JSW Steel (Salav) Limited

SETTING UP OF ADDITIONAL 3.0 MT/YR COKE OVEN PLANT & BY-PRODUCT PLANT, BTX PLANT AND 100 MW GAS BASED POWER PLANT AT SALAV, MAHARASHTRA

Pre-Feasibility Report

Mumbai, October 2018

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Executive Summary

JSW Steel (Salav) Limited proposes to set up of additional 3.0 Mt/yr Coke Oven Plant, By-Product Plant and BTX Plant for the substitution of Natural Gas with Coke Oven Gas in the Sponge Iron Plant. The by-product generated in the manufacture of coke like crude tar, benzol, sulphur shall be recovered and sold in the market. The crude benzol will be processed in the BTX Plant to produce value added products.

In order to meet the requirement of electrical power for the proposed and existing plant, a gas based captive power plant of capacity 100 MW has been envisaged. The gas based Captive power plant will be operated from the boiler fired with coke oven gas and superheated steam from CDQ. The project has been envisaged keeping in view the substitution of scarce & inconsistently available Natural Gas by Coke Oven gas. The 3.0 Mtpa Coke Oven & by-product Plant, BTX Plant and gas based power plant are proposed to be set up near the existing sponge iron plant. The existing sponge iron plant is situated in Salav village of Raigad district in the state of Maharashtra.

The existing plant is situated within 58.7 ha of plant area. The township is located adjacent to the plant within 30 ha of land area. The proposed facilities will be set up in an area of about 16.2 ha within the existing plant complex of 58.7 ha.

The net and dry annual requirements of various major raw materials for the proposed plant are :

Sl. No.	Raw material	Quantity	Source	Mode of Transport
1	Coking Coal	4,200,000 t/yr	International Market	Sea/Road
2	40% NaOH	9,400 t/yr	Domestic	Road
3	Wash Oil	4,200 t/yr	Domestic	Road

The finished product produced from the proposed plant are :

Sl. No.	Product	Quantity	Destination	Mode of Transport
1	Coke and Coke Fines	3,000,000 t/yr	JSW Steel Plants at Dolvi/Vijayanagar	Sea/Road/ Rail
2.	Crude tar	135,000	Domestic	Sea/Road/Rail
3.	Sulphur	9,000	Domestic	Road
4.	Crude Benzol	41,000	Domestic	Road
5.	Benzene	28,700	Domestic	Road
6.	Toluene	5,350	Domestic	Road
7.	Xylene	2,250	Domestic	Road

The make-up water requirement for the proposed project shall be about 20 MLD. The total power generation from the gas based captive power plant considering steam from CDQ and balance coke oven gas from coke oven plant will be about 100 MW. The estimated power requirement for the proposed plant is about 40 MW and for the existing DRI Plant & township is about 10 MW. The surplus power about 50 MW will be exported to the nearest grid.

The generation of waste water will be from cooling towers blow down, BOD Plant, DM Water Plant, Soft water plant, etc, which would be treated in Central Effluent Treatment (CET) Plant for re-use in the plant. The estimated effluent quantity to be treated from the proposed plant shall be about 300 m^3/h. The treated water is proposed to be dispose into the sea.

The proposed plant will employ about 650 people including skilled, semi-skilled, unskilled and clerical manpower apart from managerial staff.

The coke oven plant will be commissioned in 36 months and CDQ in 48 months and the commissioning of By-Product plant, BTX plant and power plant will be in 36 months after obtaining the Environment Clearance for the proposed project.

The total capital investment in the proposed project will be Rs. 4600 Crores which includes cost of land development, infrastructure cost, civil work and structural steelwork, plant and equipment, erection and commissioning.

The proposed investment will boost the socio-economic profile of the region and will act as an engine of economic growth for the country and will open up employment opportunities for the local people in the region.

Introduction of the Project

Identification of the Project & Project Proponent

The JSW Group has emerged as a dynamic US$ 11 billion conglomerate. The Group is a multi-location, multi-product business with interest spanning across Mining, Carbon Steel, Power Generation and Ports & Infrastructure. “Growth with a social conscience” is a paradigm the Group lives by. Its strength lies in its individual companies, with each one committed to consolidate its core strength and excelling in its field of specialization.

JSW Steel is India’s leading integrated steel producer with a capacity of 18.0 Mt/yr. The Group is also leading from the front in every sector that it operates in. By maintaining exemplary operational efficiencies, JSW Energy has grown ten-fold in just three years while JSW Cement creates the building blocks of India with its environment friendly products. JSW Infrastructure is contributing to the nation’s development by providing world class services to clients through state-of-the-art ports, terminals, shipyards and other facilities.

JSW Steel Limited operates a 12.0 Mt/yr Steel plant at Vijayanagar, Karnataka based on COREX/BF/DR-BOF/EAF process route which is the largest Integrated Steel Plant at a single location in India. The group operates two more integrated steel plants in India viz. a 5.0 Mt/yr Steel plant at Dolvi, Maharashtra, based on BF-DR-CONARC process route and a 1.0 Mt/year capacity steel plant at Salem, Tamil Nadu. JSW also has state of the art cold rolling, galvanizing and colour coating plants at Tarapur, Vasind and Kalmeshwar in Maharashtra, India.

JSW offers the entire gamut of steel products - Hot Rolled, Cold Rolled, Galvanized, Prepainted Galvalume, TMT Rebars, Wire Rod, Special steel bars, Rounds and Blooms. JSW exports its downstream products from these facilities to over 85 countries in the world.

JSW propose to set up a 3.0 Mt/yr Coke Oven Plant, By-Product Plant and BTX Plant for the substitution of Natural Gas with Coke Oven Gas and production of

value added benzol products. The by-products like coke fines, crude tar, benzol, sulphur, BTX shall be recovered and sold in the market. To meet the requirement of power for the proposed and existing plant, a coke oven gas based captive power plant of capacity 100 MW has been envisaged. The gas based Captive power plant will be operated using steam from boiler fired by coke oven gas and superheated steam from the CDQ.

Brief Description of Nature of the Project

JSW Steel (Salav) proposes to set up of additional 3.0 Mt/yr Coke Oven Plant & By-Product Plant, BTX Plant and 100 MW gas based power plant within the land area of the existing plant at Salav. The coke will be fed to the steel plants of JSW at Dolvi and Vijayanagar.

The coke oven gas generated from the coke making, will be about 150,000 Nm^3/hr with a Calorific value of 4150 Kcal/Nm3, with an energy equivalent of 625 Gcal/hr. Out of this 69,000 Nm^3/hr (285 Gcal/h) of coke oven gas will be used as the substitution of Natural Gas in the existing DRI Plant, 60,000 Nm^3/hr (250 Gcal/hr) would be required internally in the coke oven plant for under firing of battery & ammonia cracking, 1000 Nm^3/hr (4 Gcal/hr) would be required in the BTX Plant and the balance 20,000 Nm^3/hr (86 Gcal/hr) will be used in a boiler for the generation of power in gas based power plant.

The by-products like crude tar, benzol, sulphur, shall be recovered and sold in the market.

The total capital investment for the proposed gas generation coke oven plant, by-product plant, BTX plant along with gas based power plant will be about Rs. 4,600 crores.

The project has been envisaged keeping in view the substitution of scarce & inconsistently available Natural Gas by Coke Oven gas and to feed the coke to the existing plants of JSW at Vijayanagar and Dolvi. The proposed plant shall ensure continued and additional employment of people in plant operation.

The details of the proposed plant facilities are enumerated below in Table 1.

Table 1 : Details of the Proposed Plant Facilities

S. N.	Facilities	Capacity
1.	Coke Oven & By Product Plant	3.0 Mt/yr
2.	BTX Plant	41,000 t/yr
3.	Gas based Power Plant	100 MW

Need for the Project and its importance to the country

JSW has completed the acquisition of Welspun Maxsteel Ltd. which operated a 0.90 million tons of Sponge Iron Plant at Salav, Raigad district in the state of Maharashtra. The Sponge Iron Plant (SIP) or Direct Reduction Iron (DRI) plant is based on use of natural gas based process to produce Sponge Iron. The availability of Natural Gas for steel making is becoming very scarce in India. It is apprehended that it may no longer be viable to operate this plant with Natural Gas as a feed stock, leading to closure of the plant and loss of employment of people. Hence it is proposed to substitute the Natural Gas by Coke Oven Gas for producing Sponge Iron from the plant. This technology is now being developed in steel plants and is becoming viable for usage in production of Sponge Iron. Further, the coke produced will substitute the import of costly coke at the existing steel plants of JSW at Vijayanagar and Dolvi.

Demand-Supply Gap, Imports vs. Indigenous Production, Export Possibility & Domestic/Export Markets

During the year, India's steel sector was impacted by intense competitive pressure with a surge in domestic steel production and elevated level of steel imports at predatory pricing. In FY2017-18, India's crude steel production grew by 4.5% y-o-y to 102.3 million tonnes. India with a steel demand of about 90.7 MnT.

Availability of raw materials at competitive rates is imperative for the growth of the steel industry. National Steel Policy-2017 envisages a requirement of 161 million tons of Coking Coal by 2030-31.

Coking coal production in India has grew about 5% to 10.6 Mt compared to 2016-17. Import of coking coal was 48.5 Mt in 2017-18 while imports of coke in 2017-18 was 4.0 Mt.

The consumption of coking coal has also grown by 7% to 54.8 Mt in 2017-18.

The domestic production, import, export and consumption of coking coal from FY 2013-14 to FY 2017-18 is indicated in Table 2.

Table 2 : Coking Coal Market Analysis

Particulars	Unit	13-14	14-15	15-16	16-17	17-18
Domestic Production	Mt	8.3	8.7	8.9	10.1	10.6
Import	Mt	39.4	45.5	48.0	47.4	48.5
Export	Mt	-	-	-	-	-
Consumption/Demand	Mt	42.3	45.4	47.3	51.2	54.8
Surplus/Deficit	Mt	5.4	8.8	9.6	6.3	4.3

Ref. : JPC Publication

The production of coke from the coking coal in coke oven plants in India grew about 6.8% to 31.5 Mt in 2017-18. Import of coke was about 4.0 Mt in 2017-18.

The consumption of coke within the steel plant has also grew by 5.7% to 35.5 Mt in 2017-18.

The coke production in coke oven plant, import, export and coke consumption in the steel plant from FY 2013-14 to FY 2017-18 is indicated in Table 3.

Table 3 : Coke Market Analysis

Particulars	Unit	13-14	14-15	15-16	16-17	17-18
Coke Production in Coke Oven Plants	Mt	24.4	26.1	27.2	29.5	31.5
Import	Mt	3.8	3.0	4.15	4.1	4.0
Export	Mt	-	-	-	-	-
Coke Consumption in Steel Plants	Mt	28.2	29.1	31.35	33.6	35.5

Ref. : JPC Publication

Employment Generation (Direct and Indirect) due to the Project

In the construction & operation phases of the proposed project, both direct & indirect deployment of local work force would be employed.

The proposed plant will not only require management and executive manpower but also, skilled, semi-skilled, unskilled and clerical manpower. However, a number of jobs like major repair and maintenance, cleaning, transportation and loading / unloading, etc. will be done by engaging outside agencies.

The category wise break-up of manpower is indicated in Table 4.

Table 4 : Category wise break-up of manpower

Sl. No.	Category	Requirement
1.	Managerial	20
2.	Executive	60
3.	Skilled	125
4.	Semi-skilled	200
5.	Unskilled	200
6.	Clerical	45
	Total	**650**

Project Description

Type of Project including interlinked Project

The project envisages installation of 3.0 Mt/yr coke oven plant to generate coke oven gas along with coke and by-products at Salav village in Raigad district of Maharashtra. The coke produced will substitute the import of coke to meet the demands of JSW's existing steel plants at Vijayanagar and Dolvi. The proposed plant will also generate about 150,000 Nm^3/hr of coke oven gas having total energy 625 Gcal/hr. Out of this 69,000 Nm^3/hr (285 Gcal/h) coke oven gas will be used as the substitution of Natural Gas in the existing DRI Plant, 60,000 Nm^3/hr (250 Gcal/hr) would be required internally in the coke oven plant for battery heating & ammonia cracking, 1000 Nm^3/hr (4 Gcal/hr) would be required in BTX Plant and the balance 20,000 Nm^3/hr (86 Gcal/hr) will be used for the generation of power in gas based power plant.

The project also envisages installation of 100 MW gas based power plant. The total power generation from the gas based captive power plant considering steam from CDQ and surplus coke oven gas from the coke oven plant will be about 100 MW. The estimated power requirement for the proposed plant is about 40 MW and for the existing DRI Plant & township is about 10 MW. The surplus power about 50 MW will be exported to the nearest grid.

Location

The 3.0 Mtpa Coke Oven & by-product Plant, BTX Plant and gas based power plant are proposed to be set up near the existing sponge iron plant. The existing sponge iron plant is situated in Salav village of Raigad district in the state of Maharashtra. The site is at a distance of 150 km from Mumbai, and about 45 km from Roha by Road. The location map and the regional map of the proposed site have been shown in the drawing no. JSW/MH/PR/001 and drawing no. JSW/MH/PR/002 respectively.

The indicative coordinates of the proposed site are given below:

Latitudes : 18°31'33" - 18°31'50" N

Longitudes : 72°56'38" - 72°56'52" E

Details of Alternate Sites considered and the basis of selecting the proposed site

Alternative site was not examined as the coke oven & by-product plant, BTX plant and captive power plant is being planned within the existing plant boundary of the available land area. The proposed plant will be set up near the existing sponge iron plant by utilizing the existing infrastructure. Further, since the gas produced in the plant will be utilized in the existing DRI plant, it is essential to locate the plant adjacent to the DRI Plant.

Size or Magnitude of Operation

The proposed project after its completion will facilitate in production of 3.0 Mt/yr Coke and 150,000 Nm^3/hr of coke oven gas along with value added by-products. The coke produced will be sold to the JSW Steel Plant at Dolvi or at Vijayanagar. The gas generated will be utilized in the existing DRI Plant and steam generated will be used to generate power. The proposed facilities will be set up in an area of about 40 acres within the existing plant complex of 145 acres.

The process flow sheet and general layout of proposed project is shown in Drg. No. JSW/MH/PR/003 & JSW/MH/PR/004 respectively.

Project Description with Process Details

The project envisages installation of a 3.0 Mt/yr coke oven plant to generate 150,000 Nm^3/hr of coke oven gas along with coke and by-products at Salav village in Raigad district of Maharashtra.

The following technological facilities have been envisaged for proper and smooth operation of the plant.

1. Coal Preparation Plant
2. Coke Making Plant, Quenching & Screening
3. Gas cooling and cleaning system
4. Desulphurization and sulfur recovery
5. Benzol Recovery
6. Ammonia scrubbing and distillation

7. Ammonia cracking unit
8. De-dusting for cola charging and coke pushing emission control
9. Gas holder & Booster station
10. Effluent treatment plant

Coal Preparation Plant

The coal preparation plant has been envisaged to cater to a daily average wet coal through put of about 11,500 t/day for coke oven plant.

The coking coal from the overseas sources will be imported and will be transported upto the captive jetty by barges. The coal unloaded at the jetty will be transferred to plant coal storage yard by belt conveying systems.

Coal received through conveyor will transfer the coal to a stacker cum reclaimer machine for forming stock piles according to the grades of coal. Different grades of coal will be stored separately. Transfer of coking coal to the stockpiles will be done by a rail mounted wheel-on-boom stacker cum reclaimer. The stacking operation, if necessary, can be performed in all three shift to match the coal receipt pattern at the plant site.

The coal preparation unit will consist of coal crushing and blending facilities. Reclaimed coals of size ≤ 80 mm from the storage yard will be crushed to < 3 mm not less than 80 %, in the primary crusher, delivered to the coal silos, one variety at a time, through a system of conveyors. 10 bins will be provided near the storage yard for storing of different types of coals. Each constituent of the blend will be drawn in requisite proportion from different bunkers to the secondary coal crushing station.

In the secondary crushing station, blended coal will be crushed to 90% below 3 mm in reversible hammer crushers. Coals after crushing will be conveyed to the SCP Machine or coal tower.

Coke Making Plant

Stamp charged or top charged recovery type coke ovens will be constructed with a total annual dry coke production, of around 3,000,000 tonnes.

Coal from the coal preparation shop is conveyed to the coal stamping machine through the belt conveyor. The Stamping Charging Pushing (SCP) machine delivers coal into the coal hoppers and then delivered into stamping box via plate type feeders, and stamped by the stamping machines into coal cake. The stamped coal cake is charged into the coking chamber from the coal side. Alternatively, it may be decided to use Top charging machines. The coal cake is carbonized at a temperature of 1200^{o}C, and after ~24 hours coke is pushed into the coke bucket car by coke pusher via the coke guide car. The bucket car then takes the hot coke to Coke Dry Quenching(CDQ) for dry quenching. Afterwards the cooled coke will be discharged into belt conveyor which goes to the coke screening system. In case of wet quenching, the coke will be taken by the coke quenching car to the coke-cooling wharf wherein it is discharged by the coke scraper onto the belt conveyor and then taken to the coke handling system. Wet quenching unit will be in operation till the commissioning of the CDQ unit.

The raw coke oven gas produced during carbonization goes through the top of coking chamber through the ascending pipe, and the bridge pipe, to the gas collecting main. The gas is cooled by spraying liquor ammonia at ~78℃ under ~0.3 MPa pressure at the bridge pipe and gas collector, so that it is cooled from ~700℃ to ~84℃; then, it is sucked through the suction by exhauster and to the condensing/blowing unit. The tar and ammonia condensed in the gas collecting main flow via the tar box and suction main to the condensing/blowing unit.

The coke oven gas (coke oven gas) is sent through the external pipe to the coke oven. The combined gas goes into the regeneration chamber and at the same time the air goes into regeneration chamber via waste gas shut-on-off device for air. After being pre-heated, the gas along with air goes into the vertical flue of combustion chamber. The flame length is elongated by the circulation of partial waste gas which makes the heating in the top more even

and reduces NOx emissions. The standard heating temperature is 1300~1320℃.

The waste gas, after combustion, goes through the vertical flue with downward air flow, via the regeneration chamber for partial heat recovery and finally is discharged into the atmosphere from the chimney.

The fumes and dust which is produced during coal charging will go via the gas transfer car into the adjacent coking chamber. The dust collecting hood as well as gas collecting main will be set up above the oven door on the coal side, which will capture the fume dust escaping from the oven door during the coal charging and send them into the ground de-dusting station. The fume and dust generated from coke pushing will be guided via the coke guiding car and dust collecting main into the ground de-dusting station for treatment and discharging.

The typical dimensions and process parameters of the coke oven are given below:

(1) The typical dimensions of coke oven in case of stamp charged batteries may be as follows:

Total length of coking chamber :	17000 mm
Effective length of coking chamber :	16190 mm
Total height of coking chamber :	6300 mm
Effective height of coking chamber :	6175 mm
Average width of coking chamber :	540 mm
Center distance of coking chamber :	1500 mm
Taper of coking chamber :	30 mm
No. of Ovens :	4 x 62
Center distance of vertical flue :	480 mm
Number of vertical flues :	34
Thickness of combustion chamber wall :	100mm

(2) Major technical indices of coking process:

Density of coal cake (Dry) :	1.00 t/m3
Cycle time of coke oven :	24 hr
Yield ratio of dry gas :	315 Nm3/t(dry coal)
Annual consumption of dry coal :	4,200,000 t
Annual yield of dry coke :	3,000,000 t
Temperature of raw coke oven gas from gas collector :	~84°C
Pressure of raw coke oven gas from gas collector :	-80~120Pa

The dimensional and other parameters will be frozen during detailed engineering.

Gas Cooling and Cleaning System

The mixture of tar, ammonia, and coke oven gas from coking section enters into the gas-liquid separators at about 80°C, where the tar and ammonia liquor are separated from the coke oven gas. The raw coke oven gas enters into the Primary Gas Cooler (PGC) where coke oven gas is cooled for separation of naphthalene. The cooled gas enters into the electro tar precipitators (ETP) to precipitate tar fog drops from the gas; after electric tar precipitation, the coke oven gas enters into the centrifugal exhauster and is pressurized, and sent to the desulphurization section.

Desulphurization and Sulfur Recovery

Coke oven gas (at 45℃) coming from blower section first enters final cooling tower. The gas in final cooling tower is in counter-current contact with the circulating cooling water sprayed from the tower top and is cooled to 23^{o}C, then enters H_2S washing tower to remove H_2S. The cooling water flowing out from bottom of final cooling tower is pumped to the final cooling water heat-exchanger and cooled to 21^{o}C and enters final cooling tower for circulating and spray.

The cooled gas is cleaned of most of the H_2S by passing through the H_2S washing tower with ammonia water. The clean gas is discharged from the top of

H_2S washing tower and enters the bottom of ammonia washing tower for ammonia removing.

The gas entering from the bottom of the ammonia washing tower is cleaned out of the ammonia and some hydrogen sulfide with semi rich ammonia water from second ammonia washing tower. The gas is then discharged from the top of the first ammonia washing tower and then enters alkaline washing section at the bottom of the second ammonia washing tower. At the alkaline washing section, the gas is washed by NaOH solution to remove most of the H_2S.

The distilled Coke Oven gas is led from top of the de-acidification tower to Claus Furnace for sulfur recovery.
The ammonia from ammonia distilling tower, enters ammonia cracking furnace where it is cracked into N_2 and H_2.

Tail gas at about 1100 °C temperature produced from ammonia cracking furnace is cooled to 300℃ though waste heat boiler and 0.5MPa (G) steam is produced, and then the tail gas passes through the boiler water per-heater again and cracker gas cooler to be cooled to 80℃.

The high temperature process gas discharged from bottom of Claus Furnace is cooled through waste heat boiler, and the heat recovered from the waste heat boiler is used to produce the 0.7MPa saturated steam. The process gas exiting the waste heat boiler still has H_2S and SO_2, and then conversion reaction is carried out further in Claus Furnace. This process consists of reaction with two sections and after each section of the reactor sulfur condenser and molten sulfur catcher is provided. The molten sulfur flows into the molten sulfur sealing tank and then into the molten sulfur storage tank. The tail gas is directed to the chimney.

The molten sulfur stored in sulfur pool is pumped regularly with submerged pump to sulfur slicer and cooled, formed and packed.

Benzol Recovery

This unit recovers Benzol from the coke oven gas. It includes two section viz. benzol scrubbing and benzol recovery.

Benzol scrubbing uses scrubbing oil (either wash oil or Solar oil) to absorb the benzol in the coke oven gas, and afterward the gas is sent to the consumers. After benzol scrubbing, the benzol contents in gas reduces to 2 ~ 5 g/Nm^3.

The Benzol Recovery Plant will consists of three sections -

1. Cooling section
2. Benzol scrubbing
3. Benzol recovery

BTX Plant

BTX Plant or Benzol-hydro-refining unit of capacity 41,000 t/yr will utilize the crude benzol as raw material and remove the harmful impurities such as hydrocarbon, hydrogen sulfide, ammonia and water etc containing the sulfur, nitrogen, oxygen through chemical and physic methods, in order to get high pure benzene, toluene, xylene.

The following are the process unit steps –

1. Deoctaniser
2. Hydrogenation
3. Stabiliser
4. Deheptaniser
5. Recycle gas treating
6. Absorption section
7. Aromatic extraction
8. Aromatic Post fractionation
9. Hydrogen production unit

De-dusting System

“U” type gas transferring is arranged with high pressure ammonia liquid spraying for the charging de-dusting, and the ground de-dusing station is arranged for de-dusting purpose.

Gas Holder & Booster Station

The gas holder in this section is a 100,000 m^3 dry gas holder for coke oven gas buffering and storage; the gas is boosted with Roots blowers.

The main purpose of the section is to even out the fluctuations in production of gas and uneven coke oven gas consumption. The gas stored in the gas holder is also used as a buffer to handle short-time operation break-downs.

Coke Dry Quenching Process

Two nos. of 190 tph Coke Dry Quenching (CDQ) units have been envisaged to handle 3.0 Mt/yr output from the coke oven plant.

The coke bucket car loaded with red hot coke is hauled by the electric locomotive to the bottom of the lifting shaft. The crane lifts the coke bucket to the top of CDQ chamber, where the charging device with the distributor charges the coke into the CDQ chamber. In the CDQ chamber coke is directly heat-exchanged with the inert gas, the coke is cooled down to the temperature below 200°C in average and the coke is discharged by the coke discharging device onto the belt conveyor and sent to the coke handling system.

The circulating fan blows the inert gas for cooling coke from the gas supply device at the bottom of CDQ chamber into the CDQ chamber where the gas contacts with red hot coke counter-currently. The hot circulating gas at the temperature of about 880-960°C discharged from the CDQ chamber is de-dusted by the primary dust collector and then enters into the CDQ boiler for heat exchange, where its temperature is lowered to 160-180°C. The cooled circulating gas out of the boiler is de-dusted by the secondary dust collector and then boosted by the circulating fan and passed through the thermal tubular heat exchanger to cool down to about 130°C and finally entered into the CDQ chamber for circulating usage.

The coke fine separated by the primary and secondary dust collector is conveyed by the special conveying equipment and collected into the storage tank and ready for transport outside.

The fumes emitted from the coke charging device, discharging device, prechamber and circulating gas system of the CDQ is delivered into the stationary bag-house unit of the CDQ system; after de-dusting the gas is discharged into atmosphere.

Table 5 : Basic process parameters of CDQ system

Max handling capacity of CDQ system	2x190t/h
Temperature of coke into CDQ chamber	950-1050°C
Mean temperature of cooled coke:	≤200°C
Coke burning loss rate:	~0.95%
Gas ratio of each ton of coke into CDQ chamber	1250m^3/t coke
Rated flow of circulating gas in each CDQ	272,000 Nm3/h
Full pressure of circulating fan	13.5kPa
Temperature of circulating gas into CDQ chamber	130°C
Temperature of circulating gas out of CDQ chamber	880-960°C
Operation system of CDQ chamber	continuous for 24h
Annual working day of CDQ chamber	340 days
Annual repair days of CDQ chamber	25days/CDQ chamber
Boiler type	Heat Recovery Boiler
Pressure of steam generated	12.8 MPa
Temperature of steam generated	540^oC
Generation of steam (avg.) in each CDQ	99 t/h
Total Power Generated in Power Plant	51 MW

Gas based Captive Power Plant

To meet the requirement of power for the proposed and existing plant, a gas based captive power plant of capacity 100 MW has been envisaged. The gas based Captive power plant will be fueled by firing coke oven gas in boiler and also steam from CDQ.

Coke oven plant will generate about 150,000 Nm^3/hr (625 Gcal/hr) of coke oven gas. Out of which 69,000 Nm^3/hr (285 Gcal/h) coke oven gas will be used as the substitution of Natural Gas in the existing DRI Plant, 60,000 Nm^3/hr (250 Gcal/hr) would be required internally in the coke oven plant for battery heating & ammonia cracking, 1000 Nm^3/hr (4 Gcal/hr) would be required in BTX Plant

and the balance 20,000 Nm^3/hr (86 Gcal/hr) will be used for the generation of about 49 MW of power in gas based power plant.

The superheated steam about 198 t/h at 540^oC temperature and 12.8 MPa pressure from both CDQ units of coke oven plant will be utilized in the gas based power plant for generation of 51 MW of power.

The total power produced is proposed to be utilized for the various units of the existing DRI plant, proposed coke oven & by-product plant and BTX plant through its internal distribution systems.

The major technological facilities required for gas based captive power plant are as follows :

1. Steam Boiler
2. Steam Turbine
3. Generators
4. Condensers
5. Condensate Extraction Pumps
6. Boiler Feed Pumps
7. De-Aerator
8. Cooling Tower
9. DM Water Plant
10. Fuel Oil System
11. Water Complex
12. Gas boosting and cleaning
13. Compressed Air System
14. Transformer and Panels
15. Mechanical equipments
16. Power receiving and distribution system

Compressed Air Station / Nitrogen Requirement

A captive compressed air station and Nitrogen plant would be established for the proposed plant.

The details of the proposed plant facilities are enumerated below in Table 6

Table 6 : Details of the Proposed Plant Facilities

S. N.	Facilities	Capacity
1.	Coke Oven & By Product Plant	3.0 Mt/yr
2.	BTX Plant	41,000 t/yr
3.	Gas based Power Plant	100 MW

Raw Material

The coke making facilities are planned to generate 150,000 Nm^3/hr of coke oven gas to be used for Sponge Iron/DRI production along with by-products viz 3,000,000 tonnes of gross coke per year & chemicals. It is proposed to use 100% imported coal, of different qualities and blend it suitably.

The proposed coke oven plant is designed based on use of low ash imported coal in the coal blend to produce about 3,000,000 tonnes of gross coke per year. The net and dry annual requirements of various major raw materials and their sources are given in Table 7 for 3.0 Mtpa Coke Oven Plant.

Table 7 : Annual Raw Material (net and dry basis) Requirements

Sl. No.	Raw material	Quantity	Source	Mode of Transport
1	Coking Coal	4,200,000 t/yr	International Market	Sea/Road
2	40% NaOH	9,400 t/yr	Domestic	Road
3	Wash Oil	4,200 t/yr	Domestic	Road

Coking Coal

Availability of low ash coking coal of desired quality in this country is limited. Hence, it has been envisaged that total requirement of metallurgical coal 4,200,000 t/yr for the proposed coke oven plant will be met through imports, as given in Table 8.

Table 8 : Tentative Quality of Imported Coal Blend

Sl. No.	Quality parameters	Unit	Value
1	Size	mm	0 to 50
2	Ash	%	9.0 – 9.5 (max.)
3	VM	%	24 to 26
4	Moisture	%	8 to 10
5	Sulphur	%	1.2 (max.)
6	Phosphorous	%	0.06 (max.)
7	Grey king coke type	-	G 5 (min.)
8	Crucible swelling	No.	6.5 (min.)
9	Mean max. reflectance (R0 max)	-	1.10 to 1.30
10	Gieseler fluidity	ddpm	600-2000

Sodium Hydroxide (NaOH)

It is proposed to use Sodium Hydroxide (40% NaOH) alkali solution in the ammonia distillation tower. The requirement of Sodium Hydroxide is about 9,400 t/yr. The typical quality is given in Table 9.

Table 9 : Typical Quality of Sodium Hydroxide

Description	Value
Sodium hydroxide (NaOH) % w/w	40 min.
Sodium carbonate (Na_2CO_3) % w/w	0.30
Sodium chloride (NaCl) % w/w	0.04
Fe_2O_3 %w/w	0.003

Wash Oil

The requirement of fresh wash oil is about 4,200 t/yr for benzol recovery and it is proposed to procure it from coal tar processing units. A typical analysis of fresh wash oil is given in Table 10.

Table 10 : Typical Quality of Wash Oil

Description	Value
Density (20 °C)	1.03 – 1.06 g/cm^3
Phenol Content (V)	≤ 0.5
Naphthalene Content	≤ 15%
Moisture	≤ 1.0%
Viscosity (E50)	≤ 1.5

Finished Products

The details of the finished products from the Coke Oven Plant are given below in Table 11.

Table 11 : Finished Products from Coke Oven Plant

Sl. No.	Description	Unit	Output
1.	Coke oven gas (dry)	Nm^3/hr	150,000
1.1	Used for heating in COP	Nm^3/hr	60,000
1.2	Net gas available	Nm^3/hr	90,000
2.	Gross coke (dry)	t/yr	3,000,000
3.	Tar	t/yr	135,000
4.	Sulphur	t/yr	9,000
5.	Crude Benzol	t/yr	41,000
6.	Benzene	t/yr	28,700
7.	Toluene	t/yr	5,350
8.	Xylene	t/yr	2,250

Product Quality

Cleaned Coke Oven gas

The coke oven gas produced from the coke oven plant will be cleaned in the by-product plant and will have the composition shown in Table 12.

Table 12 : Composition of Coke Oven Gas

Constituents	Unit	Value
H_2	% vol	52 - 56
CO	% vol	6 - 9
CH_4	% vol	24 – 26.5
C_nH_m	% vol	2 – 2.6
CO_2	% vol	3 – 4
O_2	% vol	0.5
N_2	% vol	3 – 4
H_2O	% vol	0
Tar	g/Nm^3	0.01 max
Ammonia	g/Nm^3	0.04 max
H_2S	g/Nm^3	0.5 max
HCN	g/Nm^3	0.6 max
Naphthalene	g/Nm^3	0.2 max
Benzol	g/Nm^3	2-5
Nominal pressure	Bar (g)	0.1
Nominal Temp.	°C	25
Net Heating Value	Kcal / Nm^3	4150

Coke

The quality of coke produced from the coke oven plant is given in Table 13. It is proposed to transport the coke from Salav to the JSW Steel Plant at Dolvi and/or Vijayanagar through Rail/Road/Waterways.

Table 13 : Quality of Coke

Sl. No.	Quality parameters	Value
1	Ash	12 % (max.)
2	VM	1.0 % (max.)
3	M10	8.0 (max.)
4	CSR	64 (min.)
5	Moisture	4 % (max.)

Resource Optimization / Recycling and Reuse Envisaged in the Project

The proposed plant has been designed with state-of-art technology for optimum consumption of energy & other resources. While the coke will be consumed in the steel plants, coke oven gas would be used in the existing DRI plant as a replacement of Natural gas. The balance coke oven gas and steam from CDQ of coke oven plant will be used to produce power in the gas power plant. In addition, adopting a compact layout for the Plant would enable to optimise the utilisation of land, which is another critical resource. The tar sludge, coal fines and coke fines generated during the process will be recycled within the coke oven plant itself,

Water consumption would also be optimized by treatment of water to the extent possible and recycle of treated water as make-up in the network.

Availability of Water and Power

Water

The fresh water requirement for the proposed project shall be about 20 MLD. At present, the company has been allocated 45.7 MLD of water from River Kundalika, Dhatav of which the existing DRI plant including township uses 5.6 MLD. The permission for drawl of 45.7 MLD water has been already obtained from Irrigation Dept. Government of Maharashtra. The unit wise requirement of make-up water for the proposed plant is given in Table 14.

Table 14 : Unit Wise Requirement of Make-up Water for Proposed Plant

Sl. No.	Plant Unit	Quantity	Quantity
1	Coke Oven & By-Product Plant	520 m^3/hr	13 MLD
2	BTX Plant	30 m^3/hr	1 MLD
3	Gas Power Plant	250 m^3/hr	6 MLD
	Total Make-up Water	**800 m^3/hr**	**20 MLD**

Power

The total power generation from the gas based captive power plant considering steam from CDQ and balance coke oven gas from coke oven plant will be about 100 MW. The estimated power requirement for the proposed plant is about 40 MW and for the existing DRI Plant & township is about 10 MW. The

surplus power about 50 MW will be exported to the nearest grid. The unit wise power balance is given in Table 15.

Table 15 : Power Balance

Sl. No.	Plant Unit	Quantity
	Power Consumption	
	Coke Oven & By-Product Plant incl. CDQ	30 MW
	BTX Plant	2 MW
	Gas Power Plant	8 MW
	Existing Plant Facilities	10 MW
	Power to be export	50 MW
	Total Power Consumed	**100 MW**
	Power Generation in Gas Power Plant	
	CDQ Steam	51 MW
	Coke Oven Gas	49 MW
	Power Generation in Gas Power Plant	**100 MW**

Fuel Systems

Coke Oven Gas will be used as reducing gas in the DRI plant, heating & burning applications in coke oven, by-product & BTX plant, and balance gas for generation of power in gas based power plant. The hourly gas balance of coke oven gas having CV 4150 kcal/Nm^3 has been given in Table 16.

Table 16 : Coke Oven Gas Balance

Description	Quantity (Nm^3/h)	Quantity (Gcal/h)
Coke Oven Gas Generation		
Coke Oven Plant	150,000	625
Coke Oven Gas Consumption		
Existing DRI Plant	69,000	285
Coke Oven Plant	60,000	250
BTX Plant	1,000	4
Gas Based Power Plant	20,000	86

To supply gas for the DRI plant, it is proposed to install a 3.0 Mt/yr coke oven plant which will generate about 150,000 Nm^3/hr of coke oven gas having total energy 625 Gcal/hr. Out of which 69,000 Nm^3/hr (285 Gcal/h) coke oven gas will be used as the substitution of Natural Gas in the existing DRI Plant, 60,000 Nm^3/hr (250 Gcal/hr) would be required internally in the coke oven plant for battery heating & ammonia cracking, 1000 Nm^3/hr (4 Gcal/hr) would be required in BTX Plant and the balance 20,000 Nm^3/hr (86 Gcal/hr) will be used for the generation of power in gas based power plant.

Waste Generation and Management

Wastewater Generation and Management

Effluent is estimated to be generated from cooling towers blow down, BOD Plant, DM Water Plant, Soft water plant, etc, which would be treated in Central Effluent Treatment (CET) Plant for re-use in the plant. The estimated effluent quantity to be treated from the proposed plant shall be about 300 m^3/h. The treated waste water meeting the norms of marine discharge will be discharged to the Revdanda Creek.

Sewage generated from toilet blocks etc would be collected by means of suitable sewer system for treatment in Sewage Treatment Plant (STP). Biological solid waste generated from STP would be used as manure for development of greenery.

Solid Waste Management

The main solid waste generated in the proposed plant will be tar sludge from coke oven plant and waste sludge from CET Plant. The tar sludge and waste sludge will be mixed with the coking coal and processed in the coke oven plant. Other solid waste includes dust from ESP, bag filter and dust extraction system and refractory debris etc. this solid waste except refractory will be briquetted and sent to the JSW Steel Plant at Dolvi for reuse in sinter plant. The coal fines generated in the coke oven plant will be reused in the coke oven plant. The

hazardous waste such as waste oil shall be disposed through authorized re-processors. With these measures, it is proposed to utilize all dust and sludge for recycling.

Air Pollution Management

All stack emission will be designed on PM emission of 50 mg/Nm^3 from pollution control equipment. To reduce fugitive dust emission due to handling of coal, dust extraction and dust suppression systems will be installed at appropriate locations. Plain water type dust suppression system will be provided at the all around the coal / raw material stockpiles. The dust suppression systems will consist of water sprinkling systems.

Emissions from coke ovens would mainly result from coal charging and coke pushing. Fugitive emissions may result from various leakages from oven doors, charging lids, ascension pipe (AP) covers etc. Charging emissions would be controlled by High Pressure Liquor Aspiration (HPLA) injection in goose neck during charging.

Coking emissions would be controlled by efficient sealing of oven doors, water sealing arrangement of AP cap etc. Land based fume extraction system would be adopted for charging and pushing emission control.

The hot coke would be quenched by coke dry quenching (CDQ) with recovery of sensible heat for steam generation.

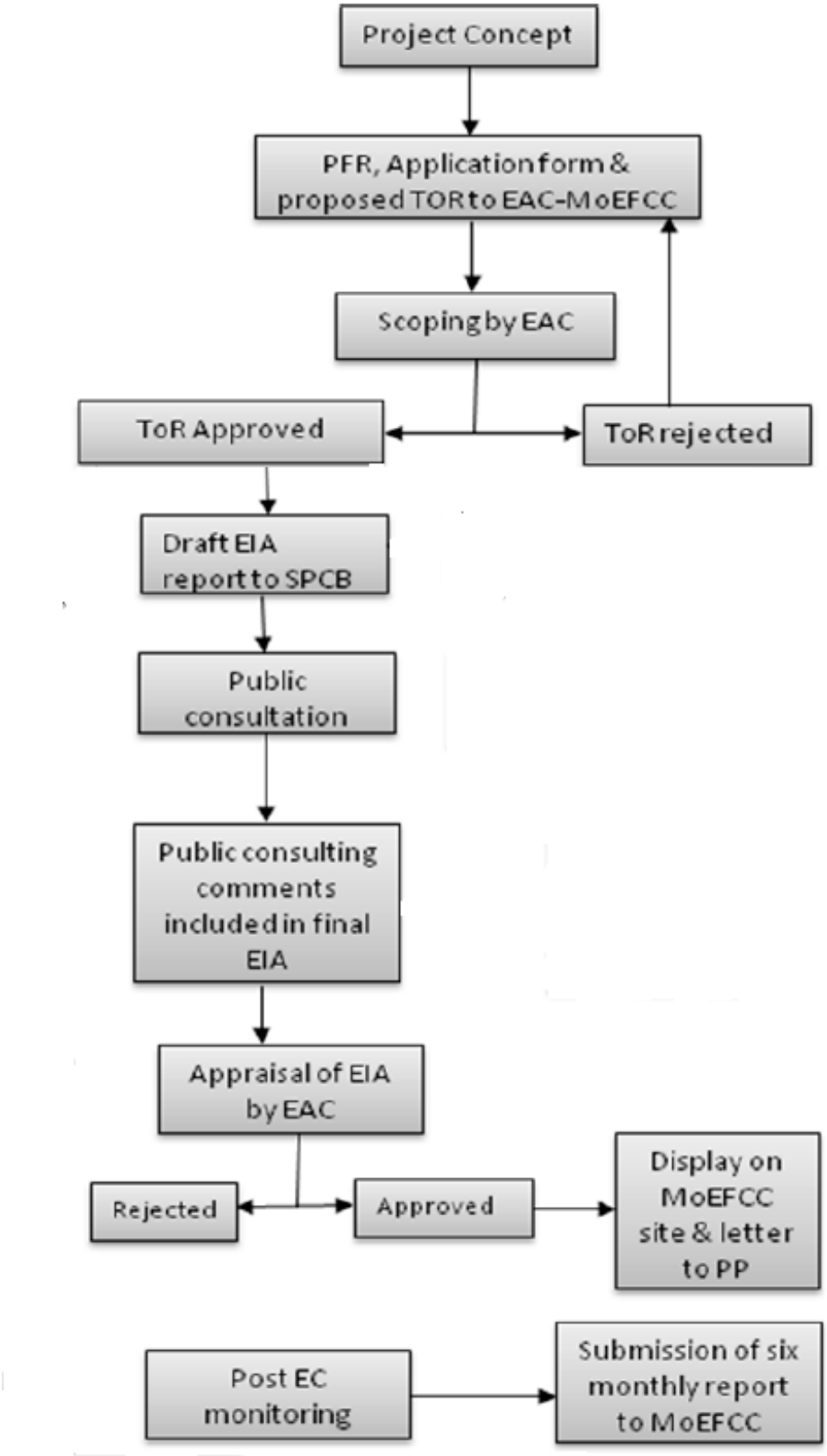
The raw coke oven gas (COG) would be cleaned in by-product recovery plant with recovery of tar, ammonia and sulphur to make it suitable for use as plant fuel and as reductant in the DRI plant.

The surplus coke oven gas and steam from CDQ will be used for the generation of power. The flue gas thus generated from the boiler would be vented through stack of appropriate height.

Schematic Representation of the Feasibility Drawing which give information of EIA Purpose

As per the Environment Impact Assessment (EIA) notification dated 14th September 2006 and subsequent amendments, this project falls under category A. It would be required to prepare EIA/EMP report to obtain the Environmental

Clearance (EC) for the project from the MoEFCC. The schematic diagram given below represents the steps required for EIA to obtain the EC.



Site Analysis

Connectivity

Road

The National Highway NH-17 (Mumbai-Goa) passes on the east side about 50 km from the plant. State Highway also passes on the west side of the plant. Mumbai city is located at about 150 km on the North-West side of the plant.

Railways

The nearest railway station Roha is about 50 km from the plant site and is located in the east on the Konkan Railway Mumbai - Mangalore main line. Rail linkage from plant site has to be established.

Air Connectivity

Nearest airport is 150 km away at Mumbai and is connected through major roads. The proposed Navi Mumbai International airport is 90 km away from plant site.

Logistics

The raw material is proposed to be transported to site by waterways. It is proposed to utilize the existing Jetty for importing the raw materials and exporting the finished products.

Land Form, Land Use and Land Ownership

The 3.0 Mtpa Coke Oven & by-product Plant, BTX Plant and gas based power plant are proposed to be set up near the existing sponge iron plant. The existing sponge iron plant is situated in Salav village of Raigad district in the state of Maharashtra.

The indicative coordinates of the proposed site are given below:

Latitudes : 18°31’33” - 18°31’50” N

Longitudes : 72°56’38” - 72°56’52” E

The existing plant is located in industrial land area and is currently in the ownership of JSW Steel (Salav) Ltd. The area under existing plant and the

proposed units are declared as Industrial Growth Centre under Murud Taluk by the Govt. of Maharashtra in 1992. Therefore, as per MOEF & CC notification dtd. 10th December 2014, the proposed project may be exempted from the process of public consultation.

The existing plant is situated within 58.7 hectares of plant area. The township is located adjacent to the plant within 30 hectares of land area. The proposed facilities will be set up in an area of about 16.2 hectares within the existing plant complex of 58.7 hectares. The area requirement for the proposed plant has been minimized since the infrastructure and auxiliary facilities are already existing. Special attention has been made to provide connectivity to the existing facilities viz. utilities, raw material corridors, finished product corridors etc.

Topography & Land Use Pattern

The topography of the study area is gently sloping from south to north. The area is covered with hill on one side, Kundalika river on the opposite side and Arabian Sea on the other side. The elevation of the existing plant and the proposed plant site is between 10m to 15m above MSL. The main river flowing on the North side of the plant is Kundalika river, which is passing at a distance of 1.5 km radius from the project site. The study area occupies a gently sloping slightly undulating plain land that forms a part of catchments of Kundalika River which finally drains into the Arabian Sea.

The earthen bund along the Kundalika river was developed by the local villagers and maintained by the Kharland Department to restrain any water ingress into the agricultural fields. The bund acts as the high tide line, which has been demarcated by National Institute of Oceanography (NIO), Goa in its studies and the CRZ map.

The proposed site for coke ovens does not fall under the CRZ area as per CRZ 2011 notification and 2018 draft CRZ Map for Raigad District, Maharashtra.

There is no forest land in the site. The Phansad wildlife sanctuary is approximately 4.7 km from site. The proposed area does not fall in the Eco-Sensitive zone of the Phansad wildlife sanctuary as per the final ESZ

notification of MoEF&CC dated 17th May 2017. Hence, the proposed area does not attract any further wildlife clearance.

Existing Infrastructure

The existing plant of JSW Steel (Salav) Ltd. at Salav, Raigad district in the state of Maharashtra operates a 0.90 Mt/yr of Direct Reduction Iron Plant. The raw material for the DRI plant is transported through cross-country conveyor from its captive jetty in Revdanda Creek. The existing jetty with a length of 235 m with Mooring Dolphin at 21 m, handles about 3.0 Mt/yr of captive cargo mainly Pellet and DRI through barges up to 3000 DWT size. Adequate rail and road connectivity along with sufficient water allocation is available. Power required will be from captive generation and excess power will be available for exporting to the grid. Township for employees is available.

Soil Classification

Raigarh district is located in the Konkan coastal region, situated between the Western Ghats and the Arabian Sea. The district contains spurs of considerable regularity and height, running westwards at right angles to the main range, as well as isolated peaks and lofty detached ridges. The main rock formation is igneous. Bauxite is the only notable mineral. Black soil is prominent on its northern part and lateritic soil on the southern part of the district. Red sandy soil may be found on the eastern hilly tracts. Saline and saline alkaline soil appears near the coastal belt.

Climate

The regional climate is humid tropical. As per India Meteorological Department, Pune (IMD), in 2017-18 the lowest temperature recorded was 16^{o}C in December as against highest temperature recorded was 40^{o}C in the month of May. The relative humidity (RH) is uniformly high in the order of 80% throughout the year except during the winters. The wind blows predominantly from North East (NE) during the year.

Social Infrastructure Available

The existing plant is situated in Salav village of Raigad district in the state of Maharashtra Odisha.

Revdanda beach is situated about 5km from the plant site. Birla Mandir is located adjacent to the plant and township. Jindal Vidya Mandir and Hospital are located within the township.

Structured townships with adequate greenbelt, luxury hotels and restaurants are available in the district. High traffic connecting routes are wider and in good condition along with strong transport links.

Planning

Planning Concept

The proposed 3.0 Mt/yr Coke Oven Plant, By-Product Plant, BTX Plant and 100 MW gas based power plant would be located at Salav in Raigad district of Maharashtra. The proposed facilities will be set up in an area of about 16.2 hectares within the existing plant complex of 58.7 hectares.

Population

Salav is a medium size village located in Murud Taluka of Raigarh district, Maharashtra with total 380 families residing. The Salav village has population of 1674 of which 858 are males while 816 are females as per Population Census 2011.

In Salav village population of children with age 0-6 is 200 which makes up 11.95 % of total population of village. Average Sex Ratio of Salav village is 951 which is higher than Maharashtra state average of 929. Child Sex Ratio for the Salav as per census is 754, lower than Maharashtra average of 894. Salav village has lower literacy rate compared to Maharashtra. In 2011, literacy rate of Salav village was 71.98 % compared to 82.34 % of Maharashtra. In Salav Male literacy stands at 79.17 % while female literacy rate was 64.66 %.

As per constitution of India and Panchyati Raaj Act, Salav village is administrated by Sarpanch (Head of Village) who is elected representative of village. The details of household and population in Salav is given in Table 18.

Table 18 : Details of household and population in Salav

Particulars	Total	Male	Female
Total No. of Houses	**380**	-	-
Population	**1,674**	858	816
Child (0-6)	**200**	114	86
Schedule Caste	**110**	57	53
Schedule Tribe	**559**	292	267
Literacy	**71.98 %**	79.17 %	64.66 %
Total Workers	**657**	448	209
Main Worker	**368**	14,805	0
Marginal Worker	**289**	146	143

Ref. - www.census2011.co.in

Salav village has substantial population of Schedule Tribe (ST). Schedule Tribe (ST) constitutes 33.39 % while Schedule Caste (SC) were 6.57 % of total population in Salav village.

In Salav village out of total population, 657 were engaged in work activities. 56.01 % of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 43.99 % were involved in Marginal activity providing livelihood for less than 6 months.

Land Use Planning

The existing plant is situated within 58.7 hectares of plant area. The township is located adjacent to the plant within 30 hectares of land area. The proposed facilities will be set up in an area of about 16.2 hectares within the existing plant complex of 58.7 hectares.

The area requirement for the proposed plant has been minimized since the infrastructure and auxiliary facilities are already existing. Special attention has been made to provide connectivity to the existing facilities viz. utilities, raw material corridors, finished product corridors etc. Greenbelt about 33% of total plant area would be developed to comply with the statutory norms.

The breakup of details of facilities with land use is shown in table 19.

Table 19 : Breakup of details of facilities with land use

Plant Facilites	Area in hectares
Existing Plant Facilities	
RMHS Yard	5.7
Main DRI Plant	8.2
Store, Workshop, Raw Water Pond, Rain Water Harvesting, Roads, Utilities, etc.	9.7
Proposed Plant Facilities	
Coke Oven Plant	4.0
By-Product Plant including ETP	9.7
BTX Plant	0.8
Gas Based Power Plant	1.6
Total Existing & Proposed Plant Area	**39.7**
Greenery @ 33%	**19**
Total Plant Area with Greenery	**58.7**

The existing plant is located in industrial land area and is currently in the ownership of JSW Steel (Salav) Ltd. The area under existing plant and the proposed units are declared as Industrial Growth Centre under Murud Taluk by the Govt. of Maharashtra in 1992. Therefore, as per MOEF & CC notification dtd. 10th December 2014, the proposed project may be exempted from the process of public consultation.

Assessment of Infrastructure Demand and Amenities/Facilities

The following infrastructure development in the area is being carried out to support the growth of plant and for its sustainable operation :

- Development of road linkage from major roads/distribution roads to the proposed site.
- Provision of safe potable water facilities in surrounding villages is being implemented by the company along with other Government agencies.
- Provision of medical facilities in the project influence area with special emphasis on primary health care through private Mobile Health Units, Government Public Health Centers and medical camps
- Industrial and Vocational training to local youth groups (both girls & boys) for diversification of skills and enhancement of livelihood
- Provision of social infrastructure like that of community toilets, playgrounds, community halls with basic amenities

Proposed Infrastructure

Industrial Area

The 3.0 Mtpa Coke Oven & by-product Plant, BTX Plant and gas based power plant are proposed to be set up near the existing sponge iron plant. The existing sponge iron plant is situated in Salav village of Raigad district in the state of Maharashtra. The indicative coordinates of the proposed site are given below:

Latitudes : 18°31'33" - 18°31'50" N

Longitudes : 72°56'38" - 72°56'52" E

The National Highway NH-17 (Mumbai-Goa) passes on the east side about 50 km from the plant. State Highway also passes on the west side of the plant. Mumbai city is located at about 150 km on the North-West side of the plant.

The nearest railway station Roha is about 50 km from the plant site and is located in the east on the Konkan Railway Mumbai - Mangalore main line. Rail linkage from plant site has to be established.

Nearest airport is 150 km away at Mumbai and is connected through major roads. The proposed Navi Mumbai International airport is 90 km away from plant site.

The raw material is proposed to be transported to site by waterways. It is proposed to utilize the existing Jetty for importing the raw materials and exporting the finished products.

Residential Area

JSW Steel (Salav) Ltd. currently has township located adjacent to the plant boundary along the periphery of the plant with about 400 dwellings. The residential area have amenities like roads, electricity, drinking water, underground drainage, sewage treatment, parks & gardens, security etc. Besides, due to the existence of the DRI plant, the surrounding villages have also been developed and are capable of handling additional population as needed. Other amenities such as school, community center, guest house, health center, hospital, shopping complex, post office, park, playground etc has also been provided in this township.

Green Belt

The existing DRI plant is surrounded by lush greenery which besides arresting pollution has helped in providing a serene environment for the surrounding population. About 33% greenery will be maintained within the 58.7 hectares of plant land area. JSW Township is located adjacent to the plant therefore the area will be completely isolated with thick green belt with three tier of plantation in 15 to 20 m width which shall attenuate any noise or dust pollution.

Social Infrastructure

JSW Foundation, the apex agency for implementing CSR activities for the entire JSW Group, over the years, has provided support for the overall socio-economic development the surrounding areas. These include :

- Rural Social Infrastructure including clean water, decent housing, environmental sanitation, personal hygiene and adequate nutrition
- Coordination between multiple funding streams and agencies supporting the surrounding areas.
- Basic education to promote quality, dignity, self-respect, with a sense of belonging as well as political integration.
- Formal and informal education to promote rural productivity
- Development of road linkage from major roads/distribution roads to the proposed site.
- Provision of safe potable water facilities in surrounding villages is being implemented by the company along with other Government agencies.
- Provision of medical facilities in the project influence area with special emphasis on primary health care through private Mobile Health Units, Government Public Health Centers and medical camps
- Industrial and Vocational training to local youth groups (both girls & boys) for diversification of skills and enhancement of livelihood
- Provision of social infrastructure like that of community toilets, playgrounds, community halls with basic amenities

Connectivity

The Plant is well connected to other cities by Road and Waterways. The raw material is proposed to be transported to site by waterways. It is proposed to utilize the existing Jetty for importing the raw materials and exporting the finished products.

The National Highway NH-17 (Mumbai-Goa) passes on the east side about 50 km from the plant. State Highway also passes on the west side of the plant. Mumbai city is located at about 150 km on the North-West side of the plant.

The nearest railway station Roha is about 50 km from the plant site and is located in the east on the Konkan Railway Mumbai - Mangalore main line. Rail linkage from plant site has to be established.

Nearest airport is 150 km away at Mumbai and is connected through major roads. The proposed Navi Mumbai International airport is 90 km away from plant site.

Drinking Water Management and Sewerage System

The water requirement for drinking & sanitation is drawn from the plant water system. The water requirement of the plant is sourced from River Kundalika at Dhatav, Maharashtra. The water is treated in a Raw Water Treatment Plant (RWTP) and the treated raw water is used for drinking purposes after necessary disinfection. The plant and township have a well connected underground and above ground sewerage network system. The sewage water is treated in a common sewage treatment plant and the treated water is used for maintenance of greenery, etc.

Industrial Waste Water Management

Effluent is estimated to be generated from cooling towers blow down, BOD Plant, DM Water Plant, Soft water plant, etc, which would be treated in Central Effluent Treatment (CET) Plant for re-use in the plant. The estimated effluent quantity to be treated from the proposed plant shall be about 300 m^3/h.

The treated water can be re-used for firefighting system, floor washing, toilet flushing, and horticulture. Sewage generated from toilet blocks etc would be collected by means of suitable sewer system for treatment in Sewage

Treatment Plant (STP). Biological solid waste generated from STP would be used as manure for development of greenery.

Solid Waste Management

The main solid waste generated in the proposed plant will be tar sludge and waste sludge from CET Plant. The tar sludge and waste sludge will be mixed with the coking coal and processed in the coke oven plant.

Other solid waste includes dust from ESP, bag filter and dust extraction system and refractory debris etc. this solid waste except refractory will be sent to the JSW Steel Plant at Dolvi for reused in sinter plant. The coal fines generated in the coke oven plant will be reused in the coke oven plant. The hazardous waste such as waste oil shall be disposed through authorized re-processors. With these measures, it is proposed to utilize all dust and sludge for recycling.

Power Requirement & Supply/Source

The total power generation from the gas based captive power plant considering steam from CDQ and balance coke oven gas from coke oven plant will be about 100 MW. The estimated power requirement for the proposed plant is about 40 MW and for the existing DRI Plant & township is about 10 MW. The surplus power about 50 MW will be exported to the nearest grid.

The unit wise power balance is given in Table 20.

Table 20 : Unit Wise Power Balance

Sl. No.	Plant Unit	Quantity
	Power Consumption	
	Coke Oven & By-Product Plant incl. CDQ	30 MW
	BTX Plant	2 MW
	Gas Power Plant	8 MW
	Existing Plant Facilities	10 MW
	Power to be export	50 MW
	Total Power Consumed	**100 MW**
	Power Generation in Gas Power Plant	

Sl. No.	Plant Unit	Quantity
	CDQ Steam	51 MW
	Coke Oven Gas	49 MW
	Power Generation in Gas Power Plant	**100 MW**

Rehabilitation & Resettlement (R&R) Plan

The proposed plant of 3.0 Mt/yr Coke Oven Plant, By-Product Plant, BTX Plant and 100 MW gas based power plant is proposed to be set up within the existing land area of the DRI plant. In view of this, there are no R & R issues.

Project Schedule & Cost Estimates

Project Schedule

Implementation of a modern Coke Oven & By-Product Plant, BTX Plant and Gas based Power Plant is a challenging task and calls for meticulous planning, scheduling and monitoring to realize the project goals in budgeted time frame. The goals can be achieved by adopting modern project management techniques. The time schedule for installation of proposed Plant will depend to a large extent upon completion of pre-project activities; methodology adopted in procurement of plant & equipment, engineering, construction and erection activities at site. The extent of import component of plant & equipment, availability of infrastructural facilities at site as well as efficient project management and monitoring also play an important role in determining the time frame requirement for the project.

JSW has a highly experienced team set up for the purpose which will execute the project.

The implementation schedule for installation of the proposed plant is indicated in the form of bar chart in the drawing no. JSW/MH/PR/005. The overall schedule shows that from the date of start of the project (Zero date), the commissioning of the plant with the first pushing of coke from the coke oven plant will be completed in 36 months and the commissioning of By-Product plant, BTX plant and power plant will also be completed within the same time. The schedule as presented is based upon conventional project implementation logics for coke oven plant, preliminary vendor information available and in-house analysis.

Capital Cost Estimate

The estimated block capital cost outlay for the project is about Rs. 4600 crores. The capital cost includes cost of land development, infrastructure cost, civil work and structural steelwork, plant and equipment, erection and commissioning. Provision for contingency, design, engineering and administration during construction are included in the capital cost.

Analysis of Proposal

Financial Benefits

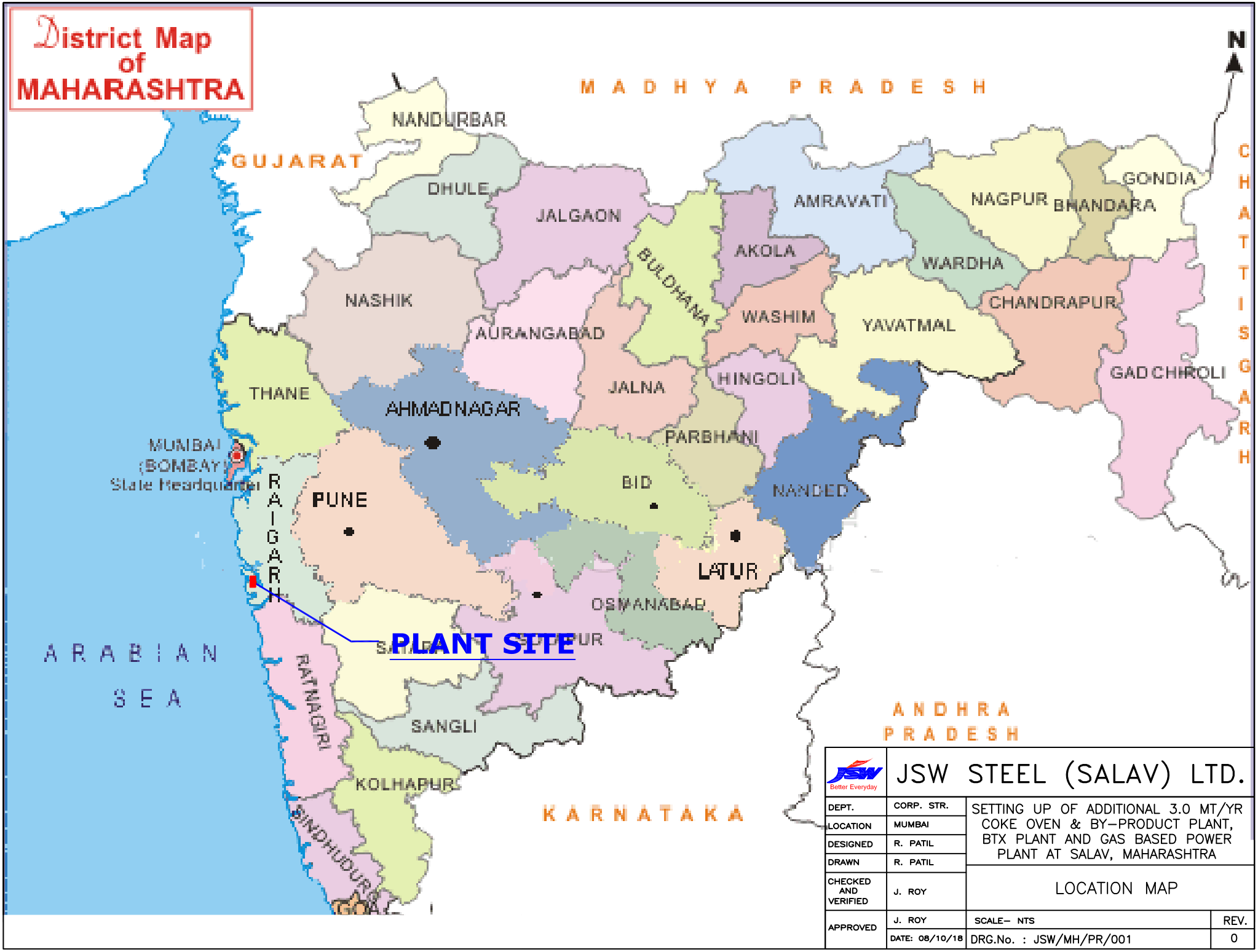
The financial benefits accrued from the project would improve the productivity and profitability of the company, but also strengthen the economy of the state due to revenues from taxes and duties derived from sale of value added products. Installation of a state-of-art plant facilities add huge impetus to the growing economy of the state and the country.

Social Benefits

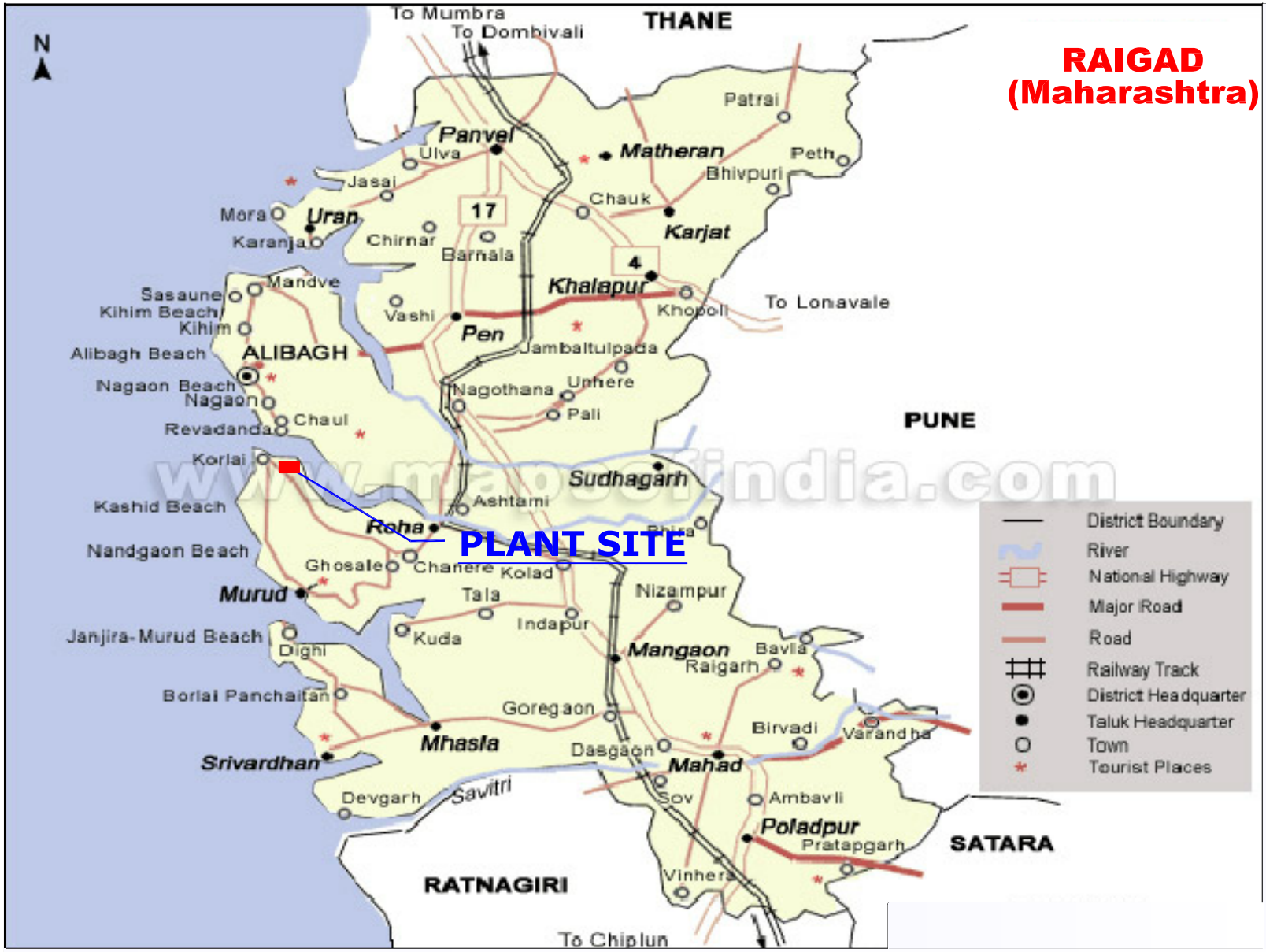
The proposed plant in the state of Maharashtra would help in

- Further enhance local direct and indirect employment opportunities in the project influence area
- promote the medium-small scale trade & commercial establishments, local entrepreneurship and diversification in skill set
- generate local income, boost the local purchasing power and promote an increase in land prices & rent
- contribute to the local economy and the state revenue

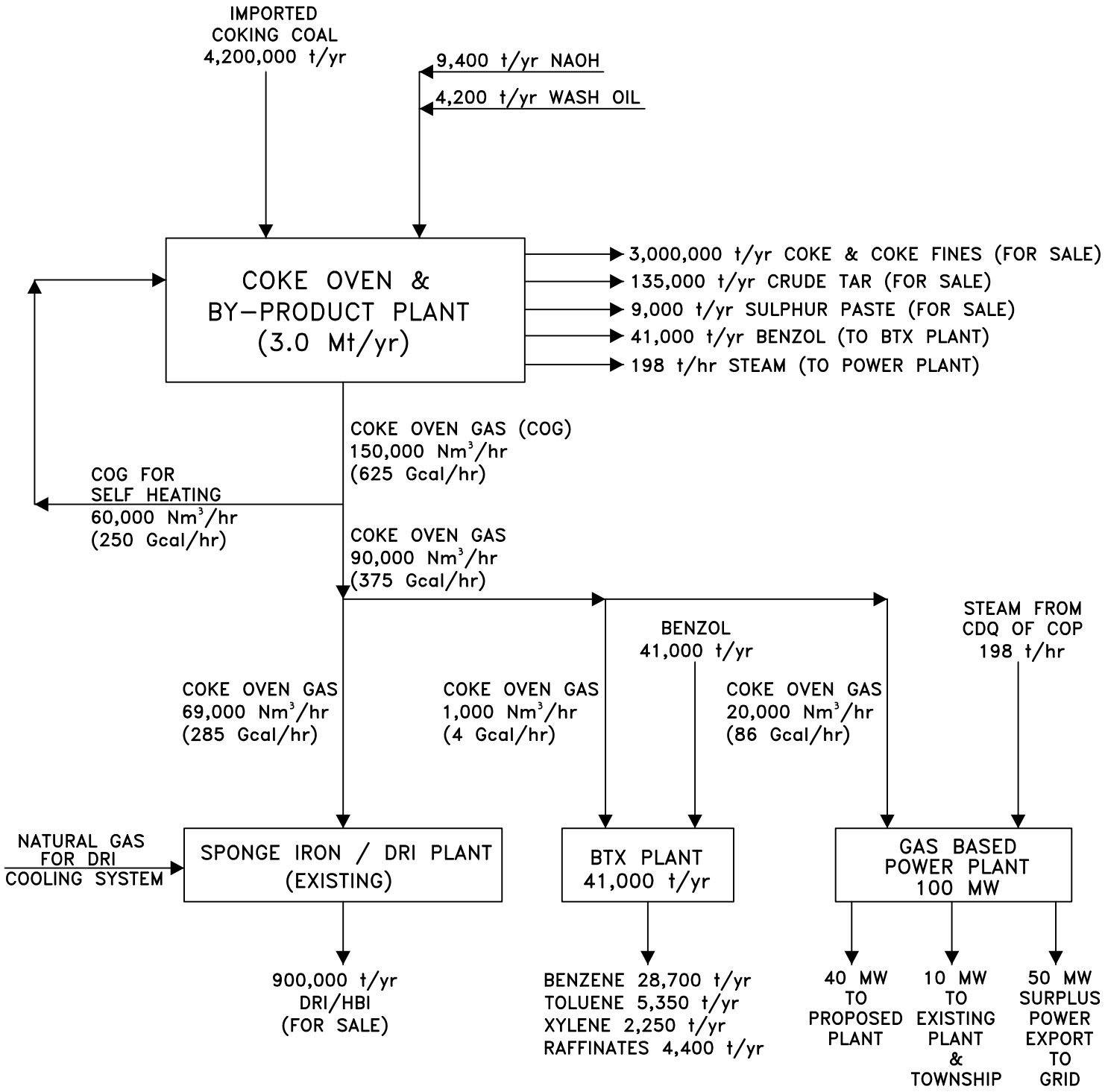
The peripheral development activities that would be undertaken by the proposed project will focus on vulnerable communities in the project influence area. The project would bring forward an overall socio-economic development with emphasis in the areas of employment, education, training, health and infrastructure.



JSW Better Everyday	JSW STEEL (SALAV) LTD.	
DEPT.	CORP. STR.	SETTING UP OF ADDITIONAL 3.0 MT/YR COKE OVEN & BY-PRODUCT PLANT, BTX PLANT AND GAS BASED POWER PLANT AT SALAV, MAHARASHTRA
LOCATION	MUMBAI	
DESIGNED	R. PATIL	
DRAWN	R. PATIL	
CHECKED AND VERIFIED	J. ROY	LOCATION MAP
APPROVED	J. ROY	SCALE– NTS / REV.
	DATE: 08/10/18	DRG.No. : JSW/MH/PR/001 / 0



JSW Better Everyday	JSW STEEL (SALAV) LTD.		
DEPT.	CORP. STR.	SETTING UP OF ADDITIONAL 3.0 MT/YR COKE OVEN & BY-PRODUCT PLANT, BTX PLANT AND GAS BASED POWER PLANT AT SALAV, MAHARASHTRA	
LOCATION	MUMBAI		
DESIGNED	R. PATIL		
DRAWN	R. PATIL		
CHECKED AND VERIFIED	J. ROY	REGIONAL MAP	
APPROVED	J. ROY	SCALE– NTS	REV.
	DATE: 08/10/18	DRG.No. : JSW/MH/PR/002	0



JSW Better Everyday	JSW STEEL (SALAV) LTD.		
DEPT.	CORP. STR.	SETTING UP OF ADDITIONAL 3.0 MT/YR COKE OVEN & BY-PRODUCT PLANT, BTX PLANT AND GAS BASED POWER PLANT AT SALAV, MAHARASHTRA	
LOCATION	MUMBAI		
DESIGNED	R. PATIL		
DRAWN	R. PATIL		
CHECKED AND VERIFIED	J. ROY	PROCESS FLOW SHEET	
APPROVED	J. ROY	SCALE– NTS	REV.
	DATE: 08/10/18	DRG.No. : JSW/MH/PR/003	0

S 400.0 | S 300.0 | S 200.0 | S 100.0 | N 0 | N 100.0 | N 200 | N 300 | N 400 | N 500 | N 600 | N 700 | N 800 | N 900

E 0 | E 100 | E 200 | E 300 | E 400 | E 500 | E 600 | E 700 | E 800.0 | E 900.00 | E 1000.00 | E 1100.00

ROAD

BOUNDARY WALL

BOUNDARY WALL

WAY TO REVDANDA

BOUNDARY WALL

GREEN BELT

BY-PRODUCT PLANT

COKE OVEN PLANT-2

COKE OVEN PLANT-1

BTX PLANT

CETP

DRI PLANT

GAS BASED POWER PLANT

RAW MATERIAL YARD

VIKRAM VATIKA

BIRLA TEMPLE

BOUNDARY

BOUNDARY

TOWNSHIP

RAIN WATER HARVESTING

VILLAGE ROAD

VILLAGE ROAD

PROPOSED BOUNDARY

VILLAGE NIDI

JSW Better Everyday	JSW STEEL (SALAV) LTD.		
DEPT.	CORP. STR.	SETTING UP OF ADDITIONAL 3.0 MT/YR COKE OVEN & BY-PRODUCT PLANT, BTX PLANT AND GAS BASED POWER PLANT AT SALAV, MAHARASHTRA	
LOCATION	MUMBAI		
DESIGNED	R. PATIL		
DRAWN	R. PATIL		
CHECKED AND VERIFIED	J. ROY	GENERAL LAYOUT	
APPROVED	J. ROY	SCALE– 1:5,500 (A3)	REV.
	DATE: 11/10/18	DRG.No. : JSW/MH/PR/004	0

SETTING UP OF ADDITIONAL 3.0 MTPA COKE OVEN & BY-PRODUCT PLANT, BTX PLANT AND GAS BASED POWER PLANT
PROJECT IMPLEMENTATION SCHEDULE

SL. NO.	ACTIVITIES	DURATION OF ACTIVITY
1	Project Approval	0 Month
2	Basic Engineering	6 Months
3	Detailed Engineering	27 Months
4	Tendering, Scrutiny and order placement	16 Months
5	Planning & construction of Infrastructure facilities	30 Months
6	Civil works	24Months
7	Fabrication & Erection of Structures	24 Months
8	Delivery of Equipment	24 Months
9	Erection of Equipment	32 Months
10	Testing & Commissioning	10 Months
11	Production to commence	-