Vol 4 Issue 4 Jan 2015

ISSN No : 2249-894X

# Monthly Multidisciplinary Research Journal

# Review Of Research Journal

Chief Editors

**Ashok Yakkaldevi**
**A R Burla College, India**

Flávio de São Pedro Filho
Federal University of Rondonia, Brazil

Ecaterina Patrascu
Spiru Haret University, Bucharest

Kamani Perera
Regional Centre For Strategic Studies, Sri Lanka

**Welcome to Review Of Research**

**RNI MAHMUL/2011/38595** **ISSN No.2249-894X**

Review Of Research Journal is a multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be double - blind peer reviewed referred by members of the editorial Board readers will include investigator in universities, research institutes government and industry with research interest in the general subjects.

## *Advisory Board*

Flávio de São Pedro Filho
Federal University of Rondonia, Brazil

Kamani Perera
Regional Centre For Strategic Studies, Sri Lanka

Ecaterina Patrascu
Spiru Haret University, Bucharest

Fabricio Moraes de AlmeidaFederal
University of Rondonia, Brazil

Anna Maria Constantinovici
AL. I. Cuza University, Romania

Romona Mihaila
Spiru Haret University, Romania

Delia Serbescu
Spiru Haret University, Bucharest, Romania

Xiaohua Yang
University of San Francisco, San Francisco

Karina Xavier
Massachusetts Institute of Technology (MIT), USA

May Hongmei Gao
Kennesaw State University, USA

Marc Fetscherin
Rollins College, USA

Liu Chen
Beijing Foreign Studies University, China

Mabel Miao
Center for China and Globalization, China

Ruth Wolf
University Walla, Israel

Jie Hao
University of Sydney, Australia

Pei-Shan Kao Andrea
University of Essex, United Kingdom

Loredana Bosca
Spiru Haret University, Romania

Ilie Pintea
Spiru Haret University, Romania

Mahdi Moharrampour
Islamic Azad University buinzahra Branch, Qazvin, Iran

Titus Pop
PhD, Partium Christian University, Oradea,
Romania

J. K. VIJAYAKUMAR
King Abdullah University of Science & Technology,Saudi Arabia.

George - Calin SERITAN
Postdoctoral Researcher
Faculty of Philosophy and Socio-Political Sciences
Al. I. Cuza University, Iasi

REZA KAFIPOUR
Shiraz University of Medical Sciences
Shiraz, Iran

Rajendra Shendge
Director, B.C.U.D. Solapur University, Solapur

Nimita Khanna
Director, Isara Institute of Management, New Delhi

Salve R. N.
Department of Sociology, Shivaji University, Kolhapur

P. Malyadri
Government Degree College, Tandur, A.P.

S. D. Sindkhedkar
PSGVP Mandal's Arts, Science and Commerce College, Shahada [ M.S. ]

Anurag Misra
DBS College, Kanpur

C. D. Balaji
Panimalar Engineering College, Chennai

Bhavana vivek patole
PhD, Elphinstone college mumbai-32

Awadhesh Kumar Shirotriya
Secretary, Play India Play (Trust),Meerut (U.P.)

Govind P. Shinde
Bharati Vidyapeeth School of Distance Education Center, Navi Mumbai

Sonal Singh
Vikram University, Ujjain

Jayashree Patil-Dake
MBA Department of Badruka College Commerce and Arts Post Graduate Centre (BCCAPGC),Kachiguda, Hyderabad

Maj. Dr. S. Bakhtiar Choudhary
Director,Hyderabad AP India.

AR. SARAVANAKUMARALAGAPPA
UNIVERSITY, KARAIKUDI,TN

V.MAHALAKSHMI
Dean, Panimalar Engineering College

S.KANNAN
Ph.D , Annamalai University

Kanwar Dinesh Singh
Dept.English, Government Postgraduate College , solan

More.....

**Address:-Ashok Yakkaldevi 258/34, Raviwar Peth, Solapur - 413 005 Maharashtra, India**
**Cell : 9595 359 435, Ph No: 02172372010 Email: ayisrj@yahoo.in Website: www.ror.isrj.org**

Review Of Research
ISSN:-2249-894X
Impact Factor : 3.1402(UIF)
Vol. 4 | Issue. 4 | Jan. 2015
Available online at www.ror.isrj.org

# STUDIES ON AIR QUALITY OF SATNA INDUSTRIAL AREA(M.P.)

**Shailendra Singh[1], M. K. Bhatnagar[2], Rajesh Sharma[3] and D.P. Prajapati[4]**

[1]Research Scholar Department of Chemistry Pt. S.N.S. Govt. P.G. College Shahdol (M.P.)
[2]Prof. & Head Department of Chemistry Pt. S.N.S. Govt. P.G. College Shahdol (M.P.)
[3]Department of Chemistry Govt. Chhatrashal P.G. College, Panna (M.P.)
[4]Asst. Prof. Department of Chemistry Govt. P.G. College Seoni (M.P.)

**Abstract:-** This paper present the air pollution emitted from an Industrial area Satna. Air quality of SatnaIndustrial area was monitored for two successive years i.e. 2011-2012 and 2012-2013 at various sites for RSPM, SOx NOX &CO .The data collected were compared with Indian Standard prescribed by CPCB. Sampling of air quality was done at various distances from the industrial area at six sampling points. It was observed that SPM was higher than the permissible limit at all the sampling points except. Air quality index was also calculated and this study indicates that the air quality of Satna is unhealthy at various sampling site. People with asthma or other respiratory diseases, the elderly, and children are the groups most at risk.

**Keywords:**Air pollution, Industrial area Satna, PM10, RPM, SO2, NOx and CO.

## INTRODUCTION

Environment means all the surrounding conditions, which influence the growth and development of life. The environment is composed of gases and substances, which exist in a certain proportion. When for any reason, one of the constitutions increases or decreases the balance of the whole atmosphere is disturbed. This imbalance of the constituents is called pollution of the environment. Pollution is the introduction of contaminants into an environment that causes instability, disorder, harm or discomfort to the ecosystem i.e. physical systems or living organisms. Pollution can take the form of chemical substances, or energy, such as noise, heat or light energy. Pollutants, the elements of pollution, can be foreign substances or energies, or naturally occurring; when naturally occurring, they are considered contaminants when they exceed natural levels. Pollution is often classed as point source or non-point source pollution. The pollution is chiefly two types - Air and water pollutions.

Today we breathe in the industrials pollution every moment. On the other hand we add that in one way and the other. We have slums cropping up like mescal in tops side by side the sooty chimneys and take pride in our industrial progress.

Pollution means of the addition of any foreign material (Inorganic, biological, or radiological) or any physical change in the natural water, which may harmfully affecting the living life (human, agricultural or biological) directly or indirectly. After some times or very long times.

According to general thinking of people “pollution means the introduction in to natural water of anything that to them appears to be foreign.The addition of something to water which changes its natural quality.

The environmental pollution is the unfavorable alternation of our surrounding. Wholly are largely as a byproduct of mains action.

Although water pollution is an age old problem but in this modern age. The problems like population increase sewage disposal industrials waste radioactive waste are some heavy metals etc. We have polluted our water resources so much so that about 70% rivers and streams not only of India but of all the countries contain polluted waters. We will discuss some important sources of industrial pollution along with the constituents which pollute the rivers stream and fields.

The rapid industrialization leading to urbanization, unplanned and excessive exploitation of natural resources have been causing pollution problems in cities and towns of developing countries. Manmade and natural sources of emissions have polluted the air with toxic substances. The national average per capita SOx emission was 4.2 kg per person in 1990, which rose to 5 kg in 1995, an increase of almost 20% in 5 yr. In 1990, coal consumption contributed 64% of total SOx emissions in India, oil products 29%, biomass 4.5% and non-energy consumption2.5%(Garget,al,2001). Total SOxandNOx (Garget,al, 2001). A recent study in middle-income homes of Delhi found PM10 levels to be as high as 170–810 μg/m3 even in homes where there was no cooking or smoking activity (Kumar, 2001).

A report showed that SPM concentrations in Shanghai, New Delhi, Mumbai, Guangzhou, Chongquin, Calcutta, Beijing and Bangkok exceeded WHO limits (90 μg/m3) by three, five, three, three, four, four, four and two times respectively. It also showed that PM10 exceeded the USEPA limit (50μg/m3) by several times in a number of cities, most notably by over four times in New Delhi and Calcutta. Data from Tokyo shows that TSP increased rapidly from 40 μg/m3 in the early 1980 to over 70 μg/$m^3$ in the early 1990; after that TSP has been decreasing or stagnating, but it is becoming an increasing challenge to contain TSP and NOX. (Saksena et al, 2003).

A study total suspended particulate (TSP), respirable particulate matter (PM10), sulfur dioxide ($SO_2$) and oxides of Nitrogen (Nox) The 24 h average TSP and PM10 concentrations were124.6-390.3 μg/m and 25.9–119.9 μg/m

Monitoring of ambient respirable suspended particulate matter or PM10 and total suspended particulate (TSP) levels around a large coal-fired power station in India was carried out. Geometric mean values of PM10 and TSP concentrations at sites of downwind direction are found in ranges of 74–144 μg/m3 (PM10) and 459–647 μg/m (TSP) in post rainy season,154–207 μg/$m^3$(RSPM) and 437–610 μg/m (SPM) in summer season and 180–275 μg/$m^3$(PM10) and 933–1578 μg/$m^3$ (TSP) in winter season (Sharma et. al, 2005).

The rural-industrial site at Satna shows significant different from urban, urban-industrial, rural, rural-remote and rural–urban influenced sites. With a minimum of one daily sample at each site, mean PM10 concentration at the rural-industrial Satna site varied from 65.5 to147.5 μg/m, and from 205.0 to 320.3μg/m at the urban-industrial Delhi site. With a minimum of one daily sample at each site, the mean TSP concentration at the rural-industrial Satna site varies from 283.9 to 678.0 μg/m, while at the urban industrial Delhi site mean TSP concentration varies from 553.4 to 827.6 μg/m. The maximum TSP concentration in Satna, 678.0 μg/m, was on December 9, 2000. Maximum TSP concentration in Delhi, 827.6 μg/m, occurred on October 23, 2000. Levels of TSP in Ashok Vihar, a residential area in Delhi, reached 10 times the permissible limit in October 2000 (Kaushiket,al, 2007).

**STUDY AREA -**

Satna is located ad 24.34n 80.55e with an evaluation of 315 Umariya and Katni on the south & SatnaDistrict is divided into the Tehsil of Amarpatan, Maihar, Nagod and Raguraj Nagar. Satna town is situated in Raghuraj Nagar Tehsil, the place in renown for dolomite mines & limestone.

few most promising cities of Madhya Pradesh because of several new industries as- Iron industries, plywood factory, Detergent factory, Stone crusher, medical hospital, transport auto workshop electrical motor & submersible manufacturing diesel rail engine workshop heavy motor workshop & other new planned by some of the reputed industrial houses in the country. Present major problem faced in city may Inter alia include electricity, water pollution, air pollution due to atmospheric wastes of cement factories. Satna is known as cement city in India. Due abundance of lime stone and dolomite in the region.

The study area is surrounded by Cement factories. Due to these industries the study area is under immense Environmental stress.


**MATERIAL AND METHOD:**

The present work is aimed to assess the Environmental status of the Satna industrial area. The study is focused only on two parameters – Air quality monitoring parameters. Based on both parameters, well versed methodology is made separately for each parameter. Standard methods of air analysis prescribed by CPCB standard methods prescribed by APHA has been used.

**RESULTS &DISCUSSION :**

In order access air quality of Satna Industrial area ambient air monitoring have been done. For this purpose air pollutant RSPM, SOx, NOx& CO in ambient air of study area has been analysed.

To assess the air pollution in Satna Industrial area various sampling site for ambient air analysis were selected . The different sampling stations are given below –

1.Santoshi Mata Mandir (A1): App. 3 Km. Distance from SemariyaChowk.
2.Sagmaniha (A2): App. 3.5 Km. Distance from SemariyaChowk.
3.Gaharwar petrol Pump (A3): App. 4 Km. Distance from SemariyaChowk.
4.Biruhali Railway Station (A4): App. 6 Km. Distance from SemariyaChowk.
5.Raj Stone Crusher (A5):App. 7 Km. Distance from SemariyaChowk.
6.Semariya Gate (A6):App. 8 Km. Distance from SemariyaChowk.

Air quality of Satna Industrial areawas monitored for two successive years i.e. 2011-2012 and 2012-2013at various sites for RSPM, SOx NOX & CO.

The various results are given in Tables. These parameters are regularly monitored in each season in every

year.

At SantoshiMandir site RSPM was found to be above the Permissible limit in almost every season in the year 2011 and 2012 except in monsoon in 2011-12 when its value was recorded 115 µg/m$^3$. Its range was from 115 µg/m$^3$to 140µg/m$^3$(2011-12) and 135 µg/m$^3$to 143 µg/m$^3$(2012-13),Sulphur dioxide and oxides of nitrogen were found to be within permissible limit. The concentration of SOx was found to be in between 13 µg/m$^3$ to 20.4µg/m$^3$ (2011-12)& 16 µg/m$^3$ to 16.7 µg/m3(2012-13) ,Similarly Nox was observed in the range between 21.6 µg/m$^3$ to 24.6 µg/m$^3$(2011-12)&. 21.5 µg/m$^3$to 24 µg/m$^3$(2012-13). The CO concentration falls within the ranges of 1 to 1.8 µg/m$^3$(2011-12) & 1 to 1.7 µg/m$^3$ in 2012-13.

In 2011-12Air quality at Sagmaniha which is situated about 3.5 Km. from SemariyaChowk was found to be within the Permissible limit except RSPM value. At this site RSPM was assessed in the range of 129 µg/m$^3$ to 132 µg/m$^3$ and Value of SOx was observed in between 14.2µg/m$^3$to 20.6 µg/m,$^3$while NOx was range between 23.3 µg/m$^3$to 27 µg/m$^3$.The concentration of CO was recordedin the range of 1.1 to1.9 µg/m$^3$ .

While in 2012-13at this site RSPM was assessed in the range of 132 µg/m$^3$ to 140 µg/m$^3$ and Value of Sox was recorded from 15.8 µg/m$^3$ to 25 µg/m$^3$.Nox was observed in between 21 µg/m$^3$to 24.5µg/m $^3$while CO was in the range between 1 µg/m$^3$to 1.8 µg/m$^3$.

During the pollution assessment of Sagmaniha monitoring station. It indicates the higher trend of Respirable suspended Particulate matter dispersion into surrounding environment especially in 2012 in respect to 2011 year because of heavy transportation in nearby area.

**Table – 1 Different site in air sample year 2011-12**

| Sample Site | | $So_x$ | | | $No_x$ | | | CO | | | RSPM | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unit | W | S | M | W | S | M | W | S | M | W | S | M |
| A-I | µg/m$^3$ | 15 | 13 | 20.4 | 21.6 | 23.9 | 24.6 | 1.8 | 1 | 1.6 | 140 | 120 | 115 |
| A-II | | 14.2 | 14.0 | 20.6 | 23.3 | 24.7 | 27 | 1.10 | 1.4 | 1.9 | 132 | 130 | 129 |
| A-III | | 15.5 | 13.5 | 20.2 | 20.1 | 23 | 23.9 | 1.9 | 1.4 | 1.5 | 142 | 134 | 121 |
| A-IV | | 14.5 | 13.5 | 20.1 | 24.6 | 24.7 | 20.9 | 1.1 | 1.10 | 2 | 140 | 125 | 120 |
| A-V | | 16.5 | 15 | 20 | 25.9 | 24.3 | 25.6 | 1.10 | 1.8 | 1.8 | 119 | 121 | 120 |
| A-VI | | 16.0 | 14.5 | 19.5 | 20.1 | 23 | 26.6 | 1.15 | 1.6 | 1.10 | 149 | 135 | 125 |

W= Winter S= Summer = Monsoon

**Table – 2 Different site in air sample year 2012-13**

| Sample Site | $So_x$ | | | $No_x$ | | | CO | | | RSPM | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | W | S | M | W | S | M | W | S | M | W | S | M |
| A-I | 16.7 | 16.2 | 16 | 24.2 | 21.5 | 21.7 | 1.10 | 1.7 | 1 | 143 | 141 | 135 |
| A-II | 25 | 15.8 | 15.9 | 24.5 | 22.7 | 21 | 1.8 | 1 | 1.7 | 140 | 138 | 132 |
| A-III | 18 | 17.7 | 17 | 24.4 | 21 | 21.10 | 1.7 | 1.4 | 1 | 139 | 136 | 132 |
| A-IV | 17.5 | 17 | 16.9 | 29.7 | 19 | 19.9 | 1.2 | 0 | 1.2 | 141 | 140 | 136 |
| A-V | 17 | 16.3 | 16.9 | 20.7 | 20 | 20.1 | 1 | 0 | 1 | 136 | 130 | 128 |
| A-VI | 20.9 | 20 | 18.7 | 23 | 22.9 | 20.5 | 1.20 | 1.15 | 1.10 | 142 | 140 | 140 |

In 2011at Gaharwar petrol pump which is situated at 4 Km distance from Semariyachowk, the RSPM was found to be higher than the permissible limit. The concentration range of RSPM was from 121 µg/m3 to 142 µg/m$^3$ and at this site Sox was assessed in the range of 94.36 µg/m3 to 156.42 µg/m$^3$. The concentration of SOx and NOx was found in the range of 13.5 µg/m3 to 20.2 µg/m$^3$ and 20.1µg/m$^3$to 23.9 µg/m$^3$.

While in 2012the RSPM was found to be higher than permissible limit at bamboo gate. The concentration range of R.S.P.M was from 135 µg/m$^3$ to 143 µg/m3 and at this site Sox was assessed in the range of 16 µg/m to 16.7 µg/m$^3$. The concentration of Nox& CO was found in the range of 21.7 µg/m$^3$ to 24.2 µg/m$^3$ and 1 µg/m$^3$ to 1.7 µg/m3.

The RSPM value at winter season in 2011-12 & 2012-13 was recorded maximum i.e. 142 &143 respectively. At the same season both values are higher than the permissible limit. It can be due to weather condition and Vehicular activities at the site.

In 2011The concentration of RSPM at Biruhali Railway Station (6 Km.) was found to be in the range 120 µg/m3 to 140µg/m$^3$ ,which is above the permissible limit as prescribed by CPCB.The range of Sox was found to be in between 13.5 µg/m$^3$ to 20.1 µg/m$^3$, while the range of Nox was in between 20.9 µg/m$^3$ to 24.7 µg/m$^3$. The value of CO was 1.1 to 2 µg/m $^3$.So values of all these parameters fall within the permissible limit as prescribed by Central Pollution Control Board & M.P.P.C.B.

While in 2012The value of R.S.P.M was in the range of 136 µg/m $^3$to 141 µg/m. $^3$The range of Sox was found to be in between 16.9 µg/m$^3$ to 17.5 µg/m,$^3$While the range of Nox was in between 19 µg/m $^3$to 29.7 µg/m $^3$ while the value of CO ranges from 0 to 1.2 µg/m.$^3$So values of all these parameters except RSPM fall within the permissible limit as prescribed by Central Pollution Control Board & M.P.P.C.B.

Dispersion of air pollutant is depend on wind speed, wind direction and location of monitoring stations,The monitoring station selected for the present study, is also located at North direction. which is most of the time, wind direction facing point therefore in 2012-13 results are comparatively higher than 2011-12 study i.e.RSPM values due to unlocalized distribution of air born dust, whereas Sox,Nox parameter are not effected on the monitoring studies.

At Raj stone crushersite RSPM was found to be above the Permissible limit in almost every season in the year 2011 and 2012 except in winter in 2011-12 when its value was recorded 119µg/m. Its range was from 119 µg/m to 121µg/m$^3$ (2011-12) and 128 µg/m$^3$ to 136 µg/m$^3$ (2012-13),Sulphur dioxide and oxides of nitrogen were found to be within permissible limit. The concentration of SOx was found to be in between 15 µg/m to 20 µg/m (2011-12)& 16.3 µg/m$^3$ to 17 µg/m(2012-13) ,Similarly Nox was observed in the range between 20.9 µg/m to 24.7 µg/m $^3$(2011-12)&. 20 µg/m$^3$ to 20.7 µg/m$^3$(2012-13 ). The value of CO was 1.1 to 1.8 µg/m$^3$ (2011-12) & 0 to 1 µg/m$^3$ in 2012-13.

In 2011The concentration of RSPM at Semariya Gate (8 Km. from semariyachowk) was found to be in the range 125 µg/m$^3$to 149µg/m,$^3$which is above the permissible limit as prescribed by CPCB.The range of Sox was found to be in between 16.0 µg/m$^3$ to 19.5 µg/m$^3$, while the range of Nox was in between 20.1 µg/m$^3$ to 26.6 µg/m$^3$. The value of CO was 1.1 to 1.6 µg/m$^3$ .So values of all these parameters fall within the permissible limit as prescribed by Central Pollution Control Board & M.P.P.C.B.

While in 2012the value of R.S.P.M was in the range of 140 µg/m$^3$ to 142 µg/m$^3$. The range of Sox was found to be in between 18.7 µg/m$^3$ to 20.9 µg/m$^3$,While the range of Nox was in between 20.5 µg/m$^3$ to 23 µg/m$^3$ .The value of CO ranges from 1.1 to 1.2 µg/m$^3$.So values of all these parameters except RSPM fall within the permissible limit as prescribed by Central Pollution Control Board & M.P.P.C.B.

**ACKNOWLEDGEMENT-**

The authors are thankful to Dr. Sandeep Kumar Shukla, Asst. Prof., Department of zoology, Govt. P.G. College, Seoni (M.P.)

**REFERENCES**

1.APHA, Standard Method for Examination of Water and Wastewater, 18th ed., American Public Health Association, Washington DC (1992).
2.Chaulya, S.K., Spatial and temporal variations of SPM, RPM, SO2 and NOxconcentrationsin an opencast coal mining area, J. Eviron. Mont., 6: 134-142(2004).
3.Garg A., Shukla, P.R., Bhattacharya, S. and Dadhwal, V.K., Sub-region (district) and sectorlevel SO2 and NOx emissions for India: Assessment of inventories and mitigationflexibility, Atmospheric Environment, 35, 703-713 (2001).
4.Kausik, S., Khare, M. and Gupta, K. B., Suspended particulate matter distribution in rural-industrial Satna and in urban-industrial south Delhi, Environ Monit. Assess,128: 431–445(2007).
5.Kumar, A.., Air Pollution Control in the Transportation Sector. Third Phase Research Report of the Urban Environmental Management Project, 2001.

6.Saksena, S., Singh, P.B., Prasad, R. K., Prasad, R., Malhotra, P., Joshi, V. and Patil, R.S., Exposure of infants to outdoor and indoor air pollution in low-income Urban areas - a case study of Delhi, Journal of Exposure Analysis and Environmental Epidemiology, 13,: 219-230 (2003).
7.Sharma, R., Pervez, Y. and Pervez, S., Seasonal variation and spatial variability of suspended particulate matter in the vicinity of a large coal-fired powerstation in India-A case study, Environmental Monitoring and Assessment, 102: 1-13 (2005).
8.Thareja S., S. choudhany and P. Trivedi Advances in Applied Research 2 (5),84. 2011.

# Publish Research Article
# International Level Multidisciplinary Research Journal
# For All Subjects

Dear Sir/Mam,

We invite unpublished Research Paper,Summary of Research Project,Theses,Books and Books Review for publication,you will be pleased to know that our journals are

## Associated and Indexed,India

- Directory Of Research Journal Indexing
- International Scientific Journal Consortium Scientific
- OPEN J-GATE

## Associated and Indexed,USA

- DOAJ
- EBSCO
- Crossref DOI
- Index Copernicus
- Publication Index
- Academic Journal Database
- Contemporary Research Index
- Academic Paper Databse
- Digital Journals Database
- Current Index to Scholarly Journals
- Elite Scientific Journal Archive
- Directory Of Academic Resources
- Scholar Journal Index
- Recent Science Index
- Scientific Resources Database

Review Of Research Journal
258/34 Raviwar Peth Solapur-413005,Maharashtra
Contact-9595359435
E-Mail-ayisrj@yahoo.in/ayisrj2011@gmail.com
Website : www.ror.isrj.org