not greatly influence the choice of the location.

59. The Deputy Inspector-General of Forests, in his report, has stated that the potential resource in respect of ply-wood timbers lies in miscellaneous forests of West Bastar, to a lesser extent, in the teak zones of South and East Bastar and South Jeypore. He has stated that a recent investigation has revealed that 160 sq. miles of reserve forests consisting of six blocks (Bijapore, Bhairamgerh, Toynar, Geedar, Jallavagu and Bandepara) in West Bastar Division are capable of yielding about 5,000 tons of ply-logs per year on a sustained basis, adopting a selection felling cycle of 30 years. Additional quantities of ply-logs would be available in the Southern region of Jeypore. The forests in this are reported to be superior to the forests in West Bastar Division. The need for further specific pre-investment survey of resources in the Bastar and Jeypore regions has been stressed. It is also stated that the prospects of locating a plywood factory based on the resources of West Bastar and South Jeypore are bright. For the manufacture of decorative veneers required for commercial plywood an additional 2,000 tons of teak would easily be procured from these forest regions. Taking into consi-

deration the availability of ply-logs and the rail and road communications, it would appear that Geedam-Dantewara area would be suitable for the location of the factory.

V. TRANSPORT REQUIREMENTS

60. The transport of ply-logs from the forests to the factory would be mainly by road. 400 wagons per annum would be needed for the transport of the finished products. About 20 wagons per annum would be required for the transport of resin.

VI. PROJECT COST AND PHASED PROGRAMME OF INVESTMENT

61. The total investment in this project would be of the order of Rs. 54 lakhs and the break-up is given below:-

(1) <u>Plant and equipment:</u>	
(i) Imported	... Rs. 25 lakhs
(ii) Indigenbus	.... Rs. 10 "
(2) Land & building	..... Rs. 7.5 "
(3) Miscellaneous	..... Rs. 4 "
(4) Working capital	..... Rs. 7.5 "
Total	Rs. 54.00 "

62. The phased programme of investment would be as follows:-

1st Year	... Rs. 20 Lakhs
2nd Year	... Rs. 34 "
Total	Rs. 54 "

VII. EMPLOYMENT POTENTIAL

63. The total emplyment potential would be of the order of 750 persons. The break-up is given below:-

(1) Supervisory ... 20

(2) LABOUR

- (i) Direct 150
- (ii) Indirect 500 to 600
 (for other ancillary service & facilities) (Depending upon the area of forests worked for felling of timber)

VIII. REQUIREMENT OF WATER, POWER & COAL.

64. Water requirements for the plywood Industry are not very large. Water would be needed for raising steam and for storing ply-logs under water. About 50,000 gallons of water per day would be adequate.

65. Power and coal requirements are small. Power to the extent of 750 KW would have to be obtained from Machkund or Korba. For raising steam considerable quantities of wood-waste unsuitable for production of particle board would be available. These could, however, be supplemented by small quantities of coal the demand for which would be less than 2,000 tons per annum. There should be no difficulty in obtaining this amount of coal from Korba.

IX. MARKET FOR THE PRODUCT

66. The demand for commercial plywood and flush doors within Madhya Pradesh is likely to be rather limited. Some quantities of these materials would no doubt be utilised in the construction of factories and townships within Madhya Pradesh, but the bulk of the products would have to be sold in bigger towns like Bombay, Madras, Calcutta, Delhi, Vishakhapatnam,

Hyderabad; and other centres of construction activity such as the major projects and the townships attached to them.

X. LINES ON WHICH
FURTHER ACTION
HAS TO BE
TAKEN

67. (a) A proper assessment of the availability of species suitable for plywood manufacture in the West Bastar and South Jeypore Division should be carried out quickly.

(b) Construction of a bridge across river Sabri near Sukra should be given priority, as it would facilitate the transport of ply-logs from the South Jeypore Division to the Geedam-Dantewara region.

PARTICLE BOARD (CHIP BOARD)

I. SCOPE OF THE INDUSTRY

68. In recent years, the manufacture of Particle Board has made considerable progress, particularly in the countries which are deficient in timber. Particle Board is manufactured from small particles or pieces of wood or other ligno-cellulosic materials by the use of organic binders, such as urea-formaldehyde resin. Industrial wood residues, logging, and forest management wastes and residues, which have not been exploited so far and have low economic value can be profitably converted into particle board.

69. Particle board can be used in place of solid timber in the manufacture of furniture. Particle boards of medium density can be used as panel material for walls and ceilings and also in railway carriages and ships, and as core-stock in flush doors. Low density particle board is used as an insulating material.

70. The need for developing the Particle Board Industry in the country would be evident from the "F.A.O. Estimate of Timber Trend Studies in India (1958)" according to which in the next 20 years there would be a serious shortage of timber in the country. Particle board is expected to bridge the gap between the supply and demand of sawn timber.

BALANCE OF REQUIREMENTS AND SUPPLY OF
INDUSTRIAL WOOD

	(in Million tons)				
	1960	1965	1970	1975	1985
Requirements	4.5	6.0	7.3	9.5	12.0
<u>SUPPLY</u>					
Recorded	3.1	3.5	4.0	4.5	5.0
Unrecorded	1.2	1.0	0.8	0.7	0.7
Deficit/Balance	0.2	-1.5	-2.5	-4.3	-6.3

71. The production of particle-board in the country has increased from about 800 tons in 1960 to about 6,000 tons in 1964. At the beginning of the Third Plan period, there was considerable enthusiasm on the part of the entrepreneurs and as many as 31 licences for a total capacity of about 194,000 tons of particle-board had been issued. Subsequently, however, several licences had to be revoked because of the difficult foreign exchange position. The entrepreneurs have to arrange foreign exchange needed for the import of plant and machinery by way either of capital investment of long-term deferred loans. At present, five plants with a total capacity of about 23,000 tons per annum are in production. It may be mentioned that three out of the five units went into production very recently.

II. ECONOMIC
SIZE OF THE
UNIT.

72. It would be desirable to set up a factory having a capacity of 7,500 tons per annum. If adequate raw materials are available, a plant of a higher capacity of the order of 10/15,000 tons could be established.

III. REQUIREMENTS
OF RAW
MATERIALS.

73. The two chief raw materials required for this industry are ligno-cellulosic materials and urea-formaldehyde resin.

Timber of pulpable quality, forest management wastes, lops and tops of trees and waste-wood residues from other wood-working industries and fuel wood to the extent of about 15,000 tons per year would be required. The demand for urea-formaldehyde resin would be about 600 tons per annum. While the ligno-cellulosic materials could be expected to become available from the forests in the West Bastar region, the resin would have to be produced from the factories located in Madras, Calcutta and Bulsar.

IV. REQUIREMENTS
OF WATER
POWER AND
COAL

74. The requirements of water, power and coal for this industry are comparatively small. It is anticipated that the water requirements of the order of 50,000 gallons per day could easily be procured in the Dantewara-Geedam area. Power to the extent of 800 KW would be obtained either from Machkund or from Korba. Considerable quantities of waste-wood that would become available could be used for raising steam. In addition to this, coal to the extent of 1,500 tons per annum would have to be procured from Korba.

V. TRANSPORT
REQUIREMENTS

75. Wood and timber would be transported in trucks to the factory site from the forest

areas. About 500 wagons would be needed for the transport of finished materials, namely particle board, every year. The number of wagons required annually for the transport of resin would be about 40.

VI. LOCATION 76. It would be desirable to integrate the particle board factory with the plywood factory and locate the particle-board factory close to the plywood factory. This would ensure not only considerable economies in overheads and services but would also ensure the utilization of wastes from the plywood factory in the chip-board plant. In view of the considerations which a reference has already been made for locating the plywood factory in the Dante-wara-Geedam area, the particle board factory also would have to be located in this area close to the plywood factory.

VII. PROJECT COST 77. The total investment in this project would be AND PHASED PROGRAMME OF INVESTMENT of the order of Rs. 60 lakhs. The break-up would

be as follows:-

		(Rs. in lakhs)
(a)	Plant & equipment	
	(i) Imported	30
	(ii) Indigeneous	10
(b)	Land & building	8
(c)	Miscellaneous	5
(d)	Working capital	7
Total		Rs. 60 Lakhs

78. The phased programme of investment is indicated below:-

Ist year	Rs. 25 lakhs
IIInd. Year	Rs. 35 lakhs
Total	Rs. 60 lakhs

VIII. EMPLOYMENT
POTENTIAL

79. The number of persons that would be employed directly and indirectly would be about 800. The approximate break-up is given below:-

(a) Supervisory .. 20

(b) Labour

(i) Direct .. 50

(ii) Indirect* .. 200

(*Considerable indirect labour would be required in the forests for extraction of timber, its collection and transport to the factory sites. This may reach upto 500 labourers)

IX. MARKET FOR
THE PRODUCT:

80. Particle board, which would be cheaper than sawn timber, is expected to bridge the gap between supply and demand of sawn timber during the next 20 years. It may be mentioned here that the demand for sawn timber is outgrowing the supplies of timber from the forests in India. Therefore, if the present building and construction activities are to be sustained, it is necessary to find acceptable substitutes for sawn timber, and particle board is the most promising material for this purpose. The market for particle boards would be the same as indicated for commercial plywood and flush-doors.

CAUSTIC SODA/CHLORINE

81. The demand for Caustic Soda and Chlorine of the pulp and newsprint mills is large enough to justify the attaching of a caustic soda/chlorine unit to these mills. As already indicated, the kraft-pulp mill would need about 15 tons of caustic soda and 25 tons of chlorine per day and the newsprint mill would need about 7 tons of caustic soda and about 7 tons of chlorine per day. Thus, the total requirements of caustic soda and chlorine work out to 22 tons and 32 tons per day respectively. Unless a caustic soda/chlorine unit is attached to the pulp and newsprint mills, it would be necessary to obtain these chemicals from long distances. Establishment of the caustic soda/chlorine unit for captive use would considerably improve the economics of these mills. Moreover, it is difficult to forecast how soon the supply position of caustic soda in the country would improve.

82. There is a shortage of caustic soda in the country at present and its price has shot up. The installed capacity of caustic soda at present is about 235,000 tons and the total licensed capacity amounts to about 440,000 tons per year. The Third Plan capacity and production targets for these chemicals are 400,000 tons and 340,000 tons respectively. The tentative Fourth Plan capacity and production target are 600,000 tons and 550,000 tons respectively. There is, thus, a clear case for establishing a caustic soda/chlorine plant for captive use with a capacity of about 30 tons/day (about 10,000 tons/year).

83. A caustic soda/chlorine unit of the capacity

indicated in the previous paragraph would have to be established close to the pulp and newsprint units. The annual requirements of raw materials for the caustic soda/chlorine unit are given below:-

Salt	20,000 tons/year
Mercury (for initial requirements)	27 " "
Mercury (Recurring)	3 " "
Graphite Electrode	50 " "
Barium Carbonate	200 " "

84. Power requirements to the extent of 7500 KVA would have to be obtained from Machkund. Water requirements would be about 100,000 gallons per day and rail wagons needed mainly for transport of salt would be about 1,000 wagons per annum.

85. The employment potential would be small (about 60) and the break-up is given below:-

(a) Supervisory staff	..	10
(b) Skilled workers	..	20
(c) Unskilled	..	30
Total:		60

86. The total investment would be of the order of Rs.200 lakhs and the break-up is given below:-

(a) <u>Plant & equipment</u>		<u>(Rs. in lakhs)</u>
(i) Imported	..	80.0
(ii) Indigenous	..	75.0
(b) Building & Services		20.0
(c) Miscellaneous		5.0
(d) Working capital		20.0
Total:		<u>Rs. 200.0</u>

87. The phased programme of investment would be as follows:-

1st Year	..	Rs. 50 lakhs
2nd Year	..	Rs. 100 lakhs
3rd Year	..	Rs. 50 lakhs

Market for the product

88. The bulk of the caustic soda and practically all the chlorine would be utilised in the pulp and newsprint mills. Small quantities of caustic soda would be available for outside sale. Since there is no caustic soda-chlorine unit within reasonable distance of either Sukma or Jagdalpur, it is anticipated that there would be no difficulty in selling small quantities of caustic soda to other users in the two river basins.

Lines on which further action has to be taken

89. (a) Availability of salt from Ganjam District in Orissa or Srikakulam in Andhra has to be investigated further.

(b) Availability of power at cheap rates has to be negotiated.

indicated in the previous paragraph would have to be established close to the pulp and newsprint units. The annual requirements of raw materials for the caustic soda/chlorine unit are given below:-

Salt	20,000 tons/year
Mercury (for initial requirements)	27 " "
Mercury (Recurring)	3 " "
Graphite Electrode	50 " "
Barium Carbonate	200 " "

84. Power requirements to the extent of 7500 KVA would have to be obtained from Machkund. Water requirements would be about 100,000 gallons per day and rail wagons needed mainly for transport of salt would be about 1,000 wagons per annum.

85. The employment potential would be small (about 60) and the break-up is given below:-

(a) Supervisory staff	..	10
(b) Skilled workers	..	20
(c) Unskilled	..	30
Total:		<u>60</u>

86. The total investment would be of the order of Rs.200 lakhs and the break-up is given below:-

(a) <u>Plant & equipment</u>		<u>(Rs. in lakhs)</u>
(i) Imported	..	80.0
(ii) Indigenous	..	75.0
(b) Building & Services		20.0
(c) Miscellaneous		5.0
(d) Working capital		20.0
Total:		<u>Rs. 200.0</u>

MATCH INDUSTRY

90. Although the development of match industry and the setting up of a saw-mill cum wood preservation plant in regions have been suggested on small scale basis, these have been discussed in this chapter as these are essentially forest based industries. The Deputy Inspector General of Forests in his report on the availability of wood and timber in the forests of the river basins has observed that about 10 species of timber suitable for match manufacture are available. He has, however, remarked that the establishment of a major match factory in the region does not appear to be an economic proposition, as quantitative availability of these species is not yet known. Steps should be taken immediately by the Forest Department to assess the sustained availability of timber of these species and if the raw material position is satisfactory, it is suggested that in the first instance a medium scale factory for the manufacture of match splints and veneers for match boxes may be set up in the Dantewara-Geedam region preferably close to the proposed plywood factory. There is a considerable unsatisfied demand for match splints and veneers for boxes in the country due to the rising demand for matches. There are a number of such factories already in existence in the State of Kerala which are being run quite profitably and these factories are at present meeting the total demand for match splints and veneers for boxes from the match factories in the Sivakasi, Sattur and Koval-patti.

regions. These factories also supply considerable quantities of match splints to the Wimco Group of match factories.

91. The plant and machinery required for manufacture of match splints veneers for boxes is available indigenously and the setting up of a factory would involve an investment of about Rs. 1½ lakhs. With this centralised supply of splints and box veneers, it would also be possible to set up small-scale match factories of B, C and D category in the various refugee townships to be set up for resettlement of refugee in the Dandakarnya region. For the successful working of these small-scale factories, it would be necessary to depute some officers to the Sivakasi, Sattur and Koval-Patti regions for studying the organisation and methods of manufacture adopted by the small-scale factories in these areas. Match manufacture on a cottage scale is labour-intensive and the setting up of such factories could provide avenues of gainful employment to a large number of refugees.

92. To ensure successful working of these cottage match factories it would be necessary for the Forest Department to undertake plantations of species suitable for match manufacture. This is essential in view of the fact that even today there is a general shortage of timber suitable for match manufacture. It may be mentioned that the Central Government offers 50% subsidy towards expense on match wood plantations undertaken by State Government.

MISCELLANEOUS WOOD-BASED INDUSTRIES

93. The Deputy Inspector-General of Forests has also observed that considerable quantities of Teak, Sal and other hard-wood timbers suitable for constructional purposes are also available in the forests of Dandakaranya. It is also understood that a few more railway lines are also to be laid in this region within the next few years. Considerable quantities of wooden sleepers would be required for laying the track. To meet the demand for sleepers it may be desirable to set up a medium-scale saw-mill in conjunction with seasoning and wood preservation plant in a suitable area preferably in the Dantewara-Geedam region. Machinery required for such a factory would be available indigenously and would need an investment of about Rs. 2½ lakhs.

Investment and Employment in Large Scale
Industries based on forest resources

Sl. No.	Name of Industry	Capacity	Capital Annual investment	Employment potenti	
				Direct	Indirect
1.	Bambookraft pulp (central pulp mill)	100,000 tons	160	250	2200
2.	Newsprint	60,000 tons	140	250	950
3.	Hard board	20,000 tons	15	110	200
4.	Commercial plywood cum flush doors	10 million sq. ft. 60,000 flush doors	5.4	170	550
5.	Particel Board (Chip board)	7,500 tons	6.0	70	200
6.	Caustic soda/ chlorine plant	10,000 tons	20.0	60	-

Chapter IV

- Large Scale Industries based on mineral resources.

The National Council of Applied Economic Research have in their report on "Development of Dandakaranya" listed some industries based on mineral resources as showing promise of development in the Dandakaranya area, the important industries being:-

- (a) Based on Bauxite -
 - (i) High Alumina Refractories,
 - (ii) High Alumina Cement, and
 - (iii) Aluminium.
- (b) Based on Clays -
 - (i) China clay washing plant, and
 - (ii) Miscellaneous items of pottery.
- (c) Based on glass sand or quartz -
 - (i) Glass,
 - (ii) Silicon carbide, and
 - (iii) Silica bricks.
- (d) Based on Limestone -
 - (i) Cement,
 - (ii) Calcium carbide, and
 - (iii) Building lime.

2. Of the above groups of industries, Aluminium may have to be ruled out for the present as the reserves of high grade bauxite ore in this area as currently known are not adequate to sustain a smelter of a capacity of even 10,000 tonnes per annum. Moreover, cheap hydro-electric power is not also presently available in bulk. At any rate, of the reported bauxite deposits in the Dandakaranya region, only those of Kalahandi have been so far studied in some detail. The more important bauxite deposits in this region occur in the laterite capping on

Kashipur.

the hills and plateaux of the Kasalapat, Kashmir, and Mahulapatna Zamindaris. The cappings rest directly on Khondolite, the hills rising to about 1,000 metres above m.s.l. Some of the important deposits in the area with a total reserve of about 0.5 million tonnes occur at Chandgiri (183,000 tonnes), Baphlimali Parbat (132,000 tonnes), Kathakhal (48,000 tonnes) and Pasangmali (50,000 tonnes). The other smaller deposits have been reported at Sasbahumali, Dombmali, Dakapatna Parbat, Kutrumali, Manjimali, Lakharishi and Karlapat Hill.

3. The alumina content of the bauxite ore in general is well above the limit of 45% Al_2O_3 which is currently acceptable for metallurgical purposes, and the silica content is, as a whole, much below the stipulated limit for minimum alumina; silica ratio of 8:1 for extraction of alumina by the Bayer process. The titania content is also within permissible limits, but Fe_2O_3 is reported to be somewhat higher. Producers of metallic aluminium by the Bayer process require bauxite containing Al_2O_3 55-62% and permit impurities in the form of silica 2-7% iron oxide 3-8%, titania 2-4%, all calculated on the basis of the dried ore. No information from Geological Survey of India is yet available as to how much of the

Source: A brief review of the Mineral resources of the Dandakaranya Region by Shri P.V. Rao, Superintending Geologist, Geological Survey of India, Madhya Pradesh Circle.

reserves of bauxite available in Kalahandi come up to these specifications. Even assuming that all the Kalahandi ore comes up to this standard, the reserves as stated above are inadequate for a smelter of even a minimum size. Further survey work on the availability and quality of bauxite is indicated.

4. There is no immediate scope for any additional capacity for making high alumina refractories, because there is already sufficient production of these refractories for meeting the requirements of the steel industry upto a production level of 18 million tonnes of steel per annum. The current capacity covers adequately the requirements of other industries like glass and cement also.

5. The country's requirements of high alumina cement are presently rather small and may be taken to be of the order of 15,000 tonnes per annum by 1970-71. An economic capacity (100 tonnes per day) would not be feasible in this area as it does not seem to offer any natural advantage for producing high alumina cement.

6. The occurrences of clays of different varieties including pottery clay, china clay etc. have been noted in the three Districts of the area, viz., Bastar, Koraput and Kalahandi. While pottery clays, which are either of alluvial or residual origin, are quite common in many places, china clays are not so widespread. In any case, only few of the deposits have been investigated in detail to ascertain their potentialities and usefulness in various clay-based industries.

7. In the Bastar District an occurrence of whitish,

buff stained clay derived from shales has been recorded in the Goral nadi section, about 1.5 K.M. north-west of Sindigar ($18^{\circ} 32' : 81^{\circ} 45'$), but the inferred reserves are of the order of 3,000 tonnes. White clay occurs about 9-11 metres below laterite in a well section at Mangapur and Madpal ($19^{\circ} 05'$ and $82^{\circ} 09'$). In view of the absence of clay in other well sections in the neighbourhood and also because of its admixture with other materials it is considered that these occurrences are of no economic importance. In the Koraput District many occurrences of pottery clay of both alluvial and residual origin as well as china clays have been reported principally at the following places:-

- (i) Near Jeypore ($18^{\circ} 52'$ and $82^{\circ} 34'$)
Brown and black alluvial clays, sufficiently plastic for making building bricks, tiles, pots etc.
- (ii) South-west of Damsaguda
(ii) South-west of Damsaguda ($18^{\circ} 51'$ and $82^{\circ} 35'$)
and also at the banks of Dudhi Jhoka.
Black and brown clays.
- (iii) Stream sections north-east of Bodosol ($18^{\circ} 52'$ and $82^{\circ} 35'$). Highly plastic and cream coloured clay.
- (iv) At the northern end of the Nokti Donger hill on the Jeypore-Koraput road. Residual clay red in colour.

8. Minor occurrences of clay have been noted in the Kalahandi at Sandala and east of Lukopali, the latter being greyish white in colour and associated with quartzite. These clays are not useful for pottery. However, some of the clays, particularly those near Jeypore in the Koraput District appear to be adequate for exploitation for the manufacture of building bricks, tiles after some treatment viz., washing.

9. It follows that the clays in this area would hold out prospects only for making building bricks, roofing tiles and at places for stoneware pipes. The setting up of a washing plant as suggested in the NCAER report would have to be ruled out, as one would not normally set up a unit for washing clay of a capacity of less than 100 tonnes per day.

10. As regards the glass industry, the mere fact that good sand is locally available is not at all an important factor in determining the location of a glass factory, as for every tonne of glass produced locally 2 tonnes of raw materials other than glass sand would have to be produced from other places located at some distance. Moreover, the demand for glass products such as flat glass (sheet, plate etc.), glass bottles including pencillin vials, and laboratory glassware in this region is negligible and there is no scope for economic production of these items in competition with other glass factories located around Calcutta in West Bengal and Cuttack in Orissa. Going however by the need for regional development and for industrialisation for giving employment to a large number of people, a general purpose glass factory producing containers for locally produced cosmetics, hair oil etc., food preserves; glass chimneys to be used mainly in villages which have not yet been electrified, and tumblers, of a total capacity of 10 tonnes of glass draw per day may be considered to be economically viable. Furthermore, the sources of quartz in the Ziram area of Bastar and Dalapur in Koraput might be eventually developed for supplying calcined and

crushed quartz to the glass factories in West Bengal and Orissa, who have now to procure their requirements of silica in the form of glass sand from Naini near Allahabad.

11. Silicon carbide is essentially an electro-metallurgical industry and unless cheap electric power is available in bulk the mere fact that silica is available locally is an insignificant factor. The requirements of abrasive grains are likely to be met by M/S Grindwell of Bombay, who have collaborated with M/S Norton Refractories of U.S.A. for setting up initially a 3,000 ton unit with provision of expansion upto 6,000 tonnes per annum in the second stage, when the present demand estimated at 2,000 tonnes per annum would justify it. Furthermore, the production of silicon carbide is not a labour intensive industry, and in fact, for a capacity of 3,000 tonnes per annum employing not more than 80-100 people, the block investment would be of the order of Rs. 75-80 lakhs. Of this, the requirement of imported machinery would be about Rs. 40 lakhs. The production of silicon carbide may also, therefore, be ruled out at least for the present in this area.

12. As regards silica refractories, there is already idle capacity to the extent of 40,000 tonnes per annum because of the switch-over in the steel making practice from silica to the basic roof practice. With the oxygen lancing process and adoption of continuous casting the consumption of silica refractories

is expected to be further reduced to less than half the present figure of 47,000 tonnes per annum.

Calcium Carbide

13. Calcium Carbide is one of the industries recommended by NCAER for this area. The production of calcium carbide in 1964 was of the order of 35,000 tonnes. This industry is banned for licensing additional capacity and no carbide based chemical industries are being encouraged. The main use of calcium carbide produced in the country would therefore be for acetylene, used for cutting and welding purposes. All future requirements in the field of acetylene and its products would now be based on petro-chemical complexes.

14. However, if the engineering industries in this area develop to a stage that would justify local consumption of calcium carbide to the extent of 15-20 tonnes per day, a 20 tonne per day plant may be envisaged at that stage. The requirements of power would be of the order of 90,000 KWH per day.

15. Based on the reported reserves of the different minerals given in the report of National Council of Applied Economic Research, the Geological Survey of India and the Madhya Pradesh G.S.I. Circle, the industries which hold out possibilities of development in this area may be broadly divided into two main groups:-

I. Large-scale mineral based industries

Cement

II. Mineral-based industries for industrial townships.

- (1) General purpose glass factory
- (2) Building bricks and tiles
- (3) R.C.C. pipes
- (4) Stoneware pipes
- (5) Low Tension Insulators
- (6) Stoneware crockery
- (7) Asbestos cement sheets and accessories

These are discussed below:

1. Cement

I. INTRODUCTION

16. There are at present 37 cement factories of a total capacity of 10.76 million tonnes per annum. The factories are fairly wide dispersed, but there is at present no cement factory in the States of Maharashtra, West Bengal, Assam and Himachal Pradesh. For these States a number of new schemes have been licensed. In addition to the existing capacity of 10.767 million tonnes, a capacity of 13.103 million tonnes has been licensed and approved, made up of 9.895 million tonnes from new schemes and 3.208 million tonnes by way of expansion of the existing factories. Of this, a capacity of 5.013 million tonnes is covered by allocation of foreign exchange for importing plant and equipment. The additional capacity expected to go into production in the remaining part of the Third Plan is 2.944 million tonnes leaving a gap of 1.529 million tonnes as a carry over to the Fourth Plan.

17. The tentative targets for the Fourth Plan are 26-27 million tonnes for capacity and 24 million tonnes

for production. As a measure of advance action, new capacity is being licensed and schemes not making progress within the stipulated period are being revoked. According to one estimate an additional capacity of 10 million tonnes can be expected to be set up in the Fourth Plan based on plant and equipment produced from indigenous sources. In view of the number of difficulties involved it may not be possible for all this capacity to be had from private sector alone. It is in this context that the proposed Cement Corporation is expected to set up a capacity of 2-2.5 million tonnes during the Fourth Plan period.

18. One of the difficulties presently facing the cement industry is the lack of information about new sources of limestone. A very large number of known limestone deposits (proved) are already available to the existing factories and new licensees, and the Geological Survey of India have not been in a position to accord that high priority to proving of new limestone deposits as was necessary for the growth of this industry. The limestone deposits of the Dandakaranya area offer possibility of immediate utilisation, as not only they are quantitatively extensive but the quality of limestone is of cement grade.

II. ECONOMIC SIZE OF THE UNIT

19. The scale of operation of the existing factories ranges from a plant having a capacity of 60 tonnes per day to ones having a capacity of 2250 tonnes per day. The latter has a series of four kilns. A study of the

productivity undertaken recently by the National Productivity Council of India has revealed that 600 tonnes per day plants are most economic under conditions presently obtaining in the country. The machine building capacity has been thus geared to produce plants of this capacity. However, at places where availability of limestone and other raw materials, fuel, water and power and demand would justify larger production units, these might have to be based on multiples of 600 tonnes per day plants to ensure economic production, easy availability of spares and maximum utilisation of the machine building capacity. The larger units cannot be ruled out, but they would have to be imported as none of the existing cement machinery producers have experience of building kilns larger than 600 tonnes per day capacity. Furthermore, where such kilns exist (capacity 700 -750 tonnes per day) as at Satna and Dalmianagar, the experience of their working is not altogether happy. The industry is now more or less settled to adopting 600 tonnes per day plants as standard. This view was also shared by the participants in an Inter-Regional Seminar sponsored by the United Nations in Copenhagen in May last. The Seminar drew a distinction between the countries having a fairly developed cement industry such as India and those that have either no production at all or the level of production was insignificant. So far as the latter countries are concerned, it was felt that capacities of 300 tonnes per day may be considered as the minimum economic unit and for other 600 tonnes per day to be the minimum scale of operation. A French firm has

manufactured unit of a capacity of 2800 tonnes per day for Russia and this is so far the largest unit. Till now in India units of only 600 tons per day or 200 thousand tons per year of cement are now generally in vogue, and whenever higher capacities are contemplated more than one such unit is set up to duplicate or triplicate the capacity, it is clear that further economies in production could be secured by the establishment of larger units straightaway, wherever conditions justify. The essential pre-requisite for setting up the larger units are the availability of large quantities of lime stone to sustain the production at higher level for a reasonably long period and adequate transport facilities for the carriage of the finished product to the extent the demand in the surrounding area does not immediately require it. It seems clear that based on the large lime stone deposits of the order of 800 million tons estimated to be available in the Kanger belt, there would seem to be a case to set up larger units of at least half a million ton of cement per year with facilities for expansion of production further to a million ton as soon as required. Following the recent example of certain countries to establish large units even upto 2800 tons per day, the question of setting up a unit of about 1500 to 1600 tons per day deserves consideration. As the indigenous manufactures of cement machinery are currently geared to produce only standard units of 600 tons, it would be necessary to import the larger unit from the most suitable source. Japan and France are reported to be producing units of these large sizes and may be able to

supply our needs. One important factor that would however seem to deserve careful prior consideration is the scope for transporting the large quantum of cement produced in such a unit to the eastern part of the country to meet its shortages.

III. LOCATION

20. In the Bastar District there are two prominent limestone belts, one along the Kanger river about 27 K.M. to the south, and the other in the Potonar-Baranji area about 20 K.M. W.N.W. of Jagdalpur. The Kanger valley limestone belt extends over a length of 40 K.M. with an average width of 2 KM and is divisible from west to east into (1) Dhurvaras-Deorguda, (2) Majhar-dongri-Majipal, (3) Gadiadongri-Kotomsar, (4) Gupensar-dongri, (5) Jagdaghati and (6) Gopodore-Chitalgur, areas. This belt more or less follows the Kanger river which flows in a south-easterly direction. At most of the places the limestone beds form cliffs and the steep escarpments rising 50 to 120 metres from the ground level in either bank of the Kanger river. The limestones are fine-grained and thinly laminated, the laminae varying from 10 mm. to 0.3 metre. They are horizontal or gently dipping at a maximum dip of 10° in varying directions.

21. Based on analytical data the limestones are classified into flux-grade (Ca° above 46%, Insolubles 12% but the marginal B.F. grade, upto 14%) cement grade (Ca° 40-46% Insolubles below 20%), blendable cement-grade (Ca° 35-40% Insolubles 20-30%) and impure varieties (Ca° below 35% Insolubles above 30%). Flux grade

limestone has been found to occur only in a few places in the form of relatively thin bands intercalated with those of cement grade. Thus at Majher-Dongri, Gadia dongri, and Gupensar dongri, flux -grade limestone bands with thicknesses of 8, 6 and 10 metres have been found to extent over lengths of 1000 m, 700 m and 2000 m respectively. These flux grade limestone bands in these areas have, however, over-burden consisting of cement-grade, blendable cement-grade and impure limestones, aggregating to 30-50 m, 30 m and over 50 m respectively. The estimated reserves of flux-grade limestones over widths of 250 m, 100 m, and 400 m across the strike in the three areas are 6.4, 2.1 and 4.0 m. (total 12.5 million tonnes) respectively. The estimated reserves of cement grade and blendable cement grades of limestone in the Kanger belt are about 800 million tonnes. Although the limestones in this belt form hills and are close to the roads and the Baildila-Vishakhapatnam rail line under construction, the workability of the flux-grade limestones of this area is directly dependent upon whether or not the cement grade limestones forming the overburden can be worked and utilised for cement manufacture or other purposes.

22. Potonar-Baraji area The limestones of this area occur in the form of oval shaped, flat topped isolated ridges over a length of about 8 KM. These deposits will be about 20 KM. from the Bailadila-Vishakhapatnam rail link. The limestones of the area are mostly fine grained dark grey, having an outcrop width of 30 to 100 metres with a maximum thickness of about

25 metres. The beds are practically horizontal, the maximum dip being 10° towards north or south. Analytical data show that the insolubles range from 15 to 21 per cent, and CaO from 41-47% indicating these limestones to be of cement grade. The indicated reserves in this area are of the order of 45 million tonnes.

Koraput District.

23. (1) Detailed investigation carried out recently by the Geological Survey of India reveal that both flux-grade and cement grade limestones occur in the Kottametta (18° 20' : 81° 41') Nandivada (18° 19' : 81° 40') area along the Sabri river in the Koraput district and in the Sukma (18° 24' : 81° 40') area in the adjacent Bastar district. Flux grade limestones of this area analyse CaO 48-52% and insolubles 6-12%, while the cement grade limestones have CaO 40-52% Mg. less than 2% and insolubles from 6 to 24%.

24. The reserves are estimated at 15 million tonnes and 1.5 million tonnes of cement grade and one million and 0.4 million tonnes of flux grade limestones in the kottametta-Nandivada and Sukma areas respectively.

(2) Sirivada (18° 50' : 82° 10'), Gupteshwar (18° 49' : 82° 10') area along the Sabari river. The limestones show in general CaO 28.10 to 47.3%, MgO 0.85 to 18.79%, SiO₂ 2.17 to 32.12%, R₂O₃ 0.76 to 2.87%. The reserves are roughly estimated at 25 million tonnes, by the Directorate of Mines, Orissa.

(3) Kondajodi (18° 57' : 82° 15'), Dummajodi area along the Sabari river. The limestones analyse,

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according to the Directorate of Mines, Orissa,

Ca 34.44 to 45.43 Mg 0.96 to 15.39%, Si 2 12.25 to 37.55%, R 2 3 to 0.94 to 2.37%. The total proved reserves are estimated at 7 million tonnes.

(4) Umpavalli (18°24' : 82°58'), Tummguda (18 25' : 83 02') area. The deposits occur in four district outcrops (i) between Gundivalsa (18 24' : 82 59') and Peddapadu Umpavalli area (ii) near Peddapadu-Umpavalli, (iii) in the valley between Kotab (18 24' : 82 57') and Kottavalasa (18 23' : 83 01') and (iv) around Tummguda (18 25' : 83 02')

25. According to the Directorate of Mines, Orissa, these limestones analyse Ca 37.42 to 53.09% Mg 0.20 to 17.08% Si 2 0.68 to 16.90%, and R 2 3 0.40 to 1.75%.

The reserves estimated by the State Department based on surface observations and trench work, are about 30 million tonnes to a depth of 9 metres. Out of these about 12 million tonnes may be suitable for the manufacture of calcium carbide.

26. Based on the above information contained in the G.S.I. report, i.e., easy accessibility of limestone, nearness to railway line and availability of power and water, a site between 14- 15 K.M. from Jagdalpur on Jagdalpur road (going to the Bailadilla iron ore deposits) appears to be most suitable.

27. In the Koraput District, there is near village Sunki a perennial nala adequate enough for meeting the water requirements of the cement factory. This place is about 10 miles from the DBK railway line and the distance from limestone deposits would be

approximately 10 miles by aerial ropeway. However, the village Sunki does not have enough land as it is bound on three sides by mountains. The alternative location for the cement factory based on Umpavalli deposits would be Araku which is on the new DBK railway line and would not be more than 10 miles from the limestone deposits by aerial ropeway. Nearly two miles off Araku is the perennial river Patal which has adequate flow even in dry months to meet the water requirements of the cement factory. This place, however, falls in Andhra Pradesh and is technically not within the Dandakaranya area. It is quite possible that the Govt. of Orissa would be able to suggest another site near Sunki, e.g., in the Dandakaranya area.

28. From the point of view of movement of cement to the deficit areas in the eastern part of the country and the fact that the limestone deposits in Dandakaranya area are ample for large production of cement, it is felt that an ultimate capacity of 6,00,000 tonnes near Jagdalpur and 400,000 tonnes near Sunki (initially 400,000 tonnes near Jagdalpur and 200,000 tonnes at Sunki) would be justified. This should preferably be based on units of 600 tonnes per day each.

IV. PROCESS TO BE ADOPTED

29. India's industry employs both the wet and dry process, the former is more predominant. The wet process was at one time considered a more suitable one,

because of ease of operation and control of quality which it ensures. Nevertheless, there is now no getting away from the shift from the wet to dry process as adequate experience has been gained in the production of cement. With the high cost of fuel in India, the dry process would be the obvious choice, unless the contrary is indicated by the nature of the limestone and other raw materials. There is 30% saving of fuel in the dry process which consumes about 10% more power. The water requirements of the wet process would be of the order of 1.5 lakh gallons per day for a unit production of 600 tonnes day. A further study of the limestone available at the two places would be necessary for deciding the process. But the raw materials being suitable for both, the dry process is recommended for this area.

V. RAW MATERIAL REQUIREMENTS

30. A unit producing 600 tonnes per day would require the following raw materials:-

<u>Raw material</u>	<u>Annual requirements</u>
Limestone	320,000 tonnes.
Clay	50,000 "
Coal (wet process)	35,000 "
" (dry process)	22,000 "
Gypsum	8,000 "
Water (by wet process)	150,000 gallons.
Power: total	4,000 KW.

(Power consumption per tonne 110 KWH)

31. Coal: Coal for a factory either near Jagdalpur or Surki would have to be drawn from coal fields at

Talcher, Singreni, Panchgani, Korba and Hingir-Rampur. There may be a small requirement of Bengal-Bihar coal for raising the calorific intensity of the fuel. Gypsum would have to be moved from Tiruchirappalli. A small quantity of gypsum can also be had from Sullurpetta deposits in Andhra.

The clay can be obtained from nearby areas.

32. IV. ESTIMATES OF PROJECT COST AND PHASED PROGRAMME OF INVESTMENT

A. For Jagdalpur Plant (For initial capacity 400,000 tonnes)

(i) Capital requirement: Rs. 750 lakhs

-comprising of:-

Plant & equipment (Indigenous)	Rs. 320 lakhs	
Plant & equipment (Imported)	Rs. 100	"
Buildings & services	Rs. 120	"
Housing	Rs. 180	"
Working capital	Rs. 100	"
Miscellaneous	Rs. 30	"
	<hr/>	
	Rs. 750	"
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(ii) Phased programme of investment

First year	Rs. 120	"
Second year	Rs. 280	"
Third year	Rs. 350	"
	<hr/>	
	Rs. 750	"
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B. For Sunki Plant: (for initial capacity 200,000 tonnes)

(i) Capital requirement

Rs. 375 lakhs.

-comprising of:

Plant & equipment (Ind.)	Rs. 160	"
(Imported)	Rs. 50	"
Building & services	Rs. 60	"
Housing	Rs. 40	"
Working capital	Rs. 50	"
Miscellaneous	Rs. 15	"
Total:	Rs. 375	"

(ii) Phased programme of investment

First year	Rs. 60 lakh
Second year	Rs. 140 "
Third year	Rs. 160 "
	Rs. 360 "

VII. TRANSPORT REQUIREMENTS

33. Coal and gypsum would have to be moved by rail. 2200 wagons per year would be required for transporting these. In addition to this, 7,000 wagons would be required for transporting finished cement, assuming road transport and local consumption will take care of 30% of the production.

VIII. LINES ON WHICH FURTHER ACTION IS TO BE TAKEN

34. 1. The Additional Director of Industries, Madhya Pradesh, informed the Survey Team that M/s. Birla Jute have applied for a prospecting licence for the Tirathgarh deposits. Both M/s. Birla Jute and Bose Investment have been recently given letters of intent to set up a unit each with a capacity of 200,000 tonnes per annum in the

District of Jagdalpur. M/S Birla Jute have since been asked by the State Government to clearly indicate the area for which they require the prospective licence/mining lease. The Survey Team could not ascertain as to whether M/S Bose Investment have also made a similar application. This point needs to be sorted out and if for the same location there are to be both public-sponsored and private parties, the limestone area should be clearly demarcated for both.

35. 2. A portion of the Umpavalli deposits (roughly 1/3) is understood to have been out to M/s. Jeypore Sugar for a period of 20 years. However, it is stipulated that calcite will not be mined. The requirements for the sugar factory and also for the nearby ferro-alloy plant are not large. The remaining area requires to be definitely proved.

36. 3. Of the reported availability of 800 million tonnes of limestone in the Kanger belt and 100 million tonnes in the Koraput District, only a part has been definitely proved. In the case of the latter, the extent of proving is only 40 million tonnes. Also there is reported availability of flux grade limestone. Economic geological investigations would be necessary to definitely prove the deposits for cement grade limestone as distinct from flux grade. Also in respect of the two locations the nearest source of clay would have to be investigated.

IX. EMPLOYMENT POTENTIAL

37. For one plant of 600 tonnes per day capacity

Managerial	3
Supervisory, technical	15
Skilled	350
Unskilled	200
Mining (both skilled & unskilled)	400
Total:	<u>968</u>

Mineral-based industries for industrial townships.

1. General purpose glass factory

38. I. There are at present 100 glass factories in the organised sector having a total installed capacity of 500,000 tonnes per annum. The production of the various items of glass and glassware like sheet glass, wired and figured glass, glass bottles and containers, laboratory glassware, vacuum flasks, lamp and tableware is of the order of 275,000 tonnes. The industry is composed of (a) mechanised sector, and (b) semi-mechanised sector. Items like sheet glass, bottles, penicillin vials, wired and figured glass are now manufactured in the mechanised sector, though there is a sizeable production of bottles also in the semi-automatic field. The consumer's preference is now for machine-made bottles as they ensure uniformity of capacity and lend themselves to capping and labelling with automatic machines.

39. The total capacity in the field of lamp and table

and pressedware is of the order of 170,000 tonnes, of which a meagre 20,000 tonnes is in the mechanised sector. It is in this sector that a factory for the Dandakaranya area is proposed. A unit with a capacity of 10 tonnes per day is expected to be economically viable to meet essentially the local demand for tumblers, chimneys and miscellaneous table and pressedware.

II. ITEMS OF MANUFACTURE AND CAPACITY.

(i) Miscellaneous containers and glass tumblers	900 tonnes/annum
(ii) Table pressedware	900 "
(iii) Glass chimneys for lanterns and other blown ware	1200 "
Total:	3000 "

III. RAW MATERIAL OCCURENCES

40. Quartzite and quartz veins suitable for glass manufacture have been reported to occur in the following localities:-

In Jhiram (Bastar Dist.) 18° 47' : 81° 51') area good quality quartz occurs on the Gojia dongri. A random sample analysed is found to have the following analyses:-

Si ⁰ 2	99.11%
Fe 2 3	0.09%
Al 2 3	0.27%
K 2	0.39%

The reserves have been estimated at 5.7 million tonnes.

41. Koraput District. A thin band of quartzite occurs near the Rest House at Dalapur (18° 46' : 82° 19')

and was found to have the following analysis:-

SiO ₂	98.82%
Fe ₂ O ₃	0.32%
Al ₂ O ₃	0.52%
CaO	0.06%
MgO	0.30%

These reserves have not been estimated.

42. Limestone would be locally available and ground calcite from near Sunki would be a suitable source of lime. There are extensive deposits of dolomite in the Machkot and adjoining areas e.g. Jagdalpur. They have not been analysed for iron content and if this impurity is found to be within 0.2% the Machkot dolomite could be used for making glass. There are findings of flourspar from Bhopal Patnam (18°52' : 30°23'), but neither qualitative nor quantitative investigations have been carried out. If some quantity of flourspar is available it could be used not only for the proposed factory but also supply to other glass and enamelware factories, and in case the quantities are adequate, even to the aluminium industry. Other raw materials like nitre, borax and arsenic required in small quantities would have to be procured from outside sources. Borax is expected to be produced in a factory in Maharashtra in the very near future.

43. The requirements of coal would have to be procured from Bengal-Bihar, Talcher, Singareni and Panchen and Chanda fields. The nearest source of soda ash would be the petri at Sahugiri near Mughal sarai.

IV. PLANT AND EQUIPMENT

44. The type of furnace envisaged for the area is the coal-fired, recuperative furnace having a draw of 15 tonnes per day, so that the production of finished articles would be of the order of 10 tonnes per day. Semi-automatic presses and blow machines are envisaged, a total number of 6 addas having two continuous type of annealing lehrs and a small workshop for maintenance purposes. All the items of machinery are available within the country.

V. INVESTMENT.

45. A total capital of Rs. 10 lakhs would be required, roughly disbursed as:-

Plan and equipment.	Rs. 3 lakhs
Furnace and annealing lehrs.	Rs. 1.5 "
Buildings and services including batch house.	Rs. 1.5 "
Working capital	Rs. 3.0 "
Miscellaneous	Rs. 1.0 "

	Rs. 10.0 "

The annual turnover would be of the order of 15 lakhs.

VI. REQUIREMENTS OF TRANSPORT, WATER AND POWER

46. Three hundred wagons would be required only for raw materials, and 100 wagons for the finished goods, providing for road transport of a sizeable part of the production. A connecting load of 100 KW would be adequate. This could be drawn from public supply. The water requirements are negligible, being 20,000 gallons per day.

VII. RAW MATERIAL REQUIREMENTS

47. For the proposed production of 3,000 tonnes per annum the following will be the requirement of various raw materials:-

Sand (including washing, wastage & rejects)	3,000 tons
Soda ash	850 tonnes
Dolomite	500 "
Limestone	375 "
Felspar	18 "
Nitre	10 "
Borax	10 "
Arsenic	2.5

48. VIII. EMPLOYMENT POTENTIAL

Managerial	2
Supervisory/technical	6
Skilled	100
Unskilled	200

Total	308

2. Building bricks and tiles

I. GENERAL

So far the production of building bricks and roofing tiles in India has been mostly confined to the small scale sector. Clay is manually blunged and pugged and the bricks are hand-moulded. These are fired in conventional kilns with coal dust. However, the tempo of industrialisation and shift of population to urban areas in recent times have necessitated a large scale increase in the production of building bricks and roofing tiles. In order to meet this demand it is necessary to resort to their production by mechanised means. The machine made bricks

are not only stronger, but they need much less plastering and there is the ultimate saving in the usage of cement.

50. The present production of building bricks is of the order of 600 crores per annum. It has been estimated that to bridge the gap an additional capacity of 400 crores would be necessary; of this 100 crores has already been covered by industrial licensing.

II ITEMS OF MANUFACTURE AND CAPACITY

Building bricks: 3 crores per annum

III. RAW MATERIAL OCCURRENCES.

51. Alluvial and plastic clays were found to occur by the Survey Team at many places in the Koraput and Bastar Districts where a number of small hand moulding factories were found to be working. Any red clay having plasticity preferably the one near the river bed would be suitable for making building bricks. No systematic investigation of the building brick clays has been reported in the G.S.I. report.

Coal would have to be moved from Bengal-Bihar. Talcher, Singareni and/or Panchen and Chanda fields.

IV. PLANT AND EQUIPMENT

52. The Hoffman type of kiln proposed for this unit is to be built locally with indigenous bricks. Blunging, pugging and forming plant would have to be imported.

The process involved is : water and clay are mixed and pugged and formed into bricks through an extrusion press by the wire-cut method. These are later baked in a Hoffman kiln.

V. INVESTMENT.

53. Accapital investment of Rs. 20 lakhs would be required.

for the economic capacity of 3 crores bricks per annum, viz as follows:-

Plant & equipment (imported)	Rs. 8 lakhs
Plant & equipment (indigenous)	Rs. 2 lakhs
Buildings & services	Rs. 4 lakhs
Working capital	Rs. 4 lakhs
Miscellaneous	Rs. 2 lakhs

	Rs. 20 lakhs.

Annual turnover	Rs. 15 lakhs

IV. TRANSPORT, WATER AND POWER REQUIREMENTS.

54. Bricks would have to be transported by rail, preferably within a distance of 40 K.M. If in an area the demand is not adequate for mechanised brick plant the conventional brick factories should be set up. There would be no transport of raw material, i.e. red clay, excepting that of coal. The wagon requirements for coal would be 200 per annum.

The water requirements would be 40,000 gallons per day and a connecting load of 100 Kw would be adequate.

VII. RAW MATERIAL REQUIREMENTS.

Red clay	100,000 tonnes/annum
Coal	3,000

VIII. EMPLOYMENT POTENTIAL

Supervisory	20
Skilled	30
Semi-skilled	100
Contract labour	50

	200

3. R.C.C. Pipes.

I GENERAL

55. There are at present 120 and odd factories

manufacturing R.C.C. pipes on the Central list.. These pipes are extensively used in the urbanisation of the underdeveloped areas to avoid constructin open drains from the point of view of hygiene and seepage of industrial wastes and sewage which will otherwise contaminate water sources of the area. Furthermore, for the implementation of the irrigation schemes to support the targetted production of food and agriculture there will be a far greater requirement of these pipes than hitherto.

56. A capacity of 300,000 r.f.t. of pipes of the various dimensions is recommended for the Dandakaranya area, the number of units to be decided when the complete picture of the industrialisation of this area merges.

II. ITEMS OF MANUFACTURE & CAPACITY

Size 4", 6", 9"	
120 pipes of 6' length / day	220,000 r.f.t.
Size 12", 15", 18", 24"	
24 pipes of 8' length/day	60,000 "
Size 30", 36", 42", 48"	
8 pipes of 8' length/day	20,000 "
	300,000 r.f.t.

III. RAW MATERIAL AVAILABILITY

57. The raw materials required for making pipes are cement, red sand, river sand, stone chips and reinforcing steel. All these would be available indigenously, the first four locally.

IV. PLANT AND EQUIPMENT

58. The centrifugal equipment for making R.C.C. pipes is manufactured in the country and the process is of a simple character.

V. INVESTMENT

59. For the above capacity an investment of Rs. 7.5 lakhs is considered necessary, made up of

Plant and equipment	Rs. 3.5 lakhs
Buildings & other services including curing tanks	Rs. 2.5 "
Working Capital	Rs. 1.5 "
	<hr/>
	Rs. 7.5 "

VI. TRANSPORT, WATER AND POWER REQUIREMENTS

60. Assuming that cement will not be transported by rail, and other raw materials like sand, stone chips would also be available from nearby sources, the only requirement of railway transport will be for the finished pipes. The estimates of requirements are 400 wagons per annum, taking into account the possibility of road transport.

VII. RAW MATERIAL REQUIREMENTS

Cement	Indigenous	2,700	Tonn's
Red sand	"	600	"
River sand	"	4,800	"
Stone chips	"	4,800	"
Reinforcing steel	"	270	"

VIII. EMPLOYMENT POTENTIAL

Managerial	1
Foremen	3
Mechanics	2
Skilled	34
Semi-skilled	30
Unskilled	30
	<hr/>
	100

4. STONEWARE PIPES

I. GENERAL

61. The present production of stoneware pipes in India is of the order of 60,000 tonnes per annum. This is one of the industries where the capacity is being utilised almost upto 90%. It is estimated that the requirements of stoneware pipes for disposal of sewage, drainage etc. would go upto 200,000 tonnes by 1970-71. As transportation of these pipes over a distance of 200-250 K.M. is not economical, factories for making S.W. pipes should be set up as near the place of demand as possible.

II. ITEM OF MANUFACTURE & CAPACITY.

Stoneware pipes 24,000 tonnes/annum.

III. RAW MATERIAL OCCURRENCES

62. For pipe clay as in the case of brick clay, no systematic investigation of the availability has been carried out, but pipe clays are generally available in the type of terrain obtaining in the Dandakaranya area.

Coal would have to be moved from Bengal-Bihar, Talcher, Sing-rani and/or Panchen and Chanda fields.

IV. PLANT AND EQUIPMENT

63. Equipment for making S.W. pipes consist essentially of grinding and mixing, pug handling block mills and chamber kilns with a provision for salt glazing. All the equipment is manufactured in the country.

64. Clay and non-plastic materials are mixed together with water in de-airing pug mill and the plastic mass thus obtained is formed into the shape of pipes of the necessary dimensions by means of a heavy duty press. The material is then dried and baked in a chamber kiln, in which salt glazing is done while firing.

V. INVESTMENT

65. For a plant of a capacity of 24,000 tonnes per annum a capital investment of Rs. 12-13 lakhs would be necessary, as follows:-

Plant and machinery	Rs. 6 lakhs
Buildings & services	Rs. 2.5 "
Working capital	Rs. 3.0 "
Miscellaneous	Rs. 1.5 "
	Rs. 13.00"

VI. TRANSPORT, WATER & POWER REQUIREMENTS

66. The requirement of wagons for raw materials and finished goods would be of the order of 3,000 wagons per year. Water requirements are negligible and a connecting load of 100 KW would be adequate.

VII. RAW MATERIAL REQUIREMENTS

Fireclay	30,000 tonnes/annum
Non-plastic grog	5,000 "
Coal	36,000 "

VIII. EMPLOYMENT POTENTIAL

Supervisory	15
Skilled	30
Semi-skilled	40
Other labour for services	65
	150

5. Pressed Porcelain and Low Tension Insulators.

I. General

67. Pressed porcelain is required for fuse carriers, small voltage switch gears and other electrical appliances and apparatus. Its production in India is at present confined to the small scale sector, of a capacity of about 500 tonnes per annum. Low tension insulators are required by railways, Post & Telegraphs and also for distribution of electric power.

68. The methods of manufacturing pressed porcelain in the small scale do not lend themselves to quality control or adherence to specifications stipulated by the consuming industries, with the result that such insulators upto 60 amp. rating have been imported. The demand for these insulators is expected to be of the order of 1500 tonnes by 1970-71.

II. ITEM OF MANUFACTURE AND CAPACITY

Pressed porcelain	600 tonnes/annum
L.T. Insulators	2000 -do-

	2600 -do-

III. RAW MATERIAL OCCURENCES

69. The deposits of china clay, quartz and felspar have been reported elsewhere in the note. There is a small requirement of fire clay, which is reported to be available at NW of Deodra village (18°18' 82°17').

IV. PLANT AND EQUIPMENT

70. Most of the equipment for grinding and processing of raw materials, their mixing, slip making, casting and firing are available from indigenous sources. Some special presses and deairing pug mills may have to be imported along with some testing and control equipment.

71. Quartz and Felspar are ground separately and mixed with china clay in blungers. The slip is then pumped into a filter press, from which the cakes are taken out and dried. In the dry powder form the material is then pressed in suitable presses into desired shapes and dimensions of pressed porcelain. These are then baked in suitable kilns. The same process is used for low Tension insulators.

V. INVESTMENT

72.

For a production of 2600 tonnes of insulators per annum, comprising of pressed porcelain 600 tonnes and other L.T. insulators 2,000 tonnes per annum, an investment of Rs. 15 lakhs would be required as follows:-

Plant and equipment (imported)	Rs. 2 Lakhs
(indigenous)	Rs. 6 "
Building & services	Rs. 2 "
Working capital	Rs. 2 lakhs
Miscellaneous	Rs. 3 lakhs
	<hr/>
	Rs. 15 lakhs

VI. TRANSPORT WATER & POWERS.

73. One hundred wagons per annum would be required for the movement of raw materials. The finished goods can be transported by road.

The water requirement would be negligible and a connecting load of 300 Kw would be needed.

VII. RAW MATERIAL REQUIREMENTS.

China clay	1500 tonnes
Ball clay (imported)	50 tonnes
Quartz	500 "
Felspar	500 "
Fireclay	100 "

VIII. EMPLOYMENT POTENTIAL.

Supervisory	10
Skilled	30
Semi-skilled	120
Others	100
	<hr/>
	260

6. Stoneware Crockery.

I. General

74. The total capacity for crockery production in the country is approximately 40,000 tonnes per annum, but the production is of the order of 25,000 tonnes in the organised sector. There is a substantial production of crockery on small scale, say, about another 20,000 tonnes per annum.

75. A small unit of a capacity of 1500 tonnes per annum for meeting local demand in the Dandakaranya area is considered feasible.

II. ITEMS OF MANUFACTURE & CAPACITY

Crockery 1500 tonnes/annum.

III. RAW MATERIAL OCCURRENCES:

76. Occurences of clays of different varieties including pottery clay, china clay etc. have been reported in all the three Districts of the Dandakaranya area, particularly in the Koraput District. Some of these have been referred to in the earlier part of the report, the others being:

- (i) N.N.W. of Deodra village (18°45' : 82°26'). The clay has good plasticity and does not fuse below 1400° c. Linear shrinkage is 7.5%.
- (ii) Boipariguda (18°45' : 82°26'), mottled cream and yellow clays are found here in large quantities.
- (iii) Bed of stream near Oduguda (18°27' : 82°45') about 4 km. E.S.E. of Koraput. The clay deposits appear to be sandy and stained with iron oxide. Washing and sun bleaching is expected to improve the quality as the caly is otherwise adequately plastic.

(iv) North of Musoriguda (18° 52' : 82° 41'). The clay is soft and has good plasticity. The linear shrinkage will be 15%.

(v) Sarisa Padder, about 13 km. from Chandeli on the Koraput-Jagdalpur road.

(vi) N. of Ramogiri (18° 48' : 82° 15') as much as 60,000 tonnes of clay has been reported, but their characteristics have not been investigated.

Other occurrences have been reported from Jodiguda (18° 20' : 82° 46'); Putkili (18° 30' : 82° 54'); Nuagam (19° 06' : 82° 30') and also in the Kalahandi district.

IV. PLANT & EQUIPMENT

77. All the machinery for washing of clay, its drying, slip making, filtration, forming and firing are available from indigenous sources.

A mixture of clays is pugged in a dearing pug mill and bunged with water in a blunger and then passed through an electro-magnet into a filter press. The pressed cake is thereafter dried and converted into a slip to enable its being cast into plaster of Paris moulds to desired shapes. The articles are then released from the mould, dried and baked in a down draught kiln. The firing is repeated after baking for the application of glaze.

V. INVESTMENT.

78. For a plant of 1500 tonnes per annum a capital outlay of Rs. 8 lakhs would be necessary, viz.,

Plant and equipment	Rs. 3.5 lakhs.
Building & services	Rs. 1.5 "
Kilns & drying equipment.	Rs. 1.0 "
Working capital	Rs. 2.0 "

	Rs. 8.0 "

The annual turnover would be of the order of Rs. 8-10 lakhs per annum.

VI. TRANSPORT, WATER & POWER

79. One hundred and fifty wagons would be required only for transport of raw materials. The finished good could be transported mostly by road.

The water requirement is negligible and a connecting lead of 70 KV would be adequate.

VII. RAW MATERIAL REQUIREMENTS.

China clay other white burning clays.	1,000 tonnes
Felspar	600 "
Quartz	600 "
Coal	1,000 "

VIII. EMPLOYMENT POTENTIAL

Supervisory	15
Skilled	45
Semi-skilled	80
Others	60

200

7. Asbestos Cement Sheets & accessories

I. GENERAL

80. There are at present eight factories producing asbestos cement sheets of the corrugated, semi-corrugated and plain variety and pipes and accessories, with a total capacity of 60,000 tonnes per annum. From a recent study made, the following region-wise gaps are still available for meeting the demand estimated at 550,000 tonnes (requiring a capacity of 600,000 tonnes) by 1965-66:-

Northern region	30,000 tonnes
Eastern region	34,000 "

II. CAPACITY

81. As 36,000 tonnes per annum is an economically viable capacity, it is proposed that a plant for making A.C. sheets and pipes and fittings of a capacity of 36,000 tonnes per

annum may be set up next to the cement factory proposed for Jagdalour, so that naked cement could be pneumatically transported to the sheet factory to ensure saving of transport of a bulk commodity like cement.

III. RAW MATERIAL OCCURRENCES.

82. Asbestos for making A.C. sheets and pipes is to be imported, but its requirements in volume are only 10% of the final product. Cement would be the main raw material which is expected to be available locally.

IV. PLANT & EQUIPMENT

83. Plant and equipment for the proposed capacity of 36,000 tonnes / annum (comprising of asbestos cement roofing sheets and building boards 30,000 tonnes, pipes & fittings 6,000 tonnes) is not available from within the country. M/s Hyderabad Asbestos Cement Products, Hyderabad, produce these machines and actually exported one of their machines to a factory in Belgium. The expansion of their factory at Hyderabad and their new factory at Ballabgarh (near Delhi) has been based on plant and equipment manufactured by them.

V. INVESTMENT

84. This project is expected to cost Rs. 70 lakhs, made up as follows:-

Plant and equipment	Rs. 40 lakhs
Buildings & services	Rs. 15 "
Working capital	Rs. 10 "
Miscellaneous	Rs. 5

	Rs. 70

The annual turnover could be Rs. 150 lakhs

VI. TRANSPORT, WATER & POWER.

85. There will be no rail transport of cement. For transporting asbestos and finished products the wagon requirements

would be 1800 --agong per annum.

Water requirements for processing, curing etc. would be 10,000 gallons per day, and a connecting load of 500 KW would be adequate.

VII. RA: MATERIAL REQUIREMENTS.

Portland cement	30,000 tonnes
Raw asbestos	4,000 "

VIII. EMPLOYMENT POTENTIAL

Managerial	3
Supervisory/Technical	10
Non-technical	12
Skilled labour	55
Semi-skilled	100
Unskilled	345
	<hr/>
	525
	<hr/>

86. All the above schemes are recommended for industrial townships wherever these may be located in the Dandakaranya area. The exact locations will have to be decided in consultation with the State Governments of Orissa and Madhya Pradesh.

Investment & employment in large scale
Industries based in mineral resources.

		Investment in million Rs.	Employment in Nos.
1. Cement plant	(i) 400,000 tonnes	75.0	970
	(ii) 200,000 "	37.5	485
2. Glass factory	3,000 "	1.0	300
3. Building bricks and tiles	30 million Nos.	2.0	200
4. R.C.C. Pipes	300,000 r.f.t.	0.75	100
5. Stone-ware pipes	24,000 Tonnes	1.3	150
6. Pressed porcelain and low tension insulators	2500 tonnes	1.5	260
7. Stone-ware crockery	1500 tonnes	0.8	200
8. Asbestos cement sheets and accessories	36,000 tonnes	7.0	525

4100

CHAPTER V

Engineering and other miscellaneous industries.

Engineering Industries.

1. The conditions which would favour the establishment of some engineering industries immediately have been already touched upon in Chapter II para 12. Apart from certain major developments, decisions on which will also be necessary simultaneously to decisions on the establishment of an integrated iron and steel plant in Bailadila region, it would appear that the following units should be planned on an immediate basis:-

(a) STRUCTURAL FABRICATION.

2. The steel structurals required are generally classified into heavy structurals, medium structurals and light structurals. Besides grouping on the above lines, it is also possible to classify the structurals into those required for construction work as distinct from associated structurals which form components of items of machinery. The former category will also include structural parts of cranes, electric transmission pylons and those required for mounting the drilling rigs etc., generally based on the facility generated for dealing with heavy, medium and light structurals and augmenting the same to the extent necessary. Manufacture of associated structurals is also generally undertaken in the same workshops. There are also cases where for associated structurals particularly those produced by forming plates of different thickness, suitable units are made to form part and parcel of heavy machine building units.

3. The capacity for structurals of all types by 1965-66 had been placed at 250000 tons against the required capacity of 1.25 million tons by 1970-71 and this will indicate the large gap to be made up through the establishment of diverse types of units and capable of dealing with anticipated requirements of different categories. Although there are already a large number of small units and more will also come into existence more easily for light structurals, the capacity for medium and particularly heavy structurals using welding techniques have still to be enlarged to a considerable extent.

4. Apart from establishing structural fabrication facilities in and around major engineering developments, it is customary to develop required capacity simultaneously or even in advance of the requirements at large consuming centres like steel plants or heavy engineering units so that after meeting their requirements in time the capacity is available for developing other industries in the vicinity later on.

5. The scope for development of structural industry in the Indravati Basin may be broadly classified into two groups: (i) immediate establishment of capacity for tubular structurals and slotted angles. The main advantage of tubular structurals consists in standardising designs so as to be able to take the ready structurals conveniently for quick assembly at suitable places and bring up the structures into existence rapidly. This facilitates the.

establishment of transit camps as well as even semi-temporary buildings both for residences as well as for industrial estates. It also gives the advantage of shifting the units from place to place without any serious loss. (ii) a separate structural shop could be set up to manufacture simple structurals to meet the requirements of pig iron and steel plants as well as other industrial establishments.

(1) Tubular Structurals.

6. An engineering unit for manufacture of tubular structurals and slotted angles of the capacity of about 5000 tonnes per year may be considered ab initio. The tubular structurals will have the advantages of standardisation and easy assembly costs as well as easy dismantling and transport to other sites as necessary. The manufacture of tubular structurals was initiated in the country by Stewards & Lloyds. These are used as roof structures delivered complete in every respect with trusses, purlins, columns etc. Some other units have also sprung up to manufacture such structures in the country. A unit of this type supported by requisite design and drawing facilities would help the DDA to standardise the structures for transit camps, settlement colonies as well as for the construction of Industrial Estates. It will also provide facility for the manufacture of hooks, bolts, studs, nuts and washers by sub-suppliers through subsidiary manufacturing programmes.

7. By including a programme of manufacture of slotted angles (similar to what is being produced

by Guest, Keen Williams), additional facilities for such purposes as construction of storage shelves in offices and factories, work benches and other workshop requirements will also become expeditiously available. To start with, a unit for producing both tubular structurals and slotted angles may be developed. In due course as the industrial programme develops this would provide further scope for the establishment of manufacture of electric resistance welded pipes (ERW pipes). In the next stage, scope for setting up of a cold rolling mill for cold rolled strips from hot rolled strips/skelps could be considered. In this context the shop contemplated now should have sufficient area available for such expansion/additions in due course. The initial investment on a plant with a capacity of 6 to 7 thousand tons of tubular structurals and slotted angles together is likely to be of the order of Rs. 2 to 2.5 crores. Details of lay-out, list of equipment and facilities for design and drawings office for developing standard specifications should be further worked out by a team of engineers.

(ii) Structural Shops.

8. Apart from a unit for tubular structurals and slotted angles indicated earlier, there would seem to be scope for establishing a separate structural shop and this could be located at a suitable site between Jagdalpur and Dantewara and have a capacity of about 25,000 tons of structurals in due course. It should, however, initially take up simple

structurals and have a capacity of about 5,000 tons only and later expand to 20 to 25,000 tons on two shift basis so as to be in a position to meet the requirements of the pig iron and steel plant as well as other industrial requirements discussed in other chapters. These developments, if undertaken, initially will help to produce a large quantum of structurals for construction of other industrial units and deserve to be given a high priority. The investment on a unit of this type is likely to be of the order of Rs. 1.5 crores increasing to about Rs. 2.5 crores eventually. Detailed plans similar to that already worked out for a structural unit at Bokaro may be adopted with necessary modifications to suit local conditions and lay-out.

(b) Grey Iron Foundry.

9. At present there is capacity of a little over 1 million tonnes of grey iron casting comprising 0.8 million tons in separate foundries and 0.25 million tons in captive foundries. The foundry capacity in Madhya Pradesh is almost totally lacking. With the development of industries in the vast area both immediately and in due course there would be substantial scope for products of a grey iron foundry. The unit should take up the production of general sanitary requirements, railway sleepers, besides cast iron pipes of smaller diameters which may be used for rural water supply schemes. Thereafter it could undertake more sophisticated castings including cast iron spun pipes, the latter being required primarily for bigger water

supply schemes in due course. Against the Third Plan target of 800,000 tons for cast iron pipes, the existing capacity is less than 300,000 tons and the capacity likely to materialise is also considerably less than the target. Establishment of a plant involving an investment of about Rs. 2 crores with an output of 20,000 tons of castings and pipes may deserve consideration. Obviously the whole scheme needs to be laid out for an ultimate development of this magnitude, initially it could be started with smaller copulas and priorities to meet immediate needs of smaller and simpler items and the same could be expanded gradually. Detailed schemes for a grey iron foundry on these lines should be worked out.

(c)

STEEL CASTINGS.

10. Against a capacity of 170,000 tons of steel castings by 1965-66 it would seem to be necessary to have a capacity of about 400,000 tons by 1970-71. Although a large number of licences have been already issued for steel castings of different categories, the progress of licences has not been adequate. Apart from large units such as at Ranchi, Hardwar or at Wardha which are being developed in the public sector for manufacture of medium and heavy specialised castings to meet the requirements of machinery industry and or other requirements, there is need for additional capacity for light and medium castings to meet the increasing needs of several industries coming up in the country. It would, therefore, seem advisable to establish a steel foundry also in association with the heavy structural

unit discussed above and synchronise with it the development of a unit of a capacity of 2000 to 3000 tons of steel castings per year may be planned with scope for expansion of the same to 5000 to 6000 tons later on. These arrangements developed along with the structural fabrication unit should go to help speedy establishment of not only pig iron and steel plant which may come up in the Bailadilla area sooner or later but also assist to meet the needs of other industries in this area from the beginning.

(d) Agricultural and forest implements.

11. It may be worthwhile to take up the manufacture of agricultural and forest implements to suit the local conditions of agriculture forestry. A unit similar to the one in operation at Hassan in Mysore State with an investment of about Rs. 20 lakhs and giving an output of Rs. 30 lakhs per annum seems attractive. The Mysore Government is proposing to increase the output of this plant and also to set up another plant of this type. We would, therefore, recommend the details of this plant being secured and a unit on those lines established at one of the industrial township areas.

Other Industries

(a) Sugar Industry

12. During our discussion with the local authorities it was suggested that a sugar factory should be established at a suitable centre like Umerkote based on some irrigation facilities which are under development. It was also pointed out that there were some pockets of sugarcane cultivation

already and the sugarcane grown in them was being utilised for gur and khandsari. It was ascertained that maximum acreage of irrigation which will be available from the dam of Umerkote was likely to be of the order of 10,000 acres. Small pockets under sugarcane in various parts of this area were rain-fed and did not amount to any considerable volume capable of ensuring supplies of sugarcane for a minimum economic unit. A unit of 1250 tons cane crushing capacity per day, which is by and large considered to be the minimum size under present economic conditions, will require 150,000 tons of cane during a crushing season of 120 days. Based on an output of 20 tons of cane per acre, approximately 7500 acres of irrigated land should be under cane every year and allowing for a minimum rotation, at least 10,000 acres should be under cane cultivation in a compact area. Obviously, under the present conditions, this does not seem to be possible and the scope for a sugar factory should, therefore, be ruled out for the present. It is only after further development of irrigation potential and adequate acreage coming under sugar-cane cultivation that one could consider this possibility.

(b) Food Industries.

13. It is understood that, although horticulture and cultivation of vegetables has not yet been practised on any extensive scale, there are vast areas which hold scope for such developments and the Dandakaranya Project Authorities are giving

attention to the same particularly in the areas near Paralkote and a few other centres. With the increased production of fruits and vegetables, there should be scope for the establishment of fruit and vegetable preservation industries. This, would, however, require to be gone into further at a later stage as the products become available.

(c) Spinning mill.

14. The region has potentialities for a spinning mill. The proposal of the Commerce Ministry for setting up of about 50 spinning mills in the cooperative sector and the public sector was recently discussed and accepted in principle. An economic sized mill to begin with may have 25000 spindles at an estimated cost of Rs. 1.5 crores. Setting up of such a spinning mill would be fully justified.

(d) Powerlooms and Handlooms.

15. There appears to be considerable scope for envisaging production of cloth through powerlooms and handlooms in the area.

(e) Production of Alcohol from Mahua Flowers.

16. While in Dandakaranya, attention of the team was invited to the possibilities of utilizing Mahua flowers for the production of alcohol. Data to the extent available in this connection has been collected and the position is as follows:-

17. Mahua flowers are found in the State of Madhya Pradesh, particularly in Jhabua, Tikamgarh, Chhindwada, Shahdol and Bastar (Dandakaranya) districts. Mahua :

flowers are also found on the borders of Madhya Pradesh and Gujarat States. At present, major part of the mahua flowers are used for human consumption as well as feeding the cattle along with the conventional cattle fodders.

Some quantities of mahua flowers are also said to be consumed by Kdivasis for producing liquors for their own use. Mahua is also used in the Government Alcohol Plant as well as other small distilleries of Madhya Pradesh for producing country-spirit which is sold in the excise shops licensed by the Government of Madhya Pradesh.

18. During the season which extends from April to June, the Mahua flowers are picked, collected, dried and stored by the people in the rural areas from where they are transported to bigger market places. The price of mahua during the last season was reported to vary between Rs. 30-35 per quintal. It is understood that the price of mahua flowers in the Bastar district is of the order of Rs. 12.50 to Rs. 15.00 per quintal. It is doubtful whether sufficient mahua flowers would be available in the Dandakaranya area of Madhya Pradesh to sustain an economic size alcohol distillery of a capacity of one million gallons per year.

19. An economic size unit of one million gallon capacity would need about 15,000 tonnes of dried mahua flowers in a year. The percentage of sugar contents in Mahua flowers varies from 40-50% depending on the age and the storage conditions. The flowers contain about 50% sugars when they are freshly dried in the month of June. This percentage of sugar can be retained if the storage conditions are fairly good. Practically, all

the sugar contents in the mahua flowers are fermentable. The yield of alcohol per maund of dried mahua flowers is reported to be 2.5 bulk gallons (30 bulk litres per quintal) at the Govt. Alcohol Plant, Ratlam.

20. The cost of production of Mahua spirit at the Govt. Alcohol Plant, Ratlam is stated to be Rs.7/- per bulk gallon. Of this, the cost of raw material alone comes to Rs. 5.15 per bulk gallon. The break-up of the cost of production at the Govt. Alcohol Plant, Ratlam is given in the enclosed Appendix. This plant is supplying mahua spirit to the smaller distilleries of Madhya Pradesh for onward sale to Exice licensees at the rate of Rs.1.25 per proof litre which comes to Rs. 9.10 per bulk gallon.

21. The Government Alcohol Plant, Ratlam have last year installed a diffusion battery for the extraction of sugar from mahua flowers. This is the only working unit in India manufacturing mahua spirit on a large-scale while the other distilleries are manufacturing mahua liquor in pot-stills on a small-scale. The average production of mahua spirit in the Government Alcohol Plant, Ratlam is about 2,000 gallons per day which is likely to be increased in the near future.

22. From the above, it would be observed that the cost of production of mahua spirit could be best brought down from Rs.7/- per bulk gallon to Rs.4/- per bulk gallon, if mahua flowers could be available at approximately Rs.12.50 per quintal. In this

connection, it may be stated that under the Alcohol Price-Control Order the maximum price chargeable on alcohol produced from molasses is about Rs.1.54 per bulk gallon. If this is taken into account, it would be difficult to envisage that alcohol produced from mahua flowers would at all be economical for use for any purpose other than potation.

23. Precise date regarding the availability of mahua flowers in the Dandakaranya area is not available. An economic size unit of one million gallon capacity would require an investment of about Rs.30 lakhs and it is doubtful whether adequate quantities of Mahua flowers would be available. Any proposal for the establishment of a smaller unit would have to be considered in the context of the present prohibition policy of the Government and the willingness of the State Governments to give priority to the utilization of mahua spirit produced for such a unit in the country-liquor shops of their States.

24. In view of the above position, it would not appear to be an economic proposition at present to think of establishing distilleries based on mahua flowers.

RATLAM ALCOHOL PLANT: RATLAM.

Total Mahua purchased	16000 quintals.
Total Production Mahua Spirit	110000 gallons.
Total days worked	75 days.
1. Cost of raw materials.	Rs. 5.870 lakhs.
2. Cost of Salary and wages at Rs. 15,000/- per month for 75 days.	Rs. 0.375 "
3. Cost of Power at Rs. 2600/- per month.	Rs. 0.065 "
4. Cost of Coal 13 tonnes per day for 75 days at Rs. 55/- per ton.	Rs. 0.536 "
5. Depreciation for Rs. 30 lakhs @ Rs. 3 lakhs per year for 2½ months.	Rs. 0.625 "
6. Repairs and maintenance for 2½ months.	Rs. 0.050 "
7. Miscellaneous and unforeseen such as insurance, interest, godown, rent etc.	Rs. 0.179 "

Rs. 7.700 lakhs

Production cost for 1.1 lakh
gallons of Spirit. = Rs. 7.7 lakhs.

Hence Production cost per gallon. = Rs. 7/-

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TRANSPORT & COMMUNICATIONS

As indicated earlier the Dandakaranya area, proposed for the integrated development, comprises of the three districts of Bastar, Koraput, and Kalahandi. The erst-while States of Batar,anker,Jeypore, Kala handi, Sukma, etc., have been integrated into these three districts. A considerable portion of this area is still forest lands very rich in forest produce and mineral deposits. The main handicap for the exploitation of the forest and other mineral resources has been the lack of communications in the area.

Railways:

2.3 A look, at the rail-way map of India, will show that this large chunk of territory, bounded on the North and North-East by the Nagpur-Raipur and Raipur-Visakhapatnam lines of the South Eastern Rail-way, on the west, by the Nagpur-Wardha-Vijayawada line of the Central Rail-way, on the East of the Vijayawada-Visakhapatnam section of the Southern Rail-way, is devoid of any internal rail links. The approximate area of this railless territory is 82,000 sq. miles, and of this, the Dandakaranya region forms about 69,000 sq. miles. The extent of forests in the Dandakaranya region itself is about 12,000 sq. miles.

3. The need for providing rail connections, so as to exploit the mineral and forest produce in this plateau area, was recognised right from the early part of the century. The former Bengal-Nagpur Rail-way, had carried out several surveys for rail links in the region. Some of the these are mentioned below:-

(1) Jeypore Plateau Survey:

This was undertaken in 1927-29, to link the Jeypore-Bastar Plateau with the Raipur-Vizianagram line. The proposed line was to take off from Lanjigarh Road, a station on the Raipur-Visakhapatnam line, terminating at Jeypore, with a length of about 161 miles.

(ii) Kondagaon-Kantabanji Railway:

The survey, carried out in 1945-46, was for a line taking off from MANTABANJI on the Raipur-Vizianagram line and connecting with Kondagaon, which again was on a proposed rail alignment from Nagpur to Visakhapatnam-length about 128 miles.

(iii) Nagpur-Visakhapatnam through route (1945-48)

The proposal was for converting the Nagpur-Nagbhir narrow gauge section (65 miles) and then to have a new railway line from Nagbhir to Bhanupratappur - 108 miles - and from there to Jagdalpur - 109 miles, connecting them with a line to Visakhapatnam.

(iv) Jeypore-Kottavalasa Survey (1947-48)

In 1911-16, a survey was carried out for a narrow gauge railway line from Durg (on the Ho-rah-Nagpur Main line) to Bastar-Jeypore-Kottavalasa. In 1947, a survey for a broad gauge line was carried out via Kondagaon-Bastar-Jagdalpur-Jeypore and onwards to Kottavalasa, via Koraput and Padma.

(v) Raipur-Jeypore Survey (1945-46):

Another survey was carried out from Raipur to Jeypore-length 264 miles, including conversion of the Raipur-Dhantari narrow gauge section, and a new line onwards to Jeypore via Bhanupratappur, Norangpur and Kondagaon.

Other surveys taken up in the 1946-48 period were

- (i) a line from Nowrangpur/Bhairamgarh to Rayagada on the Raipur-Vizianagram section;
- (ii) Kottavalasa to Bechali via Padra, Koraput, Chitrokot, Tummar;
and
- (iii) Bhairamgarh (westwards) to Ramagundam on the Chanda-Kazipet section of the Central Railway.

5. Due to limited financial resources available for such developments, none of these projects was taken up for execution during the post-war years. The problem, however, assumed a new significance with the negotiations between the Governments of India and Japan, for the export of four million tonnes of iron ore per annum from the Bailadilla iron ore deposits, during the Second Plan period. The question of resettlement of refugees from East Pakistan also assumed considerable importance during the same period. The vast virgin Dandakaranya region with its forest and mineral resources, offering immense development potential proved to be the natural choice for this rehabilitation scheme. To achieve both these objectives, the Government of India decided in 1959-60, to take up construction of a railway line from Bailadilla to Kottavalasa and onwards to Visakhapatnam. This line is about 280 miles long and passes through, more or less, the heart of the large railway-less Dandakaranya territory. The construction of this line is now progressing according to schedule and anticipations are that the line will be opened to traffic in 1966.

6. Due to the difficult Anantgiri Ghat section and the smaller Ghat section near Dantewara, the capacity of this

is expected to be somewhat restricted. With the special type of rolling stock, envisaged for the transport of ore, the capacity of the section is assessed at eight million tonnes of ore movement per annum. The commitment with the Japanese authorities is for supply, initially, of four million tonnes from the Bailadilla deposits and two million tonnes from Kiriburu area, which will move over the Raipur-Visakhapatnam line. However, when the Bokaro Steel Plant comes into being, the intention is to divert the Kiriburu deposits for feeding that plant and switch over these two million tonnes also to Bailadilla area, so that all the six million tonnes of iron ore will move over the new Bailadilla-Kottavalasa line from Bailadilla to Visakhapatnam.

7. Further schemes, for increasing the ore export from this area to eight million tonnes level, are also under consideration. In assessing the capacity of this new rail line for ore movement, as eight million tonnes, allowance has been made for the running of one passenger and two goods trains, in addition to the ore trains. These two goods trains should be able to move over one million tonne of general goods in the Visakhapatnam direction. Since the ore wagons will return as empties in the reverse direction, to Bailadilla, there is ample capacity for transport in this direction.

The question of setting up an integrated Steel Plant in the Bailadilla area is under consideration of the Government, so as to make use of this capacity in the reverse direction.

8. Keeping in view the possibility of location of a Steel Plant in the Bailadilla area, and the stepping up of the ore export programme to a much higher level, along with

the industrial development of the area, the Railways have already undertaken a survey for a new railway line towards the south from Dantewara (on the new line under construction) to Bhadrachalam Road. This link will facilitate movement of coal from the Kothagudem area to Jagdalpur-Bailadilla region, for feeding industries likely to come up there, in addition to transporting the finished products from the Steel Plant (if a decision is taken to set this up). Such a link will also facilitate augmentation of the ore export via Kakinada/Visakhapatnam ports, as sufficient capacity beyond Bhadrachalam Road has been developed on both the Central and Southern Railways, for movement to these ports. The N.M.D.C. are also carrying out studies for a rail-cum-riverine route for this increased ore export. The rail route goes via Sukma and Konta upto Konavaram on the Godavari bank; along the Bhadrachalam Road route, currently being surveyed, and there links with the riverine route from Konavaram down to Kakinada.

9. Further rail links urged in the area are :-

(i) A connection from Dantewara north-west to Dhalli Rajhara, passing through the rich Roghat ore deposits, linking with the existing Bhilai-Dhalli Rajhara line.

(ii) Another link from Ambaguda, on the new Bailadilla-Kottavalasa line under construction, to a point on the Raipur-Vizianagram section, somewhere near about Lanjigarh.

The cost-cum-feasibility studies for these new rail links, in the Dandakaranya area, are also proposed to be undertaken by the Railways during this year.

10. With the completion of the Kottavalasa-Bailadilla line, and if the proposed line from Dantewara to the South to Bhadrachalam Road, is taken up, the transport needs of

the area, would, to a great extent, be met with. Industries based mainly on mineral resources and forest produce of the area, will have naturally to be set up, keeping in view these alignments and the available capacity over these.

Roads

11. Although the road development in this area also offers considerable scope for augmentation, there are a few good roads running across the territory. An all-weather road runs from Visakhapatnam to Jeypore through Anantgiri Ghat, Araku, Padra and Tanithrou. At present, the whole produce from the Ghats, as well as from the Araku Valley goes to Srungavarapukote in the plains on this road, and the daily necessities of the tribal people, as well as those in the valley, are carried back on it. An alternative road from Visakhapatnam to Jeypore exists via Salur, Potangi and Koraput. The ascent via Salur ghat is easier, since the highest point is about 1000 feet below that of the Anantgiri Ghats, where the highest points, reaches about 4000 feet, and hence this road is more popular than the Anantgiri Ghat road route, though a little longer. There is another notable road from Visakhapatnam via Anakapalle, Chodavaram, Madhgula and Minimalur ghats to Padery and onwards from there to Araku. The existing rail heads at Rayagada (distance 68 miles) and Kesingga (distance 137 miles) are also served by roads from Koraput area.

12. In the Bastar District, Jagdalpur, is connected by a good road to Raipur and Rajnandgaon on the Nagpur-Horrah Main line and with Dhamtari, the terminus station of the Raipur-Dhamtari, narrow gauge line. A fair-weather road also connects Jagdalpur with Dantewara (53 miles) in the

south-west, Konda (116 miles) in the south, Bijapur (100 miles) and Bhopalpatnam (130 miles) in the west. There is another link from Dantewara to Konda via Sukma.

Rivers:

13. River routes are also used at present for movement of forest produce. The Tinned river ghat of the Indravati (134 miles from Jagdalpur) and the Konda river ghat on the Sabri river, are both used for moving timber, bamboos, etc., down to Rajahmundry. Movement also takes place through the Motu river ghat on the Kolab or Sabri river. This ghat is approachable by a fair weather road from Jewbore, passing through Malkangiri (distance of 116 miles from Koraput) to Rajahmundry.

GENERAL

14. Prior assessment of availability of transport and its future likely pattern of development in the Region, is vital for any plan for the integrated development of industries in an area. Capital investment on transport development schemes-particularly rail transport-is so heavy that unless an industrial project itself is such a giant complex; justifying independent rail links for it, it is necessary to select locations for industries, keeping in view the availability of rail/road transport. Short sidings from existing lines can be conveniently provided in most cases, for catering to the needs of fairly large sized industrial projects, where traffic warrants the same.

15. The types of industries contemplated for the Dandakaranya area have been already grouped under:-

- (a) Large scale industries;
- (b) Medium scale industries;
- (c) Small scale industries; and
- (d) Cottage & Rural Industries.

The Central Pulp Mill, and the Newsprint Plant, to be based on the forest resources, naturally would come under the first category. The suggested Hard Board Factory will have to be located in the same area, as the former, to utilize the waste products. The Cement Factories, to be based on lime stone deposits in the area, will also come under this category. As the asbestos Cement Sheets and accessories plant will have to get cement supplies from the cement plant, naturally this has also to be sited in the same area.

16. The commercial Ply-wood-cum-flush door, particle board, match and miscellaneous wood based industries and the Saw Mill which come under Small Scale Industries, will have to be preferably set up in contiguous locations as they are inter-dependent.

17. The other mineral based industries, such as Glass, Stone-ware pipes, Stone-ware Crockery, etc., may all be set up in an Industrial Estate, which may contain besides, several other small scale industries. Cottage and Rural Industries, being very small units, need not particularly be dependent very much on rail facilities.

18. The suggested alternative locations for the Central Pulp Mill, the Newsprint Factory and the Hard Board Plant, are :

(i) near Sukma on the banks of River Sabri;

and

(ii) near Jagdalpur on the banks of River Indrayati.

It should be easy to provide a rail siding to these plants at the Sukma site, if the proposed Dantewara-Bhadrachalam Road link is constructed, as this will pass through Sukma. Bamboo, as well as timber, required as raw material for these plants.

may have to come mostly by road or river, while rail facilities will be needed for coal-possibly, from Kothagudam area-also for the movement of finished products. The road system in the Jagdalpur-Malkangiri-Kothagudam area will have to develop considerably for linking up the various areas of activity that would emerge. Coal and other materials to move by rail, may require about 40 wagons per day and the requirements for the out-going finished products may be about 15 to 20 wagons. For the Newsprint Plant also, the wagon requirement may be of the order of 25 per day for coal, chemicals, etc., and about 10 for the finished products. The requirement for the Hard Board Plant will be very negligible, being only about 5 wagons per day.

19. At the site near Jagdalpur also rail transport may not present any problem, as a short siding can be conveniently provided from the Bailadilla-Kottavalasa line now under construction. Since the main rail movement will be that of coal, which may be from Kothagudam side along the proposed link from Bhadrachalam Road, this traffic is not likely to tax the Bailadilla-Kottavalasa line to any appreciable extent.

20. For cement production, the report visualises setting up of two Plants- one near Jagdalpur, using limestone deposits in the Kotomsar/Kanger Valley area and the other near Sunki/Araku, utilising the limestone deposits in the Sunki area. For the former, it should be easy to provide a rail siding from the Bailadilla-Kottavalasa line now under construction. A possible site for the plant may be close to the railway line under construction, near about Keslur Village (about 9 miles from Jagdalpur), where the road to Kotomsar branches off from the Jagdalpur-Gidam road. This is

between the Maranga and Torabal stations on the new line and B.G siding can be provided to the plant site from either of these stations. Coal and other materials (to come from Kothagudam via the proposed Dantewara-Bhadrachalam road link), as also outgoing finished products can avail of this rail siding. The Kothomasar/Kanger river Valley deposits will be about 12 to 14 miles from this suggested location. The terrain here is easy and for the lime stone movement from the quarries to the plant site, a N.G. Tram line can be conveniently provided as part of the project.

21. For utilising the lime stone deposits in the Umpavalli-Tuohmiguda area, two alternative locations for a 200,000 tons cement plant have been suggested one near Sunki and the other near Araku. The Sunki site will be 16 to 18 miles from the existing Salur railway station. The altitude of Sunki is about 2500 ft. and most of this has to be negotiated in the last 4 or 5 miles. Therefore, providing a rail siding from Salur to the Sunki site may be impracticable. However, there is a good metalled road all the way from Salur to Sunki. The raw materials (including coal but excluding lime stone) and the finished products may have to move by road for this Sunki location. Otherwise, if a site can be selected down in the plains, about 6 miles from Sunki, it may be possible for the coal and other raw materials to come by a rail siding about 10 to 12 miles from Salur, while the lime stone may move by a rope way about 20 to 22 miles long over the difficult terrain from Umpavalli. Even in this case, since the coal will have to be from the Korba area, the long lead may affect the economy adversely.

22. As against this, for the Araku location (Araku is a station on the Bailadilla-Kottavalasa line under construction)

only a very short siding to the plant site will be necessary. Coal etc. will move from the Athagudem area over the proposed Bhadrachalam Road link (if constructed) to Dantewara and then along the Kottavalasa line to Araku. Finished products will also have very economic rail facility. The lime stone may, however, have to move from the Umpavalli area by ropeway over a difficult terrain to Araku, a distance of about 12 to 14 miles. The investment on this needs to be carefully evaluated.

23. Of the two alternative locations, Prime facie Araku would appear to be the better one from the transportation angle. The factory will, however, then be in Andhra State (outside the Dandakaranya area), while the lime stone resources to be exploited will be in the Dandakaranya area in Orissa State.

24. For the movement of the finished products, it has been assessed that about 7,000 wagons per year, will be required for a 200,000 tonnes plant. For the two plants in Jagdalpur and the Sunki/Araku area, the daily requirement for finished products thus amounts to about 60 wagons, and as a good part of this may move towards Bhadrachalam side, there should not be difficulty in moving this traffic on the new Bailadilla-Kottavalasa line within the capacity available, after meeting the requirements of iron ore transport.

25. The smaller industries, proposed to be based in the Dantewara-Didam area are :-

- (i) Commercial plywood-cum-flush doors,
- (ii) Particle board,
- (iii) Matches and miscellaneous wood-based industries, and
- (iv) Saw Mill

As all these would be located in the same area, it should be possible to take off a short siding from Dantewara for servi-

cing these various small industries. The daily wagon requirements of all these together should not be more than 15 to 20 and movement of this order should present no problem either on the Bailadilla-Kottavalasa line or on the new proposed line to Bhadrachalam Road.

26. Other mineral based industries suggested, such as Glass factory, Stone-ware pipe factory, Porcelain Insulators factory, and Stone-ware Crockery, may be located in the industrial estates such as the one proposed near Jagdalpur. Usually, locations of such industrial estates should also be decided upon, taking into consideration, availability of established means of communications, both rail and road. The site in view near Jagdalpur is very close to the Bailadilla-Kottavalasa construction, now in progress, and can easily be serviced by a siding taking off from a convenient station on this line. Dantewara, where the proposed line from Bhadrachalam Road may join the present line, is also not far from the industrial estate site, and movement to and from that direction also should not present any difficulty.

27. It will be clear from the above considerations, that development of both rail and road transport in the area is most vital for the industrial development of the area. The Bailadilla-Kottavalasa construction now in progress and the Dantewara-Bhadrachalam Road link under investigation, if taken up, will go a long way in augmenting transport facilities. If a decision is taken to set up a Steel Plant in the area, it may bring in, in its wake other rail links to the Raipur-Vizianagram line or to the Bilai-Dhalji Rajhara line, which are also proposed to be investigated. A study of the present conditions of the roads from Jagdalpur-centre of the Dandaka-

ranya complex -to the different directions and the improvements that need to be carried out in the light of known locations of industry and the programmed exploitation of minerals in the area, appear to be very urgently called for. A phased plan for road development in the region is also necessary.

CHAPTER VIIFACILITIES TO BE DEVELOPED(a) Survey and planning of industrial resources, plantations, mineral surveys and explorations.

1. A reference is invited to relevant portions dealt with separately in chapters dealing with forest and mineral industries in which specific attention has been invited to some immediate work to be undertaken in these directions. Considerable importance is attached by this team to further work on these lines as soon as possible. It is understood that in the Koraput region where some of the forests are periodically set fire to by the Adivasis for temporary cultivation for a year or two after which they abandon them, the forests are getting denuded and climatic and other factors are also getting adversely affected. Both, in these areas as well as others declared by the State authorities as available for resettlement but not found suitable for agricultural operations, efforts should be made to undertake plantations of bamboo, hybrid eucalyptus, chin bin and other fast growing timbers to sustain production of paper and pulp industries which have been recommended by this team else where

(b) Training facilities-Establishment of training institutes:

2. The primary object of industrial development is obviously to provide increasing employment opportunities both to the adivasis and other local people as well as to the displaced persons. The problem is, therefore, one of not only reorienting the older and middle age group population but also of providing adequate facilities for development of the younger generation to useful occupations.

In this context, besides providing the minimum educational facilities in the form of primary and secondary schools, establishment of occupational and other training institutes to train the personnel required for semi-skilled and skilled work in the different industries needs to be taken in hand immediately. The number of skilled and semi-skilled workers required for the large-scale industries recommended in the different chapters broadly works out to 3. Apart from meeting these requirements in time as much as possible by training the local people and to provide the additional numbers, which will be necessary with further development of the area, there is need to make up the annual wastages. There is, therefore, a clear case for establishment of industrial training institutes both at Jagdalpur and at Koraput. A polytechnic should also follow for building up the supervisory personnel required for the next higher level.

(c) Transport and Communications, Railways and Roads

4. Besides the railway communication which is being established connecting Vishakhapatnam with Bailadila, the survey of the new line from Dantewara to Bhadrachalam has also been approved and survey work is in hand. The Madhya Pradesh Government have been pressing for further developments connecting Umerkote to Dantewara as well as to connect up with Dhalli Rajhara. From the stand point of utilising the mineral and forest resources of these areas, there is strong case for undertaking the development of communications facilities in this region also.

The Government of Orissa has indicated that, with power availability, the Balimela area is bound to develop

into a good industrial complex, which will need to be linked with the adjoining areas by rail. They have, therefore, urged the consideration of two alternative links to Balimela - one from the Dante-ara-Sukma side and the other from Jaypore side. If the survey of the former has already proceeded sufficiently and if full justification is available then Balimela can conveniently be linked with Sukma. This would involve only 40 miles of track over plain land with a bridge over the Sabri the total cost of which may be about Rs. 6 crores. The alternative link from Jaypore will be about 60 miles and would involve one ghat section and may cost about Rs. 10 crores.

(d) POWER RESOURCES :

5. A separate team headed by Shri Gopalingar has gone into this question and furnished its report and we do not purpose to go into this question. We have, however, been assured that for the various industrial developments considered by us in this report there would be no difficulty in making the required quantum of power available from the existing sources in and around this area as well as others under consideration.

(e) Organisation arrangements :

6. We have examined in this report the development of industries of diverse types and sizes and obviously a common pattern for them is neither feasible nor desirable. The cottage and rural industries have to be work-oriented and whenever any organizational set up is necessary for supply of raw materials or marketing of their products they should be of a cooperative type. The Dandakaranya Project Authorities should render assistance through ne-

ecessary Government facilities in the initial stages and guide the workers to develop cooperative arrangements as soon as possible. For development of small-scale industries through industrial estates also both private entrepreneurs and Government agencies leading up to establishment of cooperatives should be the pattern. In regard to medium industries, besides private entrepreneurs, those units which are developed through Governmental agencies should be looked after by an Industrial Development Corporation, with which the Dandakaranya Project Authorities should be closely associated there should, however, be a scope in the case of specific industries for the workers to develop their own cooperatives and take over specific units ultimately from the Industrial Development Corporation.

7. Both in the case of the large and medium scale industries, their organization should be made the responsibility of an Industrial Development Corporation. Depending on the size of the unit, there will be separate managers to look after each of them and will maintain separate accounts and operate them independently under the overall direction of the Industrial Development Corporation. Units such as, cement factories or paper and pulp factories etc., which are large ones, could have separate companies functioning independently. As there are likely to be several problems to be dealt with and sorted out with the D.D.A. as well as with the State Authorities, closer liaison is necessary between the individual companies, the Industrial Development Corporation, the D.D.A., the State Government and other orga-

nisations at State level such as the Orissa Industrial Development Corporation, the Orissa Forest Corporation etc. The Modus Operandi for securing the same needs to be worked out very carefully so as to ensure the most harmonious working and prevention of overlapping of functions.

8. Another important point which will arise particularly in the case of units which have to draw their requirements of raw materials and power from more than one state in this area is the location of the unit and arrangements for ensuring supplies of raw materials and other facilities from across the border. It is essential to face these issues from the beginning and sort them out in consultation with the concerned States so that difficulties do not arise at a later stage. As far as the team can foresee, these problems are likely to arise with reference to supply of lime stone for cement units and bamboo and other timber raw materials for pulp and paper industries.

Summary of Recommendations

1. The region is abundantly rich in forest and mineral resources. Most of the natural resources are yet un-exploited and the region has vast potentialities of development.

(1.15)

2. The water yield of both the rivers namely Indravati and Sabri and their tributaries is more than adequate to meet the requirements of the area in terms of irrigation and power and there are many suitable sites on the river in the area for dam construction, for harnessing the irrigation and power potential of these areas.

(1.18)

3. The scope and size of industrial development of the region needs to be tackled from a number of angles. Besides providing improved agricultural facilities, it is essential to provide alternative as well as additional occupations.

(2.2)

4. It is essential to provide additional employment opportunities both at the rehabilitation centres as well as through development of suitable industries wherever feasible.

(2.2)

5. Besides exploring utilisation of forest and mineral resources for establishing large scale capital intensive industries some of which will materialise only after long gestation periods simultaneous attempts are necessary to establish medium and small scale industries as well as cottage and rural industries which are labour intensive and will help to contribute to increase employment and development of skills.

(2.3)

6. The industries holding scope for development have been broadly divided into the following groups:-

- (i) Cottage and rural industries.
- (ii) Small scale industries through industrial estates.
- (iii) Medium industries and factory units through Industrial townships.
- (iv) Large Scale Industries.

(2.3)

7. The cottage industries can be developed in the several settlement colonies through education and propaganda on interesting the population to carry on their programme in the rural homes or at suitable centres especially in each re-settlement area in close proximity to their homes

(2.4)

8. In some of the large villages and small towns encouragement should be given to the population to integrate themselves in some of these branches. The main consideration should, however, be that the products manufactured are such as to meet the immediate requirements of the villages and towns in close proximity to centres of production rather than to develop markets at distances away.

(2.4)

9. The rural and cottage industries that deserve consideration on the above lines are bidi making, rope making, hand operating, spinning units, bamboo and cane work, decentralised cottage match making, weaving of handlooms and hand made foot wear.

(2.4)

10. Additions to this list have to be made based on local demand of products and the extent to which these could be produced from local raw materials through decen-

(2.5)

11. Small scale industries should develop through the establishment of industrial estates in reasonable proximity to large settlement centres or in the vicinity of small towns.

(2.6)

12. From the list of industries given, selection should be made for each industrial centre. There should be no objection depending on demand to repeat items at more than one centre. In fact in some cases it may ultimately be necessary to produce some of these items almost at each centre.

(2.7)

13. The industries holding prospects for development on small scale basis are washing soap, aluminium utensils, aerated water, bakery unit, storage battery, tyre retreading and vulcanising, general engineering workshops, tubular steel structures, hosiery textile processing, tool handles, electrical and domestic plastic ware, umbrellas, cycles, drawing and survey instruments, footwear, canvas weaving.

(2.7)

14. Simultaneously to undertaking construction of industrial estates and deciding on the industries to be developed from time to time, suitable centres should be established to train the workers in the skills involved so that as soon as the industrial estates and facilities are ready the workers could be encouraged for actual production operations.

(2.8)

15. The industrial estates should be established as a part of D.P.A. operations. The standard pattern of buildings and facilities already in vogue in other centres should be adequate.

(2.8)

16. The units could be developed either by attracting small entrepreneurs or by the D.P.A. engaging in the development directly. The workers could in due course be attracted to own the units themselves.

(2.8)

17. The estimated cost furnished in the draft report of the Small Industries Service Institute for each of these centres should serve as a broad guide.

(2.8)

18. The medium industries and factory units should be located in specially demarcated industrial township areas within reasonable distance of some of the major towns and provided with facilities such as water, power, transport, affluent disposal, etc.

(2.9)

19. Area extending from 500 to 1000 acres should be selected and laid out for integrated industrial township development. These townships should be used as centres of growth of medium as well as some large scale industries. In close proximity to these industrial areas, residential colony should also be developed providing all necessary living facilities.

(2.9)

20. The development of industries in these townships could follow a dual pattern. Besides private entrepreneurs who may show interest and undertake development, government should also establish units and provide employment and training facilities to workers in different fields.

~~21.~~ The medium industries which hold prospects are aluminum utensils, improved agricultural implements, low tension insulators, rice bran oil, spinning units, powerlooms, saw mills and wood working shops, wood seasoning and chemical treatment and bolt and nut plant etc.

(2,9)

22. The estimates of financial requirements given in the Small Scale Industries Institute report should be reasonably adequate for broad planning purposes in respect of the above industries.

(2,10)

23. Although the large scale industries involve heavier investment and longer gestation periods it is essential to make a start atleast with some of the industries for which raw materials and other data are reasonably adequate.

(2,11)

24. The large scale industries recommended for the region could be grouped into three major categories.

- (i) Industries based on forest resources.
- (ii) Industries based on mineral resources.
- (iii) Engineering and other industries.

25. There is abundant scope for the manufacture of iron and steel in the region. The question of establishing an integrated iron and steel project based on the resources of the region and the selection of a suitable site for such development is already under the active consideration of the Government. This indicates the desirability of establishing some engineering industries both for meeting immediate needs for certain types of items as well as to form a basis for further development.

(2,12)

26. The total forest area in the two river basin is approximately 11740 sq. miles. It could be safely assumed that 60 percent of the total forest area, that is, about 7000 sq.

plies could be available for exploitation. (3.1)

27. There are large surpluses of timber and fuel wood in the area which justify the setting up of wood based industries such as commercial plywood, particle board and hardboard etc. (3.5)

28. The total availability of bamboo from the Bastar and Jeypore areas would amount to approximately 246000 tons per year, as against the requirements of 2800000 tons of pulp per year. It is necessary to carry out a systematic survey of the forest resources of the region and in case there is any shortage between the availability and demand, the plantation of bamboo and also long fibred pulp woods should be taken up on an immediate basis.

(3.6)

29. The region has potentialities for a central pulp mill of a capacity of 100,000 tonnes per annum of kraft pulp. This would require an assured supply of about 280,000 tons per year of air dry bamboo. The bamboo supplies of this order could be secured only from a few possible locations in the country. One of them is in the Bastar area of Madhya Pradesh supplemented to some extent from the adjacent bamboo forest Divisions of Koraput District of Orissa. A systematic survey of the availability of bamboo in this region is however, a very important pre-requisite to the establishment of this project. (3.12)

30. The proposed central pulp unit should adopt the Kraft pulp process (sulphate with suitable provision for yield pulp). The principal chemicals required in this process are caustic soda, chlorine, sodium sulphate and lime which could be procured without any serious difficulty. (3.13)

31. Two locations one near Sukma on the banks of river Sabri and another near Jagdalpur on the banks of river Indravati satisfy the various factors essential for the setting up of a pulp mill. A detailed investigation should be undertaken in order to determine whether the choice should ultimately be near Sukma or near Jagdalpur. (3.17)
32. It would be necessary to construct a bridge across Sabri near Sukma to enable easy transport of bamboo from forests in the Jeypore Division. (3.17)
33. The total cost of the project is estimated at about Rs. 16 crores excluding the expenditure on workers' colony. The total employment potential would be of the order of 2500 persons. (3.20)
34. The availability of water to the extent required for the pulp project from Sabri and Indravati rivers should be closely examined. The data regarding the flow of water in these rivers during various seasons should be compiled in order to study the pollution problems arising of affluent disposal. In this connection the need for construction of a bund for storage of water for supply to the mill during dry months should also be studied. (3.24)
35. It might be desirable to associate the NEPA mills in the pulp project from the beginning with a view to eventually taking up this project as No. 2 mill of NEPA mill in the public sector. (3.24)
36. The Madhya Pradesh and Orissa Governments might be advised to reserve the bamboo resources in this region for the proposed pulp mill and not to allocate the bamboo of this region to any other mill. (3.24)
37. There are potentialities of setting up of a newsprint mill in the region. It should have a capacity

of at least 200 tons per day if not more. The unit could be based on utilising semi-chemical pulp from hard woods to the extent of about 70 percent of the fibre composition and the balance being made up of bamboo kraft pulp. A unit of this size would require about 60,000 tons per year of hard woods and 20,000 tons of bamboo kraft pulp. (3.30)

38. It would be desirable to locate the proposed central pulp mill and the newsprint mill at the same site near Sukma or Jagdalpur in order to have common facilities such as water supply, steam, power, affluent disposal etc. and draw bamboo pulp in slush form for newsprint production. (3.32)

39. If the newsprint and the pulp mills were located at the same place, a captive caustic soda-chlorine plant with a capacity of about 35 tonnes per day of chlorine might be installed. (3.34)

40. The total cost of the project is estimated at about Rs. 14 crores with a foreign exchange component of Rs. 7.5 crores the employment potential would be about 1200 persons. (3.37 & 41)

41. Suitability of different species of hard woods for conversion to pulp and a proper assessment of the sustained annual availability of various species of hard wood to feed the newsprint mill at least for a period of 20 years should be carried out. The results of the above assessment would indicate whether it would be necessary to select suitable compact areas for plantation purposes. (3.42)

42. It would be desirable to take up plantations in large compact blocks as far as possible. The plantations should be taken up in and round about the proposed location of factories which are to utilise the plantation timber. (3.42)

43. It is considered desirable to establish a hardboard plant in Dandakaranya region having a capacity of 20,000 tons per annum. (3.45)

44. It would be advantageous to set up the hardboard factory in the vicinity of the newsprint unit because wood which may not be suitable for pulping could be conveniently utilised in the hardboard factory and there would be obvious advantages in the extraction and transport of wood as also in the provision of common facilities for the newsprint mill and the hardboard factory. (3.47)

45. The investment on the hardboard project would be of the order of Rs. 150 lakhs and it would have an employment potential of roughly 200 persons. (3.49&51)

46. There is considerable scope for setting up a commercial plywood-cum-flush door factory particularly since there is no unit producing either plywood or flush doors in the whole of Madhya Pradesh. It would be desirable to establish a unit having a capacity of 20 million sft. per annum of commercial plywood and about 60,000 flush doors per year. The economies of scale are however, not very significant and a plant with a smaller capacity would also be economically viable. (3.55 & 56)

47. Taking into consideration the availability of ply logs and the rail and road communications it would appear that Geedam Dantewara area would be suitable for the location of the plywood-cum-flush door factory. The total investment on the project would be of the order of Rs. 50 lakhs with an employment potential of about 800 persons.

478 A proper assessment of the availability of species suitable for plywood manufacture in the West Bastar and South Jeypore Divisions should be carried out quickly.

(3, 67)

49. There are potentialities to set up a factory having a capacity of 7500 tonnes of particle board per annum. It would be desirable to integrate the particle board factory with the plywood factory and locate the particle board factory close to the plywood factory. This would ensure not only considerable economies in overheads and services but would also ensure utilisation of wastes from the plywood factory in the chipboard plant.

(3.71 & 76)

50. The total investment on the particle board project would be of the order of Rs. 60 lakhs and the employment potential would be about 300 persons.

(3.77 & 79)

51. The total requirements of caustic soda and chlorine works out to 22 tons and 32 tons per day for kraft pulp mill and newsprint plant respectively. The establishment of a caustic soda and chlorine unit for captive use would considerably improve the economies of these mills. There is, therefore, a clear case for establishing a caustic soda-chlorine plant of the capacity of about 30 tons per day (about 10,000 tons per year).

(3.82)

52. The total investment on the caustic soda/ chlorine plant would be of the order of Rs. 2 crores and it would have an employment potential of about 60 persons.

(3.85 & 86)

53. The availability of salt from Ganjam District in Orissa or Srikakulam in Andhra has to be investigated further. The availability of power at cheap rates has also to be negotiated.

(3.89)

presently available in bulk.

(4.2)

59. There is no immediate scope for any additional capacity for making high alumina refractories, because there is already sufficient production of these refractories for meeting the requirements of the steel industry up to a production level of 18 million tonnes of steel per annum as well as other industries like glass and cement. (4.4)

60. It would not be feasible to set up an economically viable unit producing high alumina cement in the region as it does not seem to offer any natural advantages for this product. (4.5)

61. The clays in this area would hold out prospects only for making building bricks, roofing tiles and at places for stone-ware pipes. (4.9)

62. The setting up of washing plant as suggested in the report would have to be ruled out as one would not normally set up a unit for washing clay of a capacity of less than 100 tonnes a day. (4.9)

63. A general purpose glass factory producing cosmetic food preserves, glass chimneys etc. of a total capacity of 10 tonnes of glass drain per day may be considered to be an economically viable unit for the region. (4.10)

64. The production of Silicon Carbide which is a high capital intensive industry and requires 50 per cent of the investment as foreign exchange, may have to be ruled out at least for the present. (4.11)

65. The plant for silica refractories is also not favourable because there is already idle capacity to the extent of 40,000 tonnes per annum in the industry because of the switch-over in the steel making practice from silica to the basic roof practice. (4.12)

66. Although calcium carbide is on the banned list for licensing additional capacity but if the engineering industries in the area develop to a stage justifying local consumption of calcium carbide to the extent of 15 to 20 tonnes per day, a 20 tonnes per day plant may be envisaged at that stage. (4.14)

67. The limestone deposits of this region offer possibilities of immediate utilisation for setting up a cement factory as these are not only quantitatively intensive but the quality of limestone is also of the cement grade. (4.18)

68. A site between 14-15 kilometres from Jagdalpur on Jagdalpur-Dantewara road (going to the Bailadilla iron ore deposits) is considered most suitable for setting up of a cement plant which will have a capacity of 600 tonnes per day. (4.26)

69. The alternative location for the cement factory based on Umpavalli deposits would be Araku which is on the new D.B.K. railway line. This place, however, falls in Andhra Pradesh and is technically not within the Dandakaranya region. It is quite possible that the Government of Orissa could be able to suggest another site near Sunki which is in the Dandakaranya area. (4.27)

70. From the point of view of movement of cement to the deficit areas in the eastern part of the country and the abundance of limestone deposits in the region it is felt that an ultimate capacity of 600,000 tonnes near Jagdalpur and 400,000 tonnes near Sunki (initially 400,000 tonnes near Jagdalpur and 200,000 tonnes near Sunki) would be justified. (4.28)

71. A further study of the limestone deposits available would be necessary for deciding the process but the raw materials being suitable for both, the dry process is recommended in this area. (4.29)

72. The capital investment on the cement plant near Jagdalour with 400,000 tonnes capacity would be of the order of Rs. 75 million and that near Sunki for an initial capacity of 200,000 tonnes would be of the order of Rs. 37 million. The employment potential for both the plants would be about 1500 persons. (4.32)

73. As letters of intent have been issued to M/s. Birla Jute and M/s. Bose Investment for setting up cement plants in the District of Jagdalpur, the limestone area for the private projects and the public sector should be formally demarcated. (4.34)

74. Geological investigations would be necessary to definitely ^{to} prove the deposits for cement grade limestone as distinct from flux grade in the Koraput District. A unit with a capacity of 10 tonnes per day or 3,000 tonnes per annum for producing glass tumblers, glass chimneys and table and pressed ware is suggested to meet essentially the local demand. This would require an investment of about Rs. one million and the employment potential would be more than 300 persons. (4.39 & 45)

75. A plant for producing 300 million building bricks per annum may be set up. This would require a capital investment of Rs. 20 lakhs and have employment potential of 200 persons. (4.53 & 54)

76. A capacity of 300,000 Rft. of R.C.C. pipes of the various dimensions is recommended for the Dandakaranya etc.

the number of units to be decided when the complete picture of industrialisation of the area emerges. (4.56)

77. The capital investment required for producing R.C.C. pipes would be of the order of Rs. 0.75 million and the employment potential would be 100 persons. (4.59)

78. A plant for producing stone-ware pipes having a capacity of 24,000 tonnes per annum could be set up in the region. This would require capital investment of Rs. 1.3 million and the employment potential would be 150 persons. (4.65 & 66)

79. A plant for manufacturing pressed porcelain and low tension insulators is recommended for a production of 2600 tonnes of insulators per annum. An investment of Rs. 1.5 million would be required. The employment potential of the unit would be 260 persons. (4.72 & 74)

80. A small unit of 1500 tonnes per annum of stone-ware crockery for meeting local demand in the region is considered feasible. This would require an investment of Rs. 0.8 million and employment potential would be 200 persons (4.75, 78 & 79)

81. A plant for making Asbestos cement sheets, pipes and fittings of a capacity of 36,000 per annum may be set up near the cement factory proposed for Jagdalpur. The capital cost of the project would be Rs. 7 million and the employment potential would be 525 persons. (4.81, 84 & 85)

82. An engineering unit for manufacture of tubular, structurals and slotted angles of the capacity of about 5,000 tonnes per year may be considered abinitio. A unit of this type supported by requisite designs and drawing facilities would help the DBA to standardise the structures for transit camps, settlement colonies as well as for the

construction of industrial estates. The initial investment on the above plant would be of the order of Rs. 20 to 25 million. (5.6 & 7)

83. There is scope also for establishing a separate structural shop which could be located at a suitable site between Jurdalour and Danterrana. Initially it would have a capacity of about 5,000 tonnes and could later be expanded to 20 to 25,000 tonnes on two shift basis so as to be in a position to meet the requirements of the pig iron and steel plants as well as other industries. The investment on a unit of this type would be of the order of Rs. 15 million increasing to about Rs. 25 million eventually. (5.8)

84. With the development of industries in this vast area there would be substantial scope for products of grey iron and foundry. A unit with an output of 20,000 tonnes of castings and pipes deserves consideration. This might cost about Rs. 20 million. Besides cast iron pipes, the unit should take up the production of general sanitary fittings, railway sleepers etc. (5.9)

85. A unit with an initial capacity of 2,000 to 3,000 tonnes of steel castings per annum and an ultimate capacity of 5,000 to 6,000 tonnes per annum is considered advisable for the region. This unit would meet the requirements of light and medium castings of several industries that would come up in the region. (5.10)

86. It may be worthwhile to take up the manufacture of agricultural and forest implements to suit the local conditions of agriculture/forestry. A unit similar to the one in operation at Hassan in Mysore State with an investment of about Rs. 20 lakhs and giving an output of about Rs. 30 lakhs per annum seems attractive. (5.11)

87. Under the present conditions it may not be possible to set up a sugar factory in the region which is to be ruled out for the present. This could, however, be considered if after development of irrigation facilities there is additional acreage under sugarcane cultivation. (5.12)

88. With the increased production of fruits and vegetables in the region there should be scope for the establishment of fruit and vegetable preservation industries.

(5.13)

89. There is justification for setting up a cotton spinning mill in the region. An economic unit should have 25,000 spindles and the estimated cost would be about Rs. 15 million.

(5.14)

90. There is considerable scope for envisaging production of cloth through power-looms and hand-looms in the area.

(5.15)

90. It could not be an economic proposition at present to think of establishing distilleries based on Mahua flowers.

(5.24)

91. In addition to the new railway lines towards south from Dantewara to Bhadrachalam road for which the railways have already undertaken a survey, further links urged in the area are

(i) A communication from Dantewara north-west to Dhalli Rajhara, passing through the rich Roghat ore deposits, linking with the existing Bhilai-Dhali Rajhara line.

(ii) Another link from Ambaguda, on the new Bailadilla-Kottavalasa line under construction to a point on the Raipur-Viziangram section somewhere near about Lanji Gargh. (6.9)

92. With the completion of the Kottavalasa-Bailadilla line and the proposed line from Dantewara to the South to

~~Shadachalar Road, the transport needs of the area could to~~
 great extent be met with. The industrial base, mainly on mineral
 resources, could have to be set up keeping in view these alignments.
 (6.10)

93. The capital investment on transport development schemes—
 particularly railway transport is so heavy that unless an industrial
 project itself is a giant complex justifying independent railway
 links for it, it is necessary to select location of industries
 keeping in view the availability of rail-road transport. (6.14)

94. It should be easy to provide a rail siding to the centr
 ould mill and the newsprint factory at the Surma site if the propo
 sed Dantewara-Shadachalar line is constructed as this will pass
 through Surma. At the other site near Jagdalour also, rail trans
 port may not present any problem as a short siding may be conveni
 ently provided from the Bailadilla-Kottavalasa line now under
 construction. (6.18)

95. For cement production the report visualises setting up of
 two plants—one near Jagdalour using limestone deposits in the
 Kotonsar/Kanher Valley area and the other near Suncil/Araku utilisin
 the limestone deposits in the Suncil area. For the former a possible
 site may be close to the railway line under construction near
 about Kestur village about 9 miles from Jagdalour. For the latter
 Araku would appear to be a better site from the transport
 tation angle. (6.21 & 23)

96. For the smaller industries proposed in the Dantewara
 Gecim area it should be possible to take off a short siding from
 Dantewara for servicing these various small industries. (6.25)

97. Other mineral based industries such as glass, steam
 pipes, porcelain insulators, stone-ware crockery etc. may be located
 in the industrial estates such as the one proposed near Jagdalour.
 Generally locations of such industrial estates should also be de
 cided upon taking into consideration the availability of establish
 means of communications—both rail and road. (6.26)

98. A study of the present conditions of the roads from
 Jagdalour—centre of the Dantewara complex to different

directions and the improvements that need to be carried out in the light of known locations of industries and the programme of exploitation in the area appears to be very urgently called for. A phased plan for road development in the region is also necessary. (6.27)

99. Efforts should be made to undertake plantations of bamboo, hybrid eucalyptus, chin pin and other fast growing timbers to sustain production of paper and pulp industries which have been recommended for the region. (7.1)

100. The establishment of occupational and other training institutes to train the persons required for semi-skilled and skilled work and the different industries needs to be taken in hand immediately. (7.2)

101. A poly-technic should be set up for building up the supervisory persons for industries in the area. From the standpoint of utilising the forest resources of the region, there is a strong case for undertaking the development of communication facilities in the region. (7.4)

102. The cottage and rural industries have to be work-oriented and whenever any organisational set up is necessary for supply of raw materials or marketing of their products, this should be on cooperative lines. (7.6)

103. The Dandakaranya project authorities should render assistance through governmental facilities in the initial stages and guide the workers to form cooperative societies. (7.6)

104. For development of small scale industries through industrial estates, the establishment of cooperatives should be the pattern. There should be scope for cooperatives even in regard to medium industries. (7.6)

105. The organisation of large scale and medium scale industries should be the responsibility of an Industrial Development Corporation. The big units such as cement factories or paper and pulp factories could have separate companies. (7.7)

106. There is need for additional coordination and liaison between the individual companies, Daidakaranya Project Authorities, the Industrial Development Corporation and the State authorities with the object of speedy industrialisation of the region. (7.7)

107. The arrangements for ensuring supplies of raw materials and power etc. from other States, if required, should be sorted out from the very beginning so that no difficulty arises at a later stage. (7.7)

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NE. DELHI,
12th August, 1965.

October

TECHNO-ECONOMIC SURVEY OF INDRAVATI-SABRI BASINS

PRELIMINARY PAPER

ON FOREST RESOURCES FOR DEVELOPMENT OF FOREST-BASED
INDUSTRIES

(By: D.H. Kulkarni, Dy. Inspector General of Forests)

INTRODUCTION

The object of compiling this paper is to present, collectively, relevant information and available data regarding the forest resources of the region, with a view to prepare a broad basis for formulating specific recommendations on the development of industries dependent on these resources. Special attention has been given to the availability of raw-material and possibilities of its economic exploitation.

AREA

2. The area included in the proposed survey wholly lies within the Dandakaranya area and in fact covers most, if not the whole, of it. Our TEAM has already decided, in its first meeting, that our survey need not necessarily be limited to the catchment of Indravati alone but may be extended to cover the catchment of Sabri river also. It was decided that the economic viability of the area chosen should be the over-riding criterion. Grouping together of land resources of these catchments, so that they form an economically viable area will naturally vary with different raw-materials required for different industries. It would, perhaps, be advisable to start with a somewhat bigger area on an ad hoc basis, so that when the initial appraisal is over, economically viable portion out of it would become identifiable.

3. The Dandakaranya Project area covers whole of Bastar District (including Kanker, North Bastar, South Bastar,

East Bastar, West Bastar and Plantation Forest Division of Madhya Pradesh and Jeypore District (including Jeypore and Rayagadha Forest Divisions) of Orissa. At the very outset it was clear that from the point of view of the economic availability of the raw-materials, Rayagadha forest division can be straightway excluded. (It is also mostly outside the basins of the two rivers) For similar reasons it would have been justifiable to exclude also the Kanker division (2545 sq. miles) except that for certain raw materials like plywoods and Myrobolam, it could economically merge with the core unit of Indravati basin. In the present paper, therefore, relevant information of Kanker division has been included, with a clear understanding that there are severe limitations on the economic availability of its raw materials due to long lead from the possible locations of industrial units located in the south and also due to intense demand of its produce going to Chhattisgarh plains in the north.

4. Total areas thus considered for the purpose of this paper, the forest area out of it, the population and per capita forest area are indicated below.

District	Total area (sq.miles)	Population (Lakhs)	Forest Area (sq.miles)	Proportion of Forest area in the total area.	Forest area per capita (acres)
Bastar (Whole)	15,124	11.68	8,672	57%	4.6
Jeypore (Part)	5,511	6.00	3,068	56%	3.0
Total:-	20,635	17.68	11,740	57%	4.2

HABITAT CONDITIONS

5. Annual rainfall in the region is 60 to 70 inches. It is well distributed over the year. There is hardly a month without rain and the dry period is never very severe. Showers during the summer months are a regular feature. Forest is unknown - except in small pockets at the very highest levels near Koraput. In short, the climate of the area is distinctly favourable for fast growth of forest. Forest soils vary largely but on the whole are good enough to support fairly high quality stands. Dominant trees reach height of 80 to 100 feet. From productivity point of view the forest lands of Bastar-Jeypore tract should stand fairly high up in India, indicating that large-scale plantations of suitable fast-growing species should succeed.

Forest Areas & their classifications

6. As already stated, the total area under 'forests' in the region is about 11,740 sq. miles, the whole of which is government-owned.

7. Legal classification of these forest is as below:-

State	Reserved (sq.miles)	Protected (sq.miles)	Unclassed (sq.miles)	Total sq.miles
Bastar Division(M.P)	3,439	5,233	-	8,672
Jeypore (Orissa)	1,335	1,733	-	3,068
Total:-	4,774	6,966	-	11,740

Broadly speaking, the 'Reserved' forests are better stocked, better looked after, more merchantable, more clearly

demeared, more valuable and less burdened with adverse right of the people, than the (Protected ones.

8. Accurate figures to show the break-up of these forests into merchantable and non-merchantable (including protection) were not available but local forest officers believe that the break-up would be somewhat as below:-

- I. Productive Forests
 - (a) Merchantable 70%
 - (b) Non-merchantable 20%
- II. 'Protection' Forests. 10%

'Protection' forests are those which require to be retained as a cover for all the time for physical protection of the terrain and are, therefore, not available for regular exploitation. The non-merchantable forests are unexploitable due to various reasons but mostly for want of communications, roads and even sufficient stocking. With improvements in communication and increase in demand, the proportion of the merchantable forests and also the degree of exploitability in them is likely to go up, within certain limits.

9. The non-merchantable forest portion includes the following areas which, though legally classed as forests, are practically devoid of any utilizable forest growth:-

- Encroachments(including those which have been regularised)- About 587 sq.miles
- Area under shifting cultivation- About 856 sq.miles

Total:- 1,434 sq.miles

It will this be fairly safe if we assume that 60% of the total (or about 7,000 sq.miles) forest areas are available for exploitation, in the tract comprising of the

whole of Bastar district of Madhya Pradesh and the Jeypore forest division of Orissa.

WORKING PLANS.

10. Nearly 40% of the total forest area is now covered over by regular working plans. For other areas working Schemes or elementary plans have been prepared.

Types of Forests.

11. Bulk of the forest area carries moist deciduous forests. Sal, which is the most prominent single species, grows in the north and the east and has a habit of forming gregarious crops. Teak, occurs mostly as scattered trees in the south and the west mixed with other miscellaneous species. One of the most important secondary species is bamboo which occurs mixed with timber forest. So far, of the total forest area (11,740 sq.miles), only 3,438 sq.miles would be stock-mapped. From the results of the stock maps and also from the ocular observations by the local forest officers, of areas which have not been stock-mapped the overall proportions of various forest types are roughly as indicated below:-

Teak	5%
Sal	26%
Miscellaneous	55%
Blanks	14%

(Regarding the extent of occurrence of bamboos and salai, reference will be made ahead).

12. Teak and Sal are the principal timber species. There are other timber species especially in the miscellaneous forest, which are utilisable as plywood, matchwood and

timber for other uses. Amongst the naturally grown forest species, bamboo is the only one which is known to yield long fibre pulp.

GROWING STOCK & INCREMENT.

13. Although the forests of this region are fairly well stocked, they are natural forests and, therefore, the canopy density varies. For the merchantable forests as a whole, we shall not be far out if we assume the general canopy density to be about 0.7 to 0.8. At present the only source of indications regarding the quantity of growing stock per acre in existence is the data obtained from the enumerations carried out in connection with compilation of various working plans and working schemes in the region. Because these enumerations were confined to certain valuable species only and trees were enumerated down to certain girth limits; there are obvious limitations in applying the enumeration figures for calculating the entire growing stock all over. The matter was discussed separately with 8 different forest officers not below the rank of Divisional Forest Officers. Data regarding the past estimates of growing stock were also examined. Taking all these into account, the general consensus was that for the merchantable forest as a whole the average existing growing stock of all kinds of trees per acre is roughly:-

- 4 tons of timber
- 12 tons of fuelwood

Total:- 16 tons

(The above break-up into timber and fuelwood is on the basis of the present use practice. As demand for secondary

timbers and small-sized woods increases the proportion for timber will increase). On the basis of above assumed figures, the total growing stock standing over 7,000 sq.miles of forests available for exploitation, will be 71.68 million tons (including 17.92 million tons of timber and 53.76 million tons of fuelwood). For such natural forests the mean annual increment may be taken to 2% which gives the annual increment of 1,4336 million tons (including 0.3584 million tons of timber and 1.0752 million tons of fuelwood). There could be a further reduction in increment on account of damage due to fire, wind flood etc.

14. It has to be pointed out that the existing growing stock is far from being what the productive potentials of the forest lands could have supported and, further, that the forest are not putting on maximum possible increment. Introduction of systematic management in these forests are of comparatively recent time and continuance of it is bound to improve both the growing stock as well the increment per acre.

RECORDED OUTTURN.

15. The latest division-wise figures on recorded annual outturn of timber, fuelwood and bamboos from the forests in the region are shown in Statement I and, likewise, out-turns of other (minor) forest products are shown in STATEMENT II. These figures were collected from the six divisional forest officers on the basis of their latest Annual Reports.

16. As regards STATEMENT I, we shall consider ahead the position of bamboos separately. So far as the timber and

fuelwood are concerned, it will be seen that the recorded annual outturn from all the forests under the survey is only 0.1305 million tons (0.0873 million tons currently used as timber and 0.0432 million tons as fuelwood), which is hardly 9% of the total wood increment of these forests as estimated in para 13. (Separate percentages for timber and fuelwood work out to 21% and 4% respectively).

UN-RECORDED OUTTURN.

17. Before commenting on the incompleteness of utilization of wood, it will be necessary first to consider the question of the unrecorded out-turn of timber and fuelwood. In addition to the quantities which are recorded in the Annual Reports, substantial materials which remain unrecorded come out of the forests towards free nistar to the local population and, to some extent, as material from illegal fellings and extraction. There was no way to assess this kind of out-turn except by oral enquiries from the concerned Divisional Forest Officers. These enquiries revealed that the unrecorded annual outturn from the concerned forests works out to the tune of:-

<u>Timber (tons)</u>	<u>Fuelwood (tons)</u>	<u>Total (tons)</u>
21,000	1,70,000	1,91,000

It will be seen that, compared to the recorded figures, the unrecorded outturns tend to be substantial quantities, especially in respect of fuelwood, and this is understandable when one comes to realize the quantum of wood that goes out of the forest every year by way of privileges for hona-fide domestic and agricultural requirements in the region populated with forest-oriented communities.

SURPLUS WOOD.

18. Even taking into account the recorded and the unrecorded outturns together, the total hardly exceeds 24% of the annual increment (31% of timber and 20% of fuelwood). Although the above figures may not be considered sufficiently reliable, they are enough to indicate broadly how very incomplete the current wood utilization and exploitation are. It is a common knowledge in the region under survey that, except for the timber which is the very best in quality, of the most favourite few species and of the very big size and also the fuelwood which is available in the vicinity of the few townships or sizable villages, the rest of the yield is either not utilizable or is not exploitable currently. It has, however, to be remembered that the above seemingly wasteful utilization and incomplete exploitation of the annual yield is not so much a matter of defective forest management as of the insufficiency of demand and lack of social developments. In an underdeveloped tract such as the one under survey the outturn of timber and fuelwood has always been within certain limit, adjusting itself to the demand in the context of possibility of economic extraction. For saving the enormous wastage of the resource potential of the forests in the region, further developments, especially in connection with industries, are imperative.

19. Nevertheless, the forest management stands in need of radical reorientation for improving the forest increment by (a) augmenting the growing stock and (b) gradually replacing the slow-grown uneconomic crops by the fast-grown man-made industrial woods. This again is a matter closely linked up with bringing about integrated developments.

20. The above rough analysis will help in indicating the great scope that lies in utilizing the surplus wood in the region by establishing industries like plywood, chipboard etc.

Water supply, Power and Communications.

21. Most of the rivers and prominent streams hold water for the greater part of the year. Where the bed gets dry, water can be reached by digging a few feet. Water table is generally high and wells are not required to be too deep. Both the rivers, Indravati and Sabri, give enough possibilities of choosing locations for industrial units from the point of view of availability of water.

At present power comes to this tract from Machkund (Orissa) and Korba (Madhya Pradesh). Coal has to come from Korba.

22. The information about the metal roads and progress of construction of D.B.K. Railway line is too well-known to be reproduced. In addition to these, there are some fair-weather forest roads constructed and maintained by Forest Department for extraction of forest produce. On the whole, the forested areas are not yet served with adequate extraction roads. Therefore, plans for establishing any project concerning forest-based industry will have to have adequate provision for opening up new roads and improving the existing ones to facilitate extraction of raw-materials. The location of the factory and the distribution of the raw-material resources will determine what new roads would be required and which ones need to be up graded. Procurement of road metal and red murrum does not present much difficulty in this tract.

Saw Milling, Kiln Seasoning and Wood
Preservation Integrated Units.

23. Due to long leads to rail-head and consuming centres, currently, only teak in round and good quality sal and few other valuable hard-woods of larger size both in the log form as well as in sleepers or whole sizes are transported by lorries, in the region. This constitutes just the cream of the forest crop. Poor quality sal and less durable or refractory other hard woods, which would normally be readily accepted elsewhere, are either only partially utilized in a few small-sized privately owned saw-mills, or wastefully used as fuelwood, or not utilized at all. In remoter places such material generally perishes whole-sale in situ and the national loss on this account is of colossal magnitude. This region is, therefore, quite suitable for establishing at least one, if not more, integrated unit consisting of a large and modern saw-mill with a sizable seasoning kiln and preservative plant attached to it. The latter will render the sawn timbers of secondary species market-worthy. Addition of a joinery mill or wood-working to the unit can be kept as a matter of subsequent expansion. It is the public sector (or the proposed Bastar Forest Corporation) which is perhaps best suited to take a lead in this venture. To start with, it will be possible, and even necessary, to anchor the disposal of the finished products from such an integrated unit to an assured demand in some other public sector e.g., railway, P.W.D., etc. The regional forest resources are sufficient to feed annually not less than 10,000 tons of secondary timber to this unit on a sustained basis. The most convenient location would be Jagdalpur. It has, however, to

be remembered that the raw-material resources for this kind of industry will largely overlap the resources envisaged under plywood industry to which we shall come later. For obvious reasons priority will have to be given to the plywood industry which needs timber of highly restricted specification. By carefully locating these two industries it should still be possible to have both the units in the region without serious encroachment of raw-material resources.

INDUSTRIAL CHARCOAL

24. Development potential for the annual production of 100,000 tons of special grade pig iron for quality casting has already been sighted at Beladilla, which requires about 10,000 tons of charcoal which is free from phosphorus and sulphur. Charcoal is also likely to be required for production of ferrosilicon and other ferro-alloys the quantity of which is not known. NCAER, in their study 'Development of Dandakaranya', had recommended contemplating production of 150,000 to 200,000 tons of charcoal, although it is not clear from that report to what use the surplus quantity, after meeting the requirement of the iron and steel industry, will be put. Industry's member of the team will kindly look into this as also about the possible location of the pig iron plant—whether at Beladilla or Koraput. Assuming that 4 tons of air-dry wood would produce one ton of high quality charcoal, the above production will need about 0.6 to 0.8 million tons of wood per annum. It must be stated that this is an enormous quantity and can doubtfully be supplied without seriously affecting the supply of raw-materials to chip-board and hard board factories. It is not clear whether the charcoal made out of logs and tops of sal trees, which is usually

considered inferior in market, will be industrially accepted as good. There will, however, be no difficulty whatsoever in finding 0.04 million tons of wood for manufacturing quality charcoal for pig iron industry no matter where the plant is located. This supply can be met from hitherto unsalable fuelwoods, lops and tops of timber trees, wastes and slash of fellings and from forestry point of view will be greatly welcomed as their removal will act as a scavenging operation. The supply of wood for manufacturing quality charcoal for pig iron is not likely to interfere with supply of similar wood to hard-board or chip-board factories.

Destructive Distillation of Wood.

25. NCAER in their report on 'Development of Dandakaranya' on page 78 has advocated undertaking of wood distillation as a major industry in the area and to obtain the charcoal (150 to 200 thousand tons per year) as a product of it. So that such a plant should become industrially viable, the production of such high quantity of charcoal might have been probably suggested. In any case, feeding of dry wood to 10 wood distillation plants at the rate of 100 tons per plant per day is bound to affect supplies of raw materials to hard-board and chip-board factories. There will, however, be no difficulty if the quality charcoal required for pig iron industry alone is prepared by retort distillation method.

Plywood and Decorative Veneering.

26. The list of tree species which grow in the forest of this region and which, according to ISI specification, are suitable for peeling is given in STATEMENT III. Except for

be remembered that the raw-material resources for this kind of industry will largely overlap the resources envisaged under plywood industry to which we shall come later. For obvious reasons priority will have to be given to the plywood industry which needs timber of highly restricted specification. By carefully locating these two industries it should still be possible to have both the units in the region without serious encroachment of raw-material resources.

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Plywood and Decorative Veneering.

26. The list of tree species which grow in the forest of this region and which, according to ISI specification, are suitable for peeling is given in STATEMENT III. Except for

teak, the rest are secondary hardwoods which occur in a scattered manner, more commonly in the miscellaneous forests and to a lesser extent as associates in the teak forests.

Sal forests are on the whole deficient in these trees.

The potential resource in respect of plywood timbers, therefore, lies in the miscellaneous forests of West Bastar and to a lesser extent in the teak zones of South East Bastar and South Jeypore.

27. Recent investigations specially conducted in connection with the application of Madhya Pradesh Trading Industries, Bhopal, for grant of timber licence for establishing a plywood factory in Bastar has revealed that in the 160 sq. miles of the Reserved Forests, consisting of six Blocks (Bijapur, Bhairamgarh, Toynar, Goodam, Jallavagu and Bandopara) in West Bastar Division, on an average per acre there are 3.36 trees of 5' and over girth and of plywood species, each with an average clear bole of 25.75 feet and peelable volume of about 28 cubic feet. Adopting Selection Feelings on a cycle of 30 years, it was estimated that this area was capable of yielding about 2.50 lakhs of cubic feet per year on a sustained basis.

28. It has to be remarked that the above area of 160 sq. miles of miscellaneous forests is by far the best available locality in the region under survey from the viewpoint of obtaining plylogs. Indications are clear that in the other miscellaneous forests as a whole and also in the teak type areas, the occurrence of plywood species is much less abundant. The current working plan of West Bastar division in which 5,433 acres of miscellaneous forests were enumerated 100%, it was found that on an

average there are only 2 trees per acre which included all miscellaneous species and both sound and unsound. For such a forest taken as a whole we may, for safety sake, take that there will be only one tree per acre capable of yielding peelable logs.

29. Assuming that an economically viable plywood factory will need a minimum sustained annual supply of 5 lakhs cubic feet of plylogs, and considering that half of this can be had from the 160 sq. miles of forests of the six blocks of West Bastar division mentioned already, it is estimated that about 500 sq. miles of extra forest area which is exploitable will be needed. The question arises, what are the possibilities of finding additional areas. This problem too was tackled sometime ago by the Conservator of Bastar who suggested further areas, mostly of West Bastar and South Bastar divisions, to make up the total requirement.

30. The local forest officers feel that the area thus required is abnormally large. The Chief Conservator of Forest was not in favour of granting monopolistic lease of selected species of special quality and size, involving only partial utilization of even the trees chosen for felling. The proposal of Madhya Pradesh Timber Industries has not come through, presumably on account of the above views.

31. So far as the general question of establishing a plywood industry in the tract is concerned, I feel that the matter need not rest at that only. First of all, the objection of incomplete utilization need not stand if the plywood factory is integrated with a hardboard unit just as has been the case with the present unit at

Baliapattam in Kerala. While peeling the large logs, the waste lops and tops may be utilized in the adjacent hard board unit.

32. Secondly, the resources lying in the Sabri basin in the Southern region of Jeypore division may also be considered as additional. Although, similar detailed investigations in that division have not been carried out, the local forest officers have reported that in that region also on an average the forests hold about 50 cubic feet of ply logs per acre.

33. Admittedly, there is a need for further and specific pre-investment survey of resources in the region for setting up a plywood-cum-hard board unit. In this preliminary paper, nevertheless, it can safely be indicated that the prospects of locating such a unit in the region are indeed bright. The most suitable locality for establishing the factories appears to be Geedam or Dantewara which can economically attract raw materials from both Bastar and Jeypore.

34. For decorative purpose and for face veneering, about 1 lakh cubic feet of teak would be needed, which I think can be had easily from the teak forests, provided competitive prices are paid.

Hard Boards, Chip Boards, etc.

35. As already stated, these industries can be conveniently integrated with the plywood factory. The hard boards or chip boards factory has got a wide choice of resources for selecting its raw-material from. The waste wood obtainable at a plywood factory, various saw-mills and also unsalable wood lying in the jungle would be

so very plentiful that there will be no difficulty in meeting the demand of a board factory of a normal size. From the point of view of availability of raw-material it may even be possible to establish the board factory independent of the use of waste wood from other mills and dependent only on the jungle wood. The total forest area from which free extraction of fuelwood is uneconomical as reported by the various forest officers concerned in the region comes to over 4,500 sq. miles. There is also a wide choice for selecting the centre for locating the board factory, purely from the viewpoint of availability of raw-material. The various names suggested by the local officers are, Gidam, Dantewara, Jagdalpur, Korgaon, Bhanupratap and Balemela. The area of the forests mentioned above lies within 75 miles of the radius of the above places. Estimates regarding the unused portion of the wood not utilisable as timber in the region concerned have already been given.

MATCHWOOD

36. The following species found in the region are suitable for the Match industry:-

1. Salmalia malabarica (Semal)
2. Kydia calycina (Baranga)
3. Ailanthus excelsa (Moharukh)
4. Mangifera indica (Am.)
5. Hymenodictyon excelsum (Potur), (Bhormal)
6. Stereosermum chelonoides (Mokha)
7. Lannea grandis (Jhingan)
8. Holoptelia integrifolia (Chirhol)
9. Boswellia serrate (Salai)

Many of these softwoods are required for other industries recommended separately. Establishment of a major match factory in the region does not appear to be an economic proposition. Instead, this industry can be considered for developing it as a cottage industry. Koranput, Jagdalpur, Kanker, Umarkote and Dantewara appear to be suitable centres for starting this cottage industry. Supply of raw material will not be appreciable and, therefore, can be arranged for without difficulty.

Small-scale and Cottage Industries.

37. This field of survey was already covered by NCAER in their report on 'Development of Dandakaranya' (pages 73 to 84) and, therefore, not repeated in this preliminary report.

RESOURCES FOR PULP INDUSTRY.

BAMBOOS

38. Bamboos occur as an understory in extensive wooded areas scattered all over the region. In nature they invariably grow in association of other trees and not as pure crops. The commonest species is Dendrocalamus strictus, but Bambusa arundinacea, Oxtenanthra nigrocialata and Cephalostachyum oerfocita are also common. All these are valuable cellulosic raw material.

39. Attempts were made to collect maximum possible information and data regarding the availability of this resource as a raw material. This included replies to a questionnaire, specially set out for it, from the six Divisional Forest Officers concerned and material collected at the personal discussions with three Conservators. Some of the replies received from different sources were

found to be contradictory and as information was required urgently naturally some of the figures supplied were not sufficiently accurate. Instead of, therefore, rigidly sticking to the figures supplied, it was found advisable to reply on a general method of carrying out a broad assessment based on data which are considered fairly reliable.

40. Conservator of Forests, Jeypore Circle, told me that a rough survey of the bamboo resources of Malkangiri, Kalimela and Rangiri ranges which fall within the Sabri basin towards the south of Jeypore and along the Bastar border were carried out. Information handed over by him is attached with this paper as STATEMENT IV. According to this source, 656 sq. miles of bamboo forests of these three ranges are capable of yielding 95,836 tons of air dry bamboos every year. This comes to about 146 tons per sq. mile. per year.

41. On the Bastar side, although similar information was lacking, the Conservator of Bastar showed me a report prepared by him in 1962 according to which he had estimated that the Reserved forests and to-be-reserved forests which were covered by the current 4 Working Plans, contained 594 square miles of workable bamboos forests capable of supplying 47,000 tons of air dry bamboos per annum, excluding the bamboos needed for local requirements. These estimates are on conservative side as compared to those made available for the three ranges of Jeypore.

42. For other bamboo areas lying outside the areas of the four working plans, no estimates of bamboo

resources were available.

43. The following figures concerning the bamboo resources which were considered by me as fairly dependable were available:-

<u>Division</u>	<u>Area of Bamboo Forests(Sq.miles)</u>	<u>Actual Annual Outturn.</u> (Nos).
Bastar North	230	2,46,835
Bastar South	176	1,98,505
Bastar East	212	3,96,178
Bastar West	208	2,70,465
Bastar Kanker	850	14,83,810
<u>Total Bastar -</u>	<u>1,676</u>	<u>25,95,793</u>
<u>Jeypore -</u>	<u>656</u>	<u>12,07,350</u>
<u>Grand Total --</u>	<u>2,332</u>	<u>38,03,143</u>

44. Accepting on the figures supplied by Conservator of Jeypore for his areas, we may now attempt to have a rough idea about similar position in Bastar on broad lines. We have here in all 1,676 square miles of forests in which bamboos occur.

45. In the case of areas covered over by the working plans, it was found that out of 594 square miles about 295 square miles were classified as commercial bamboo areas and the rest of the 299 sq.miles as nistar bamboo areas. This proportion works out to 49% and 51% respectively. Division-wise break-up of bamboo areas indicate that nearly half of total bamboo areas of Bastar lie in Kanker division where nistar incidence is much higher than where the four working plans are in operation.

Keeping a safe margin for future nistar requirements, increase in population etc., it will be advisable to assume that in Bastar only about 45% of the total bamboo areas would be commercially available for exploitation. This gives an area of 754 square miles available. Working the above area on a four year cycle and presuming an outturn of 1 ton per acre the annual availability of bamboos will be about 1,20,640 tons per year. This gives a figure of 150 tons per square mile per year, which compares favourably with the figure of 146 tons per square mile per year obtained for Jeypore forests.

46. According to another estimate of the Forest Department of Madhya Pradesh (a reference about which was made by Conservator of Forest, Dandakaranya, in his report (on page 17 in the file) the following surplus bamboos will be available in the Bastar District every year:-

<u>Region</u>	<u>Quantity (Tons)</u>
Kanker Division	27,200.
Other Divisions of Bastar.	<u>87,000</u>
	<u>1,14,200</u>

The above figure agrees closely with the figure of 1,20,640 tons arrived at in the previous paragraph.

47. Conservator, Dandakaranya, in the same report, has mentioned that (page 6) bamboos to the extent of 50,000 tons and 1,20,000 tons were estimated to be available from Bastar district and Motu-Malkangiri area of Koraput district. As regards the reported figure of 50,000 tons for Bastar, the same appears to have been borrowed from the 1962 report of the Conservator of Forest Bastar, in

which case it is clear that the above was the estimated yield from the Reserved and to-be-reserved forests covered under 4 working plans and not from the whole of Bastar forests. As regards the figure of 1,20,000 tons of Motu-Malkangiri Area of Koraput, the source of this information is not known. Nevertheless, it will be safer to rely on the more conservative figure of 95,835 tons a year.

48. For the purpose of this paper we may safely assume that the following quantities of surplus bamboos will be available per year as raw material for pulp industry:-

Bastar area -	1,00,000 tons (air dry)
Jeypore area -	95,000 tons (-do-)
Total:-	1,95,000 tons (-do-)

The exact location of the pulp factory may superimpose a further factor of reduction on the basis of economic lead. But since today itself bamboos have been transported to much longer distances to the existing paper mills elsewhere from other areas and since we assume that our area will be fast opened up as a result of these developments the reduction required on account of this factor can be taken as insignificant.

49. Purely from the viewpoint of situations of raw-material resources, the most convenient places for locating a chemical pulp plant would be Jagdalpur. Next best would be Jeypore. Of course, other considerations too will have to be examined.

50. Here, it may be relevant to record that when I had visited Jeypore, I had learnt about a Canadian Team

of experts having just returned from Jeypore division and having recommended location of a paper-mill at a place called Motu in the extreme south of Koraput district on Sabri river. I could not reconcile to this location - unless the idea is to tap adjoining bamboo resources of Andhra Pradesh.

51. Regarding bamboos, I tried to obtain information on the existing commitments to the industries. As regards Bastar, I was told that at present the Forest Department is not aware of any such commitments anywhere, although negotiations have been and are still being going on between Madhya Pradesh Government and certain leading paper manufacturers. It will be necessary to obtain specific information about this at Bhopal. In commercial Bamboo Felling series annual coupes are sold to contractors for one year's lease period but there is no direct connection of such contracts with any paper mills.

52. In Jeypore division of Orissa, however, I understand the Indian Paper Pulp has a lease of over 40% of the bamboo resources for 4 years of which 1964 is the second year.

Further and more specific information can be had at Bhubaneshwar.

Hard-woods for News Print.

53. The following hardwood species which are known to be utilizable for news print pulp occur in the region:-

Albizzi lebbek

Ailanthus excelsa (Salai)

Mangifera indica

Kydia calycina

Sterculia species

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Sterculia species

54. As regards salai, the position appears rather disappointing. Occurrence of this tree is throughout sporadic (except in the West Bastar Division) for which reason its exploitation will be uneconomic. In West Bastar division, from an area of about 100 square miles at the most, about 4,000 tons a year can be exploited over 15 years; but here the terrain is very hilly, communications bad and extraction difficult.

55. As regards other hardwoods listed above, no special enquiry was made by me regarding the quantities available as no such data was available. The local forest officers are of the view that the quantities available will be so small that it will not suffice for the new paper mill of even a small size. I am inclined to agree and feel that the newsprint mill in this region purely dependent on the existing occurrence of these species in the natural forests will not be feasible.

56. - However, such a mill will become feasible if it is based on raw material to be grown in the form of plantations (mostly of Eucalyptus) for which vast areas are available:-

Plantations of Fast-growing Species For
Paper and Pulp

57. In addition to the bamboos and the cellulosic hardwoods that occur in natural forests, there is yet another, and a very important, potential resource of raw material for pulp and that is the areas in forests available for and capable of raising fast-growing species, mainly Eucalyptus, and also bamboos and tropical pines. The total area thus available is 250 square miles, the division-wise break-up of which is given below:-

<u>S.No.</u>	<u>Division</u>	<u>Name of the Forest</u>	<u>Situation</u>	<u>Area</u> (sq.miles)
1.	North Bastar	Paralkol P.F.	60 miles from Narayanpur.	25
2.	North Bastar	Gudabeda P.F.	35 miles from Narayanpur.	35
3.	North Bastar	Jhara P.F.	15 miles from Narayanpur.	40
4.	South Bastar	Golapalli P.F.	In 3 patches	25
5.	West Bastar	Pathakutru & Karkeli Blocks.	Head from Kutru 12 miles.	10
6.	West Bastar	P.F. between Somanpalli and Kutru.	-	15
7.	Jeypore	Dharamgarh	30 miles from Jeypore.	100

Total:- 250

(Note:- This is a tentative list and can be revised later)

58. It has to be mentioned here that in Bastar there is already a separate organisation called Plantation Division in charge of a D.F.O., exclusively for such plantation work. The plantation work presently is only at a beginning stage. So far 5.5 square miles have been planted. At present 15,000 acres are being planted annually. This target, according to the scheme, will be increasing. The main species planted is Eucalyptus. Although sufficient experience is yet to be gained in such planting locally, there is no doubt that these areas are eminently suited for such plantations and there should be no doubt about their full success in future. The present growth is on an average 6 feet in 1½ years. But ploughing, which is done

elsewhere, is not yet started here and the same is strongly recommended for achieving faster rate of growth. A beginning has also to be made for planting tropical pines. The bottleneck is to import seed and the micorrhiza. The areas are also well-suited for bamboo plantations. A mixture of Euclyptus and bamboos might be tried to see if it could be the ideal composition.

59. Eucalyptus plantations at closer spacing (6'x6') raised on 15 years' rotation is likely to yield mean annual increment of about 5 tons per acre. The 250 square miles of plantations are estimated to yield 6,40,000 tons of wood per year.

60. Today the planting cost is about Rs. 200/- per acre. There are bold indications that the medium quality sal forests, after conversion into these plantations of fast-growing species, will yield much higher revenue per acre than they would be if they are continued as natural sal forests.

61. Dedication of extensive forest areas in compact blocks for the purpose of industrial plantations are likely to encounter administrative difficulties of nistar and grazing. In my opinion these difficulties are surmountable.

Sd/-

(D. H. Kulkarni)

1.12.1964.

Deputy Inspector General of Forests.

A C K N O W L E D G E M E N T

I owe special thanks to Conservators of Forests, Dandakaranya, Jeypore and Bastar Circles and also to the Divisional Forest Officers of North, South, East and West Bastar Kanker and Managing Director, Orissa Timber Corporation stationed at Jeypore. I am grateful to them for their valuable help and cooperation without which it would not have been possible to compile this paper in such a short time.

Sd/-

(D. H. Kulkarni),
Deputy Inspector General of Forests.

S T A T E M E N T I

RECORDED ANNUAL OUTTURN OF TIMBER, FUEL AND BAMBOOS

(1963 - 64)

<u>Division</u>	<u>Timber(Tons)</u>	<u>Fuel (Tons)</u>	<u>Total Wood (tons)</u>	<u>Bamboos(Nos)</u>
Bastar North	14,940	16,420	31,360	2,46,835
Bastar South	9,020	3,280	12,300	1,98,505
Bastar East	12,280	5,460	17,740	3,96,178
Bastar West	15,680	2,500	18,180	2,70,465
Bastar Kanker	28,420	6,630	35,050	14,83,810
Jeypore	6,960	8,900	15,860	12,07,350
Total	87,300	43,190	1,30,490	38,03,143

S T A T E M E N T . . . II

Receipted output of minor Forest Produce of Bastar District and
Jeypore Division of Rayasada District (1933-34).

Tamarind (nds)	1,57,589	
Tora seeds (nds)	38,035	
Mahuwa (Flower & seed) (nds)	10,000	
Karanja seed (nds)	9,535	
Karra	31,312	
Wax	133	
Thilair	437	
Honey	97	
Tendu leaves (nds)	20,700	
Tatching Grass	721	
Other grass in Bundles	31,312)	
(For West Bastar in Cld).	31)	
Grass mats (nos)	2,090	
Gum (nds)	3,137)	
(Auction price for West Bastar Division only) Rs.	1,850)	
Albark (K. Ld.)-	538	
Kosa (Cocoon) (Nos)	12,31,505	
Chital, Sambar Horns & bones (nds)	112	
Dhalanji (nds)	1,122)	
Tamarind Seed (nd)	4,109)	(East Bastar Division only)
Teridal (")	2,57)	
Bachandi (")	57)	
Goat Skin (Nos)	64	(West Bastar Division only)
Gilgar in tons	280	(South Bastar Division only)
Syari rope & bark (kg.)	109)	
Chironji (nd.)	25)	
Store Laurin (cft.)	2,125)	(North Bastar Division only)
Root (nd.)	72)	
Chitraitai (nd.)	5)	
Chil (nd.)	30)	
Canes (Kg.)	30)	
Pipal root (kg.)	410)	
Shailab fibre (Siali) (qntls)	1,040)	(For Jeypore Division only - for both reserved & unreserved forest area.)
Broom Grass (Nos.)	1,50,000)	
Hyrobalsam (qntls.)	23,309)	
Kusum seed "	150)	
Siali leaves "	1,590)	

STATEMENT - III

LISTS OF TREES SUITABLE FOR PLYWOOD AND DECORATIVE VENEERING.

PLYWOOD

1. Adina cordifolia (Kaidu)
2. Albizia lebbek (Siris)
3. Dalbergia sisso (Shisham)
4. Diospyros species (Tendu)
5. Eugenia jambolana (Jamun)
6. Gmelina arborea (Siwan, Gambhar)
7. Lannea grandis (Noyen)
8. Tectona grandis (Sagon)
9. Terminalia tomentosa (Saj)
10. Mangifera indica (Am)
11. Terminalia arjuna (Koha)
12. Terminalia bitorica (Behera)
13. Alantinos excelsa (Malarukh)
14. Salmalia malabarica (Somal)
15. Boswellia serrata (Salai)
16. Cargua pinnata (Kekad)
17. Kordia calycina (Baranga)

DECORATIVE VENEERING

1. Albizia lebbek (Siris)
2. Dalbergia sisso (Shisham)
3. Tectona grandis (Sagon)
4. Terminalia tomentosa (saj)

STATEMENT - IV

CONSOLIDATED STATEMENT SHOWING THE BAMBOO OF BARGI,
KALINGA AND KALINGA RANGES OF JEPPIE DIVISION.

1.	Total area of Reserve lands	5,35,314.49 acres.
2.	Total bamboo area.	4,30,295.74 "
3.	Area enumerated (Partial)	23,394.00 "
4.	Areas which do not contain bamboo	1,05,518.75 "
5.	Percentage of (a) Net area enumeration. (b) Gross area.	5% 4.9%
6.	Average culms per clump.	16
7.	Average number of clumps per acre	24
8.	Average number of old clumps acre.	533
9.	Average number of new culms per acre	72
10.	Average number of culms per acre.	407
11.	Total number of culms	1,02,94,083
12.	Total number of old culms.	14,34,35,714
13.	Total number of new culms.	3,21,10,524
14.	Total number of culms (old & new).	17,53,05,233
15.	Total yield in tons	95,833 tons.

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A BRIEF REVIEW OF THE MINERAL RESOURCES OF THE
DANDAKARANYA REGION

BY

P. V. RAO,
Superintending Geologist
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The Ministry of Rehabilitation, Government of India, have set up in July, 1964, a Techno-Economic Appraisal Team for the Indravati Basin in Dandakaranya, to assess the potentialities for development in the fields of irrigation, power, forest resources, mineral resources and industry, with special reference to the possibilities of large scale rehabilitation of displaced persons in the area. A separate Investigation Team has been set up for an appraisal of the Hydro-electric and irrigation potential, specially of the Chitrakut Hydro-electric project.

The first meeting of the TEA Team was held on 27.7.1964 in the office of the Secretary, Ministry of Rehabilitation at New Delhi where the different aspects of the work of the Team were discussed. On behalf of the Geological Survey of India and Indian Bureau of Mines, a short note regarding the mineral resources of the region, with special reference to Indravati Basin, was presented by Shri P. V. Rao. As a sequel to the discussion on mineral resources, it was suggested in the meeting that a more detailed paper on the mineral resources of the region may be prepared.

As the over-riding criterion for the choice of the area to be taken up for integrated development in the way it was intended, should be its economic viability, it was suggested that the area to be covered by the Team's work may extend beyond

the Indravati Basin to include the adjoining areas or even the entire Dandakaranya. Accordingly, in the Report that follows is given an account of the mineral occurrences in the Dandakaranya region as a whole. The more important minerals of which there are large known reserves are dealt with in some detail. Brief mention is made of the other minerals which are known to occur in small quantities or about which there is little information. The manner in which the important minerals could be exploited or for setting up of mineral based industries is also indicated.

Mineral Resources of Dandakaranya Region.

Introduction:

The Dandakaranya region comprises the districts of Koraput and Kalahandi of Orissa and Bastar of Madhya Pradesh, the total area covered being 77,835 sq. km. A good part of the area is hilly and forest clad, with inadequately developed means of communication. The principal rivers flowing through the region are the Indravati and the Kolab or Sabari which rise in the Eastern ghats and join the Godavari near Bhopalpatnam ($18^{\circ} 52' : 20^{\circ} 23' ; 65 B/5$) and Kunavaram ($17^{\circ} 35' : 21^{\circ} 13' ; G/2$) respectively. The most striking features of the wild country through which these rivers flow, are the hilly terrain of the Eastern ghats, the high Bailadila range, the great massif of Tuls Dongar and the steep scarps bordering the Jagdalpur and Dantewara plateaux. The famous Chitrakut ($19^{\circ} 12' : 21^{\circ} 42' 65E/12$) falls on the Indravati and the Tiratgarh ($12^{\circ} 55' : 21^{\circ} 52' ; 65F/13$) falls in the Kanger river, a tributary of the Kolab, are also noteworthy features. Hydel projects are being planned at Chitrakut, Bodghat ($19^{\circ} 11' : 21^{\circ} 22' ; 65E/8$)

and a number of other places in the region.

Though Geological Survey has been in progress in different parts of the region for many years, there are still large tracts, specially in Bastar District, yet to be systematically mapped. Only about a third out of the total area of 32,000 sq. km. has so far been covered in this district. In view of the emphasis laid by the Government of India for the industrial development of the region and improved means of communications, the Geological Survey of India has been, in recent years, carrying out systematic geological mapping as well as investigation of various mineral deposits. Some of the important mineral deposits taken up during the period include those of the famous Bailadila iron ores, reserves of which have been estimated at 1153 million tonnes; high grade dolomite deposits near Jagdalpur, where 35 million tonnes of the mineral have been located; and cement grade limestone deposits with reserves of over 200 million tonnes in the neighbourhood of Jagdalpur.

With the completion of the Bailadila-Vishakhapatnam railway line and development of hydro-power in the region it is expected that it would be possible to exploit economically many of the mineral deposits already known and investigated as well as those that would be brought to light by further geological survey and detailed work. Intensive exploratory operations are already in progress in the Bailadila region by the Indian Bureau of Mines and the National Mineral Development Corporation to demarcate areas for working of the iron-ore deposits for export.

The chief rock types met with in the Dandakaranya region are the Archaeans comprising gneisses, schists, granites, khondalites and charnockites. The iron-ores occur in the Bailadila series of rocks which are underlain by those of Sukma and Bengal series. Sandstones, shales, limestones and dolomites constitute the Purana (Cuddapah) formations. Laterite, formed by alteration of different rock types, is usually found as capping on flat topped hills. Bauxite, is commonly associated with the laterites.

Iron - Ores

Out of the total of over 21,600 million tonnes of iron-ores estimated in the country, Bastar district alone accounts for about 2000 million tonnes. The iron-ore deposits of Koraput and Kalahandi districts are comparatively very small.

Bastar District:

The well known, extensive and high grade iron-ores of Bailadilla, as well as those of Rowghat and other places are located in Bastar districts.

Bailadila:- Fourteen individual deposits have been recognised in this area during the course of preliminary investigation by the Geological Survey of India over two decades ago. The iron-ore deposits are mainly found at the tops of two north-south ridges comprising ^{banded} hematite-quartzite and ferruginous shales of the Bailadila iron ore series. The rocks have generally an easterly dip at steep angles.

Detailed mapping and sampling of these deposits were taken up by the Geological Survey of India during the years 1952-60. The investigation revealed that the deposit Nos. 6, 7, 9 and 12 are comparatively small in extent while

all the other ones are much more extensive than what has been indicated by earlier workers. A number of other small deposits have also been newly located in the region during the course of this work.

Two types of iron-ore namely massive and laminated varieties with associated laterite and/or lateritic ore constitute the different deposits. Massive ore, which is the purest type of ore, comprises the major portion of the deposits. The tentative gross reserves (indicated and inferred) have been estimated at about 1153 million tonnes.

Grab samples representing different types of iron-ore have indicated 65 to 69 per cent iron for massive ore and 60 to 66 per cent iron for laminated ore, with phosphorus content rarely exceeding 0.043 per cent. Sulphur and manganese are found in traces.

Rowghat: The iron-ore deposits of Rowghat are also extensive and of high grade. The ore-bearing area lies about 28 km. N.N.W. of Narainpur ($19^{\circ} 43' : 81^{\circ} 15' ; 65 E/2$) and comprises a chain of high hills forming a horse-shoe shaped loop round the plain of Kolar ($19^{\circ} 55' : 81^{\circ} 08' ; 65 E/1$). These hills are locally known as Mednighat ($19^{\circ} 51'$ to $19^{\circ} 57' ; 81^{\circ} 05' ; 65 E/1$) and Rowghat ($19^{\circ} 48'$ to $19^{\circ} 52' ; 81^{\circ} 05'$ to $81^{\circ} 13' ; 65 E/1$) hills. They rise to a height of nearly 500 m. above the surrounding country and 1000 m. above m.s.l. giving a bold relief to the surrounding landscape.

The iron-ore occurs in banded hematite-quartzite which form the high hills and dip at high angles ranging

from 40° - 60° . The ore consists of hematite with some limonite. About half a dozen individual deposits have been located on the top of the horse-shoe shaped Rowghat ridge. The indicated reserves here are 753 million tonnes with over 60 per cent iron content within a depth of 50 metres.

Narainpur: During the course of reconnoitry survey in Narainpur tahsil by the Geological Survey of India, iron-ore deposits on ridge, .3076, 5 km. west of Chhota Dongar (19° : $81^{\circ} 21'$; 65 E/7) and on the southern part of the ridge 3 km. north of Mandatikra ($19^{\circ} 28'$: $81^{\circ} 21'$; 65 E/7) were noted. A few grab samples from the deposits have indicated iron content varying from 61 to 66 per cent. The reserves are estimated at 33 million tonnes.

Existence of large quantities of low grade lateritic iron-ore has been reported on the ridge 1.6 km. south of Kanger valley, south-west of Kotomsar ($18^{\circ} 52'$: $81^{\circ} 56'$; 65 F/13). These ores are extracted on a small scale by the village smiths in many localities.

Hahalaodi: Several valuable deposits of high grade iron-ore are located on hill tops; .2132, .2110 and .2117 near the village of Hahalaodi ($20^{\circ} 03'$: $80^{\circ} 50'$; 64 D/16). The estimated reserves of ore in this region are of the order of 12.4 million tonnes.

Koraput District:

About 8 km. south-west of Umarkot ($19^{\circ} 40'$: $82^{\circ} 12'$; 65 I/2) in Hiraput hills, occur 10 million tonnes of hematite with an iron content of over 60 per cent.

Workable deposits of iron-ore of lesser extent occur in several other places both in Bastar and Koraput district but the details regarding their quality and quantity are not available. Some low grade iron-ores occur in Kalahandi district but these are not considered to be of commercial importance.

Limestone

Bastar District:

There are two prominent limestone in the Bastar district, one along the Kanger river about 27 km. to the south and the other in the Potonar Baranji area about 20 km W.N.W. of Jagdalpur.

'Kanger Valley': The limestone belt of this arealies between Lat. $18^{\circ} 49'$ & $19^{\circ} 00'$ and Long. $81^{\circ} 50'$ and $82^{\circ} 04'$ and extends over a length of about 40 km. with an average width of 2 km. It is divisible from West to East into (1) Dhurvaras-Deorguda, (2) Majhar-dongri-Majipal, (3) Gadiadongri-Kotomsar, (4) Gupensar-Dongri, (5) Jagdaghat and (6) Gopopodoro-Chitalgur, areas. This belt more or less follows the Kanger river which flows in a south-easterly direction. At most of the places the limestone beds form cliffs and the steep escarpments rising 50 to 120 metres from the ground level in either bank of the Kanger river. The limestones are fine-grained and thinly laminated, the laminage varying 10 mm. to 0.3 metre. They are horizontal or gently dipping at a maximum dip of 10° in varying directions.

The limestones in the Kanger belt are divisible into three horizons viz., the lower horizon of bluish

white cream and dark grey limestone; the middle of dark grey limestone; and the upper of dull grey limestone. The lower and middle horizons vary in thickness from 15 to 45 metres and are of better grade than the upper horizon, which varies in thickness from 10 to 25 metres. The limestones of the two lower horizons show in general CaO 46 to 48 per cent, MgO less than 2 per cent, R₂O₃ less than 7 percent, and SiO₂ 11 to 25 percent. They are suitable for cement manufacture. The limestones of the upper horizon analysing in general CaO about 35% and insolubles 30% are impure and unsuitable for making cement.

Based on analytical data the limestones are classified into flux-grade (CaO above 46%; Insolubles 12% but in marginal B.F. grade, upto 14%); cement grade (CaO 40 - 46%, Insolubles below 20%) blendable cement-grade (CaO 35% to 40%, Insolubles 20 to 30%) and impure varieties (CaO below 35%, Insolubles above 30%). Flux-grade limestone has been found to occur only in a few places in the form of relatively thin bands intercalated with those of cement grade. Thus at Majhar-dongri, Gadia-dongri, and Gupensar dongri, Flux-grade limestone bands with thickness of 8, 6 and 10 metres have been found to extend over lengths of 1000 m., 700m. and 2000 m. respectively. The flux-grade limestone bands in these areas have, however, overburden consisting of cement-grade, blendable cement-grade and impure limestones, aggregating to 30 to 50 m., 30 m. and over 50 m. respectively. The estimated reserves of flux-grade limestones over widths of 250 m., 100 m., and 200 m. across the strike in the three areas are 6.4, 2.1, and 4.0 m. (total 12.5 million tonnes) respectively. The estimated reserves of cement grade and blendable cement

grades of limestone in the Kanger belt are about 800 million tonnes. Although the limestones in this belt form hills and are close to the roads and the Bailadila-Vishakhapatnam rail line under construction, the workability of the flux-grade limestones of this area is directly dependent upon whether or not the cement grade limestones forming the over-burden can be worked and utilised for cement manufacture of other purpose.

Potonar-Baranji area: The limestones of this area occur in the form of oval shaped, flat topped isolated ridges over a length of about 8 km. These deposits will be about 20 km from the Bailadila-Vishakhapatnam rail link.

The limestones of the area are mostly fine grained and dark grey, having an outcrop width of 30 to 100 metres with a maximum thickness of about 25 metres. The beds are practically horizontal, the maximum dip being 10° towards north or south. Analytical data show that the insolubles range from 15 to 21 per cent, and CaO from 41 to 47 percent, indicating these limestones to be of cement grade. The indicated reserves in this area are of the order of 45 million tonnes.

Presence of cement grade limestone has been recorded in Chintavagu and Timed ($18^{\circ} 51'$: $80^{\circ} 21'$; 65 B/5) in Bhopalpatnam area. The inferred reserves of 1.5 million tonnes in this area have to be proved by exploratory operations.

white cream and dark grey limestone; the middle of dark grey limestone; and the upper of dull grey limestone. The lower and middle horizons vary in thickness from 15 to 45 metres and are of better grade than the upper horizon, which varies in thickness from 10 to 25 metres. The limestones of the two lower horizons show in general CaO 46 to 48 per cent, MgO less than 2 per cent, R₂O₃ less than 7 percent, and SiO₂ 11 to 25 percent. They are suitable for cement manufacture. The limestones of the upper horizon analysing in general CaO about 35% and insolubles 30% are impure and unsuitable for making cement.

Based on analytical data the limestones are classified into flux-grade (CaO above 46%; Insolubles 12% but in marginal B.F. grade, upto 14%); cement grade (CaO 40 - 46%, Insolubles below 20%) blendable cement-grade (CaO 35% to 40%, Insolubles 20 to 30%) and impure varieties (CaO below 35%, Insolubles above 30%). Flux-grade limestone has been found to occur only in a few places in the form of relatively thin bands intercalated with those of cement grade. Thus at Majhar-dongri, Gadia-dongri, and Cupensar dongri, flux-grade limestone bands with thickness of 3, 6 and 10 metres have been found to extend over lengths of 1000 m., 700m. and 2000 m. respectively. The flux-grade limestone bands in these areas have, however, overburden consisting of cement-grade, blendable cement-grade and impure limestones, aggregating to 30 to 50 m., 30 m. and over 50 m. respectively. The estimated reserves of flux-grade limestones over widths of 250 m., 100 m., and 100 m. across the strike in the three areas are 6.4, 2.1, and 4.0 m. (total 12.5 million tonnes) respectively. The estimated reserves of cement grade and blendable cement

Flux grade and cement grade limestones have been located in the Sukma area ($18^{\circ} 24'$: $81^{\circ} 40'$; 65 F/11), Bastar district, by the Geological Survey of India, recently. These limestones are referred to under Kottametta-Nandivada deposit in Koraput district.

Koraput District:

(1) Detailed investigation carried out recently by the Geological Survey of India reveal that both flux-grade and cement grade limestones occur in the Kottametta ($18^{\circ} 20'$: $81^{\circ} 41'$; 65 F/11), Nandivada ($18^{\circ} 19'$: $81^{\circ} 40'$; 65 F/11) area along the Sabari river in the Koraput district and in the Sukma ($18^{\circ} 24'$: $81^{\circ} 40'$; 65 F/21) area in the adjacent Bastar District. Flux grade limestone of this area analyse CaO 48 to 52% and insolubles 6 to 12% while the cement grade limestones assay CaO 40 to 52%, MgO less than 2% and insolubles from 6 to 24%.

The reserves are estimated at 15 million tonnes and 1.5 million tonnes of cement grade and one million and 0.4 million tonnes of flux grade limestone in the Kottametta-Nandivada and Sukma areas respectively.

(2) Jirivada ($18^{\circ} 50'$: $82^{\circ} 10'$; 65/J/1) Gupteshwar ($18^{\circ} 49'$: $82^{\circ} 10'$; 65-J/1) area along the Sabari river. The limestones show in general CaO 28.10 to 47.39%, MgO 0.35 to 18.79%, SiO_2 2.17 to 32.12%, R 203 0.76 to 2.87%. The reserves are roughly estimated at 25 million tonnes, by the Directorate of Mines, Orissa.

(3) Kondajodi ($18^{\circ} 15'$: $82^{\circ} 15'$; 65J/5) Dummajodi area along the Sabari river. The limestones analyse, according to the Directorate of Mines, Orissa, CaO 34.44 to 45.43%, MgO 0.96 to 15.39%, SiO_2 12.25 to 37.55%

R_2O_3 0.91 to 2.37%. The total proved reserves are estimated at 7 million tonnes.

(4) Umpavalli ($18^{\circ} 24'$; $82^{\circ} 58'$; 65 J/15) -
Tummiguda ($18^{\circ} 25'$; $83^{\circ} 02'$; 65 N/3) area. The deposits occur in 4 distinct outcrops: (i) between Gundivalasa ($18^{\circ} 24'$; $82^{\circ} 59'$) and Peddapadu-Umpavalli area, (ii) near Peddapadu-Umpavalli, (iii) in the Valley between Kotab ($18^{\circ} 24'$; $82^{\circ} 57'$; 65 J/15) and Kottavalasa ($18^{\circ} 28'$; $83^{\circ} 01'$; 65 N/3) and (iv) around Tummiguda ($18^{\circ} 25'$; $83^{\circ} 02'$; 65 N/3).

According to the Directorate of Mines, Orissa, these limestones analyse CaO 37.42 to 53.09%, MgO 0.20 to 17.08%, SiO_2 0.68 to 16.90% and R_2O_3 0.40 to 1.75%. The reserves estimated by the State Department based on surface observations and trench work, are about 30 million tonnes to a depth of 9 metres. Out of these about 12 million tonnes may be suitable for the manufacture of calcium carbide.

D o l o m i t e

Bastar District:

Extensive deposits of dolomite occur in the Nachkot and adjoining areas E.S.E. of Jagdalpur. The occurrences in the Nachkot ($19^{\circ} 01'$; $82^{\circ} 11'$; 65 I/4) area are in the form of hillocks and are intercalated with shales. They vary in colour from purple through grey to white and are fine to medium grained. Promising deposits occur (i) north of Sadartera ($19^{\circ} 00'$; $82^{\circ} 10'$; 65 I/4) between Nachkot and Aurabhata ($19^{\circ} 02'$; $82^{\circ} 02'$; 65 I/4) (ii) between Kaupal ($18^{\circ} 58'$; $82^{\circ} 10'$; 65 J/1) and Taipodora ($18^{\circ} 57'$; $82^{\circ} 11'$; 65 J/1) (iii) in the Kelab river, 3 km. north-east of

Tiraja (18° 55' : 82° 11' ; 65 J/1), and (iv) South-west Sirivada (18° 50' : 82° 10' ; 65 J/1).

Results of chemical analysis of samples collected from the region reveal about 20 per cent MgO, 30 per cent CaO and less than 5 percent insolubles. The reserves have recently been estimated at 35 million tonnes of flux grade dolomite up to ground level. Out of these, 17 million tonnes are of S.M.S. and refractory grade, containing insolubles upto 4 per cent, CaO up to 29 per cent and MgO 21 per cent.

Bauxite

Bastar District:

Low titanium bauxite occurs associated with laterite on the Tarallimetta (18° 32' : 81° 14' ; 65 E/2) and the water shed between the Sankani and Gallinalas, 2.5 km. south of Bailadila Rest House (18° 44' : 81° 14' ; 65 E/2). Chemical analysis of the samples collected is as follows:-

	Tarallimetta per cent	Bailadila Water shed. per cent.
SiO ₂	0.26	1.34
Al ₂ O ₃	62.96	61.85
Fe ₂ O ₃	7.09	3.15
CaO	0.06	0.13
MgO	0.05	0.24
TiO ₂	2.45	4.05
MnO	Trace	Trace
H ₂ O at 110° C	1.08	0.32
H ₂ O above 110° C	26.12	23.96
	<u>100.05</u>	<u>100.04</u>
Sp. Gr.	2.51	2.41

The laterite from which the specimens were obtained occurs about the 915 m. level on the Bailadila range and also caps the Tarallimetta. The margins of the laterite are covered with dense vegetation and have been examined only in a few favourable localities. The existence of scattered occurrences of lithomarge at the base of the laterite was observed. These generally indicate the presence of bauxite in the overlying laterite.

The ore at the Bailadila watershed was not recognised in the field as bauxite. There is a considerable quantity of this ore but it is not possible to assess the quality, without further investigation. The ore on the Tarallimetta occurs as scattered boulders and the quantity available was not estimated.

A few minor occurrences of bauxite are also reported from 20 km. west of Narainpur ($19^{\circ}43'$: $81^{\circ}15'$; 65 E/2), three km. south-west of Karkanar ($19^{\circ}34'$: $81^{\circ}12'$; 65 E/2), 1.6 km. south-west of Ukpar ($19^{\circ}34'$; $81^{\circ}05'$; 65 E/2), 1.6 km. south-west of Muhinberi ($19^{\circ}33'$: $81^{\circ}03'$; 65 E/2) and 0.8 km. south-west of Kutul ($19^{\circ}31'$: $81^{\circ}01'$; 65 E/2).

Koraput District:

The known deposits of bauxite in the Koraput district are only few. Bauxite has been reported to occur in the laterite capping of the hills in the Eastern Ghats, in the northern parts of the district as at (i) Giriliguma village ($19^{\circ}07'$: $82^{\circ}55'$; 65 I/6), (ii) at the base of the laterite plateau, north of Manduru ($19^{\circ}56'$; $83^{\circ}33'$; 65 M/9), (iii) in the Nagarsari state forest N.N.W. of Padwa ($18^{\circ}22'$: $82^{\circ}41'$; 65 J/12), (iv) hills .4278 and .4063 and (v) Pachapat Mali.

The extent and reserves in the first four areas are too small for the deposits to be of any commercial importance. In the Pachpat-Mali area reserves of bauxite are estimated at 14,000 tonnes.

Kalahandi district:

The more important bauxite deposits in the region occur in the Kalahandi district, in the laterite capping on the hills and the plateaux of the Kasalabet, Kashmir and Mahulapatna Zamindaris. Laterite capping rests directly on Khondolite, the hills rising to about 1,000 metres above m.s.l.

Some of the important deposits in the area with a total reserves of 0.64 million tonnes occur at the following localities:-

Out of the total of 0.54 million tonnes, a reserve of 0.42 million tonnes was estimated from 4 localities, namely (1) Chandgiri - 183,000 tonnes; (2) Baphimali Parbat - 132,000 tonnes; (3) Kathakhal - 48,000 tonnes; (4) Pasangmali - 50,000 tonnes. The other deposits, which account for the 0.12 million tonnes (0.54 - 0.42) are given below:-

<u>Sasbahumali</u>	<u>Reserves (tonnes)</u>
1.6 km. N.E. of Kanjakana (19° 18' : 83° 09' ; 65 M/3)	2,400
2 km. N.N.E. of Kanjakana	3,000
55 km. E.N.E. of 3490	600
	<hr/>
	6,000
	<hr/>
Dombali (19° 17' : 83° 10' ; 65 M/3)	
Northern part	8,000
Eastern Part	4,000
Southern Part	6,000
	<hr/>
	18,000
	<hr/>
<u>Dekapatna Parbat, 3410</u>	
(19° 16' : 83° 09' ; 65 M/3)	
Southern extremity	9,000

Around Charan Maribhata

(19°14' : 83°07' ; 65 M/3)

.3405 hill Nagaibhata mali,
minor occurrences 3,000

Kutrumali (19°27' : 83°12' ; 65 M/3)

Northern extremity 500

North-eastern extremity 1,200

North-west of Boundry Pillar 395 4,000

E.N.E. of Boundry Pillar 595 2,400

700 metres W.N.W. of Kutrumali 800

Southern part (between Boundry
Pillars 653 and 635) 12,000

S.E. edge of Tangri Dongar, \angle .4031 1,400

22,300

Manimali (.3456) (19°27' : 83°09' ; 65 M/3)

180 m. S.E. of .3456 3,600

270 m. N.E. of .3456 2,000

Western edge of hills 8,000

-Northern portion 8,000

21,000

Lakharishi (19°25' : 83°15' ; 65 M/3)

Within 500m. S.W. of .4325 and
400m. N.E. of it. 8,000

Taljhiri (19°23' : 83°15' ; 65 M/3)

Hill South of Taljhiri 6,000

Hill east of Taljhiri (small occurrence)

Siji Mali (.3992)

Southern portion, 660 m. W.N.W. of .3992 2,300

1300 m. east of Putlimali 1,500

(19°29' : 83°07' ; 65 M/3)

Northern portion; 1 km. S.W. of Malipadar ($19^{\circ}32':83^{\circ}09'; 65\text{ M}/2$)	1,500
Others	1,500
	<u>6,800</u>

Karlapat Hill

Near Kalaguda ($19^{\circ}41' : 83^{\circ}10'; 65\text{ M}/2$)	2,000
2 km. E.N.E. of Δ .3416 (very thin layer)	6,600
East of Δ .3416	1,000
N. 30° E. of Polingpadar ($19^{\circ}37':83^{\circ}09'; 65\text{ M}/2$)	12,000
1 km. S.S.E. of .3316	1,400
	<u>23,000</u>

Kisan Mali (.3412) ($19^{\circ}40':83^{\circ}05'; 65\text{ M}/2$)

1800 m. and 400 m. N.N.W. of Δ .3412	Small occurrences.
Hill (.3280) S.E. of Jiragaon ($19^{\circ}36' : 83^{\circ}12'; 65\text{ M}/2$) South-western extremity of hill top and western scarp E.S.E. of Jiragaon	Small occurrences.
Eastern edge of the hill top east of Karniber, and on isolated flat top 700 m. E.N.E. of .3208	Small occurrences.

The analysis of samples (where available) from some of above areas and estimates of reserves (source G.S.I) are shown in the following table:-

Locality	Al ₂ O ₃	Fe ₂ O ₃	TiO ₂	SiO ₂	Reserves in tonnes.
1) Chandgiri area ($19^{\circ}23':83^{\circ}03'; 65\text{ M}/3$)	46.96 to 57.65	9.25 to 19.31	1.70 to 6.95	0.76 to 4.01	185,937
2) Baphlimali ($19^{\circ}21':82^{\circ}58'; 65\text{ M}/3$)	46.09 to 60.02	6.4 to 24.01	1.32 to 2.48	0.80 to 4.40	1,134,525

3) Hill near Kathakali (19° 19' : 82° 59' ; 65 I/15)	49.01 to 53.59	12.88 to 17.71	2.08 to 6.90	0.60 to 2.60	49,075
4) Pasangmali (19° 20' : 83° 11' ; 65 M/3)	51.65 to 64.77	8.03 to 17.71	1.84 to 4.76	0.12 to 2.80	60,960
5) Sasbahumali & Dom Mali	37.45 to 58.21	2.86 to 13.60	1.35 to 2.20	2.40 to 3.35	24,385
6) Kutrumali (19° 27' : 83° 12' ; 65 M/3)	52.72 to 63.07	4.43 to 13.68	2.20 to 2.10	Trace to 4.10	22,607
7) Manjimali (19° 22' : 83° 12' ; 65 M/3)	41.01 to 57.08	9.66 to 28.17	1.54 to 3.00	2.12 to 4.00	21,947
8) Deposits in other areas					57,356
			Total.		5,56,795

A detailed survey of the important deposits in the Chandgiri, Karlapet and Baphlimali areas has been carried out subsequently by the State Directorate of Mines. The revised estimate of bauxite deposits and analysis of samples taken from these areas are given in the following table:-

Proved reserves of bauxite in
Changiri, Karlapet and
Baphlimali areas

.....
(Directorate of Mines, Orissa)

<u>Location</u>	<u>Proved reserves</u> (tonnes)
<u>Chandgiri area:</u>	
1. Hill area .3242 north of Chandgiri (19° 23' : 83° 03' ; 65 M/3)	1,05,826
2. Hill .3304 east of Chandgiri	33,621
<u>Karlapet area:</u>	
3. Karlapet Plateau (19° 41' : 83° 09' ; 65 M/2)	1,25,736

4. Polingpadar plateau south-east of
Karlapat ($19^{\circ}37' : 83^{\circ}10'$; 65 M/2) 1,23,958

Other areas:

5. Baphimali area 1,70,122
6. Sunger area ($19^{\circ}28' : 83^{\circ}06'$; 65 M/3) 30,481
7. Khariar area 50,802
8. Miscellaneous deposits 16,256

6,56,802

Analysis (percentage) of samples of
bauxite from the Chandgiri and
Karlapat area

(Directorate of Mines, Orissa)

<u>Location</u>	Al_2O_3	Fe_2O_3	R_2O_3	TiO_2	SiO_2	MgO	<u>Loss on ignition</u>
Chandgiri	56.80	8.98	68.20	2.42	2.86	0.76	27.20
-do-	52.27	13.38	72.80	7.15	2.46	0.40	22.64
Karlapat	56.61	5.19	64.00	2.20	2.98	0.65	27.72
-do-	52.53	7.58	64.40	4.29	3.20	0.40	27.24
Karlapat and Chandgiri	47.34	13.97	66.15	4.84	2.39	0.68	27.04
Chandgiri	54.70	6.18	63.30	2.42	3.46	0.43	27.70
-do-	55.65	5.19	63.70	2.86	3.34	0.36	26.64
-do-	46.51	16.17	66.70	3.02	2.14	2.29	26.52
-do-	47.43	16.77	67.50	3.30	3.72	0.24	28.04

The alumina content of the bauxite ore in general is well above the limit of 45% Al_2O_3 which is currently acceptable for metallurgical purposes and the silica content is as a whole, much below the stipulated limit for minimum alumina-silica. Ratio of 8:1 for extraction of alumina by the Bayer process. The TiO_2

content is within permissible limits but Fe_2O_3 appears to be slightly higher as seen from some of the analysis given above.

It will be seen from the data given above that the total reserves of bauxite as estimated so far in the Kalahandi area containing not less than 45 per cent Al_2O_3 , are of the order of 0.65 million tonnes with possibilities of large additional reserves. It may be mentioned here that of all the bauxite deposits in the Dandakaranya region, only those of Kalahandi have been studied in some detail.

Producers of metallic aluminium by Bayer process in U.S.A. require bauxite containing Al_2O_3 55 to 62% and permit impurities in the form of SiO_2 2 to 7%, Fe_2O_3 3 to 8%, TiO_2 2 to 4%, all calculated on the basis of ore dried at 93°C .

How much of the reserves available in Kalahandi come up to these specification cannot be said in the absence of more detailed data. Even assuming that all the Kalahandi ores come up to this standard, the reserves in the area are not sufficient to sustain a smelter of 10,000 tonnes of annual capacity, which consumes about 40,000 tonnes of bauxite annually. These may, however, be found suitable for aluminium industry if more reserves are proved by additional work and cheap power is available in bulk, as in Kerala.

As at present, the Kalahandi bauxite, may, therefore, be suitable only for the manufacture of high alumina-cement which permits employing somewhat ferruginous ore also, the general specification being $Al_2O_3 : SiO_2$ about 10:1 and $Al_2O_3 : Fe_2O_3$ about 2:1 with the provision that cement with a lower iron content can support a higher percentage of silica. This aspect is important in view of the availability in the region of abundant reserves of limestone suitable for cement industry.

The ferruginous Kalahandi ore may also be suitable for export to some foreign countries as the analysis of typical cargo samples shown Fe_2O_3 1.50 to 25.72% on ore crushed, washed, and dried at 93°C.

The Tarallimetta bauxite compares very favourably with cargo samples of Indian as well as foreign bauxites as shown below:- (Ref: 'Minerals for the Chemical and Allied Industries' - S.J. Johnstone).

	Tarallimetta per cent.	Typical cargo samples per cent.	Indian cargo samples per cent.
Al_2O_3	62.97	41.60 to 61.12	56.64
Fe_2O_3	7.09	1.50 to 25.72	8.18
TiO_2	2.45	0.68 to 6.34	6.34
SiO_2	0.26	0.53 to 6.13	3.48
CaO	0.06	0.10 to 0.46	0.14
MgO	0.05	N.D.	N.D.
MnO_2	Trace	Nil to 0.16	0.05
H_2O at 110°C	1.08	N.D.	N.D.

H ₂ O above 110°C	26.12	N.D.	N.D.
Loss on ignition	N.D.	11.30 to 30.80	25.59

(N.D. Not determined. Analysis of Cargo samples based on ore crushed, washed & dried at 93°C.)

These also compare favourably with the requirements for production of metallic aluminium by Bayer process but whether the reserves will prove adequate or not cannot be said till the reserves are determined.

Manganese - Ore

There are several deposits of manganese-ore near Kutingi in Koraput district and around Nishakalin Kalahandi district. A minor occurrence of manganese ore has been reported from Rajgarh (near Jagdalpur-Raipur road) in Bastar district but no details are available.

Koraput district:

Five deposits of manganese-ore are reported from Kutingi (19°05' : 83°10' ; 65 M/4) area along the western edge of the granite-khondalite contact; the ore is associated with a dark chocolate coloured quartzose rock, composed mostly of psilomelane with minor quantities of pyrolusite. The total reserves in the area are estimated at 0.41 million tonnes with 44.35 to 54.60% manganese. Other minor occurrences of manganese ore are also reported from many localities in the area.

As at present, the Kalahandi bauxite, may, therefore, be suitable only for the manufacture of high alumina-cement which permits employing somewhat ferruginous ore also, the general specification being $\text{Al}_2\text{O}_3 : \text{SiO}_2$ about 10:1 and $\text{Al}_2\text{O}_3 : \text{Fe}_2\text{O}_3$ about 2:1 with the provision that cement with a lower iron content can support a higher percentage of silica. This aspect is important in view of the availability in the region of abundant reserves of limestone suitable for cement industry.

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SiO_2	0.26	0.53 to 6.13	3.48
CaO	0.06	0.10 to 0.46	0.14
MgO	0.05	N.D.	N.D.
MnO_2	Trace	Nil to 0.16	0.05
H_2O at 110°C	1.08	N.D.	N.D.

H ₂ O above 110°C	26.12	N.D.	N.D.
Loss on ignition	N.D.	11.30 to 30.80	25.59

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Kalahandi district:

The Kutingi manganese deposit extends from Boripatta (19°05' : 83°10' ; 65 M/4) in Koraput district to Minakhunti (19°18' : 83°12' ; 65 M/3) in the Nishkhal area in the adjoining Kalahandi district. The deposits occur at the following places:-

Nishkhal and south of Nishkhal.	(19°13' : 83°13' ; 65 M/4)
Podakona	(19°12' : 83°10' ; 65 M/4)
Taloshi	(19°11' : 83°13' ; 65 M/4)
Pullabodi	(19°09' : 83°12' ; 65 M/4)
Khadikaju	(19°09' : 83°12' ; 65 M/4)
Karajhlla	(19°09' : 83°11' ; 65 M/4)
Piplapadur	(19°06' : 83°10' ; 65 M/4)
Boripatta	(19°05' : 83°10' ; 65 M/4)
Koka	(19°15' : 83°13' ; 65 M/4)
Lilagumia	(19°16' : 83°13' ; 65 M/3)
Dulki	(19°16' : 83°10' ; 65 M/3)
Bolkapai	(19°16' : 83°10' ; 65 M/3)
Kavanjaguda	(19°18' : 83°11' ; 65 M/3)
Kinchkhal	(19°15' : 83°13' ; 65 M/3)

Deposits in the northern part of the Nishkhal area were examined in some detail and reserves here were estimated at about 246,000 tonnes within a depth of 15 metres from surface, of which nearly 60,960 tonnes contain 40 percent and above of manganese. The different grades of ore, with estimated reserves in the three bands, are given below:-

	Above 48% Mn	45-48%Mn	40-45% Mn	30-40% Mn	30-30%Mn	Total (Tonnes)
Top band	8,128	4,064	19,812	8,940	6,299	47,246
Middle band	2,844	-	21,945	48,668	79,251	157,112
Bottom band			2,032	15,646	29,957	46,636

The total estimated reserves, within a depth of 15.2 metres from the surface of all the deposits in all the localities referred to above are of the order of 1.01 million tonnes, of which about 203,200 tonnes would be with 40 per cent and above of manganese.

Clays

Occurrences of clays of different varieties, including pottery-clays china clays etc., have been noted in all the three districts. While pottery clays, which are either of alluvial or residual origin are quite common in many places, china clays and other clays are not so widespread; these clays appear to be more predominant in Koraput district. Few of the deposits, however, have been investigated in detail to ascertain their potentialities and usefulness in various industries. Particulars of the more important known occurrences are given below:-

Bastar district:

An occurrence of whitish, buff stained clay derived from shales has been recorded in the Goralinadi section about 1.5 km. north-west of Sindigar ($18^{\circ}32'$: $81^{\circ}45'$; $65^{\circ}14'$). The inferred reserves are of the order of 3,000 tonnes

White clay occurs about 9 to 11 m. below laterite in a well section at Mangapur and in another well at Madpal ($19^{\circ}05'$: $82^{\circ}09'$; $65^{\circ}14'$). In view of the absence of clay in other well sections in the neighbourhood, and also because of its admixture with other materials, it is considered that these occurrences are not of economic importance.

Another occurrence of clay has been noted on the western slope of Kukra Dongri, 2.8 km. north-west of Ulnar ($19^{\circ}10'$: $82^{\circ}07'$; $65^{\circ}14'$). The few pits examined in the area reveal only kaolinised siliceous shade. This occurrence is not of commercial importance.

Occurrence of white, purple and buff clays has been recorded in the following localities :-

- (i) In the nala 1.5 km. east of Jojo / (18° 58' : 82° 05' ; 65 J/1) the clay is white, with a buff tint and fuses to a yellowish grey colour when heated above 300° C. It can be used as a filler.
- (ii) In the ghat-road section about 1.5 km. E.S.E. of Kotomsar (18° 53' : 81° 55' ; 65 F/13); the clay is yellow or buff in colour and can be used in distemper industry. For an assumed depth of 8 metres the reserves of this deposit are of the order of 406 tonnes.
- (iii) 3 km. of Kotomsar; the clay remains white after fusion above 1,300° C. and can be used in ceramics. About 24,000 tonnes of clay may be available in this deposit.
- (iv) East of Balu Metta (18° 53' : 81° 11' ; 65 F/2); pure white china clay has been reported.
- (v) Near the 19th milestone on the Jagdalpur-Sukma road; white clay, about 1.8 metres thick has been reported.

Koraput District:

Many occurrences of pottery clays of both alluvial and residual origin, as well as china clays occur in this district.

Pottery clays occur at the following places :-

1. Near Jepore (18° 52' : 82° 34' ; 65 J/9); Brown and black alluvial clays, sufficiently plastic for making tiles, bricks posts etc
2. South-west of Demsaguda (18° 51' ; 82° 35' ; 65 J/9) and also on the banks of Dudhi Jhoka, near the village; black and brown clay;
3. Stream sections north-east of Bodesol (18° 52' : 82° 35' ; 65 J/9); highly plastic, mottled yellow and cream coloured clay.
4. At the northern end of the Nokti Dongar hill on the Jeypore-Koraput road; residual clay red in colour.

China clays: The following are some of the important occurrences of china clay in the district :-

1. W.N.W. of Deodra village (18° 18' : 82° 17' ; 65 J/7) the clay has good plasticity and can be used as fire clay; neither cracks nor fuses at 1400°C and linear shrinkage is 7.5%.

2. Boipariguda (18° 45' : 82° 26' ; 65 J/5); mottled cream and yellow clays are found in large quantities.

3. Bed of stream near Qduguda (18° : 82° 45' ; 65 J/9) about 4 km. E.S.E. of Koraput, clay deposit appears to be extensive but is of poor quality as it is sandy and stained with ferric oxide. Washing and sunbleaching may improve the quality. It has good plasticity and does not crack or fuse at 1400°C; shrinkage about 15%.

4. North of Musoriguda (18° 52' : 82° 41' ; 65 J/9); clay of poor quality. It is soft and has good plasticity, linear shrinkage being 15%.

5. Near sarisa Paddar, 13 km. (eight miles) from Chandeli on the Koraput-Jagdalpur road good quality clay deposits.

6. N.W. of Ramogiri (18° 46' : 82° 15' ; 65 J/1); 61,000 tonnes of clay have been reported from two localities but details are not available.

7. Occurrences of clay have also been reported from Jodiguda (18° 20' : 82° 46' ; 65 J/15); Pukkili (18° 30' : 82° 54' ; 65 J/15), Nuagam (19° 06' : 82° 30' : 65 1/8) Ambodala (19° 49' : 83° 28' ; 65 M/5), Rithakonda (18° 11' : 81° 56' : 65 F/16), Singarajukunta (18° 17' ; 81° 48' ; 65 F/15), Umarkote (19° 40' : 82° 12' ; 65 I/2) etc.

Kalahandi District:

Minor occurrences of clay have been noted in the Kalahandi district at Sandala and east of Lukopali the latter being greyish white in colour and associated with quartzites. It is 2-2½ metres in thickness, plastic and free from grit. It is likely to be useful in the manufacture of refractories.

It is necessary to make a detailed assessment of the quality and reserves of clay in the region, considering specific proposals for their industrial utilisation. However, some of the clays such as those at Sarisa Paddar and Jeypore in Koraput district may be exploited for the manufacture of pottery, tiles bricks etc., after washing.

Mineral Pigments

Bastar District:

Occurrences of red and yellow ochres are reported from the following localities. However, they have not been investigated in detail :-

1. Near the 10/4 milestone on the Jagdalpur-Koraput road; red ochre is present.

2. On hill 1818 on the eastern bank of Pul Nadi, 1.6 km. S.S.W. of Rokel ($18^{\circ} 35' : 81^{\circ} 44' ; 65 E/10$), red ochre is reported to occur.

3. At Bamini ($19^{\circ} 04' ; 82^{\circ} 10' ; 65 I/4$) yellow ochre is present.

4. 2 km. east of Devrapal ($18^{\circ} 58' ; 81^{\circ} 48' ; 65 F/13$) on a hillock on the eastern bank of Kanger river, yellow ochre is reported to occur.

5. 1 km. S.E. of Kadma Chhote ($18^{\circ} 58' : 81^{\circ} 52' ; 65 F/13$) yellow ochre is present.

Koraput District:

Red ochre deposits occur at Saraji ($18^{\circ} 19' : 82^{\circ} 45' ; 65 J/11$) Geruputtu ($18^{\circ} 35' : 82^{\circ} 44' ; 65 J/10$); Kandagam ($18^{\circ} 55' : 82^{\circ} 38' ; 65 J/9$) and Moganda ($19^{\circ} 06' ; 83^{\circ} 21' ; 65 M/8$), Yellow ochres occur at Boipariguda ($18^{\circ} 45' : 82^{\circ} 26' ; 65 J/6$), Binsuli ($19^{\circ} 02' , 82^{\circ} 18' ; 65 I/8$) and other localities.

For a deposit of ochre to be of economic proposition, it should be capable of yielding large quantities of a pigment which is uniform both as regards colour and physical properties. Specific proposals for a paint industry based on these mineral pigments can be made when reserves have been computed and quality studied keeping in view factors such as (1) their state of aggregation, pulverulence, fineness of particle size and absence of hard gritty particles, (2) the type and purity of colour and (3) the strength of staining power of the ground pigment.

Glass Sand

Quartzites and quartz veins suitable for glass manufacture occur in the following localities. Besides being useful for glass making, they may also be useful for manufacture of silica bricks.

Bastar District :

In Jhiram (18° 47' : 81° 51' ; 65 F/13) area, good quality quartz occurs on the Gojia dongri. A random sample is reported to analyse SiO_2 99.11 %, Fe_2O_3 0.09%, Al_2O_3 0.27% and K_2O 0.39%. The reserves have been estimated at 5.73 million tonnes.

Koraput District:

A thin band of quartzite occurs near the rest house at Dalapur (18° 46' : 82° 19' ; 65 J/5). A random sample has been reported to analyse SiO_2 98.82%, Fe_2O_3 0.32%, Al_2O_3 0.62%, CaO 0.06% and MgO 0.30%. The reserves have not been estimated.

Copper

Bastar District

A zone of silicified shale with gossan in two small hillocks 11 km. S.S.W. of Narainpur has been recorded and this extends for about 2.4km. in N.70° W. - S.70° E. direction. Green malachite stains are recorded on the surface near

Mundanar (18 49' : 81 46' ; 65 F/13). Some disseminations of copper pyrite are recorded in the rocks for a distance of 1.6 km. A small boulder with rich chalcopyrites and malachite was picked up on a path 800m. south of Pakanar (18 53' : 81 44' ; 65 F/9) but the source could not be traced.

A wide silicified horizon with patches of goossan having indication of sulphide mineralisation was newly located within the Dharwar rocks, north of Mundatikra (18 28' : 81 19' ; 65 E/7). Further survey supplemented by large scale mapping and geochemical ^{/sampling} and drilling was carried out but the results were not encouraging.

Lead

Bastar District :

Lead ore (galena) has been reported from the following localities in the district : -

(i) About one kilometer south-east of Binjam village (18 56' : 81 19' ; 65 F/5), disseminated in a quartz vein. The occurrence is pockety in nature and needs to be investigated further before its potentialities could be ascertained.

(ii) About 3 km. N.N.W. of Banchi village (18 46' : 81 17' ; 65 F/5), in a block of quartz-vein. The occurrence has been investigated and found to be of no economic importance.

Andalusite

Andalusite is known to occur at several places in Bastar district associated specially with the rocks of Benghal series.

In the nala east of Netapur (18 48' : 81 25' ; 65 F/5) sandstones cramed with large crystals of andalusite are found. Purer and harder crystals of the mineral are found in the phyllites between Kumharas (18 51' : 81 21' ; 65 F/5) and Chandanar (18 49' : 81 23' ; 65 F/5) and also west of Mankeali (18 43' : 80 52' ; 65 B/14) and at Ziram. It is reported that besides other occurrences

which may be located, the area between Netapur and Kumharas is worthwhile taking up for prospecting operations.

Normally andalusite is a more valuable refractory material than sillimanite and Kyanite, but the known occurrences of the mineral are not large and pure enough to be exploited economically. If the available material is intended to be used, the andalusite bearing rock would have to be crushed and the mineral concentrated. In places this should not be an expensive process for the andalusite occurs as hard crystals over a centimetre across, in rocks which could be easily crushed.

Samples of andalusite from Ziram area show the following analytical results :-

	<u>Green variety</u>	<u>Pink variety</u>
SiO ₂	63.2	71.9
Al ₂ O ₃	27.1	17.7
Fe ₂ O ₃	3.8	2.6
CaO	1.0	1.0
MgO	0.5	0.5
Loss on ignition	1.9	3.6
K ₂ O and Na ₂ O	2.6	2.7

Andalusite from this and other areas, obtained by crashing the mineral bearing rock, will have to be concentrated before bringing it up to standard of the Californian mineral, which when mined, analyses, Al₂O₃ 56.89%, SiO₂ 33.78%, H₂O 0.37%, loss on ignition 3.67%, others 5.29%.

Even if the mineral is found to be not up to the standard as a refractory, calcined andalusite may be suitable for making spark plug insulators. For this purpose small quantities of other associated minerals such as corundum, bauxite, pyrophyllite, rutile, pyrite, paryte, although detrimental in refractory industries, are not objectionable. The calcined andalusite can

also be used in the manufacture of laboratory porcelain and thermocouple protection tubes.

The mineral may thus be useful in promoting an important small scale industry if reserves are found to be adequate.

Lepidolite

At the base of the greenstone ridge south of Mundval (18° 39' 31" 56"; 65 F/14) in Bastar district were found boulders of lepidolite-bearing rocks over a distance of about 1.5 km. Subsequently the mineral was discovered in situ in a pegmatite cutting the greenstone about one kilometre south-east of Mundval.

The lepidolite occurs as rather large fine-grained masses, which except for a little quartz, are free from impurities. A partial analysis in the laboratory of the Geological Survey of India, showed :

Lithium Oxide	.. ..	3.34 per cent
Fluorine	.. ..	4.88 per cent

This may be compared with the composition of the lepidolite of south-west of Africa which contains 4 per cent or more of lit

The richer of the two pegmatites containing lepidolite occur about 600 metres south-west of Mundval. It should be possible to get about 15 tonnes of rock containing 50% lithia mica for every foot in depth to which the pegmatite was quarried. How far the lepidolite continues depth is not known for certain.

Mica

Koraput district:

About 200m. north-west of Chatterla (19° 00' PP : 82° 35'; 65 J/9) ruby mica (muscovite) occurs in pegmatite. The mica associated with a small quantity of beryl, north of Padda Dubili (19° 04' : 82° 37'; 65 J/12) is of better quality than that near Chatterla. A number of other small mica deposits occur in the district and are of limited economic importance.

Kalahandi district

Mica has been reported at Tandla (19° 53' : 83° 03' ; 65 M/1) and other localities in the area but it is not of economic importance.

Corundum

Bastar district:

Occurrences of corundum reported from Bhopalpatnam (18° 52' : 80° 23' ; 65 B/5) is of detrital nature and is derived from the crystallines of the north-eastern hill tract. The larger crystals have already been removed by visitors and annual production is not expected to be much.

Corundum is also found in a sillimanite cordi-gneiss on the south-western end of hill 1024 west of Kerlapal (18° 18' : 81° 32' ; 65 F/11).

Reserves of corundum will have to be proved before prospective industries are planned. As a general rule, the industrial value of corundum as an abrasive can only be decided by actual trials. Finely ground corundum, bonded with clay, can be used for making refractory crucibles.

Some rather low grade corundum can be used in the preparation of non-alip treads on ceramic tiles and concrete slabs.

Garnet

Koraput district :

Garnet is found in a fairly concentrated state at Banapur (19° 53' : 83° 27' ; 65 M/5) as a surfacedetritus but details as to quality and reserves are not available. Garnets are also likely to be found in other parts of the Eastern Ghats in this district.

Gold

Panning tests for alluvial gold carried out in Kukur river at Sonpur (19° 42' : 81° 01' ; 65 E/2) and in the Sabari at Puspal (18° 38' : 81° 53' ; 65 F/14) indicated the presence of traces of gold. The average recovery of gold at Supansar ghat

(18° 24' : 81° 42' ; 65 F/11) in the Sabari works out at 0.3 grains of gold per 0.7 cubic metre of gravel and sand. In the Sonpar area of the eastern hill tract, and in the Fusal area the boundary between the Puranas and the Archaeans appear to contain the source rocks of alluvial gold.

Gold has also been recorded in river gravels along the streams south of Malkangiri, in the Malengar river, and in the tributary of Sankani, running south-east from near Masenar. The source of the gold is uncertain. It can be recovered economically only by the local gold washers.

Graphite

Bastar district :

Graphite occurs in quartzite on the west bank of Sabari river where it crosses the latitude 18° 15'. Flaky graphite also occurs in khondalites, quartzites, pyroxane quartzites and impure granitic rocks in the area. The occurrences reported so far are not sufficiently rich for exploitation.

Koraput district:

Graphite occurs in both acicular and massive forms as narrow bands along foliation planes of khondalites on the southern bank of a nala to the south of village Chichkona (19° 09' : 83° 15' ; 65 M/4). The graphite is fairly pure and of good quality but reserves have not been estimated.

Graphite, though not of very good quality, also occurs near Majikelan (19° 28' : 83° 27' ; 65 M/7).

Kalahandi district :

Promising deposits of graphite have been noted near Densurgi (20° 118' : 83° 31' ; 64 P/12) Lengigarh and Kaladi hill, but reserves are not known.

Fluorspar

Bastar district :

Finds of fluorspar have been reported from Bhopalpatnam

- : 34 : -

(18° 52' : 80° 23' ; 65 B/5) but details as to quality and reserves are not known.

Koraput district:

Small pockets of ilmenite have been noticed about three kilometres south-west of Gangadharpur railway station (19° 49' : 83° 18' ; 65 M/5) and east of Kumandol village (19° 48' : 83° 16' ; 65 M/5) but details as to quality and reserves are not available.

Steatite

Koraput district:

Soapstone variety occurs near Katpadi (18° 41' : 82° 20' ; 65 J/6) and Kenduputtu (18° 42' : 82° 19' ; 65 J/6) The deposit is not of economic importance.

Asbestos

Bastar district :

A vein of tremelite-asbestos, 2 cm. thick, occurs in actionelite-tremelite schist N.W. of Salispara (20° 15' : 81° 10' ; 64 H/4). The occurrence is impersistent and uneconomic.

Cobaltiferous wad

Kalahandi district :

Small deposits of cobaltiferous wad have been reported associated with the iron-ores at Olatura (20° 24' : 83° 33' ; 64 F/11) off Madhanpur but the quality and quantity of the occurrence are not known.

Building Stones

Most of the areas in the Dandakaranya region contain some types of rock or other which can provide building materials and road metal. No specific investigations have been carried out for locating such stones. The gneissic granites, gneisses and charnockites, are the principal building stones in Koraput district. The eastern ghats consist mainly of charnockites and khondalites; khondalites, are not, however, so good as building stones. Charnockites are usually within easy reach of Koraput, Jeypore and other places. In Bastar district, sandstones, limestones and granites

afford good building materials. Granites, gneisses and a variety of other rocks furnish road metal. Laterites in some localities, also serve as building stones.

MINERAL BASED INDUSTRIES

From the foregoing, it will be seen that there are occurrences of over 20 different minerals in the Dandakaranya region. Few of these, however, can be classed as major mineral occurrences. The other minerals do not either occur in quantities large and pure enough for being economically exploited, or sufficient data are not available from the investigations carried out so far, in regard to their quality, reserves etc. Besides the quality and quantity, several factors, like transport, possibilities of starting industries utilising the minerals, availability of other raw materials for such industries, demand for products, play an important part in deciding whether and when a particular mineral deposit can be taken up for exploitation. Even many of the important deposits like the Bailadila iron-ores could not be taken up for systematic exploitation till now, due to lack of transport facilities.

The Bailadila-Vishakhapatnam, railway line, expected to be completed in about a year's time, will not only pave the way for systematic and large-scale exploitation of the iron-ores but will also add greatly to the industrial development of the areas along and near the railway line. One of the reasons why the mineral deposits of this region, specially those of minor minerals as well as small deposits of even important minerals, have not been investigated in detail is that the scope of development of such deposits for exploitation for different purposes has been limited. With the improved

transport facilities and other amenities now being gradually developed, the mineral deposits will have to be investigated in greater detail so as to ascertain their potentialities to sustain particular mineral based industries.

The various factors to be taken into consideration for starting mineral based industries, amongst others, and the mineral deposits that could be taken into account for such industries has been dealt with at length by the National Council of Applied Economic Research, in their publication "Development of Dandakaranya" 1963. It is, therefore, not considered necessary to repeat all the details. Brief reference to the views expressed therein with additional information where available, are given below:-

The most important minerals which occur in large quantities and about which adequate information is available for exploitation are, iron-ores, limestones, dolomites and manganese-ores.

IRON-ORES

Export: Iron-ores, the most important and extensive mineral occurrences in Dandakaranya, are located mainly in Bastar district, the total reserves being of the order of 2000 million tonnes, representing about 10 percent of the country's reserves. The reserves in Koraput district are estimated at only 10 million tonnes while those in Kalahandi are even smaller.

Elaborate arrangements are already afoot for development of the Bailadila iron-ores for export to Japan, from 1966 at the rate of about four million tonnes per annum. This arrangement is for an initial period of 15 years but may be extended later to longer periods with the quantity of ore also increased to 12 million tonnes or more per annum. The

about 320 km. long,

the vital link for the export trade, is expected to be completed by January, 1966.

Steel Plant: Besides, yielding enormous quantities of ore for export for considerable periods, the Bailadila ores as well as those of Rowghat and other areas in Bastar district can support large-scale steel plant. Apart from the availability of the ore for the purpose, several other factors such as availability of other raw materials, transport and the costs involved, demand and marketability of the products, have to be taken into consideration. Many of these aspects have been considered in some detail by the N.C.A.E.R. who have suggested Rowghat or Bailadila area as a place where an integrated steel Plant may be established to meet the additional demands in the coming years. Possibilities of export of steel through the port of Vishakhapatnam, and availability of empty wagons for transport of metallurgical coal from Vishakhapatnam to the plant site on return trips after unloading the ore at the port, are some of the main considerations which weighed in favour of this suggestion. It was also expected that adequate reserves of blast-furnace grade and steel-melting grade limestones would be available in the Kanger area. The investigations carried out by the G.S.I. till recently do not, however, confirm this presumption. Further details in this regard are given under 'limestones' below:-

Pig Iron: The third important use to which the iron-ore suggested to be put is the manufacture of special pig iron for various castings etc. There is now a general agreement that pig iron for such purposes is best-manufactured independent of that required for making steel in larger establishments.

The foundry pig iron units may, therefore, be of a modest size, enabling smaller deposits to be utilised. One important factor is, however, that the pig iron for castings should be very low in phosphorus. The general high phosphorous content in the Indian coals has proved an impediment for the manufacture of low phosphorus pig iron. The alternatives to combat this difficulty are: (i) use of charcoal instead of coking coal, (ii) use of electricity and (iii) using iron-ores with very low phosphorus content. It may be possible to resort to the first alternative as generally there is scope for the systematic production of charcoal in the thick forests existing in many parts of the Dandakaranya region. The second alternative may not be possible to be adopted till cheap hydro-power could be available in bulk.

As the iron-ores of Umurkote in Koraput district are reported to be low in phosphorus and the area has certain other advantages, the N.C.A.E.R. has suggested that this deposit may be exploited for setting up of a 100,000 ton pig iron plant. It may be pointed out, however, that the analysis carried out by the G.S.I. also quoted by the N.C.A.E.R., show fairly high contents of phosphorus in these deposits. There is, therefore, need to look into this aspect more carefully.

LIMESTONE

Cement: Though there are several occurrences of limestone in many parts of Bastar and Koraput districts, not all of these have been investigated fully as yet. It is known, however, that many of the limestones have magnesia and silica contents within the permissible limits for manufacture of port-land cement. Considering the growing demand for cement in the country as a whole and many other factors

which have a direct bearing in the development of the cement industry in the Dandakaranya region, the V.C.A.E.R. has suggested establishing of two cement plants, of about 200,000 tonnes capacity, one in Umpavalli Tummiguda area in Koraput district, in the Fourth Plan period and another of similar capacity in the Kanger area, in the Fifth period. The proved and probable reserves of limestones at the Umpavalli-Tummiguda area are 30 and 100 million tonnes respectively.

Recent investigations by the Geological Survey of India have revealed the existence of two potential areas in the vicinity of Jagdalpur, where cement industries can be started. The Kanger valley limestones are about 27 km. from Jagdalpur on the Sukma road and will be within very easy reach of the railway line under construction. The estimated reserves of cement grade limestone here are of the order of 800 million tonnes. The other, Potonar-Baranji area, is the smaller of the two and has estimated reserves of 45 million tonnes of cement-grade limestones. This area is about 30km. from Jagdalpur on the way to Chitrakot. The deposits will be very close to the hydro-electric power station and also quite near the new railway line.

Considering that the limestone requirements for the manufacture of one tonne of cement is about 1.6 tonnes, the annual consumption of limestones for a 200,000 tonne plant be of the order of one third of a million tonnes. It will be seen that at this rate, the vast reserves of limestone in this region can sustain many cement plants for several years. At the rate of 0.4 tonnes of coal for making one tonne of cement, the requirements for a 200,000 tonne plant will be of the order of 80,000 tonnes. The coal can be obtained from the Godavary

coalfield (Andhra Pradesh), Talchir coalfield (Orissa) or Ib river coalfield, (Orissa), which are each about 875 km. from the limestone belt in Bastar. As in the case of coal for steel plant, there is the possibility of utilising the empty wagons from Vishakhapatnam on their return trip to Bailadila, after unloading the iron-ore at the port.

The other important requirements for the cement plant are, power, water and gypsum. With the existence of the two rivers Indravati and Kanger and establishment of the hydro-electric projects in the region, water and power may not present any problems. The quantity of gypsum required is of the order of 0.40% (about 8,000 tonnes for a 200,000 tonne cement plant) and this can be obtained from Sulurpet (13 42' : 80 01' ; 65/C/2) area in Andhra Pradesh, which is about 725 km. by rail from Kottavalasa.

As has been stated earlier, flux grade limestone occurs as comparatively thin bands, under thick overburden consisting of cement-grade, blendable cement-grade and impure limestone in the Kanger area. If the sites for working of limestone for cement are selected carefully it may be possible to work at least some of the flux-grade limestones. There are smaller deposits of both flux-grade and cement-grade limestones in the neighbourhood of sukma, some 75 km. south from Kanger valley but it may not be possible to work either of these at present due to lack of transport facilities.

Due to the industrialisation that has already set in the outer limit of the annual demand for cement in the Dandakaranya region, may be of the order of 0.3 million tonnes at the end of the Third Plan, 0.75 million tonnes at the end of the Fourth Plan and considerably more in the Fifth Plan Period. Recent press reports indicate that the Government of Madhya Pradesh have given licences for establishment of two cement factories in the Jagdalpur area in Bastar district.

DOLOMITE

Recent investigations by the Geological Survey of India have revealed the existence of high grade dolomite deposits within easy reach of Jagdalpur and the new railway line. The estimated reserves of flux-grade up to ground level area about 35 million tonnes of which 17 million tonnes are of S.M.S. and refractory grade. The reserves will be much more if the dolomite is worked to some depth. The reserves are, therefore, considered quite adequate to meet the needs of the steel furnaces of one or more steel plants. The material may also be used in the manufacture of dolomite bricks to a limited extent, depending upon the demand for the same, which has to be studied in detail. Though dolomite is not commonly used in the blast furnaces, as a flux, this possibility may also be examined, in view of the dearth of flux-grade limestone in this area.

MANGANESE ORES

There are many known occurrences of manganese-ores in Koraput and Kalahandi districts. The ore occurrence near Kutingi 37 km. from Rayaguda on the Rayaguda-Koraput road is being made partly for use in ferromanganese industry at Rayaguda and partly for export. It is considered that the ferro-manganese industry has limited scope for expansion due to the demand for ferro-manganese being low from foreign markets. One of the reasons for this is the highest cost of production of the material in India. The present production and that envisaged in the near future is considered to be adequate to meet the country's internal requirements.

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BAUXITE

Aluminium: Bauxite is known to occur in Kalahandi and Bastar districts. While some data regarding the quality and quantities of the Kalahandi deposits are available, the extent and other details of the Bastar deposits are not yet available. The reserves of the Kalahandi deposit have been estimated at over 0.6 million tonnes of which only about 150,000 tonnes are stated to be of high grade, suitable for the manufacture of aluminium. There are, however, possibilities of locating additional reserves. The Kalahandi ores are in general somewhat ferruginous.

Considering that there are large reserves of high grade ores in other parts of the country, the possibilities of establishing an aluminium industry in Dandakaranya region appear to be remote, unless other deposits yet to be investigated prove to be large and of high grade and hydro-electric power becomes available more easily and at low cost.

Cement Fondu: The bauxite may, therefore, be used in the manufacture of 'Cement Fondu' or high alumina cement. Bauxite for this purpose should have a minimum aluminium/silica ratio of 10:1 and that of alumina/ferric oxide about 2:1. The two ratios are not however, entirely independent as ore with a lower iron content can support a higher percentage of silica. In view of the possibilities and steps being taken for setting up cement plants in the area, it should not be difficult to incorporate smaller units within the cement plants for making "cement fondu". The quantities to be manufactured will have to be determined, as per possible local and regional demands.

Export: Bauxite occupies an important position amongst minerals for export, the chief importer being Japan. Kalahandi bauxite compares favourably with typical charge samples of ores exported. Before shipment, the samples will, however, have to be washed to remove clay and certain other impurities and then dried at about 93°C.

CLAY

There are many deposits of different kinds of clay reported from various parts of the Dandakaranya region. Although they have not been investigated in great detail, it may be stated that none of these is extensive enough to support large-scale industries. The known deposits will have to be developed and worked locally, after ascertaining their extent and the possible uses to which they can be put on a small scale. Many of the pottery and brick clays may thus be utilised after suitable investigations and, if necessary, some experimentation.

With the data available, the N.C.A.E.R. has suggested the establishment of a 5 tonne/day washing plant for processing the china-clay occurring at Sarisa Paddar, about 12 km. away from Chandion, the Koraput-Jagdalpur road. This has to be taken up after ascertaining the extent of the deposit by pitting, trenching etc., has also some experimental tests on washing the clay. The properties of the washed clay will also have to be studied to determine its suitability in various industries. The washed clay can easily be transported to the consuming centres, within the Dandakaranya region as well as in the neighbouring areas.

MINERAL PIGMENTS

Many deposits of ochre, both yellow and red, have

been reported from different localities in the Dandakaranya region. As in the case of the clays these have not been also studied in detail partly due to the deposits not being extensive and partly because of transport problems and lack of demand. The possibilities of setting up paint industries on a small scale, may, therefore, be examined, if necessary, after ascertaining potentialities of some of the important deposits.

GLASS SAND

There are two important deposits, one of quartz in Jhiram area in Bastar district and another of quartzite near Dalapur in Koraput district. Both the deposits are fairly extensive and the few analytical data available show that the sand obtainable from both of them would be of fairly good quality; suitable for the manufacture of glass ware, silica bricks and silicon carbide. The prospects for establishing any of these industries in this area are not, however, very favourable, due to various factors such as absence locally of other raw materials required, lack of sufficient electric power, small local demand for the products at present and inadequate transport facilities.

GRAPHITE

The large number of known occurrences of graphite in Kalahandi and Koraput districts are reported to be too small to sustain any mineral based industries. The graphite occurrences in Bastar are almost negligible. The mineral worked by manual labour from the deposits in the above two districts is sent out of the Dandakaranya region for being processed for use in the manufacture of various articles, like crucibles, electrodes, lubricants and paints.

LEPIDOLITE

Lepidolite, a lithium and flourine bearing mica, finds use in the manufacture of glass-ware, ceramic products and enamel-ware. It has the property of imparting greater fluidity and gloss and opalescence to glazes and enamels. Lithium metal and lithium chemicals are also used for a variety of purposes.

As the quantity required in ceramic, glass and other industries is not considerable, large-scale production of the mineral is not called for; nor are statistics regarding the consumption, reserves etc., available. Though it is considered that the known deposits may not yield more than a few hundred tonnes of the mineral per year, further investigation regarding the potentialities of the deposits reported from Bastar district, may be carried out. The working of the deposit may possibly form the basis for a small scale industry.

ANDALUSITE

Small deposits of somewhat impure andalusite have been reported from Bastar district. The andalusite may not be suitable for refractory industry but the concentrated and calcined material may be useful in the manufacture of spark plug insulators etc. Before it is planned to take up such work even on a small scale, the deposits will have to be investigated further.

The other mineral occurrences referred to in this report are too small and as such do not merit any attention at present unless larger or greater number of deposits of such minerals are brought to light.

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S U M M A R Y

Of the occurrences of 22 minerals reported from the Dandakaranya region, only those of a very few, like iron-ores, limestones and dolomites, are large enough to support large scale mineral-based industries. The mineral of the highest importance is iron-ore of which there are very large reserves which can be exploited on large scale for export, steel manufacture and making of pig iron. The deposits of limestone are large enough to sustain many cement plants for several years. Some of the other raw materials required, such as coking coal for steel manufacture, coal, gypsum etc., for cement industry will no doubt require to be brought in from outside the region. It is expected that this will be possible to be done at fairly lesser cost than normal, because of the availability of empty wagons that would be running between Vishakhapatnam and Bailadilla, after the iron-ore for export is unloaded at the port. The large dolomite deposits may be used in the steel industry and in the manufacture of refractory bricks etc.

Another important mineral which can sustain a large-scale industry is bauxite but from the available information, the known deposits are not considered to be adequate or quite suited for the manufacture of aluminium. These ores, as also those of manganese may therefore be worked on a small scale, for export, if suitable conditions prevail. Manganese-ore is already being used on a small scale for making ferro-manganese and the possibilities of using bauxite for the manufacture of 'Cement Fondu' may be explored.

The large reserves of silica of requisite quality in the form of quartz and quartzite, may be used in the manufacture of glass-ware, silica bricks and silicon carbide, if there is reasonable demand for these products. Only one deposit of clay that of ~~the~~ is considered large enough to form the basis for

establishing a small clay washing unit. Before it is possible to utilise the other known occurrences of clays, ochres etc. additional work has to be done for ascertaining their extent and quality. It may be possible to work the known occurrences of minerals like lepidolite, andalusite and steatite, only after investigating their potentialities. From the information available so far, the occurrence of other minerals appear to be of very little commercial importance.

It appears from the above that there is very little scope for establishing any small-scale mineral-based industries in the region; it may be possible to set up a few, after detailed investigations are made in regard to certain minerals known to occur e.g. clays, lepidolite and andalusite. It may not be difficult, however, to set up small-scale industries for making such articles as pottery, tiles and bricks for local use in various parts for which there is bound to be an increasing demand, with the growing industrialisation of this part of the country.

It is considered that the Geological investigations to be carried out are best entrusted to a whole-time team of officers selected from the Geological Survey of India/or the Indian Bureau of Mines. This view has also been expressed by the Financial Adviser and Chief Accounts Officer, of the D.D.A. in his comments regarding the N.C.A.E.R. Report.

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TOUR ITINERARY OF THE TEAM IN DANDAKARANYA
REGION.

<u>Date</u>	<u>Places Visited</u>
14.12.54	Raipur Jagdalpur (afternoon)
15.12.54 to) 17.12.54)	Tour in Basin area including Koraput, Dantewara, Bailadilla etc.
18.12.54	Jagdalpur
17.4.55	Bhopal
23.6.55	Bhubaneswar

Record of discussions held with the officers of the Madhya Pradesh Government by members of the Techno-Economic Appraisal Team on 17.4.65, at 3 P.M. at Bhopal.

P R E S E N T

<u>MADHYA PRADESH GOVERNMENT</u>	<u>TECHNO-ECONOMIC APPRAISAL TEAM</u>
1. Shri R.P. Moronha, Chief Secretary	1. Dr. A. Nagaraja Rao - Chairman Adviser (I & M) and ex-officio Additional Secretary, Planning Commission.
2. Shri P.S. Bapna, SPD	
3. " M.A. Khan, PWS	2. Shri K.M. Butani - Member Deputy Secretary, Secretary Ministry of Rehabilitation, New Delhi
4. " Devinder Nath, SCI	
5. " B.K. Dube, STW	3. Dr. A. Seetharamiah - Member Industrial Adviser
6. " S.B. Lal, DI	
7. " Brahma Swarup, DS(Forest)	4. Sri P.V. Rao, Superintending Geologist, Madhya Prad Circle, Bhopal.
8. " G.P.D. Patariya, DS (Rehab)	
9. " S. Pasupathi, Dy. CCF	
10. " G.S. Karnard, Dy. C.E., MP.E.B.	

Opening the meeting Sri Moronha mentioned that he appreciated and welcomed the realistic approach that had been made by the Team in its Report. While he was in agreement with the specific proposals made for the setting up of industries in this area, he mentioned that a cautious approach would have to be made in respect of industries based on forest resources. As an immediate first step, he suggested that a quick and actual survey should be made of the species on which the forest based industries were to be developed. He emphasised that this assessment should be an actual assessment and not one derived on the basis of stock maps etc. As regards cottage industries, Sri Moronha was of the view that cottage industries tend to follow a set pattern. They do not take into account difficulties of import of raw materials and of marketing of

finished products. These difficulties have to be considered in order to avoid failures. In his view, it would not be correct to place too much emphasis on cottage industries. Dr. Nagaraja Rao mentioned that the Team also has pointedly suggested in its draft report that an assessment of the resource availability should be made immediately. Simultaneously he would also urge immediate steps being taken for an industry-oriented regeneration of quick growing forest species in and around the possible industrial locations. Sri Naraha agreed with this and mentioned that he would strongly recommend to the Forest Department that in addition to eucalyptus, bamboo plantation should also be vigorously pursued. The second point emphasised by Sri Naraha was the question of communications. He mentioned that because of lack of communications, the North and South of Bastar are almost completely separated. The greater part of the forest resources of the area are in the North. The feeding of recommended industries with this raw material would be a problem and in his view road transport would not be adequate for this. He would, therefore, give the greatest importance to the Dalli-Rajhara-Rewhat-Dantewara rail links and without it no industrial development could be possible. In his view this northern rail link was the key to the entire development programme and merited a much higher priority than the Dantewara-Badrachalan road-rail link, as the latter will not solve the problem of transport of raw material for the forest based industries.

2. Sri Naraha also suggested that the Kanker region should be excluded when taking into account the bamboo resources for the pulp and paper industries in the Bastar area since Kanker resources had been earmarked for the setting up of a pulp plant in the Bilaspur area. Dr. Nagaraja Rao mentioned that the Team would take note of this and also requested that the areas earmarked for Birlas for their proposed plant in the Vindhya Pradesh

region may also be indicated to the Team clearly to enable it to assess the resources available for the projects contemplated by the Team.

3. In respect of the choice of location for the central pulp mill, Sri Koronha mentioned that he would prefer the location near Sukma on the Subr to the site near Jagdalpur on the Indravati because in addition to the difficulty of long haulage of bamboo already mentioned by the Team, the latter is likely to present difficulties in respect of the requirements of water.

4. Mr. Lal, Director of Industries, desired to know if the results of the F.A.O. survey of forest resources be awaited before taking up the intensive survey mentioned in para 1. It was explained that the F.A.O. survey was intended to be of the nature of a pilot exercise for the development of a method of assessing forest resources in tropical areas by aerial photography. It was not intended to result in an immediate and clear assessment of the forest resources. This was the first time, Dr. Seethuramiah mentioned, that such an exercise was being undertaken by aerial photography in a tropical region. Sri Koronha mentioned that the Forest Department need not wait for the results of the F.A.O. survey but should organise its own survey immediately.

5. The Public Works Secretary, H.P. pointed out that for the development of an industrial complex of this magnitude it was essential that the road communications of the district should be improved. The present roads would have to be upgraded, and new roads and bridges would have to be constructed. Sri Koronha suggested the preparation of a master plan for road development in Bastar. He was also quite definite that the funds required for this road programme would have to be found outside the Plan. Dr. Rao mentioned that this matter was also under

consideration by the Steering Committee which had been set up for the development of an industrial complex in the Dandakaranya area and that it would be useful if the M.P. Government could give an idea of the requirements, as they visualise them, in the light of the industrial programme indicated in the draft report.

6. About the need for a more detailed assessment of the availability of water, it was agreed that the Madhya Pradesh Government would examine the matter and furnish more detailed data regarding the flow of water in the Indravati and Sabri rivers during the various seasons of the year. This was essential, to enable amongst other things, a study to be made of the pollution problems arising from effluent disposal.

7. A suggestion was made about the utilisation of Mahowa flower for industrial alcohol. Shri Noronha said that, apart from the fact that the Team had found this to be uneconomic, he would even otherwise discourage the utilisation of Mahowa flowers for a distillery because they were being used as food by the Adivasis in the area.

8. In respect of cement, Shri Noronha mentioned that the location of one plant between Jagdalpur and Dantewara was alright. In respect of the second unit further studies would be necessary. He also mentioned that the State Geological Survey should immediately take up the work of proving the deposits of cement grade limestone.

9. A question was raised about the recommendation of the Team for the production of low tension insulators. It was asked why high tension insulators were not being recommended. Dr. Nagaraja Rao explained that apart from comparative ease of manufacture, there was a large demand for low tension insulators which was required by railways, posts and telegraphs and for distribution of electric power.

10. A question was also asked why the Team had not recommended production of silicon carbide and calcium carbide. Dr. Nagaraja Rao explained that for the time being the production of these would not be justified. Adequate capacity for the manufacture of silicon carbide has been licensed to meet present estimates of demands. It was also a highly capital-intensive industry for which the block investment of the order of 70-80 lakhs would be needed of which the requirement of imported machinery would be about 40 lakhs. In so far as calcium carbide was concerned, its production was not recommended for the time being because it was essentially used for the production of acetylene and it had been decided that all future requirements of acetylene for conversion to products like PVC will be based on the petro-chemical complexes that were being developed.

11. The next question that came up for discussion was about the availability of power in this area for the industrial complex that was proposed to be developed. Sri Naraha mentioned that while there is tremendous power potential in this area which should be developed, he had no doubt that even from existing power projects sufficient power would be available for the needs of the industrial complex. He mentioned that by the second year of the Fourth Plan about 200 megawatts would be available from even the existing thermal plants. An important consideration, however, was the length of the transmission lines. Long transmission lines would lead to more frequent break-downs and the possibility of artificial break-down caused by sabotage could also not be ignored. In his view, therefore, local generation had certain advantages and it would be desirable to pursue the question of Chitralat Project for taking a speedy decision. Dr. Nagaraja Rao said that this question was already being considered by the other team appointed by the Rehabilitation Ministry.

RECORD OF DISCUSSIONS HELD AT BOMBAY ON 10.10.1965
ON 23-6-1965 REGARDING DRAFT REPORT OF THE
TECHNO-ECONOMIC APPRAISAL TEAM

MEMBERS PRESENT:

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|--------------------------------------|--|
| 1. Dr. A. Nagaraja Rao, | Adviser Industry & Mining
Planning Commission, New Delhi. |
| 2. Dr. A. Seetharamiah, | Industrial Adviser, Director
General of Technical Development. |
| 3. Shri K.M. Dutani, | Deputy Secretary, Ministry of
Rehabilitation. |
| 4. Shri A.K. Barren, I.A.S., | Chief Secretary to Government
of Orissa. |
| 5. Shri R.P. Pachi, I.A.S., | Development Commissioner. |
| 6. Shri S.C. Roy, I.A.S., | Chief Administrator,
Dandakaranya Project. |
| 7. Shri V. Natarajan, I.A.S., | Deputy Chief Administrator,
Dandakaranya Project. |
| 8. Shri T.M. Thomas, | Joint Director Works, Railway
Board, Ministry of Railway. |
| 9. Shri D.D. Purkayastha, I.A.S., | Chairman, Industrial Development
Corporation. |
| 10. Shri A.L. Nair, I.A.S., | Rehabilitation Commissioner and
Secretary to Government,
Health Department. |
| 11. Shri B.K. Malanti, I.A.S., | Additional Rehabilitation
Commissioner and Additional
Secretary to Government,
Health Department. |
| 12. Shri Gian Chand, I.A.S., | Addl. Secretary, Industries
Department. |
| 13. Shri L.I. Parija, I.A.S., | Director of Industries. |
| 14. Shri D.K. Choudhury, | Chief Conservator of Forests. |
| 15. Shri J.S. Baijal, I.A.S., | Addl. Secretary, P. & C. Department. |
| 16. Shri H.N. Das Mohapatra, I.A.S., | Deputy Secretary, I. & P. Department. |
| 17. Shri J.K. Bhattacharya, I.A.S., | Deputy Rehabilitation Commissioner,
Koraput. |

18. Shri R.J.Jachak, Deputy General Manager,
Orissa Small Industries Corporation.
19. Shri U.K.Parida, Under Secretary to Government,
Co-operation & Forestry Department.
20. Shri J.Mohapatra, Under Secretary to Government,
Health (L.S.G.) R.R. Department.

1. Opening the meeting, Dr. Nagaraja Rao explained briefly the background to the setting up of the Techno-Economic Appraisal Team. The Union Ministers, Finance and Rehabilitation were keen on developing an industrial complex in the Indravati-Sabari basin. This would lead to accelerated exploitation of the vast natural resources in this area and would generate considerable employment for the local people and for the migrants from East Pakistan. In its approach to resources development, the Team had adopted regional approach to planning and not one based on State boundaries. The most economic utilisation of the resources of the area was the main criterion. Dr. Nagaraja Rao mentioned that the Draft Report presents only the beginning of the industrial programmes that could be attempted in the area; the Report does not present the final picture of the various potentials of the area. The recommendations included in the Draft Report were based on the available information which, in some respects, was quite inadequate. The Team had, therefore, suggested detailed surveys to be conducted immediately. In the light of information that may become available as a result of these surveys, necessary modifications may be made in the programme suggested in the Draft Report. Development of the areas will be taken up in a phased manner according to availability of financial resources and technical manpower etc.

2. Dr. Nagaraja Rao further observed that the list of cottage, rural and small-scale industries included in the Draft Report was not intended to be exhaustive; it was only illustrative. The suggestions made in the comments of the Orissa Government regarding these industries would be included in the final Report. The suggestions of the Orissa Government relating to medium industries were also agreed to. Dr. Rao, however, suggested that the small sugar mills proposed in the comments of the Orissa Government may not be taken up, unless these implied Khandasari and Gur Units.

The present thinking in the Planning Commission is that economies are achieved only in large Sugar Units for which the acreage under sugar-cane attached to the unit should be between 10,000-20,000 acres. If such a large area was available under Sugar-cane in the Dandakaranya area, there would be no objection to consider the establishment of a (white) sugar plant also.

3. The comments of the State Government regarding large scale industries were then considered.

PULP MILL AND NEWSPRINT MILL

4. Dr. Seetharamiah explained that there were several reasons necessitating establishment of central pulp units in the country. Firstly, we have hitherto been importing substantial quantities of pulp and should develop indigenous capacity. Secondly, existing bamboo resources in the country are already earmarked for production of paper and as such, utilisation of alternative resources has to be considered. In this connection, Bagasse and some hard woods are relevant. But both these produce short-staple pulp which needs to be mixed approximately with long-staple pulp to make for production of good quality paper. Considering these circumstances, it would be better to put up a Pulp Unit than a Paper Plant. The Director of Forests, Orissa, mentioned that Koraput area had substantial resources of hard woods which were going un-utilised. If, as suggested by Dr. Nageswara Rao, a detailed survey is undertaken to assess the precise availability of hard woods, there could be no objection to the setting up of paper units also in this area, as these could be fed from the proposed Pulp Unit in the area. This was agreed to.

5. The Director of Industries mentioned that newsprint production may not be as economical as the production of other paper. Dr. Nageswara Rao

explained that in the light of national demands, there was acute shortage of newsprint which was being imported and this set high priority to the manufacture of newsprint.

3. The Development Commissioner mentioned that in indicating the location of a Pulp Unit near Jagdalpur or Sukma, the Team had perhaps not considered the relative advantages of the Balimela region in Crissa. Substantial power would soon be available in that area and the area is known to be rich in bamboo and other forest resources. Dr. Nagaraja Rao explained that final decision about the location of the pulp and all other large industrial Units would be made only after detailed locational studies covering all aspects e.g., precise resources availability, transport, water, power, programme of effluent disposal etc. Accordingly, the relative advantage of the Balimela region would also be considered. He suggested, however, that the Crissa Government might organise detailed survey of the forest resources around the Balimela Project forthwith.

RAILWAY LINK BETWEEN SUKMA AND BALIMELA

7. Shri Thomas referred to the proposal of the Crissa Government regarding provision of a Railway link between Sukma and Balimela. He explained that allocation of funds for construction of new lines had to be based on national priorities. He was not sure whether the proposed link would figure in the list of high priorities. He mentioned that if the cost of the Railway link is to be added to the investment on one or two industrial units only in the Balimela area, the investment may not be economic. Development Commissioner pointed out that the proposed Railway link would be not only for a Pulp Plant, but for the entire industrial complex which can be built up in the Balimela area e.g., Pulp, paper, ply-wood, chip board, hard-board, cement, aluminium industrial units etc. Dr. Nagaraja Rao agreed

that all these possibilities will be duly considered before taking a final decision regarding the proposed extension of the Railway line.

ALUMINIUM PLANT

8. Dr. Nagaraja Rao explained that as per the present thinking, Aluminium plants of 50,000 tons or higher capacity were considered economic. Accordingly, as far as practicable, the Planning Commission would like to expand smaller units and to licence new units with capacity of 50,000 tons or above. Chairman, Industrial Development Corporation, Orissa mentioned that there was already a proposal for a private entrepreneur to set up an aluminium plant at Raygada in Koraput district. Dr. Nagaraja Rao agreed that such proposals could be considered on their own merit, keeping in view the above policy.

CHIP BOARD, HARD BOARD, PLY WOOD

9. Considering the comments of the State Government, it was agreed that it should be possible to locate some units in Koraput district area for production of chip board, ply wood and hard board. It was pointed out that, so far as possible, the hard board unit should be in vicinity of the newsprint plant, and similarly, chip board and ply wood units will have to be located together.

WASHING PLANT

10. Dr. Nagaraja Rao mentioned that the Team was not against the setting up of a washing plant provided detailed assessment of the demand justified it. This should be gone into.

CEMENT PLANT

11. Dr. Nagaraja Rao mentioned that he had already requested the Cement Corporation of India to examine the location of a Cement plant to utilise the lime stone deposits in the Sunkri area. The comments of the State Government in this regard will be kept in view before a final decision is arrived at.

MANGANESE

12. Dr. Nagaraja Rao suggested that in the absence of demand for manganese, the question of setting up of a manganese plant should be ruled out for the present. This may be considered in future as and when the need arises.

OTHER FACILITIES AND ORGANISATIONAL ARRANGEMENTS

13. The comments of the Orissa Government were taken note of, and it was agreed that, to the extent possible, the existing organisations of the Orissa Government should be made full use of for the development of industrial programme in the area.

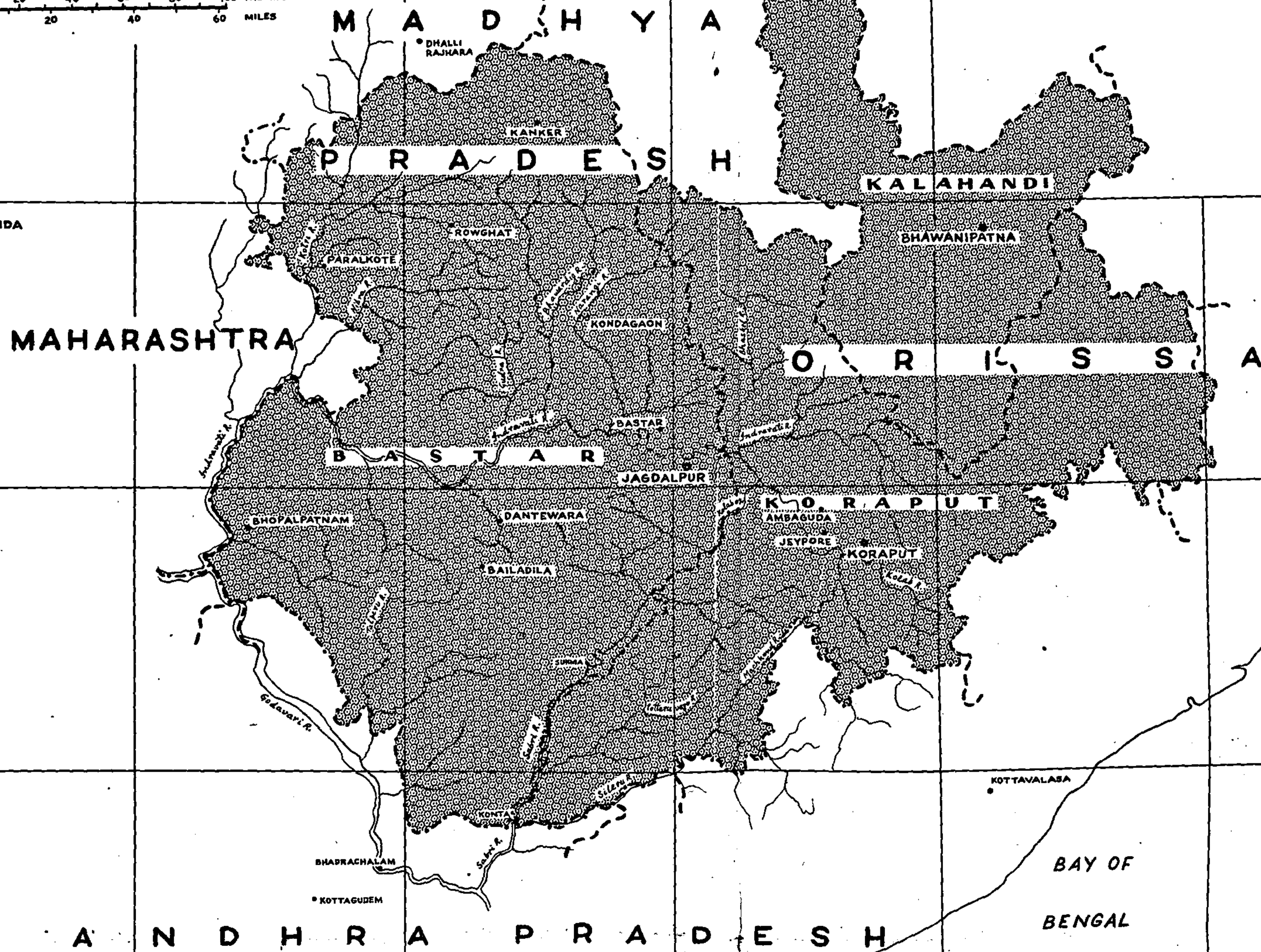
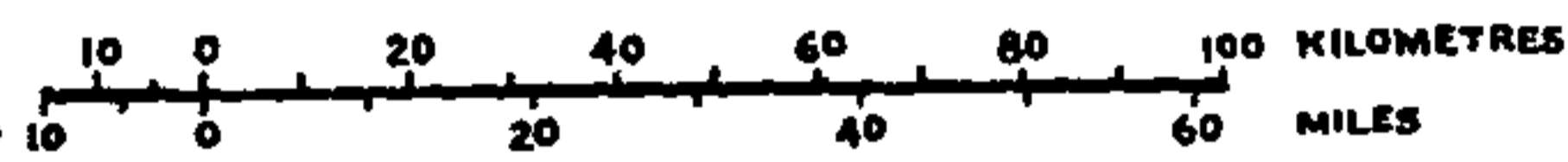
14. It was agreed that the Draft Report of the Committee would be suitably modified in view of the above discussions and the State Government would be kept informed about finalisation of the Report.

DANDAKARANYA AREA



STATE BOUNDARY - - - -
DISTRICT BOUNDARY - - - -
RIVER (INDRAVATI-SABRI-BASINS) ~ ~ ~

SCALE



DANDAKARANYA - MINERAL RESOURCES

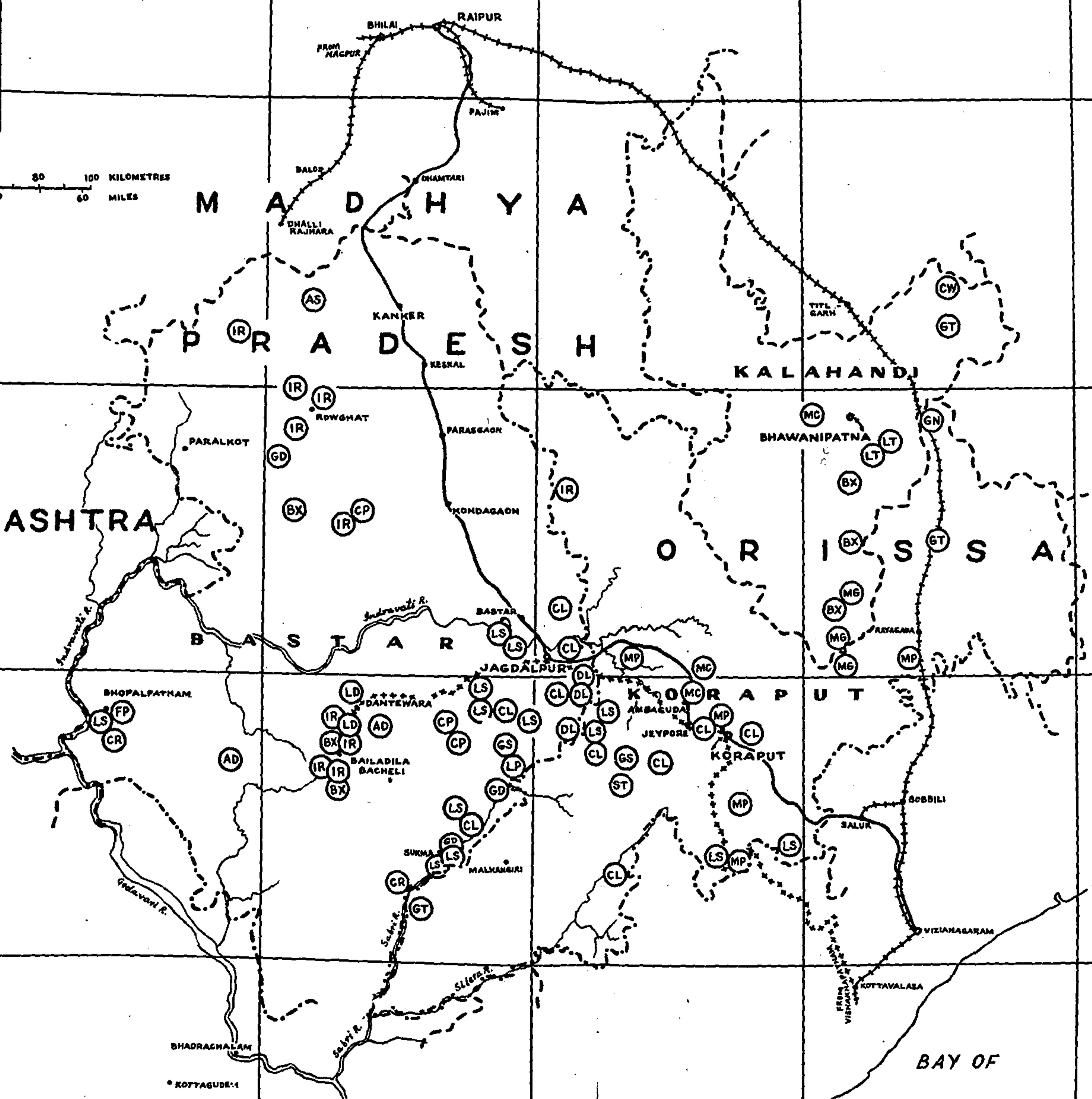


SCALE 1:1,000,000

10 0 20 40 60 80 100 KILOMETRES
0 0 20 40 60 MILES

MAHARASHTRA

A N D H R A P R A D E S H



LEGEND

BOUNDARY:	
STATE	----
DISTRICT	----
RAILWAY:	
EXISTING	----
UNDER CONSTN.	----
NATIONAL HIGHWAY	
RIVER	----
MINERAL RESOURCES:	
IRON-ORE	(IR)
LIMESTONE	(LS)
DOLOMITE	(DL)
BAUXITE	(BX)
MANGANESE-ORE	(MG)
CLAYS	(CL)
MINERAL PIGMENTS	(MP)
GLASS SAND	(GS)
COPPER	(CP)
LEAD	(LD)
ANDALUSITE	(AD)
LEPIDOLITE	(LP)
MICA	(MC)
CORUNDUM	(CR)
GARNET	(GN)
GOLD	(GD)
GRAPHITE	(GT)
FLUORSPAR	(FP)
LIMONITE	(LT)
STEATITE	(ST)
ASBESTOS	(AS)
COBALTIFEROUS WAD	(CW)