

4.1 Land Formation and Drainage

The physiographic of the land in Sambalpur Development Area, (SDA) is undulating. Burla has undulating land with hilly terrain. The land at Hirakud is ragged. Ranges of hills and crisscross drainage channels from the hilly ranges are connected to the river Mahanadi and its tributaries. The ground slopes from North West to South East with few rock formations strewn on the ground. The area has mostly red soil. Mixed red and black soil is found in southern part of Sambalpur. Three reserved forests (RF) namely Motijharan, Lamdungri (RF) and Budharaja at Sambalpur; small hillock Dehri Hill inside the Sambalpur University campus and Chandli Dungri (RF) on east of the Burla NAC; laxmi Dungri (RF), and Reserved Forest Hill (RF on north) at Hirakud are located in the area. The landscape of Sambalpur, Burla, and Hirakud urban complex has wonderful range of hills, forests, high lands, river, rivulets, ponds and nallahs offering opportunities to create well knit natural spots.

Health hazards have definite connection with natural environment. The water borne diseases are very common in the area. More over it is revealed that people suffer from waterborne and airborne diseases to the maximum extent. The area of Sambalpur, Burla and Hirakud Complex has been growing very fast. This has resulted into environmental degradation with regard to air, water, and soil quality and noise level. Urbanization cannot be controlled. Population will keep on growing and the urban area will keep on expanding. There is no limit to development and growth. As such it is very necessary to manage the required environment of the urban area now and in future. The beginning to improve and control the environmental management can be initiated with introduction of safe drainage and sewerage system followed by proper disposal of solid wastes and medical wastes management. The congestion on roads and activity areas requires fresh planning and the new development of various residential, commercial, industrial, recreational etc sectors will have to be wisely planned and managed with a view to provide fairly clean environment to the urban complex.

At present the elements that endanger the public life are as follows:

- (i) In addition to river Mahanadi, there is numerous water bodies scattered over the land which are not protected from pollution.
- (ii) Over all environmental quality of the urban area is not good and further deteriorating.
- (iii) Due to absence of good hygienic condition, entrepreneurs are not attracted to contribute in the economy of the town. Thus, the employment opportunities are reduced.
- (iv) The generation of waste water by industrial units keeps on rising which adds to the unhygienic environment.
- (v) There is no sewerage system in the SDA area creating pollution and unhygienic conditions all around.

Following proposals are made to improve the environment in Sambalpur Development Authority (SDA)'s area. Refer **Figure 4.1** for the environmental plan of the SDA area. The plan indicates, land gradient, proposed urban area by 2030, agricultural land, area under reserve forest, hill, forest land, river, nalas, water bodies, environmentally sensitive areas including garbage disposal sites, area under mining, brick kiln, stone crushing, etc., and the major road network.

A3 size fig. 4.1 to be inserted Separately

4.2 Water Bodies

Ranges of hills and crisscross drainage channels along with water ponds and rivulets from the hilly ranges are connected to the river Mahanadi and its tributaries. It is necessary to save these water bodies from getting silted. And therefore the ponds are required to be trenched (removing silt from the beds) and given good shape over a period of time. To create good environment in the built up area of Sambalpur, it is proposed to remove the silt from the following ten ponds located in Sambalpur Town and to develop green parks around the ponds. The 3 feet pitching of the ponds and 15 feet wide paved walkway with trees 50 feet center to center around these ponds will also help in creating required greenery in the area.

Ten ponds selected in the developed area are stated below.

- (1) Dehariapali on south of Anthiapali Chowk having a proposed Botanical Garden around
- (2) South of railway line and east of Dhobijore nalah in Sambalpur mahal
- (3) South of the main city railway station and north of river Mahanadi in Talbhata
- (4) On west of Dhobijore Nalah and north of river Mahanadi in Badabandha
- (5) Modipara Chowk
- (6) North of jail in Charbhati
- (7) On west of Budharaja hill in Danipali
- (8) On north of NH 6 near Remed Chowk
- (9) At Mathapali near Dhanupali Chowk
- (10) At Umbersingha (east of Dhanupali)

4.3 Water Channels

In absence of underground sewerage system in 95 percent of the area of Greater Sambalpur, most of the untreated sewerage is dumped in to existing natural drain “Dhobijore Nala” and other natural drains located all over the area. This untreated sewerage and dirt thrown in these channels drain out to river Mahanadi which is the life line of the entire Orissa and pollute the water body perennially. More over keeping in view the topography which has natural drainage system from west to east, the storm water flows from Burla- Hirakud towns towards Sambalpur town and in to the river Mahanadi on south west. Thus the source of drinking water of river Mahanadi poses serious problems for water treatment and to some extent causes health risk to the citizens. There are other water ponds and bodies on the land and it is necessary to protect all water bodies including river Mahanadi from pollution. This will help improve community health and hygiene.

The pitching of water channels up to 3 feet from the ground level and providing hard surface of 15 feet width with tree plantation at the distance of 50 feet center to center on either bank of Dhobijor Nalah, Tangra Nalah, Durgapali Nalah and Hardijore Nalah are proposed. The

local knowhow of the experts for developing landscaping of above mentioned ponds, parks and botanical garden will help enhancing the environment status of the built environment.

It is proposed to streamline the Dhobijore nala and the Tangra Nala to avoid overflow of the Nalas and to free the land for development.

4.4 Primary Treatment Plant

Primary Treatment Plant is proposed on these two nalas so that water is filtered and treated before it falls in the Mahanadi River.

4.5 Preservation of Forests and Hills

The Flora, Fauna and Animal species are required to be given the required environment. As such an overall preservation of forests and hills namely Motijharan, Lamdungri (RF) and Budharaja at Sambalpur; small hillock Dehri Hill inside the Sambalpur University campus and Chandli Dungri (RF) on east of the Burla NAC, laxmi Dungri (RF), and Reserved Forest Hill (RF) on north at Hirakud and Reserved Forest on north of Kankhinda mouza within 67 mozas by providing 100 metre wide open land of landscaped strip towards developing area / all around the reserved forest will provide excellent environment (**Figure 4.1**).

4.6 Tree Plantations

Keeping in mind the beautiful terrain of the Sambalpur, Burla, Hirakud urban complex, with undulating landscape; hills and hillocks; ponds and lakes; creeks, nallahs and rivulets along with the majestic river Mahanadi, various schemes are required to be formulated to preserve and enhance the beauty of the urban environment.

The cityscape hardly has required open spaces and the trees which were not disturbing the development of buildings; roads and infrastructure have been retained. The Motijharan, Lamdungri and Budharaja at Sambalpur; small hillock Dehri Hill inside the Sambalpur University campus and Chandli Dungri (RF) on east of the Burla NAC; laxmi Dungri (RF), lambadunguri (RF), and Reserved Forest Hill (RF on north) at Hirakud do have trees and greenery. However, it is very necessary to get the trees of various spices planted in the urban area. It is also necessary to create open spaces with plenty of plantation, vegetation and green land cover. Roads must get the benefit of tree plantation and the odd spots must be landscaped with beautiful water bodies and greenery.

Some years ago a worldwide survey adjudged Islamabad as the world's Greenest City, with 325 trees per hectare. Immediately count of trees was undertaken at Gandhinagar, the capital city of Gujarat and officials were surprised to know that Gandhinagar had 425 trees per hectare. With 32 lakh trees, made up with 35 spices including neem, gulmohar, banyan, papal mahua and rhine in its 56 square kilometers, for a 1.5 lakh population Gandhinagar has an enviable 22 trees per person. However the nearest city of Ahmadabad does not have even one tree per person.

Considering the tree density of atleast one tree per person living in the urban areas for the better living environment of the people residing there, the area of Sambalpur, Burla, Hirakud

complex must have 2,19,241 trees in 183.02 square kilometers of area in 2001 without considering the trees in hills and reserved forest. By 2030, at the same rate of one tree per person, considering the projected population, the development areas of Sambalpur, Burla and Hirakud should have 300500, 74000 and 50000 trees respectively. It is proposed that the trees can be planted around hills and forests, in parks and open spaces, in parking areas, on road sides and on private properties. It is proposed to provide wherever possible, 100 meter wide open land strip along hill / forest. 20 feet wide murrum road along the land strip shall be provided and trees shall be planted at a distance of 50 feet center to center.

Tree plantation shall be made compulsory at the time of issuing development permission and deposit may be taken which can be refunded after 3 years if the tree survives.

4.7 Water Pollution

At Sambalpur mainly Dhobijore, Hardjore and Durgapali nallahs drain the sludge and sewage into river Mahanadi. In Burla the wastes and storm water are dumped into the power channel and waste of medical college hospital is drained to a pond in Kirba. Thus the sewage and waste from the various parts of Sambalpur, Burla and Hirakud must be treated before the same are discharged into river Mahanadi. It also gets polluted with the various domestic, agricultural and industrial wastes. However there is hardly any discharge of trade effluent into the river. But the river water is unfit for human uses and it has been creating imbalances in ecosystem. In fact treatment of various polluting effluents should be worked out and only the treated effluent may be discharged into the river Mahanadi. Ponds provide the life time necessity to human beings by providing water for daily use where tap water or river water are not available. However quality of water in ponds is not fit for bathing or drinking. Thus the situation is grave as community do use pond water and get affected by various diseases. Quick siltation of nallas, ponds, rivulets and river Mahanadi causes deterioration of water quality. Thus the polluted water bodies create ecological imbalances and health hazards. The quality of bored / tube wells and shallow / dug wells is less affected by percolation of domestic and industrial wastes. Thus the quality of water is good and free from impurities.

4.8 Air and Noise pollution

The Sambalpur Railway Station is located in Khetrajpur area and the absence of adequate space for movement of traffic, goods and vehicles is acute all types of pollution occur. Moreover there exists heavy industrial establishments of seven rice mills, four stone crushers, one coke manufacturing unit, seven service garages etc. and commercial activities are taking place around Remed chowk. In view of these developments, heavy plantation of trees is necessary to offset air and noise pollution in these areas.

4.9 Solid Waste Management

The duty of the Local Authority is to provide clean healthy sanitary condition and healthy environment to the urban dwellers. In absence of appropriate civic sense to maintain healthy environment, it is difficult for the local authority to deal with the efficient management of cleanliness of the urban area.

There is no satisfactory management of solid waste in the Sambalpur Burla Hirakud urban complex. Residents are also not aware and concerned for the hygienic manner in which the solid waste could be collected and disposed of scientifically. The waste of all sorts is thrown on roads, open spaces, within and outside public buildings. There is total absence of collecting bags within residence and the collected waste within the residence is dumped outside the dwelling unit. There are not enough dustbins to collect the refuse on the road and the provisions of such collection points are inadequate. Households, Hotels, Restaurants, Hospitals and Nursing homes, Offices, Schools, Education and other Institutions, Markets, Cinema Halls, Railway Stations, Religious places, Bus Stands, Truck Terminals, Slum pockets, Way side Hawkers etc. throw solid waste everywhere on the urban land. Waste dump sites are not managed well by the local authorities. Rag pickers, children or adults pick up plastic items, papers, cardboard and metal scrap. The municipal sweepers collect the refuse and clear the drains of waste and get the dry and wet sludge carried away through handcart or tractor. The lifting of defected waste by the slum population and low income group residents is carried away through fleet of vehicles by the municipal employees. The defected waste creates serious hygienic problem and when the slum population is high, non availability of public latrines and bathing places create alarming environmental problems. It seems the fleet of sweepers and availability of hand carts and tractors or trucks are not sufficient to manage the collection and disposal of the solid waste by the local authorities. The bus stands, truck terminals, railways and public places are not responsible to manage the collection and disposal of the solid waste. The collected waste is disposed of at Lakshmidungri and thrown in to land fill sites. The inadequate measure to dispose of waste does require fresh attempts to work out the scientific manner in which the solid waste can be taken care of. Garages, hospitals and clinics, certain commercial establishments, truck terminals, Bus stands, Railway Stations etc. and large, medium, small industries, Rice Mills, Oil Mills and stone crushers are outstanding units creating pollution in the atmosphere. However, treatment of waste, with settling pits, filter beds etc. are inadequate for treating the polluted out flow. The industrial waste from industries will keep growing in future and this requires adequate process to reuse the land on which hazardous industrial waste is disposed off. Care is required to be taken to see that environmental problems are not created due to the hazardous waste. The attention is also required to look after the disposal of mill scrap, various types of ash, husk-ash etc.

As per the information available, Sambalpur municipality has following equipments for Garbage disposal:

- (i) Dumper – 02 nos./ per day 3 trips
- (ii) Container – 01 nos. / per day 3 trips
- (iii) Tractor – 07 nos./ per day 3 trips
- (iv) Hand carts – 140 nos.
- (v) Main big Dustbins – 26 nos.
- (vi) Tempo – 07 nos.

Garbage is collected from 62 collection points.

Burla Notified Council has following equipments for Garbage disposal:

- (i) Hand carts – 30 nos.

- (ii) Tractor – 2 nos. Try Cycles – 5 nos. old and 18 nos. new

Garbage is collected from 23 collection points. Garbage Disposal point is Mota Nala about 3 kilometers from the urban area.

Hirakud Notified Council has following equipments for Garbage disposal:

- (i) Tractor with trolley – 3 nos.
- (ii) Trolley Rikshaw – 14 nos.
- (iii) Auto Rikshaw – 2 nos.
- (iv) Hand Trolley - 20 nos.

Garbage is disposed of by land filling near Gandhinagar and Sadeipali area of Hirakud.

At present garbage collection in the Sambalpur municipality is to the tune of 100 metric tone per day. Assuming that 50 percent of the garbage is collected by the municipality, it means 200 metric tons of solid waste is generated in the Sambalpur town daily by the roughly 1.80 lakh population as per 2011 census. Considering the projected population of urban area of the SDA to be 3,68,500 by 2030, it means the solid waste generation in the urban area of SDA shall be to the tune of 400 metric tons. Considering this huge volume, the SDA will have to make arrangement of manpower and machinery to collect four times the garbage of what is being collected today.

The municipal sweepers collect the refuse and clear the drains of waste and get the dry and wet sludge carried away through handcarts or tractors. The lifting of defected waste by the slum population and low income group residents is carried away through fleet of 7 tractors and 140 hand carts at Sambalpur, 2 tractors and 30 hand carts at Hirakud and 3 tractors and 20 hand carts at Hirakud. Looking to about 40% of the population following open defecation practice, more numbers of hand carts, tractors, trucks along with fleet of sweepers are required for efficient removal of waste.

The inadequate numbers of public latrines and bathing places create alarming environmental problems. It is recommended that on priority basis latrines and bathrooms at three urban centers shall be provided as discussed in the Chapter 3.

The industrial waste from industries will keep growing in future and this requires adequate process to reuse the land on which hazardous industrial waste is disposed off. Care is required to be taken to see that environmental problems are not created due to the hazardous waste. The attention is also required to look after the disposal of mill scrap, various types of ash, husk-ash etc.

Existing Garbage collection points are at 62 places in the Sambalpur development area. This Garbage is collected by wheel borrows and lifted by trucks and ultimately deposited at two places namely Laxmi Dungri by the side of National Highway No. 6 before Burla bridge and at Jamadarpali at a distance of 11 kilometres from Sambalpur. Garbage collection points at Burla are at 23 places and the same is lifted and disposed off through land filling on the outskirts of the NAC area. Most of the Garbage is disposed at Mota Nala about 3 kilometers from the urban area. At Hirakud, from the existing garbage collection points, the garbage is disposed of by land filling near Gandhinagar and Sadeipali area. Introduction of Incineration mechanism in place of earth filling to dispose of solid waste will be required.

It is recommended that an expert should examine whether the equipments mentioned above are adequate for efficient management of the generated Solid Waste in the urban areas of the SDA. Adequacy of the above mentioned equipments must be examined periodically and additional facilities must be added from time to time. All the three local authorities have Garbage dumping yards away from the developed area. SDA may go for incineration plant for disposal of waste from the dumping site. Available technology for production of Bio gas from the garbage dumping site shall be explored for power generation and earning money from the waste.

It is pertinent to note that the Government of Orissa has formulated the Odisha Urban Sanitation Strategy (OUSS) and has got prepared the City Sanitation Plan (CSP) for Sambalpur from the OPHS as the consultant. As per the draft report on City Sanitation Plan submitted by the consultant recently, Sambalpur town generates about 1800 tons of solid waste per month with average collection of 78% and is disposed at Laxmi Dungri 10 Km away. They have also observed that there is a lack of waste management plan. As per the report, the cattle wastes from the villages that have been added to the municipality area also require a safe and scientific disposal. The design year for collection and transportation of solid waste has been considered as 2015 which can take care of upto 2022. The treatment and landfill are designed for 15m years. The additional infrastructure suggested in this report consists of primary collection system, street sweeping, transportation vehicles, secondary transfer station, recovery centers, composting unit, mechanical and electrical equipments, bio-methanation plant, landfill site and bio-medical waste handling. This report has estimated the total project cost for solid waste management to the tune of Rs. 25 crores to be implemented in a time horizon of three years i.e. 2012 to 2015. The SDA shall adopt the proposal of this report to manage the solid waste atleast in the Sambalpur municipality area.

However, the SDA may also consider providing Community Dust Bins at regular intervals at the road side, marginal open spaces in the urban area and at the places where the demand is acute. In case of Hospitals, Hotels, Restaurants, Gardens, Cinema Halls, Community Halls, Multiplexes, Malls and Shopping streets etc. Solid Waste collection Bins should be provided in abundance. Garbage collection system needs to be improved. Special study by municipality may be taken.

The incineration plants may be constructed to burn away the solid waste.

SDA should implement vermi-composting technology for disposal of organic solid waste.

Technology is now available to get the bio gas from the solid waste which can be used to get the power to run the streetlights and other equipments. SDA can explore such possibilities.

4.10 Environmentally sensitive Areas

Environmentally sensitive areas have been identified and are shown in the **Figure 4.1**. It is recommended that wherever possible large number of tree shall be planted. The traffic management should be done so that least pollution is created. Pollution control board shall be roped in to get suggestion as how to protect the sensitive areas.

Area under mining, stone crushing, brick kiln, and rice mill etc. shall be separated from the

other areas by thick tree plantation all around these areas. Same shall be done at the landfill site and the garbage disposal sites falling in the SDA area.

4.11 Disaster Management Plan

Orissa is in dangerous seismic zone. SDA has to remain concerned to rebuild the environment and building structures. The structural engineers will have to get additional support elements to strengthen the Hirakud dam, power house and water channels. The forest and agriculture departments will have to be ready for reclamation of land, hills, water bodies and fresh plantation. With the development of a zoo, Zoo authorities and health department will provide necessary help to faunal richness. The SDA, Sambalpur Municipality and Burla and Hirakud Notified Area Committees will have to insist that with regard to public buildings and structures like elevated water tank, power house, high rise building, hospital, fire station, factory with chimney, gravity dam, fly over and bridge over river necessary design specifications have been followed and during construction necessary checks should be done to make the building resistant to the natural disaster. The Cyclone and Earthquake Resistant Design Structures (CERDS) are required as suggested by Bureau of Indian Standards (BIS).

The SDA, Sambalpur Municipality and Burla and Hirakud Notified Area Committees will have to insist that the Cyclone and Earthquake Resistant Design Structures (CERDS) are required as suggested by Bureau of Indian Standards (BIS). CERDS are required especially for elevated water tank, power house, single storey building, low rise building, high rise building, hospital, fire station, factory with chimney, gravity dam, fly over and bridge over river. Within SDA area, while building a house, one must make sure it is designed for safety. SDA must see that the building is designed and built as per the norms laid by BIS codes. Long term strengthening or, retrofitting must be done to avoid future failures. The technology, expertise and codes of practice for this exist in the country. Retrofitting of buildings not initially designed for devastation by cyclone or earthquake will cost 2 to 3 times as much as the extra cost of cyclone and earthquake resistant features in the new building.

The proposal of **Charuapada housing scheme** of SDA should be dropped to be saved from the flood.

4.12 Environment Complex

A huge environment complex have been proposed in the Khetrajpur area in the development area of Sambalpur municipality on the south of the railway line having approach from the existing 18 m and 24 m road and from the proposed 18 m road which pass through the proposed complex. A flyover is proposed on this proposed 18 m road so as to cater to the other surrounding areas. The complex comprises of land specifically designated for urban forestry, Environment Education Park, Zoo and Spiritual Hall. Vehicular parking space has also been proposed in this complex. This complex will serve as regional recreation center and will be the main attraction of the SDA.

4.13 Slums Rehabilitation

Most of the slums in the SDA area are found in the Sambalpur municipality. About 20 percent of the population of the Sambalpur municipality are living in slums as per the 2001 census data. The slum population has increased over a period of time since then. Slums have developed along the natural drainage channels popularly known as Dhobijore Nala and Tangra Nala. These slum dwellers pollute this natural drainage by open defecation and throwing garbage in the nalla destroying the environment and are the main source of water and air pollution. There is an urgent need to rehabilitate these slum dwellers to some other place with all necessary basic amenities so that the natural drainage channel can be made pollution free and help in channelizing the storm water drainage. As part of CDP, the location for slum rehabilitation has been proposed on about 16 hectares of area on the west side of the Sambalpur municipality area. The slums shall be shifted in the phase manner and once successful other area may also be earmarked in future to rehabilitate all the slum dwellers. Care should be taken by the SDA to control the development and growth of slums in the town. The natural drainage is also realigned so as to avoid flooding and reduce the influence area of the natural drainage. These nala shall be paved and walk way is proposed with line of trees 50 feet centre to centre to improve the surrounding environment.

4.14 Pedestrian Path

Pedestrian path has been proposed in the Sambalpur municipality area of the SDA so as to reduce the movement of non-motorized vehicles and in turn reduce the air pollution. Designated pedestrian walkway shall make the people to use the walkway and avoid the motorised vehicles. This will certainly improve the health of the citizen as well as of the town.

4.15 Underground Parking Space

Parking of vehicle is one of the major issues before the SDA. Haphazard parking is the rule rather than exception. On street parking can be seen all through the day more particularly during morning and evening peak hours. Situation is grim in the CBD of Sambalpur in the Golbazaar area. Haphazard parking creates hurdle in smooth movement of traffic which in turn add to the air and noise pollution. Near Laxmi talkies chowk near Gol Bazar of Sambalpur town, underground parking space has been proposed so that parking space can be created without adding to the already congested CBD of the town. This is one of the measures contemplated in the CDP for the environment improvement.

4.16 Satellite Town

Madhupur - Jogipali Community Satellite Town is proposed over 426.59 Hectares of land on the north side of the Lamdungri reserve Forest in the Madhupur and Jogipali village near Sambalpur. The site is made accessible by the proposed 30 mt road passing through the reserve forest and connecting the NH-6 /53. Width of the road is proposed only 9 m in the forest area to maintain its sanctity. The township is accessible from the SH-10 by a proposed 30 m road running east west. Another 24 m road is also proposed to connect the Baramunda

area with the site. Satellite town is proposed to attract entrepreneurs to the town of Sambalpur. This site can be well planned and developed in an environment friendly manner by taking the help of experts and professionals so that land can be used optimally and overcrowding in the Sambalpur town can be avoided. Planned development of the satellite town will help reduce the consumption of water and power and proper underground drainage system will help protect the environment. Open space, parks and play ground with lot of trees will certainly improve the overall environment of the SDA area. Rain water harvesting system will help conserve the water and also in recharging of ground water.

4.17 Mahanadi River Front Development

The river front is totally neglected. There is a great scope and opportunity to undertake river front development which will be self financing development in the long run. Such a scheme will provide water front to the new development that can be undertaken on both the banks of the river by rebuilding part of the river bed land for construction and recreation use. Government will have to undertake hydraulic survey and constitute Mahanadi Riverfront Development Corporation for formulating the river front development to improve the overall environment of the SDA area. Suitable regulations can be framed for this development by the Mahanadi Riverfront Development Corporation.