Literature Review

Dr. B.S. Mahajan, Suma Nair, 2004 explained that to develop the model, it is mandatory to understand the requirements of the end users. The needs of CIDCO and NMMC can be analyzed by surveying the proprietary research reports and other literature about the environmental impact assessment published by various research agencies. The proprietary research reports that were used are published by HBCSE.

The HBCSE has assessed the air and water pollution parameters. Earlier work by Dr. B.S. Mahajan was carried out through “Health And Environment Action Based Learning” (HEAL) project undertaken by Homi Bhabha Centre for Science Education (HBCSE), a branch of Tata Institute of Fundamental Research (TIFR), Mumbai with joint venture of NSS cell of University of Mumbai was studied in presence of an author.

Under this project, Air, Water, Waste, Green cover Data was collected in scientific way and further it is analysed in chemical labs in author’s presence. Physical properties are also studied and proper conclusions are drawn. Also health surveys were conducted to correlate health with pollution and conclusion is drawn. The remedial measures are also suggested. It is found that such a huge data should be managed somewhere to keep it up-to-date and data should be retrieved fast and queries should be replied. They have drawn the following analysis from which the author have considered only air and water.

Air Data Analysis

Air quality was monitored in five zones (Airoli, Kopar Khairane, Nerul, Turbhe and Vashi) of Navi Mumbai over three seasons: monsoon, winter and summer of 2004-2005. Two monitoring points (residential and traffic) were set up in each zone. Monitoring was carried out for 24 hours (at a height varying from 10-15 metres at residential sites) and for 12 hours at ground level at traffic junctions in each of the three seasons.

This project gives some idea about the air quality in Navi Mumbai. Besides more detailed, long term studies involving source identification of different pollutants, some steps (such as, better traffic management with emphasis on public transport, good road maintenance, construction practices and waste disposal practices, along with strict monitoring of industrial emissions with regulated hill quarrying) could help considerably in cleaning up the Navi Mumbai air.

Water Data Analysis
In this study, water quality of several fresh water bodies and creek water in the Navi Mumbai region (Airoli, Kopar Khairane, Nerul, Turbhe and Vashi) was studied in three seasons: monsoon, winter and summer of 2004 and 2005.

NMMC Environment Status Reports from the year 2008 were studied; the whole data about Navi Mumbai with map and Air, Water, Waste Management, data is given. Also population, Health victims only suffering with malaria are published. It is found that its just a compiled information at one place.

F. Karimipour1, M. R. Delavar1 and M. Kinaie, 2005, stated Geospatial information systems (GISs) have been widely considered to handle diverse range of geospatial data. One of the important issues in geospatial data management is to explore the relationships and future trends of the data, which is possible through geospatial data mining and knowledge discovery. Geospatial data mining, its need and analyses have been investigated in this paper. In addition, applications of geospatial data mining in environmental data management and especially in water quality management have been introduced. Finally, regarding the abundance of industrial centers in Western and Eastern Azerbaijan Provinces in North-West of Iran and their effects on water quality in this region, correlation between industrial pollutions and water quality indicators through geospatial data mining has been modeled as a case study.

Section 2 describes the concept of data mining, its stages and analyses are introduced. In Section 3, spatial data mining and its individual characteristics are mentioned. Section 4 contains reasons for water quality management and past efforts to use GIS in this direction. Section 5 concentrates on the case study and explains used spatial and attribute data. In this section, dependency analysis is used to extract hidden relationships between industrial and population. Concentration and water pollutant parameters. In Section 6 the validity of achieved results are verified. Finally, Section 7 contains conclusions and open opportunities for future works. In the reminder of the paper, importance of water quality management and some past efforts in this area using GIS are investigated.

F. Karimipour, M.R. Delavar* and H. Rezayan, 2005, It has been clear that conventional approaches of statistical analyses of geospatial data in analogue form and in small amount cannot
further be efficiently implemented for digital data and in large volume, which are being produced nowadays. Such functionalities can be efficiently employed using geospatial data mining and knowledge discovery. One of the important applications of GIS is environmental data management. GIS can be used to provide scientists and managers with a range of scenarios for spatial distribution of the data and predict future trend of the data to avoid possible environmental crisis. Geospatial data mining can be used to assess the amount of pollutions to take necessary measures for environmental protection. This paper is concentrated on water quality management using geospatial data mining in a GIS environment. Geospatial data mining, its needs and analysis have been investigated in this paper. In addition, an application of geospatial data mining in environmental data management and especially in water quality management has been introduced. This application is the neighborhood analysis that specifies the rivers with the same pollution assessed.

Puyam S. Singh, Dibyajyoti Chutia, Singuluri Sudhakar, 2012 There is growing needs for web based GIS for easy and fast dissemination, sharing, displaying and processing of spatial information which in turns helping in decision making for various natural resources based applications. In order to make a cost effective implementation, operation and maintenance of spatial information over the web, a cheaper yet feature rich alternative to commercial software is required which can be fulfilled by Open Source GIS software. This paper conveys an efficient approach to customize and integrate an open source web GIS system based on Mapserver as a web GIS server and PostgreSQL/PostGIS as an object oriented relational database management system (ORDBMS) for effective dissemination, sharing and management of spatial information over the internet. An open source web application tool built on top of MapScript using the PHP programming language has been used as for development of interactive user interface. The configurable Web Mapping Client Components (CWC2) tags have been added to HTML template pages in order to deploy the mapping contents to a web application. It is observed that the present system developed using open source software enables user to view, update, customized retrieval, query and analysis of natural resources information for specific needs.

Kyriaki Remoundou and Phoebe Koundouri, 2009
This paper provides a review of the literature on valuation studies eliciting monetary values associated with reduced environmental risk and in particular focusing on reduced indoor and outdoor air pollution, enhanced water quality and climate change mitigation. The findings of the valuation studies have important policy implications, since the environmental risk factors that are studied can largely be avoided by efficient and sustainable policy interventions. Minimizing exposure to environmental risk factors by enhancing air quality and access to improved sources of drinking and bathing water, sanitation and clean energy is found to be associated with significant health benefits and can contribute significantly to the achievement of the Millennium Development Goals of environmental sustainability, health and development.

Rida Al-Adamat, 2012 The researcher explained that groundwater is considered to be the major water resource for many areas and the only source of water in some areas in Jordan. Some of Jordan groundwater resources are presently exploited at maximum capacity and in some cases are exploited beyond there safe yield. One of the efficient ways to fight the deficit in groundwater resources is through re-charging the water tables naturally or artificially. This research aimed to select the optimum sites for groundwater re-charge in the Azraq Oasis area/Jordan through the use of GIS techniques. The selection criteria were based on slope, drainage density, lineament density within the study area. The adopted selection technique was the Boolean techniques (Multiplication) within a Raster GIS.

Sam A. Bacharach, 2007 The purpose of this memo is to nominate the OpenGIS® Web Map Service Implementation Specification (WMS) for adoption as a NASA ESDS community standard for disseminating views of raster and vector data (“maps”) via the World Wide Web. WMS uses HTTP and defines several operations that allow a client to discover the functions a server is capable of providing, request a specific "map", and, optionally, request information about individual features shown on a map. This nomination is for version 1.1.1 of the WMS specification. Future installations of WMS should consider use of the most recent version. WMS 1.3 is identical to ISO 19128, which the International Organization for Standardization (ISO) released as an International Standard during calendar year 2005. This OpenGIS® Standard specifies the behavior of a service that produces georeferenced maps. This standard specifies operations to retrieve a description of the maps offered by a service instance, to retrieve a map,
and to query a server about features displayed on a map. A Web Map Service produces maps of georeferenced data. We define a "map" as a visual representation of geodata; a map is not the data itself. This specification standardizes the way in which maps are requested by clients and the way that servers describe their data holdings. This document defines three operations, the first two of which are required of every WMS.

**Khaled Ahmed Ali Abdulla Al Koas, 2010** In this thesis, the relationship between air pollution and human health has been investigated utilising GIS and an analysis tool. The research focused on how vehicular air pollution affects human health. The main objective of this study was to analyse the spatial variability of pollutants, taking Brisbane City in Australia as a case study, by the identification of the areas of high concentration of air pollutants and their relationship with the numbers of death caused by air pollutants. A correlation test was performed to establish the relationship between air pollution, number of deaths from respiratory disease, and total distance travelled by road vehicles in Brisbane. GIS was utilised to investigate the spatial distribution of the air pollutants. The main finding of this research is the comparison between spatial and non-spatial analysis approaches, which indicated that correlation analysis and simple buffer analysis of GIS using the average levels of air pollutants from a single monitoring station or by group of few monitoring stations is a relatively simple method for assessing the health effects of air pollution. A non-spatial approach alone may be insufficient for an appropriate evaluation of the impact of air pollutant variables and their inter-relationships. It is important to evaluate the spatial features of air pollutants before modelling the air pollution-health relationships.

**Hao Ding, Richard Pascoe & Neville Churcher, 2002** Java technologies are widely used in web application development. In this paper are described three approaches to developing Java-based web applications and our experiences with applying each to the development of client that interact with servers implementing the OGC (Open GIS Consortium) Web Map Service (WMS) specification. Also described is the installation and configuration of open source software that implements the WMS specification. The paper is concluded with some preliminary insights into when one of the three approaches to WMS client implementation is more suited to another. OGC Web Map Service (WMS) is an interoperable web mapping system. It provides common interfaces to connect with the client application and dynamically process geo-referenced data.
such as geographic maps and features coded using Geography Markup Language (GML) documents. The objective of the research presented here is to evaluate the efficacy of three Java based technologies for implementing clients that interact with servers implementing the OGC WMS. GIS applications are often different from common web applications such as on-line stores, because they involve geographic data handling. For each approach, a client is implemented that achieves a series of tasks with different contexts in order to compare various aspects of the three approaches, including how easily they make the development of clients that handle geographic data and utilise the functionality provided by the WMS.

Fang-Yie Leu, Tai-Shiang WANG, 2006 stated that researchers and policymakers can input environmental data to a GIS system to gain spatial analysis result which can show up how data are geographically dispersed. Besides, the data mining and data warehouse technologies can automatically mine hidden knowledge and analyze/extract knowledge from raw data, respectively. If it can be put with GIS, the hidden meanings or rules embedded in the environmental data can be then more deeply and precisely uncovered. In this paper, they discussed how to use the two data analytical tools, GIS and data mining, to analyze the data collected for the Situn district so that researchers can realize some facts that can not be superficially obtained from raw data. In this paper, they have analyzed social and geographic phenomena, and then explain the phenomena according to the mining result.

Pallavi S. Talegaonkar, 2008, In this paper the author explained that the Geographic data which is immensely heterogeneous is increasingly becoming available on the Internet. For sharing and accessing this data GIS technology can be embraced within the context of an SOA using Web services. Open GIS Consortium has developed the web-based Geographic information and services accessible via internet through OGC consensus process. It was developed before SOAP emerged, so previously Web Map Server and Web Feature Server did not refer SOAP.

Nance Upham, “Making Health Care Work for the Poor” WHO Report, 2003 The purpose of this paper is to conduct a review of NGOs’ contributions to health care in Asia. Taking into consideration the World Health report and the recommendations of the national consultations on macroeconomics and health, they have focused on these NGOs which have Primary Health
Care as a stated goal. This paper strongly advocates to strengthen, integrated primary health care systems, and rebuild efficient ones where they are very weak or inexistent. Clearly, national macroeconomic mechanisms, which bring together responsibility for health and finance, have a responsibility to undertake. The task is bringing health back on top of the agenda, nationally and globally.

Barry Evans Clive E Sabel, 2012, presented the design and development of an open source web-based Geographical Information System allowing users to visualise, customise and interact with spatial data within their web browser. The developed application shows that by using solely Open Source software it was possible to develop a customisable web based GIS application that provides functions necessary to convey health and environmental data to experts and non-experts alike without the requirement of proprietary software.

Using maps to visualise data can enable quicker interpretation of complex geographical phenomena, identify patterns, and aid in planning, resource allocations for policy and decision making. Mapping, in the context of the Environment and Health sub-discipline, provides a visual assessment for investigating the spatial distribution of a disease and potential associations and underlying causes. Developments in Geographical Information Systems (GIS) have now made the mapping of this information commonplace and are used in a large range of applications. Within the environment and health fields, recent applications using GIS have been used in projects such as identifying regions at risk to malaria, monitoring effects of air pollution on asthmatics and defining an "Index of Relative Wellbeing" for an area from census data.

The Benefits of the application of GIS in public and environmental health, WHO, 1990 stated health and ill-health always have and always will have a spatial dimension. Already more than a century ago, epidemiologists and other medical scientist began to explore the power of maps in helping the human mind to assimilate and understand the spatial dynamics of disease. One of the most famous early users of map in medical science was Dr. John Snow (1813-1853) a London anesthetist and Queen Victoria’s obstetrician. Snow had the idea that cholera- the classic epidemic disease of the nineteenth century – might be spread by contaminated water supplies. By using maps showing the geographical distribution of cholera deaths in the Soho area.
of London in 1854, he demonstrated that associations between cholera deaths and contaminated water supplies resulted in a striking geographical distribution.

**Tami H. Funk, Frederick W. Lurmann, Sonoma Tech. Inc, Petaluma, 2001** presented the use of GIS to integrate and display human air pollution exposure data in the Southern California Children’s Health Study (CHS). The CHS is a 12-year prospective epidemiological study designed to improve the understanding of the potential chronic health effects of ambient air pollutants, such as ozone, particulate matter, nitrogen dioxide, and acids. The study was conducted over 5000 students are followed longitudinally from ages 10 to 18 to assess respiratory symptoms and pulmonary function by a research team from University of Southern California’s Keck School of Medicine. Extensive analyses are conducted of associations between the student’s health outcomes and measured ambient air pollution levels, modeled human air pollution exposure, and other surrogates for exposure such as traffic density.

**Sushil Kulkarni, Dr. M.A. Sanglikar, 2007** explained how temporal DBMS manages time-referenced data, and times are associated with database entities this paper discussed about how to deal with data related to changes in geographical space according to time. The space of interest is two dimensional abstraction of the surface of the earth and the change of attribute instances related to it. In this paper, author proposed Y-schema, which enables to handle spatio-temporal data. As mobile users are increasing and there is a demand of retrieving, manipulating spatio-temporal data they proposed a query processor called Carrier and Courier processor to handle the spatio-temporal mobile queries.

**Karine Zeitouni, 2002** explained data mining methods for Geographic Information Systems were described and their value in performing spatial data analysis were highlighted. It will survey both statistical approaches and those involving inference from databases. In section 2 they have defined spatial data mining and subdivide it into generic tasks. Then in section 3 they classified spatial data mining methods, whether drawn from the realm of databases, statistics or artificial intelligence, in terms of these different tasks. Lastly, they conclude and discuss research issues. Spatial data mining (SDM) consists of extracting knowledge, spatial relationships and any
other properties which are not explicitly stored in the database. SDM is used to find implicit regularities, relations between spatial data and/or non-spatial data.

**Dr. V. N. Sharma, Jafrullah Mohammed, Srinivas Uppuluri, 2002** stated enormous variety of environmental data is generated from different sources. Many people who work on environmental aspects feel the paucity of right tools to perform an effective spatial analysis. Apart from this lack of awareness on existing tools and high investment on the tools also hinders the usage of these tools. GIS is a readily available spatial analysis tool which gives unique and unparalleled insights into the natural and man made environments due to its strength to link the "generic information" with its "location". GIS is a powerful tool which not only analyses the present environmental scenario but also helps in projecting the future, in other words, one can effectively use the GIS tool for past, present and future studies on environment and its protection for the generations to come in future.

**Stuart Rich, Kevin H. Davis, 2010** This white paper provides a detailed overview about geographic information systems, including five case studies. The white paper is intended to be useful for individuals and leaders within facility management, as well as real estate managers, property developers, architects, engineers, consultants and government entities. Students in facility management will also find this white paper relevant.

**Tord Kjellstrom, Madhumita Lodh, Tony McMichael, Geetha Ranmuthugala, Rupendra Shrestha, and Sally Kingsland, 2006** explained with the help of evidence that a number of chemicals that may be released into the air or water can cause adverse health effects. The associated burden of disease can be substantial, and investment in research on health effects and interventions in specific populations and exposure situations is important for the development of control strategies. Pollution control is therefore an important component of disease control, and health professionals and authorities need to develop partnerships with other sectors to identify and implement priority interventions. Developing countries face major water quantity and quality challenges, compounded by the effects of rapid industrialization. Concerted actions are needed to safely manage the use of toxic chemicals and to develop monitoring and regulatory guidelines. Recycling and the use of biodegradable products must be encouraged. Technologies to reduce air
pollution at the source are well established and should be used in all new industrial development. Retrofitting of existing industries and power plants is also worthwhile. The growing number of private motor vehicles in developing countries brings certain benefits, but alternative means of transportation, particularly in rapidly growing urban areas, need to be considered at an early stage. The principles and practices of sustainable development, coupled with local research, will help contain or eliminate health risks resulting from chemical pollution. International collaboration involving both governmental and nongovernmental organizations can guide this highly interdisciplinary and intersectoral area of disease control.

Environmental Pollution and Impacts on Public Health: Implications of the Dandora Municipal Dumping Site in Nairobi, Kenya, 2007

Over the last three decades there has been increasing global concern over the public health impacts attributed to environmental pollution, in particular, the global burden of disease. The World Health Organization (WHO) estimates that about a quarter of the diseases facing mankind today occur due to prolonged exposure to environmental pollution. Most of these environment-related diseases are however not easily detected and may be acquired during childhood and manifested later in adulthood. Improper management of solid waste is one of the main causes of environmental pollution and degradation in many cities, especially in developing countries. The poor disposal and handling of waste thus leads to environmental degradation, destruction of the ecosystem and poses great risks to public health.

Xianfeng Song, Yasuyuki Kono, and Mamoru Shibayama, 2004, stated the Open Source GIS Software is growing in popularity within geo-informatics community. The software with a strong momentum, such as Minnesota Mapserver, PostgreSQL/PostGIS, GRASS GIS, and GDAL/OGR packages, have begun offering a technically competitive and open-source alternative solution to the proprietary software. This paper illustrates such an Open Source solution to web mapping service, by which the data preprocess and the construction of prototype system both used merely open source GIS software. Although this system serves Environment Cambodia on the Web, the methodology can be applied elsewhere for similar processes. This paper illustrates an open source GIS solution to web mapping services by means of the development of an online prototype system - Environment Cambodia. To be open and interoperable, the prototype system
was designed to be compatible with OGC WMS specification. The data preprocessing and the construction of web mapping system both used merely open source GIS software.

**Sergio Cinnirella, Francesco D’Amore, Nicola Pirrone, 2010** explained atmospheric pollution monitoring and modelling applications are fundamental tools for developing environmental policies oriented to control and possibly reduce its impact on ecosystems and human health. In order to standardise protocols and procedure the EU directives (e.g. INSPIRE, Air Quality Directive) and international programs (i.e. GEOSS) have oriented the scientific community to develop advanced interoperable systems able to assure real time data analysis and dissemination within the scientific community as well as to stakeholders and policy makers. To coordinate national earth and cross-disciplinary systems for promoting GEOSS and to support INSPIRE implementation, CNR promoted the GIIDA project (Integrated and Interoperable Management of Environmental Data). Among the various working groups active within GIIDA, that on air quality is addressed develop an interoperable system for air quality information management and dissemination. The system that has been developed in the GIIDA framework is based on open-source tools compliant with European standards and oriented to develop an integrated system that facilitate data storage, data mining and visualization. In our case PostGIS, a de facto standard open source geographic database, was used for data storage. PostGIS was linked to Geoserver, a Web Map Server hosted in a Servlet Container (Tomcat), that export WMS Services with data contained in the database. GeoNetwork was used for discovering the data exported; it also offers a complete tool for adding metadata compliant to INSPIRE directive (ISO 19115, ISO 19139). Stored and discovered information is finally rendered through Intermap, a tool for WMS layer visualization exported from Geoserver. It will support modelling activities and environmental assessments for different case studies aiming to evaluate the impact of atmospheric pollution on terrestrial and aquatic ecosystems and human health.

**Jessica Spatea, Karina Gibertb, Miquel Sanchez-Marrè\`e,c, Eibe Frankd, Joaquim Comase, Ioannis Athanasiadisf, Rebecca Letcherg, 1996**, This paper introduces several data mining concepts and briefly discusses their application to environmental modelling, where data may be sparse, incomplete, or heterogenous. The field of data mining is concerned with findings new pattern in large amounts of data. Data mining can be applied to environment for e.g.: to find
out which pollutant is likely to make larger difference. Here they are interested in mining air and water parameters from environment perspective. The goal of their project is to define how to make data possible to mine, to identify which data mining techniques are useful and understand how to discover and present patterns that are in favor for the learners, practitioners concerned for the environment.

Saso D’zeroski, 2010 stated data mining is the central activity in the process of knowledge discovery in databases (KDD), is concerned with finding patterns in data. This paper introduces and illustrates the most common types of patterns considered by data mining approaches and gives rough outlines of the data mining algorithms that are most frequently used to look for such patterns. In this paper, the author also gave an overview of KDD applications in environmental sciences, complemented with a sample of case studies. The latter are described in slightly more detail and used to illustrate KDD-related issues that arise in environmental applications. The application domains addressed mostly concern ecological modelling.

L. khouban, Ali A. Alesheikh, Abbas.A. Ghaiyoomi, 2001, stated the effects of air pollution on public health are being felt worldwide. Pollutants, such as particulates matters (PM10) and ozone; primarily resulting from emissions of oxides of nitrogen (NOx) and hydrocarbons/air toxins (HC or VOCs), destroy sensitive tissues (in people, animals and plants), impair respiratory functions, degrade building materials and deteriorate the aesthetic aspects of environment. The costs of air pollution, from health and other damages, together with public concerns, are thus prompting all governments to seek better urban air quality. This research concentrates on identifying the most dangerous air pollutant parameters in Tehran. The parameters are then measured on the field, and presented in a GIS environment. A topographic map of 1:25000 scale has been overlaid on the position of the field sites. The values are interpolated to acquire the range of pollutants in the entire area. PSI index are then used to locate the positions of the most volatile area in the city. It is found that the most polluted area city centre in which most of the elderly resides. This indicates the potential area for creating public parks. The paper elaborates on the methodologies used in detail. The results are assessed and presented in GIS.
Geographic Information Systems and Environmental Health: Incorporating Esri Technology and Services  April 2011

Environmental health (EH) agencies at all levels of government and the partners that support them are increasingly using geographic information system (GIS) technology to assess and protect the health of the populations they serve, understand the impacts of the environment on human health, and improve environmental health services delivery. GIS technology is a key component in modernizing the IT of EH organizations. This paper describes the scope of EH programs and services, the development of environmental public health tracking networks, and a broad overview of EH research, an overview of GIS, the benefits of understanding geography as a common frame of reference within EH, including an explanation of enterprise GIS within health and human services (HHS) agencies, an overview of geographically enabling EH programs and services, the future of GIS within EH programs and research and finally it also offers suggestions on how to get started, including additional specific resources available from Esri and its business partners for EH agencies, systems integrators, and other software developers.

M. Richards, M. Ghanem*, M. Osmond, Y. Guo, J. Hassard, 2006 In this paper, the researchers explained distributed infrastructure based on Grid computing technology and data integration and mining tools to discuss the main informatics challenges that arise when a high-throughput sensor network is constructed to address real-time urban air pollution monitoring and mapping. They have also explained the background to urban air pollution monitoring and modelling and described the high-throughput sensors developed within this project to tackle the problem. They have also presented a solution that addresses the informatics challenges based on the integration of distributed sensors, Grid technologies, data integration, data mining and GIS systems. With the help of a case study they have examined the effectiveness of visual and automated methods developed for the analysis of generated data sets.

Wang Gu, Chen Weishi & Miao Jungang, 2007 The electromagnetic scattering computation has developed rapidly for many years; some computing problems for complex and coated targets cannot be solved by using the existing theory and computing models. A computing model based on data is established for making up the insufficiency of theoretic models. Based on the “support vector regression method”, which is formulated on the principle of minimizing a structural risk, a
data model to predicate the unknown radar cross section of some appointed targets is given. Comparison between the actual data and the results of this predicting model based on support vector regression method proved that the support vector regression method is workable and with a comparative precision.

Source, Dispersal and Impacts of Airborne Pollutants: A Case Study of Mangalpur Industrial Complex, Raniganj, West Bengal, India, 2011 The consequences of Industrialization and its pollution are increasing day by day causing impact on human health. Particulate matter and gaseous emission from industries are responsible for rising discomfort, increasing airway diseases, decreasing productivity and causing deterioration of environment. Using remote sensing and GIS technique the pollution zone has been identified and health data has been collected accordingly. Wind direction and velocity are also taken into consideration to understand the dispersal pattern of the pollutants. The results depict a clear correlation between health problems and level of pollutants. Various health problems like intestinal, skin, respiratory have been categorised. Spatial distribution of pollutants and the worse affected villages have also been identified, considering that some remedial measure had been suggested.