

STUDY ON ENVIRONMENTAL PROFILE OF DAVANAGERE CITY: A GEOGRAPHICAL PROSPECTIVE. KARNATAKA

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Abstract

The environmental profiles methodology assesses environmental indicators that reflect impacts occurring globally, regionally, and locally – in the air, in water and on the land, impacting human and the environment. The environmental problems in India are more health and livelihood threatening in nature. Air pollution, soil degradation, deforestation, desertification, shrinking wetlands, inadequate public health and sanitation, indoor pollution in rural areas, growing water scarcity, falling ground water tables, lack of minimum flow in rivers, and over extraction of water for irrigation. Davanagere was once the hub of industries in Karnataka, but it bad roads have now brought it the ignominy of being a highly polluted city in the state. As per World Health Organisation (WHO) Air Pollution Database released recently, Davanagere has crossed permissible limits of air pollution, and the increasing air pollution will have a severe impact on the health of people in the years to come if precautionary measures are not taken. The WHO report stated that particulate matter, PM10 is 75 micrograms in Davanagere, while it is 118 in Bengaluru and 36 micrograms in Hassan district. The report also indicates that the pollution in Hassan district is below permissible levels, in contrast to the alarming levels in Davanagere. According to sources in Davanagere District Pollution Control Board, the major reason for the increasing dust and air pollution is improper roads, especially in commercial areas, and improper footpaths. The permissible limit of the pollution control board at commercial areas is 100 microgram and the equipment installed at the Gandhi Circle records a minimum of 250 to 260 microgram every day, said the source. However, in residential areas, the pollution is well within the limits, as the per equipment installed at residential areas showing it's around 80 micrograms. Environmentalist Gopal Goudar attributes the increase air pollution to cutting of tree in the name of development and the authorities concerned have started chopping of trees and constructing cement concrete roads. After cutting the trees, no step have been taken to plant new ones to control pollution. The number of vehicles in the district has also increased considerably, another factor for the pollution.

Keywords: Airpollution, Soil degradation, Deforestation, Desertification, Shrinking wetlands, Health and Sanitation, Indoor pollution.

Introduction

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Location and Study Area

Geographically, Davanagere city is located at latitude of 14°28' N and longitude of 75°59'E, at an average altitude of 602.5 m above the mean sea level (MSL). It is the headquarter town of Davanagere District, and is located at about 260 km from Bangalore. Davanagere is primarily an educational and commercial centre for the vast hinterland. It is located on the main trade route that connects northern part of the country to the southern peninsula. Extending to an area of 66.08 sq km, the town's population is 435,128. National Highway No. 4 (NH 4) connecting Bangalore – Pune/ Mumbai passes through the City.

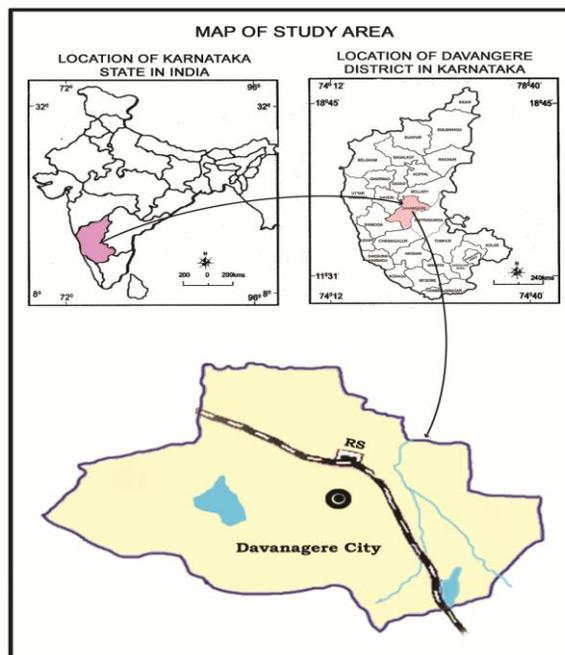


Figure 1. Location map

Objective of the Study

To know the Ground Water and Land Use pattern of Davanagere city. To study the Environmental degradation of study Area.

Methodology

The present study is purely based on secondary data. The related data sources has carried out by visiting to the district statistic office, urban development authority, urban pollution control board, and slum clearance board, district at glance, district report, magazine, and news paper.

Topography, Soil & Geology

Situated in the Deccan Plateau and close to River Tungabhadra (15 km), the topography of the town is almost flat and slopes gently towards north and west. The north eastern and south eastern part of the city drains towards north, to Beturhalla, whereas the western and south western part drains towards west to Bathi Tank. Red and black cotton soils are predominant in the region, which favours the growth of cotton, paddy and oil seeds. Red Sandy soil comprises of red loams, red sandy, sandy loams and medium black soils. Predominant geological formation in the region consists of Granites, Gneiss & Schist. As per the seismic zoning map of India, Davangere City falls under Zone II, which is the lowest earth quake risk zone in India. This zone is termed as “low damage risk zone”.

Climate

Davangere enjoys semi-arid climate, dryness in the major part of the year and hot summer. In general, southwest monsoon contributes 58% of total rainfall and northeast monsoon contributes 22% rainfall. The remaining 20% rainfall is received as sporadic rains in summer months. It receives low to moderate rainfall. The district falls under central dry agro-climatic zone of the Karnataka state and is categorized as drought prone. Normal climatic parameters of Davangere are increasing temperature from March to May, usually maximum in May month and minimum temperature that is coldest month during month of December. The normal annual rainfall is 680 mm. However in the last decade (1996-2005) the average rainfall was just 589 mm much below the long term average. Year 2003 was the worst rainfall year, receiving just 388.6 mm. The temperature varies between 35°C to 38°C during summer and 16°C to 20°C during winter. The hot summer season starts in early March and last till the beginning of June when the district comes under the influence of southwest monsoon.

Air Quality and Noise Level

The major sources of sound pollution in the city are from the vehicles. Karnataka State Pollution Control Board (KSPCB) monitors air and noise pollution in the State in line with Air (Prevention and Control of Pollution) Act, 1981. KSPCB have monitoring stations located at various places across the state; however covers major cities, and industrial locations. There are no regular monitoring stations in Davangere. Dust pollution in the city appears to be high, especially in areas such as Azad Nagar and MandakkiBhatti due to presence of puffed rice factories and movement heavy goods vehicles and traffic. Poor quality roads and dry weather is compounding the dust problem in the city. As per a report of KSPCB (2005-06), suspended particulate matter (SPM) and respirable suspended particulate matter (RSPM) in the ambient air is well above the permissible (SPM value of 280 µg/m³ along the main corridor of the town-PB Road. National Ambient Air Quality Standard is given in Location of bulk water supply project components intake- jack well and WTP are located at open area no chance of air and noise pollution. Even transmission main pipeline will pass through vacant part (edge of the road). Before starting of construction base line data will be generated.

Surface Water

There are no notable rivers and streams in and around the city. Tungabhadra River flows at a distance of 15 km from the town. Kunduwadakere (lake) situated in the south western part of the town is an important water body in the town. This is one of the water supply sources to the city besides river Tungabhadra. Bathi tank is a small lake in the western part. Located on the downstream side of Kunduwadalake, this tank receives outflow from Kunduwada, and

the sewage/wastewater from western part of the city. Presently, a wastewater treatment plant is under construction near Bathi tank to treat the sewage from eastern parts of the town. Besides these, there are irrigation channels outside the city, originating from a reservoir at Budihal, about 15 km southwest of the town. Water quality monitoring of Tungabhadra River is conducted by Karnataka State Pollution Control Board (KSPCB) in Karnataka. The Tungabhadra water quality is classified as Category C “Drinking water source after conventional treatment and disinfection”. Following table shows the water quality of the river near intake location.

Table1. Tungabhadra River water Quality

Parameters	Waterqualitycrite		KudliHonnal		Haralahal Ullanu	
			u/s ofHarihar	d/s of Harihar		
		Min	25.0	22.0	22.0	26.0
Temp, °C	-	Max	27.0	32.0	32.0	31.0
		Mean	26.0	25.5	25.1	28.0
		Min	5.2	7.3	7.	6.0
DO,mg/l	>4mg/l	Max	7.0	7.5	7.	8.0
		Mean	6.0	7.4	7.	7.2
		Min	7.5	7.3	7.	7.6
pH	6.5–8.5	Max	8.3	8.2	8.	8.4
		Mean	8.0	7.9	8.	7.9
		Min	116	120	136	270
Conductivity,µmhos/	<2250	Max	400	500	560	1240
		Mean	259	330	381	847
		Min	2.3	1.2	1.	1.7
BOD,mg/l	<3mg/l	Max	3.1	3.4	3.	5.2
		Mean	2.7	2.6	2.	3.1
		Min	0.21	0.08	0.	0.2
Nitrate,mg/l	-	Max	0.54	0.7	0.63	1.4
		Mean	0.33	0.33	0.36	0.54
		Min	-	-	-	-
Nitrite,mg/l	-	Max	-	-	-	-
		Mean	-	-	-	-
	<2500MPN/100ml	Min	80	30	40	1100
FeacalColiform,MPN		Max	240	170	170	9000
		Mean	155	114	82	6872
	<5000MPN/100ml	Min	110	50	60	2200
TotalColiform,MPN		Max	3000	2220	1300	16000
		Mean	1928	1176	932	13109

Station(S1):The site of this habitat is located at the upstream of Harihara city before the river enters into city., **Station(S2):**This station is located on the main stream of river Tungabha drain a place just near the confluence point of Sulekere stream(Tributary), **Station(S3):**This station is located at the downstream of HariharaPolyfibers effluent discharge (near Harlapura), **Station (S4):**This sampling station is located about 2km away from confluence point (S2)

Table 2. Average values of physical-chemical parameters at 4 stations of Tungabhadra River from May 2016 to April 2017

Sl.No.	Parameters	Station	Station	Station	Station
		S1	S2	S3	S4
1	Temperature, °C	29.00	28.50	30.00	29.50
2	pH	8.10	7.98	7.57	7.86
3	Turbidity, NTU	5.00	10.00	18.00	8.00
4	Electrical Conductivity $\mu\text{mhos/cm}$	235.04	332.23	595.76	294.60
5	Dissolved Oxygen, mg/l	8.10	7.70	6.80	7.60
6	Biological Oxygen Demand, mg/l	5.28	4.50	4.80	5.10
7	Chemical Oxygen Demand, mg/l	66.92	81.33	186.42	94.50
8	Nitrates, mg/l	8.46	4.86	9.00	2.71
9	Chlorides, mg/l	35.22	45.94	146.94	51.00
10	Sulphates, mg/l	7.67	9.25	14.82	8.45
11	Total Dissolved Solids, mg/l	129.27	199.32	357.45	162.03
12	Phosphates, mg/l	0.46	0.68	1.13	0.56
13	Total hardness as CaCO_3 , mg/l	83.75	80.58	89.42	97.00
14	Calcium as Ca, mg/l	52.70	580.00	141.40	50.00
15	Magnesium as Mg, mg/l	31.00	36.00	48.00	47.00

Ground water

In Davangere fractured granitic-gneisses, gneisses and hornblende-schists are the main water bearing formations. Ground water occurs within the weathered and fractured rocks under water-table conditions and semi-confined conditions. Aquifers are encountered between the depths of and 32 m below ground level (bgl). Bore wells are drilled from a minimum depth of 35 to a maximum of 200 m bgl. Depth of weathered zone ranges from 5.5 mbgl to 30 mbgl. Yield ranges from 1.5 to 4.0 lps. Transmissivity ranges from 5.27 to 110.67 m^2/day . Specific capacity ranges from 4.54 to 36.0 lpm draw down. The main source of ground water occurring in the district is through precipitation 44 and return flow from applied irrigation. During May 2006 (pre-monsoon season) the minimum and maximum depth to water level was 4.28 mbgl and 7.65 m bgl respectively. During November 2006 (post-monsoon) water level ranged from 5.30 m bgl to 10.20 m bgl. Although overall groundwater development in Davangere Taluk is 61%, major parts including Davangere City fall under over exploited category (Central Ground Water Board, 2008). The Ground Water Quality in the district is generally potable and suitable for irrigation and domestic purposes. Electrical conductivity of ground water in general ranges from 584 to 2720 micro mhos/cm at 25 °C. Fluoride ranges from 0.2mg/l to 2.41 mg/l. Nitrate ranges from 10 to 352 mg/l.

Table 3. Groundwater Water Development in Davangere City

Particulars	Details (in hectare meter)
Net annual ground water availability	10576.79
Existing gross ground water draft for all uses	6439.13
Allocation for domestic and industrial use for next 25 years	1032.85
Net ground water availability for future irrigation development	4827.88
Balance ground water irrigation potential available (ha)	5905.66

Ecological Resources

Davangere is an urban area surrounded by land that was converted for agricultural use many years ago. There are no forest areas within or near Davangere. Owing to fertile lands and availability of irrigation facilities, the land around the city is extensively cultivated. The outer areas within the CC limits also under cultivate. There are 2 trees located at headwork area, which need to fell. Intake, Jack well, raw water main and WTP are located at village environment. Other than intake- jack well there will be no impact on terrestrial ecology.

Land Use

Davangere/Harihar Urban Development Authority (DHUDA) has formulated a development plan for Davangere outlining the land-use pattern up to the year 2021. The area usage under the suggested Land UsePattern in the city is presented below.

Table 4. Proposed Land Use for Davangere

Land-Use Pattern	Area (Km ²)	Percentage Use
Residential	27.80	45.08%
Commercial	2.90	4.70%
Industrial	6.37	10.33%
Public & Semi-Public	4.18	6.78%
Parks, Play-ground and Open Space	5.34	8.66%
Public Utilities	0.46	0.74%
Transport and Communication	12.95	21.04%
Water Shed	1.65	2.68%
Total	61.65	

Industry & Agriculture

Until recently the city was known as the "Manchester of Karnataka" because of its many cotton mills and supporting trades and business. Although these mills contributed to the industrial and commercial development of the city many of them were closed in the 1990's. Currently, the major agro-industrial activity in Davangere revolves around rice and sugarcane, with a number of rice mills and sugar mills in and around the city. There are vast agriculturally rich lands around the town, cultivated by Tungabhadra water. Sugar cane, paddy, jowar and cotton are the major crops grown in and around Davangere. There is an industrial estate in Davangere developed by Karnataka Small Scale Industries Development Corporation (KSSIDC) and spread over an area of 19.35 acres. 14 units are working in this area and are mostly engineering fabrication units. There is another industrial area on Lokikere road, developed by Karnataka Industrial Area Development Board (KIADB), spread over 93.08 acres with 52 working units at present. The industrial mix is mainly engineering, fabrication and garment making. Besides these there are few rice, sugar industries and distilleries in and around the city.

Davangere has a large Agriculture Produce Marketing Committee (APMC) yard that caters to the surrounding cities/ towns and villages which mainly deals with cotton, paddy and oil

seeds. Due to good connectivity by roads and railway line with other parts of the region, it has become a focal point for trade and commerce.

Water Supply.

Currently water supply within Davangere is intermittent and varies across the town. The reported duration and frequency is 1-2 hours every 3 days. The current per capita volume made available to customers is assessed at 86litres/head/day, compared with the norm of 135 liters/head/day. Tungabhadra River and Kunduwada Lake are the main sources of water supply to the town.

Sewerage and Sanitation.

Davangere is partially covered with underground sewerage – this old system covers about 25% of the city in the central part. The sewerage system in Davangere is divided into three major districts 1, 2 & 3 and a smaller sub-district 1A. This existing sewerage system is mostly in District1 and District 2, coverage in District 3 is very limited. Under NKUSIP, it is proposed to improve the sewerage system in District 1 including the treatment works. However, due to lack of adequate funds, the project will not cover entire District 1. The capacity of the existing wastewater treatment plant (WWTP) is 19.45 MLD (stabilization pond based).

Storm Water Drainage

Due to the absence of a properly functioning sewerage system, the open drains are mostly catering to wastewater except during monsoon which carries both wastewater and surface runoff. These open drains dispose waste into Bathi Tank in the west, BeturNala in the east and Davaragere Lake in the southeast.

Transportation

The National Highway No. 4 connecting Bangalore and Pune/Mumbai is the major regional road running in the midst of the city. The city has direct rail connectivity with a broad gauge line connecting Bangalore–Hubli/Mumbai. This railway line contributes a major share in passenger and goods transportation. With a total length of over 1000 km, internal road network in the city is well developed, however are not in good in condition. Most of the roads in the central part are congested.

Power Supply

Hydal power is the main source of energy in Karnataka, with 61% of total installed capacity. Remaining is mostly from thermal power stations. Contribution of wind and solar energy, although increasing, is negligible. Government run Karnataka Power Corporation Limited (KPCL) is responsible for power generation while Karnataka Power Transmission Corporation Limited (KPTCL) is responsible for power transmission. The distribution to users in Davanagere is provided by regional company – Bangalore Electricity Supply Company Limited. Power is supplied from the central grid by overhead cables carried on metal and concrete poles, mainly located in public areas alongside roads. The power supply in Davangere is poor; there are frequent outages in warmer months, and fluctuations in voltage.

Socio cultural resources

Demography

During the last decade the population of Davangere City had increased from 363,780 in 2001 to 435,128 in 2011 indicating a decadal growth rate of 19.6 percent. This growth is much less than the last decadal growth rate of 26.6%.

Table 5. Population Growth of Davangere City

Year	Population	Decadal Growth Rate
	Nos.	%
1991	287,233	-
2001	363,780	26.6
2011	435,128	19.6

Sex Ratio

The sex ratio (female population per 1,000 of male population) in Davangere City, as per 2011 census, is 972, which is lower than the district and state urban average figures of 975 and 973 respectively.

Literacy

The literacy rate of the city is 84.89 percent (2011 census). Largest proportion of population comprises Hindus followed by Muslims and then Christians. Almost all speak in Kannada followed by Hindi.

History, Culture & Tourism

Davangere was originally a small village, forming one of the suburbs of Betur. Sultan Haiderali gave it as jagir to a Maratha chief named Apoji Ram, who encouraged merchants to settle there. While Appoji Ram died without heirs, the place continued to grow, favoured by Tippu Sultan. After the fall of Tippusultan's regime, a European firm stepped in and started a cotton mill. These mills flourished as cotton was grown in plenty, in and around Davangere, as well as the adjacent town of Harihar. Climatic conditions and the nature of the soil (black gypsum) favoured its growth. Davangere Cotton Mills is a well-known name in the region.

City has some locally important religious places. Durgambika Temple, said to be around 200 years old, attracts good number of devotees throughout the year. Subramanya Temple is another important temple in the City. Kundavada Lake, Sulekere Lake and BathiGudda (hill) are the local tourist spots. Majority of people in Davanagere are Hindus and the remain are mainly Muslims and Jains. Kannada is the native language. A good proportion can speak Hindi and a few can converse in English.

Result and Discussion

Davanagere city was situated in the Deccan plateau, it was falls under 2nd zone which is the lowest earth quake risk zone in India. Where as consideration of climate it was having semi-arid climate, like agro climatic zone and it was falls in drought prone area. Where as air quality the dust pollution in the city appears to be high ,area such as Azad Nagar and

MandakkiBhatti, due to puffed rice factories and Movement of goods vehicles. Then surface water and ground water also decreasing in the city this was a major problem which was city facing and also dust problem which was causing on city environment.

Conclusion

Davanagere was once the hub of industries in Karnataka. Today this city was highly polluted city in the state and it was having very poor air quality and rapid growth of urban population also causing on the urban environment.

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