CHAPTER 2 :   PHYSICAL PROFILE

2.1   Location and Connectivity

Dadra & Nagar Haveli (DNH) territory is located on the western coast of India between the parallels of 20° - 0' and 20° - 25' of latitude north and between the meridian 72° - 50' and 73° - 15' of longitude east. DNH is abutted by the State of Maharashtra in south and Gujarat in north. Refer Map 2-1 in context to location of Maharashtra and Gujarat.

Map 2-1 : Location of Dadra & Nagar Haveli

Note: Map is indicative and not to scale

2.1.1   Road Accessibility

DNH is accessible form NH-8 which connects the cities of Mumbai (Maharashtra) – Ahmedabad (Gujarat), through SH-85 and SH-85A via Bhilad (around 2.5 km. off NH-8 towards eastern direction is the border village of Naroli) and via Vapi - Dadra (which is again off NH-8 towards south-east direction) respectively. While Mumbai is at the distance of over 170 km. towards south, the city of Surat (Gujarat) is at the distance of 140 km. towards north along NH-8. Nasik is one of the important industrial, trading, and pilgrimage towns of Maharashtra and is located at the distance of 140 km. towards east of DNH.

2.1.2   Railhead Accessibility

The nearest Railway Station is Vapi (Gujarat) which is at the distance of about 18 km. from Silvassa, DNH and Bhilad (Gujarat) which is at the distance of 14 km. on the Western Railway Network Line of Delhi – Mumbai, and is accessible off the Mumbai – Surat NH-8 route towards the western direction.

2.1.3   Airport Accessibility

The nearest airport to the territory is the Mumbai airport though it does not have one of its own. An airfield station under the Indian Coast Guard is located in the Daman part of the UT of Daman and Diu (about 30 km North West of Silvassa). The facility permits the use of airfield for civil aircrafts and for any aircraft emergencies with prior approval. Within DNH, a possible location for a small Airport has been under consideration (as mentioned in the Regional Plan 2007-2021 zoning map) near Luhari village (western part of DNH), and the same has been integrated in the DNH ODP-2031.

2.1.4   Port Accessibility

As far as sea ports are concerned, a minor port in a small industrial town of Umergaon (in Valsad District on the western coast of Gujarat), is said to be located at the distance of 30 – 40 km. from Silvassa, where a major port proposal is under consideration.

2.2   Geographical Spread and Distribution of DNH

The total area of the territory is 491.00 sq. km. comprising two geographically separates enclaves – Dadra, and Nagar Haveli, having 70 villages and two census towns within the municipal jurisdiction of Silvassa. There are 11 Patelads which constitute the total area of DNH and its 70 village and 2 town settlements.

Table 2-1 : Patelads & their Constituent Village Settlements in DNH

| Patelad	Villages within the Patelad
Amboli	Amboli, Bindrabin, Dolara, Kala, Karachgam, Khadoli, Kherdi, Parzai, Tinoda, Velugam
Dadra	Dadra, Demani, Tighra
Dapada	Apti, Chikhali, Chinchpada, Dapada, Pati, Surangi, Vasona
Dudhani	Ambabari, Bildhari, Dudhani, Ghodbari, Gunsa, Jamalpada, Karchond, Kauncha, Kherarbari, Kothar, Medha, Vaghchauda
Khanvel	Chauda, Goratpada, Khanvel, Khutali, Rudana, Shelti, Talavali, Umbervarni
Kilavani	Falandi, Galonda , Kilavani, Sili, Umarkui
Mandoni	Bedpa, Bensda, Chinsda, Khedpa, Mandoni, Sindoni, Vansda
Naroli	Athal, Dhapsa, Kanadi, Kharadpada, Luhari, Naroli
Rakholi	Karad, Kudacha, Rakholi
Randha	Bonta, Morkhal, Mota Randha, Nana Randha
Samarvaani	Athola, Masat, Saily, Samarvarni, Vaghchhipa
Silvassa Urban Area	Amli & Silvassa CT

2.3   Climate and Topography

The climate in DNH is moderate and generally healthy, particularly in the central zone. Annual average temperature in DNH area is reported as 26 ^{0}C (District Planning Map Series of DNH, NATMO, Department of Science & Technology, GoI, 1991).

Normal rainy season is reported from June to September, and average annual rainfall received by the DNH Region is between 200 and 250 cm. The rainfall pattern within DNH area is distributed within the rainfall contours of 200 cm (western part), 240 cm (north to south axis including the central part, of which the north-eastern part is more undulating / hilly terrain), and above 240 cm rainfall contour covers the south-eastern part (which is more undulating / hilly terrain in nature) of DNH. Refer Map 2-2 for Rainfall pattern distribution in the DNH area.

As indicated earlier, a significant portion of the land area is of the hilly terrain nature with predominantly under forest cover and/or in agricultural usage. The topography is undulating and rolling. The territory has a hilly terrain, in the north-east and south-eastern part which is surrounded by the ranges of Sahyadri Mountains (Western

Ghats). The central and remaining part of the Region is fairly plain. The highest point in the Region is 423 m above the mean sea level. Refer Map 2-3 for the topographical slopes/reliefs in DNH area.

Map 2-2: Rainfall Pattern Distribution in DNH Area
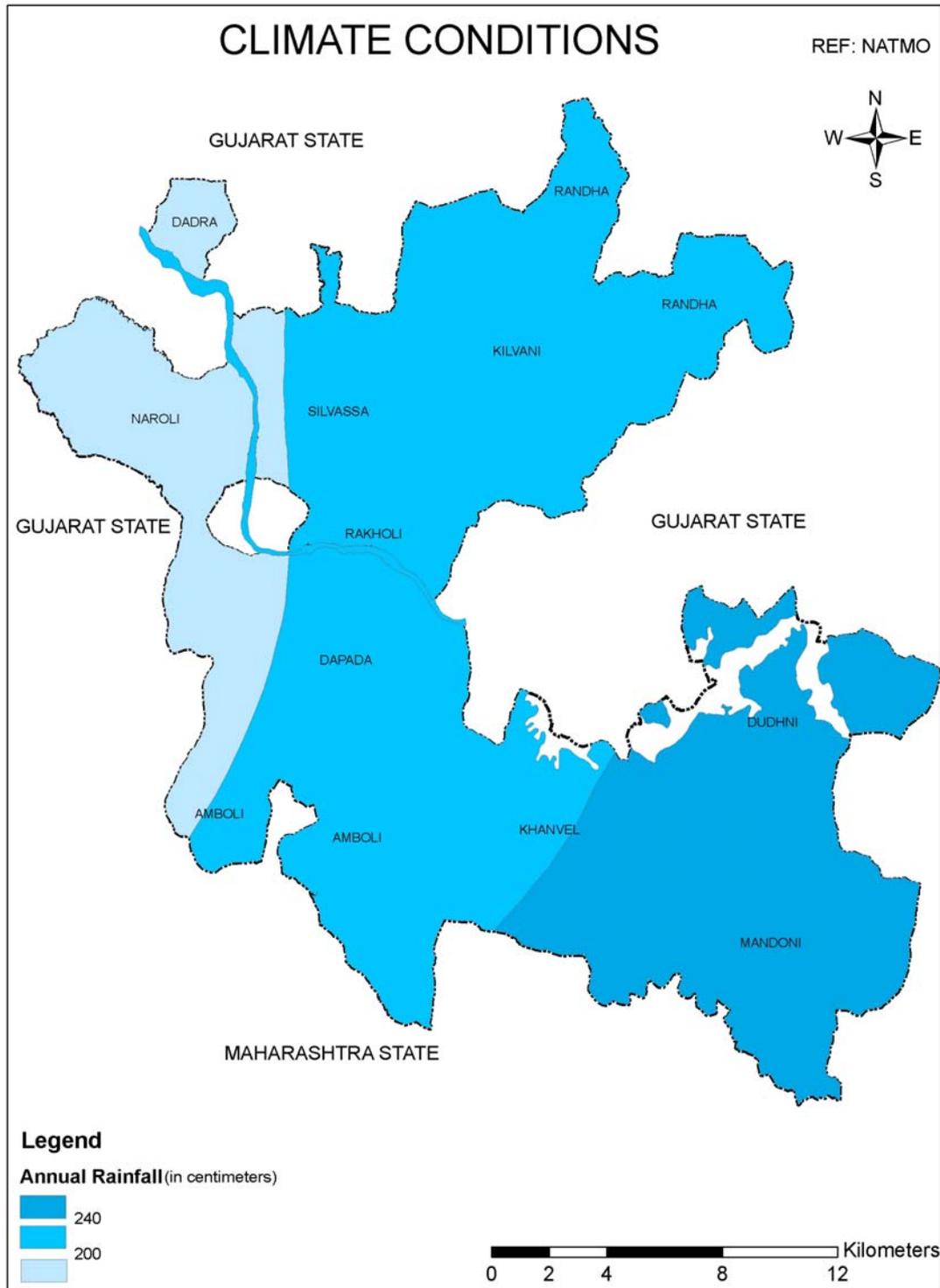
Source: District Planning Map Series, NATMO, Department of Science & Technology, GoI, 1991 with Patelad names added

Map 2-3: Topographical Slope / Relief Pattern in DNH Area
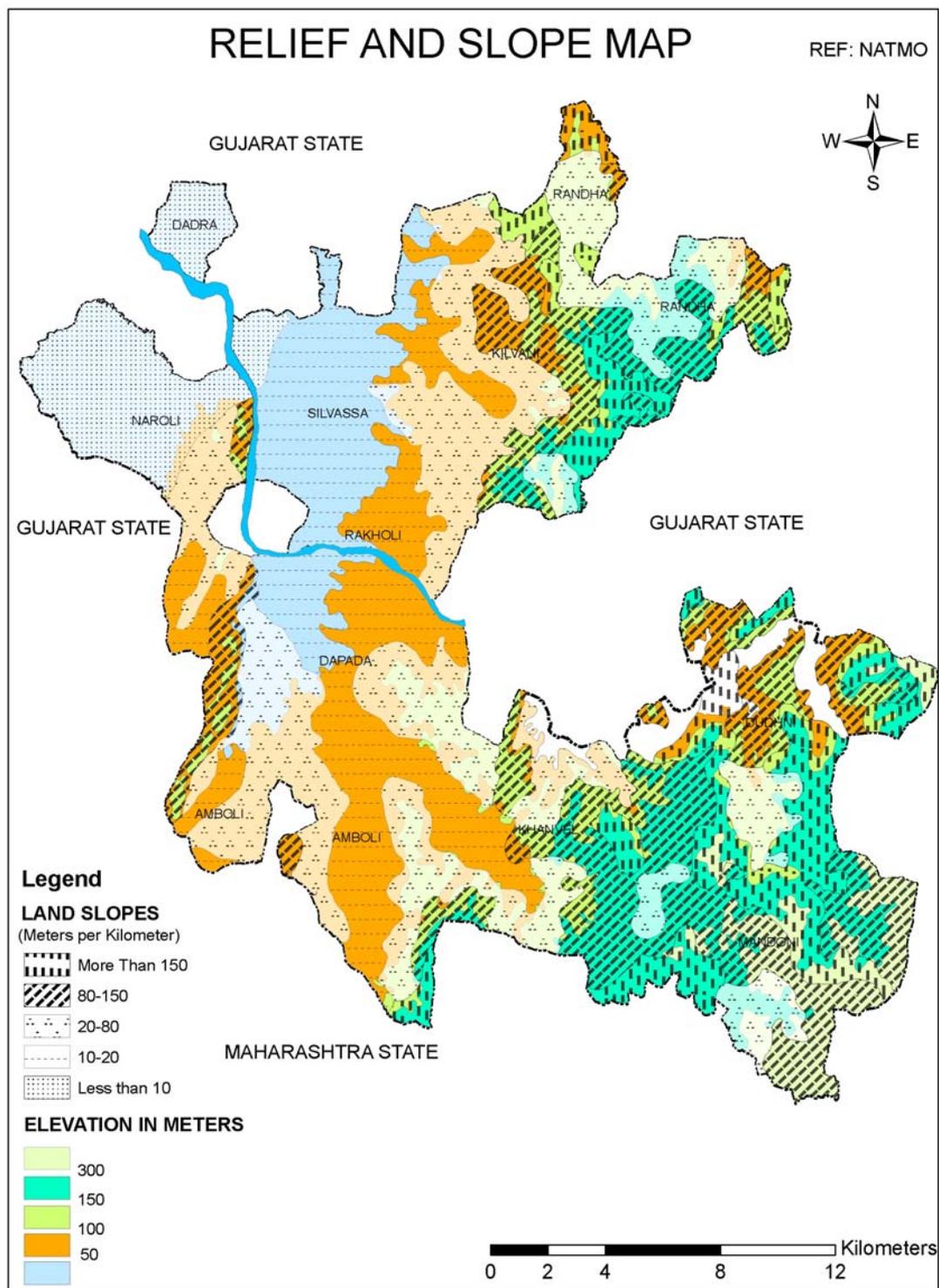
Source: District Planning Map Series, NATMO, Department of Science & Technology, GoI, 1991 with Patelad names added

Damanganga River which flows in east to west direction passes through DNH before joining Arabian Sea. Three tributaries namely Pipariya, Golak and Sakartod join Damanganga within the region. Construction of Madhuban dam on Damanganga

River has assisted in controlling the water flow which in turn has increased the irrigation potential of the land.

2.4   Geology

DNH region is completely covered by various types of basaltic lava flows of the Deccan traps of the volcanic origin. The Volcanic components consist of compact and stratified basalt.

To the west of the region, basaltic lava lies in flat topped ranges separated by valleys, trending from west to east. In some flow the basalt is columnar in nature, which weathers into spherical shapes. The formation at the base of the traps is chiefly amygdaloidal in nature containing quartz in vertical veins, crystals of zeolithic minerals, especially apophyllites.

According to the District Planning Map Series, Department of Science & Technology, GoI, 1991 the three types of soils reported are vertisols i.e. deep black soils that normally form from basaltic material and said to have high clay content (majority of north-to south axis including central part and north-western part of DNH), inceptisols i.e. shallow black soils (western part of DNH), and ultisols i.e. lateritic soils said to have low clay component (found predominantly in the north-eastern, eastern part abutting the Damanganga Reservoir, and south-western part of DNH, and most of these as mentioned earlier is more undulating / hilly terrain). Refer Map 2-4 for the soil pattern in the DNH area.

2.5   Natural Resources

Forest areas occupy 203.21 sq km, about 41.4 percent of the total area of DNH as proposed in the Regional Plan 2021 and 92.00 sq.km of the forest area is declared as Wildlife Sanctuary Area. The area is dense mostly in the north-eastern, eastern and south eastern parts of the region with a tropical moist deciduous type and form an important economic source. The important species of trees that are found are; teak (Tectona grandis), Sadad (Terminalia tomentosa), Khair (Acacia catechu), Mahua (Madhuca indica), Sisam etc. which constitutes main wealth of territory. Apart from the forest resources, major and minor industrial establishments add to the economy of the area.

The forests also serve as habitat for several species of fauna and flora like Panther, Bhekar, Hyena, Wild Pig, Peacock, Woodpecker, Kingfisher, Wild owl, Titar, Tailor birds. The successful introduction of Chital, Sambhar, Nilgai and few other herbivores in a small area has encouraged the Department of Forests to extend it to other natural habitats.

Map 2-4: Soil Pattern in DNH Area

Source: District Planning Map Series, NATMO, Department of Science & Technology, GoI, 1991 with Patelad names added

2.6   Introduction to Environmental Importance in DNH

Dadra & Nagar Haveli predominantly has a rural characteristic except in the urban areas with a significant portion of land being hilly / undulating terrain mostly under agricultural use and forest. The planning area defined excludes the forest cover that shares a 41.4 percent of the DNH area. Other significant features include the Damanganga River that flows in the east to west direction and passes through Dadra & Nagar Haveli along with its three main tributaries Pipariya, Golak and Sakartod.

The Dadra & Nagar Haveli UT Administration adopted a policy of industrial promotion in 1993 by offering concessions for locating new industrial units within the DNH region. A number of industries began to locate within the region post adoption of the industrial policy. The location of industries apart from creating economic development opportunities negatively affected the quality of environment. While the economic benefits of the development within the region appear too obvious, it is important to keep in mind the possibility of any potential negative impacts the industries impose on the environment within the DNH region.

The key objective of the initial environmental assessment is to assess the environmental quality and understand the environmental issues faced by the DNH region which can be intervened and mitigated during the implementation of the outline development plan.

The threat to the environment of the DNH region is due to urbanization, deforestation, land degradation, dependence on ground water, inefficient waste water systems and growing industrialization. Also, since the RP-2021 emphasises on the approach of accelerated economic growth, further developments plans at various levels would have to be well integrated with due considerations of a healthy environmental status through proper monitoring and enforcement, or else increasing anthropogenic stresses of various kinds are likely to further damage the environment in future.

The broad environmental issues of the DNH region assessed under the initial analysis level are grouped under following major heads:

- Terrestrial Environment
- Water Environment
- Biological Environment
- Air Quality and Noise Levels.

2.7   Terrestrial Environment

2.7.1   Environmental issues due to rapid Industrialization and Urbanization

Over the years number of industrial units have been set up in the DNH region owing to its accessibility to industrial hubs like Vapi, Surat, Mumbai etc. and more so due to the tax concessions declared. As on 2007, there were 2847 industrial units in DNH compared to only 2293 industrial units in 2006.

Rapid industrialization had lead to employment generation, but resulted in unplanned urban development as well (as only macro-level RP 2000-2020 was initially available for plan regulation of developable zones, and recently revised as RP 2007-2021). Employment generation had also resulted in migration from the other states. The region is experiencing steady growth in population. The urban population has increased from 17.77% (1991) to 22.89% (2001). There has been steady shift in demographic profile of the region. Decline in household size and sex ratio implies presence of single migrants, mainly contributed due to industrialization.

Industrial development trend is found to be unorganized within the region, as no regulatory control was implemented for selection of site for establishment of industries. This led to unmanaged and scattered growth of industries causing difficulties to provide necessary infrastructure within the vast DNH region, because of which tremendous pressure is exerted on environment. This environment as mentioned earlier consists of a large area under forest jurisdiction, which is also scattered in DNH region thus increasing the complexity of causing many areas that are not in forest jurisdiction becoming rather discontiguous pockets of lands.

Urbanization with poor infrastructure development boosts most of the environmental issues. There may be ecological and social imbalance as well, as a part of environmental hazard and economic imbalance. To overcome these problems proper land use policy is required with provision of well integrated infrastructure like water supply, sewerage, drainage, transportation (with due attention to green infrastructure and streetscape development within the road's ROW), etc.

2.7.2   Reasons of Land Degradation in DNH Region

The DNH region is facing threat of land degradation due to various activities and habits such as deforestation, agriculture and industrialization in both urban and rural areas. The pressure on land has led to soil erosion, and lowering of the ground water table, and soil pollution. Some of the key reasons of land degradation observed in the DNH region are as follows:

- The local people are extensively dependent on the forest products like fire wood. The excessive use of forest wood results in depression of the forest cover comprising trees and shrubs which is major factor responsible for soil erosion. Social forestry is promoted by the forest department but the implementation of the social forestry in the region is poor.

- Soil erosion is caused due to current agricultural pattern and overgrazing. Agricultural activities that cause land degradation include shifting cultivation. Excessive use of chemicals, pesticides leads to further contamination of soil. Overgrazing and over-extraction of green folder lead to forest degradation through deceased vegetative regeneration.

- Several brick making kilns are observed in terraced fertile agriculture land in region which would reduce the fertility of top surface of soil which would in turn disturb the crop productivity in area.

- The solid waste and industrial waste collected at present is not disposed in to a proper designated sanitary land fill site which results in soil degradation and contamination of water.

2.8   Water Environment

Rapid expansion of industries in the region without proper sewage systems, drainage systems, sewage treatment facilities, effluent treatment plant has become the major cause of deterioration of water quality in the region.

Industrialization and unplanned urban growth have resulted in heavy discharge of toxic chemical effluents and untreated wastes water into sources including streams, rivers, and tanks causing serious damage to water quality and contamination of groundwater. In DNH, it is observed that as of 2008, the red category industries account for 0.59% share, and orange being 25.69% indicating a significant load by such hazardous and polluting industries, and it would be beneficial to have a cap on such numbers / area under such industrial use, with due waste disposal facilities.

The most severe environmental problem in the region is the pollution of water resources by industrial discharge, household waste, and sewage. Industries are not covered by the water supply schemes and they meet their requirement by the bore wells. With the increasing human population and growing urbanization and industrialization, most of these water bodies are being gradually polluted. As per socio-economic survey conducted in DNH in 2008, 67% of the household do not have the facility of latrines, and proper sanitation disposal system like septic tanks.

The strain on the environment is manifested directly in water quality, which in turn affects the soil quality and has serious impact on crop yield as well as human health.

In year 2007, 37524 cases of Diarrhoea were registered; this is owing to the poor quality of drinking water.

The water quality in Dadra and Nagar Haveli, as per samples taken by Pollution Control Committee, the dissolved oxygen is as low as 1.5 to 2.5 mg/l in industrial areas like Pipariya, Dapada, Kharadpada. Impact of these is brownish, reddish orange water, low pH, low DO and high BOD.

The U.T administration requires to take preventive actions for extraction of the ground water. The attempt to regulate groundwater withdrawals through licensing and adequate monitoring methods needs to be devised so that mining of groundwater can be reduced. A detailed study needs to be undertaken for integrated water management for the territory so that the menace of depleting groundwater resources and pollution of the same can be taken care.

Currently the solid waste and industrial waste is collected and dumped beyond urban boundaries without the facilities of modern sanitary landfill (the current integrated hazardous waste disposal facility at Mota Randha is reported still under development), this will further result in contamination of groundwater.

2.9   Biological Environment

As mentioned briefly in the above section on natural resources, DNH has about 40% forests with moderate thick jungle cover. The name Silvassa means 'woods' in Portuguese. Teak, Sandra, Khair, Mahara and Sisam are the major tree species in the region.

The territory also has a very good amount of fauna. Wild animals such as Panther, Nilgai, Sambar are found especially in the Natural Forest area, Satmaliya etc. Varieties of birds are found in different parts of the territory and on the banks of the river upstream of the reservoir. The Administration has declared a wild life sanctuary area, which is expected to further help in preserving the natural habitat of the region.

Deforestation with shifting agriculture, over-exploitation for fuel wood and timber collection activities is the main causes of serious concern. Deforestation causes degradation when the land is steeply sloping, or has shallow or easily erode-able soils, and when clearance is not followed by good management.

The development is being observed in the close vicinity of forest area. This would be a threat to the flora and fauna of the forest. The U.T administration has taken control to restrict the development within the distance of 100 m from wildlife sanctuary areas. This will help to conserve the wild life area.

2.10 Ambient Air Quality and Noise Levels

The ambient air quality varies in different areas of Dadra & Nagar Haveli. The predominantly industrial areas like Silvassa, Dadra, Rakholi, etc. have moderate to poor air quality. However, Dudhani and other tourist, potential areas are devoid of air pollution and the ambient air quality is very good.

Due to significant distances between the industries there is effective dispersion of gases emitted by industries; therefore currently there is not much impact of air pollution from industries. But in future there can be increase concerns if industrial development is not planned properly.

Emissions from furnaces noticed are serious cause for environmental health of small area around the industries. The major identified industrial type is the rubber, plastic & textile based plants.

There has been increase in power demand to fulfil the industrial requirements. There are number of Diesel Generator Sets (D.G.), Furnaces and Boilers in the UT of DNH, the electricity demand of industries has increased to a great extent with the growth of industrialization and the total supply is not adequate to satisfy the required power load. This has compelled the industries to set up their own power generation facilities and as a result most of industries have set up their own D.G. Sets. The major fuel used is Diesel and therefore emission from the D.G. Set has raised the pollution levels. Heavy Vehicular traffic to cater the needs of the industrial needs along the arterial roads is also the cause of pollution within the region.

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