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Annexure L Greenbelt Development Plan

With rapid industrialization and consequent deleterious impact of pollutants on environment, values of environmental protection offered by trees are becoming clear. Trees are very suitable for detecting, recognizing and reducing air pollution effects. Monitoring of biological effects of air pollutant by the use of plants as indicators has been applied on local, regional and National scale. Trees function as sinks of air pollutants, besides their bio-aesthetical values, owing to its large surface area.

The greenbelt development not only functions as foreground and background landscape features resulting in harmonizing and amalgamating the physical structures of the project in the surrounding environment, but also acts as pollution sink. Thus, implementation of afforestation program is of paramount importance. It will also check soil erosion, make the ecosystem more complex and functionally more stable and make the climate more conducive.

With a view to attenuate noise propagation and mitigate fugitive air pollution impacts, it is planned to develop a greenbelt in and around the project site. Compatible species identified by DPCL for greenbelt development will be planted. Saplings will be suitably nurtured. Regular watering will be undertaken. Soil conditioning and fertiliser application will be undertaken. If required, suitable soil treatment will be provided to ensure good growth of tree cover. Greenbelt development will be carried out in and around the proposed port along the roadside and on the vacant areas to reduce pollution as well as to improve aesthetic value within port premises. Species recommended by horticulturists will be selected on the basis of air pollution tolerance index of tree. Selection of the plant species will be based on their adaptability to the existing geographical conditions and the vegetation composition of the forest type of the region. During the development of the green belt within the project area, it has to be emphasized that those native plant species should be planted which are good ornamental values and are fast growing with excellent canopy cover.

L.1.1 Objectives of Greenbelt Development Plan

The Greenbelt Development has the following objectives:

- Enhancement of the overall environmental quality
- Provide a shelter belt around the port bulb for dust absorption
- Compliance of the conditions stipulated in the environment clearance
- Improve ambient air quality
- Conserve soil and moisture and provide healthy climatic conditions
- Increase aesthetic value
- Create awareness for environmental conservation and tree planting
- Provide adequate shelter and habitat to the local fauna
- Generate employment for the local people
- Protect human health and prevent pollution

L.1.2 Establishment of Nursery

A large nursery has been established in the port site for production of quality planting material for the plantation. The seedlings of the above mentioned species are raised in the nursery. The nursery is maintained throughout the year and qualified technicians are

engaged for production of healthy seedlings. The capacity of the nursery is to produce two lakh seedlings per annum.

L.1.3 Greenbelt Development - Revised Master Plan

Dhamra Port is being developed in various phases. Green Belt development activities were also considered during each phase. Plantation has been carried out on both the edges of the 62.5 km log rail corridor during the Phase I development. Environment / CRZ clearance for phase -II expansion has already been obtained and development has been initiated on the basis of approval. Now, DPCL has proposed for development of Revised Master Plan for which Environment / CRZ clearance process is going on. It is proposed that Greenbelt development plan will be considered inline to the Revised Master Plan layout.

Plantation carried out along Railway corridor (43.0 Ha) during Phase –I operation is given in **Exhibit L-1**.



Exhibit L-1: Plantation carried out along Railway corridor during Phase –I Operation

The Phase -I of the Dhamra port has been developed in an area of 234 ha out of which 22 ha is assigned for Green Belt. Phase -II approval has been received to develop additional area of 456 Ha including basin area out of which 84 ha is assigned for Green Belt. Now Revised Master Plan is proposed for total area of 2013.4 ha (including area of Phase I & II).

As part of revised master plan, it is proposed to develop Green belt in an area of 129 Ha as a part of Revised Master Plan (5 Year) and 258.9 Ha (Cumulative) as a part of Revised Master Plan (30 Year). A estimated approx. capital cost of about INR 71.0 Crore will be earmarked for this purpose as a part of 5 Year Revised Master Plan (including Immediate Development Plan). Greenbelt is under development stage. Considering revision in the expansion plan adequate area is kept under consideration for Green belt development.

Based on the availability of area, Greenbelt is normally desirable in 3 tiers i.e. Trees, Shrubs and Small bushes. These 3 tier plantation comprises of native species as lower tier, bushes and shrubs as middle tier and trees as upper tier with an objective to establish biodiversity and food chain; and to improve the local climate regime.

Combination of various species is sought while selecting trees for green belt / vegetation cover. The green belt will be planted close to the source or to the area to be protected to optimize the attenuation within physical limitations.

Locally growing varieties with fast growth rate and ability to flourish even in poor quality soils will be selected for plantation.

L.1.3.1 Species for Plantation

The species proposed will have broad leave. Trees will be selected based on the type of pollutants, their intensity, location, easy availability and suitability to the local climate like coastal adaptability. They have different morphological, physiological and bio-chemical mechanism / character like branching habits, leaf habits, leaf arrangement, size, shape, surface (smooth / hairy), presence or absence of trichomoes, stomatal conductivity proline content, ascorbic acid content, cationic peroxides and sulphite oxidize activities etc. to trap or reduce the pollutants. Species to be selected will fulfil the following specific requirement of the area “

- Tolerance to specific conditions or alternatively wide adaptability to eco-physiological conditions
- Capacity to endure water stress and climate extremes after initial establishment
- Difference in height and growth habits
- Pleasing appearances
- Should be fast growing and providing optimum penetrability
- Should be wind-firm and deep-rooted
- Should be tolerant to salinity
- Should form a dense canopy
- As far as possible, the species should be indigenous and locally available
- Species tolerant to air pollutants like PM, SO₂ and NO₂ should be preferred
- Should be permeable to help create air turbulence and mixing within the belt
- Introduction of monocultures and alien plant species would be avoided to the maximum possible extent
- Further the plants will:
 - Be fast growing and attaining a height of 5 m or more in 3 to 4 years
 - Have thick canopy cover
 - Be preferably evergreen
 - Have large leaf area index
 - Be resistant to specific air pollutants
 - Maintain species diversity
 - Be able to attenuate noise generated within the area
 - Be well adapted to the existing soil conditions.

The pollutants namely dust/fugitive emissions, sulphur dioxide, smoke and carbon dioxide along with noise pollution can be effectively curbed by planting the below mentioned specific floral species.

Based on the above, the recommended species for greenbelt and plantation are given in **Table L-1**.

Table L-1: Recommended Plants for Greenbelt Development

Tier	Types	Proposed Species	Scientific Name	Ecological Significance
		(Common Name)		
1	Bushes	Acalypha	Acalypha sp.	Soil Improver

Tier	Types	Proposed Species (Common Name)	Scientific Name	Ecological Significance
		Ixora	<i>Ixora chinensis</i>	Soil Improver
		Ficus long island	<i>Ficus oblangeta</i>	Soil Improver
		Inerme	<i>Clerodendrum inerme</i>	Soil Improver
		Eranthemum	<i>Eranthemum sp.</i>	Soil Improver
		Raphais palm	<i>Raphais excelsa</i>	Soil Improver
		Zamia	<i>Zamia furfuracea</i>	Soil Improver
		Kantia palm	<i>Howea forsterana</i>	Soil Improver
2	Shrubs	Kamini	<i>Murraya paniculata</i>	Soil Improver
		Calliandra	<i>Calliandra tweedii</i>	Soil Improver
		Karabira	<i>Nerium oleander</i>	Soil Improver
		Kaniar	<i>Thevetia sp.</i>	Soil Improver
		Tecoma	<i>Tecoma gaudichaudi</i>	Soil Improver
		Bougainvillea	<i>Bougainvillea sp.</i>	Soil Improver
		Tagara	<i>Tabernaemontana spp</i>	Soil Improver
		Mandar	<i>Hibiscus rosasinansis</i>	Soil Improver
		Bisnuchuda	<i>Cesalpenia pulcherima</i>	Soil Improver
3	Trees	Jhaun	<i>Casuarina equisetifolia</i>	Soil Binder & Wind Breaker
		Karanj	<i>Pongamia pinnata</i>	Soil Binder, Noise Abatement, Dust Abatement
		Sunajhari	<i>Acacia auriculiformis</i>	Soil Improver & Wind Breaker
		Neem	<i>Azadirachta indica</i>	Soil Improver & Wind Breaker
		Rupajhari	<i>Acacia mangium</i>	Dust, Particulate & Noise Abatement
		Nilagiri	<i>Eucalyptus sp.</i>	Gases / Particulate Abatement
		Bakul	<i>Mimosops elengi</i>	Noise Abatement, Wind Breaker & Soil Binder
		Radhachuda	<i>Peltophorum ferrugineum</i>	Dust, Particulate & Noise Abatement
		Arjun	<i>Terminalia arjuna</i>	Dust, Particulate & Noise Abatement; Wind Breaker
		Haveli	<i>Thespesia populneoides</i>	Soil Improver & Wind Breaker
		Badam	<i>Terminalia catappa</i>	Wind Breaker & Noise Abatement
		Sirisa	<i>Albizia lebbeck</i>	Soil Binder
		Golden Rain tree	<i>Cassia fistula</i>	Soil Improver & Wind Breaker
		Ou	<i>Dillenia indica</i>	Dust, Particulate & Noise Abatement
		Kaitha	<i>Limonia acidissima</i>	Dust, Particulate & Noise Abatement
		Ashoka	<i>Saraca asoca</i>	Soil Improver & Wind Breaker
		Polanga	<i>Calophyllum inophyllum</i>	Dust, Particulate & Noise Abatement
		Rain Tree	<i>Samania saman</i>	Dust Abatement
		Champa	<i>Michelia champaca</i>	Soil Improver & Wind Breaker
		Mango	<i>Mangifera indica</i>	Dust, Particulate & Noise Abatement
Shisham	<i>Dalbergia sissoo</i>	Dust & Particulate Abatement		
Bamboo	<i>Bambusa sp.</i>	Soil Binder & Wind Breaker		