Preface

Barshi Municipal Council (BMC) has been preparing Environmental Status Reports (ESRs) since 2004. We take pleasure in presenting the ESR for 2008-09.

In order to standardize the ESR development process and enhance the quality of ESRs, a more comprehensive ESR preparation methodology has been developed by the Maharashtra Pollution Control Board (MPCB). It is necessary that this methodology be demonstrated to create a Model ESR that will serve as a guide for other Urban Local Bodies (ULBs).

For this purpose, the Barshi Municipal Council has developed the ESR for 2008-09 using the methodology developed by MPCB. In doing so, it presents this ESR as a Model ESR. Using this opportunity, the BMC envisions Barshi town as a Model Town. The Council has formulated an Environmental Policy to support this vision along the lines of sustainable development. It is our aspiration that the Environmental Policy will guide all Departments under the BMC to achieve their environmental objectives and targets.

Mr. G. K. Rathod
Chief Officer
Barshi Municipal Council

Mr. Yogesh Sopal
President
Barshi Municipal Council

Acknowledgement

This ESR is a demonstration of a participatory and consensus driven approach to prepare ESRs by ULBs in Maharashtra. The ESR is based on outcomes of the stakeholders' consultation workshops conducted with the Environmental Management Centre (EMC).

We would like to acknowledge the support, advice and direction provided by the MPCB and technical assistance from EMC. We would also like to thank MITCON Consultancy for conducting environmental monitoring and providing data towards the preparation of this Report.

Our special thanks for support from the citizens of Barshi in developing this ESR.

Mr. G. K. Rathod
Chief Officer
Barshi Municipal Council

Mr. Yogesh Sopal
President
Barshi Municipal Council

Environmental Status Report

2008-09

Table of Contents

List of Annexures

List of Figures

List of Tables

Abbreviations

BMC	Barshi Municipal Council
BMW	Bio-Medical Waste
BOD	Biochemical Oxygen Demand
BTM	Barshi Textile Mill
CPCB	Central Pollution Control Board
EMC	Environmental Management Centre
ESR	Environmental Status Reports
ICU	Intensive Care Unit
LPCD	Liters Per Capita per Day
MLD	Million Liters per Day
MPCB	Maharashtra Pollution Control Board
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
SH	State Highway
SPM	Suspended Particulate Matter
TDS	Total Dissolved Solids
ULB	Urban Local Body
WTP	Water Treatment Plant
E&S	Environmental and Social
SO_2	Sulphur Dioxide
NO_x	Nitrogen Oxides
ST	State Transport

Executive Summary

Barshi Municipal Council (BMC) has been preparing Environmental Status Reports (ESRs) since 2003-04. The ESR of BMC for the year 2008-09 is a demonstration of the comprehensive ESR preparation methodology developed by the Maharashtra Pollution Control Board (MPCB)

Barshi's ESR preparation process is based on participatory approach involving various stakeholders from government bodies and citizens. The primary objective of the stakeholder consultation is to identify the town's needs and most urgent issues for action planning.

A working group was formulated which included personnel from various departments of BMC headed by the Chief Officer Mr. G. K Rathod. A launch workshop was organized to explain the concept of model ESR and preparation process for BMC personnel. Stakeholders' consultation workshops were held twice. The first workshop was held to understand the issues faced by the stakeholders as well as various activities and programs taking place in the town in order to improve the quality of the environment. During this workshop, many stakeholders from various fields participated.

BMC launched a website for all citizens 'www.ecocityindia.org' so that stakholders' participation is not limited to workshop only. On this website, citizens can share their concerns as well as initiatives on Google Map for Barshi. Also they can have interactions with registered experts in field of environment through this site.

The second stakeholders' consultation workshop was held to share the Draft ESR with Action Plan and get stakeholders' views on the report.

The situation analysis provides an understanding of the present state of affairs in the town. The purpose of this analysis is to enable the effective mapping of external environmental challenges with internal institutional capabilities and available resources towards drawing out an appropriate Action Plan.

The DPSIR (Driver-Pressure-State-Impact-Response) framework has been used for analysis of environmental issues relevant to the town and drawing out an Action Plan. The driving forces considered are population growth, industrialization and tourism. The pressures along with state of natural resources and services have been analyzed. The analysis of the state of natural resources includes air quality, noise, water quality, land, flora and fauna. The analysis of the state of services includes water supply, sewage and sanitation, solid waste management and transportation. The impacts on the environment and people are identified based on the status of natural resources and services. Impacts were also identified in the stakeholders'

consultation workshop as per the peoples' perception. The issues highlighted here mainly included sanitation facilities like public toilets, sewerage system, quality and width of roads, and lack of green open spaces. The impacts of air pollution were not deemed as evident. Ground water depletion appears is an issue requiring further consideration and The number of patients suffering from water borne disease indicates some amount of water contamination. Further, there is a risk of agricultural land getting polluted due to direct application of sewage to these lands for irrigation.

The Action Plan is prepared as a response to the issues and opportunities identified during the assessment and is in line with the Environmental Policy of Barshi.

Driven by BMC's vision, the Barshi's Environmental Policy was framed while preparing this ESR for the year 2008-09. The vision is based on the concept of a 'Model Town' moving towards zero environmental impacts. The Environmental Policy is founded on the concept of Sustainable Development and thereby recognises Environmental and Social (E&S) considerations in its business operations. This Policy applies to all Departments under BMC. Under the Environmental Policy, objectives and associated targets have been identified.

The Objectives in line with the Environmental Policy for ESR 2008-09 are –

- To provide basic infrastructure in terms of sanitation facilities, regular water supply, transportation facilities and open / green spaces
- To involve citizens and stakeholders in environmental protection and management
- To revise the Development Plan when the need arises and ensure its strict implementation to benefit the town

The targets are based on the objectives and include providing adequate sanitation facilities, improving the sewerage network, constructing a sewage treatment facility, widening arterial roads and conducting necessary land acquisitions for implementation of the Development Plan.

Various Actions in terms of projects, programs as well as studies or surveys have also been identified, along with their priorities. Some of them are -

- Provision of public sanitation facilities as well as technical and financial assistance to individuals to build latrines **– High Priority**
- Design and construction of sewers (centralized and decentralized options) **– High Priority**
- Provision of a sewage treatment facility (constructed wetland treatment at Lendi Nala) **– High Priority**
- Improvement in the Environmental Monitoring Program focusing on air and noise - **High Priority**

- Conducting studies and surveys such as the traffic survey to plan road widening or make provision for new roads, an avian fauna survey focusing on migratory birds, and so on

The high priority actions are further detailed out to include the type of action, its objectives, location, targeted beneficiaries, tasks under it, a broad level implementation plan, responsibility allocation, tentative budgetary requirements, recommendations for additional studies required and illustration of similar interventions which have been implemented elsewhere.

Non-technical Executive Summary (Marathi)

बार्शी नगरपालिका २००३ - ०४ पासून पर्यावरण स्थितीचा अहवाल तयार करत आहे. परंतु या वर्षीचा अहवाल मागील वर्षांपेक्षा थोडा वेगळा असून महाराष्ट्र प्रदूषण नियंत्रण मंडळाच्या मार्गदर्शनाखाली बनविला गेला आहे. इतर शहरांच्या नगरपालिका आणि महानगरपालिका यांसमोर आदर्श अहवाल प्रस्तुत करणे हा या मागील उद्देश आहे. प्रथमच पर्यावरण अहवाल बनविण्यामध्ये नागरिकांचा सहभाग आणि योगदान आहे. नागरिकांच्या दृष्टीने महत्वाचे मुद्दे कोणते, काळजीचे विषय काय आहेत, तसेच नागरिकांनी स्वतःहून चालू केलेले उपक्रम जाणून घेण्यासाठी एका कार्यशाळेचे आयोजन करण्यात आले होते.

नागरिकांचा सहभाग फक्त कार्यशाळेपुरताच मर्यादित राहू नये यासाठी एक वेबसाईट बनविण्यात आली. www.ecocityindia.org या वेबसाईटवर नागरिकाना त्यांची मते, काळजीचे मुद्दे, उपक्रम केव्हाही मांडता येतात.

या सर्व माहितीचा तसेच नगरपालिकेच्या पदाधिकार्यांकडून मिळालेल्या माहितीचा उपयोग करून पर्यावरणाच्या सद्यस्थितीचा अभ्यास केला गेला. या अभ्यासाद्वारे 'शहराचा विकास होण्यासाठी परंतू पर्यावरणाचा समतोल बिघडवणारे कोणते घटक जबाबदार आहेत', 'या घटकांमुळे नैसर्गिक स्त्रोतांवर काय विपरीत परिणाम होत आहेत', 'या स्त्रोतांची सद्यस्थिती कशी आहे', 'ती मानवी जीवनाला पूरक आहे का', 'नसल्यास त्याचे आपल्यावर कसे आणि कोणते परिणाम होत आहेत', 'ते होऊ नयेत यासाठी कोणत्या उपाययोजना कराव्या लागतील' इत्यादी प्रश्नांची उत्तरे शोधण्याचा प्रयत्न केला गेला.

विशिष्ट पद्धतीने केलेल्या या अभ्यासामुळे विविध मुद्दे, त्यांची कारणे लक्षात आली. काही महत्त्वाचे मुद्दे खालील प्रमाणे -

१. बार्शी मध्ये मलनिस्सारणाच्या सुविधा अपू-या आहेत.
२. सांडपाण्यासाठी गटारे मोजक्याच जागी असून त्यांच्या स्वच्छतेबद्दल प्रश्न आहेत.
३. रस्ते अरुंद असून वाहतुकीचे प्रश्न आहेत.
४. मैदाने, बगीचे यांसारखी सार्वजनिक ठिकाणे कमी आहेत.
५. भूजल पातळी दिवसेंदिवस कमी होत आहे.

६. सांडपाण्याचा शेतीसाठी वापर केला जात असल्यामुळे जमिनीचा कस कमी होत आहे. इत्यादी

या सर्व प्रश्नांवर एक एक करून उपाययोजना करण्यापेक्षा एकत्रितपणे विचार करणे जास्त फायद्याचे आणि परिणामकारक ठरेल. यासाठी आणि बार्शीचा विकास 'आदर्श शहर' म्हणून करण्यासाठी नगरपालिकेने पर्यावरण नीति (Environmental Policy) अवलंबिली आहे. याद्वारे शाश्वत विकासाकडे वाटचाल करताना सामाजिक घटक, पर्यावरण संरक्षण आणि संवर्धन या बाबींना महत्त्व देण्यात येणार आहे. या पॉलिसी द्वारे नागरिकांच्या सोयीसाठी विविध नागरी सुविधा उपलब्ध करून देण्यात येतील. उदाहरणार्थ संडास आणि गटारे बांधणी, रस्ते रुंदीकरण, सार्वजनिक बागा आणि मैदाने इत्यादी. वेगवेगळ्या स्तरांवरील उपक्रमांमध्ये नागरिकांच्या सहभागावर भर दिला जाईल. विकास आराखड्याची पूर्णतः अंमलबजावणी करण्याचे प्रयत्न केले जातील.

बार्शी नगरपालिकेने बनविलेल्या या पर्यावरण अहवालामध्ये प्रथमच कृती आराखड्याचा समावेश करण्यात आला आहे. पर्यावरण संरक्षण आणि संवर्धन नगरपालिकेच्या सर्व विभागांनी अंगिकारावे आणि कृती आराखड्याचे पालन करावे हा यामागील उद्देश आहे.

1. Background of ESRs

Preparation of Environmental Status Reports (ESRs) is mandated in the 74th Constitutional Amendment Act and the Twelfth Schedule. Some cities of Maharashtra have been publishing ESRs since 1997.

The ESR is a comprehensive document that serves as an information resource base for identification of critical issues and also as an input for new city / town development plans or even revisions in them. The ESR attempts to identify current and emerging environmental concerns as well as opportunities at the town level. It does this through the identification of demographic, social and economic driving forces behind various issues that can pose risk to environment and health and safety of citizens. The ESR also encourages the Urban Local Bodies (ULBs) to formulate and adopt an overarching Environmental Policy, which would ultimately help in planning and implementation of the Action Plan (a product of the ESR).

Thus, the objectives of preparing an ESR may be listed as below -

- To assist in drawing meaningful inferences about the status of the environment for a city / town
- To provide a logical decision making structure for responses (including appropriate resource allocation) to planners and policy makers
- To communicate the status of the environment as well as proposed actions to resolve identified issues to all stakeholders including citizens

1.1. Barshi ESR

Barshi Municipal Council (BMC) is one of the oldest municipal councils, established in 1865. It was classified as Class A municipal council in 2001. BMC has been preparing an ESR every year since 2003. The Status Report covers the state of natural resources in terms of air, water and noise pollution, land management etc. and details of associated infrastructure services such as solid waste management, sewerage and sanitation, education and health care facilities, transportation etc.

2. ESR Preparation Process

Barshi's ESR preparation process involves stakeholders as it is based on the participatory approach. This most important element - stakeholder participation and consultation - remained weak in formulating past ESRs, but has been incorporated in Barshi's ESR for 2008-09. As the name suggests, the primary objective of stakeholder consultation is to identify the town's needs through consultations with a range of stakeholders. These workshops are conducted at the following stages –

- A Launch Workshop – first stakeholders' consultation workshop was organized to explain the intent of the ESR, its preparation process etc. This was mainly attended by the BMC staff. Refer **Annexure 1** for workshop details.
- The second workshop - This Stakeholders' Consultation Workshop was organized to understand the issues faced by the stakeholders as well as various activities and programs taking place in the town in order to improve the quality of the environment. The issues identified from the review of past ESRs were also discussed in this workshop. Refer **Annexure 2** for workshop details.
- The third workshop was conducted to share the Environmental policy and Draft ESR with Action Plan. Stakeholders' views on the report were collected and relevant comments are incorporated in this report. Refer **Annexure 3** for workshop details**.**

The overall ESR development methodology followed is explained in **Figure 1. The d**etailed methodology is explained in **Annexure 4**

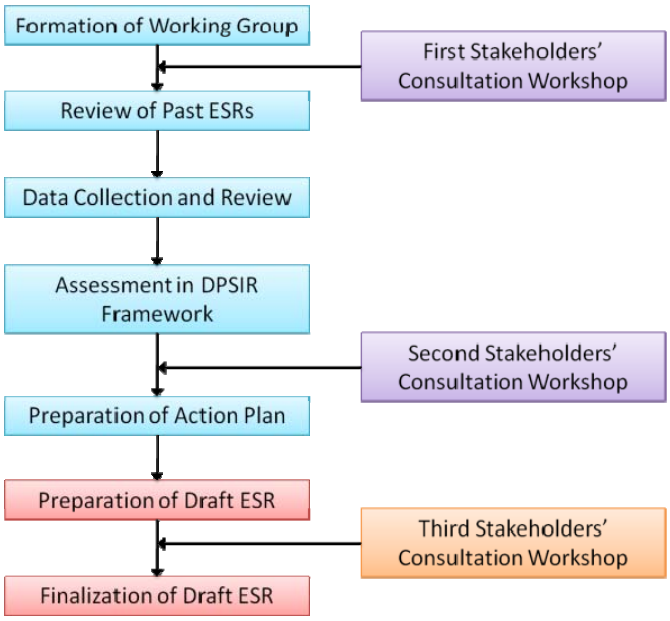


Figure 1. Methodology followed for preparation of the ESR

3. Review of Past ESRs

BMC has been preparing the ESRs since 2003-04. Four ESRs were reviewed to understand the town, its environmental and social concerns; and past and ongoing environmental and social initiatives by Authorities as well as people. Environmental concerns mainly focus on air and water pollution, green cover in the town etc. Social assessment is limited to health and education infrastructure, amenities in terms of open spaces etc.

Elements of the reviewed ESRs cover the following–

- Geographical set-up
- Demography
- Land use
- Education
- Health Facilities
- Veterinary Facilities
- Water Supply and Management
- Solid Waste Management
- Sewerage and Sewage Treatment
- Air Pollution
- Noise Pollution
- Water Pollution

In past ESRs all these elements are explained under three sections (wherever applicable) as –

- Data explaining the present situation
- Areas of concern
- Management Actions

For example, Water Supply and Management element includes the data on sources for water supply, description on available infrastructure. In 2007-08 ESR, it highlighted the issues such as quality of water, inadequate water supply in summer season moths etc. And under management actions, report gives details about the initiatives undertaken by BMC in order to resolve the issues or to strengthen the infrastructure.

Past ESRs included monitoring data for ambient air quality, noise, water quality, sewage quality and solid waste analysis. Monitoring was conducted once in every quarter, thus 4 times in a year. All observations from environmental monitoring were compared with respective standards to assess the compliance.

3.1. Issues identified in Past ESRs

The issues identified from ESR 2007-08 can be listed as –

- Unlifted solid waste dumps from public places such as the bus stand, railway station, commercial premises and shopping complexes
- Construction and demolition waste dumped in the open without proper (scientific) treatment and handling
- Open defecation resulting in unhygienic conditions and public health issues
- Misuse of storm water drainage gutters for solid waste dumping resulting in choking and flooding during the monsoon season. This also creates an unhealthy environment by allowing breeding of flies and mosquitoes, odor etc. 'Leakages and overflow from gutters' is a common issue, mainly in slum areas.

The above-mentioned issues have been addressed while preparing the Action Plan for this ESR

4. Situation Analysis

This chapter aims to provide an understanding of the present state of affairs in the town. The analytical distillation of information demonstrates a roadmap towards action planning. The DPSIR framework has been used for this analysis and in drawing out the Action Plan.

This chapter is based on the data collected from secondary sources such as Annual Reports of BMC, previousESRs, and stakeholder consultations. Information has also been collected from personal interviews / discussions with BMC staff.

4.1. Introduction to Barshi

Barshi town is located in Solapur District in Maharashtra. It is also a *Taluka* and one of the oldest municipal councils in Maharashtra. Refer to **Figure 2** for its location in the state.

Barshi is famous for its *toor dal* (lentil) and other agricultural products. It is also known as *Door* to Marathwada. Barshi has one of the two temples dedicated to Vishnu as Lord *Bhagvant*; the other is at *Kashi.* The temple is built in *Hemadpanthi* style in the year 1245 A.D.

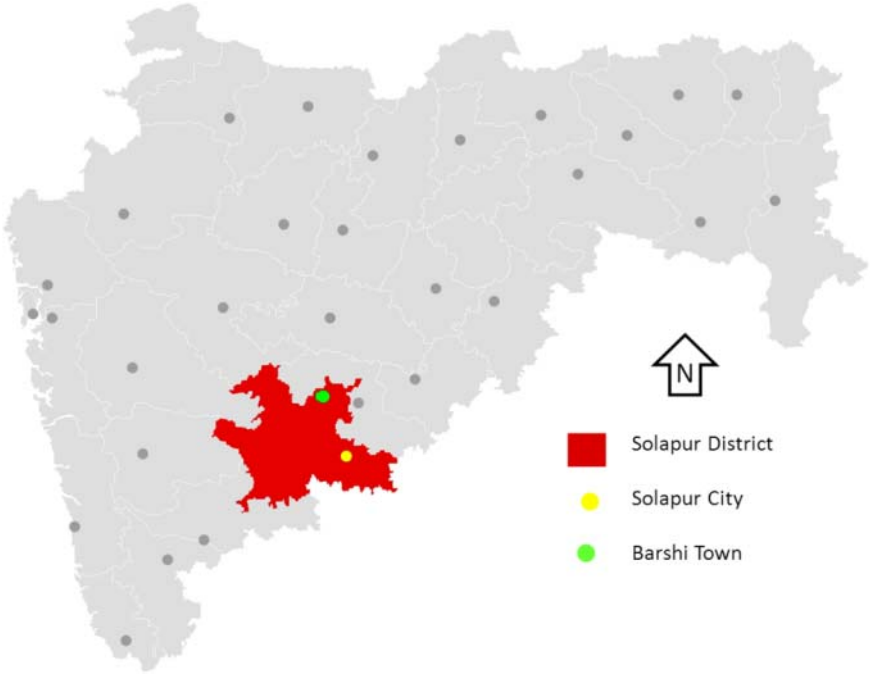


Figure 2. Location map for Solapur District and Barshi Town

4.1.1. Geographical Features and climatic conditions

- Latitude and longitude – 18^0 14' N, 73^0 42' E
- Altitude (from mean sea level) – 515.62 m

- Terrain – flat – general slope from North to South
- Climate – Hot and dry
- Annualaverage rainfall – 677 mm
- Maximum temperature – 41^{0}C
- Minimum temperature – 15 ^{0}C

4.1.2. Administrative set-up

- Area of town – 36.26 sq km
- Population – 1,04,786 (Census 2001)
- Status of Council – Class A Municipal Council
- Number of wards – 38

4.1.3. Connectivity

Barshi is located at about 70 km to the North of Solapur city. It is connected to Akkalkot by State Highway (SH) 51. This state highway touches the cities of Barshi - Vairag - Solapur - Akkalkot and then proceeds south towards the Maharashtra-Karnataka state border. SH 60 connects to Latur via Kurduwadi while SH 33 connects to Osmanabad. Refer to **Figure 3** for the highway network around Barshi.

Figure 3. Highway network around Barshi town[1]

Barshi is also well-connected by rail. A narrow gauge railway line passes through the town which was earlier connected to Miraj, but is now abandoned. The railway line divides the town into two parts. These two sides have different land use characteristics (discussed in detail in **Section 4.1.4.**) A broad gauge railway line

[1] Source of the map – Google Earth

connects to Kurduwadi, Latur and Miraj. Refer to **Figure 4** for railway lines in and around Barshi town.

Figure 4. Railway lines crossing through Barshi Town

4.1.4. Land use

The major land use category in Barshi town is agriculture. It occupies about 77% of the total town area within its administrative boundaries. The percentage land use distribution across the town is explained **Figure 5.**

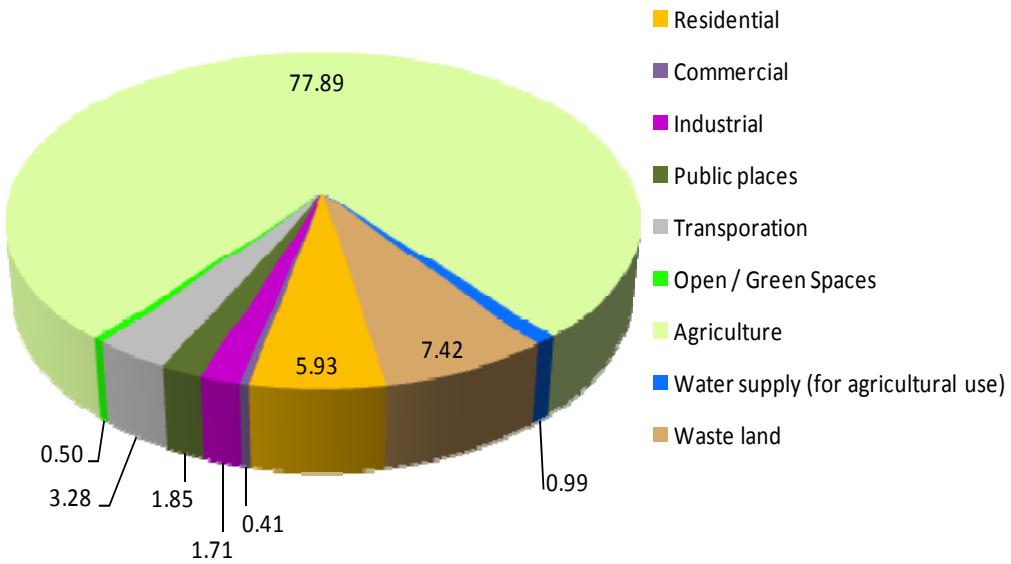


Figure 5. Percentage land use distribution in Barshi Town

This distribution is as proposed in Development Plan for Barshi (Second Edition, 1991). Actual development taken place is only on 4% area. Maximum development has taken place in the residential category followed by transportation i.e. development of roads, railway and related infrastructure. Refer to **Figure 6** for a comparison between land use reservations and actual development. Data for this comparison is sourced from Development Plan (Second edition).

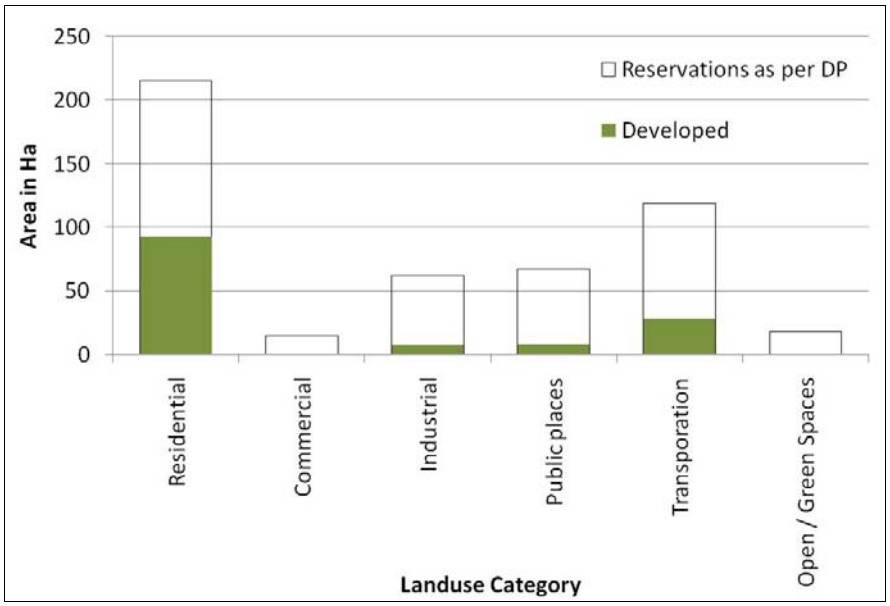


Figure 6. Land use reservation and development

The ratio of development against reservations is somewhat skewed for for various categories for following reasons –

- Mixed land use patterns are often observed in Indian cities. In Barshi also residential and commercial uses share the land. Thus commercial areas area difficult to measure unless dedicated commercial complexes.
- Residential development has taken place on the land which not designated for residential use. For example, reserved open space within town area has been encroached upon for residential of commercial (mainly informal sector). Such areas are categorized under non-developed public spaces or non developed open / green spaces and not being considered as developed residential areas.

4.2. DPSIR Framework

The Driving force – Pressure – State – Impact – Response (DPSIR) framework used in this situation analysis, assumes cause-effect relationships between interacting components of environmental, social and economic systems. This framework attempts to effectively report the complex interrelationship between the causes of environmental impacts and their effects. As a result, the DPSIR framework leads the way towards Strategic Action Planning.

Figure 7 shows the relationship between Strategic Action Planning and the DPSIR framework.

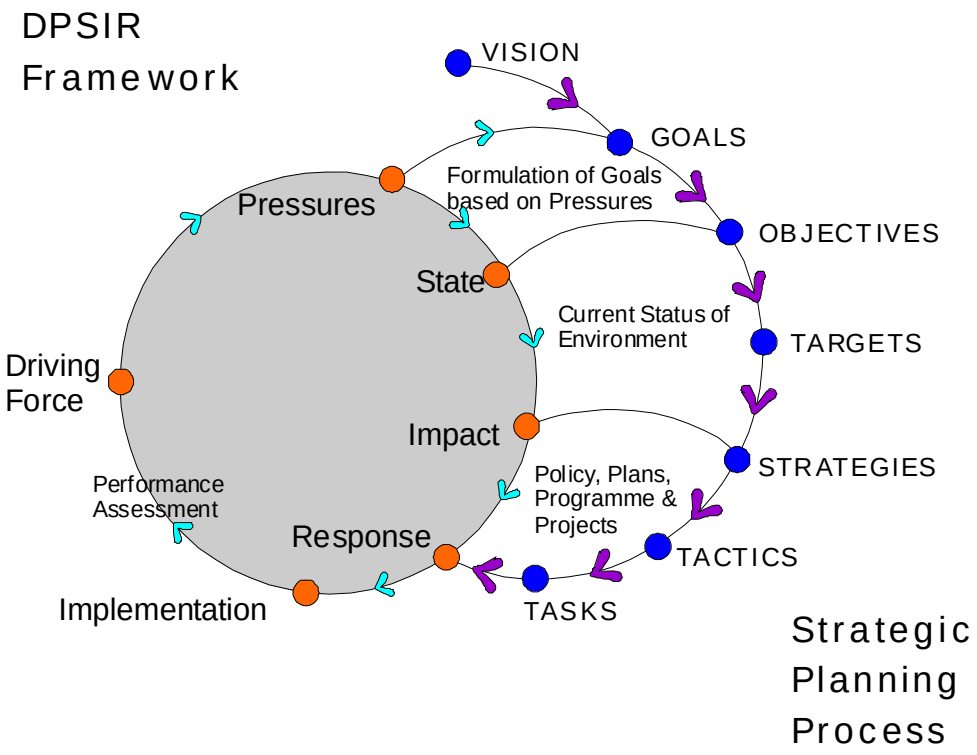


Figure 7. Relationship between Strategic Action Planning and the DPSIR framework

The DPSIR framework attempts to answer five questions that are essential towards understanding the inter linkages between causative factors and resulting environmental impacts, so that appropriate responses may be developed. The five questions are as follows:

- What is happening to the environment and what are the reasons for the pressures exerted on it?
- What are the consequences for / impacts on the environment and public health?
- What is being done about it and how effective are these actions?
- What other / alternative actions may be taken?

Some of the key terms used in the DPSIR framework are outlined in **Annexure 5**.

4.3. Driving Forces

A driving force is a human activity that is generated to satisfy a 'need'. This section discusses the most significant driving forces contributing to maximum pressures on the environment in Barshi, namely -

- Population growth
- Industrialization
- Tourism

4.3.1. Population Growth

Population growth is one of the indicators of development. It has direct linkages to the environmental status of the town. Two components responsible for population growth are natural growth and in-migration. This section explains the population status in Barshi and expected growth trends.

As per Census 2001, the population of Barshi town was 1,04,786. It has been increasing consistently since 1921, with an average decadal growth rate of 22.74%. Refer to **Figure 8** for the trend in population growth in Barshi.

Figure 8. Population growth trend in Barshi

The maximum decadal growth rate observed in Barshi is 24.54% for decade 1961 – 71. It can be seen from the graph that the growth rate pattern in Barshi town over 50 years follows the trend for entire State of Maharashtra. However, the growth rate has been lower than that of the State and Solapur District. Considering the population trend for Barshi, the projected population for year 2011 is about 1,14,135[2], i.e. an approximate increase of 9,300 from the base year as 2001.

Natural population growth is the major contributing factor to the increasing population (in-migration does not contribute to the total population growth). Refer to **Annexure 6** for more details Census data related to Barshi.

[2] Linear Projection using Barshi Population Data

4.3.2. Industrialization

Barshi is famous for its agro-processing units. The pulses in the form of '*Tulvar*' are converted into '*toor daal*'.

There are about 25-30 dal mills functioning in the town. As the process does not require large manpower, the population engaged in this type of industries is comparatively less. However total turnover per annum is about Rs. 10 crores.[3]

In addition there are about 20 oil mills, engaged in the production of the edible oil from groundnut seeds. Here again, the population engaged in this business is marginal, as the process does not require large manpower.

Barshi had three cotton textile mills, although only one survives. The three were Rajan Mill, Lokmanya Mill and Barshi Textile Mill (called BTM – earlier known as JaiShankar Mills Ltd.) Now only BTM exists.

Bidi industries are also found in the town. Thakur-Savdekar– one of the big players in bidi sector – has their unit in Barshi.

There are three industrial estates developed on a co-operative basis. All these estates are located in northen part of the town near Subhash Nagar. Refer to **Figure 9** for location of industrial estates.

Main industrial units in these estates are in textile sector, engaged in manufacturing hosiery. Other industries are soap and aluminum brass vessels manufacturers. Few industries manufacture cement pipes, tiles, etc. All industrial units are small scale and generally fulfill the needs of the local demand and demand from surrounding areas. Also these units are neither labor intensive nor they demand skilled labors from outside the town or surrounding area.

Figure 9. Location map of Industrial estates in Barshi

[3]Development Plan of Barshi, (2nd Revision)

4.3.3. Tourism

Barshi is a town of historical as well as religious importance. As stated earlier, the Temple of Bhagwant is one of the historically important places in Barshi constructed in *Hemadpanthi* style. Many devotees to Pandharpur visit the shrine. Almost all the devotees of *Vithoba* of Pandharpur, and especially those belonging to the *varkaris*, visit the shrine on *dvadashi* on the day of *ekadashi (i.e. from July – August).*

At such times, the "floating population" increases by 20,000 – 25,000.[4] At its peak, this population is about 20 to 25% of the total population.

Additionally, in the summer season, when *muhurats* for marriages are at their peak, Barshi's floating population increases once again. Barshi is well-known place for marriage events. People from Latur, Osmanabad and other neighboring towns and villages prefer Barshi for such events because of the availability of water and other facilities. Though, there is not data available to support this finding and assess the load on environmental resources due to such event, it is proposed to maintain such data and monitor key indicators such as water demand and noise levels particularly on '*muhurat*' days, etc for future ESRs.

4.4. Pressures and State and - Natural Resources

The state of the environment is represented by the qualitative and quantitative indicators of environmental resources as well as services. Environmental monitoring data for air, water quality and noise are some typical quantitative indicators.

This section explains the state of following resources -

- Air Quality
- Noise
- Water Quality
- Land
- Flora and Fauna

This ESR includes monitoring data for ambient air quality, noise, water quality, sewage and solid waste analysis. All observations from environmental monitoring are compared with the respective standards to assess compliance.

The state of infrastructure and services includes a look at –

- Water supply
- Sewage and sanitation
- Solid waste management
- Transportation

[4] *Santa Gadge Baba Gram Swachata Abhiyan Report* (2009-10)

4.4.1. Air Quality

Air quality monitoring has been conducted[5] for 2 quarters [6]as January 2009 and July 2009. Monitoring has been done at 30 locations – 29 for residential and rural areas and 1 for an industrial area. The analysis presented here has been done using the observations for 27 locations identified on the map. Refer to **Figure 10** for locations of these monitoring locations.

Figure 10. Monitoring locations for air quality

The analysis of the monitored data is as follows.

The sulphur dioxide (SO_2) and nitrogen oxides (NO_x) data has been compared with the new National Ambient Air Quality Standards (NAAQS) enforced since 2009.[7] As the new NAAQS standards do not include Suspended Particulate Matter (SPM), the previous NAAQS standard (pre-2009) has been used for assessment of compliance.

The SPM, SO_2 and NO_x levels are well within limits in winter as well as summer seasons. There is a marginal variation in the air quality for the three monitored parameters in the given months. Refer to **Figure 11** for SO_2 levels at all 27 monitoring stations. Refer to **Figure 12** for NO_x concentrations. The high levels of NO_x can be attributed to the traffic congestion on roads. It may be noted that the SO_2 and NO_x levels are substantially higher near the ST bus stand (monitoring station A15) than other monitored locations. Refer to **Figure 13** for SPM levels. The SPM levels are quite low which indicates that there is no re-suspension of dust.

[5] Environmental Monitoring was outsourced to MITCON Consultancy Serves by BMC.
[6] Monitoring has been done once in a quarter for 48 hours. Average of these 48 hour monitoring values has been provided as an input to this ESR. Data was given for two quarters – monitoring conducted in January and July 2009.
[7] Revised NAAQS at http://www.cpcb.nic.in/FINAL_AIR_STANDARD.pdf

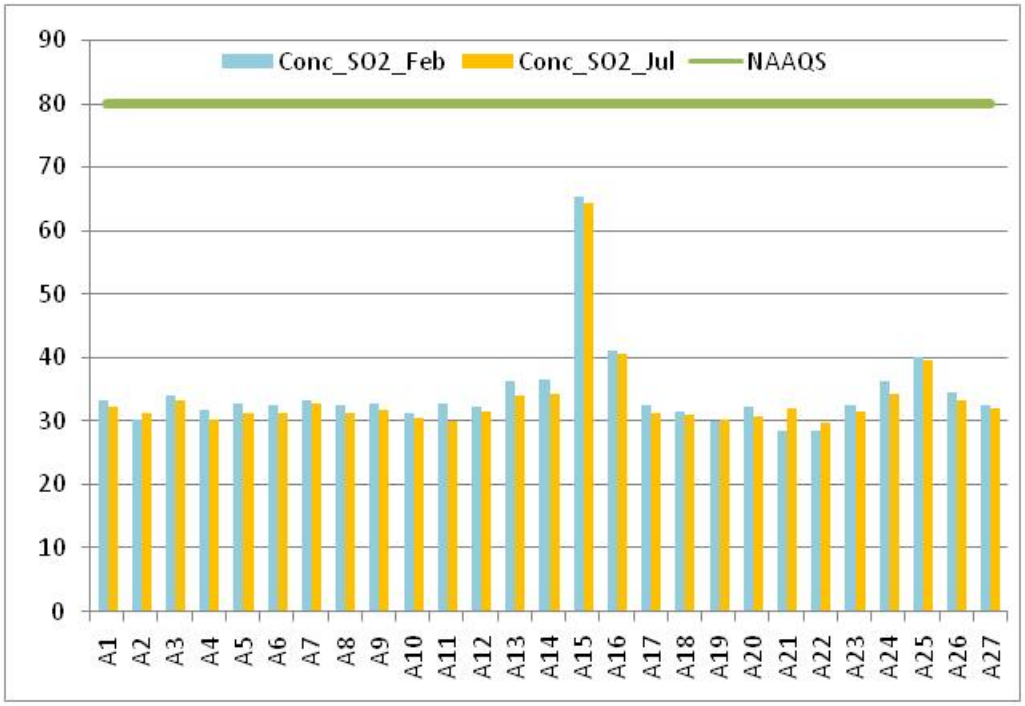


Figure 11. SO_2 concentrations ($\mu g/m^3$) at monitoring stations

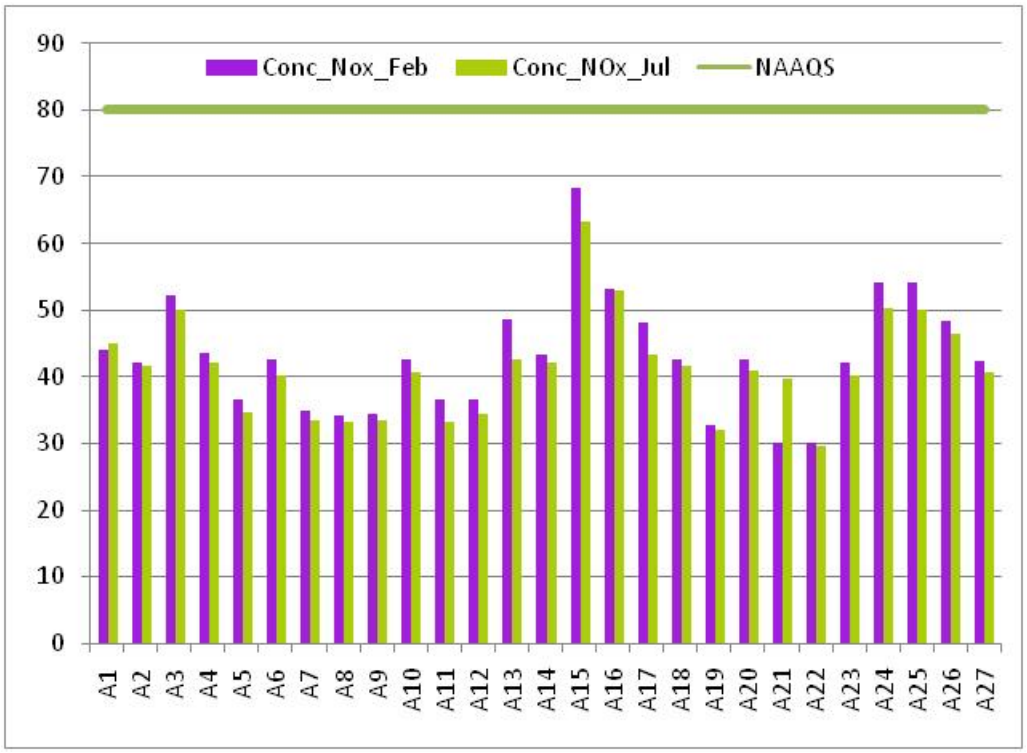


Figure 12. NO_x concentrations ($\mu g/m^3$) at monitoring stations

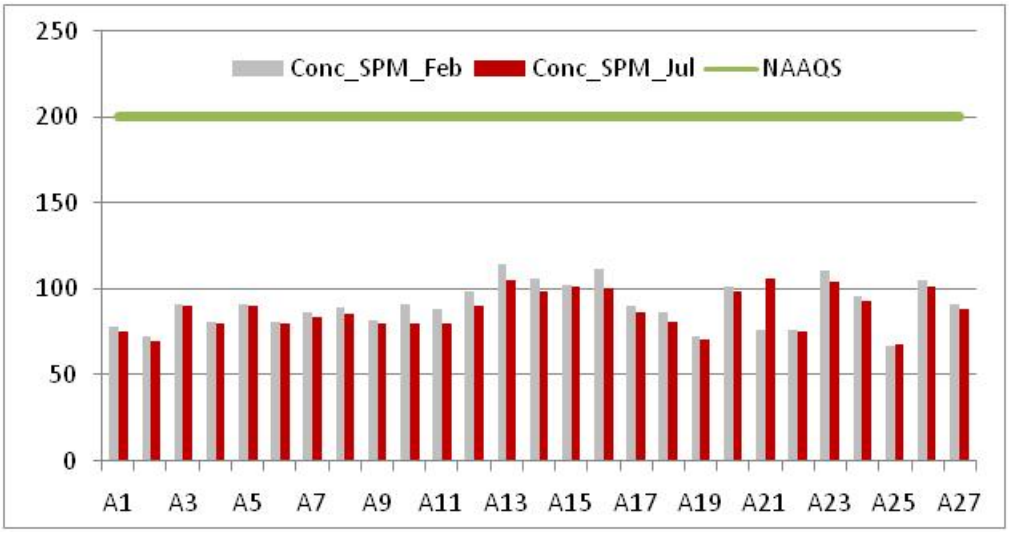


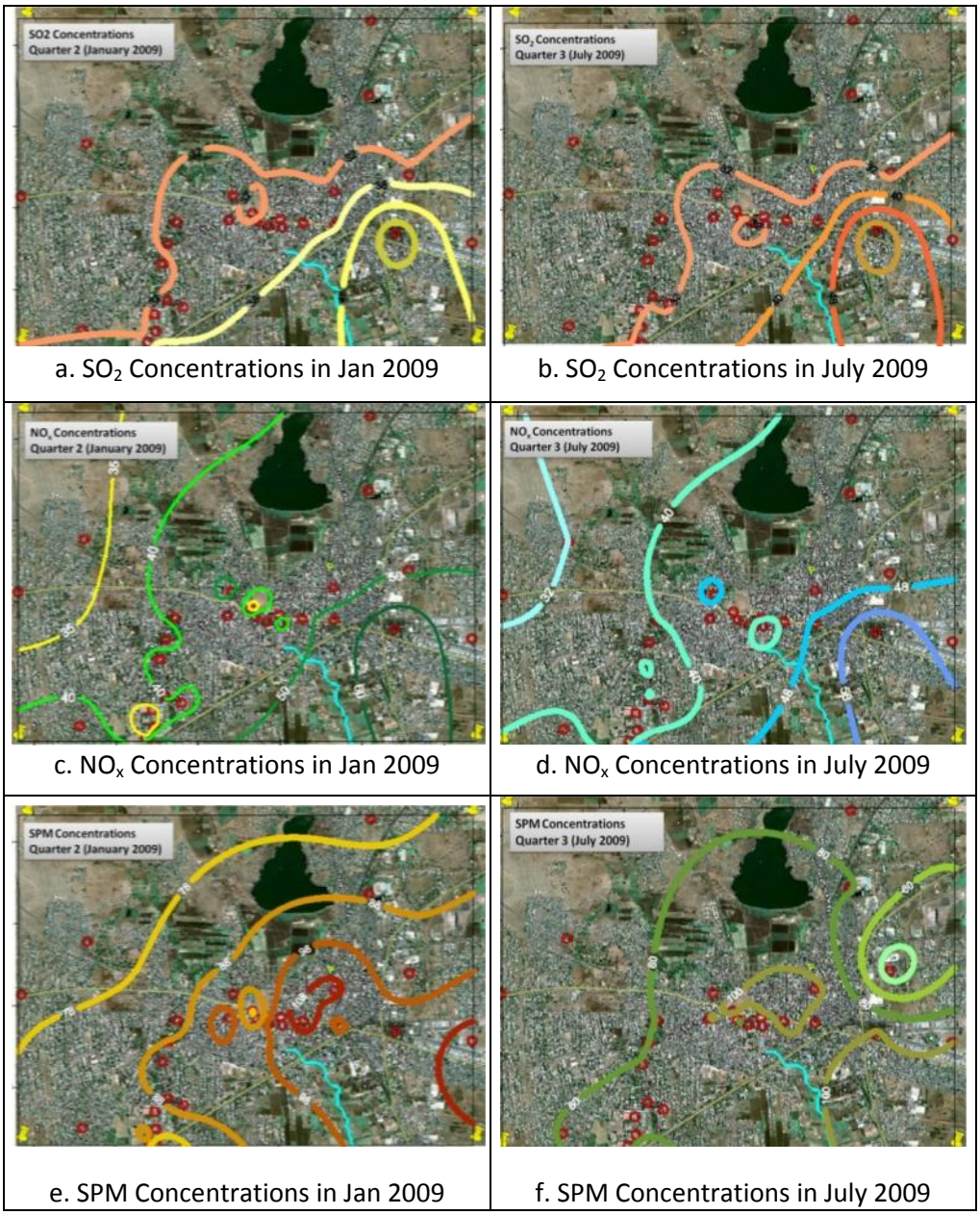
Figure 13. SPM concentrations (µg/m^3) at monitoring stations

Legend

A1	BMC Building	A15	ST Stand
A2	Subhash NGR	A16	Market Committee
A3	Mangalwar Peth	A17	Barshi Railway Station
A4	Renukamata Mandir Upali	A18	Barshi Textile Mill
A5	Jagdale Hospital	A19	Water supply scheme
A6	Sankeshwar Garden	A20	Jawahar Hospital
A7	Law college	A21	Bhagwant ground
A8	Polytechnic College	A22	Mook Badhir Vidyalaya Paranda Road
A9	Shivaji College	A23	Bhawani Peth
A10	Veterinary Hospital	A24	Somwar Peth
A11	Court	A25	Kurduwadi Road
A12	Vegetable Market	A26	Kasba Peth
A13	Pande Chowk	A27	Shivaji Nagar
A14	M. G. Shopping Centre		

Using the monitoring data for 27 stations, contour plots for these air pollutants in Barshi have been developed using the Kriging[8] method. As mentioned before, SO_2 and NO_x concentrations are high in south-west area of the town, the reason being the location of ST bus stand in that direction. SPM concentrations are high in the central part of the city. This may be attributed to traffic congestion in that area. Refer to **Figure 14 (a to f)** for the contour plots. For a reproduction of enlarged plots, refer to **Annexure 8.**

[8] Kriging is a method of interpolation named after a South African mining engineer named D. G. Krige who developed the technique. For more information refer http://www.ems-i.com/gmshelp/Interpolation/Interpolation_Schemes/Kriging/Kriging.htm



a. SO_2 Concentrations in Jan 2009

b. SO_2 Concentrations in July 2009

c. NO_x Concentrations in Jan 2009

d. NO_x Concentrations in July 2009

e. SPM Concentrations in Jan 2009

f. SPM Concentrations in July 2009

Figure 14. Contour plots for ambient air quality parameters – SO_2, NO_x and SPM

4.4.2. Noise

Noise levels were observed[9] at 29 locations (same as the locations of ambient air quality monitoring) covering all zones – residential, industrial and silence zones. Standards used for assessing compliance are those specified in the Ambient Air

[9] Monitoring conducted by MITCON Consultancy Services.

Quality standards for Noise.[10] It has been observed that the noise levels at many locations, especially in silent zones, exceed the standards.

Refer to **Table 1** for data related to noise monitoring.

Table 1 - **Observations for noise monitoring**

Location	Noise (Jan 2009)	Noise (July 2009)	Location	Noise (Jan 2009)	Noise (July 2009)
Commercial Zone			**Residential Zone**		
BMC Building	64	64	Subhash NGR	64	63
Mangalwar Peth	64	64	Shivaji Nagar	60	61
Renukamata Mandir	70	69	**Silence Zone**		
Sankeshwar Garden	64	63	Jagdale Hospital	64	63
Veterinary Hospital	64	63	Law college	63	63
Vegetable Market	73	71	Polytechnic College	60	61
Pande Chowk	70	69	Shivaji College	61	61
M G Shopping Centre	68	67	Court	60	60
ST Stand	67	67	Jawahar Hospital	63	63
Market Committee	68	69	Mook Badhir Vidyalaya	60	60
Barshi Railway Station	67	66	**Industrial Zone**		
Water supply scheme	62	61	Barshi Textile Mill	63	63
Bhagwnat ground	59	60			
Bhawani Peth	66	66			
Somwar Peth	64	64			
Kurduwadi Road	62	64			
Kasba Peth	70	70			

If these observations are compared with the Day time Standard for Noise Levels in relevant zones, then the highlighted locations do not comply with the standard.

4.4.3. Water Quality

Water quality was tested from wells and hand pumps from 30 locations[11]. These sources are mainly used in summer season when the water quantity supplied by the BMC reduces. The testing was carried out for the months of February and July 2009. A total of 9 parameters (chemical and bacteriological) were assessed - pH, total

[10] The Noise Pollution (Regulation and Control) Rules, 2000 at http://envfor.nic.in/legis/noise/noise.html

[11] Monitoring conducted by MITCON Consultancy Services.

hardness, total dissolved solids (TDS), chlorides, iron, sulphates, nitrates, turbidity and fecal coliforms. All parameters which were tested are well within standards. The standards used for assessing suitability for drinking are Water Quality Criteria for V drinking water by CPCB[12]. There is no variation observed in the water quality data for given months. The low concentration of hardness, chlorides, TDS and absence of coliforms, indicate that the ground water is potable. Tap water testing has not done.

Refer to **Figure 15** for TDS concentrations, **Figure 16** for hardness concentrations and **Figure 17** for chlorides concentrations in February and July 2009. Locations of wells are not provided by the monitoring agency.

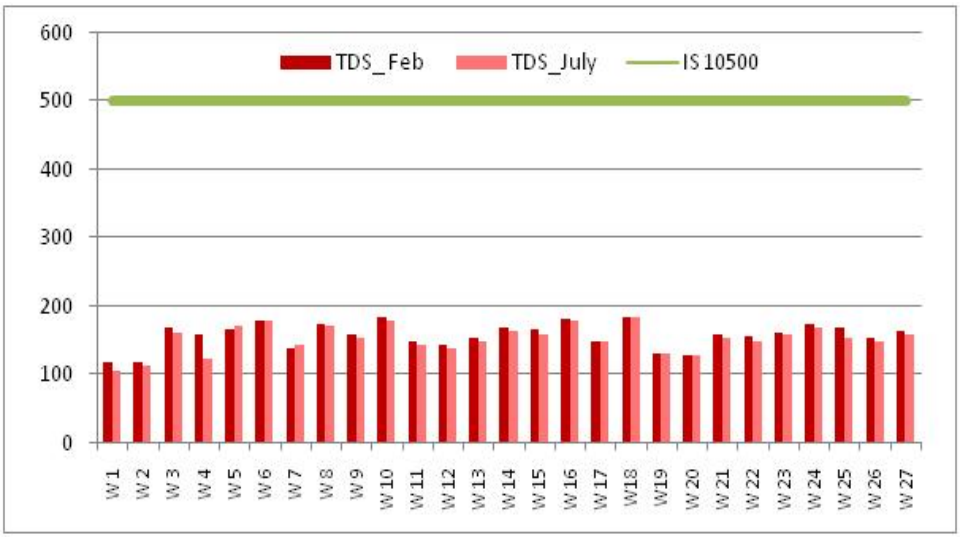


Figure 15. TDS concentrations (mg/l)

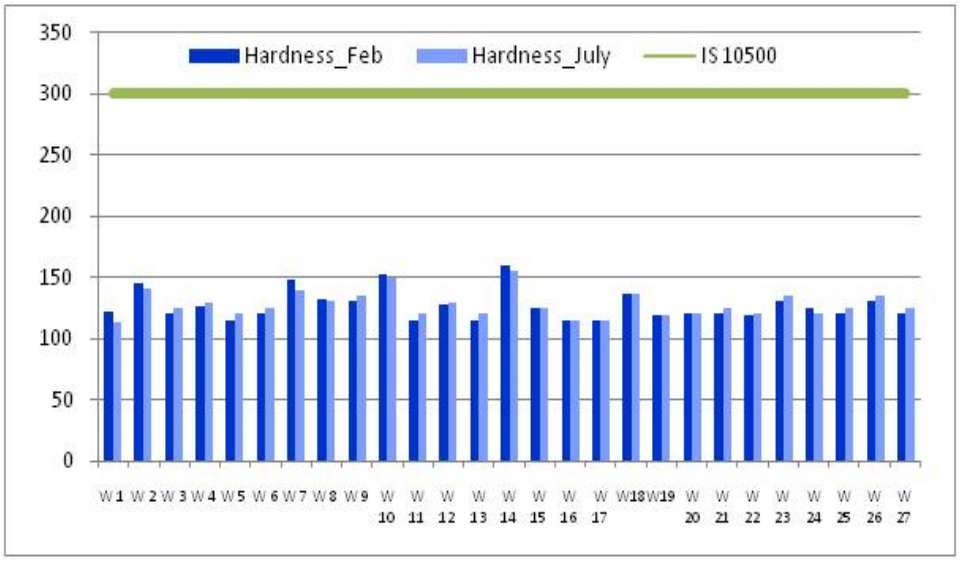


Figure 16. Hardness concentrations (mg/l)

[12] http://www.cpcb.nic.in/Water_Quality_Criteria.php

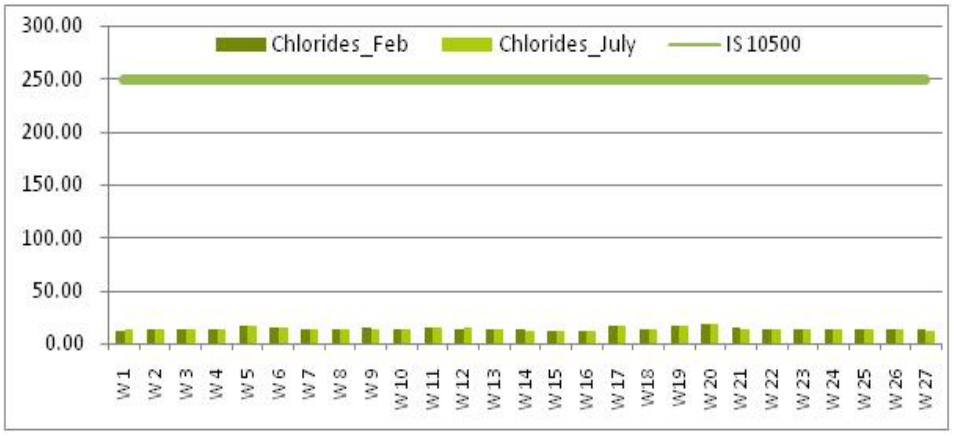


Figure 17. Chloride concentrations (mg/l)

4.4.4. Land

Land is an important resource for Barshi the as economy is based on agriculture. A qualitative analysis of soil has been done by soil testing. Samples were collected from 10 different locations. Refer **Annexure 7** for monitoring data. Locations for soil testing are not provided by the monitoring agency.

Encroachments on land have been observed, especially in built-up areas. While the designated use of land is for open / recreational purpose, the land has been occupied by slums and residential units. Refer to **Figure 18** for a partial illustration of encroachments on open spaces in the past near Bhavani Peth.

Figure 18. Illustration of encroachments on open space

4.4.5. Flora and Fauna

Barshi town is about 15 to 20 km away from Maldhok Wild Life Sanctuary, Nannaj. The forest is a tropical thorn forest. The main trees found in the sanctuary are *Neem, Sishu, Babul, Bor, Tarwad, Henkal, Dongri, Kusali, Pavanya, Sheda*, *Marvel* etc. The common fauna species of this forest are the Great Indian Bustard, Blackbuck, Wolf, Indian Fox, and Jackal.

Barshi sees many migratory birds during winter season around the lake near Subhash Nagar. However there is no authentic data available on the numbers of migratory birds.

4.5. Pressures and State - Urban Infrastructure

Urban or municipal infrastructure refers to systems generally owned and operated by municipalities, such as transportation, water supply, sewer system, etc. Indian cities and towns face serious challenges posed by unplanned growth. Issues of urbanization manifest in the form of overcrowding, congestion, insufficient infrastructure, inadequate service provisioning in terms of drinking water, sanitation, power, transport, solid waste management, etc. These factors affect the socioeconomic development of the area adversely.

Barshi is not exception to this. Deficient infrastructure and increasing demands on natural resources have been creating negative environmental impacts. Also, referring to **Figure 6**, it can be clearly seen that there is considerable growth potential in Barshi. As per Development Plan (II Revision), about 57% area under residential land use and 78% area under industrial land use are officially unused. It is therefore important to ensure that land use is carried out in a planned manner in accordance with the Development Plan of the town. With this logic in mind, this section explains the existing urban infrastructure facilities in Barshi.

4.5.1. Water Supply

The town has a piped water supply scheme, constructed in 1918. The main source of water is the Ujani Dam which is about 60 km away from the town. The other 2 important sources are the A. M. Pathari irrigation tank and the Chandani Lake, approximately 18 km away from the town. The water is conveyed by gravity. Daily requirements of water are about 13.60 MLD. Refer to **Figure 19** for locations of these water sources.

Figure 19. Source of water for Barshi Town

The components of the water supply system are as follows –

- **Water Treatment Plant (WTP)** – the capacity of water treatment plant is about 29.5 MLD whereas the requirement of water is 13.5 MLD (Census 2001). The capacity of the WTP is sufficient for the projected population up to the year 2041. Water supply is for limited period of 1 hour daily and works out as 85 LPCD
- **Elevated Storage Reservoirs -–** Total capacity for water storage is 6.75 MLD. Two new elevated storage reservoirs of 0.8 MLD capacities each have been constructed. Construction work is in progress for3 additional elevated storage reservoirs of total capacity 3.2 MLD
- **Distribution Network** – 90% area of the town is connected to the piped water supply scheme. The distribution network first constructed in 1918 to supply water from *Pathari* irrigation tank. Second scheme was implemented in 1972-72 to draw and supply water from *Chandani* Lake. Now connections to remaining 10% areas have been proposed by BMC and project is awaiting funds.

Other sources of water

There are 9 wells and 369 hand pumps in the town, of which 6 wells and 353 hand pumps are currently being used for potable water supply. These sources are mainly used in the summer season when the supplied water quantity reduces.

Water supply to slums

Water is supplied in slum areas by 526 connections and 115 stand posts.

a. Pressure on Water Supply

Water is supplied for limited period of 1 hour daily at 85 LPCD, which is less than the standard of 135 LPCD[13]. However, it has been understood through public consultations that there is no need to increase the supply and quantity of water as the duration and timings of water supply are fixed.

Nevertheless, in future, the existing infrastructure for water supply may prove inadequate with the increase in population and other developmental activities such as industrial growth, construction etc.

4.5.2. Sanitation, Sewers and Sewage Treatment

There is no underground drainage system in the town. Gutters aggregating to 66 running km connect the households to 21 main gutters and then to Lendi Nala which is a sewage carrier. These gutters are partially lined and covered. About 70% of Lendi Nala is covered by concrete slabs. This gives rise to unhygienic conditions. Sewage discharged into Lendi Nala is used by farmers for irrigation. Refer to **Figure 20.**

[13] CPHEEO Standard for water supply

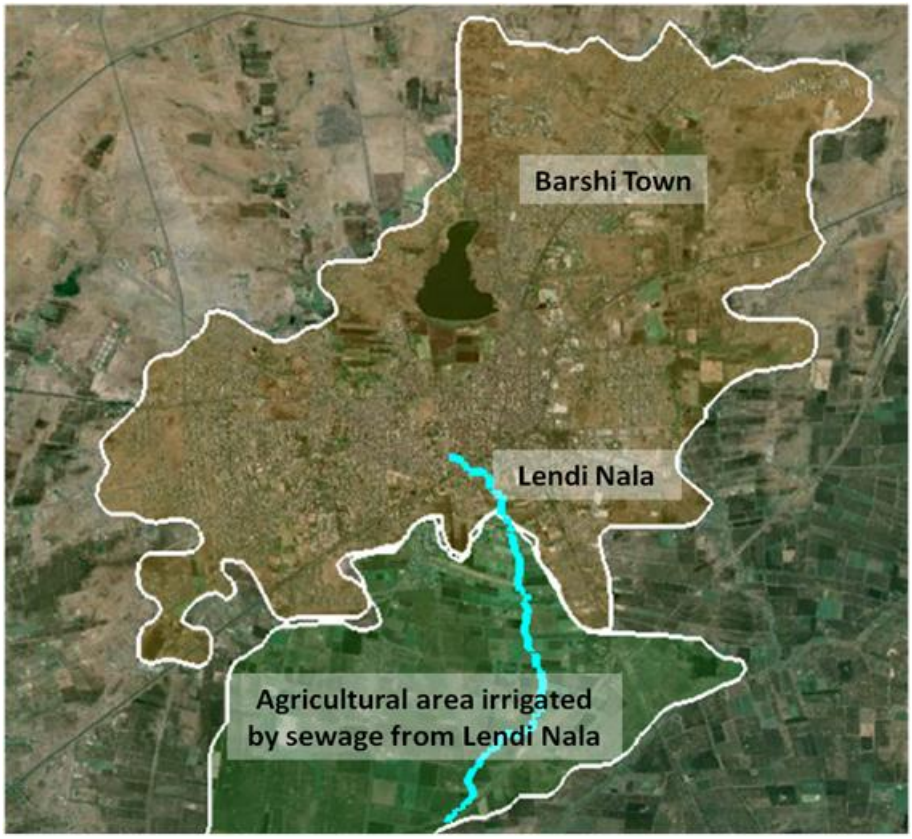


Figure 20. Location map for Lendi Nala and agricultural land irrigated by sewage

A detailed study of the impacts of use of untreated sewage water on agricultural land and crops has been proposed by BMC.

Sewage from areas not connected by gutters is disposed of in soak pits. Some of the bungalow societies have provided septic tanks for treatment and treated water is used for gardening.

a. Pressure on Sanitation Facilities

Sanitation facilities are inadequate resulting in open defecation. There is no awareness among citizens regarding usage of latrines. Another important concern is the non-availability of space for public toilets. The tenements are densely located. People are not ready to give up land for public toilets in their locality. It is expected that the issue of sanitation will get worse with the increasing population.

There is no sewage treatment facility catering to the town. Sewage is directly discharged into Lendi Nala. Sewage has been tested near Rahul Talkies during quarterly monitoring done in January and July.[14] The parameters tested were pH, suspended solids and biochemical oxygen demand (BOD). The BOD level was found

[14] Sewage samples tested by MITCON Consultancy Services.

to be greater than 80mg/l; this means the sewage requires treatment before discharge into Lendi Nala (since the CPCB mandates BOD for sewage disposal to an inland water body as no more than 30 mg/l).

4.5.3. Solid Waste Management

Barshi town generates about 46 tons of solid waste on daily basis[15]. Per person waste generation works out to about 439 g per day, slightly higher than the average considered as 400 g per person per day.

The eEntire city is divided into 12 sectors for solid waste collection. Rag pickers collect and segregate waste and it is sold to '*bangarwala*'.

As part of the centralized system, 3 dumpers owned by Council and 3 privately owned tractors collect the waste. Waste is collected separately from the vegetable market (*mandai*). Around 33 tons waste is picked up and transported out of the town to a dumping site. Remainig waste is either managed by the decentralized system in their respective sectors by composting in colonies or dry waste is sent for recycling through ragpickers or being dumped on barren land pockets available nearby.

At present solid waste is being dumped at two locations. The solid waste has been tested at these two dumping sites during the winter and summer seasons in the year 2009. The parameters monitored were pH, moisture, organic carbon, nitrogen, phosphorus and potassium. Not much variation was observed in the monitored data between the winter and summer seasons.

The carbon to nitrogen ratio for dumping site #2 was found to be ideal for conversion into compost. Refer to **Table 2** for the sampling results.

Table 2 - **Test results for the solid waste sample from dumping sites**

Sr. No	Parameters	Unit	MSW Site 1	MSW Site 2	MSW Site 1	MSW Site 2
1	Date of sampling	---	31.01.2009		09.06.2009	
2	pH	%	7.45	7.35	7.40	7.30
3	Moisture	%	28.50	31.10	26.70	32.05
4	Organic Carbon	%	12.10	16.75	12.05	17.10
5	Nitrogen	%	0.66	0.68	0.62	0.70
6	Phosphorous	%	1.20	2.10	1.15	2.12
7	Potassium	%	0.25	0.32	0.27	0.33
8	Carbon / Nitrogen Ratio	--	18.33	24.63	19.43	24.42

[15] *Santa Gadge Baba Gram Swachhata Abhiyan* Report 2009

A new landfill site of area 10 Ha has been identified and acquired. This site is approved by MPCB. The location of this site is about 4 km away from the town. Refer to **Figure 21** for the approximate location of this landfill site. A composting and waste recovery plant may be set up at this site.

Figure 21. Location of landfill site

4.5.4. Transportation and Storm Water Drainage

As discussed in the section on 'Connectivity', Barshi town is well-connected with the surrounding urban and business centers.

Within Barshi, there are 3 main types of roads –

- Concrete roads, approximating 5.2 km in length
- Tar roads, approximating 84.3 km in length
- *Kutccha* roads, approximating 9.8 km in length

The storm water drainage system runs parallelly along62% of the concrete road length.

a. Pressures on Transportation

Road widths are inadequate in the town because of two reasons - increasing traffic volumes and encroachments along the roads. It can be clearly seen from satellite images from Google Earth that the construction line is adequately away from the road but due to encroachments, road widths have decreased over time. Refer to **Figure 22** highlighting encroachments along one of the roads in the town.

Figure 22. Illustration for encroachments along the main road in the town

Major roads and important junctions in Barshi town are seen in **Figure 23**. The junction highlighted in circle near Barshi Police station is a critical point as it is prone to traffic congestion. The ST bus stand is also located near this junction, thus adding to the congestion.

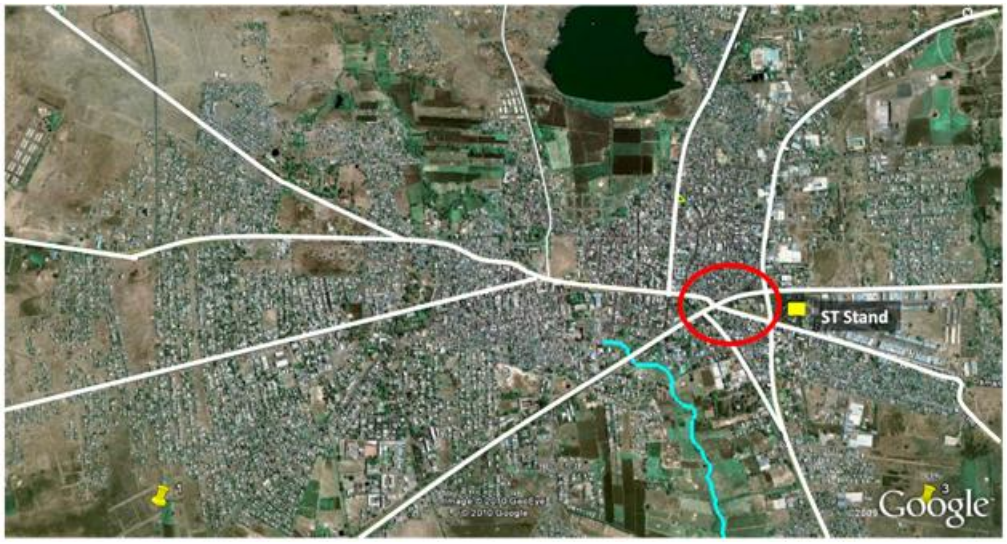


Figure 23. Important roads and junction in Barshi

4.5.5. Social Infrastructure

Social infrastructure consists of education facilities, hospitals, recreational spaces etc. This section discusses the social infrastructure facilities available in Barshi.

a. Education Facilities

The town is well known in the region for its state of the art educational institutions and nearby districts and *tehsils* also depend upon these educational facilities. Barshi town has good education facilities starting from kindergarten and going on to higher education. Technical, agricultural and vocational education facilities are also available.

There are total 33 primary schools, including private and government-run schools. About 14,000 students are enrolled in these schools.

Shri Shivaji Shikshan Prasarak Mandal, Barshi is the leading organization which has developed a cluster of educational institutions starting from Primary Schools to the College of Education.

Table 3 below gives details of schools

Table 3 - **Academic institutions in Barshi**[16]

Category	Owned by BMC	Private
Pre-Primary School	28	18
Primary School	19	27
High School		14
Colleges		7

There is also a Vedic institution *Veda Shala* in Barshi. It has been established to teach Vedas and rituals to aspiring students.

Environmental awareness and action programs have been initiated in these schools which celebrate occasions such as the World Environment Day, World Water Day etc.

b. Health Care Facilities

Health Department of Municipal Council is proactive and has been instrumental in providing sufficient infrastructure for citizens.

There are 2 Government Hospitals and 3 big private hospitals providing 450 beds. There are around 25 nursing homes in the town. Seven hospitals have the facilities for ICU.

Citizens have benefitted from National and State level Health Programs such as Prevention Program for Malaria, awareness programs for water-borne diseases, etc.

About 200 kg of bio-medical waste (BMW) is generated daily by 3 big hospitals, 2 government hospitals and 38 nursing homes located in the town. At present the BMW is transported to Solapur for disposal.

c. Open / Green Spaces

As per the Development Plan (2nd Revision) for Barshi town, there should have been 18 Ha area under gardens and play grounds for citizens. However, at present there is only 0.65 Ha area developed under this category. Major open spaces in the town are Bhagwant Ground and Sankeshwar Udyan which are owned by the Council and open to the public. Private open spaces include the Shivshakti Maidan, Barshi College

[16] Barshi ESR 2007-08

Ground and Pavellion Ground. Refer to **Figure 24** for their locations. Clearly, there is a need to increase the area of green / open spaces.

Figure 24. Open spaces in Barshi

4.6. Impacts and Risks

Impacts of driving forces and current status of resources and infrastructure (discussed in earlier sections) on environment and health are discussed in this section.

These impacts are identified based on the status of resources and services. Additionally, impacts were identified in stakeholders' consultation workshops, as noted below -

- Provision of sanitation facilities for individual tenements and public toilets is crucial
- There must be an improvement over the current sewerage system – preferably an underground sewerage system for the entire city
- There is a need to widen roads
- Lack of open and green spaces must be addressed

These impacts are interlinked as explained in **Figure 25.** Refer **Annexure 9** for enlarged figure.

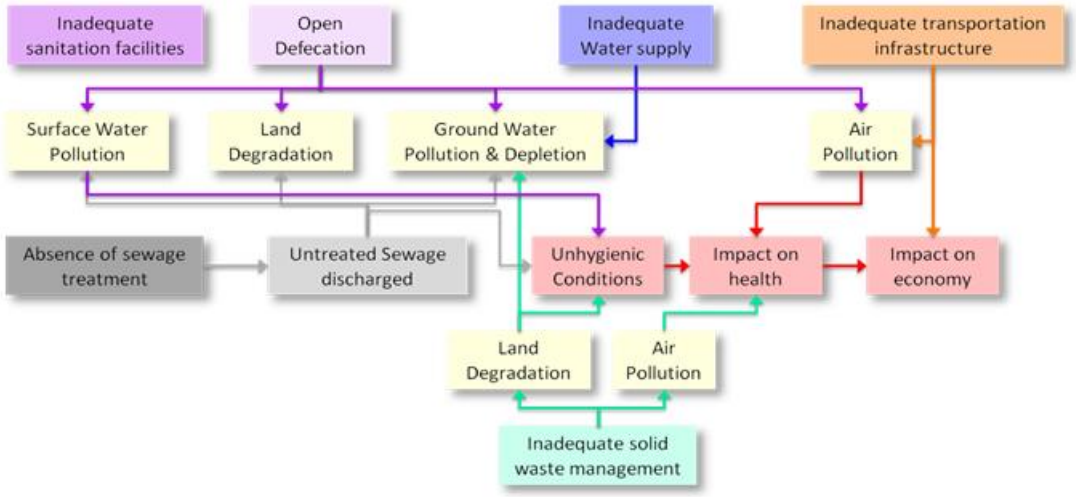


Figure 25. Interlinking of impacts

4.6.1. Impacts of Air Pollution

Studies carried out in the field of air quality assessment and impacts show that high levels of SPM, NOx and SPM levels can cause a high incidence of respiratory diseases like asthma and even cardiovascular diseases. In addition to negative health effects, other adverse effects include loss of visibility, damage to materials, deterioration of buildings (particularly heritage buildings), etc.

In Barshi the impacts of air pollution are not very evident. However, over a period of time the number of vehicles plying on narrow roads has increased. This has resulted in traffic congestion and in turn resulted in more air emissions.

At present, there is no statistical information available regarding the number of people suffering from respiratory diseases as a result of air pollution (. It is proposed to track such records for future use in ESRs.

4.6.2. Impacts of Surface and Ground Water Pollution

Water pollution affects plants and organisms living in these bodies of water; in almost all cases, the effect is damaging not just to individual species and populations, but also to entire natural biological ecosystems. The consumption of polluted water also affects human health.

Contamination of water (surface and ground) may take place due to various reasons such as discharge of untreated sewage, discharge of industrial effluent, solid waste dump etc.

In Barshi water is sourced from distant water bodies as discussed in the section on Urban Infrastructure. Thus the contamination may occur during conveyance to city. Barshi Kurduvadi Combined Water supply scheme has been proposed by Maharashtra Jeevan Pradhikaran (MJP)[17].

Water extracted from wells and hand-pumps may also contaminate. Reason for this pollution could be open defecation resulting into ground and surface water pollution.

In the monsoon season, chances of contamination are at peak. In 2008-09, 2 out of 80 samples of ground water collected in month of July indicated contamination.

Last year, there were approximately 100 cases of water-borne diseases such as diarrhea.

Unhygienic and damp conditions also resulted in malaria; there were 5 recorded cases of malaria in year 2009.

Ground water is getting depleted due to over extraction of water from ground water resources. Thought there is no data available for ground water levels in past and present or before and after monsoon, this issue was discussed during stakeholders' consultation. According to their experience, the depths of new wells are more than older wells in same locality.

4.6.3. Impacts of Land Degradation

Land degradation results change in land use. For example, the land is degraded due usage of untreated sewage for agricultural purpose. Further degradation of land will make the land ineffective for its original purpose. Land degradation also results in surface and ground water pollution by leaching of pollutants from the soil into receiving water bodies as well as into the ground water aquifer.

[17] http://tenders.indiamart.com/details/3837217/

5. Action Plan

The Action Plan is prepared as a response to the issues identified in assessment and is in line with the Environmental Policy of Barshi. Action Plan is in terms projects, programs plan or policy interventions. Projects are localized and specific interventions whereas programs are more on continuous basis and might be repeating with respect to time and / or location. Plans are long term interventions can be implemented in phases. Policies are usually one time decision but will be applicable to all related activities in future. Projects, programs plans and policies can be linked to each other. This structure is called as 4P structure, helpful to plan the implementation.

The Plan also highlights possible opportunities which may be pursued to the benefit of the town. Prioritization of issues and respective actions are based on logical criteria such as severity of issues, geographical extent, temporal patterns, etc. Each action is detailed out in Action Sheets to include -

- **Action** (title)
- **Type of Action** (Project / Program / Plan / Policy)
- **Objective** (to give the basis of the action, denote which issues will be resolved with this action or what opportunities will be stimulated on the basis of which the action is planned)
- **Location / geographical extent of application / targeted beneficiaries** (mainly in case of programs and policies)
- **Tasks** (delineating a roadmap for implementation)
- **Implementation plan** (as per the priority, implementation period shall be defined for each action. For example, high priority actions shall start immediately. Tentative completion dates or duration of action will also be stated wherever possible)
- **Responsibility allocation** (responsibilities may be assigned to relevant departments in the Corporation / Council, also highlighting outsourcing requirements wherever relevant)
- **Budgetary requirements** (in terms of broad level estimates for implementation)
- **Recommendations** (if a particular action needs additional studies or surveys to be carried out or pilots to be implemented)
- **Illustrations (**examples of particular interventions that have been implemented elsewhere

5.1. Environmental Policy

Barshi's Environmental Policy was framed while preparing this ESR. The details of the Policy are as follows -

5.1.1. Vision

The Vision of Barshi Municipal Council is to develop Barshi as a **"Model Town"** mainly in environmental aspects, where past and existing environmental issues have been mitigated ensuring new issues do not arise.

5.1.2. Environmental Policy

Barshi Municipal Council is driven by its Vision to develop Barshi as Model Town for its environmental management.

The Environmental Policy is founded on the concept of Sustainable Development and thereby recognizes Environmental and Social (E&S) considerations in its business operations to add value, minimize impacts on natural resources and risks to the urban infrastructure. BMC strives to conserve natural resources, protect the environment and improve standards of living of present as well as future generations.

Sustainable development is a pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but also for future generations. The term was used by the Brundtland Commission which coined what has become the most often-quoted definition of sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainable development ties together concern for the carrying capacity of natural systems with the social challenges facing humanity.

The Environmental Policy applies to all Departments under BMC.

BMC is committed to comply with its Environmental Policy, applicable laws of the land and be responsive to existing and emerging global E&S concerns on a proactive basis.

5.1.3. Objectives

The objectives identified in line with the Environmental Policy for ESR 2008-09 are –

- To provide basic infrastructure in terms of sanitation facilities, regular water supply, transportation facilities and open / green spaces
- To involve citizens and stakeholders in environmental protection and management
- To revise the Development Plan when the need arises and ensure its strict implementation to benefit the town

5.1.4. Targets

The targets derived from the objectives are –

- To provide adequate sanitation facilities
- To improve sewerage network in Barshi
- To construct sewage treatment facility
- To widen the arterial roads so as to reduce traffic issues
- To do the necessary land acquisitions for implementation of the Development Plan

5.2. Actions

Actions are based on the issues and impacts identified and in line with BMC's environmental policy. Table explains the mapping of actions with issues identified.

Table 4 - **Mapping of Actions and issues**

Issues	Actions
Impact on health, land and water due to unhygienic conditions arising because of open defecation	▪ Provision of public sanitation facilities as well as technical and financial assistance to individuals to build latrines ▪ Awareness campaigns at various levels
Unhygienic conditions due to open gutters	▪ Provision of underground sewers / covered gutters
Land contamination due to direct use of untreated sewage for agriculture	▪ Provision of sewage treatment facility ▪ Study / survey to be conducted to assess the extent of impact of untreated sewage on agricultural land
Soild waste is being dumped in gutters, construction and demolition waste being dumped in non-designated area.	▪ Integrated solid waste management
Lack of open / green space	▪ Proper implementation of Development Plan ▪ Dedicated agency / department within BMC to look after gardens / open spaces etc ▪ Plantation activities to improve green cover of the city ▪ Tree census
Traffic congestion	▪ Traffic surveys in order to propose road widening, and traffic management plan

	▪ Road widening wherever required

5.3. High Priority Actions

Based on the targets, actions identified for ESR 2008-09 are –

- Provision of public sanitation facilities as well as technical and financial assistance to individuals to build latrines **– High Priority**
- Design and construction of sewers – centralized and decentralized options **– High Priority**
- Provision of sewage treatment facility (constructed wWetland treatment at Lendi Nala) **– High Priority**
- Improvement in Environmental Monitoring Program focusing on Air and Noise - **High Priority**

Details about High Priority actions as an illustration are provided below.

5.3.1. Provision of Sanitation Facilities

a. Action

Provision of Public Sanitation Facilities as well as technical and financial assistance to individuals to build latrines.

BMC should not give permission to new constructions without latrines.

b. Type of Action and Priority

Program – High Priority

c. Objectives

- To provide basic infrastructure for citizens
- To improve hygiene
- To prevent land and water contamination due to open defecation

d. Past Interventions

BMC has contracted private organization for operation and maintenance of public toilets. 29 toilet seats have been constructed at public places. In slum areas, there are 650 toilet seats provided by BMC and construction is going on at 4 locations for 18 seats. Mobile toilets (100 seats) have been made available. However, in spite of these interventions, there are 7,200 households without latrine facilities.

e. Location

Suitable locations for public toilets shall be identified.

f. Tasks

- Detailed need assessment

- Identification of suitable locations
- Bidding process for contracting out the work
- Construction of facilities
- Maintenance

g. Budgetary requirements

- **Per seat construction cost – Rs. 4000**/- Under the 5 lakh latrines scheme, construction cost limit of Rs .4,000/- per latrine was fixed (Government subsidy Rs.3,500/- + beneficiaries share Rs.500/-). This scheme is implemented by the Water Supply and Sanitation Department of Maharashtra State
- **Per seat maintenance cost** – Approximately Rs. 500/- per year
- **Communal Toilet Blocks** – Approx. Rs. 8,00,000/- for 6 seats

h. Responsibility

- Primary responsibility – Water and Sanitation Department
- Tasks such as detailed need assessment and identification of suitable locations can be outsourced

i. Recommendations

- Priority shall be given to areas where open defecation is evident
- BMC shall initiate awareness programs for usage of toilets

j. Illustration

Research cum Action Project (RCAP) by the Health and Family Welfare Department, Tamil Nadu: The major objective of the project was to improve educational methods, conducting systematic research in various public health programs and to evolve a low cost sanitary latrine suitable for the rural household. Refer http://www.tnhealth.org/rcap.htm for more information.

5.3.2. Design and Construction of Sewers

a. Action

Design and construction of sewers – centralized and decentralized options

b. Type of Action and Priority

Project with High Priority

c. Objectives

- To provide well-planned sewers
- To improve hygiene and reduce health impacts due to open gutters

d. Interventions in the Past

There are no previous plans or proposals for underground sewers for Barshi. Some modifications have been done in the existing set up to improve the quality of environment; for example, Lendi Nala has been covered partially in some areas of the town

e. Location

Implementation shall be undertaken for the entire town but may be planned in a phase-wise manner.

Depending on the population density and sewage discharge volumes, priority zones can be defined. Evaluation of centralized and decentralized options shall be carried out for each zone.

f. Tasks

- Define zones based on population density
- Estimate sewage load for each zone
- Evaluate centralized and de-centralized options for each zone
- Prepare Detailed Project Report

g. Budgetary requirements

- Decentralized option - Septic tanks option – Rs. 6,000 to 15,000/- per tank
- Conventional sewers - Approximately Rs. 50,000 for 1m^3/day flow. Low to medium investment costs if population density is high, number of connections is large, and three to four households share one connection
- Small bore sewage – Approximately Rs. 28,000/- per unit

h. Responsibility

- Primary responsibility – Water and Sanitation Department
- Tasks such as need assessment, identification of suitable locations can be outsourced

i. Recommendations

- A suitable option should be identified based on population density, sewage volume and space availability
- Future population should be considered at the planning and designing stage

j. Illustration

"**A Guide to Decision making Technology Options for Urban Sanitation in India**: Published by Government of India in September 2008. Source: www.wsp.org/UserFiles/file/**Urban_Sanitation**.pdf

5.3.3. Provision of Sewage Treatment Facility

a. Action

Provision of Sewage Treatment Facility – evaluation of constructed wetland treatment or reed bed option for Lendi Nala

b. Type of Action and Priority

Project with High Priority

c. Objectives

- To prevent ground water and soil contamination due to leaching by untreated sewage
- To reuse treated sewage for agricultural purpose without affecting the soil quality

d. Interventions in the Past

Proposal for sewage treatment facility is under consideration. Though it is in preliminary stage of designing the treatment plant, the land acquisition is under progress.

e. Location

At present untreated sewage is discharged at Lendi Nala. Proposed land is being acquired along the Lendi Nala.

f. Tasks

- Estimate sewage load for treatment
- Evaluate centralized and de-centralized options for treatment
- Identify suitable location
- Bidding process for construction contract
- Construction phase
- Operation and maintenance phase

g. Budgetary Requirements

Reed Bed Treatment Facility - Estimated cost at Rs. 1,300/m^2 for horizontal flow beds and Rs. 2,100/m^2 for vertical flow beds, excluding land cost.

h. Responsibility

- Primary Responsibility – Water and Sanitation Department.

i. Recommendations

- A suitable option should be identified based on population density, sewage volume and space availability
- Future population should be considered at the planning and design stages

j. Illustrations

Community based Waste Water Treatment Plant constructed in Madhyapur Thimi Municipal Council area: Refer to www.unwac.org/new_unwac/pdf/.../CWTP_Thimi_Municipality.pdf for more information.

5.3.4. Improvement in Ambient Air Quality Monitoring Program

a. Action

Environmental monitoring for ambient air, ground and surface water and noise. (As monitoring is being done quarterly, this action gives guidelines for monitoring)

b. Type of Action and Priority

Program – High Priority

c. Objectives

Understanding baseline environment of Barshi by monitoring components such as air, water, noise.

d. Interventions in the Past

BMC outsources environmental monitoring to external agency. Monitoring is done once in quarter, thus 4 times a year. Ususally duration is 24 / 48 hours.

e. Location

CPCB guidelines for locations of ambient air quality monitoring shall be followed[18].

Ground water samples should be collected from locations covering various land use categories such as from residential area, from industrial area etc.

Tap water should be collected for testing.

f. Tasks

- Draft Terms of References for monitoring agency
- Appoint an agency for environmental monitoring
- Check the process and methodology followed during monitoring.
- Assess the observations by comparing with applicable standards

g. Budgetary Requirements

Approximately Rs. 50,000/- for

- Ambient air quality monitoring at 3 locations for 3 days
- 24 hours spot monitoring for noise
- Water quality sampling at 3 locations

h. Responsibility

[18] http://www.cpcb.nic.in/newitems/7.pdf

- Primary Responsibility – BMC.

i. Recommendations

1. Monitoring should be carried out at maximum 6-7 locations within the city
2. The frequency of monitoring should be increased to minimum 104 observations per year as per CPCB standards[19]. These readings can be limited to at least 2 locations if there are no drastic variations in land use
3. Selection of monitoring locations should follow CPCB Guidelines
4. Calibration details along with the monitoring results should be provided
5. Photographs of monitoring stations while monitoring being conducted, with instruments should be enclosed
6. Locations of monitoring stations should be displayed on map. (Land use map / Google Maps)

5.4. Medium Priority Actions

Activities have given medium priorities where MBC has already taking actions on these issues. Actions can be listed as -

- Stepping up awareness and action programs like Eco-clubs at educational institutions as well as for the community– **Medium Priority**
- Implementation of the Development Plan, specifically with respect to provision of open spaces -– **Medium Priority**
- Integrated Solid Waste Management **– Medium Priority**

Schools in Barshi have started with Eco-Clubs. BMC is supporting various activities initiated by such clubs. For example, tree plantation campaigns, cleaning activities in town.

On solid waste management, BMC has acquired a land for landfill site. A composting plant is proposed as part of solid waste management.

For implementation of developments plan, BMC is planning to acquire land for various purposes such as development of green belts etc.

5.5. Studies and Surveys

Studies and surveys to be done –

- Traffic surveys to propose the road widening plan or provision of new roads
- Ambient air quality and noise monitoring during festival season
    - Water demand monitoring and noise monitoring during wedding season, especially in summer.

[19] http://www.cpcb.nic.in/newitems/7.pdf

5.6. Actions Recommended By Citizens

During the Stakeholders Consultation Workshop, citizens recommended the following actions towards the improvement of environment in Barshi -

- Municipal Council should not give permission to new constructions without latrines. Also services like water supply, electricity should discontinued to existing houses without latrines
- Heavy vehicles should use bypass so that traffic will be controlled
- There should be separate garden department with BMC to maintain gardens
- Trees in the town should be numbered and maintenance should be under a garden department as proposed above
- It will be a good idea if people decide and follow a 'No Vehicles Day' once a year at least
- Strict implementation of ban on less than 50 micron polythene bags
- Awareness programs on solid waste management, effects of open defecation etc. should be arranged more frequently and at different locations.
- Lake beautification

5.7. Citizens' Initiative

There are people in Barshi who are enthusiastic and sensitive towards the environment. Many initiatives have been undertaken by them and include -

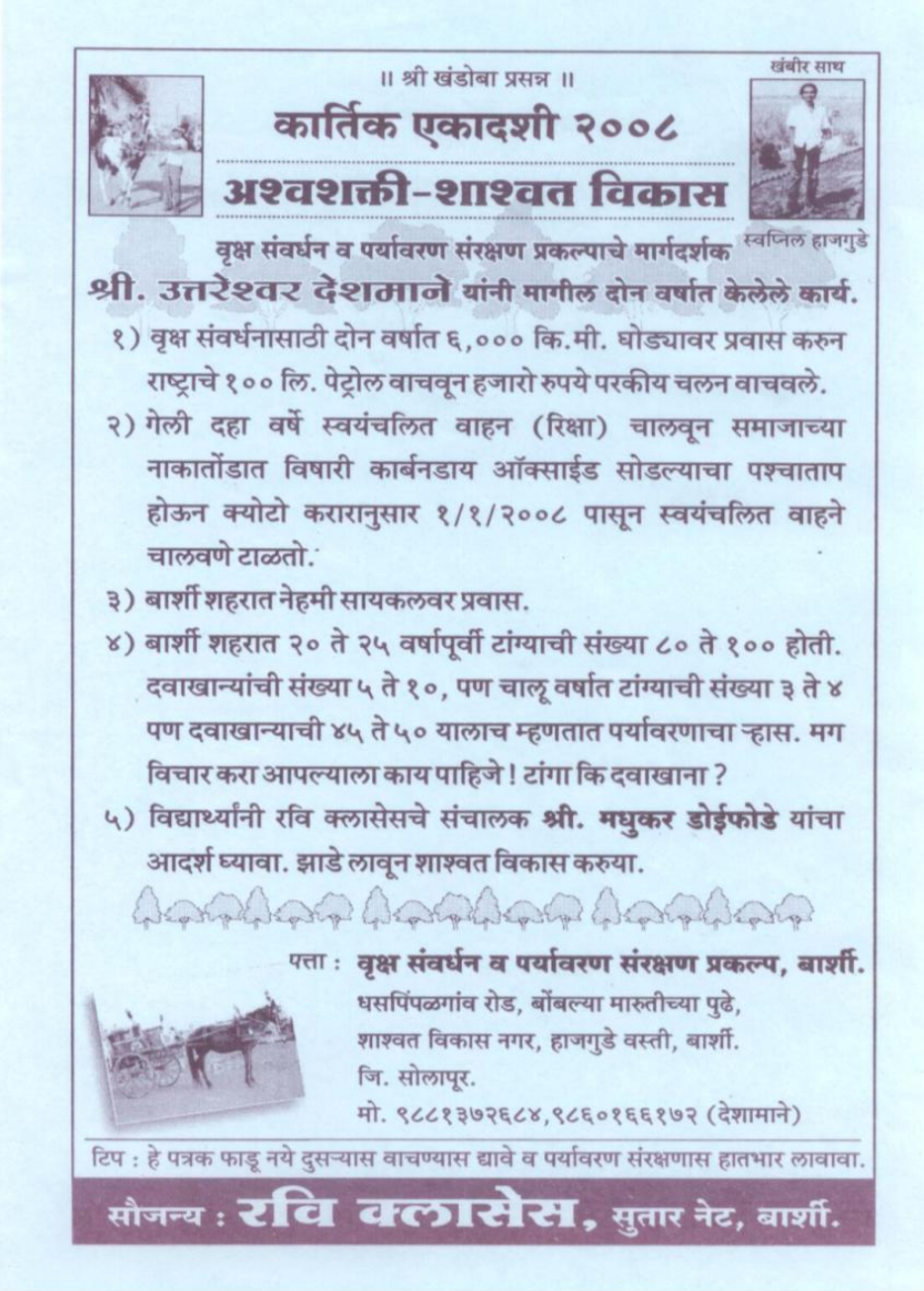
- Tree plantation
- Water conservation at the household level
- Solid waste segregation at the household level
- Awareness campaigns for students

Shri Uttareshwar Deshmane, Shri Madhukar Doiphode, Pratik Talwad, Vikram Savle are among those who care for the environment.

Shri Deshmane was an auto driver for 10 years. Now he has given up that profession for environmental reasons and prefers bicycle or *tanga* for commutation. His *tanga* is not an ordinary one; it serves as an inspiration for others through its displayed messages about environmental protection and conservation.

Figure 26. Shri Uttareshwar Deshmane with is 'tanga'

Shri Doiphode is a teacher by profession. He ensures that his students are concerned for the environment. Shri Deshmane and Shri Doiphode together have initiated number of awareness campaigns, tree plantation activities, roads and public toilet cleaning in town.



॥ श्री खंडोबा प्रसन्न ॥

खंबीर साथ

स्वप्निल हाजगुडे

कार्तिक एकादशी २००८

अश्वशक्ती-शाश्वत विकास

वृक्ष संवर्धन व पर्यावरण संरक्षण प्रकल्पाचे मार्गदर्शक

श्री. उत्तरेश्वर देशमाने यांनी मागील दोन वर्षात केलेले कार्य.

१) वृक्ष संवर्धनासाठी दोन वर्षात ६,००० कि.मी. घोड्यावर प्रवास करुन राष्ट्राचे १०० लि. पेट्रोल वाचवून हजारो रुपये परकीय चलन वाचवले.

२) गेली दहा वर्षे स्वयंचलित वाहन (रिक्षा) चालवून समाजाच्या नाकातोंडात विषारी कार्बनडाय ऑक्साईड सोडल्याचा पश्चाताप होऊन क्योटो करारानुसार १/१/२००८ पासून स्वयंचलित वाहने चालवणे टाळतो.

३) बार्शी शहरात नेहमी सायकलवर प्रवास.

४) बार्शी शहरात २० ते २५ वर्षापूर्वी टांग्याची संख्या ८० ते १०० होती. दवाखान्यांची संख्या ५ ते १०, पण चालू वर्षात टांग्याची संख्या ३ ते ४ पण दवाखान्याची ४५ ते ५० यालाच म्हणतात पर्यावरणाचा ऱ्हास. मग विचार करा आपल्याला काय पाहिजे ! टांगा कि दवाखाना ?

५) विद्यार्थ्यांनी रवि क्लासेसचे संचालक **श्री. मधुकर डोईफोडे** यांचा आदर्श घ्यावा. झाडे लावून शाश्वत विकास करुया.

पत्ता : **वृक्ष संवर्धन व पर्यावरण संरक्षण प्रकल्प, बार्शी.**
धसपिंपळगांव रोड, बोंबल्या मारुतीच्या पुढे,
शाश्वत विकास नगर, हाजगुडे वस्ती, बार्शी.
जि. सोलापूर.
मो. ९८८१३७२६८४,९८६०१६६१७२ (देशामाने)

टिप : हे पत्रक फाडू नये दुसऱ्यास वाचण्यास द्यावे व पर्यावरण संरक्षणास हातभार लावावा.

सौजन्य : रवि क्लासेस, सुतार नेट, बार्शी.

Figure 27. Flier designed, printed and distributed by Shri Madhukar Doiphode and Shri Deshmane

Annexure 1 - First Consultation Workshop Report

Workshop Date

22nd August 2009

Place

Barshi Municipal Council

Background

ULBs in the State of Maharashtra have been publishing Environmental Status reports (ESRs) for last 12 years. These ESRs are submitted to Ministry of Urban Development (MoUD) and follow Mumbai Metropolitan Region Development Authority (MMRDA) guidelines for preparation.

In order to enhance quality of ESR and standardize across all the cities, more comprehensive ESR preparation process and methodology has been developed by Environmental Management Centre (EMC). It is necessary that this process and methodology is demonstrated to create Model ESRs that will serve as a guide for ULBs.

Maharashtra Pollution Control board (MPCB) has appointed EMC to develop model ESRs for State Municipal Councils and Corporations based on the methodology developed as mentioned above. For this purpose, Thane Municipal Corporation and Barshi Municipal Council have been selected.

Agenda of the Meeting

The agenda of meeting was as follows –

- To sensitize Municipal Council staff towards the ESR preparation process and its importance
- To understand current practice and methodology preparing ESR
- To explain briefly the model ESR framework and methodology
- To collect the available information

Discussions

Key discussion points are explained in this section.

Project Objectives

The objective of this Project is to demonstrate the process and methodology of preparing ESR through stakeholders' consultations and following DPSIR framework. Stakeholders' consultation will be important to enable the participatory approach

and develop the sense of ownership towards the city's environment. *Driving Force-Pressure-State-Impact-Response* (D-P-S-I-R) framework will provide the strong analytical base to draw rational and scientific conclusions and plan the strategies to protect and enhance the city-environment.

The Model ESRs developed in this process will help achieve the following objectives

- Refine and firm up the ESR preparation process and methodology to serve as a framework for other cities and councils to follow
- Build capacity at the selected Municipal Corporation and Municipal Council (e.g. Thane and Barshi)
- Provide a Model report that will help standardize as well as raise quality of the ESRs

Proposed Tasks

In order to prepare the ESRs for Thane and Barshi, generic tasks are explained in this section, applicable to both the cities. The proposed tasks are as follows –

1. Formation of Working Core Group for ESR preparation
2. Situation Analyses based on Review of past ESRs and other such Reports
3. Stakeholders' Consultation Workshop (1) and Installation of EkoVoices Platform
4. Data Update and Review
5. Assessment based on D-P-S-I-R Framework
6. Developing Action Plan with Stakeholders' Consultation Workshop (2)
7. Preparation of Draft ESR
8. Stakeholders' Consultation Workshop (3)
9. Finalization of ESR

Brief Introduction to D-P-S-I-R framework

DPSIR is a general framework for organizing information about state of the environment. The framework assumes cause-effect relationships between interacting components of social, economic, and environmental systems, which are

- **Driving forces** of environmental change (e.g. industrial production)
- **Pressures** on the environment (e.g. discharges of waste water)
- **State** of the environment (e.g. water quality in rivers and lakes)
- **Impacts** on population, economy, ecosystems (e.g. water unsuitable for drinking)
- **Response** of the society (e.g. watershed protection)

Model Table of Contents (ToC) of ESR

A Model ToC was discussed for each section. Using this model as well as information available from past ESRs of Barshi, additional information requirements for new sections were identified.

Ekovoices

In order to ensure community participation in process of ESR preparation, a web-based tool tilted as “Ekovoices”was proposed. The importance of this tool and how it will help to build information as well as to understand people’s views, issues faced by them etc. was explained.

Annexure 2 - Second Stakeholders' Consultation Workshop

Workshop Date

22nd August 2009

Place

Barshi Municipal Council

Objectives of the Workshop

Barshi Municipal Council has shared ESRs for last 4 years (2004-05 to 2007-08) with EMC. The observations from past ESRs are communicated in this workshop. The objectives of preparing ESRs were explained to stakeholders. Also all stakeholders participated in the process of preparing ESR. All participants were given the questionnaire to be filled in before the workshop. All discussions were guided by these questions –

- What are the three main environmental issues according to you, the town is facing today?
- What would you as a citizen like the Municipal Council to do to improve the environmental performance of Barshi?
- Has there been any initiative taken in your locality to improve the environment like treatment of household waste, rain water harvesting, greening the area etc? Give details.
- What are the issues faced by the city in terms of solid waste disposal, water supply, sanitation, roads and other such infrastructure?
- According to your perception does the town have enough green space? If no, what measures would you suggest to the Council?
- What are the main sources of pollution in Barshi?

This workshop was proposed to run for half a day Timing - 15:00 am to 17:30 pm.

The program for the workshop is given in **Table 1**.

Table 1: Program for Stakeholders' Workshop

Sr. No.	Duration	Activity	Addressed By
1.	3.00-3.15p.m.	Welcome note to the workshop	Mr. Kadle, SRO, MPCB
2.		Objectives of the workshop	Ms Pratima Raykar, EMC
3.	3.15-3.30	Brief introduction to ESR	Ms Lucille Andrade, EMC

Sr. No.	Duration	Activity	Addressed By
4.	3.30-3.45p.m.	Presentation of the situation analysis of Barshi based on past ESRs	Ms Pratima Raykar, EMC
5.	3.45-4.15p.m.	Presentation of the EkoVoices platform for sharing concerns and highlighting issues	Ms Pratima Raykar, EMC
6.	4.15-5.15p.m.	Issue and cause identification exercise on map	Interactive session - guided by Ms Pratima Raykar and Ms. Lucille Andrade
7.	5.15-5.30p.m.	Summing up of issues identified on map and Collection of citizen response forms	Ms Pratima Raykar, EMC

Invitees

The stakeholders invited for the workshop were representatives of -

1. Various departments in Urban Local Body (Water, sanitation, solid waste, transport, health, etc.)
2. Government Organization such as MPCB, MJP, MSEB, BSNL, Police Dept.
3. Hospitals in the town
4. Social Club such as Rotary Club, Lion's Club
5. Industry and business associations, industrial development corporation etc.
6. Schools and Academic institutions
7. Environmental NGOs active in the city
8. Media personnel

30-40 persons representing different institutional bodies of Barshi were present for the workshop.

Annexure 3 - Third Stakeholders' Consultation Workshop

Workshop Date

26th February 2010

Place

Barshi Municipal Council

Objectives of the Workshop

A draft of the ESR for Barshi Municipal Council for the year 2008-09 was prepared following the model ESR format. The ESR includes situation analysis of Barshi town in the D-P-S-I-R framework and action planning based on priority of issues. The action plan also includes tentative budget for high priority issues.

This draft was placed before the stakeholders inviting comments and suggestions.

This workshop was proposed to run for half a day Timing - 3:00 pm to 5:30 pm.

The program for the workshop is given in **Table 1**.

Table 2: Program for Stakeholders' Workshop

Sr. No.	Duration	Activity	Addressed By
1.	3.00-3.15p.m.	Welcome note and Objectives of the workshop	Dr. V. G. Godepure, BMC
2.	3.15-4.30	Presentation of the ESR	Ms Pratima Raykar, EMC
3.	4.30-5.30p.m.	Question Answer Session	Ms Pratima Raykar, EMC and Ms. Lucille Andrade

Outcomes

The workshop enabled discussion on how to put the action plans into implementation between the Municipal Council and citizens. Various models such as Public Private Partnerships were also discussed. Through the ESR preparation process and workshops, citizens active in the field of environment have offered their services and workforce to work hand-in-hand for making Barshi a 'Model Town'.

Invitees

The stakeholders invited for the workshop were representatives of:

9. Various departments in Urban Local Body (Water, sanitation, solid waste, transport, health, etc)

10. Government Organization such as MPCB, MJP, MSEB, BSNL, Police Dept.
11. Hospitals in the town
12. Social Club such as Rotary Club, Lion's Club
13. Industry and business associations, industrial development corporation etc.
14. Schools and Academic institutions
15. Environmental NGOs active in the city
16. Media personnel

20-25 persons representing different institutional bodies of Barshi were present for the workshop.

Workshop Photos

Annexure 4 - Methodology for ESR preparation

Formation of Working Group

In order to build capacity and ownership at the Council, a Working Group was formed. It consisted of representatives from various Departments in the Council such as Health Department, Water and Sanitation Department, Solid Waste Department etc.

The functions performed by Working Group are –

- Providing all required data
- Logistics support to all stakeholder consultation workshops
- Support in preparing Action Plan for the BMC.

The Working Group consists of –

Person	Department and Designation
Mr. G. K Rathod	Chief Officer (Group Head)
Dr. V. G. Godepure	Health Officer
Mr. A. B Bhad	Head, Town Planning Department
Mr. S. A. Pathan	Water Supply Engineer
Mr. A. G. Shinde	Light Inspector
Dr. B. J. Gaikwad	Chief Medical Officer
Mr. ShivrajPatil	Head Admin Department

First Stakeholders Consultation Workshop

First Stakeholders Consultation Workshop was arranged on 22nd August 2009. The objectives of this workshop were -

- To sensitize Municipal Council staff towards the ESR preparation process and its importance
- To understand current practice and methodology preparing ESR
- To explain briefly the model ESR framework and methodology
- To collect the available information

Review of Past ESRs

BMC has shared 4 years' ESRs, as listed –

- ESR for year 2004 -05
- ESR for year 2005 -06
- ESR for year 2006 -07
- ESR for year 2007 -08

These ESRs are reviewed to understand past environmental issues, responses to them and their effectiveness.

Data Collection and Review

This step mainly involved collection of secondary data. Apart from the past ESRs, other reports from BMC as listed below are collected and referred.

- Barshi Smritigranth
- Gadgebaba Gram Swachhata Abhiyan Report 2004
- Environmental Monitoring Reports for 3 quarters in year 2008-09
- Master Plan for Barshi City 1997

  Drawings
- Master plan of Barshi town (scanned copy)

The information was also collected from various stakeholders such as Regional Office, Maharashtra Pollution Control Board (MPCB) and web-based resources.

Assessment in DPSIR Framework

DPSIR is a general framework for organizing information about state of the environment. The framework assumes cause-effect relationships between interacting components of social, economic, and environmental systems, which are

- **Driving forces** of environmental change (e.g. industrial production)
- **Pressures** on the environment (e.g. discharges of waste water)
- **State** of the environment (e.g. water quality in rivers and lakes)
- **Impacts** on population, economy, ecosystems (e.g. water unsuitable for drinking)
- **Response** of the society (e.g. watershed protection)

The data collected for Barshi is assessed using this framework.

Second Stakeholders' Consultation Workshop

Second Stakeholder Consultation workshop was organized on 4th November 2009. The agenda of the workshop was –

1. Brief introduction to ESR
2. Present the situation analysis of Barshi based on previous ESRs
3. Present the Ekovoices platform for sharing concerns and highlighting issues
4. Issue and cause identification exercise on map
5. Summing up of issues identified on map and discussions

Various stakeholders were invited for this workshop, such as representatives from academic institutions and schools, NGOs, and citizens.

Preparation of Action Plan

The Action Plan is prepared as a response to the issues and opportunities identified in assessment. Based on the assessments, the environmental issues and necessary responses are prioritized to develop Action Plan in line with the Environmental Policy. Prioritization of issues and respective actions are based on logical criteria such as geographical extent, temporal patterns, severity of issues etc. Each action is detailed out in Action Sheets to include –

- **Action** (title)
- **Type of Action** (Project / Program / Plan / Policy)
- **Purpose** (to give the basis of action. What all issues will be resolved with this action or what opportunities will be stimulated on the basis of which action is planned)
- **Location / Geographical extent of application / targeted beneficiaries** (mainly in case of programs and policies)
- **Tasks** (delineating road-map for implementation)
- **Implementation plan** (as per the priority, implementation period shall be defined for each action. For example, high priority actions shall start immediately. State tentative completion date or duration of action wherever possible).
- **Responsibility allocation** (Responsibilities may assigned to relevant departments in Corporation / Council. Highlight the outsourcing requirements wherever relevant)
- **Budgetary requirements** (these can be broad level estimates for implementation)
- **Recommendations** (if particular action needs study or survey to be carried out or pilot to be implemented, such recommendations shall be covered in action sheets)
- **Illustrations** - Give illustrations where particular interventions are already implemented elsewhere.

Preparation of Draft ESR

Based on the assessment and action plan developed, the draft ESR is prepared.

Third Stakeholders Consultation Workshop

Draft Report is shared with the stakeholders for their review and comments, in the third stakeholders' consultation workshop. The workshop was organized on 22nd January 2010.

Finalization of Draft ESR

Based on the comments received from various stakeholders, the ESR is finalized.

Annexure 5 - DPSIR Framework

Driving Forces (D)

A driving force is a human activity that is generated to satisfy a 'need'. Driving forces can be of two types - *primary driving forces* which are related to activities to fulfill the needs for shelter, food and water, and *secondary driving forces* which are activities to satisfy the need for mobility, entertainment and culture. The following are some of the typical driving forces:

- Population growth
- Industrialization (resource extraction and processing)
- Urbanization
- (Lack of adequate) Infrastructure
- Intermittent driving forces such as religious- or leisure-based tourism

Pressures (P)

The driving forces exert a stress on the available environmental resources which in turn induce pressures on the environment. These pressures can be divided into two main types, namely:

- **Depleting pressures**, which are induced by driving forces that extract environmental resources, such as declining forest cover and reduced levels of groundwater table, etc.
- **Degrading pressures**, which are induced by driving forces that discharge pollutants into the environment such as air pollution, water pollution and soil erosion.

State (S)

As a consequence of the pressures, the state of the environment – its quality and quantity - gets affected. The state of the environment is represented by the following:

- Air quality
- Water quality and reserves
- Soil quality
- Productivity of land

Impacts (I)

The physical, chemical or biological changes in the state of the environment impact the quality of environmental resources, including biodiversity and health and welfare of humans. Polluted environmental resources have health and/or economic

impacts, threatening the sustainability of all economic activities. The following are some typical impacts:

- Status of biodiversity
- Human health

Response (R)

Due to an undesired impact, a response is triggered to address the change(s) in the environment. A response is directed specifically towards regulating driving forces, pressures or impacts to mitigate environmental pollution. A response should ideally be a part of the larger Action Plan. Response measures under an Action Plan can be categorized under four heads, namely:

- **Policy** – A Policy is a definite course or method of action that guides and determines present and future decisions. It is the overall framework that embraces the general goals and procedures of an institution (in this case BMC)[20]. A Policy is usually directed towards regulating the Driving Forces (D)
- **Plan** – A Plan is defined as a detailed formulation of a program of action. It can be described as intent to carry out an action[21]. A Plan targets to regulate the Driving Forces (D) and Pressures (P).
- **Program** - A Program is a system of projects and services[22]. A Program, like the Plan, targets to regulate the Driving Forces (D) and Pressures (P).
- **Project** - A Project is the most location-specific response that may be planned under a Program. A Project targets to change the State (S) of the Environment.

Using this framework, environmental status of Barshi is assessed.

[20] *Merriam-Webster Online Dictionary Definition Search*. Available at: http://www.m-w.com/cgi-bin/dictionary?book=Dictionary&va=policy&x=12&y=14
[21] *Merriam-Webster Online Dictionary Definition Search*.Availableat:http://www.m-w.com/cgi-bin/dictionary?book=Dictionary&va=plan
[22] *Princeton University WordNet Search 2.1*. Available at:www.cogsci.princeton.edu/cgi-bin/webwn2.1

Annexure 6 - Population information

Census Year	Population	Growth Rate		
		Barshi	Maharashtra	Solapur Dist.
1951	41849	0.00	Not Available	Not Available
1961	50389	20.41	Not Available	Not Available
1971	62374	23.78	27.45	Not Available
1981	72537	16.29	24.54	Not Available
1991	88810	22.43	25.73	24.84
2001	104786	17.99	22.73	19.32
(Projected) 2011	114135.267		21.87	

Annexure 7 - Soil Testing Observations

MITCON CONSULTANCY SERVICES LTD.

SOIL ANALYSIS REPORT

Client's Name & Address	Report No.	EME/LAB/BMC/2008-09/785
Barshi Municipal Council., Barshi, Dist. Solapur - 413401	Dated	05/02/2009
	Lab Reference No.	EME/LAB/BMC/2008-09/785
	Date of Analysis	01/02/2009

RESULTS

Sr. No.	Parameters	Unit	Results				
			S 1	S 2	S 3	S 4	S 5
01	Date of Sampling		31/01/2009				
02	PH	---	7.10	7.05	7.05	7.15	7.65
03	Moisture	%	12.10	12.50	13.20	12.50	12.00
04	Water Holding Capacity	%	254.60	226.59	210.1	215.6	216.3
05	Organic Matter	%	0.10	0.16	0.15	0.17	0.12
06	Free Ammonical Nitrogen	%	0.10	0.09	0.15	0.18	0.12
07	Potassium as K	%	1.10	1.25	1.06	1.05	0.96
08	Phosphorous as P	%	1.31	1.65	1.28	1.31	1.62
09	Copper as Cu	ppm	1.08	1.07	1.10	1.05	0.99
10	Cadmium as Cd	ppm	ND	ND	ND	ND	ND
11	Lead as Pb	%	ND	ND	ND	ND	ND
12	Chromium as Cr	ppm	ND	ND	ND	ND	ND

- ND – Not Detected

Legends:

- S 1 – Kurudwadi Road
- S 2 – Upali Road
- S 3 – Paranda Road
- S 4 – Bhoom Road
- S 5 – Latur Road

REMARKS / OBSERVATIONS:

For MITCON Ltd
Sr. Chemist

MITCON CONSULTANCY SERVICES LTD. ENVIRONMENT LABORATORY PUNE

For MITCON Ltd
Lab In-charge

Environment Laboratory recognized by Ministry of Environment & Forests, Govt. of India, New Delhi, Under E. P. Act, 1986, vide Gazette Notification No. S.O. 1139 (E) Dated October 15, 2004, valid upto October 14, 2009.

MITCON CONSULTANCY SERVICES LTD.

SOIL ANALYSIS REPORT

Client's Name & Address	Report No.	EME/LAB/BMC/2008-09/785
Barshi Municipal Council., Barshi, Dist. Solapur - 413401	Dated	05/02/2009
	Lab Reference No.	EME/LAB/BMC/2008-09/785
	Date of Analysis	01/02/2009

RESULTS

Sr. No.	Parameters	Unit	Results				
			S 6	S 7	S 8	S 9	S 10
01	Date of Sampling		31/01/2009				
02	PH	---	7.20	7.05	7.60	7.40	7.15
03	Moisture	%	13.02	12.66	14.10	13.20	12.60
04	Water Holding Capacity	%	223.6	255.4	248.5	230.6	231.4
05	Organic Matter	%	0.65	0.4	0.30	0.32	0.65
06	Free Ammonical Nitrogen	%	0.3	0.26	0.06	0.11	0.13
07	Potassium as K	%	1.16	1.12	1.20	1.28	1.09
08	Phosphorous as P	%	4.20	3.10	3.26	3.08	2.69
09	Copper as Cu	ppm	1.02	0.85	1.06	1.06	1.21
10	Cadmium as Cd	ppm	ND	ND	ND	ND	ND
11	Lead as Pb	%	ND	ND	ND	ND	ND
12	Chromium as Cr	ppm	ND	ND	ND	ND	ND

- **ND** – Not Detected

Legends:

- **S 6 – Tuljapur Road**
- **S 7 – Mohol Road**
- **S 8 – Shelgaon Road**
- **S 9 – Solapur Road**
- **S 10 – Alipur Road**

REMARKS / OBSERVATIONS:

For MITCON Ltd

Sr. Chemist

MITCON CONSULTANCY SERVICES LTD. ENVIRONMENT LABORATORY PUNE

For MITCON Ltd

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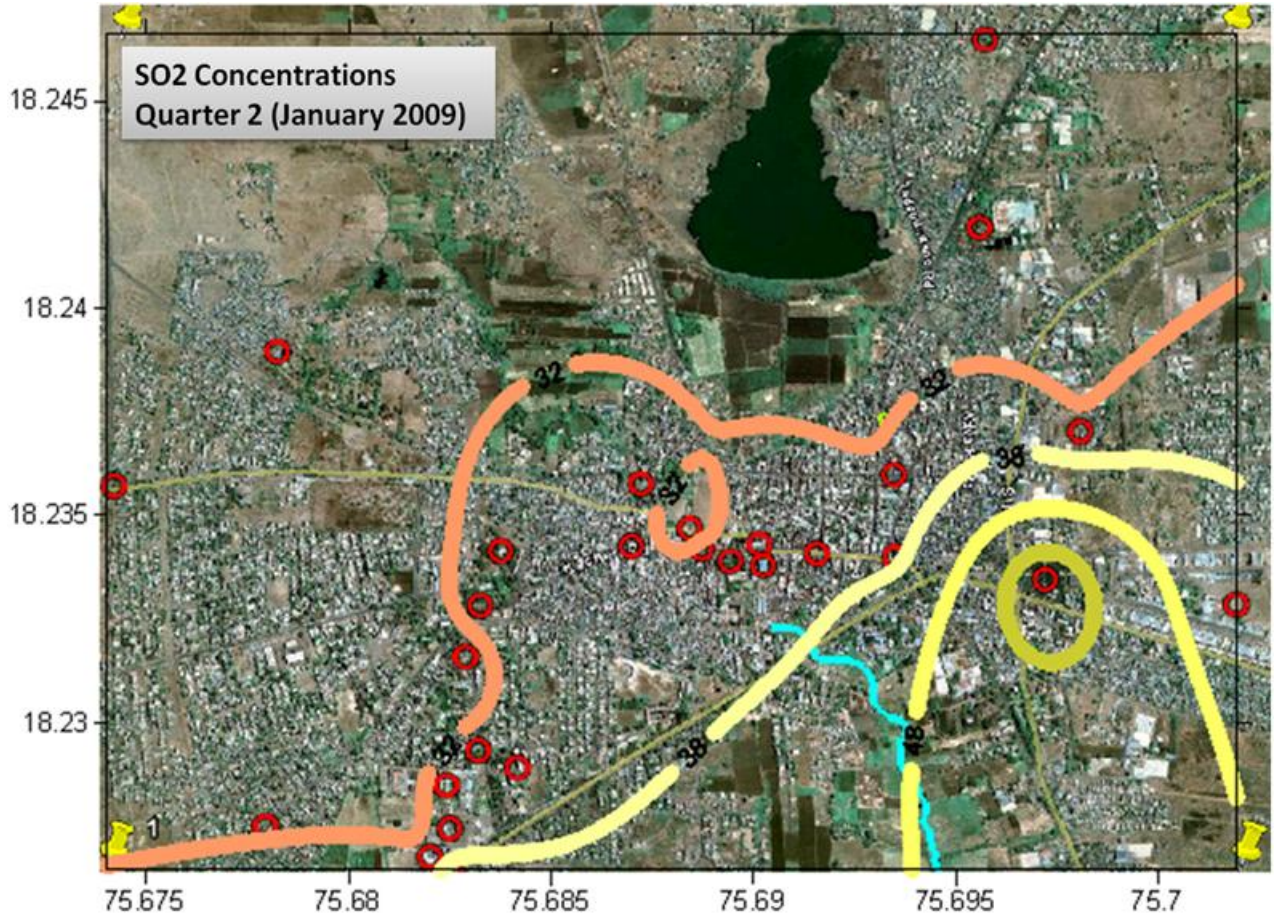
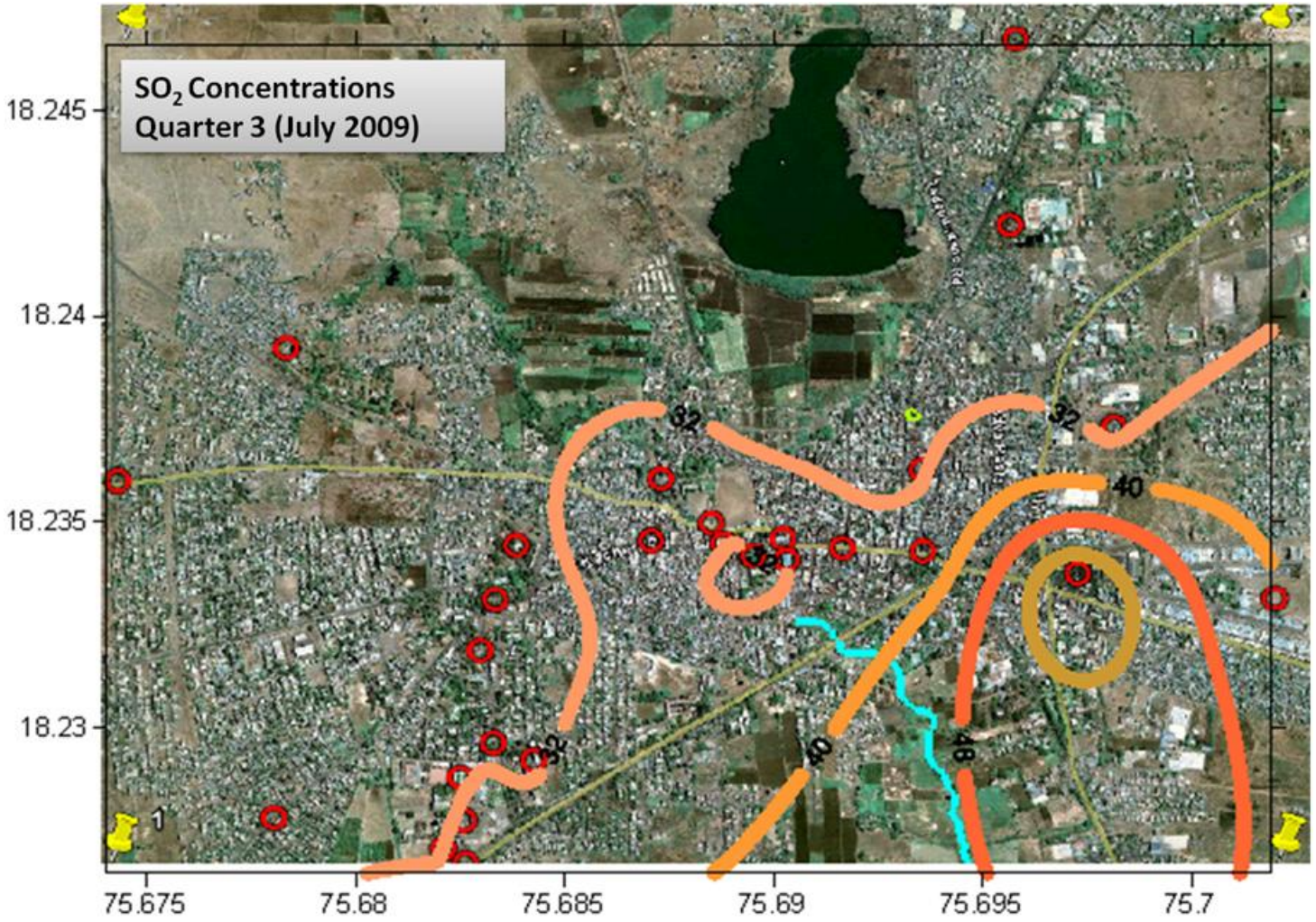
Environment Laboratory recognized by Ministry of Environment & Forests, Govt. of India, New Delhi, Under E. P. Act, 1986, vide Gazette Notification No. S.O. 1139 (E) Dated October 15, 2004, valid upto October 14, 2009.

Annexure 8 - Contour Plots for Ambient Air Quality

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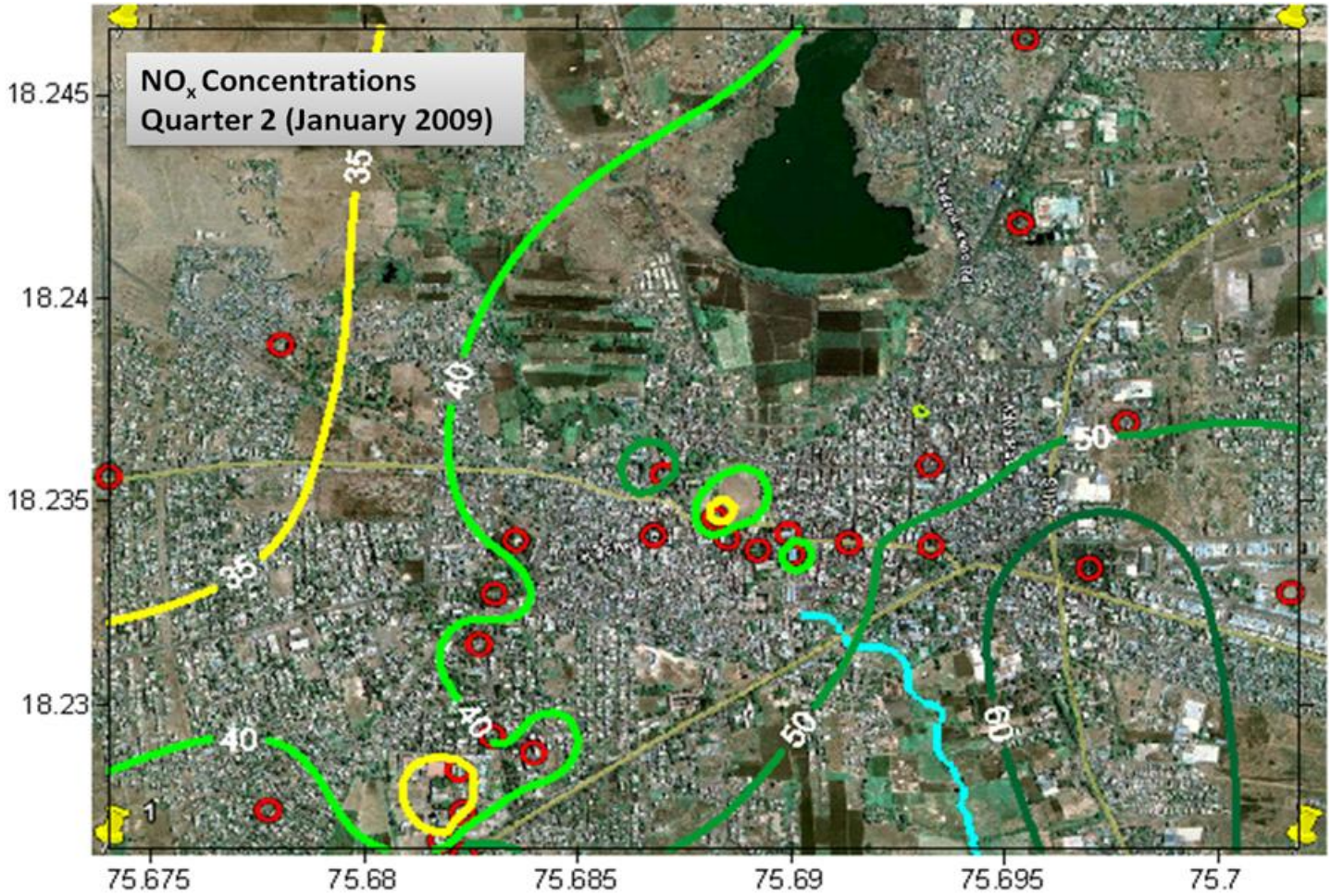
Quarter 3 (July 2009)
18.245
18.24
18.235
18.23
75.675
75.68
75.685
75.69
75.695
75.7
32
32
40
40
40
1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Quarter 2 (January 2009)
18.245
18.24
18.235
18.23
75.675
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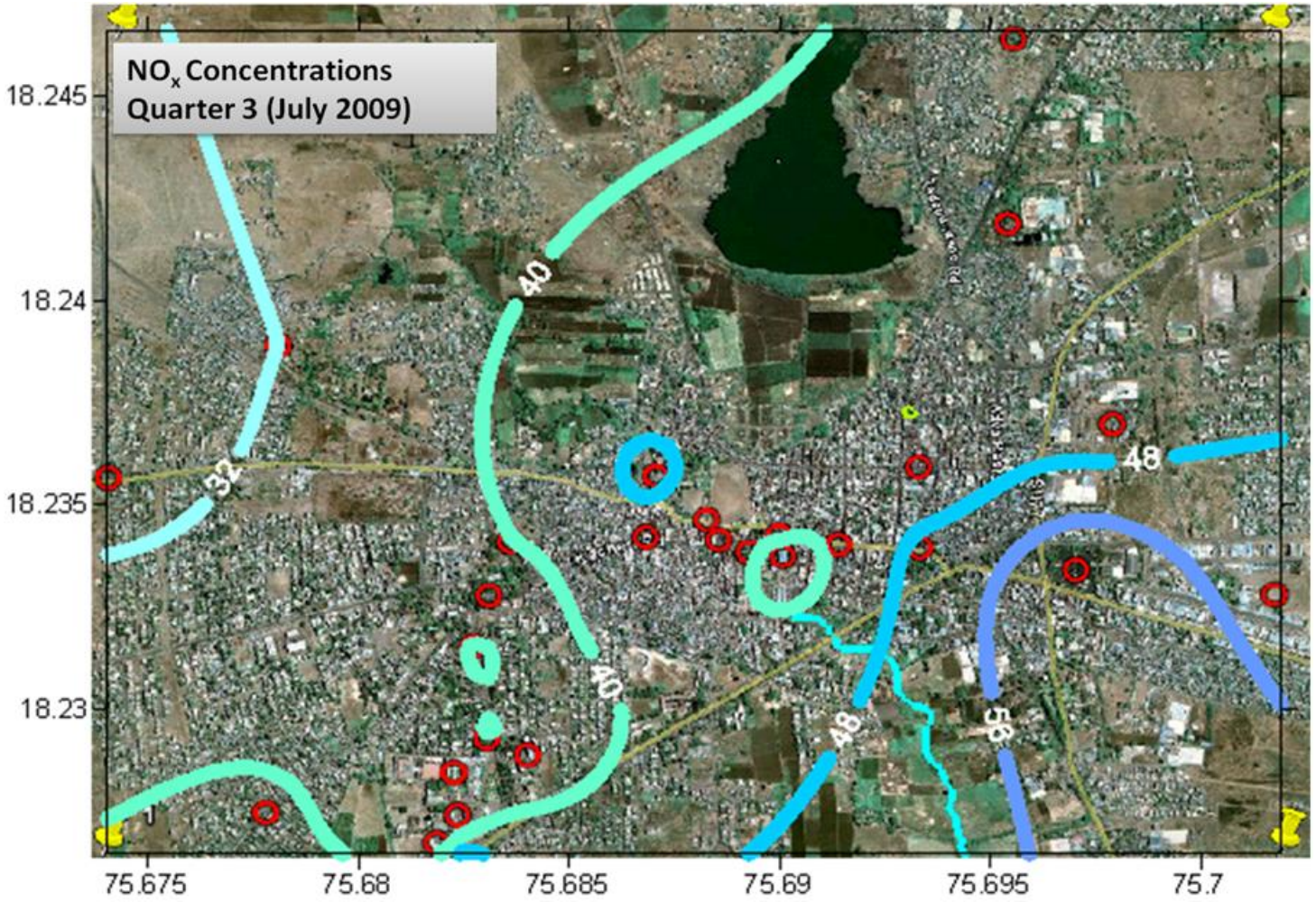
75.685
75.69
75.695
75.7
35
40
50
60


NOx Concentrations
Quarter 3 (July 2009)
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18.24
18.235
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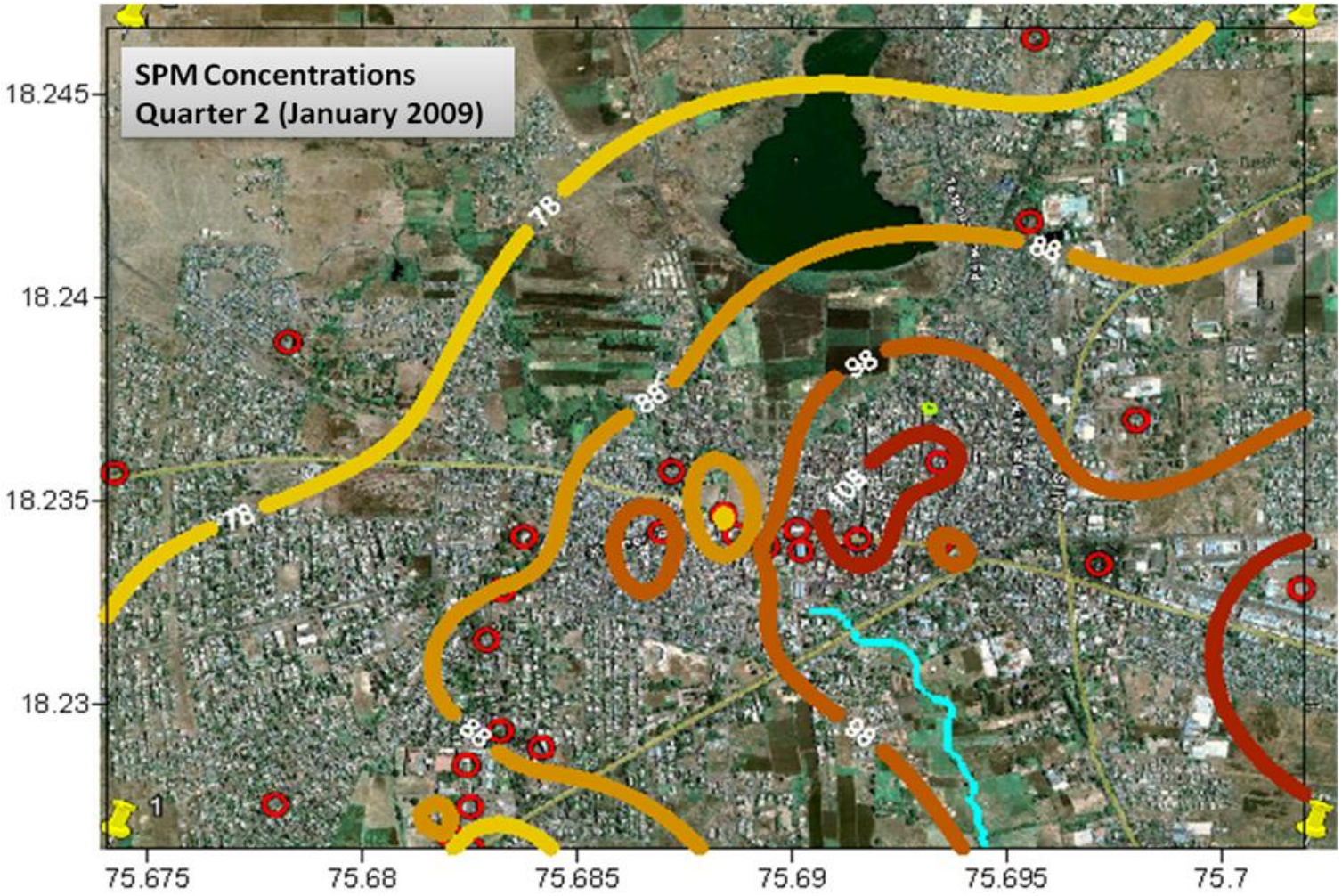
75.7
40
32
48
40
48
56


SPM Concentrations
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18.23
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75.68
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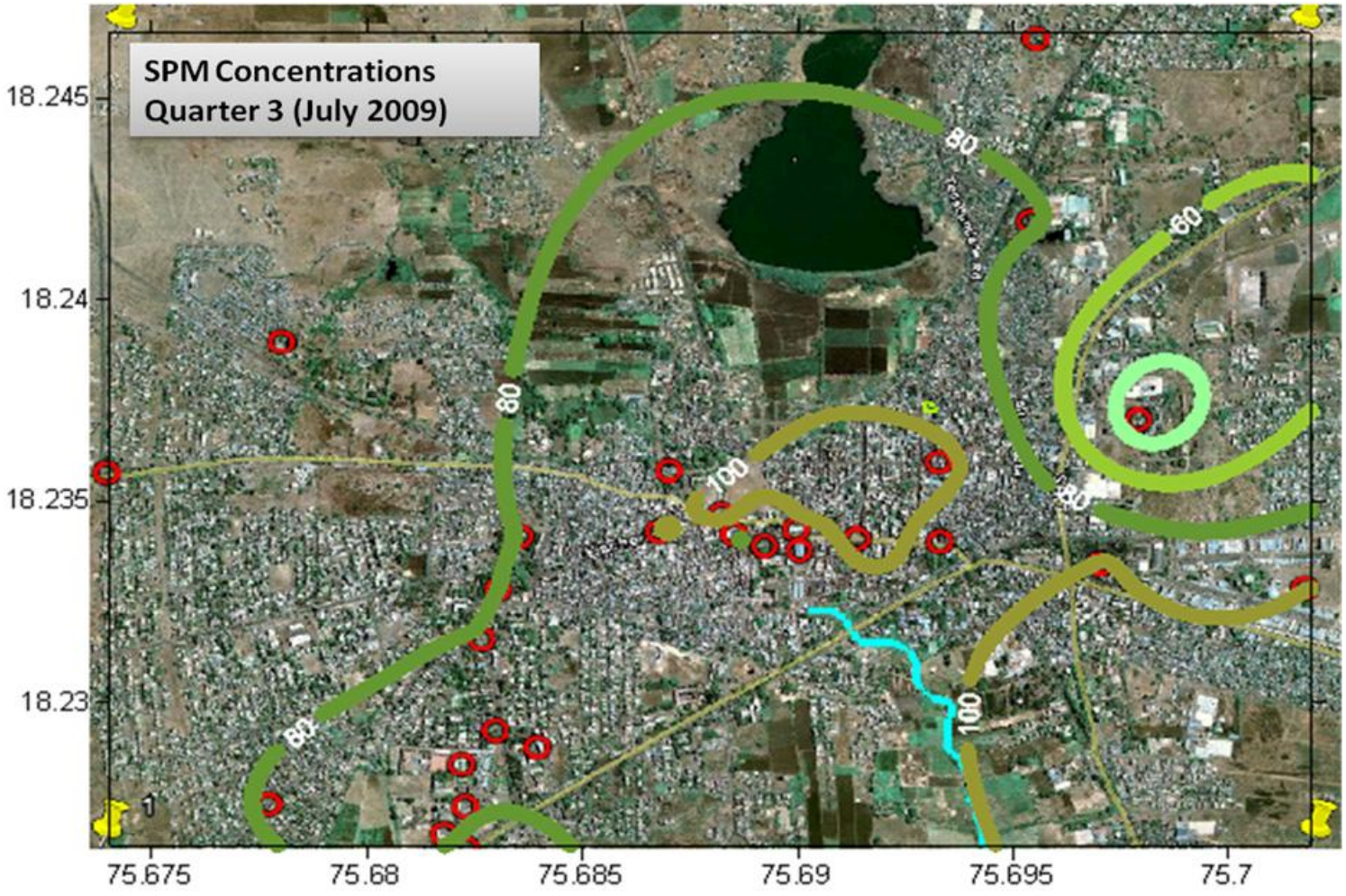
75.69
75.695
75.7
78
88
98
108


SPM Concentrations
Quarter 3 (July 2009)
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18.24
18.235
18.23
75.675
75.68
75.685
75.69
75.695
75.7
80
100

Annexure 9 - Interlinking of Impacts