Maharashtra Pollution Control Board

महाराष्ट्र प्रदूषण नियंत्रण मंडळ

(A Govt. of Maharashtra Enterprise Under Ministry of Environment)

FINAL REPORT

Comprehensive Study on Polluted River Stretches And Preparation of Action Plan of River Girna from Malegaon to Jalgaon

CONSULTANT

UJWAL PATIL

19, Siddivinayak Colony, Near Tulshiram Nagar,
Deopur, Dhule - 424002

Mobile : 9423007455, Email: ujwalgpatil@rediffmail.com

INDEX

CHAPTER-I

INTRODUCTION

Water is the gift of nature making life possible on our planet. It is variable in quality and availability, and fluctuates from season to season and from year to year. Its availability is largely dictated by climate.

India is blessed with abundant water resources, which are unevenly distributed in space and time. When one part of the country is reeling under severe water scarcity whereas, floods damage in another part. This creates economic losses as some parts of the country do not have enough water even for raising a single crop and in other parts excess rainfall plays havoc due to floods. Moreover demand for water is ever increasing with the increase in population and water is likely to become one of the limiting resources as well as one with multiple uses.

The Girna river originates at Kem Peak in the Western Ghats range of Nashik District, and flows east across Nashik District and is joined by the Mausam River and then east into Jalgaon District where it then swings north to join the Tapti River. The dams on the Girna are Chanakapur Dam and Girna Dam. Girna Dam was built in 1969. The name Girna derives from the name of the goddess Giraja (Parvati). The basin of the Girna lies on the Deccan Plateau, and its valley has fertile soils which are intensively farmed.

The Gazetteer of the Bombay presidency describes the river as... "Rising in the western hills of the Kalvan sub-division of Nasik, and fed by streams from the northern slopes of the Chandor or Saptashring range, after a course of about 150 miles, falls into the Tapti near Nander. Its course lies in nearly equal parts in Nasik and Khandesh. Passing through Nasik almost in a straight line eastwards, in Khandesh its course changes to north-east, till, near Jalgaon, it bends north and then north-west flowing for several miles with many windings almost parallel to the Tapti. In Khandesh, except in one or two places where it is hemmed in by rocky hills, the Girna, over a broad sandy bed, flows through a well tilled valley gradually spreading into the great central plain. Its waters, both in Nasik and Khandesh, are much used for irrigation.

Status of Wastewater Generation and Treatment in India (by- R.M.Bhardwaj)

The Central Pollution Control Board carried out studies to assess the status of wastewater generation and treatment in Class I cities (population > 100,000) and Class II towns (population between 50,000 and 100,000) during 1978-79, 1989-90, 1994-95 and 2003-04. The latest study indicates that about 26 254 million litres per day (Ml/d) of wastewater are generated in the 921 Class I cities and Class II towns in India (housing more than 70% of urban population). The municipal wastewater treatment capacity developed so far in India is about 7044 Ml/d - accounting for 27% of wastewater generation in these two classes of urban centers. An attempt is made to estimate the urban population and resultant wastewater generation for 2005

State Scenario & Local Scenario:

The volume of wastewater generated by domestic, industrial, and commercial sources has increased with population, urbanization, improved living conditions, and economic development. It is estimated that about 38,254 million litres per day (mld) of wastewater is generated in urban centres comprising Class I cities and Class II towns having population of more than 50,000 (accounting for more than 70 per cent of the total urban population). The status of wastewater generation and treatment capacity developed over the decades in urban centres (Class I and Class II) is presented in Table (1.1).

Table 1.1: The status of wastewater generation and treatment capacity

Parameters	*Class I cities*					*Class II towns*				
	1978–9	*1989–90*	*1994–5*	*2003–4*	*2009*	*1978–9*	*1989–90*	*1994–5*	*2003–4*	*2009*
Number	142	212	299	423	423	190	241	345	498	498
Population (millions)	60	102	128	187	187	12.8	20.7	23.6	37.5	37.5
Water Supply (mld)	8638	15,191	20,607	29,782	44,448	1533	1622	1936	3035	3371
Wastewater Generated (mld)	7007	12,145	16,662	23,826	35,558	1226	1280	1650	2428	2696
Wastewater treated (mld) (per cent)	2756 (39)	2485 (20.5)	4037 (24)	6955 (29)	11,553	67 (5.44)	27 (2.12)	62 (3.73)	89 (3.67)	234
Wastewater untreated (mld) (per cent)	4251 (61)	9660 (79.5)	12,625 (76)	16,871 (71)	24,004	1160 (94.56)	1252 (97.88)	1588 (96.27)	2339 (96.33)	2463

Source: Bhardwaj (2005).

It is estimated that the projected wastewater from urban centres may cross 120,000 mld by 2051 and that rural India will also generate not less than 50,000 mld in view of water supply designs for community supplies in rural areas.

Industrial waste water generation

Industrial water demand has been increasing with the pace of industrial development. The growth in some of the water intensive industries has been quite significant, putting further pressure on the industrial demand for water. Industries not only consume water but also pollute it. According to the *World Development Report* (WDR) of 2003, in developing countries, 70 per cent of industrial wastes are dumped without treatment, thereby polluting the usable water supply. Thousands of small scale and bigger industrial units dump their waste, more often toxic and hazardous, in open spaces and nearby water sources. Rapid industrialization has resulted in the generation of huge quantity of wastes, both solid and liquid, in industrial sectors. Despite requirements for pollution control measures, these wastes are generally dumped on land or discharged into water bodies, without adequate treatment, and thus become a large source of environmental pollution and health hazard. In a broad sense, industrial wastes could be classified into two types.

- Hazardous industrial waste:

  Hazardous wastes, which may be in solid, liquid or gaseous form, may cause danger to health or environment, either alone or when in contact with other wastes. Hazardous waste in particular includes products that are explosive, flammable, irritant, harmful, toxic, carcinogenic, corrosive, infectious, or toxic to reproduction.

- Non-hazardous industrial waste

  According to CSE (2004), on an average, each litre of wastewater discharged further pollutes about 5–8 litres of water which raises the share of industrial water use to somewhere between 35–50 per cent of the total water used in the country, and not the 7–8 per cent that is considered as the industrial water use. Table provides estimates of water consumption and wastewater generated by different industries in India (Table 1.2).

Table 1.2: Estimates of water consumption and wastewater generated by different industries in India

Industrial Sector	*Annual wastewater discharge (million cubic metres)*	*Annual consumption (million cubic metres)*	*Proportion of total water consumed in industry (per cent)*
Thermal power plants	27,000.9	35,157.4	87.87
Engineering	1551.3	2019.9	5.05
Pulp and paper	695.7	905.8	2.26
Textiles	637.3	829.8	2.07
Steel	396.8	516.6	1.29
Sugar	149.7	194.9	0.49
Fertilizer	56.4	73.5	0.18
Others	241.3	314.2	0.78
Total	30,729.2	40,012.0	100.0

Source: CSE (2004).

Together, India's largest cities generate more than 38,254 million litres of sewage1 each day. Of this, it is estimated that less than 30 per cent of what is collected undergoes treatment before it is disposed into freshwater bodies or the sea

Impact on Environment:

The municipal waste material has positive and negative impact on the environment. Undesirable constituents in wastewater can harm human health as well as the environment. The negative impact on the environment and human health of waste is due to the improper treatment of waste disposal. Raw domestic wastewaters normally carry the full spectrum of pathogenic microorganisms—the causative agents of bacterial, virus, and protozoan diseases endemic in the community and excreted by diseased and infected individuals. Toxic chemicals from sewage water transfer to plants and entire in the food chain and affect public health. Hence, wastewater irrigation is an issue of concern to public agencies responsible for maintaining public health and environmental quality.

The semi-arid tropics (SAT) are generally characterized by highly variable, erratic and low rainfall, low productivity soils and poor development infrastructure. Due to variations in seasonal rains during the crop growing period, crop may face drought and occasionally water logging. Thus environmental degradation only leads to soil and water pollution, natural hazards, and scarcity of water etc.

Today, millions of small-scale farmers in urban and peri-urban areas of developing countries depend on wastewater or wastewater polluted water sources to irrigate high-value edible crops for urban markets, often because they have no alternative sources of irrigation water. Hence, wastewater irrigation is an issue of concern to public agencies responsible for environmental quality.

According to the WHO report on Environment and Sanitation (1998), it was reported that in most of the peri-urban areas around the world, an increase in population, water consumption, and a rapid increase in waterborne diseases stresses on the need of wastewater disposal. Health risks are increased by the fact that households and surface water drainage systems are always combined, resulting in the impurification of floodwater with excreta. Diseases like malaria are transmitted by mosquitoes that breed in block drains and ponds. This issue is particularly persistent, in locations where piped water is brought before digging drainage channels.

The insufficient physical, organizational structures and facilities for managing wastewater have resulted into extensive pollution of surface and groundwater thus worsening issues related to environmental health. The greatest impacts have been felt by poor communities, who often inhabit low-lying and marginal lands, such as wetlands and along channels.

In addition to the above, decline in the availability of water resources mainly due to a rise in demand for the same has left farmers in peri-urban areas with no option but to use untreated wastewater for their irrigation and aqua farming. While some wastewater re-use has been in accordance with the usual requirements, the majority which is in most cases not treated is re-used without formality. Therefore, this effect poses a serious health risk for communities working under such agricultural settings and even those feeding on the products obtained under similar conditions. Wastewater irrigation is a common reality in three fourth of the cities in Asia, Africa, and Latin America. Wastewater irrigation is known to have its significant contribution to the heavy metal content of soils (Mapanda et al 2005, Nan et al, 2002).

Due to this the heavy metals often leads to degradation of soil health and contamination of food chain mainly through the vegetables grown on such soils (Rattan et al, 2002).Irrigation demand is typically the largest household water demand, estimated to be about 100 gallons per capita per day or approximately 60 % of typical homes overall water use (Mayer, 1999). Organic chemicals usually exist in municipal wastewaters at very low concentrations and ingestion over prolonged periods would be necessary to produce detrimental effects on human health. This is not likely to occur with agricultural/aqua cultural use of wastewater, unless cross-connections with potable supplies occur or agricultural workers are not properly instructed, and can normally be ignored.

While recycling and reuse of wastewater for agriculture, industry, and non-potable urban purposes can be a highly effective strategy for developing a sustainable water resource in water-scarce areas, nutrient conservation, and environmental protection, it is essential to understand the health risks involved and to develop appropriate strategies for the control of those risks. There is need to concentrate on the control of pathogenic micro-organisms from wastewater in agricultural reuse since this is the most widely practiced form of reuse in India. There will be an increased motivation to divert recycled wastewater from low income agriculture to areas where the added value of water is greater, such as industrial and non-potable urban uses including public parks, green belts, and golf courses. As time goes on and water shortages in arid areas increase, there will undoubtedly be an expansion of the reuse of purified wastewater for industrial and a wide variety of urban non-potable purposes. Concern for human health and the environment are the most important constraints in the reuse of wastewater.

The physical and mechanical properties of the soil, such as dispersion of particles, stability of aggregates, soil structure and permeability, are very sensitive to the type of exchangeable ions present in irrigation water. Thus, when effluent use is being planned, several factors related to soil properties must be taken into consideration.

Impact from wastewater on agricultural soil, is mainly due to the presence of high nutrient contents (Nitrogen and Phosphorus), high total dissolved solids and other constituents such as heavy metals, which are added to the soil over time. Wastewater can also contain salts that may accumulate in the root zone with possible harmful impacts on soil health and crop yields. The leaching of these salts below the root zone may cause soil and groundwater pollution (Bond 1999). Wastewater induced salinity may reduce crop productivity (Kijne et al. 1998). The net effect on growth may be a reduction in crop yields and potential loss of income to farmers. Wastewater irrigation may lead to transport and bio-accumulate heavy metals to soils, affecting soil flora and fauna. e.g., Cd and Cu, may be redistributed by soil fauna such as earthworms (Kruse and Barrett 1985). In general, heavy metal accumulation and translocation is more a concern in sewage sludge application than wastewater irrigation, because sludge formed during the treatment process consists of concentrations of most heavy metals. The impact of wastewater irrigation on soil may depend on a number of factors such as soil properties, plant characteristics and sources of wastewater.

Heavy Metal Contamination:

The use of untreated wastewater for irrigation, no doubt pose a high risk to human health in all age group. However, the degree of risk may vary among the various age groups. Untreated wastewater irrigation leads to relatively higher prevalence diseases. Impact of wastewater on human health is the valuation of public health risk associated with wastewater irrigation. The public living within and outside the wastewater irrigation zone, should be considered as potential exposure groups for economic valuation purpose.(Meaning). Thus, the wastewater disposal and reuse of wastewater with treatment is necessary. So the no. of techniques are available for wastewater treatment but in current situation the economical and environmental friendly technique is accepted.

Heavy metals in wastewater pose to health risk if they are in high concentration, it may be toxic to environment. Uptake of heavy metals by plants and enters in the food chain and affected to animal and human health by consuming such contaminated vegetables.

Municipal sludge, however, often contain undesirable chemicals which may be toxic to plants and/or eventually toxic to animals and human that consume edible parts of such plants [E. Epstain, 1975].

Metals are extensively used in several industries, including mining, metallurgical, electronic, electroplating and metal finishing. Under certain environmental conditions, metals may accumulate to toxic level and cause ecological damage. (Jefferies and firestone, 1984) Heavy metal pollution occurs due to the untreated effluent from industries, refineries and waste treatment plants and contaminants indirectly enter to the water supply systems and from the atmosphere via rain water (Vijayaraghavan and Yun 2008). Now a day the situation become worst by addition of heavy metals to the environment by increasing of industrial and domestic activities. Human activities also create situations in which the heavy-metals are incorporated into new compounds and may be spread worldwide **(Young, 2000).**

A significance rise in metal production began since the beginning of 20th century, which witnessed increase the in the global population and gross net product (GNP) of developed countries. Hence, the metals become important role in life of human being. Increasing environmental pollution by heavy metals results from their utilization in industrial process (Nriagu and Pacyna, 1998). Thus, in modern days, a great deal of concern has been expressed over problems of the contamination of the water and soil due to heavy metals. The rapid development of the industrialization and urbanization is responsible for increasing of the environmental pollution through out the world. Apart from natural processes, heavy metals may enter environment through anthropogenic activities such as mining, smelting, sewage sludge disposal, application of pesticide and inorganic fertilizers and deposition from atmosphere.(Alloway 1995, Banuelos and Ajwa 199, Knox et.al 1999, Mc Laughlim and Singh 1999).

The heavy metal pollution related to industrial emission but now days various types of manmade activities also produce a large amount of waste. The heavy metals most frequently encountered in this waste include arsenic, cadmium, chromium, copper, lead, nickel, and zinc, all of which pose risks for human health and the environment. These elements can accumulate in the plants and animals eventually in humans also through food chain. The health hazards presented by heavy-metals depend on the level of exposure and the length of exposure. In general, exposures are divided into two classes: acute exposure and chronic exposure. Acute exposure refers to contact with a large amount of the heavy-metal in a short period of time. In some cases the health effects are immediately apparent; in others the effects are delayed. Chronic exposure refers to contact with low levels of heavy-metal over a long period of time **(Young, 2000).**

Pollution in the Girna River

River Girna is the primary source of drinking water for Malegaon and Jalgaon City and also for many cities; towns and villages in the neighbouring river, houses about 86 villages are on the bank of the River from Malegaon to Jalgaon where Girna meets River Tapi. (Cities and Villages population over 12,61,033), effluents from unidentified industries may be from household small scale industrial activity and polluting wastes from several other non-point sources are discharged into the river Girna resulting in its pollution.

In the last few decades, however, there has been a serious concern over the deterioration in its water quality. The river has been receiving large amounts of partially treated and untreated wastewater during its course, especially from Malegaon and Jalgaon. Pollutants flowing into the river are contributed from the waste of the cities situated along its bank.

From unknown many industrial activities, people living in big colonies, slums and rural areas, there domestic activities trigar the pollution load in the river with impunity because of untreated water. Increasing pollution of the Girna has now become a major issue and a cause of concern for environmentalists.

Two major towns on the bank of the Girna are densely populated. Most of the unidentified household small scale industries have no effluent treatment facilities and dump their wastes directly into the river. Once the lifeline of adjoining villages and towns, Girna has now became the most polluted water resource of the State. It now looks like a sewer.

Impact of River water pollution

The pollutants include oils, greases, plastics, plasticizers, metallic wastes, suspended solids, phenols, toxins, acids, salts, dyes, cyanides, pesticides etc. Many of these pollutants are not easily susceptible to degradation and thus cause serious pollution problems. Contamination of ground water and fish-kill episodes are the major effects of the toxic discharges from industries. Discharge of untreated sewage and industrial effluents leads to number of conspicuous effects on the river environment (Table 1.3). The impact involves gross changes in water quality viz. reduction in dissolved oxygen and reduction in light penetration that's tends loss in self purification capability of river water.

Table 1.3: Environmental implications of the discharge of sewage and industrial effluents

S.N.	Factor	Principal environmental effect	Potential ecological consequences	Remedial action
1.	High biochemical oxygen demand (BOD) caused by bacterial breakdown of organic matter	Reduction in dissolved oxygen (DO) concentration	Elimination of sensitive species, increase in some tolerant species; change in the community structure	Pretreatment of effluent, ensure adequate dilution
2.	Partial biodegradation of proteins and other nitrogenous material	Elevated ammonia concentration; increased nitrite and nitrate levels	Elimination of intolerant species, reduction in sensitive species	Improved treatment to ensure complete nitrification; nutrient stripping possible but expensive
3.	Release of suspended solid matter	Increased turbidity and reduction of light penetration	Reduced photosynthesis of submerge plants; abrasion of gills or interference with normal feeding behavior	Provide improved settlement, insure adequate dilution
4.	Deposition of organic sludges in slower water	Release of methane and hydrogen as sulphide matter decomposes anoxically, Modification of substratum by blanket of sludge	Elimination of normal benthic community loss of interstitial species; increase in the species able to exploit increased food source	Discharge where velocity adequate to prevent deposition
Other poisons				
1.	Presence of poisonous substances	Change in water quality	Water directly and acutely toxic to some organisms, causing change in community composition; consequential effect on pray- predator relation; sub- lethal effects on some species	Increase dilution
Inert solids				
1.	Particles in suspension	Increased turbidity. Possibly increased abrasion	Reduced photosynthesis of submerged plant. Impairing feeding ability through reduced vision or interference with collecting mechanism of filter feeders (e.g. reduction in nutritive value of collected material).Possible abrasion	Improve settlement
2.	Deposition of material	Blanketing of substratum, filing of interstices and/or substrate instability	Change in benthic community, reduction in diversity (increased number of a few species)	Discharge where velocity adequate to ensure dispersion
				Source: S. C Santra

On the worldwide scale, the river water pollution leads hazardous impact on aquatic animals and plants. Some studies show alarming condition of river pollution implications. Pratap B and Vandana performed detailed study on pesticide accumulation in Fish species and concluded that, pesticide bioaccumulation was higher in cat- fishes as compared to carps and have species specific in their tissues (liver, brain and ovary) causing metabolic and hormonal imbalance affecting at GnRH and GTH secretion. The reproductive sex steroid hormones were lowered in catfishes and carps of the polluted rivers. They suggested that the bio accumulated insecticide in ovary may cause blocking of the receptor site so that natural hormone cannot bind at the site of estrogen receptor which may cause the dysfunctions of the reproduction in catfish and carps inhabiting the polluted rivers. They also suggested that the fish bio accumulated insecticide beyond permissible limit must be avoided for the food purpose from such polluted rivers.

Contamination by synthetic organic pollutants is a more recent phenomenon which is even more difficult to demonstrate for lack of appropriate monitoring. Many streams and rivers in South America, Africa and particularly on the Indian sub-continent show high coliform levels together with high BOD and nutrient levels. Eutrophication, which has spread widely to lakes and reservoirs of developing countries now also, affects slow flowing rivers.

CHAPTER II

INTRODUCTION OF MAJOR CITIES

MALEGAON CITY

Malegaon is the city which lies in the north-west region of the Nashik district of Maharashtra state. Malegaon is situated on the Mumbai-Agra national highway no NH-3. It is also district administrative center. The local language spoken in Malegaon is Khandeshi, as it is situated very near to the Dhule district of Khandesh region. The city is situated at 425 M. above MSL. The general topography is plain sloping towards the Mosam River which flows North - South direction.

The Mosam River is one of the main features in the Malegaon city and is tributary of Girna River and divides the Malegaon city into two parts and flows in West to East direction. The eastern part of the river, houses old Malegaon, which is main commercial market in the city, whereas western part of the city is new Malegaon consists of newly developed Hindu Residential areas. Malegaon is also one of the major producer and exporters of the grapes and pomegranates in the Nashik region. The predominant soil is Black Cotton soil. The population of Malegaon city as per 2001 census is 4,09,403. It is one of the cities having largest population density in India today. Malegaon is famous for its Powerlooms business. This business is more than 100 years old and is prominent with major economic dependence. The Rangeen Saree made at Malegaon was very famous and was exported to all over the country. Currently, cotton and synthetic textiles are main product from the power looms business in the city. The 70% population in the Malegaon city is of Muslim community mainly came from Uttar Pradesh and Rajasthan. All of them are involved in weaving business and hence are known as weavers. It has evolved as the regional growth center, attracting economic activities and providing livelihood for large in-migrating population.

Malegaon Municipal Corporation is a ‘D’ Class Corporation and has come into existence on the 17th December 2001. The corporation is constituted under the provision of Bombay Provincial Municipal Corporations Act, 1949 and is also governed by the provisions of the 74th Constitutional Amendment Act 1992 (CAA). The growth of any urban centre has the influence on it from the regional sphere. After attaining a sizable centre it will in turn greatly influence the region. Malegaon city which has grown rapidly through the last decades has a 4 lakh population at present. It has reached a stage wherein its growth is interconnected to the growth of Malegaon Tehsil. So it is necessitated to incorporate a brief study of the Tehsil with district also.

Brief History of Malegaon City

Malegaon city is located in the northwestern Maharashtra state, western India, on the Girna River, part of the Nasik urban agglomeration, on the Bombay–Agra highway. An important market for agricultural produce, it was an early centre of the handloom industry. It has rapidly industrialized and recorded remarkable growth since the 1940s. Cotton and silk goods are exported to Bombay, Pune and other places. Despite being known as a city of power looms, Malegaon has seen the infrastructure and quality of life deteriorate over the years. While population has grown from 1.21 lakh in 1961 to an estimated four lakh people now, the roads, drainage systems and educational facilities are poor. Around 55 per cent of the residents stay in slums and 44,173 of the 71,245 households lack toilets.

There are almost no open spaces, water supply is erratic and literacy rate is a dismal 35.5 per cent for women. Half the children are delivered at home and public health facilities are not able to cater to the population. Most of the residents of this 13 sq-km area around a fort built by Peshwa general Naro Shankar are descendants of Muslim weavers from Uttar Pradesh who migrated here after 1857. Nearly three-quarters of Malegaon's population belong to minority Muslim community. It has a history of communal violence and the town is divided by a river Mosam separating the two communities which needs to be given special emphasis while planning.

Looking at the development through the decades and existing Infrastructure inadequacies, renewed efforts have to be taken up to uplift the standard of living and revive the economy.

Profile of Malegaon City

Malegaon City with a jurisdiction of about 12.95 sq. km., is the headquarter of the Malegaon Taluka of Nashik District in the Khandesh Region. It has got a very rich historical background. In A. D. 915 Malegaon was known as “Mahuli Gram” under the emperor of Indra Raj (Third) who belong to the Rashtrakut King. Then after in 1757, under Mughal Emperor, Malegaon was awarded to a Maratha Sardar of Peshwa

– Naro Shankar Raje Bahadur. He built a historical Fort – Bhuicoat, on the left bank of the river Mosam and to protect the Fort, Raje Bahadur introduced Momin Solders' army, in future has started the Handloom industries, which has given a historical fame to Malegaon as big centre in Handloom industry. During their rule, the city expanded considerably. Malegaon's heritage structures – Fort, Lord Shiva's Old Temple, and old Raja Bahadur Wada in Gaothan area – indicate the historical importance of this town.

In 1818, after a long war with Maratha and Momin Army, British Rulers captured the Fort of Malegaon. British Army stayed in the North portion of the city which is known as Camp Area and the ultimately the development of Camp site was accelerated.

Alongside, Malegaon has been functioning as one of the engines powering the Indian economy in power loom. In 1935, Power-loom industries overcome the handloom industries has multiplied and has drastically increased the employment in this sector and given a strong shape to this sector and which ultimately became the traditional look of this City. Every corner of the City has the sound of Power loom as its characteristic. In 1857 the first revolution for freedom was started and in 1948, Hyderabad Mukti Sangram took place and because of the fear of British Rulers a large amount of Muslim people migrated to Malegaon and adopted the traditional power loom business. Day by days, as industry developed and the employment base widened, migrant population from the nearest villages, Districts, States to Malegaon in search of employment and settled in various parts of the town and contributed in power loom industry to become the identity of Malegaon as one of the biggest centre in power loom. Through 1.1 lakh power looms, 80000 people are directly employed in power loom industry with more than Rs.10 Crores daily turnover and also 2.5lakh people are engaged in textile sector. Today, Malegaon has emerged as the most vibrant economic belt in power loom industry of the nation. Thus the city became predominantly a marketplace and mixed land use prevailed.

In general industrial activity in Malegaon town is predominantly power loom based which forms the main source of and is also considered as a backbone of livelihood. But apart from the powerloom industries, the other important industries are Agri-industries, Plastic Pipes manufacturing; cotton spinning, Ginning, Oil Mills, Fabrication, Tile Manufacturing and Lie factories etc. contribute to Industrial base in Malegaon.

The Civil Administration of the Town was formerly carried out by the Municipal Council which was functioning since 1863. Council converted into the Corporation and the Malegaon Municipal Corporation came into existence on 17th December 2001. Corporation is governed by the Bombay Provincial Municipal Corporation (BPMC) Act, 1949 and is bound to provide basic infrastructure like water supply, drainage, sewerage, health, education, roads in present electoral 72 wards of the city.

Important Events that shaped today's Malegaon City

- Above 200 years back, Malegaon was a kasba (a small place) and was called Maliwadi (hamlet of gardeners).
- One of the Sardars of Bajirao Peshwa, Naroshankar, was given 18 villages including Maliwadi and he invited a number of engineers, stone cutter an artisan, who were mostly
- Muslims from the north, especially suburbs of Delhi.
- These Muslim artisans also brought their language Urdu for the first time to Maliwadi.
- The artisans lived in a basti (settlement) opposite to the fort, across the river, which is today known as Sangmeshwar and, Maliwadi became Malegaon.
- The first Idgah in Malegaon was built by one of the Rohilla sepoys Dilawar Khan in 1816.
- When the British captured the Malegaon fort in 1818, they invited Muslims of Hyderabad from Nizam's territory to Malegaon.
- After the munity in 1857, many Momins, the largest number of Muslims ever to migrate to Malegaon, came from north India to Malegaon in search of security.
- In 1862, Muslims from Banaras who were mostly weavers, as there was a famine around this time, too migrated to Malegaon.
- Malegaon has become traditional handloom-weaving centre in Maharashtra.

- The era of power looms in Malegaon emerged after 1935
- The cloth industry in Malegaon flourished due to increased productivity.
- Many more Muslims weavers from U.P., Khandesh and Deccan migrated to Malegaon. These migrants created slums for the first time in Malegaon.
- Kamalpura, the first and the biggest slum in Malegaon, was established in the 1940s.
- Many more slums were created as the political and social turmoil in Hyderabad in the late 1940s and 50s and the riots in 1960s led to massive migration of Muslims into Malegaon.
- The influx was so large that three new municipal wards came into existence.

Location:-

Malegaon with a jurisdiction of about 12.95 sq. km. is geographically located at 20032' North Latitude and 72035' East Longitude at about 478.44 meter above mean sea level. Malegaon is well connected with all the nearest States and the districts of Maharashtra. It is situated on the road linking Mumbai and Agra — now National Highway No 3 — it was once a small junction known as 'Maliwadi' (hamlet of gardens). Nashik City is located around 110 km. whereas the nearest Railway Junction, Manmad is about 40 km. from Malegaon. Dhule is nearest City at just 51 km.

The area of the corporation is spread up to the boundary of village Soygaon on Satana Road, village Dabhadi and Bhaygaon towards west, villages Dyane, Daregaon on the North side, villages Sayane, Mhalde on East and villages Chandanapuri and Mhalde on South side.

Climate and Rainfall

The climate of the city is almost dry except southwest monsoon season that sets in the first week of June and last about 2.5 to 3 months i.e. upto September. The average annual rainfall in the city is about 550 mm and the temperature range is between 42.50 (maximum) in summer and 20 centigrade (minimum) during the winter.

Economy

The Economy of Malegaon has passed through phases of transformation over the years. The growth of modern industry in Malegaon started way back in the nineteenth century. Malegaon was a city with a predominantly working class population and its urban economy was heavily dependent on the Powerloom and Plastic Industries.

Malegaon has been functioning as one of the engines powering the Indian economy in powerloom. In 1935, Power-loom industries overcome the handloom industries. It has drastically increased the employment in this sector and gave a strong shape to this sector and which became the traditional look of this City.

In due course the textile industry has become important economic driver, providing employment to even migrant people and later on the industry consolidated. Presently around 1.1 lakh powerlooms operate in various parts of the city employing about eighty thousand people. More than 5000 industrial units are in operation of all the sizes of Powerloom. Mainly the powerloom industries are engaged in Grey Cloth, Synthetic and Cotton Fabrics, Dyed Cloth, Printed / Dyed Sarees, Lungis, Processing of raw clothing etc. Majority of population is having the weaving to be the main occupation. Women and children work on the Looms as well undertake the associated operations.

Major concern of the city is been sprawl of slums estimated to be 132 nos. with estimated population of 2.67 lakhs and 90% of the slum population is engaged with the Powerloom associated workings. Low operating and maintenance cost, cheap material and simple living standard is the main boosting and supporting factor for the growth of this Sector here. In due course, Malegaon emerged as the most vibrant economic belt in powerloom industry of the nation. In short, the below mentioned table describe the entire scenario of Powerloom Industry in the city (Table 2.1).

Table 2.1 Assessment of Powerloom Industry

Number of Powerloom in City	More than 110000
Employment through Powerloom	More than 80000
Employment through entire Textile Sector	More than 250000
Daily Production in Powerloom Industry	More than 60-70 lacs meter
Daily turnover through entire Textile Sector	More than Rs.10 Crores

(Source: - City Sanitation Plan)

Nearby villages like Kawlana Area, Chalisgaon Phata, Dyana, Ramjanpura, Mhalde Shiwar, Daregaon Dhiwar are also providing their valuable contribution in increasing the picture of Powerloom industry in this region. With the strong economical backing of these villages Malegaon stands very strongly in the line of Powerloom sector in India. There are 18 lacs total powelooms in India out of that Bhiwandi (Thane) & Surat is having 7 lacs each, Malegaon – 1.10 lacs and Ichalkaranji – 1 lacs. This is the third largest powerloom centre in India. Powerloom industry in Malegaon is known as Manchester of Powerloom of India. For giving a concrete base to the Powerloom sector including other, "D+ Zone" MIDC industrial zone with around 160 hectares is under development at Saine which is on NH-3 and also very close to Malegaon City.

Malegaon has one spinning mill 'Malegaon Co-op. spinning Mill'. It also has three sugar factories, which are currently under not working and oil mills in nearby regions. In general, industrial activity in Malegaon town is predominantly power loom based which forms the main source of and is also considered as a backbone of livelihood. But apart from the power loom industries, the other important industries are Agricultural Plastic Pipes manufacturing; cotton spinning, Ginning, Oil Mills, Fabrication, Tile Manufacturing and Lie factories etc. are also providing their contribution in supporting and boosting the industrial activities in Malegaon.

Another important business in the city is PVC pipe manufacturing business. The business consists of small and medium scale units spread across the outskirts of the city. Some of the main PVC pipes manufacturing units in the city are Navkiran Plastics, Sujal Plastics, Kabra Plastics, Nakoda Plastics etc.

This is the second largest industrial activity which is on boom and providing a strong support to the urban economical activities of Malegaon. This is one of the biggest centres of reprocessing unit in Asia. Raw material for this sector is imported from various cities of India. From Nashik, Pune, Mumbai, Hyderabad, Ahmedabad, Surat, Delhi etc. more than 120 tonnes of raw material i.e. minimum 30 trucks a day of raw material provides activity to the plastic industry in Malegaon.

In Malegaon city, 100 Pipe Units, 200 Gitts/Lumps Units, 300 Sorting Godwons and 20 Granual & Tubing Units provide employment for more than 70000 people in Plastic Industries while more than 20000 women workers are engaged in this industrial activity. Because of the poverty, low standard of living and poverty, huge number of workers is easily available for this sector.

Malegaon being dependent on agrarian activity, trade and commerce in the city is also driven by the prospects in the agro-sector. Malegaon has emerged as one of the important regional centers for trade and commerce because –

a) By virtue of Malegaon being the largest urban center in the region it has emerged has one of the important hubs for trade and commerce particularly for power loom and agro-based products.

b) Its close proximity as well as good connectivity to other large urban centers like Nasik, Aurangabad and Pune etc. Historically, the city is known for its strength in trading of Cotton goods, particularly clothing and readymade goods. Malegaon is also famous for its regzeen sarees manufacturing which were exported to many parts of the country.

Agriculture is the one more main economic activity for people of Malegaon city as well as Taluka which provides the largest employment opportunities. The total areas available for agricultural activities are 165.828 hectares which is about 23% of the total geographical area. The principal crops are Corn, Bajara, Maize, Onion, Groundnut, Tur, Sprouts, Pomogranate, Vegetables, Rice, Wheat, Harbhara, Cotton and Sugarcane etc.

Malegaon is center for agro based products in the nearer regions. It has Agricultural Produce Market Committee (APMC) located on the camp road of the city in 23 acres of area, having administrative building, storage shed, agent’s offices etc. APMC was established during 1947 AD.

Majority of crops exported to Gujarat, Madhya Pradesh, Rajasthan, Uttar Pradesh, Bihar and rest of Maharashtra. With the help of 135 authorized commission agents and various other sources, APMC deal with daily turnover of around Rs.80 to 100 Lakhs. Total Gross Income to APMC is Rs.1.39 Crores during the financial year 2005-2006 out of which Rs.33 lakhs is the Net Income. Considering the huge activities APMC at Camp road, there are certain proposals for expansion of market yards. They are starting the Onion Market Yard at Mungase – Patan Phata (Agra Road) by the end of this year and also having proposal for the construction of more sheds. Currently APMC is having four submarkets at Umarani, Zodge, Nimgaon, Jalgaon (Nim). Out of these four Umarani is showing huge activities. It is nominated as first ranker sub-market in Maharashtra State. Daily inflow of Onion is 500 to 600 tractors through with APMC's annual income is around Rs.63 Lacs.

SEWERAGE

Sewage produced by all human communities is often left to compost naturally or it is treated using processes that separate solid materials by settlement and then convert contaminants in to biological sludge and into gases such as carbon dioxide or methane. Sewage infrastructure is designed as a safety feature that reduces sewage backups and minimizes public health impacts for residents. In view of fast development of Malegaon city, population and area-wise it has become most essential to make disposal of drainage effluent of the city in a scientific and hygienic manner in public health point of view. Moreover Malegaon is a power loom city and considerable quantity of effluent arising from the dyeing process of newly produced cloths is also to be disposed off in scientific manner.

Existing Sewerage System

An underground sewerage scheme was sanctioned for 4 lakhs populations and drainage works have been executed partly along the pumping stations. Under this scheme no work has been executed in the entire district No.1, some works of lying of collecting branch sewer is completed in District No. 2. Sewage Treatment Plant of 15 MLD capacities has been also constructed. In Dist. No. 3 & 4 trunk mains are completed partly, Pumping stations No. 2 & 3 are completed, Rising mains from Ps - II to STP site 750 mm dia. CI pipe and from PS - III to manhole chamber of Trunk line of District No.3600 mm dia are completed 90% of the work of 15 MLD STP has also been completed. The scheme has not been commissioned as envisaged in the project report.

District-I

This district is on the Eastern part of the corporation area, at the Eastern boundary the Awadi nalla flows and on the western side the North South ridge line "NS" is passing as shown in the general plan. No drainage work has been carried out in this District under the sewerage scheme sanctioned earlier.

The main sewer lines are running north-south as per the natural gradient of the city. The Sewage from the entire district is carried through the trunk main to the pumping station-1.

District-II

This district is spread along the left bank of Mosam river from North to South boundaries of the corporation area and on the East side the ridge line "North - South." The existing Trunk sewer 250 to 1200 mm dia passing along left bank of Mosam river in northsouth direction is proposed to be used .To this trunk main all main sewer lines are joined .The branch lines & laterals in the district are joined to the respective main lines . The trunk line terminates at Motibag naka on Mosam river.

District-III

This district lays North South on the right bank of Mosam river and on the west the boundary of the Corporation area. The Girna river is flowing on the southern boundary of this district. The entire sewage of this district plus 50 % of sewage from district no 4 is conveyed through above existing 700 to 900 mm dia trunk main up to Motibag Naka bridge on Mosam river and joined to the existing trunk main of district No 2 .

Fig. 2.1 Existing Sewerage System

District-IV

This district is located on the right bank of Mosam River which flows north-south direction. The northern boundary is the corporation limit on the western side villages Dabhadi & Soygaon. The effluent from the entire district is collected in existing collecting well 6.5 m dia. at the pumping station No.3 through trunk main. The S.T.P. site is located in village Mhalde on opposite side of NH3 bypass as per the original scheme sanctioned in 1979. An area of 17.84 Hectare (45 acres) is already acquired. A STP of 15 MLD capacity was constructed but the scheme was not commissioned. The waste water and sewage from city collected through the open drains is directly discharged into the Mosam river and by nallas without any treatment. The sludge flows through the open drain creating unhealthy atmosphere and bad smell, thus resulting in unhygienic conditions.

The sewerage system in the gaothan area and other dense areas is not working effectively. In the outer areas houses with independent latrines and septic tanks are coming up. In most of the developing outer area pucca surface drains are not provided which result in unhygienic conditions. It is estimated that around 21MLD of sewage generated is allowed to flow into the natural drains and only some part is treated. Malegaon city has just 6.00% of the households having closed drainage for wastewater disposal whereas around 76% of the household have open drainage channel for wastewater disposal. However, nearly 19% of the household has no proper drainage connectivity.

JALGAON CITY –

Jalgaon city is situated in north-west Maharashtra bounded by Satpuda mountain ranges in the north and Ajanta mountain ranges in the south. Jalgaon city is headquarter of Jalgaon District. Jalgaon City is considered as the agricultural and commercial capital. The Jalgaon railway junction serves routes to Mumbai, Nagpur, Delhi and Surat. The city is well developed with good roads, shopping centers and residential areas with a moderate infrastructure in communication and transport. Modern Jalgaon now boasts of vast industrial areas, educational institutes and good hospitals. Jalgaon is also the hometown of her highness Smt. Pratibha Patil, Honourable President of India.

Geographical Setup: Jalgaon city lies between 75° 31’ 36.39” to 75° 36’ 5.30”E Longitude and 20° 58’ 22.40” to 21°01’26.35”N Latitude. The average rainfall of the city is 700-750 mm which categories it as semi-arid region. Temperature extends from 10° to 46° C. City has a total of 5 lakh population during 2008 with a literacy rate 76.06%.

Linkages and Connectivity

Road Linkages: Jalgaon city is well connected by road linkages to important places of the State. The National Highway No. 6 from Mumbai – Nagpur passes through the length of the city and is the central axis of the city of Jalgaon. Further, the State Highways are Jalgaon – Ajantha and Jalgaon – Pachora that pass through the South side of the City and the Jalgaon – Mamurabad State Highway that passes through the North of the city. Major district roads are Pimprale – Avhane towards the North –

West, Jalgaon – Saokhede on South - West, Pimprala – Mamurabad on North and Jalgaon – Pimprala towards the West.

Rail Linkages: The city of Jalgaon is situated at the centre of the district geographically, and is well connected by the broad gauge lines of Central and Western Railway to Bombay, Delhi, Ahmedabad, and Calcutta. The major railway junction is located about 22 km away from the city (at Bhusawal) which is a major junction of Central & Western railway of the Mumbai – Delhi and Mumbai – Howrah line.

Air Linkage: The nearest airport is situated at Aurangabad, which is 155 km away from the city. A tender has been floated for the proposed development of the Jalgaon Airport on BOOT basis 3 or through Public Private Partnership basis.

Jalgaon Municipal Corporation:-

Jalgaon Municipal Council was established on 24th November 1864. The State Government in its notification has announced the formation of Jalgaon City Municipal Corporation (JCMC) with effect from 21st March 2003. Jalgaon City Municipal Corporation was formed as a corporate body under the Bombay Provisional Municipal Corporation (BPMC) Act, 1949.

Jalgaon City Municipal Corporation serves an area of approximately 68.24 sq. km including the city and its peripheral areas and provides a range of civic services to citizens of the city of Jalgaon. The BPMC Act entrusts the authority with responsibility for administering of duties to the city. The Jalgaon City Municipal Corporation has divided the city into 69 wards. It consists of 69 Councilors who are elected representatives of the city (ward wise) and 5 persons nominated by the councilors. The councilors are elected every 5 years. The Mayor is the first citizen of the city and is elected by the councilors and holds office for a period of two & half years. The elections to the municipal body are held every five years. The city is classified under major urban zone (Fig 2.2).

Climate

Jalgaon has a diverse climate. The climate of the town is hot and dry (except in the monsoon period) with the temperature reaching as high as 47°C. It is exceptionally hot and dry during summer that lasts from the month of March to May. The summer is the driest part of the year. Monsoon starts from June to September, which is followed by winter. The monsoon months of June to September receive about 99% of the annual rainfall with an average of 700 mm rainfall here. The amount of rainfall received per year does not vary greatly. The relative humidity is highest i.e. 92% in August and lowest i.e. 16% in April. Winters are quiet pleasant in Jalgaon city. The winter season lasts from December to February.

Topography:

Situated at 201 meters above mean sea level, Jalgaon city is bounded by the Satpuda ranges in North and Ajanta, Satmala and Chandur ranges in south. The town is situated in a generally flat terrain. A gentle slope is present towards the south as hilly areas are present along the Shirsoli and Mohadi roads and towards south-west along Girna Pumping Station road. The Girna River runs in the north - south direction along the western boundary of Jalgaon city near Nimkhedi village. The Mehrun tank is situated at the southern side of the city. The southern and northern sides of the city are rich agricultural lands (Table 2.2).

Table 2.2: Demography: Population Growth of Jalgaon City

Year	Population Growth	Decade Growth	% Growth	Growth in Annual	Growth in Decade
1951	75,303	--	--	--	--
1961	88,452	13,149	17.46	1.74	--
1971	1,17,312	28,860	32.63	3.26	15,711
1981	1,65,507	48,195	41.08	1.1	19,335
1991	2,42,193	76,686	46.33	4.63	28,491
2001	3,68,000	1,25,807	51.94	5.19	49,121
2011	4,60,228	92228	25.07	2.50	-33,579

(Source: - Census of India)

The population growth of Jalgaon city according to census 2011 is given in following table 3. The city has expanded due to increase in boundary also & it is observed that, population density is 53.94 habitants /hectare, the core density in city is on higher side. The city is presently divided in 69 wards by City Corporation.

Population Projection

The Population Growth can be assessed by geometric rate of increase and compounded average growth rate (Table 2.3).

Table 2.3: Population projection

Method	2001	2006	2011	2021	2031
Geometric rate	368000	430903	530607	693214	855821
Compounded annual	368000	423694	509312	692664	94849
Average projected growth	--	427298	519959	692939	948949

Floating population:

Jalgaon being district place and business centre, floating population is assessed on basis of influx through mode of transportation like railway, bus (M.S.R.T.C and Private bus), private vehicle etc. It is estimated that 25000 person/ day is floating population.

Scheduled caste and scheduled tribe population:

As per census 2011 the scheduled cast population is 22,128 i.e. 6% of total population and scheduled tribe population is 16,448 which contributes 4.5% of total population of Jalgaon city (Table 2.5).

Issues:

The reason for high growth rate of population is due to influx of people from the rural areas in search of employment, work, business, education etc. Hence planning in terms of infrastructure especially water supply, sanitation facility etc for such an incremental & floating population is required.

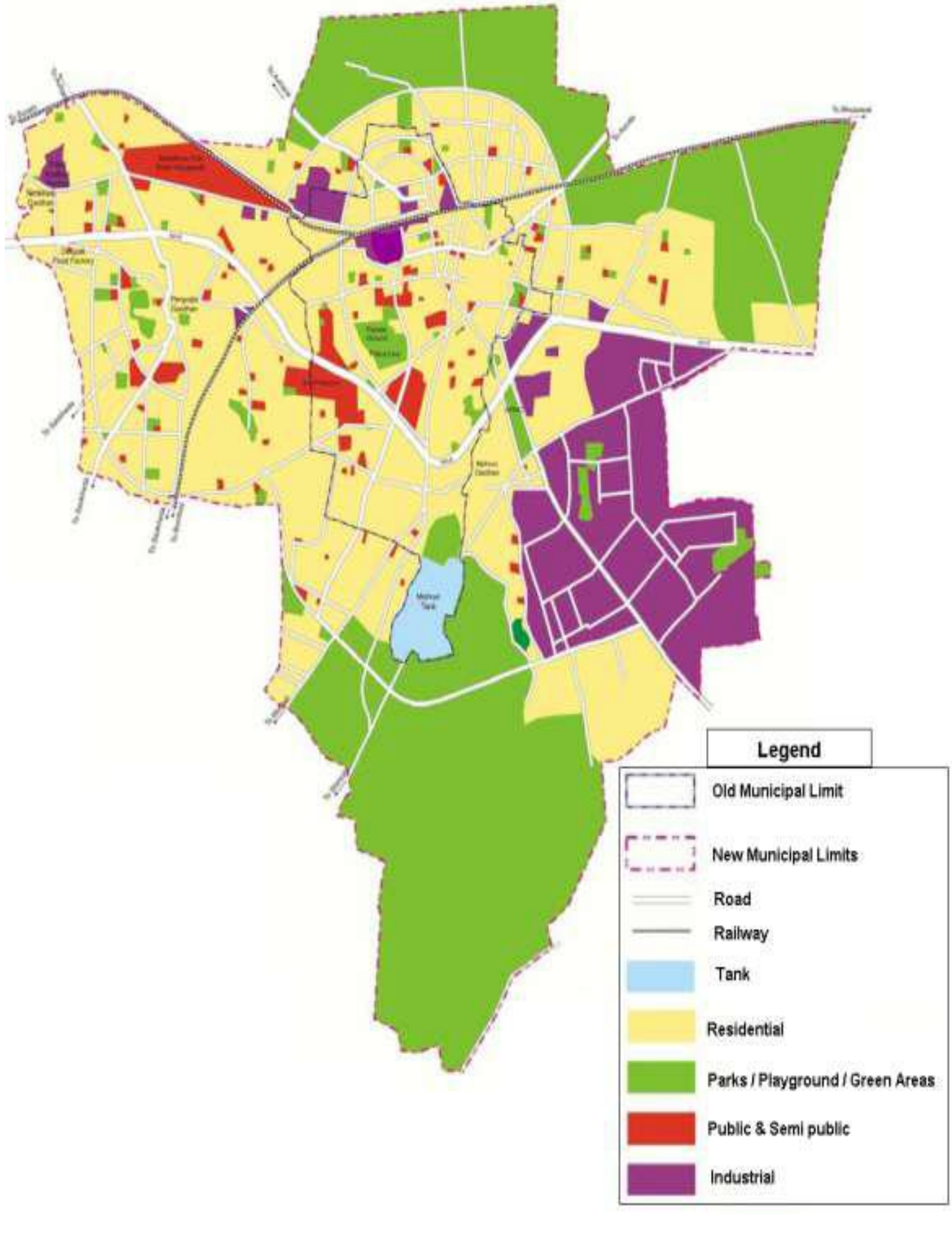


Fig. 2.2: Jalgaon Municipal Limits

Jalgaon Sanitation:-

Sewerage:

The proper sewerage system is not functional in the city. The entire city has an open sewage system with the absence of an underground drainage network. The present quantum of sewerage generated in the city is quantifiable based on population and water supply. Sewage from houses is being discharged into septic tanks and the effluent is passed either into soak pits or into surface drains creating are hazardous and unhygienic conditions in these areas.

Water Supply:

Daily water supply to the citizens is required in the city. There is a water supply system for provision of the water to all wards of the city. The system is having underground network for the water supply. If this network is not proper and the water is not provided, due to inadequate water supply and due to inefficient water supply system the leakages are observed which may create ditches and water gets accumulated where mosquitoes and other microorganisms may be surviving and creating the health problems in the surroundings.

Environment:

Healthy environment is the need of the healthy city. So as to keep the city pollution free, mass tree plantation programs are necessary. There must be certain restrictions over the tree cutting in the city. City should be green and clean to provide the fresh air and oxygen to the city population. The environmental pollution causes various health related problems in the citizens. To avoid these problems and to make city totally sanitized, environment must be clean.

Existing System

Sewerage:

A sewerage system proposal was prepared by Environmental Engineering Department of Maharashtra in 1965 for an estimated flow of 20 MLD. The proposed sewer network system was laid on the main roads and no branch sewer in the side streets to pick house connection was provided. At present existing sewerage system is non -functional .The entire city has an open sewage system with the absence of an underground drainage network. The present quantum of sewerage generated in the city is quantifiable based on population and water supply. Sewage from houses is being discharged in to septic tank and the effluent is passed either into soak pits or into surface drains creating hazardous & unhygienic condition in this areas.

Therefore in absence of any Sewerage system, sewage primarily treated at septic tank in developed area and untreated from slum area, along with waste water from kitchen and bathroom, flows through constructed /unconstructed gutters on surface, ultimately leading to four major natural nallas /streams flowing through cities.

Water Supply:

Water supply in this area at present is mainly served by three water supply schemes viz, Girna water pumping station and Dapora filtration plant on Girna River. The Girna Dam is located 140 km away from Jalgaon .The Dapora filtration plant is situated 5 km away from the city in proximity to Girna water pumping station. The water source to this filtration plant is through the Dapora weirs schemes viz, Girna water pumping station and Dapora filtration plant on Girna river tank through the rising main.(Table 2.4)

Table 2.4: Details of water supply schemes for the town

	Scheme-1	**Scheme-2**	**Scheme-3**
	Girna Intake Wells	**Dapora K.T. weir**	**Waghur Dam**
Year of Commissioning	1927	1987	2008
Capacity of scheme (MLD)	20.00	30.00	108.20
Financial assistance and amount	--	Govt. Grant and Municipal Funds	Govt. Grant and Municipal Funds through Hudco loans
Components added	Infiltration wells	Water treatment plant	Water treatment plant, pure water gravity main

Augmentation to Jalgaon Water Supply Scheme Stage V, Phase –I is an ongoing project from the water source of Waghur dam, located 16 km southeast of Jalgaon city. The scheme proposes to serve as a secondary source of water supply to the city whose population by 2030 is projected to be 8,76,700 persons, with a water supply requirement of 149 MLD. The scheme is planned at a total cost of Rs. 159.25 Crore (Rs.25.00 Crore-Govt. of Maharashtra, Rs. 47.55 Crore - State Government – Department of Irrigation and remaining Rs. 84.26 Crore - JCMC through a loan from HUDCO).

There are 10 Elevated Storage Reservoirs (ESR) & 4 Ground Level Storage Reservoirs (GLSR) in

Jalgaon city, out of which 9 ESR's are spread around the city such as:

1. Genda Lal mill located at Shivajinagar ,with a capacity of 2 million litres
2. Akashwani located behind Collectors office with a capacity of 2.5 million litres
3. DSP Chowk with a capacity 2.8 million Litres
4. Daulat nagar tank with a capacity of 0.3 million litres
5. Pimprala with a capacity of 0.175 million litres
6. Mehrun with a capacity of 0.125 million litres
7. Tambapurawith a capacity of 0.1 million litres
8. Khanderao nagar with a capacity of 28 MLD
9. Nithyanand nagar with a capacity of 28 MLD
10. Girna taki with a capacity of 3.5 million Litres

There are 5 GLSR reservoirs of which two are combined; they are the Hari Vittal Nagar with a capacity of 0.05 million Litres, Girna Taki 1 & 2 located behind M J College with a capacity of 2.25 million Litres, Girna Taki No. 3 with a capacity of 4.5 million Litres and Girna Taki No.4 with a capacity of 3.5 million Litres. Water supply is provided on alternate day covering 50 % area daily.

Sewerage

Wastewater generation, collection, treatment and disposal

JCMC report daily water supply level of 140 Litres per person at consumer level. In 2001 the population of Jalgaon was 3,68,681 Considering annual growth of percent (observed in 1991-2001decade) , the population in 2010 is expected to be about 5,10,130 Assuming a sewage return factor of 0.80 (80 %) ,the current wastewater generated can be estimated to 57.13 MLD

Sewage return factor is the unit quantity of Sewage (wastewater) generated, expressed as a percentage (or proportion) of water supply. E.g. sewage return factor of 0.80 indicates that sewage generation is 80% of water supplied.

Jalgaon has industrial area where waste water is treated and utilized as per the industrial norms. The Municipal wastewater primarily consists of sullage and overflow from septic tanks. Waste water is mainly disposed through roadside drains of which some sections are covered in a few cases, latrines discharge is directly into the drainage. Therefore causes a situation where the drainage system serves a dual purpose of carrying domestic waste water (mainly sullage and overflow from individual septic tanks) as well as rainwater runoff. This is not a desirable situation and needs to be improved. The proposal contained in this report considers safe containment, treatment & disposal of human excreta and community liquid waste. The topography of Jalgaon city and the surrounding is such that the natural drainage system generally slopes towards South-North as shown in plans of UGD project & city development plan .Domestic wastewater from the city is discharged into four major nalla. This is not a desirable situation.

Considering the above fact, JCMC has prepared detailed underground drainage proposal covering 69 wards of the city except, few wards are partly covered. As per CPHEEO manual, the design period of 30 years is considered from the year of commissioning of the project. The commissioning year is considered 2013. The scheme is designed for 2043 population viz.11,64,298 no’s. The Jalgaon city is divided in to four zones, based on the topography and the availability of location for sewerage pumping station and sewerage treatment plant .Each zone is generally related to four major water courses i.e. natural nalla flowing through the city.

Zone I: - The zone I contains ward no's 34, 35 area is completely covered and ward no. 7,8,9,10,36 &69 are partly covered.

Zone II :-The zone II contains ward no's 6, 11, 12, 13, 14, 27, 28, 29, 30, 31, 32, 33, 37, 38,39, 40, 54,55,56,57,58,59,60,61,62,63& 64 are completely covered .And ward no's 5,7,8,9,10,36,41,53,65,68&69 are partly covered.

Zone III :- The zone III contains ward no's 1, 2, 3, 4,15,16, 17, 18, 19, 20, 24, 25, 26, & 42 are completely covered and ward no's 21, 23, 41, 43, 44, 52, 53 & 66 are partly covered.

Zone IV:- The zone IV contains ward no's 22, 45, 46, 47, 48, 49, 50, 51 & 67 are completely covered. And ward no's 21, 23, 43, 44, 52, 65, 66&68 are partly covered.

Out of the above wards, some of the wards are repeatedly covered under consecutive zones according to topography of wards and the zones proposed. The components of the sewerage scheme are designed for the peak flow 289.21 MLD in 2043 year. The sewer lines are designed for the year 2028 population and pumps and Sewage treatment plant are proposed and designed for the population in year 2043. However, construction is proposed in phase manner.

The sewer lines are not respected to receive storm water. The trunk sewers are proposed along the side of nalla to which mains are proposed to be connected. Property connections are proposed to connect branch sewer and branch sewer to trunk sewer. The connection cost of property connection is not included in this proposed scheme. Minimum size of sewer is 150 mm for gravity pipe line section, concrete pipes proposed. And for rising main D.I. K-9 pipe are proposed.

Two conventional sewage treatment plants each having the capacity of 50 MLD and in immediate step two plants of 20 MLD are proposed design period of population up to year 2043. The sewage from low line is proposed to be lifted with submersible pump. The expected efficiency of these conventional sewage treatment plants is considered as 85 to 87%. The treated effluent from these treatment plants are proposed for irrigation purpose and the methane gas liberated will be used in the premises of the plants for running the machinery and purpose of lighting. The total cost of the sewage scheme work out is Rs. 183.77 Cr. Net and Rs. 224.20 Cr. (as per DSR- 2007) Gross including 5% contingencies plus 2% work charge establishment.

Table 2.5: List of adjoining villages to River Girna or those whose waste water comes to River Girna

District	Taluka	Village	No_HH	TOT_P	TOT_M	TOT_F	P_SC	M_SC	F_SC	P_ST	M_ST	F_ST	P_LIT	M_LIT	F_LIT
Nasik	Malegaon	Amode	439	2,377	1,302	1,075	91	44	47	794	481	313	1,642	987	655
Nasik	Malegaon	Nardane	302	1,509	792	717	344	175	169	399	215	184	880	506	374
Nasik	Malegaon	Borale	413	2,198	1,142	1,056	262	134	128	744	361	383	1,241	724	517
Nasik	Malegaon	Malgaon	437	1,713	913	800	93	49	44	764	395	369	1,073	637	436
Nasik	Malegaon	Umbardhe	277	1,392	726	666	151	77	74	645	316	329	777	446	331
Nasik	Malegaon	Kalamdari	487	2,173	1,135	1,038	111	56	55	777	401	376	1,503	842	661
Nasik	Malegaon	Dahiwal	660	3,362	1,768	1,594	109	57	52	463	254	209	2,308	1,336	972
Nasik	Malegaon	Ronzane	255	1,480	780	700	73	37	36	504	261	243	890	510	380
Nasik	Malegaon	Malagaon	598	3,057	1,591	1,466	358	184	174	743	389	354	1,953	1,112	841
Nasik	Malegaon	Sitane	146	854	432	422	101	54	47	62	35	27	542	308	234
Nasik	Malegaon	Ajande Kh	118	786	411	375	66	32	34	582	297	285	343	202	141
Nasik	Malegaon	Khayade	434	2,232	1,146	1,086	42	21	21	396	193	203	1,600	889	711
Nasik	Malegaon	Namgule	141	602	332	270	48	30	18	26	11	15	470	278	192
Nasik	Malegaon	Gilane	360	1,766	925	841	126	66	60	267	134	133	1,274	725	549
Nasik	Malegaon	Khalane	128	738	388	350	23	9	14	337	172	165	417	257	160
Nasik	Malegaon	Ajande	236	1,227	621	606	46	25	21	151	70	81	842	456	386
Nasik	Malegaon	Malhanagaon	254	1,341	720	621	109	63	46	274	132	142	851	497	354
Nasik	Malegaon	Savandgaon	607	3,275	1,699	1,576	207	104	103	1,401	714	687	1,852	1,082	770
Nasik	Malegaon	Yesgaon	534	2,430	1,231	1,199	50	25	25	453	217	236	1,615	867	748
Nasik	Malegaon	Yesgaon Bk	742	3,699	1,904	1,795	371	185	186	726	360	366	2,427	1,373	1,054
Nasik	Malegaon	Maldhe	1961	11,881	6,071	5,810	53	24	29	543	261	282	7,711	4,065	3,646
Nasik	Malegaon	Malegaon	78501	471,312	238,868	232,444	18,106	9,143	8,963	6,320	3,166	3,154	345,816	180,272	165,544
Nasik	Malegaon	Dyane CT	8371	49,192	25,181	24,011	3,031	1,570	1,461	964	487	477	32,565	17,411	15,154

District	Taluka	Village	No_HH	TOT_P	TOT_M	TOT_F	P_SC	M_SC	F_SC	P_ST	M_ST	F_ST	P_LIT	M_LIT	F_LIT
Nasik	Malegaon	Bhuigavahan	135	675	364	311	0	0	0	509	270	239	296	178	118
Nasik	Malegaon	Soyagaon	7336	34,341	18,070	16,271	2,143	1,100	1,043	1,942	1,015	927	28,172	15,208	12,964
Nasik	Malegaon	Chandanpuri	1289	6,623	3,376	3,247	743	375	368	2,389	1,190	1,199	4,218	2,365	1,853
Jalgaon	Jalgaon	Jalgaon	99361	460228	240590	219638	33244	17079	16165	24316	12583	11733	355368	192090	163278
Jalgaon	Jalgaon	Bambhori Pr. Chandsar	1179	6392	3515	2877	639	353	286	1112	592	520	4889	2904	1985
Jalgaon	Jalgaon	Savkhede Bk.	835	3834	1972	1862	627	321	306	413	208	205	2862	1569	1293
Jalgaon	Jalgaon	Mohadi	667	4102	2297	1805	138	66	72	1307	675	632	2811	1791	1020
Jalgaon	Jalgaon	Nagziri	27	130	68	62	0	0	0	123	63	60	48	28	20
Jalgaon	Jalgaon	Shirsoli P.B.	1940	9126	4835	4291	295	150	145	1158	619	539	6185	3491	2694
Jalgaon	Jalgaon	Dapore	526	2516	1316	1200	99	46	53	706	382	324	1459	859	600
Jalgaon	Jalgaon	Kurhadade	138	753	397	356	0	0	0	221	109	112	511	313	198
Jalgaon	Jalgaon	Lamanjan P.Bornar	154	734	376	358	9	4	5	95	54	41	424	240	184
Jalgaon	Jalgaon	Mhasawad	1787	8424	4275	4149	647	327	320	327	156	171	5656	3140	2516
Jalgaon	Jalgaon	Bornar	775	3757	1949	1808	139	75	64	547	279	268	2587	1460	1127
Jalgaon	Pachora	Dahigaon	455	1822	940	882	174	90	84	342	180	162	1233	729	504
Jalgaon	Erandol	Pimpri Sim	161	687	363	324	11	5	6	80	41	39	425	252	173
Jalgaon	Pachora	Varasade Pr.Bornar	194	843	457	386	83	45	38	158	91	67	578	352	226
Jalgaon	Pachora	Mahiji	506	2617	1320	1297	267	151	116	88	40	48	1754	1009	745
Jalgaon	Erandol	Hanmantkhede Sim	270	1141	597	544	73	41	32	257	129	128	681	416	265

District	Taluka	Village	No_HH	TOT_P	TOT_M	TOT_F	P_SC	M_SC	F_SC	P_ST	M_ST	F_ST	P_LIT	M_LIT	F_LIT
Jalgaon	Erandol	Utran Gujar Hadd	918	4179	2137	2042	220	114	106	1309	669	640	2466	1404	1062
Jalgaon	Pachora	Kurangi	791	3524	1796	1728	227	103	124	337	170	167	2136	1236	900
Jalgaon	Pachora	Bahuleshwar	7	36	21	15	0	0	0	0	0	0	16	9	7
Jalgaon	Pachora	Dasegaon Bk	311	1384	710	674	228	117	111	814	426	388	824	465	359
Jalgaon	Erandol	Utran Ahir Hadd	964	4328	2197	2131	476	243	233	675	349	326	2718	1537	1181
Jalgaon	Pachora	Pardhade	336	1455	746	709	83	44	39	677	332	345	803	477	326
Jalgaon	Pachora	Bhatkhande Kh.	317	1,408	730	678	91	45	46	217	121	96	881	518	363
Jalgaon	Pachora	Anturli Kh.Pr.Pachora	234	1110	574	536	52	26	26	250	117	133	699	420	279
Jalgaon	Pachora	Ozar	176	866	464	402	75	40	35	79	43	36	617	357	260
Jalgaon	Pachora	Mandaki	52	253	130	123	0	0	0	139	69	70	100	57	43
Jalgaon	Pachora	Pungaon	656	2940	1544	1396	459	247	212	553	278	275	2050	1166	884
Jalgaon	Bhadgaon	Bhattagaon	144	714	362	352	78	43	35	336	168	168	434	238	196
Jalgaon	Pachora	Bambarud Kh. Pr.Pachora	378	1788	913	875	102	55	47	468	233	235	1189	695	494
Jalgaon	Pachora	Anturli Bk.	392	1686	865	821	219	111	108	343	178	165	1159	644	515
Jalgaon	Pachora	Lohatar	929	4026	2053	1973	192	91	101	749	377	372	2741	1590	1151
Jalgaon	Bhadgaon	Tongaon	627	2509	12470	6490	5980	851	431	420	851	433	418	4549	3395
Jalgaon	Bhadgaon	Bhadgaon (M Cl)	7736	37214	19334	17880	1940	967	973	3249	1625	1624	26132	14538	11594
Jalgaon	Bhadgaon	karab	31	127	627	323	304	26	13	13	252	129	123	233	176

District	Taluka	Village	No_HH	TOT_P	TOT_M	TOT_F	P_SC	M_SC	F_SC	P_ST	M_ST	F_ST	P_LIT	M_LIT	F_LIT
Jalgaon	Bhadgaon	Wadadhe	30	121	603	294	309	18	10	8	128	66	62	205	159
Jalgaon	Bhadgaon	Kothali	583	2654	1368	1286	40	20	20	413	208	205	1968	1056	912
Jalgaon	Bhadgaon	Nimbhore	541	2461	1259	1202	400	185	215	364	176	188	1750	968	782
Jalgaon	Bhadgaon	Devhari	195	939	487	452	124	75	49	436	226	210	494	302	192
Jalgaon	Bhadgaon	Kanashi	292	1536	769	767	229	120	109	126	74	52	1149	605	544
Jalgaon	Bhadgaon	Lon Pr. Bhadgaon	299	1328	668	660	97	43	54	143	75	68	850	484	366
Jalgaon	Bhadgaon	Ghusardi Kh.	272	1508	796	712	144	71	73	410	215	195	1107	597	510
Jalgaon	Bhadgaon	Gondgaon	940	4242	2204	2038	525	272	253	84	45	39	2950	1666	1284
Jalgaon	Bhadgaon	Bambrud Pr. Bahal	384	1792	899	893	182	88	94	302	149	153	1152	624	528
Jalgaon	Bhadgaon	Navare	84	428	212	216	0	0	0	234	113	121	294	170	124
Jalgaon	Bhadgaon	Wade	1113	5299	2781	2518	717	364	353	859	451	408	3420	1944	1476
Jalgaon	Chalisgaon	Tekwade Kh.	177	727	364	363	55	23	32	154	71	83	473	250	223
Jalgaon	Chalisgaon	Tekwade Bk.	49	235	121	114	0	0	0	89	49	40	145	74	71
Jalgaon	Chalisgaon	Bahal	1731	7897	4188	3709	835	441	394	1179	614	565	5369	3058	2311
Jalgaon	Chalisgaon	Borkhede Bk	587	2571	1351	1220	376	193	183	159	82	77	1744	1020	724
Jalgaon	Chalisgaon	Rahipuri	305	1336	701	635	86	49	37	359	179	180	897	530	367
Jalgaon	Chalisgaon	Bhaur	445	2051	1041	1010	386	185	201	387	195	192	1246	676	570
Jalgaon	Chalisgaon	Vadgaon Lambe	631	2780	1433	1347	463	241	222	740	395	345	1780	991	789
Jalgaon	Chalisgaon	Dasegaon Bk	311	1384	710	674	228	117	111	814	426	388	824	465	359
Jalgaon	Chalisgaon	Mehunbare	2079	9619	5007	4612	1046	541	505	1332	657	675	6566	3711	2855

District	Taluka	Village	No_HH	TOT_P	TOT_M	TOT_F	P_SC	M_SC	F_SC	P_ST	M_ST	F_ST	P_LIT	M_LIT	F_LIT
Jalgaon	Chalisgaon	Umbarkhede	1514	7159	3658	3501	752	380	372	1397	686	711	4613	2562	2051
Jalgaon	Chalisgaon	Pimpalwad Mhalsa	666	3035	1593	1442	344	182	162	614	313	301	1813	1063	750
Jalgaon	Chalisgaon	Varkhede Kh.	157	798	389	409	7	3	4	98	47	51	439	251	188
Jalgaon	Chalisgaon	Varkhede Bk.	683	3420	1792	1628	205	105	100	459	231	228	2074	1213	861
Jalgaon	Chalisgaon	Tamaswadi	211	971	506	465	14	5	9	431	227	204	495	286	209
Jalgaon	Chalisgaon	Upkhede	520	2566	1315	1251	242	127	115	667	331	336	1555	877	678
Jalgaon	Chalisgaon	Mandurne	707	3288	1719	1569	94	52	42	531	274	257	1707	1006	701
		Total	**244641**	**1261033**	**662762**	**616321**	**81928**	**39415**	**37269**	**77842**	**40893**	**38367**	**923191**	**500963**	**430342**

CHAPTER III

HYDROCHEMISTRY

Field and laboratory analysis

Direct measurements were made at each site with a digital water analysis field set of probes, giving readings for electrical conductivity (EC), TDS and pH. In the laboratory of School of environmental and earth Sciences, North Maharashtra University, Jalgaon, the samples were analyzed according to the standard methods for the examination of water and waste water (APHA, 1995) for the major and minor elements.

All data about the location of the river water for domestic waste & Industrial effluents used in this study are show in Table 3.1. The results of the whole geochemical analysis are shown in table 3.1 following various major & minor elements were described in detail

pH

On the basis of pH values, water can be grouped into three categories, viz., less than 7 pH as Acidic, 7 pH as Neutral and more than 7 pH as Alkaline. The pH value of absolute pure water is 7. The pH values indicate that the all waters samples are alkaline nature.

In the present study the values of pH in water samples is as follows

1. Surface water Girna: Maximum 8.74 and Minimum 6.9
2. Domestic Water Girna: Maximum 8.44 and Minimum 7.93
3. Industrial Samples: Maximum 8.78 and Minimum 7.38

Electrical conductivity

The electrical conductivity (EC) is a measure of the total salt content of water based on the flow of electrical current through the sample. The higher salt content, the greater the flow of electrical current. The range of electrical conductivity values from the area under study in water samples (in µmohs/cm) are is as follows

1. Surface water Girna: Maximum 1166 and Minimum 349.5
2. Domestic Water Girna: Maximum 4069 and Minimum 522
3. Industrial Samples: Maximum 2920 and Minimum 897

Total dissolved solids

Total dissolved solids (TDS) comprise inorganic salts, principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides and sulfates and some small amounts of organic matter that are dissolved in water. The TDS concentration is a secondary drinking water standard and is regulated because of its aesthetic effect rather than a health hazard. Elevated TDS indicate that the dissolved ions may cause the water to be corrosive, of salty or brackish taste, resulting in scale formation, and interfere and decreased efficiency of hot water heaters. It may also indicate that water may contain elevated levels of ions that are above the primary or secondary drinking water standards, such as: elevated levels of nitrate, etc. The dissolved substances combined with H^+ or OH^- ions alter the pH of the water and thus upsets the chemical equilibrium.

From the results it is clear that most of the collected samples of are of fresh water type due to TDS values less than 1000 mg/L, except 04 water samples of post monsoon In the present study the values of TDS in water samples is as follows

1) Surface water Girna: Maximum 1166 and Minimum 196
2) Domestic Water Girna: Maximum 3073 and Minimum 394

TH

Hardness is the property of water which prevents the lather formation with soap and increases the boiling point of water. Hardness of water mainly depends upon the amount of calcium or magnesium salts or both. According to the grading standards of TH (as CaCO3), groundwater can be divided into soft water (TH<150 mg/L), moderately hard water (150<TH<300 mg/L), hard water (300<TH<450 mg/L) and extremely hard water (TH>450 mg/L).

The range of Total Hardness values in water samples from the study area is as follows

1. Surface water Girna: Maximum 395 and Minimum 142
2. Domestic Water Girna: Maximum 1167 and Minimum 310
3. Industrial Samples: Maximum 825 and Minimum 310

Sulphate

Discharge of industrial wastes and domestic sewerage tends to increase the SO4 concentration. The utility of water for domestic purposes is severely limited by high sulphate concentrations (> 250 mg/L). Higher SO4 content was found in the samples are within the permissible of BIS and WHO.

The range of sulphate values in water samples from the study area is as follows

1. Surface water Girna: Maximum 30.9 and Minimum 5.92
2. Domestic Water Girna: Maximum 142.3 and Minimum 5.72
3. Industrial Samples: Maximum 13.4 and Minimum 9.8

Total Alkalinity (TA)

Higher alkalinity (TA) is noted in the Girna area.

The range of alkalinity values in water samples from the study area is as follows

1. Surface water Girna: Maximum 340 and Minimum 155
2. Domestic Water Girna: Maximum 688 and Minimum 250
3. Industrial Samples: Maximum 720 and Minimum 280

Nitrate

Nitrate is a very important element to be controlled in the drinking water due to its negative effects on the human health especially infants less than 2 years old, when drinking water containing elevated amounts of nitrate (WHO, 1993). Elevated nitrate concentrations in drinking water are assumed to be responsible for an increased risk to blue baby specially in children if consumed for long periods. Nitrate is generally an indication of contamination from major nitrogen sources such as a sewage disposal system, animal manure, nitrogen fertilizers. Concerning the nitrate concentration,

1. Surface water Girna: Maximum 39.2 and Minimum 5.92
2. Domestic Water Girna: Maximum 50.8 and Minimum 4.5
3. Industrial Samples: Maximum 7.92 and Minimum 5.9

Chemical Oxygen Demand (COD)

COD is measure that total quantity of oxygen required for oxidation of nearly all organic compounds in waste waters by the action of a strong oxidizing agents COD values indicates practically the overall pollutional streanth of raw waste, domestic or Industrial.

Maximum permissible limit of COD for Industrial elements discharged into inland surface water is 250 mg/l as per BIS 2490

COD values are

1. Surface water Girna: Maximum 114.4 and Minimum 61.6
2. Domestic Water Girna: Maximum 616 and Minimum 79.2
3. Industrial Samples: Maximum 65120 and Minimum 782

Salinity:

Excess of salts concentration adversely impacts on plant growth as well as soil degradation. This leads to soil salinity.

The salinity is measure with the help of automatic digital water analysis kit. The permissible limit of salinity is 1400 mg/l. the salinity values are

1. Surface water Girna: Maximum 1166 and Minimum 150.8
2. Domestic Water Girna: Maximum 2012 and Minimum 3456
3. Industrial Samples: Maximum 2280 and Minimum 1148

Dissolved oxygen (DO)

Atmospheric oxygen is not readily soluble in water. Its solubility is directly proportional to its partial pressure. DO determine the pollution status of the river. DO level of more than 3mg/l is desirable for the existence & growth of fish & such other forms of aquatic life.

DO values are ranges from

1. Surface water Girna: Maximum 6.18 and Minimum 5.1
2. Domestic Water Girna: Maximum 7.76 and Minimum 2.48
3. Industrial Samples: Maximum 7.76 and Minimum 5.8

Biological Oxygen Demand (BOD)

BOD is defined amount of dissolved oxygen utilized by heterotrophic, organic matter, present in waste water. BOD is used for determining the pollution strength of organic waste water, domestic or industrial, inland surface water for use of raw waste for public water supply and for bathing is 3mg/l as per BIS 2296. Domestic sewage effluents discharged into inland surface water is 20 mg/l as per BIS 4764

BOD values are ranges from

1. Surface water Girna: Maximum 21.32 and Minimum 4.63
2. Domestic Water Girna: Maximum 98.3 and Minimum 24.63
3. Industrial Samples: Maximum 29.33 and Minimum 5.15

Evaluation of water for domestic use

Drinking water standards respectively MCL's (Maximum contamination levels) differ due to different scientific knowledge, different techniques to calculate risk, economical issues (how much money is a available in a community), availability of water resources, nature of the water resource, and the political situation. Therefore variations between the WHO guidelines and national standards are common. The 2003 Indian standards (BIS, 2003) and the WHO (1996) guidelines that are shown in Table 2.6 will be used as guides for the water quality evaluation of using the water for the use of human kind.

Trace elements

The trace elements is primarily source of rock due to weathering processes and their moderately contamination levels are usually harmless to organism. But their concentration increased considerably harmful to human and other living organism. Last some year's trace element in surface water contaminated due to human activities like agricultural chemicals, fossils fuels burning, and industrial effluent etc. It's clear that trace elements are entered in aquatic system from different source either point or non point source (Elder 1988). The analysis of trace elements from water samples were determined from different location of Girna river, which also includes domestic water nearby city or town and industries situated nearby rivers.

Iron

Fe concentration maximum permissible limit of 1 mg/l for drinking purpose (BIS 2003) suggest that the all samples of the study area excellent. Fe concentrations in water samples are observed in the ranges from are.

1. Surface water Girna: Maximum 0.207 and Minimum 0.0495
2. Domestic Water Girna: Maximum 0.13 and Minimum 0.0435
3. Industrial Samples: Maximum 24.14 and Minimum 0.19

Manganese

Mn concentration in the study area is under the maximum permissible limit (0.5 mg/l- BIS 2003). Manganese is essential nutrient for human if the deficiency of Mn to disruption of central nervous system and reproductive functions (MC Neely et al. 1979). Mn concentrations in water samples are observed ranges from

1. Surface water Girna: Maximum 0.264 and Minimum 0.01
2. Domestic Water Girna: Maximum 0.09 and Minimum 0.00 (BDL)
3. Industrial Samples: Maximum 3.455 and Minimum 0.155

Nickel

The concentration of Nickel in all the water samples from the study area within the permissible limit (0.3 mg/l, BIS -2003). The higher concentration of nickel is harmful to human health they may be causes of lung cancer (MC Neely et. al. 1979). Ni concentrations in water samples are observed ranges from

1. Surface water Girna: Maximum 0.033 and Minimum BDL
2. Domestic Water Girna: Maximum 0.15 and Minimum BDL
3. Industrial Samples: Maximum 0.176 and Minimum BDL

Copper

The concentration of cu in all water samples collected from the study area within the maximum permissible limit (1.5 mg/l BIS- 2003). Cu is essential element for the human health. It has toxic affect on human health if the concentration below the desirable limit. Anaemia, diaarrohea etc. are caused due to cu deficiency. Copper values are

1. Surface water Girna: Maximum 0.1607 and Minimum 0.0012
2. Domestic Water Girna: Maximum 0.25 and Minimum 0.03
3. Industrial Samples: Maximum 0.39 and Minimum 0.15

Cadmium

The concentration of Cd in 10 (55%) water sample observed above the maximum permissible limit (0.05 mg/l BIS 2003). Cadmium (Cd) is found in very low concentrations in most rocks other sources of cadmium in groundwater including burn of fossil fuels and application of fertilizer, etc. Cadmium element is not essential to plants, animals and human. Its presence of harmful to human and all living organism short-term exposure (over days or weeks) to high levels of cadmium in drinking water can cause vomiting, and diarrhea. Long-term exposure (over years or decades) to cadmium in drinking water may be cause of kidney damage (WHO 2004). Cd values are

1. Surface water Girna: Maximum 0.0836 and Minimum BDL
2. Domestic Water Girna: Maximum 0.27 and Minimum 0.01
3. Industrial Samples: Maximum 0.2381 and Minimum 0.085

Cobalt:-

Cobalt (CO) is found in very low concentration in surface or groundwater, generally co is found in mining area or copper mineral rich area. Cobalt is not essential to human and animals. It’s presence in living organism they level to toxicity.

According to BIS drinking water limit of CO is 0.001mg/l CO values are

1. Surface water Girna: Maximum 0.121 and Minimum 0.001
2. Domestic Water Girna: Maximum 0.037 and Minimum 0.007
3. Industrial Samples: Maximum 0.369 and Minimum 0.121

Lead (Pb): -

The concentration of Pb in 50% water sample of study area observed above the maximum permissible limit (0.05mg/l BIS 2003). Suggest that the 50% samples are not suitable for drinking purpose in the study area. Lead is naturally present in trace amounts in all biological materials i.e. in soil, water, plants and animals. The main source of lead concentration is transportation. (Smirjakova S and et. Al 2005) Pb values are

1. Surface water Tapi: Maximum 0.321 and Minimum BDL
2. Domestic Water Tapi: Maximum 0.180 and Minimum BDL
3. Industrial Samples: Maximum 0.434 and Minimum BDL

Table 3.1: Water quality data of Girna River

Standards (BIS)	300	200	6.5 to 8.5	4	1400	500	1400	250	3	0.07	0.05	0.3	0.1	0.01	0.001	1.5	200	NA	45
Surface Water																			
Sample location	TH	TA	PH	DO	EC	TDS	Salinity	COD	BOD	NI	pb	FE	MN	CD	CO	CU	SO4-	PO4-	NO3-
Girna at NH3	340	280	8.31	4.45	1166	1016	1166	114.4	21.32	0	0	0.159	0.2645	0.0483	0.0236	0.084	12.87	0.71	39.2
Malegaon Bandhara	193	180	8.52	6.18	503	183.1	213	61.6	6.18	0	0.2633	0.1272	0.1653	0.0063	0.1096	0.1158	8.97	0.21	9.2
Yesgaon	190	170	8.11	5.76	173	175.9	175.9	79.2	5.15	0	0.3216	0.172	0.0868	0.0342	0.1214	0.126	7.92	0.19	8.2
Girna Dam	142	155	8.19	6.07	356.5	196	150.8	61.6	5.66	0.0332	0	0.1029	0.0248	0	0.0826	0.1607	6.5	0.12	7.2
Down Stream Jamda	172	160	8.74	5.97	349.5	245	283	79.2	4.63	0	0	0.0495	0.0147	0.0836	0.0191	0.0499	6.12	0.19	6.9
Jamda Bandhara	287	310	8.3	4.6	789	512	290	62.4	4.52	0	0	0.11	0.0127	0.0062	0.0121	0.012	5.92	0.21	5.92
Girna Pumping	300	310	7.1	6.2	770	500.5	293	52.8	5.11	0	0	0.169	0.011	0.0001	0.0112	0.009	30.9	11.2	11.2
Nimkhedi	398	340	7.2	5.1	780	507	285	58.9	4.59	0	0	0.193	0.0212	0.009	0.017	0.0012	31	12	12
Kantai Bandhara	395	320	6.9	5.9	773.3	500.5	289	58.6	5.39	0	0	0.207	0.084	0	0.001	0.042	30	11.1	11.9
Domestic									20										
Sample location	TH	TA	PH	DO	EC	TDS	Salinity	COD	BOD	NI	pb	FE	MN	CD	CO	CU	SO4-	PO4-	NO3-
Malegaon near NH3 Road	310	280	8.19	2.48	1643	959	1107	201.5	87.2	0	0	0.0459	0.096	0.0628	0.003	0.2501	7.92	0.51	22.4
Mosum River	790	422	7.96	5.9	1844	1611	1849	616	93.36	0	0	0.0726	0.0634	0.073	0	0.1081	11.2	0.83	36.42
Bhadgaon	312	272	8.44	5.76	552	394	456	79.2	24.63	0	0	0.0435	0.0308	0.0588	0.0085	0.0399	5.72	0.63	12.97
Khawajamiya Nala	1010	622.4	7.92	6.6	1240	1960	1256	223.3	97.3	0	0.09	0.019	0.02	0.27	0.007	0.03	80.06	15	25.8
Pimprala Nala	1111	641.9	7.79	5.9	2270	3073	2012	343.3	94.3	0.06	0.18	0.11	0.05	0.17	0.022	0.07	77.33	16.6	4.5
Savkheda Nala	1145	681.8	7.93	6.1	1489	726.6	982	283.3	88.2	0.15	0.16	0.13	0.04	0.01	0.037	0.08	142.3	13.3	50.8
Sirsoli	1167	688	7.84	6.2	4069	1226.4	1160	258.6	98.3	0	0	0.07	0	0.01	0.007	0.03	82.4	12.3	17.2
Industrial									30										
Sample location	TH	TA	PH	DO	EC	TDS	Salinity	COD	BOD	NI	pb	FE	MN	CD	CO	CU	SO4-	PO4-	NO3-
Saree Dyes	795	690	7.38	6.11	2720	1918	1930	2860	28.8	0	0.4344	24.1488	3.455	0.6122	0.3569	0.1566	12.17	0.83	7.92
Slaughter house	310	280	7.55	6.31	897	853	1148	65120	29.33	0.1762	0.413	1.2116	0.648	0.2381	0.1216	0.3902	11.2	0.59	6.2
Textile Industries	820	720	8.16	5.8	2440	1929	2280	1144	24.67	0	0	0.1916	0.4156	0.085	0.3697	0.1997	13.4	0.63	5.9
Saree Dyes	670	480	8.78	5.76	2140	1410	1666	792	5.15	0	0	0	0.1551	0.0992	0.1657	0.2398	11.2	0.73	6.3
Saree Dyes	825	640	8.72	5.8	2920	1932	2023	782	5.09	0	0	0.315	0.492	0.089	0.256	0.21	9.8	0.51	6.21

Graphical representation and analysis representation of Surface water Girna

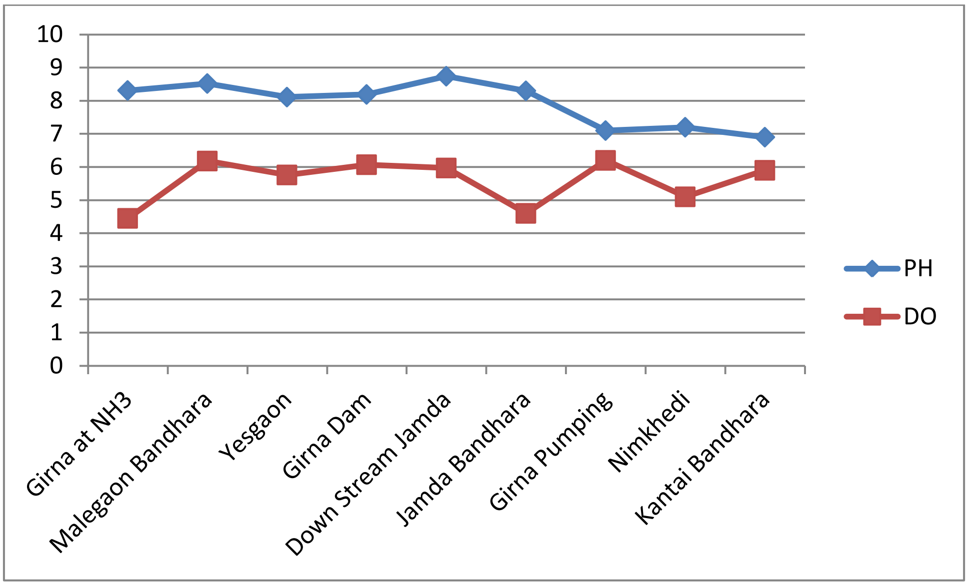


Fig. 3.1: pH and DO values (Surface water Girna)

The above figure shows values of pH & DO are under prescribed limit of BIS whereas DO values are declining at Jamda Bhandara & Nimkhedi due to stagnant water body but it is under limit

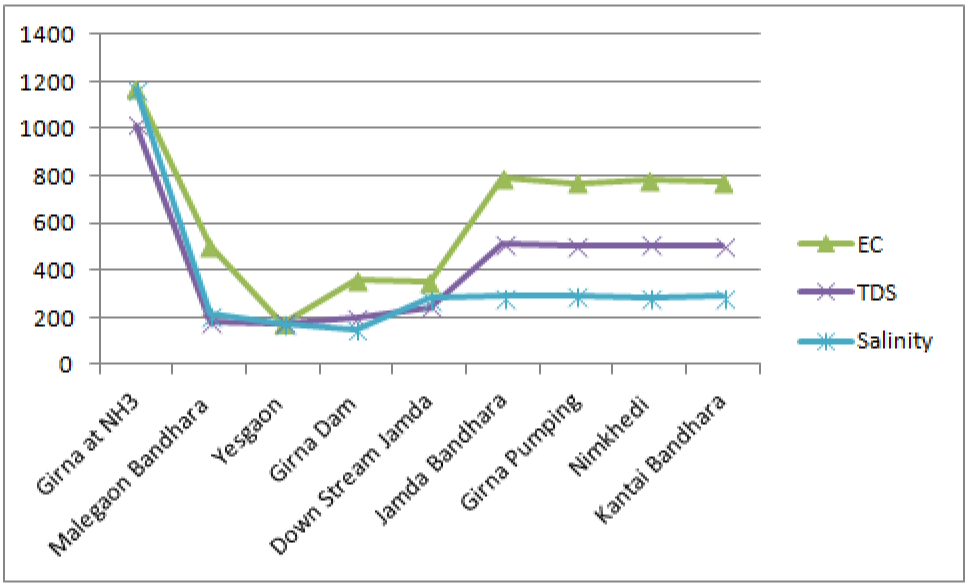


Fig. 3.2: EC, TDS and salinity (Surface water Girna)

The above graph shows values are under limit of BIS except Girna at NH3 at Malegaon, Jamda Bhandara, Nimkhedi shows higher TDS values. It is due to anthropogenic sources.

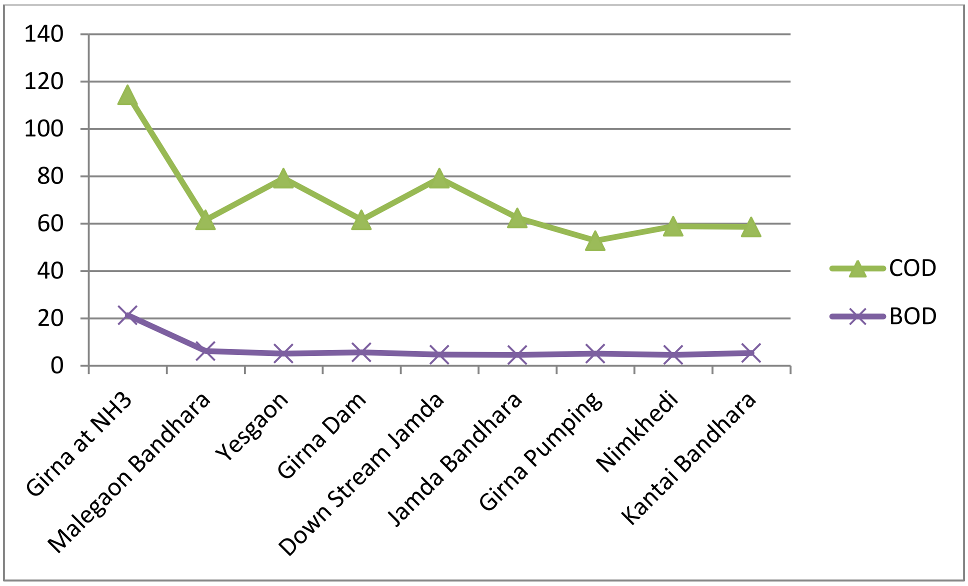


Fig. 3.3: COD, and BOD values (Surface water Girna)

The CoD, BoD values of Girna of pH & DO are under prescribed limit of BIS, where as DO values are declining at Jamda Bhandara & Nimkhedi due to Stagnant water body but it is under limit

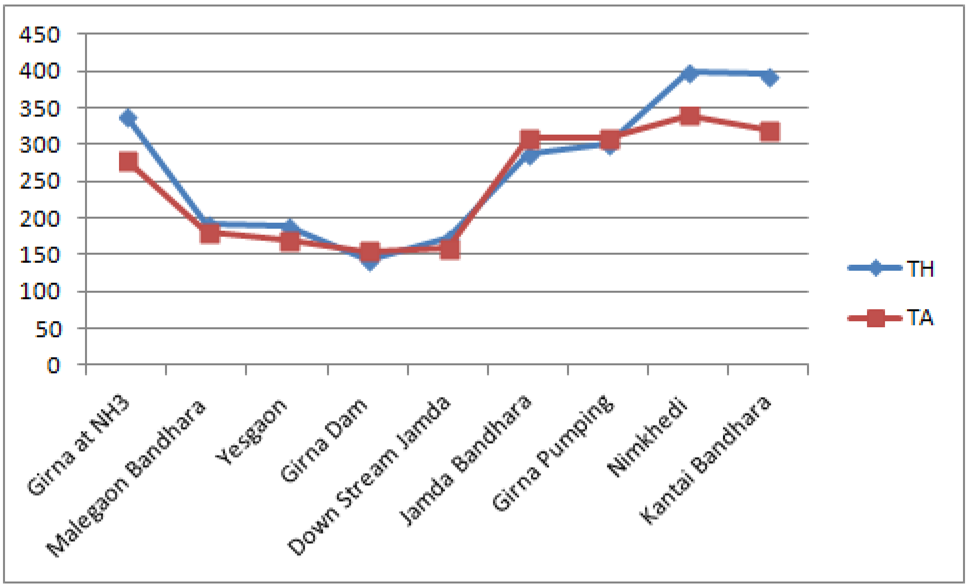


Fig. 3.4: TH and TA values (Surface water Girna)

The above graph shows values trend of TH & TA at last four stations it is due to stagnant water body and less flow of Girna river water are under limit of BIS except Girna at NH3 at Malegaon, Jamda Bhandara & Nimkhedi shows higher TDS values. It is due to anthropogenic sources.

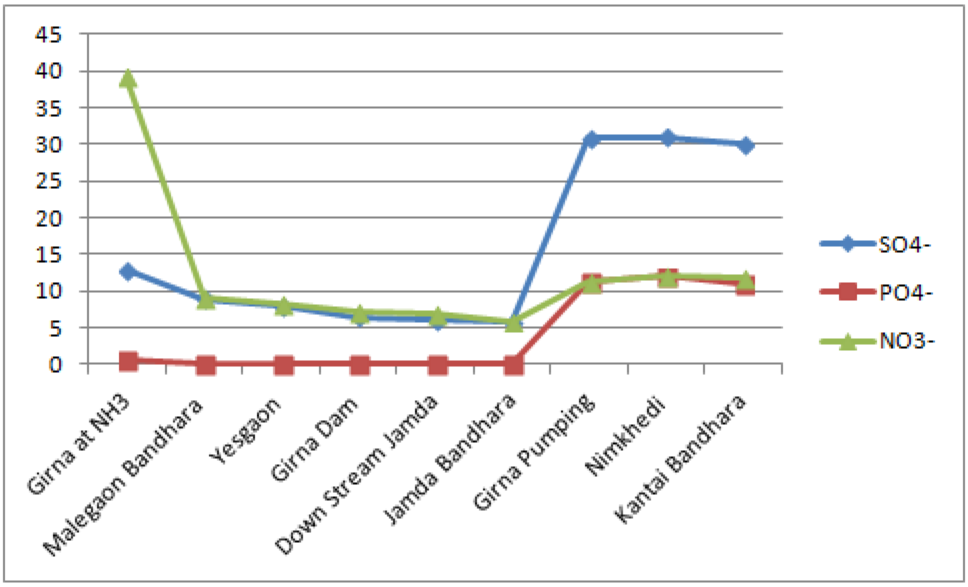


Fig. 3.5: SO4, PO4 and NO3 values (Surface water Girna)

The above graph shows the values of above parameters are under prescribed limit of BIS

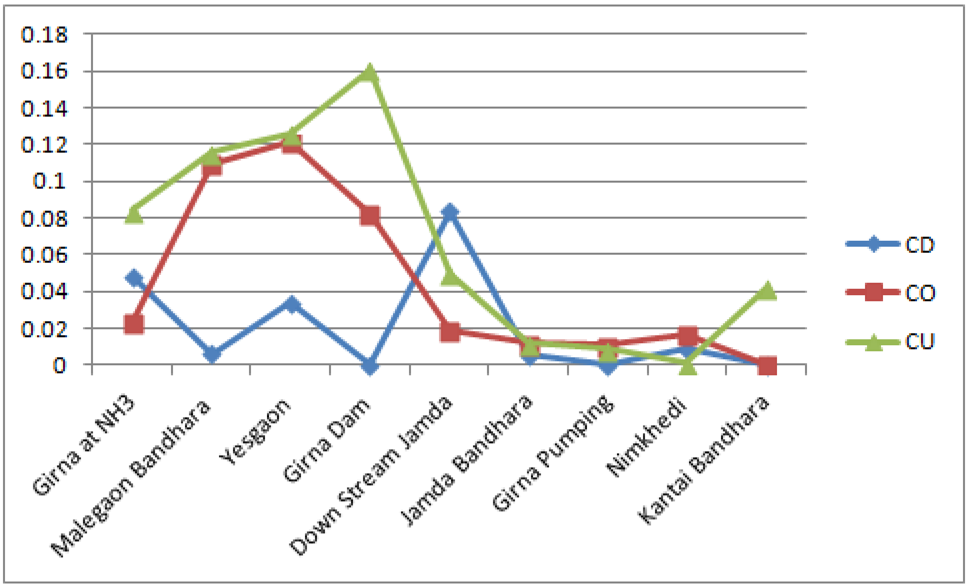


Fig. 3.6: Cd, Co and Cu (Surface water Girna)

The above graph shows Cadmium & Cobalt is somewhere higher trend as per prescribed limit. The source of Cd is due to leaching of Waste material & fertilizers i.e. anthropogenic source. The source of cobalt is due to anthropogenic activities.

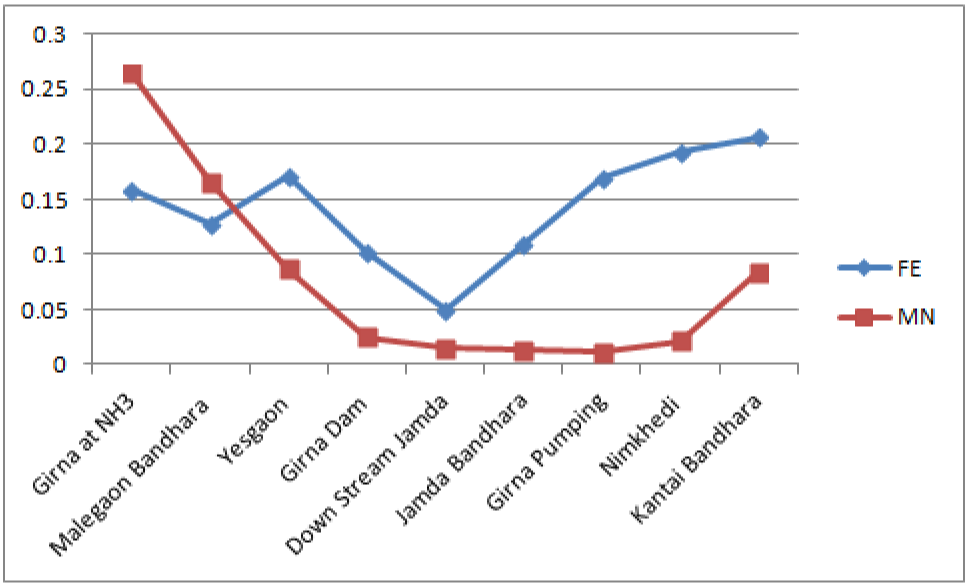


Fig. 3.7: Fe and Mn values (Surface water Girna)

The Fe & Mn values are less than the limit except Mn values of Girna at NH3 and Malegaon Bhandara & it is due to all nalas of Malegaon city is merges nearby this stations & this is anthropogenic sources.

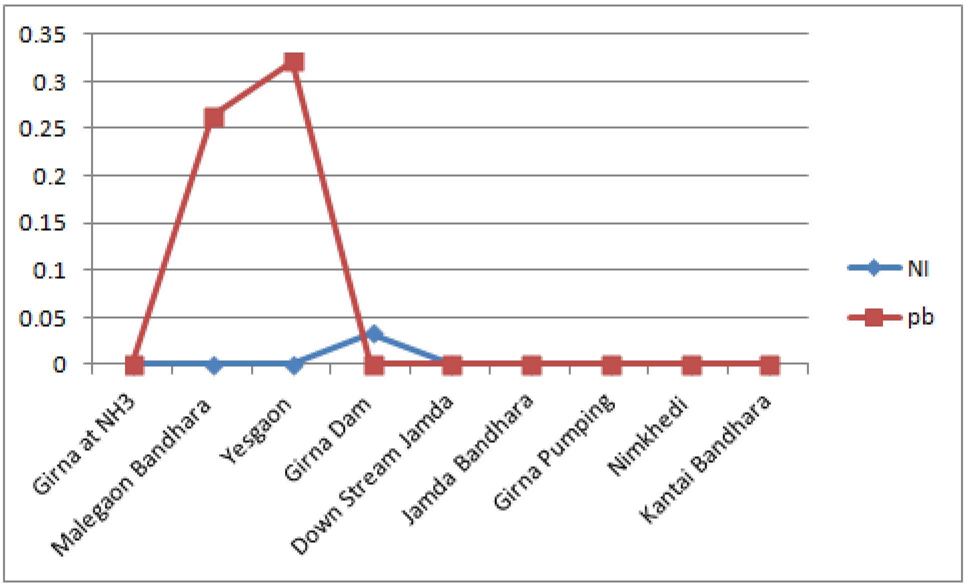


Fig. 3.8: Ni and Pb values (Surface water Girna)

The Ni &Pb values are under limit except Malegaon Bhandara & Yesgaon Station & it is due to anthropogenic activities.

Graphical representation and analysis representation of Domestic waste water Girna

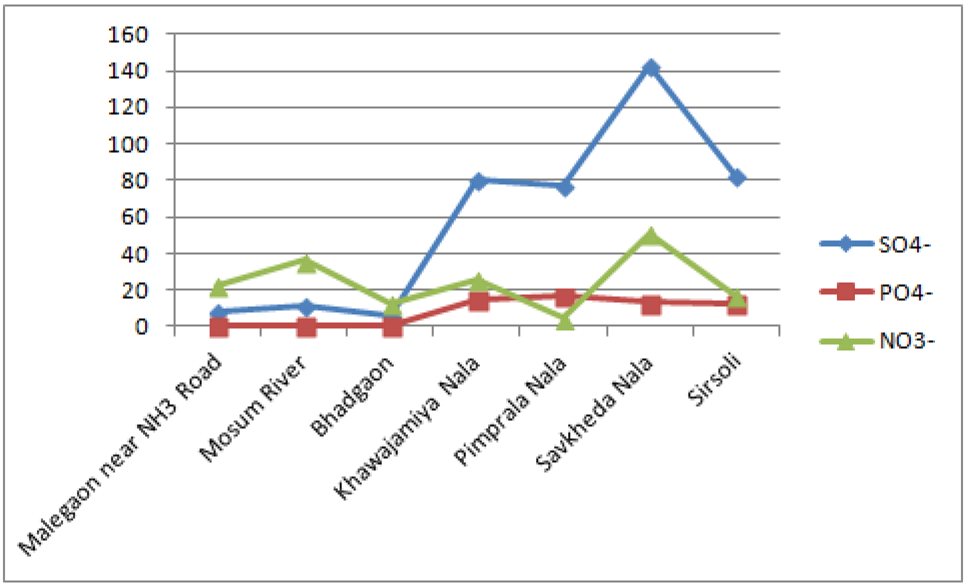


Fig. 3.9: SO4, PO4 and No3 values (Domestic waste water Girna)

The above graph shows the values of above parameters are under the prescribed limit.

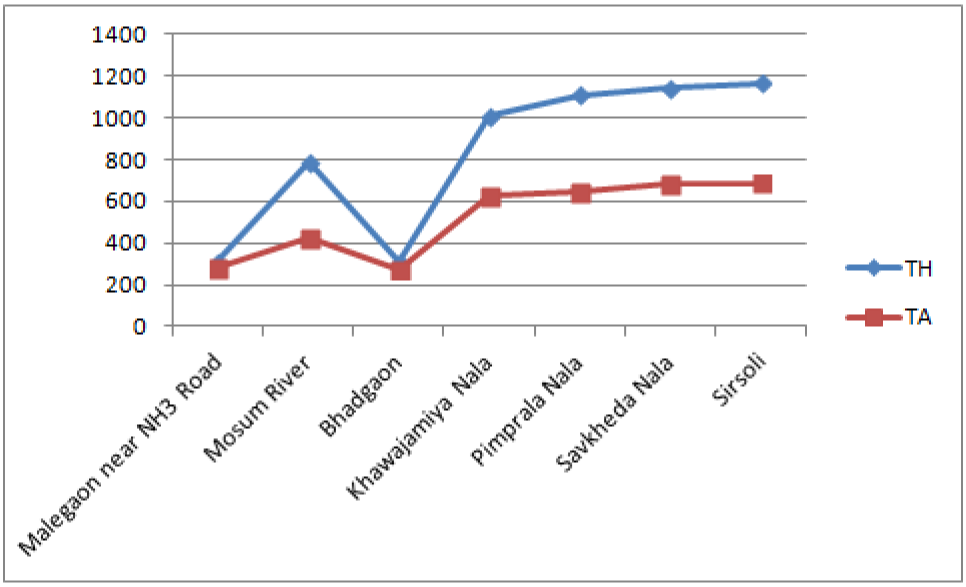


Fig. 3.10: TH and TA values (Domestic waste water Girna)

The above graph shows higher values of TH & TA than the prescribed limit of BIS. It is due to anthropogenic activities of untreated domestic water.

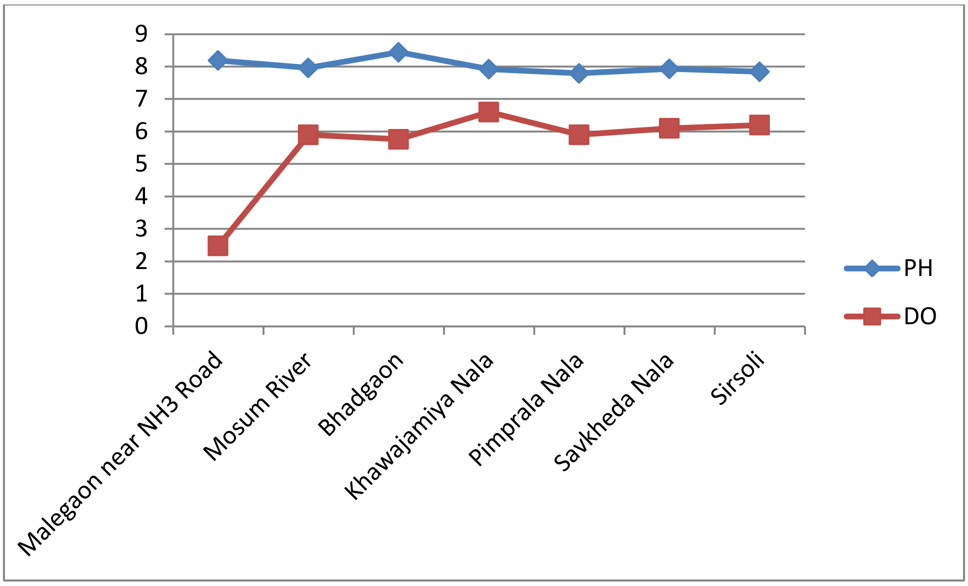


Fig. 3.11: pH and DO values (Domestic waste water Girna)

The above graph shows the values are within the limit except DO value at NH3 road at Malegaon shows less DO due to Municipal wastewater from Malegaon city

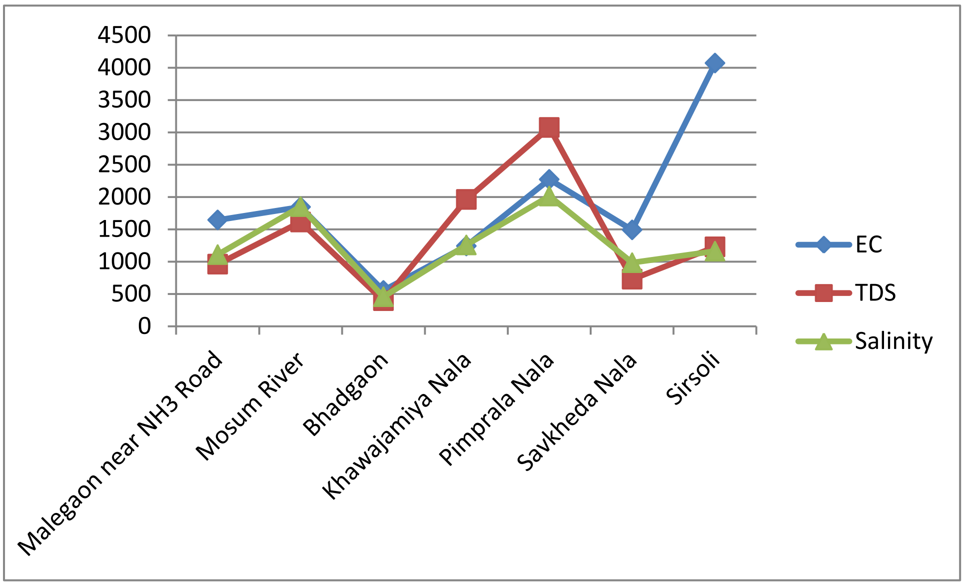


Fig. 3.12: EC, TDS and salinity values (Domestic waste water Girna)

The above graph showing higher trend of this parameter it is due to untreated domestic waste water

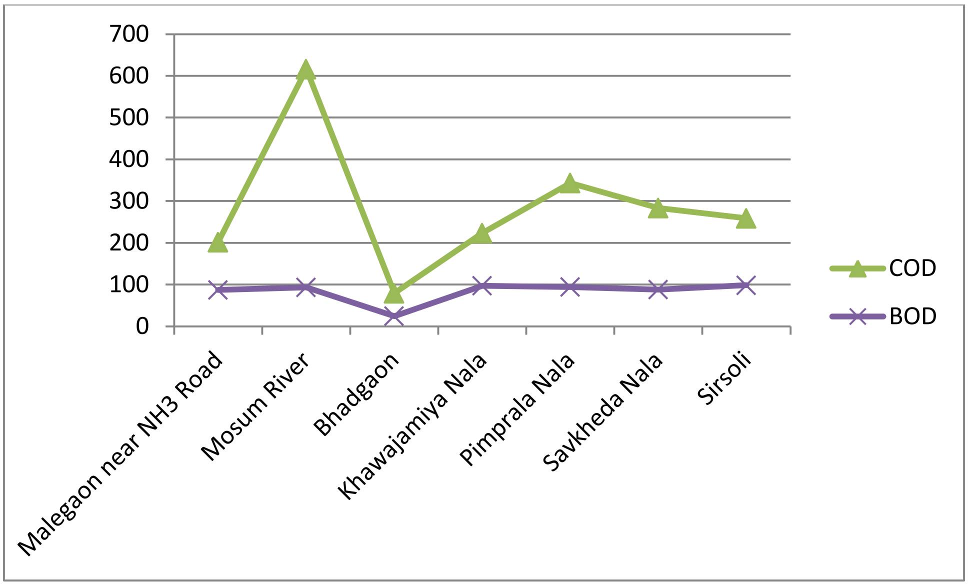


Fig. 3.13: COD and BOD values (Domestic waste water Girna)

COD, BoD values shows higher trend due to dumping waste and untreated industrial wastewater or somewhere anthropogenic sources.

Industrial Effluent affecting Girna

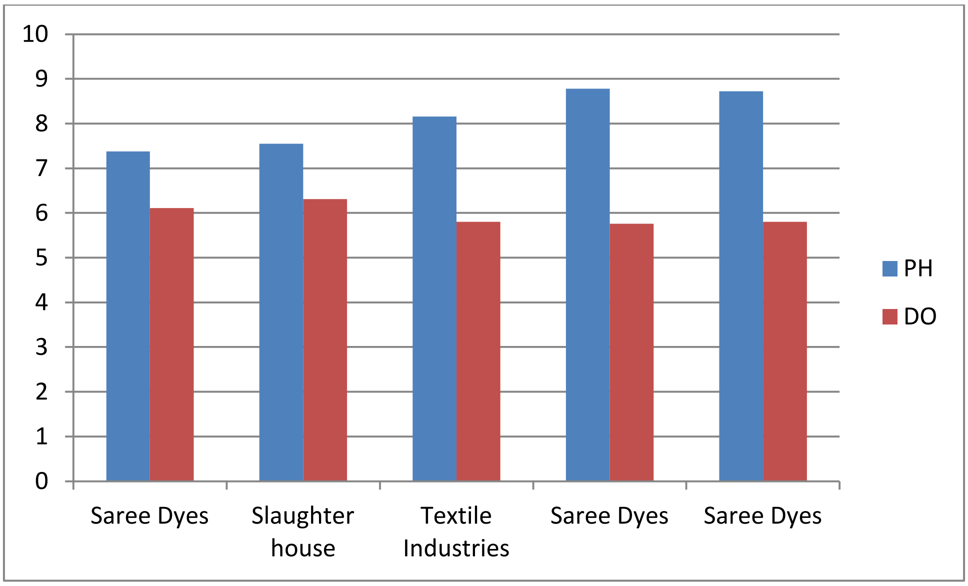


Fig. 3.14: pH and Do values (Industrial Effluent affecting Girna)

The above figure shows the values are within the limit

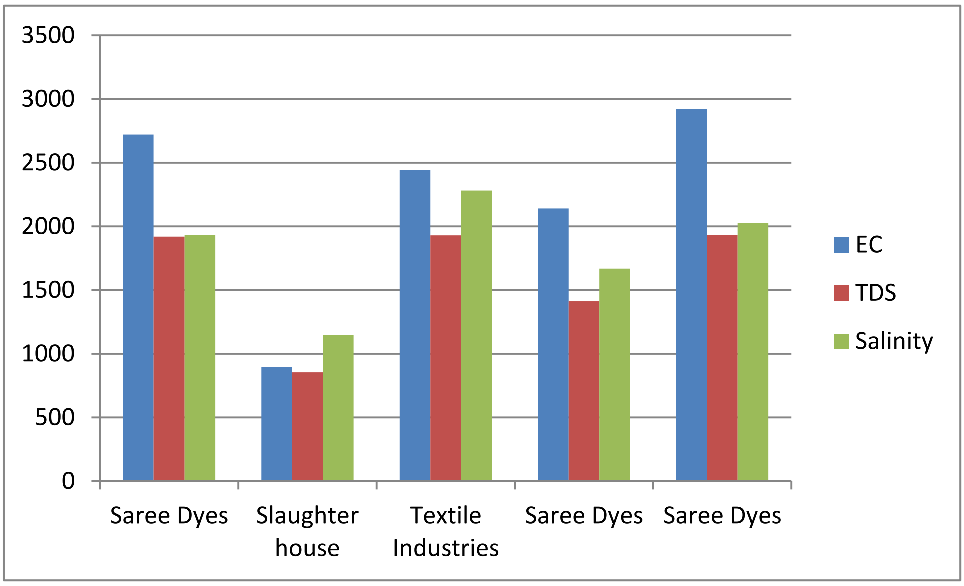


Fig. 3.15: EC, TDS and Salinity values (Industrial Effluent affecting Girna)

The above figure shows higher trend of EC, TDS and Salinity which is above the prescribed limit. It is due to untreated effluent.

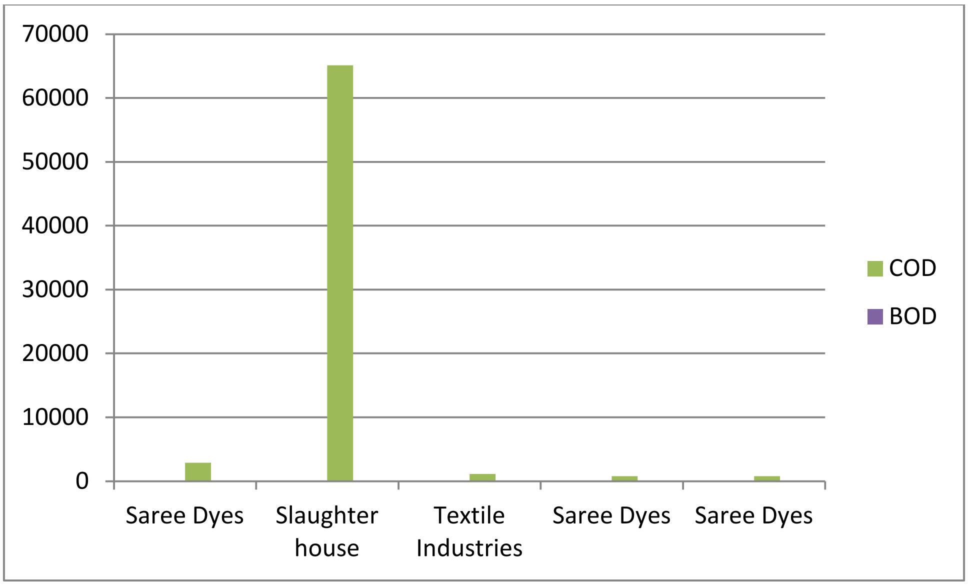


Fig. 3.16: BOD and COD (Industrial Effluent affecting Girna)

COD/BOD values are above the prescribed limit is due to untreated wastewater of various Industries

Fig. 3.17: Ni and Pb values (Industrial Effluent affecting Girna)

Ni & Pb is showing higher trend due to untreated effluent

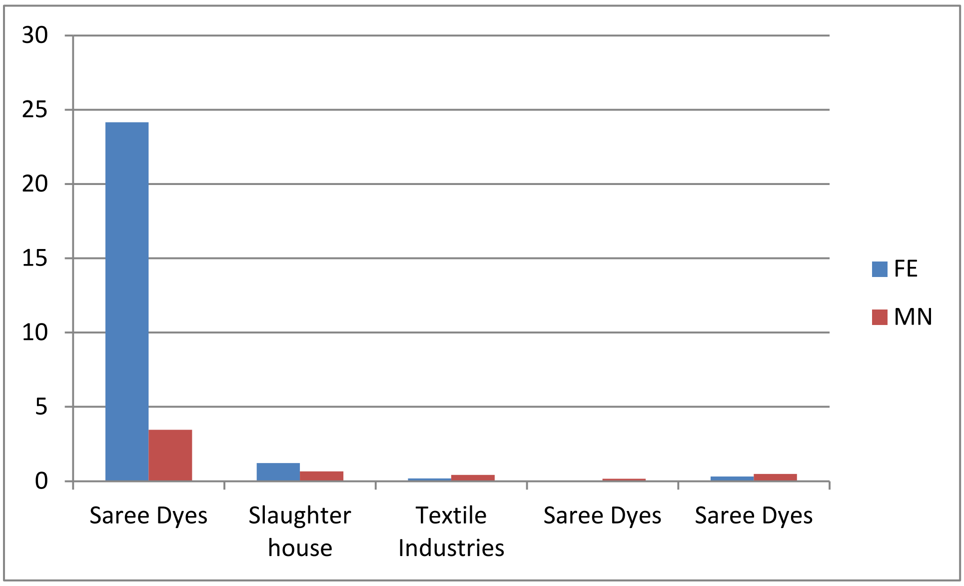


Fig. 3.18: Fe and Mn values (Industrial Effluent affecting Girna)

Fe & Mn showing higher trend due to untreated effluent

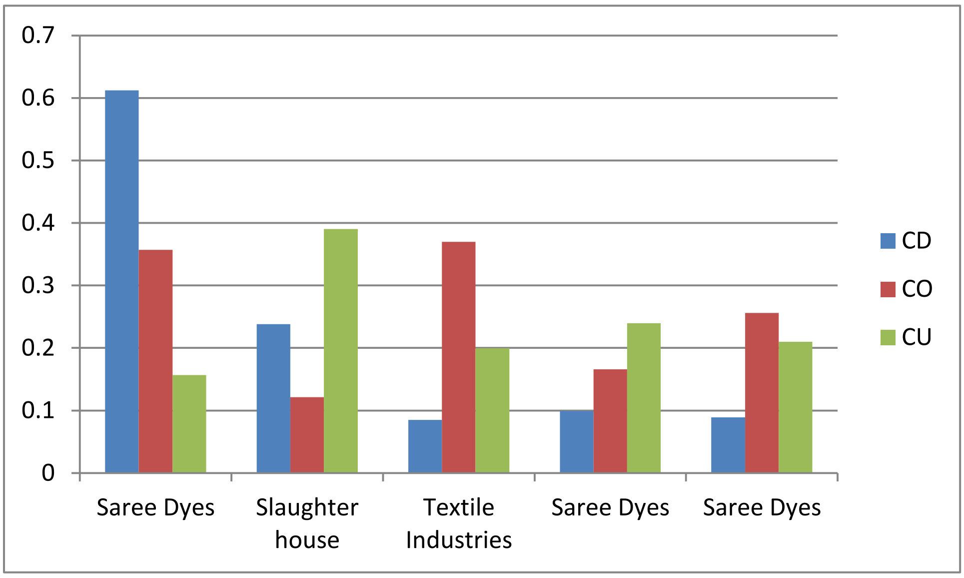


Fig. 3.19: Cd, Co, Cu values (Industrial Effluent affecting Girna)

D & CO shows higher trend i.e. above prescribed limit is due to untreated effluent.

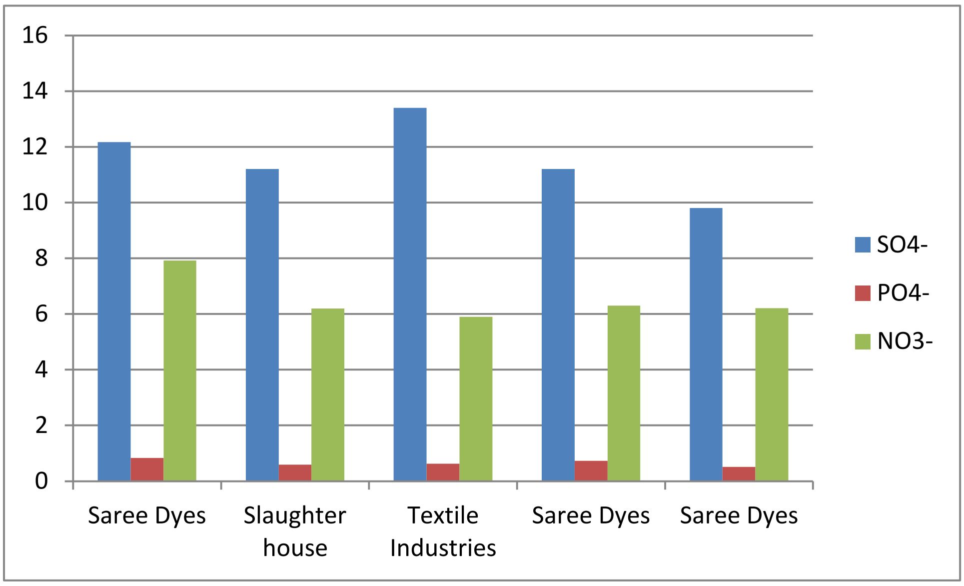


Fig. 3.20: SO4, PO4 and NO3 values (Industrial Effluent affecting Girna)

The above figure shows the values are within the limit

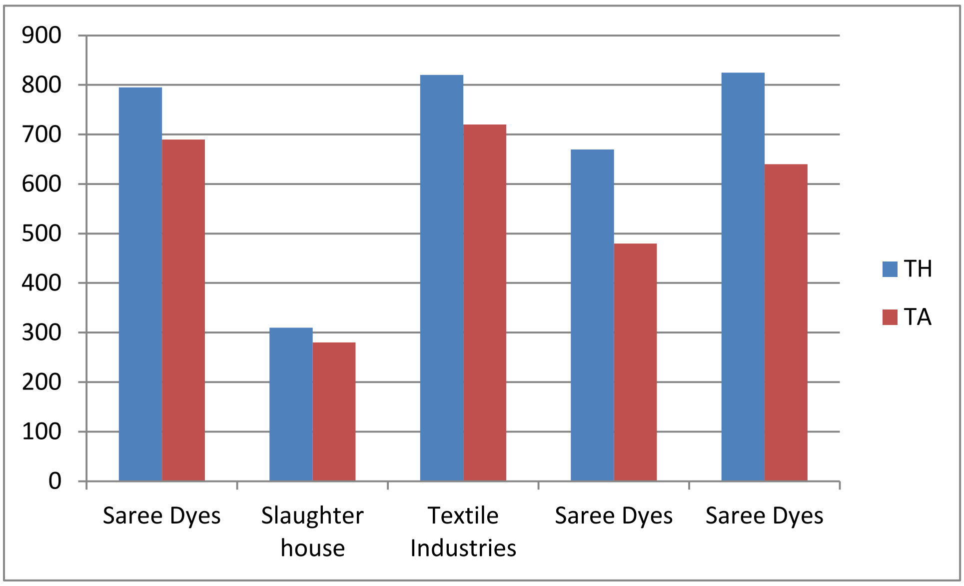


Fig. 3.21: TH and TA values (Industrial Effluent affecting Girna)

TH & TA values are above the limit is due to untreated effluent

Pesticides

Several studies earlier reported that the pesticide exposure lead to cancer. The relationship have been established with brain, kidney, liver, lung and skin cancers (Gilden et al., 2010) Increased frequency of cancer has been found among farm workers who apply these chemicals (McCauley et al. 2006). A mothr's occupational exposure to pesticides during pregnancy is associated with increases in her child's risk in the form of tumor and brain cancer (Van et al., 2010). Furthermore, studies indicated that the pesticide exposures are associated with long-term health problems such as respiratory problems and memory disorders (Beseler et al. 2008).

The pesticide residues are accumulated insoil and then pass to the plant through the roots (Fismes et al., 2002; Otani et al., 2007). Contamination levels of other vegetables do not seem to present a danger to human health according to FAQ and WHO (2001) standards. However, the study shows contaminations of vegetables, water and soil but it was not possible to determine long-term effects on living organisms and ecosystem function. It is clear that the absorption of pesticide residues present in vegetables and fruits produce may present a risk of poisoning when consumption is associated with a regular intake in small doses (kamdem and Fofiri, 2008).

To carried out pesticide analysis of water samples to know the contamination levels of pesticide viz. Aldrin, Di Aldrin, Heptachlor, DDT, Endosulphan, Chloro piro phos, Ethion, Di Methonate, Malathion, Mono croto phos etc.

Results of Analysis

Table 3.2: Results of pesticide analysis

Sr. No	Parameters	Unit	Mausom River	Bhadgaon	BIS Standards
1	DDT	µg/Lit	BDL	BDL	1
2	Endosulphan	µg/Lit	0.1	0.1	0.4
3	Aldrin	µg/Lit	BDL	0.01	0.03
4	Di Aldrin	µg/Lit	BDL	BDL	0.03
5	Heptachlor	µg/Lit	BDL	BDL	BDL
6	Chloro Piro Phos	µg/Lit	BDL	BDL	BDL
7	Ethion	µg/Lit	BDL	BDL	BDL
8	Di Methonate	µg/Lit	BDL	BDL	BDL
9	Malathion	µg/Lit	BDL	BDL	190
10	Mono croto phos	µg/Lit	BDL	BDL	BDL

Pesticide analysis result shows that the Aldrin, Di Aldrin, Heptachlor, DDT, Endosulphan, Chloro piro phos, Ethion, Di Methonate, Malathion, Mono croto phos etc. pesticides are found in water samples. All samples are within the prescribed limits of BSI.(Table 3.2)

Table 3.3: Concentration of pesticide as per BIS Standards

Sr. No	Name of Pesticide	Standards
1	Aldrin	0.03
2	Dieldrin	0.03
3	Carbonyl	NA
4	Chlordane	NA
5	DDT	1
6	DDE	NA
7	Diazion	NA
8	Dichlorophos	NA
9	Dicofol	NA
10	Diamathoate	NA
11	Endosulfan a	0.4
12	Endosulfan b	0.4
13	Fenitrothion Hydrogen Cyanide	NA
14	Hexacholorocyclohexane	NA
15	Parathion methyl	0.3
16	Malathion	190
17	Monochrotophos	1
18	Phosphamidon	NA
19	Chloropyriphos	30
20	Thiometon	NA
21	Carbendazim	NA
22	Benomy Carbifuran copper	NA
23	Fenthion	NA
24	Phorate	2

Water samples pesticide residue results show that the examined pesticide were observed less than 0.1 ppb (as per above table). Relation of pesticide residue in water shows that the pesticide values in water is observed to be in traces amount.

Girna water samples at Mausom river at Malegaon and Bhadgaon areas this areas are also famous for agriculture belt & farmers and utilizing chemical fertilizers / pesticides etc for increasing growth of food grains & it involves into river water system. Some of traces of endosulphan and Aldrin was observed in Girna river water system. All concentrations are within the limit but still they observed in traces.

CHAPTER IV

CONCLUSION, RECOMMENDATIONS AND ACTION PLAN

From the foregoing discussions & data generated from field observations it is clear that observations and suggestions are mostly useful for clear understanding the area. Further recommendation & suggestions will be useful for scientific planners & implementation will be beneficial for the management of future of the society.

Girna River originates in Nasik district of Western Ghats in Kalwan areas of Nasik district. The area occupies under study is from Malegaon to Jalgaon city. Total area is about 180 kms. There are many streams & nala meet river Girna, Mausom River meets Girna at Malegaon. Malegaon is a big capital of various sectors. Many small scale industries are situated in Malegaon. The pollution load is increases day by day into Girna river water system. The samplings were divided into three categories viz. surface water, domestic water and Industrial samples. Total 21 samples were collected out of which 9 samples from surface water, 7 samples from domestic water and 5 samples from Industrial effluent. Pesticide (two) samples were also collected for determining the pesticide concentrations in Girna river water system.

To evaluate the overall quality of samples for determining the quality for domestic purpose and to suggest the remedial measure for strengthening the pollution free river water system for the benefit of the future of the society. TDS level is higher in some samples as discussed earlier, it is due to anthropogenic sources some of heavy metals are observed it is due to anthropogenic sources and Malegaon city waste water merges with Girna & heavy pollution load is increases day by day so concentration of heavy metals and other TDS values of surface water and domestic wastewater is increases, it’s due to untreated wastewater of Malegaon & Jalgaon city. COD/BOD values are also higher in industrial samples. It reflects that untreated industrial waste water. So there should be an urgent need to launch treatment plan for every industry and they should recycle the wastewater and then treated wastewater drain into nala system. Certain heavy metals are observed above the prescribed limit especially into Malegaon & Jalgaon city waste water nala which are drains into Girna river water system.

The main source of pollution in the Girna River is untreated domestic discharge from various villages and towns situated along the river. According to WHO estimate, about 80% of water pollution in developing country, like India is caused by domestic waste. The present studies were under taken to investigate the impact of quality of water for domestic suitability.

The sampling points were chosen to cover the entire span of 180 Km of Girna River. After primary survey of the area, 16 samples stations along the river starting from Malegaon shown in Map no 1 were chosen for study to obtain a good distribution of the area to evaluate the overall quality.

The average value of physicochemical data of various water samples collected from the 16 sites in the month of Dec 2013 were tabulated in table 1. The sampling were divided in three categories viz surface water, Domestic and Industrial samples. Therefore there is an urgent action plan should be enforced for integrated approaches for pollution free river water system, so that pollutants load should not be increased in river water system. For good health of every human kind, therefore amendments are required for utilizing the river water, use of chemical fertilizer/pesticides etc. use of chemical fertilizer /pesticide etc. utilization in and around surface water bodies and also domestic wastewater treatment plan, solid waste management plan for every village or town and major cities in and around major river water areas.

There is an urgent need to launch these Recommendations & remedial measures as shown in table 4.1 for strengthening and protecting pure water resources which are need of the society for future.

Following recommendations were made for protecting the surface water system and treatment is essential for domestic waste water of villages, towns & cities. Industries should also be note the same regarding treatment of wastewater plant & reuse the wastewater for their needs and drain treated water for societal domestic purposes.

Measures control of water pollution:

1. Accurate calculations for water & wastewater to be done from all areas from city & villages.
2. Underground drainage system should be done in all areas (100%) for waste water

3. Wastewater Treatment Plants should be constructed and operated calculating future population growth.

4. Wastewater Treatment Plants should be constructed at such a place where wastewater should be collected by gravity so that there will be no effect of load shading on collection and maintenance.

5. Land should be made reserved for plants as per geographical location. Detailed survey should be made to construct plant combining two or more villages and population.

6. Improved Technology should be used for production of Power, fertilizer.

7. All hospitals or groups should start treatment plants.

8. In the areas where less wastewater is generated should be collected and driven to suitable place for treatment. Currently all wastewater is released in nalas respectively to rivers without treatment.

9. Untreated waste water should not be released without treatment.

10. Untreated wastewater should not be release without treatment on Land, Open Pits, Ducts, Wells, Tanks, etc.

11. Water should be stored under closed concrete tank under which clorination or Sodium Hypochlorite should be used.

12. Municipal Council/Corporation should be alert from biomedical solid waste, should not be mixed with domestic waste or wastewater.

13. Wastewater generated from other business like River bank service stations, Slaughter house, Meat & Fish market, Hotels, mess, lorries etc. likewise types of business more or less wastewater generated. Due to such wastewater types of domestic wastewater gets change. More due to release of solid waste mixed into roadside drainage which leads to bad odor, mosquito and block of drains such question arises.

14. Waste water treatment plants to be constructed in capacity and operated.

15. Excepting slaughter house, it should be strictly prohibited to cut animals elsewhere

16. Oil and Grease separating scheme should be made compulsory

17. Division wise plan should be made to collect wastewater from Lorries.

18. Awareness campain for farmers should be made by Agriculture Universities and Agricultural Department.

19. Sale of Fertilizers and Pesticides should be strictly monitored.

20. Application of water meter for consecutive use.

21. Awareness campaign or program should be undertaken by agriculture department to restrict fertilizer/Pesticide and promote Bio-fertilizers near Rives 3Km, 5Km, 10Km distance.

Table 4.1: Proposed waste water management Plan for River Girna from Malegaon to Jalgaon

Sr. No	District	Taluka	Village	Total Population	Water supply Lit/Day	Waste water Generation Lit/day	Proposed Waste water Scheme
1	Nasik	Malegaon	Amode	2,377	95080	76,064	Gutter with Soak Pit
2	Nasik	Malegaon	Nardane	1,509	60360	48,288	Gutter with Soak Pit
3	Nasik	Malegaon	Borale	2,198	87920	70,336	Gutter with Soak Pit
4	Nasik	Malegaon	Malgaon	1,713	68520	54,816	Gutter with Soak Pit
5	Nasik	Malegaon	Umbardhe	1,392	55680	44,544	Gutter with Soak Pit
6	Nasik	Malegaon	Kalamdari	2,173	86920	69,536	Gutter with Soak Pit
7	Nasik	Malegaon	Dahiwal	3,362	134480	107,584	Gutter with Soak Pit
8	Nasik	Malegaon	Ronzane	1,480	59200	47,360	Gutter with Soak Pit
9	Nasik	Malegaon	Malagaon	3,057	122280	97,824	Gutter with Soak Pit
10	Nasik	Malegaon	Sitane	854	34160	27,328	Gutter with Soak Pit
11	Nasik	Malegaon	Ajande Kh	786	31440	25,152	Gutter with Soak Pit
12	Nasik	Malegaon	Khayade	2,232	89280	71,424	Gutter with Soak Pit
13	Nasik	Malegaon	Namgule	602	24080	19,264	Gutter with Soak Pit
14	Nasik	Malegaon	Gilane	1,766	70640	56,512	Gutter with Soak Pit
15	Nasik	Malegaon	Khalane	738	29520	23,616	Gutter with Soak Pit
16	Nasik	Malegaon	Ajande	1,227	49080	39,264	Gutter with Soak Pit
17	Nasik	Malegaon	Malhanagaon	1,341	53640	42,912	Gutter with Soak Pit
18	Nasik	Malegaon	Savandgaon	3,275	131000	104,800	Gutter with Soak Pit
19	Nasik	Malegaon	Yesgaon	2,430	97200	77,760	Gutter with Soak Pit
20	Nasik	Malegaon	Yesgaon Bk	3,699	147960	118,368	Gutter with Soak Pit
21	Nasik	Malegaon	Maldhe	11,881	475240	380,192	Gutter with Soak Pit
22	Nasik	Malegaon	Malegaon	471,312	18852480	15,081,984	Closed Gutter & Treatment Plant

Sr. No	District	Taluka	Village	Total Population	Water supply Lit/Day	Waste water Generation Lit/day	Proposed Waste water Scheme
23	Nasik	Malegaon	Dyane CT	49,192	1967680	1,574,144	Closed Gutter & Treatment Plant
24	Nasik	Malegaon	Bhuigavahan	675	27000	21,600	Gutter with Soak Pit
25	Nasik	Malegaon	Soyagaon	34,341	1373640	1,098,912	Closed Gutter & Treatment Plant
26	Nasik	Malegaon	Chandanpuri	6,623	264920	211,936	Gutter with Soak Pit
27	Jalgaon	Jalgaon	Jalgaon	460228	18409120	14,727,296	Closed Gutter & Treatment Plant
28	Jalgaon	Jalgaon	Bambhori Pr. Chandsar	6392	255680	204,544	Gutter with Soak Pit
29	Jalgaon	Jalgaon	Savkhede Bk.	3834	153360	122,688	Gutter with Soak Pit
30	Jalgaon	Jalgaon	Mohadi	4102	164080	131,264	Gutter with Soak Pit
31	Jalgaon	Jalgaon	Nagziri	130	5200	4,160	Gutter with Soak Pit
32	Jalgaon	Jalgaon	Shirsoli P.B.	9126	365040	292,032	Gutter with Soak Pit
33	Jalgaon	Jalgaon	Dapore	2516	100640	80,512	Gutter with Soak Pit
34	Jalgaon	Jalgaon	Kurhadade	753	30120	24,096	Gutter with Soak Pit
35	Jalgaon	Jalgaon	Lamanjan P.Bornar	734	29360	23,488	Gutter with Soak Pit
36	Jalgaon	Jalgaon	Mhasawad	8424	336960	269,568	Gutter with Soak Pit
37	Jalgaon	Jalgaon	Bornar	3757	150280	120,224	Gutter with Soak Pit
38	Jalgaon	Pachora	Dahigaon	1822	72880	58,304	Gutter with Soak Pit
39	Jalgaon	Erandol	Pimpri Sim	687	27480	21,984	Gutter with Soak Pit
40	Jalgaon	Pachora	Varasade Pr.Bornar	843	33720	26,976	Gutter with Soak Pit
41	Jalgaon	Pachora	Mahiji	2617	104680	83,744	Gutter with Soak Pit
42	Jalgaon	Erandol	Hanmantkhede Sim	1141	45640	36,512	Gutter with Soak Pit
43	Jalgaon	Erandol	Utran Gujar Hadd	4179	167160	133,728	Gutter with Soak Pit
44	Jalgaon	Pachora	Kurangi	3524	140960	112,768	Gutter with Soak Pit
45	Jalgaon	Pachora	Bahuleshwar	36	1440	1,152	Gutter with Soak Pit
46	Jalgaon	Pachora	Dasegaon Bk	1384	55360	44,288	Gutter with Soak Pit

Sr. No	District	Taluka	Village	Total Population	Water supply Lit/Day	Waste water Generation Lit/day	Proposed Waste water Scheme
47	Jalgaon	Erandol	Utran Ahir Hadd	4328	173120	138469	Gutter with Soak Pit
48	Jalgaon	Pachora	Pardhade	1455	58200	46560	Gutter with Soak Pit
49	Jalgaon	Pachora	Bhatkhande Kh.	1,408	56,320	45056	Gutter with Soak Pit
50	Jalgaon	Pachora	Anturli Kh.Pr.Pachora	1110	44400	35520	Gutter with Soak Pit
51	Jalgaon	Pachora	Ozar	866	34640	27712	Gutter with Soak Pit
52	Jalgaon	Pachora	Mandaki	253	10120	8096	Gutter with Soak Pit
53	Jalgaon	Pachora	Pungaon	2940	117600	94080	Gutter with Soak Pit
54	Jalgaon	Bhadgaon	Bhattagaon	714	28560	22848	Gutter with Soak Pit
55	Jalgaon	Pachora	Bambarud Kh. Pr.Pachora	1788	71520	57216	Gutter with Soak Pit
56	Jalgaon	Pachora	Anturli Bk.	1686	67440	53952	Gutter with Soak Pit
57	Jalgaon	Pachora	Lohatar	4026	161040	128832	Gutter with Soak Pit
58	Jalgaon	Bhadgaon	Tongaon		0	0	Gutter with Soak Pit
59	Jalgaon	Bhadgaon	Bhadgaon (M Cl)	37214	1488560	1190848	Closed Gutter & Treatment Plant
60	Jalgaon	Bhadgaon	karab		0	0	Gutter with Soak Pit
61	Jalgaon	Bhadgaon	Wadadhe		0	0	Gutter with Soak Pit
62	Jalgaon	Bhadgaon	Kothali	2654	106160	84928	Gutter with Soak Pit
63	Jalgaon	Bhadgaon	Nimbhore	2461	98440	78752	Gutter with Soak Pit
64	Jalgaon	Bhadgaon	Devhari	939	37560	30048	Gutter with Soak Pit
65	Jalgaon	Bhadgaon	Kanashi	1536	61440	49152	Gutter with Soak Pit
66	Jalgaon	Bhadgaon	Lon Pr. Bhadgaon	1328	53120	42496	Gutter with Soak Pit
67	Jalgaon	Bhadgaon	Ghusardi Kh.	1508	60320	48256	Gutter with Soak Pit
68	Jalgaon	Bhadgaon	Gondgaon	4242	169680	135744	Gutter with Soak Pit

Sr. No	District	Taluka	Village	Total Population	Water supply Lit/Day	Waste water Generation Lit/day	Proposed Waste water Scheme
69	Jalgaon	Bhadgaon	Bambrud Pr. Bahal	1792	71680	57,344	Gutter with Soak Pit
70	Jalgaon	Bhadgaon	Navare	428	17120	13,696	Gutter with Soak Pit
71	Jalgaon	Bhadgaon	Wade	5299	211960	169,568	Gutter with Soak Pit
72	Jalgaon	Chalisgaon	Tekwade Kh.	727	29080	23,264	Gutter with Soak Pit
73	Jalgaon	Chalisgaon	Tekwade Bk.	235	9400	7,520	Gutter with Soak Pit
74	Jalgaon	Chalisgaon	Bahal	7897	315880	252,704	Gutter with Soak Pit
75	Jalgaon	Chalisgaon	Borkhede Bk	2571	102840	82,272	Gutter with Soak Pit
76	Jalgaon	Chalisgaon	Rahipuri	1336	53440	42,752	Gutter with Soak Pit
77	Jalgaon	Chalisgaon	Bhaur	2051	82040	65,632	Gutter with Soak Pit
78	Jalgaon	Chalisgaon	Vadgaon Lambe	2780	111200	88,960	Gutter with Soak Pit
79	Jalgaon	Chalisgaon	Dasegaon Bk	1384	55360	44,288	Gutter with Soak Pit
80	Jalgaon	Chalisgaon	Mehunbare	9619	384760	307,808	Gutter with Soak Pit
81	Jalgaon	Chalisgaon	Umbarkhede	7159	286360	229,088	Gutter with Soak Pit
82	Jalgaon	Chalisgaon	Pimpalwad Mhalsa	3035	121400	97,120	Gutter with Soak Pit
83	Jalgaon	Chalisgaon	Varkhede Kh.	798	31920	25,536	Gutter with Soak Pit
84	Jalgaon	Chalisgaon	Varkhede Bk.	3420	136800	109,440	Gutter with Soak Pit
85	Jalgaon	Chalisgaon	Tamaswadi	971	38840	31,072	Gutter with Soak Pit
86	Jalgaon	Chalisgaon	Upkhede	2566	102640	82,112	Gutter with Soak Pit
87	Jalgaon	Chalisgaon	Mandurne	3288	131520	105,216	Gutter with Soak Pit

ACTION PLAN

Action plan is prepared as per scope of work provided by the Maharashtra Pollution Control Board (MPCB), Mumbai. Here we are prevailing action plan for implementation of various suggestions for the wellbeing of the society.

Short Term action Plan

Sr.No.	Activity	Responsibility	Time Frame
1	Organize awareness programs about environment pollution	Malegaon & Jalgaon Municipal Corporation and Girna river adjoining 87 Grampanchyats	One Month
2	To prepare quantum of Solid Waste and Sewage generated	Malegaon & Jalgaon Municipal Corporation and Girna river adjoining 87 Grampanchyats	One Month
3	Operate existing STP round the clock in scientific manner	Malegaon & Jalgaon Municipal Corporation	Immediately
4	Organize awareness programs about promotion of organic farming on the River bank of villages. Restriction of chemical Pesticide, insecticide, fertilizer etc.	Agriculture Department, Malegaon & Jalgaon Municipal Corporation and Girna river adjoining 87 Grampanchyats CO	Immediately
5	Common toilets should be constructed in all areas to be covered. Stop open deification and awareness program should be conducted in these areas	Malegaon & Jalgaon Municipal Corporation and Girna river adjoining 87 Grampanchyats CO	3 months
6	Vehicle, cloths, animal wash should be stopped on the bank of river and awareness program should be conducted in river bank areas	Malegaon & Jalgaon Municipal Corporation and Girna river adjoining 87 Grampanchyats CO	3 months
7	Environment expert should be appointed by the every concern municipal council and ZP to monitor the environmental aspects in the area. Referred by MPCB, Nasik	Malegaon & Jalgaon Municipal Corporation and CO	Immediately
8	For biomedical solid waste, all hospitals or groups should treat the same	Private and Govt Hospital CEO	2 months

Long Term action Plan

1	Meat & Fish market should be at a such locations, where waste water can be treated.	Malegaon & Jalgaon Municipal Corporation and Girna river adjoining 87 Grampanchyats CO	1 year
2	Compulsory application of water meter.	Malegaon & Jalgaon Municipal Corporation and Girna river adjoining 87 Grampanchyats CO	1 Year
3	Maintaining continuous flow in the river	MGP, Irrigation Department	1 Year
4	For the treatment of 100% waste water prepare a plan, construct & operate STP in scientific manner	Malegaon & Jalgaon Municipal Corporation	2 Years
5	Illegal industries to be brought outside in MIDC areas and no household industry should be allowed	Malegaon & Jalgaon Municipal Corporation and Girna river adjoining 87 Grampanchyats CO	2 years
6	Underground drainage system should be done in all areas (100%) for wastewater	Malegaon & Jalgaon Municipal Corporation and Girna river adjoining 87 Grampanchyats CO	1 year
7	Additional Suggestions made by Committee should be implemented	Committee mentioned below	

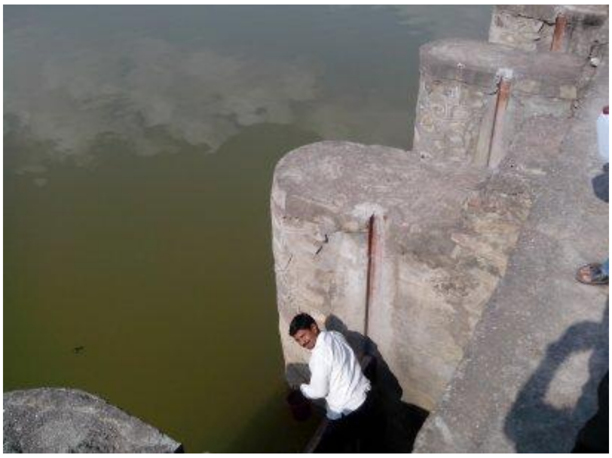
In view of above following monitoring committee should be constituted with suggestion from MPC Board to harmonize recommendations made in this report. Quarterly meeting should be held at the district level or at Council, Corporation or ZP.

1	Regional Officer, MPCB, Nasik	Chairman
2	Commissioner, Malegaon & Jalgaon Municipal Corporation	Member
3	Zilla Parishad Chief Officer, Jalgaon	Member
4	Environment Expert	Member
5	Sub Regional Officer, Nasik & Jalgaon	Convener

PHOTO PLATE I

Mausom River flowing from Malegaon city

Confluence of Girna & Mausom river



Collection of water sample at Malegaon Bhandara

Site visit at recycle plastic factory, Malegaon

Site visit at recycle plastic factory, Malegaon

Direct use of wastewater for agriculture & other purposes

PHOTO PLATE II

Nala adjacent to Slaughter house at Malegaon

Site visit at Textile industry at Malegaon

Factories under construction in MIDC, Malegaon

Recording information at Yesgaon

Pump house for Malegaon at Girna Dam

Dry portion of Girna River, downstream of Girna Dam