# Editorial Board

<table>
<thead>
<tr>
<th>Editor-in-Chief</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. D.R. Tiwari</td>
</tr>
<tr>
<td><a href="mailto:editor.ijfar@gmail.com">editor.ijfar@gmail.com</a>, <a href="mailto:editor@ijfar.org">editor@ijfar.org</a></td>
</tr>
</tbody>
</table>

## Editorial Cum Advisory Board

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Institution/University</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alex Afouxenidis</td>
<td>Professor</td>
<td>National Center for Social Research</td>
<td>Athens, Greece</td>
</tr>
<tr>
<td>Prof. Jozef Drabowicz</td>
<td>Professor</td>
<td>Center of Molecular &amp; Macromolecular Studies, Polish Academy of Sciences, Sienkiewicza 112, 90-363 LODZ, Poland</td>
<td></td>
</tr>
<tr>
<td>Prof. (Dr.) Jason L. Powell</td>
<td>Professor</td>
<td>University of Central Lancashire</td>
<td>UK</td>
</tr>
<tr>
<td>Prof. Ismael Saadoune</td>
<td>Professor</td>
<td>Universite Cadi Ayyad, Faculte des Sciences at Techniques MaraktechLaboratoire do chimie des materiaux et de l' Environment BP 549, Marakech, MAROC</td>
<td></td>
</tr>
<tr>
<td>Dr. Fardoon Jawad Admed</td>
<td>Professor</td>
<td>Professor Of Molecular Cell Biology, Department of Pathalogy, King Edward Medical university, Lahore, Pakistan</td>
<td></td>
</tr>
<tr>
<td>Dr. Neelam Gupta</td>
<td></td>
<td>National Bureau of Animal Genetic Resources India</td>
<td></td>
</tr>
<tr>
<td>Dr. Vinod Singh</td>
<td></td>
<td>Microbiology Department Barkatullah University, Bhopal</td>
<td></td>
</tr>
<tr>
<td>Dr. Mona Purohit</td>
<td></td>
<td>Department of Legal Studies &amp; Research, Barkatullah University.</td>
<td></td>
</tr>
<tr>
<td>Dr. Charu P. Pant</td>
<td></td>
<td>Department of Geology, Kumau University, Nainital</td>
<td></td>
</tr>
<tr>
<td>Dr. Pramendra Dev</td>
<td>Professor &amp; Head</td>
<td>School Of Studies In Earth Science, Vikram university, Ujjain MP, India</td>
<td></td>
</tr>
<tr>
<td>Prof. J. P. Shrivastav</td>
<td></td>
<td>Department of Geology, University Of Delhi, India.</td>
<td></td>
</tr>
<tr>
<td>Dr. L. P. Chourasia</td>
<td>Professor &amp; Head</td>
<td>Department of Applied Geology, Dr. Hari Singh Gour University, Sagar, M.P. India</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Piyush Verma</td>
<td>NITTTR, Bhopal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. K. S. Tiwari</td>
<td>Bhopal, MP, India</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anil Shukla</td>
<td>Deputy Secretary NCTE, Ministry of HRD, Govt. Of India</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prof. Santosh Kumar</td>
<td>Former Vice Chancellor Dr. H S Gour University Sagar.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Executive Editor &amp; Owner</td>
<td>Dr. Shashi Tiwari. Circulation Manager Esha Raje Tiwari</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASSOCIATE EDITORS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Abha Swaroop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Alok Rastogi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Santosh Bhargava</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Praveen Jain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Kailash Tyagi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. H. C. Kataria</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. J. S. Chouhan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Pawan Pandit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. J. P. Shukla</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. U. C. Pandey</td>
<td>Regional Director IGNOU, Bhopal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S No</td>
<td>Title</td>
<td>Authors</td>
<td>Page No</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------------------------------------------</td>
<td>----------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>1</td>
<td>Inventorization of E-Waste in Bhopal City</td>
<td>Bhadoriya rani</td>
<td>1-5</td>
</tr>
<tr>
<td>2</td>
<td>पंचायती राज व्यवस्था एवं ग्रामीण विकास एक अभिनव पहल</td>
<td>डी एस पंवार</td>
<td>6-7</td>
</tr>
<tr>
<td>3</td>
<td>Quality parameters of Groundwater in and around urban area of Bhopal city, (Hoshangabad road)</td>
<td>Bhadoriya Rani, Kataria H.C and Gupta D.K</td>
<td>8-16</td>
</tr>
<tr>
<td>4</td>
<td>जैविक एवं रासायनिक खादों का मृदा जीवन पर प्रभाव</td>
<td>रोली शुक्ला, चांदनी मिश्रा नेहा आर्य</td>
<td>17-21</td>
</tr>
<tr>
<td>5</td>
<td>Systematic Architecture to Indian Languages Massive Open Online Course (SAIL-MOOC)</td>
<td>Rudranarayan Mohapatra</td>
<td>22-27</td>
</tr>
<tr>
<td>6</td>
<td>A STUDY OF ATTITUDE AND AWARENESS TOWARDS RAIN WATER HARVESTING FOR INDORE CITY</td>
<td>SHARMA . S.</td>
<td>28-32</td>
</tr>
<tr>
<td>7</td>
<td>Management of E-Resours in Academic Libraries</td>
<td>Shail Shrivastav</td>
<td>33-36</td>
</tr>
<tr>
<td>8</td>
<td>RECENT TECHNIQUES FOR THE CHARACTERIZATION OF MICROPOROUS AND MESOPOROUS MATERIALS</td>
<td>Diwa Mishra</td>
<td>37-45</td>
</tr>
<tr>
<td>9</td>
<td>Morphometric analysis of Karondiya Watershed using Remote Sensing and GIS Method</td>
<td>DEVENDRA RAJPUT, VARSHA WAIKAR, D. R. TIWARI</td>
<td>46-50</td>
</tr>
<tr>
<td>10</td>
<td>Green Communication :Current Scenario with special reference to Mobile Industry-Growth and Potential</td>
<td>Roli Shukla Pavni Shukla</td>
<td>51-52</td>
</tr>
<tr>
<td>11</td>
<td>A STUDY ON MENTALLY CHALLENGED CHILDREN</td>
<td>SHARMA S.</td>
<td>53-55</td>
</tr>
<tr>
<td>12</td>
<td>Indian Women’s Fiction in Translation</td>
<td>Prachi Pabra. Singh Chawdhry</td>
<td>56-61</td>
</tr>
</tbody>
</table>
Inventorization of E-Waste in Bhopal City

Bhadoriya rani
Govt.MVMBhopal,MP(India)

ABSTRACT
E-waste is waste electronic and electrical equipments generated at the point of no further usage for original intended purpose, but the valuable resources can be recovered in most eco-efficient manner without any damage to environment and health. The management of discarded electronics or “E-waste” presents challenging scenario in today’s world. The electronic industry is the world’s largest and fastest growing manufacturing industry. Bhopal city is one of the biggest cities of central India. One of the reasons is the presence of heavy metals and organic pollutants in E-waste. During the last decade, it has assumed the role of providing a forceful leverage to the socio-economic and technological growth of a developing society. Concerns have been raised that toxic chemicals will leach from these devices when disposed.

INTRODUCTION
The toxic chemicals commonly used in electronic devices include metals and metalloids (TABLE1). E-waste is one of the fastest growing waste streams in the world. According to a study carried out by MAIT-GTZ in 2007 about 3.3 hundred thousand tones of e-waste is generated annually in India and the generation of e-waste is expected to touch 4.7 hundred thousand tones by 2011 (Chaturvedi 2007). It is an emerging problem as well as a business opportunity of increasing significance, given the volumes of e-waste being generated and the content of both toxic and valuable materials in them. The fraction including iron, copper, aluminum, gold and other metals in e-waste is over 60%, while plastics account for about 30% and the hazardous pollutants comprise only about 2.70%. E-waste is one of the fastest growing waste streams in the world. The study also reveals that only about 19,000 tones of the e-waste is recycled, of which 95 per cent is recycled in the informal sector. E-waste is the combination of both the hazardous (PBR, lead, mercury, chromium, cadmium, etc.) and non-hazardous as well as precious material (gold, silver, copper, etc.) (DEFRA, 2004). The uncontrolled recycling of WEEE —backyard recycling by the so called informal sector is the main concern in Non-OECD (Organization for Economic Co-operation and Development) countries like India, China, etc. Based on the existing evidences informal recycling is the most pressing environmental issue associated with the E-waste (Williams et al., 2008). Primitive tools and methods often involve the open burning of plastic waste, exposure to toxic solders, acid baths to recover saleable materials and components from WEEE with little or no safeguards to human health and the environment which results in polluting the land, air and water due to river dumping of acids and widespread general dumping (Manomaivibool, 2009). The controlled experiments characterizes very high emission factors of heavy metal, dioxins and furans (both chlorinated and brominated) in fly and residual ash from the open burning of PWBs and PVC-coated wires (Gullet et al., 2007).
OBJECTIVES:–
The goal of this study is the qualitative & quantitative analysis of WEEE generation in Bhopal City. The main objective of this study is:-
• To estimate the existing quantity of WEEE in the city (study area).
• Inventorization of e-waste for the seven electronic sub sectors namely televisions, refrigerators, personal computers, mobile phones, air conditioners, washing machines and waste batteries in Bhopal city.

Study Subject: –

Target Respondents: –
There are three main target respondents included in the survey study Subject as defined in the project contract. The three main categories are:
• Households
• Offices both govt. and private sectors (business entities and institutions)
• Recyclers (Including importers and exporters, manufacturers, collectors, second-hand shops, repair shops, dismantlers, and processors of recyclable materials from used EEE).

Table No. 1 (COMPONENTS AND EFFECTS OF E-WASTE ON HEALTH)

<table>
<thead>
<tr>
<th>Sources of e-waste</th>
<th>Constituent</th>
<th>Health effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solder in printed circuit boards glass panels and gaskets in computer monitors</td>
<td>Lead (Pb)</td>
<td>Damage to central and peripheral nervous systems, blood systems and kidney damage. Affects brain development of children.</td>
</tr>
<tr>
<td>Chip resistors and semiconductors</td>
<td>Cadmium (CD)</td>
<td>Toxic irreversible effect on human health, accumulate in Kidney and liver, Cause neural damage Teratogenic.</td>
</tr>
<tr>
<td>Relays and switches, printed circuit boards</td>
<td>Mercury (Hg)</td>
<td>Chronic damage to the brain. Respiratory and skin disorders due to bio accumulation in fishes.</td>
</tr>
<tr>
<td>Corrosion protection of untreated and galvanised steel plates, decorators or hardener for steel housings</td>
<td>Hexavalent chromium (Cr) VI</td>
<td>Asthmatic bronchitis. DNA damage.</td>
</tr>
<tr>
<td>Cabling and computer housing</td>
<td>Plastics including PVC</td>
<td>Burning produces dioxin. It causes reproductive and developmental problem. Immune system damage. Interference with respiratory hormones.</td>
</tr>
<tr>
<td>Plastic housing of electronic equipments and circuit boards</td>
<td>Brominated Flame Retardants (BFR)</td>
<td>Disrupts endocrine system functions</td>
</tr>
<tr>
<td>Front panel of CRTs</td>
<td>Barium (Ba)</td>
<td>Short exposure causes: Muscle weakness; Damage to heart, liver and spleen.</td>
</tr>
<tr>
<td>Motherboard</td>
<td>Beryllium (Be)</td>
<td>Carcinogenic (lung cancer) Inhalation of fumes and dusts. Causes chronic beryllium diseases or beryllicosis. Skin diseases such as warts</td>
</tr>
</tbody>
</table>
Target Electrical and Electronic Equipments:
- There are seven types of electrical and electronic equipment (EEE) targeted in this survey to determine the e-waste disposal patterns which are:
  - Television sets
  - Computer sets with CRT monitors or LCD Monitors and Notebook.
  - Washing Machines

- Mobile Phones
- Refrigerators
- Air Conditioners
- Rechargeable batteries (mobile phones)

STUDY AREA
For inventory of household city is divided into various pockets like arera colony, T.T nagar, Saketnagar, Nehru nagar, Shyamla hills, Idgah hills, Bairagarh, Bagmugaliya, Rachnanagar, etc.

2.4 Questionnaires:
Five principal types of questionnaire were designed for data collection purposes. The questionnaires were designed with different content and format depending on the respondent group. The types of questionnaires are as follows:
- Household
- Business Entities and Institutions
- Importers and Exporters
- Collectors, Repair Shops, Second-hand Shops, Dismantlers and Processors
- Manufacturers

RESULT AND FINDINGS:
Returned Questionnaires:
The distribution of the e-waste survey questionnaires was started on the 23rd of December 2010 and ended on the 29th of June 2011. Around 800 sets of questionnaires were sent out to all target subjects through site visit interviews and through emails. Of these 500
questionnaires were sent out to household respondents and around 300 questionnaires to business entities and institutions respondents. **Household Questionnaire:** For the household category, 500 responses are required in this survey. A total of 500 Houses were approached out of which 441 houses responded and completed questionnaires returned. The questionnaires were received directly by the interviewer during the personal interviews. Till date in these 441 houses 491 televisions, 369 computers, 1484 mobile, 445 refrigerators, 220 AC’s and 351 washing machines are in use. Difficulties encountered in collecting data from the household category are:

- Individuals were not aware about e-waste and were not interested to fill the form.
- Individuals were reluctant to disclose their ownership level of electrical/electronic appliances.
- Many people do not keep track of the various electrical/electronic appliances that they dispose and were reluctant to spend the time to recall the information.
- General public apathy.

**Business Entities and Institution Questionnaire:** There were 500 completed responses required for the business entities and institutions category. Total of 450 respondents of business entities and institutes were approached but only 241 respondents agreed to receive the questionnaire. The total returned questionnaire from Bhopal city is 202 which include 52 departments of mantralaya also. Difficulties encountered in collecting data from this category are:

- Businesses entities have a great reluctance to disclose information about their internal operations.
- Many businesses groups do not keep track of their disposal, as reported by them during visit; therefore there are no records which are easily retrievable.

**Recyclers Questionnaire:** As there are no recyclers in Bhopal city so this questionnaire does not applied here, but as per our survey it is found that firstly the e-waste of city is collected by local road side vendors and then they finally send this e-waste to new kabaddkhana (old city) and from there it is being transported to Delhi and other cities for recycling purpose (based on the information collected from local people).

**Manufacturers, Exporter and Importers Questionnaires:** As there are no Manufacturers, Exporter and Importers in Bhopal city so this questioners does not applies here.

**DISCUSSION AND RECOMMENDATION:**

**Response from the Target Subject:** Generally, the respondents from the household were most cooperative in providing information about the WEEE generation with moderate cooperation from business entities and institutions. However, the co-operation given by the recyclers, dealers and distributors was poor. The factors that affected the process of data collection are:

- The survey forms require a lot of information to be filled & thus takes lot of time and therefore respondents are particularly not keen to do the grouping of EEE.
- Business entities, large and small, do not normally entertain this type of survey as it requires business sensitive data and they do not perceive it as providing any tangible benefits to their business.
- The recycler category is not applicable in Bhopal city.

**The trend of EEE Possessed in Households:** From the data obtained it is found that EEE usage in household is for mobile phones with 42%, television with 14%, computers and washing machine with 10%, discarded items
and AC with 6%. Thus it is clear that maximum usage of EEE in household is of mobile phones and the minimum is of air conditioner.

**CONCLUSION:** Waste electrical and electronic equipment (WEEE) has surfaced as a major concern in most countries in the world especially in those countries where WEEE is imported and processed in an unregulated fashion creating significant adverse environmental impacts. The indications are that the volume of WEEE will continue to rise year by year and Bhopal is no exception. The analysis from this study shows that by 2016, the cumulative total of WEEE from the seven categories of WEEE that will be discarded in Bhopal is estimated to be around 36,000-43,200 metric tones. According to the information, there are 16 registered recyclers who are responsible to collect and process the e-waste in India. Madhya Pradesh is in the process of establishing registered recycler of WEEE in the state. The scope of the materials collected is limited.

1. **REFERENCES**

2. Assessment of occupational health and safety of in formal e-waste recycling sector (GTZ-TERICOEH, 2009)
5. E-waste Assessment Studies: National Level, Delhi, Kolkata (in progress) (GTZ-MAIT) and Bangalore (HAWA)
पंचायतीराज व्यवस्था भारतीय ग्रामीणों की एक सांस्कृतिक विशेषता है। ग्रामीण समाज को संगठित रखने का ग्रामीण विकास व्यवस्था और निगमण स्थापित करने में पंचायतों का महत्वपूर्ण योगदान रहा है। पंचायत व्यवस्था चूंकि ग्रामीण समाज को संगठित रखने की एक महत्वपूर्ण इकाई थी, इसलिए सभी विदेशी शासकों ने इसे कमजोर करने का प्रयास किया। पंचायतों को कमजोर करने के कारण विदेशी शासकों को ग्रामों पर आधिकारिक और राजनीतिक शिकार करने में सहायता मिली, व्यक्तित्वों के बाद पंचायतों की पुनर्स्थापना कर उन्हें शक्ति अधिकृत बनाने के प्रयास किए गए। वर्तमान में मध्यप्रदेश में 23040 ग्राम पंचायतें, 236 नगर पंचायतें और 313 जनपद पंचायतें और 50 जिला पंचायतें कार्यरत हैं। प्रस्तुत शोध पत्र में पंचायतीराज व्यवस्था एवं ग्रामीण विकास पर प्रकाश डालने का प्रयास किया गया है।

i fj; p;
पंचायतीराज व्यवस्था भारतीय ग्रामीणों की एक सांस्कृतिक विशेषता है। ग्रामीण समाज को संगठित रखने का ग्रामीण विकास व्यवस्था और निगमण स्थापित करने में पंचायतों का महत्वपूर्ण योगदान रहा है। पंचायत व्यवस्था चूंकि ग्रामीण समाज को संगठित रखने की एक महत्वपूर्ण इकाई थी, इसलिए सभी विदेशी शासकों ने इसे कमजोर करने का प्रयास किया। पंचायतों को कमजोर करने के कारण विदेशी शासकों को ग्रामों पर आधिकारिक और राजनीतिक शिकार करने में सहायता मिली, व्यक्तित्वों के बाद पंचायतों की पुनर्स्थापना कर उन्हें शक्ति अधिकृत बनाने के प्रयास किए गए। वर्तमान में मध्यप्रदेश में 23040 ग्राम पंचायतें, 236 नगर पंचायतें और 313 जनपद पंचायतें और 50 जिला पंचायतें कार्यरत हैं। प्रस्तुत शोध पत्र में पंचायतीराज व्यवस्था एवं ग्रामीण विकास पर प्रकाश डालने का प्रयास किया गया है।

x b l o k %
पंचायतीराज का अतिम लक्ष्य ग्रामीण विकास ही है। पंचायतों के माध्यम से यह अवस्था की गई है कि ग्रामीण विकास को एकता के रूप में सबसे पहले स्थानीय तर ग्राम की आवश्यकताओं और समस्याओं के बारे में ग्राम पंचायत ग्राम समा विचार और प्रायोजन करने। खाना तर पर समुपुर्ण विकास विकास में यह विचार और प्रायोजन स्थानीय ग्राम पंचायतों के बुद्धि और समस्याओं पर जनजाति पंचायत का होगा ऐसा ही जनजाति पंचायत को अनुसरण करेंगे। जिला पंचायत से और जिला पंचायत के अनुसरण के प्रायोजन स्थानीय वर्तमान कार्य का होगा ऐसा ही।

x b l o k %
आदारी के बाद शासित पंचायतीराज व्यवस्था के बारे में विभिन्न सर्वे शासकों, अध्ययन वन के रिपोर्ट और शीर्ष पत्तों के माध्यम से विकास के कुछ दृष्टिकोण उभरे हैं। पंचायतीराज अपने उद्देश्याः तथा ग्रामीण विकास के मूल लक्ष्य को प्राप्त करने में सक्षम रहा है। पंचायतीराज व्यवस्था ग्रामीण विकास विकास में बद्दे हुए हैं।

x b l o k %
पंचायतीराज के अधिकार और क्षेत्र में कृषि, तपाई व कृषि चरमों वा का विकास और धन की उन्नति तथा विकास के साथ समृद्धी भारत को भी प्रसारण मिला हथा है। श्रमदान एवं दक्षिणात्य के माध्यम से भी आधिकारिक विकास का बद्दा हुआ है। कुछ खंडों में इस दिशा में अधान कार्य भी हुआ है। पंचायतीराज संस्थाओं के पार्श्व लाइन में बहुत अधिक उत्साह पाया गया है। इन समस्याओं ने सरकारी कर्मचारी की सरल होने उन्नत
पंचायतीराज का मुख्य लक्ष्य ग्राम विकास करना है। ग्रामीण विकास हेतु त्योहारित कृषि पंचायतीराज व्यवस्था द्वारा सत्ता के विकेंद्रीकरण के साथ-साथ अग्रे गरेगा विकास कार्यों के मूलभूत और विवेचना से समन्वय होता है कि पंचायतीराज ग्राम विकास के लक्ष्य की ओर ढीले-ढीले आगे बढ़ रहा है। ग्रामीण विकास पर ही देश का विकास निर्माण करता है, लेकिन विकास की दौड़ में ग्राम आज भी पिछले हुए है। इसलिए संबंध में 73वें संसद कर पंचायतीराज व्यवस्था को ग्रामीण विकास की जिम्मेदारी सीमी गई है। पंचायतीराज के क्षेत्रान्वयन से ग्रामीण समाज में में नेतृत्व के नये-नये कीर्तिमान उदित हुए हैं। पंचायतों को अभिन्नता भी निहित में गांवों में पंचायत के माध्यम से कृषि विकास की उन्नति तकीक विकसित हुई है एवं ग्रामीण क्षेत्रों का व्यापक विकास हुआ है। यह उपर्युक्त प्रस्तुत शोध समय के अन्तर्गत पर यह स्पष्ट है कि शासन के पंचायत एवं ग्रामीण विकास विभाग द्वारा विभिन्न प्रकार से ग्रामीण क्षेत्रों में सामाजिक,आर्थिक, विकास के लिए प्रयास किए जा रहे हैं जिसके परिणामस्वरूप स्वतंत्रता प्राप्ति के 67 वर्षों के बाद ग्रामीण विकास की विनिमय कल्याणकारी योजनाओं के माध्यम से ग्रामीण विकास ग्रामीण क्षेत्रों में दिख रहा है। इस व्यवस्था ने ग्राम विकास में महत्वपूर्ण सृजन किया है। इस कारण से ग्रामीण विकास में जागरूकता की नई पहल का उदय हुआ है।

संदर्भ :

1. डे, एस. के. 1965 पंचायतीराज
2. नरेन इकबाल एवं एम. बी. माधुर 1963 पंचायतीराज एवं आर्थिक नियोजन पंचायतीराज मासिक पत्रिका
3. खन्ना बी. एस.एवं एम. बी. माधुर पंचायतीराज एवं लोकतांत्रिक योजना
4. दुबे डी.श्री 1961 सामाजिक अध्ययन एवं पंचायतीराज
5. राज के. रंग 1968 ग्रामीण नेतृत्व ग्रामीण नेतृत्व x be

i p k r = e w l d if = d k
Quality parameters of Groundwater in and around urban area of Bhopal city, (Hoshangabad road) M.P
Bhadoriya Rani¹, Kataria H.C² and Gupta D.K ¹
Department of chemistry, Govt MVM ,Bhopal, India
Department of chemistry, Govt. Geetanjali college, Bhopal, India

ABSTRACT
Various samples of bore well water collected from different areas in and around Hoshangabad road, urban area of Bhopal city and analysed for their physiochemical characterizations. The results of this analysis were compared with the water quality standards of BIS:10500 and WHO. In this analysis the various physio-chemical parameters such as pH, EC, Turbidity, Alkalinity, Ca-H, Mg-H,T-H, PO₄³⁻, NO₃⁻, SO₄²⁻, Cl⁻, F⁻, Na⁺, K⁺, DO, BOD, Mn, Zn, Cu, Fe & MPN etc were determined using standard procedure. Total 20 water samples from different colonies i.e residential areas were collected and analysed.

INTRODUCTION
Various samples of bore well water collected from different areas in and around Hoshangabad road, urban area of Bhopal city and analysed for their physiochemical characterizations. The results of this analysis were compared with the water quality standards of BIS:10500 and WHO. In this analysis the various physio-chemical parameters such as pH, EC, Turbidity, Alkalinity, Ca-H, Mg-H,T-H, PO₄³⁻, NO₃⁻, SO₄²⁻, Cl⁻, F⁻, Na⁺, K⁺, DO, BOD, Mn, Zn, Cu, Fe & MPN etc were determined using standard procedure. Total 20 water samples from different colonies i.e residential areas were collected and analysed.

Introduction: -
About 95% of rural populations living in India depends on ground water for domestic use[5] changes in local topography and drainage system directly affect both quality and quantity of the ground water[6]. The quality of ground water may also vary with depth of water table, seasonal changes & composition of dissolved salts depending upon sources of the salt and sub surface environment[7]. In the present study, an efforts has been made to evaluate the status of ground water quality in the fast developing areas of Hoshangabad road of Bhopal city having population more than 90,000. Sampling stations are: -
1. Saket Nagar
2. Baghsewaniya
3. Baghmughaliya
4. Nirupam Estate
5. Vidya Nagar
6. Nikhil Homes
7. Kunjan Nagar
8. Harbansh Vihar
9. Danish Nagar
10. Unique Residency
11. Rajat Vihar
12. Jyoti Nagar
13. Chinar Upwan
14. Surendra Landmark
15. Chinar Fortune
16. Akshat Homes
17. Shalimar Seven Garden
18. Nirupam Royal
19. Mohnideep
20. Shriram Colony.

Materials and Methods: - Overall, 20 samples were collected from borewell of various places.
around Hoshangabad road area of Bhopal. All samples were collected in clean and dry polyethylene bottles from borewell after flushing them from 10 minutes [2]. All the collection of samples are immediately preserved for analysis of heavy metals [2] and others processed for different analysis with in 6-12 hours after collection. pH, EC, Turbidity, Alkalinity, Ca-H, Mg-H, T-H, PO$_4^{3-}$, NO$_3^-$, SO$_4^{2-}$, Cl$^-$, F$^-$ were measured by water analysis & manual methods, complex metric titration method & standards volumetric method [2,3]. Na$^+$ & K$^+$ by flame photometric method and COD by Dichromate reflux method. BOD by winklers method. Mn, Zn, Cu & Fe analysed on AAS [8,9]. MPN in terms of index/100 ml using standard tables.

**Result & Discussion:**- The physico-chemical data of bore wells water samples collected in pre-monsoon, post-monsoon & monsoon are presented in table 1-3.

**pH**- The pH value of drinking water is an important index of acidic, alkalinitities. The pH values ranges between 6.1-7.9 the tolerance limit is 6.5-8.5 pH scale.

**EC**- The EC measurement is an excellent indicator of TDS, which is measure of salinity that affects the taste of potable water. The EC ranges between 160-400 umhos/cm the tolerance limit is 750-1000 umhos/cm.

**Turbidity**- The Turbidity is presence of colloidal and extremely fine suspension. The Turbidity ranges between 2.8-14 NTU the tolerance limit is 5-10 NTU.

**Alkalinity**- Alkalinity is the cause of carbonate and Bi-carbonates. The Alkalinity ranges between 160-450 mg/l the tolerance limit is 200-600 mg/l.

**Calcium**- Calcium is needed for the body in small quantities though water provide only part of total requirement. Water containing high calcium may cause gas to intestinal diseases and stone formation. The C-H ranges between 132-174 mg/l the tolerance limit is 75-200 mg/l.

**Magnesium**- Magnesium is a beneficial meta but toxic at high concentration, cause hardness of exerts a cathartic and diuretic action. The M-H ranges between 62-123 mg/l the tolerance limit is 30-100 mg/l.

**Total hardness**- The hardness of water is not a pollution parameter but indicates water quality, mainly in terms of Ca$^{++}$ & Mg $^{++}$, expressed as CaCO$_3$. The T-H ranges between 222-291 mg/l the tolerance limit is 300-600 mg/l.

**Phosphate**- The higher values of the phosphate are mainly due to use of fertilizers and pesticides by the people residing in this area. If phosphate is consumed in excess, phosphine gas is produce in gastrointestinal tract on reaction with gastric juice. This could cause lead to the death of consumer. The Phosphate ranges between 1.452-4 mg/l the tolerance limit is 5 mg/l.

**Nitrate**- Nitrate nitrogen is one of the major constituents of organism along with carbon and hydrogen as amino acids, protein and organic compounds present in bore wells water. The Nitrate ranges between 13.2-28 mg/l the tolerance limit is 45-100 mg/l.

**Sulphate**- Sulphate occurs naturally in water as a result of leaching from gypsum and other common salt. The Sulphate ranges between 99-185 mg/l the tolerance limit is 150-400 mg/l.

**Chloride**- Chloride is invariably present in small amounts in almost all natural waters and its content goes up appreciably with increasing salinity. The Chloride ranges between 71-190 mg/l the tolerance limit is 250-1000 mg/l.

**Fluoride**- Tracer amount of fluoride occur in many waters and higher concentrations are often associated with underground sources. Skeletal fluorosis, haemorrhage gastroenteritis, toxic nephritis, mottling of teeth,
mongolism and cancer are some of the very serious consequences of elevated levels of fluoride in water. The Fluoride ranges between 0.1-0.9 mg/l the tolerance limit is 1-1.5 mg/l.

**Sodium** - The Sodium ranges between 120-290 mg/l the tolerance limit is 200 mg/l.

**Potassium** - The Potassium ranges between 10-23 mg/l the tolerance limit is 82-400 mg/l.

**DO** (D.O) - D.O is one of the most important parameters in assessing water quality. The DO ranges between 0.23-3.1 mg/l the tolerance limit is 4.0 mg/l for Drinking water.

**BOD** - B.O.D is a good index of the organic pollution in water and decides the suitability of water for use. The B.O.D ranges between 1.1-5.1 mg/l the tolerance limit is 6 mg/l.

**COD** - The chemical oxygen demand determines the oxygen requirement for chemical oxidation with strong oxidizing agent of organic matter present in water. The COD ranges between 1.2-1.7 mg/l the tolerance limit is 2.5-7.5 mg/l in drinking water.

**Manganese** - Manganese is a vital micro-nutrient for both plants and animals. The Manganese ranges between 0.1-1.34 mg/l the tolerance limit is 0.1-0.3 mg/l.

**Zinc** - Zinc toxicity is due to galvanized pipes and waste from industrial sources and domestic sewage. The Zinc ranges between 0.1-0.9 mg/l the tolerance limit is 5-15 mg/l.

**Copper** - Copper is essential element for plants and animals. The Copper ranges between 0.1-0.9 mg/l the tolerance limit is 0.05-1.5 mg/l.

**Iron** - Iron is present in the soluble form in soil. The Iron ranges between 0.1-2.9 mg/l the tolerance limit is 0.3-1.0 mg/l.

**MPN** - MPN shows the portability of water. MPN ranges between 5.2-18 100 ml/index.

**Conclusion** - Groundwater plays an important role in both private and public water supplies all over the world. Finding of this study depicts that water quality of study area is suitable for drinking purpose except Turbidity and MPN which were cause of degradation in the clarity in water was found above the permissible limit of BIS:10500 & WHO.

**References**:

### 1. Physico-chemical analysis of Pre-monsoon 2011

<p>| SAMPLING STATION | pH | EC (µhos/cm) | TUR-BIDITY NTU | ALKALINITY | Ca-H (mg/l) | Mg-H (mg/l) | T-H (mg/l) | PO₄³⁻ (mg/l) | NO₃ (mg/l) | SO₄²⁻ (mg/l) | CL⁻ (mg/l) | F⁻ (mg/l) | Na⁺ (mg/l) | K⁺ (mg/l) | DO (mg/l) | BOD (mg/l) | COD (mg/l) | Mn (mg/l) | Zn (mg/l) | Cu (mg/l) | Fe (mg/l) | MPN (100ml) |
|------------------|----|--------------|----------------|------------|-------------|-------------|-----------|-------------|-----------|-------------|-----------|-----------|-------------|----------|---------|-----------|-----------|----------|-----------|----------|---------|---------|---------|---------|----------|
| SS1              | 7.7| 380          | 9.1            | 450        | 171         | 120         | 291       | 2.563       | 21.09     | 150         | 102       | 0.3       | 290         | 12.3     | 1.08    | 2.5        | 5.4       | 0.2      | 0.89      | 0.1       | 1.6      | 12.4     |
| SS2              | 7.5| 390          | 9.8            | 440        | 163         | 110         | 273       | 2.541       | 19.2      | 160         | 100       | 0.5       | 190         | 14.5     | 1.26    | 1.1        | 6.1       | 0.3      | 0.56      | 0.5       | 1.4      | 11.1     |
| SS3              | 7.2| 360          | 8.9            | 400        | 159         | 109         | 268       | 2.421       | 20.9      | 170         | 105       | 0.2       | 130         | 15.6     | 3.06    | 2.4        | 5.9       | 0.8      | 0.91      | 0.6       | 1.3      | 12.2     |
| SS4              | 6.5| 160          | 7.8            | 399        | 168         | 100         | 268       | 1.861       | 19.2      | 180         | 150       | 0.4       | 180         | 16.2     | 2.1     | 3.2        | 5.2       | 0.6      | 0.85      | 0.8       | 1.2      | 15.1     |
| SS5              | 7.6| 209          | 10.1           | 259        | 159         | 99          | 258       | 1.452       | 18.6      | 140         | 160       | 0         | 160         | 18.9     | 1.89    | 4.3        | 5.6       | 0.4      | 0.45      | 0.9       | 1.3      | 10.8     |
| SS6              | 7.2| 290          | 8.2            | 260        | 168         | 100         | 268       | 1.452       | 15.4      | 120         | 150       | 0.5       | 220         | 19.6     | 1.59    | 3.2        | 6.4       | 0.6      | 0.56      | 0.4       | 1.5      | 16.2     |
| SS7              | 7.4| 301          | 6.2            | 400        | 172         | 104         | 276       | 1.892       | 16.8      | 103         | 120       | 0.6       | 210         | 21.3     | 1.6     | 4.1        | 6.1       | 0.2      | 0.42      | 0.5       | 1.2      | 15.6     |
| SS8              | 7.9| 369          | NIL            | 420        | 174         | 105         | 279       | 1.867       | 19.6      | 109         | 102       | 0.9       | 140         | 19.7     | 2.1     | 3.4        | 7.1       | 0.3      | 0.56      | 0.6       | 1.6      | 0        |
| SS9              | 7.4| 380          | 9.2            | 206        | 170         | 106         | 276       | 2.456       | 18.4      | 108         | 103       | 0.6       | 145         | 18.6     | 1.09    | 2.9        | 5.1       | 0.8      | 0.23      | 0.4       | 1.5      | 16.1     |
| SS10             | 7.1| 391          | 11.2           | 209        | 170         | 108         | 278       | 2.411       | 14.9      | 108         | 105       | 0.4       | 160         | 15.4     | 2.12    | 2.1        | 5.9       | 0.9      | 0.12      | 0.5       | 1.56     | 15.6     |
| SS11             | 6.1| 399          | 6.6            | 204        | 172         | 109         | 281       | 1.819       | 19.3      | 109         | 100       | 0.2       | 150         | 13.4     | 1.86    | 3.11       | 6.2       | 0.5      | 0.4       | 0.3       | 1.29     | 12.8     |
| SS12             | 7.5| 400          | 5.6            | 190        | 151         | 110         | 261       | 2.546       | 18.7      | 160         | 86        | 0.1       | 145         | 18.4     | 2.4     | 3.9        | 6.9       | 0.6      | 0.5       | 0.5       | 1.3      | 20.8     |
| SS13             | 7.2| 389          | NIL            | 290        | 154         | 102         | 256       | 2.169       | 20        | 109         | 90        | 0.1       | 199         | 15.4     | 3.1     | 2.7        | 7.1       | 0.2      | 0.62      | 0.2       | 1.2      | 10.6     |
| SS14             | 7.9| 382          | NIL            | 380        | 148         | 101         | 249       | 1.901       | 16        | 149         | 150       | 0.2       | 158         | 16.2     | 2.11    | 3.5        | 5.1       | 0.4      | 0.51      | 0.1       | 1.1      | 8.8      |
| SS15             | 7.6| 400          | 4.2            | 350        | 149         | 106         | 255       | 2.41        | 19        | 190         | 89        | 0.3       | 149         | 17.6     | 1.19    | 3.6        | 6.1       | 0.3      | 0.56      | 0.5       | 0.01     | 7.8      |</p>
<table>
<thead>
<tr>
<th>SS16</th>
<th>7.5</th>
<th>345</th>
<th>2.8</th>
<th>390</th>
<th>132</th>
<th>102</th>
<th>234</th>
<th>1.912</th>
<th>15</th>
<th>106</th>
<th>90</th>
<th>0.5</th>
<th>168</th>
<th>19.5</th>
<th>1.16</th>
<th>3.1</th>
<th>6.2</th>
<th>0.1</th>
<th>0.42</th>
<th>0.2</th>
<th>1.2</th>
<th>5.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS17</td>
<td>6.9</td>
<td>400</td>
<td>10.1</td>
<td>399</td>
<td>157</td>
<td>120</td>
<td>277</td>
<td>2.546</td>
<td>19</td>
<td>159</td>
<td>140</td>
<td>0.4</td>
<td>170</td>
<td>20.6</td>
<td>1.5</td>
<td>3.9</td>
<td>7.1</td>
<td>0.8</td>
<td>0.53</td>
<td>0.1</td>
<td>12</td>
<td>10.4</td>
</tr>
<tr>
<td>SS18</td>
<td>7.1</td>
<td>390</td>
<td>5.8</td>
<td>400</td>
<td>170</td>
<td>121</td>
<td>291</td>
<td>2.169</td>
<td>19.5</td>
<td>140</td>
<td>150</td>
<td>0.9</td>
<td>180</td>
<td>20.1</td>
<td>1.1</td>
<td>3.5</td>
<td>6.1</td>
<td>0.4</td>
<td>0.35</td>
<td>0.3</td>
<td>1.2</td>
<td>0</td>
</tr>
<tr>
<td>SS19</td>
<td>7.4</td>
<td>380</td>
<td>10.2</td>
<td>380</td>
<td>145</td>
<td>123</td>
<td>268</td>
<td>1.912</td>
<td>20</td>
<td>169</td>
<td>160</td>
<td>0.1</td>
<td>209</td>
<td>14.3</td>
<td>1.16</td>
<td>2.9</td>
<td>5.2</td>
<td>0.6</td>
<td>0.48</td>
<td>0.2</td>
<td>0.98</td>
<td>6.2</td>
</tr>
<tr>
<td>SS20</td>
<td>6.9</td>
<td>390</td>
<td>8.4</td>
<td>290</td>
<td>159</td>
<td>120</td>
<td>279</td>
<td>2.563</td>
<td>19</td>
<td>180</td>
<td>190</td>
<td>0.5</td>
<td>200</td>
<td>15.1</td>
<td>1.16</td>
<td>2.3</td>
<td>5.9</td>
<td>0.2</td>
<td>0.53</td>
<td>0.1</td>
<td>0.59</td>
<td>7.8</td>
</tr>
</tbody>
</table>
### 2. Physico-chemical analysis of Monsoon 2011

| Sampling Station | pH | EC (μhos/cm) | Turbidity (NTU) | Alkalinity (mg/l) | Ca (mg/l) | Mg (mg/l) | H (mg/l) | PO₄³⁻ (mg/l) | NO₃ (mg/l) | SO₂⁻³ (mg/l) | Cl⁻ (mg/l) | F⁻ (mg/l) | Na⁺ (mg/l) | K⁺ (mg/l) | DO (mg/l) | BOD (mg/l) | COD (mg/l) | Mn (mg/l) | Zn (mg/l) | Cu (mg/l) | Fe (mg/l) | MPN (100ml) |
|------------------|----|--------------|-----------------|------------------|-----------|-----------|----------|-------------|-----------|-------------|---------|----------|-----------|----------|---------|----------|-----------|-----------|-----------|-----------|-----------|-----------|----------|
| SS1              | 7  | 320         | 11              | 400             | 147       | 99        | 246      | 2.012       | 18        | 130         | 99      | 0.1       | 263       | 10       | 1.1     | 3.8       | 7.2        | 0.1       | 0.5       | 0         | 1.1       | 14        |
| SS2              | 7.4| 380         | 10              | 420             | 160       | 101       | 261      | 2.201       | 15        | 150         | 97      | 0.2       | 170       | 11       | 1.1     | 2.1       | 5.1        | 1.5       | 0.3       | 0         | 0.98      | 17        |
| SS3              | 7.5| 320         | 10.4            | 350             | 140       | 82        | 222      | 2.3         | 19        | 160         | 101     | 0.1       | 120       | 13       | 1.2     | 2.3       | 5.4        | 0.69      | 0.61      | 0         | 0         | 11.2      |
| SS4              | 7.6| 150         | 5.9             | 360             | 150       | 90        | 240      | 1.521       | 15        | 170         | 142     | 0.2       | 160       | 14       | 1.2     | 2.1       | 4.9        | 0.52      | 0.65      | 0         | 1.02      | 12.5      |
| SS5              | 7.4| 180         | 4.2             | 262             | 140       | 85        | 225      | 1.452       | 16        | 125         | 150     | 0         | 150       | 16       | 1.3     | 3.2       | 6.8        | 0.89      | 0.21      | 0         | 1.01      | 14.2      |
| SS6              | 7.1| 270         | 2.9             | 240             | 146       | 98        | 244      | 1.452       | 13        | 110         | 140     | 0.2       | 200       | 11       | 1       | 2.1       | 4.8        | 0.98      | 0.36      | 0.3       | 1.03      | 13.5      |
| SS7              | 7.2| 280         | 8.4             | 380             | 160       | 99        | 259      | 1.892       | 14.9      | 99          | 110     | 0.3       | 190       | 16       | 1.1     | 1.1       | 3.4        | 0.91      | 0.21      | 0.2       | 1.02      | 12.4      |
| SS8              | 7.5| 350         | 2.4             | 400             | 162       | 80        | 242      | 1.867       | 16.2      | 100         | 101     | 0.5       | 130       | 14       | 1.2     | 3.2       | 6.9        | 0.82      | 0.45      | 0.2       | 1.03      | 15.4      |
| SS9              | 7.6| 360         | 5               | 190             | 160       | 88        | 248      | 2.456       | 15.3      | 100         | 99      | 0.3       | 130       | 15       | 0.23    | 2.8       | 6.1        | 0.72      | 0.11      | 0.2       | 0         | 13.9      |
| SS10             | 6.4| 370         | 8               | 180             | 160       | 91        | 251      | 2.411       | 13.2      | 99          | 102     | 0.2       | 140       | 12       | 1.23    | 1.9       | 3.4        | 1.25      | 0.6       | 0.2       | 0.22      | 12.7      |
| SS11             | 6.1| 380         | 10.1            | 200             | 155       | 80        | 235      | 1.819       | 16.2      | 101         | 90      | 0.1       | 120       | 10       | 0.59    | 2.9       | 5.1        | 1.34      | 0.1       | 0.1       | 0.1       | 14.1      |
| SS12             | 6.2| 358         | 7.2             | 160             | 140       | 90        | 230      | 2.546       | 16.5      | 154         | 71      | 0         | 120       | 14       | 0.25    | 3.4       | 6.8        | 0.98      | 0.2       | 0         | 0.89      | 16.1      |
| SS13             | 6.8| 370         | 8.9             | 280             | 150       | 94        | 244      | 2.169       | 18        | 104         | 85      | 0         | 170       | 12       | 0.52    | 3.2       | 7.1        | 0.57      | 0.25      | 0         | 0.56      | 14.8      |
| SS14             | 6.1| 360         | 7.5             | 350             | 140       | 84        | 224      | 1.901       | 14        | 139         | 148     | 0         | 140       | 12       | 1.23    | 3.9       | 7.8        | 0.42      | 0.2       | 0         | 0.23      | 12.1      |
| SS15             | 7.6| 380         | 10.4            | 268             | 139       | 92        | 231      | 2.41        | 16        | 180         | 75      | 0.2       | 120       | 11       | 1.02    | 3.4       | 7.9        | 0.36      | 0.3       | 0.2       | 0         | 0         |

Corresponding Author: email: ranirajput18985@gmail.com
| SS16 | 7.4 | 300 | 9.2 | 381 | 130 | 90 | 220 | 1.912 | 12 | 101 | 81 | 0.2 | 142 | 12 | 0.98 | 2.9 | 6.1 | 0.81 | 0.23 | 0.1 | 0.56 | 7.2 |
|------|-----|-----|-----|-----|-----|----|-----|-------|----|-----|----|-----|-----|----|-----|-----|----|-----|-----|-----|-----|    |
| SS17 | 7.2 | 390 | 8.6 | 381 | 150 | 82 | 232 | 2.546 | 17 | 151 | 120 | 0.3 | 160 | 12 | 0.99 | 3 | 7.2 | 0.46 | 0.21 | 0.1 | 0.54 | 10.2 |
| SS18 | 7.0 | 305 | 7.8 | 350 | 160 | 89 | 249 | 2.169 | 18 | 130 | 120 | 0.6 | 170 | 12 | 0.89 | 2.2 | 5.9 | 0.22 | 0.21 | 0.1 | 0.56 | 11.5 |
| SS19 | 6.9 | 320 | 8.1 | 340 | 140 | 96 | 236 | 1.912 | 18.5 | 155 | 140 | 0 | 180 | 10 | 0.93 | 2 | 4.8 | 0.11 | 0.19 | 0 | 0.51 | 11.1 |
| SS20 | 6.1 | 300 | 9.5 | 280 | 150 | 91 | 241 | 2.563 | 17.2 | 170 | 140 | 0.2 | 170 | 12.6 | 0.59 | 3.2 | 6.9 | 0.64 | 0.23 | 0 | 0 | 8.4 |
### Physico-chemical analysis of Post-monsoon 2011

| SAMPLING STATION | pH | EC | TURBIDITY | ALKALINITY | Ca+H | Mg+H | T-H | PO₄³⁻ | NO₃⁻ | SO₄²⁻ | CL⁻ | F⁻ | Na⁺ | K⁺ | DO | BOD | COD | Mn | Zn | Cu | Fe | MPN |
|------------------|----|----|----------|------------|------|------|-----|-------|------|-------|-----|----|-----|----|----|----|-----|----|----|----|----|----| 100ml/index |
| SS1              | 7.5| 330| 11       | 409        | 151  | 99   | 250 | 2.5   | 23   | 141   | 103 | 0.9 | 271 | 19 | 1.6 | 2.9 | 5   | 0.1 | 0.67 | 0.2 | 1.9 | 15 |
| SS2              | 7.1| 389| 6        | 425        | 171  | 80   | 251 | 2.4   | 21   | 171   | 99  | 0.7 | 182 | 20 | 1.5 | 2.8 | 6.5 | 0   | 0.48 | 0.1 | 1.02 | 18 |
| SS3              | 7.8| 329| 13       | 359        | 154  | 88   | 242 | 2.1   | 21   | 180   | 106 | 0.8 | 132 | 17 | 1   | 2.5 | 7   | 0   | 0.89 | 0.1 | 0.1 | 12.5 |
| SS4              | 7.2| 160| 14       | 369        | 155  | 82   | 237 | 1.6   | 22   | 185   | 149 | 0.9 | 171 | 18 | 1.8 | 2.6 | 5.5 | 0   | 0.89 | 0.4 | 1.04 | 13.2 |
| SS5              | 7.1| 190| 9        | 269        | 157  | 81   | 238 | 1.5   | 20   | 134   | 156 | 0.1 | 162 | 18 | 1.7 | 1.9 | 5.2 | 0   | 0.42 | 0.2 | 2.56 | 15.1 |
| SS6              | 6.9| 280| 10       | 246        | 153  | 79   | 232 | 1.8   | 19   | 119   | 144 | 0.37| 222 | 19 | 1.5 | 1.5 | 6.2 | 0   | 0.5  | 0.3 | 2.56 | 14.1 |
| SS7              | 6.4| 290| 11       | 380        | 168  | 76   | 244 | 2     | 16   | 105   | 111 | 0.38| 200 | 22 | 1.4 | 5.1 | 7.5 | 0   | 0.32 | 0.2 | 2.89 | 13.4 |
| SS8              | 7.4| 360| 12       | 406        | 166  | 66   | 232 | 2.1   | 19   | 109   | 109 | 0.59| 145 | 21 | 1.4 | 3.2 | 7.3 | 0   | 0.9  | 0.2 | 2.13 | 16.2 |
| SS9              | 7.5| 369| 14       | 199        | 166  | 84   | 250 | 3     | 19.6 | 108   | 105 | 0.36| 142 | 19 | 0.29| 2.5 | 6.3 | 0   | 0.85 | 0.2 | 1.02 | 15.2 |
| SS10             | 7.5| 378| 9.4      | 188        | 168  | 91   | 259 | 4     | 21   | 107   | 107 | 0.27| 151 | 21 | 1.3 | 2.9 | 7.5 | 0   | 1.5  | 0.2 | 0.89 | 13.5 |
| SS11             | 6.5| 389| 10.2     | 207        | 159  | 86   | 245 | 2     | 22   | 107   | 99  | 0.4 | 135 | 23 | 0.62| 3   | 5.4 | 0   | 1.2  | 0.1 | 0.61 | 15.3 |
| SS12             | 7.5| 361| 10       | 165        | 149  | 88   | 237 | 3     | 25   | 168   | 81  | 0.1 | 141 | 22 | 0.3 | 2   | 5.5 | 0   | 1.8  | 0   | 1.08 | 16.5 |
| SS13             | 7.6| 379| 11.3     | 284        | 156  | 74   | 230 | 4     | 28   | 107   | 89  | 0.1 | 182 | 20 | 0.68| 4.5 | 7.5 | 0.1 | 1.5  | 0   | 1.23 | 8.5  |
| SS14             | 7.4| 370| 12.2     | 352        | 146  | 68   | 214 | 3.23  | 19   | 141   | 152 | 0.2 | 162 | 21 | 1.75| 3.5 | 6.5 | 0.1 | 108  | 0   | 1.56 | 12.6 |
| SS15             | 7.8| 390| 13.2     | 300        | 142  | 62   | 204 | 3.9   | 20   | 191   | 79  | 0.5 | 130 | 17 | 1.4 | 3.8 | 5.6 | 0.1 | 0.9  | 0.2 | 0.23 | 10.9 |
| SS16 | 7.2 | 391 | 12.1 | 388 | 135 | 91 | 226 | 2.9 | 19 | 121 | 99 | 0.8 | 152 | 20 | 1.98 | 2.7 | 5.5 | 0.1 | 0.3 | 0.1 | 1.04 | 8.9 |
|------|-----|-----|------|-----|-----|----|-----|-----|----|-----|----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|
| SS17 | 7.1 | 399 | 9    | 400 | 152 | 99 | 251 | 3.1 | 21 | 160 | 132 | 0.3 | 180 | 19 | 1.54 | 0.9 | 6.4 | 0.1 | 0.29 | 0.1 | 1.10 | 7.2 |
| SS18 | 7.4 | 310 | 12.4 | 355 | 164 | 87 | 251 | 3.8 | 26 | 140 | 140 | 0.8 | 181 | 18 | 1.32 | 2.9 | 5.2 | 0    | 0.23 | 0.1 | 1.03 | 11.5 |
| SS19 | 6.9 | 333 | 10.9 | 347 | 145 | 89 | 234 | 3.6 | 22 | 162 | 149 | 0.2 | 192 | 16 | 1.33 | 2.7 | 6.6 | 0    | 0.22 | 0    | 1.02 | 12.3 |
| SS20 | 6.6 | 320 | 8.9  | 300 | 152 | 90 | 242 | 3.4 | 24 | 181 | 148 | 0.9 | 180 | 14 | 1.02 | 3.9 | 5.2 | 0.1  | 0.29 | 0    | 0.23 | 15.1 |
मूड़ की उर्वरकता किसी वातावरण में बड़ी देर तक के तापमान मूड़ में खाद देना होता है। यह खाद रासायनिक या जैविक हो सकती है Ca, Mg, S, Zn, Fe, Mn, Cu, B, Cl, Ni. किसी भी मूड़ में पाये जाने वाले पीपों के लिये आवश्यकता तथा उस देर तक के कारण संदर्भ में वृद्धि/प्रदूषण का भी प्राकृतिक साप्ताहिक दण्ड से बढ़ता जा सकती है।

2. मूड़ जीवन में विशेषता का आवश्यकता:
मिटटी किसी प्रकार से अस्वस्थ हो अवश्य अपनी, क्षुद्रीय या नवनिर्माण हो तो उसके सुधार हेतु सुधारक की आवश्यकता अवश्य होनी चाहिए क्योंकि जब तक सुधारक के प्रयोग से मिटटी को सुधार नहीं मिला तब तक उर्वरकता का अंश तत्काल नहीं उठा जा सकता है। अंत में मिटटी के अंदर विभिन्नका अवश्यकता का अंश की जाती है। यह जड़ विभिन्द है कि मिटटी में उसके उर्वरक की जाती है, जैसे-जैसे मिटटी की अवश्यकता ओर में जमीन आती है। मिटटी जंगल के आधार पर उर्वरक अनुसंधान मुख्यत: दो विधि द्वारा निर्धारित है।
• मिटटी में सुधारक प्रयोग के साथ, माध्यम एवं उच्च श्रेणी में वाजिन्दूरण करणे के अनुसरण अवश्यकता।
• लक्षित उपज समीकरण के आधार पर लक्षित उपज का प्रामाण्य हेतु उर्वरक अवश्यकता।

3. मूड़ तंत्र की पीपों में भूमिका:-
१. मालिश्याम (Ca) :
○ यह क्लोरोफिल के निर्माण व स्थायीकरण में मुख्य भूमिका विभाजित है तथा हिया और यह पौधों के अन्य वर्णको (पिगमेंट्स) का भाग है।

जोरेंज (B)
○ जोरेंज पौधों में पराज कणों के बनने व उनकी वृद्धि के लिए आवश्यक है।
○ यह जड़ों की वृद्धि को प्रेरित करता है।
○ यह विशिष्ट एन्जाइमों के बनने, बीज के बनने, पोषक कोष्ठ भित्री के निर्माण तथा मुख्य रूप से शकरीय के परिवर्तन में सहायक है।

क्लोरीन (Cl)
○ प्रकाश संरचना की किया के लिए क्लोरीन आवश्यक है।

निकल (Ni)
निकल पौधों में लोह तत्व को अवश्यक में सहायक है।
यह बीजों के उगने व बढ़ते में सहायक है।
4. किया जवाब मृदा का उत्साहित विश्लेषण

<table>
<thead>
<tr>
<th>क्र.</th>
<th>नमूना</th>
<th>वजन</th>
<th>आयतन</th>
<th>धनत्व</th>
<th>विशिष्ट गुल्लक</th>
<th>नमीधारण क्षमता</th>
<th>pH</th>
<th>चालकता</th>
<th>क्षारीयता</th>
<th>कठोरता</th>
<th>मृदा में उपस्थित आयन</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>नमूना १</td>
<td>20 g</td>
<td>6.0 cm³</td>
<td>333 g/cm³</td>
<td>5.71</td>
<td>7.3</td>
<td>7.73</td>
<td>0.765</td>
<td>8.0</td>
<td>17.50</td>
<td>CO₃⁻</td>
</tr>
<tr>
<td>2.</td>
<td>नमूना २</td>
<td>20 g</td>
<td>6.0 cm³</td>
<td>333 g/cm³</td>
<td>5.28</td>
<td>6.5</td>
<td>8.30</td>
<td>0.812</td>
<td>7.8</td>
<td>1866.57</td>
<td>उपस्थित</td>
</tr>
<tr>
<td>3.</td>
<td>नमूना ३</td>
<td>20 g</td>
<td>6.0 cm³</td>
<td>333 g/cm³</td>
<td>5.43</td>
<td>7.85</td>
<td>7.50</td>
<td>0.752</td>
<td>7.1</td>
<td>1583.33</td>
<td>उपस्थित</td>
</tr>
<tr>
<td>4.</td>
<td>नमूना ४</td>
<td>20 g</td>
<td>6.0 cm³</td>
<td>333 g/cm³</td>
<td>5.34</td>
<td>6.9</td>
<td>7.60</td>
<td>0.873</td>
<td>7.0</td>
<td>2216.67</td>
<td>उपस्थित</td>
</tr>
</tbody>
</table>
जैविक खेती:

जैविक खेती कृषि की वह विधि है जो संशोधित उर्वरकों एवं संशोधित कीटनाशकों के आवरोध या व्यवस्था प्रयोग पर आधारित है तथापि भूमि की उर्वरक शक्ति को बचाये रखने के लिए कम्पोस्ट, गोबर खाद, हरी खाद इत्यादि का प्रयोग करते है।

भारत वर्ष में जैविक अर्थव्यवस्था का भूमि आधार कृषि है और कृषिकों की मुख्य आय का स्रोत खेती है। हरी खाद के समावेश से ही खेती की उर्वरक शक्ति का उपयुक्त वातावरण को देखते हुए एवं आय की वृद्धि से उत्पादन बढ़ने आवश्यक है अधिक प्रयोग के लिए खेती में अधिक वातावरण में रासायनिक उर्वरकों एवं कीटनाशक का प्रयोग करना पड़ता है। इससे वायु जल भूमि प्रदूषित हो रहा है। साथ ही खाद वस्त्र भी जमीनी के हो रहे हैं। इस समस्या का जल्दी समाधान के लिए निरंतर विकास क्षेत्री के सिद्धांत पर खेती की जानी वाली इस विशेष प्रकार की खेती की जैविक खेती कह जा रही है जो कहा जाता है।

7.

केंद्रु आद संसाधित खाद की पोषक तत्त्व आंकदेः

<table>
<thead>
<tr>
<th>पोषक तत्त्व</th>
<th>केंद्रु आद</th>
<th>प्रस्तावत आद</th>
</tr>
</thead>
<tbody>
<tr>
<td>नाटम (%)</td>
<td>46-5</td>
<td>41-5</td>
</tr>
<tr>
<td>धुलनशील कार्बन (%)</td>
<td>0-88</td>
<td>1-60</td>
</tr>
<tr>
<td>जानिज (%)</td>
<td>52-5</td>
<td>49-0</td>
</tr>
<tr>
<td>कुल कार्बन (%)</td>
<td>27-2</td>
<td>28-0</td>
</tr>
<tr>
<td>लक्षण (%)</td>
<td>1-9</td>
<td>1-4</td>
</tr>
<tr>
<td>कार्बन : लक्षण अनुपात</td>
<td>13-6</td>
<td>20-6</td>
</tr>
<tr>
<td>फैस्टरॉस (%)</td>
<td>2-0</td>
<td>1-8</td>
</tr>
<tr>
<td>पोटेशियम (%)</td>
<td>0-8</td>
<td>0-7</td>
</tr>
<tr>
<td>जिक (पीपीएम)</td>
<td>100</td>
<td>80</td>
</tr>
<tr>
<td>तौबा (पीपीएम)</td>
<td>48</td>
<td>40</td>
</tr>
<tr>
<td>मैनीजिया (पीपीएम)</td>
<td>500</td>
<td>260</td>
</tr>
</tbody>
</table>

मूठा के परीक्षण पश्चात् खेत में नियंत्रित प्रयोग किया जायेगा। खेत तीन स्थान बारे क्रमशः किये जायेंगे।
1. प्रथम खाद: फसल सभी का प्रथम खाद पर बिना किसी उर्वरक के बोने।
2. द्वितीय खाद: फसल का द्वितीय खाद पर बोने के बाद द्वितीय खाद पर रासायनिक उर्वरक का प्रयोग किया जायेगा।
3. तृतीय खाद: पहले खाद पर सबी को बोने के बाद हमारे द्वारा बनाये गये मक्खी कैम्पोस्ट व गोबर की आद का उपयोग किया जायेगा।

परिणाम एवं दृष्टांकन प्रभाव:
हमारे द्वारा किये जाने वाले कार्य के लिए विश. लाभ प्राप्त हो सकते है।
1. समय: पल्लों के उत्पादन में वृद्धि।
2. भूमि की उपज ज्ञातन में वृद्धि संभव क्योंकि ज्ञातन रासायनिक खाद के उपयोग से भूमि की उर्वरक शक्ति बढ़ना हो जाता है।
3. रासायनिक खाद पर विभेदित कम होने से कमी संभव।
4. भूमि की जल धारण क्षमता में बढ़ती बिना।
5. आयुर्वैज्ञानिक सम्य में निरंतर बढ़ती हुई जनसंख्या प्रयरण प्रदूषण, भूमि की उर्वरक शक्ति का संरक्षण एवं मामला स्थायी के लिए जैविक खेती की उपचार लाभदायक हो सकती है।

5. शोध विधि:
हमारे द्वारा किये जाने वाले कार्य का उद्देश्य जैविक खेती की वर्मी कैम्पोस्ट और गोबर खाद विधि को अन्तर्गत कर बैठाना व भूमि के संरक्षण एवं उर्वरक शक्ति पर उत्तर रहने का अध्ययन करना।
भूमि का परीक्षण विभाजन भौतिक गृहीत एवं रासायनिक पैरामीटर के आधार पर किया गया।

P a g e  | 20


ABSTRACT
In the recent years, the concept of distant learning and online courses are gaining huge attention from students’ across the globe. And such courses also promote young individuals to experience quality learning towards higher education. The unique feature of MOOC is providing education to public, at minimum level of cost at large scale and to deliver an attestation of completion to those who fulfill their study. In order to establish an all-round quality, affordability, scalability, inclusion and employability education, SAIL-MOOC is a state-of-the-art to Massive Open Online Courses program through Indian Languages. It would be an online environment where learning is centered on collaborating, creating connections and resolving queries through continual cognition in Indian language preferably in a classic regional language Odia.

INTRODUCTION
Adaptive Learning is the other major educational technology development over the past few years. However to provide learners an opportunity to build a sustainable portfolio for lifelong learning, no such means yet to prove to be qualified such level. Again to improve the quality and scale of tertiary education in developing countries like India, infrastructure to multilingual digital contents and local context to its outcomes across sectors are going to be important to establish. Massive Open Online Courses (MOOC) is the latest buzz vocabulary offers an alternative to lecture-mode classroom instruction using digital content. Through this course students can downloaded their course anytime, anywhere depending upon their convenience. However the Indian local language like Odia, even if after a status of Classical language, yet to be more steps required in this area. No any visible demarcating MOOC product using Odia language is available for Odia language learner students as well as Native mother tongue migrants. For this purpose here we are trying to establish a four phased circular and business Module MOOC (i.e SAIL-MOOC) for the learners in order to establish a dynamic teaching learning free-flung environment.

What is a MOOC?
A MOOC (Massive Open Online Course) is a free, open access and scalable online higher education courses for large scale participation. It is an extension of existing online learning or adaptive learning approaches. The aim of the MOOC is to provide lifelong learning and development to virtually everyone, anytime, anywhere in the world with internet access. MOOCs offer free online courses covering wide range of topics delivered by qualified lecturers from some of the most well-known universities in the world. It enables people with an interest in a selected topic to study and learn through interaction with others of similar interest. It provides an opportunity for people in remote areas and developing countries as well as people with aspirations to achieve more with their lives. The established MOOC teaching learning environment may help to lower the cost of
higher education which attracts the learners looking for lower cost education.

MOOCs started as a form of collaborative online learning with people interacting and learning from each other and being exposed to different perspectives, views and ideas. Now-a-days many high profile and elite universities are now offering their standard courses as open courses. A growing number of institutions have been involved in engaging and experimenting with MOOCs for the purpose of expanding access, marketing and branding, as well as the potential of developing new revenue streams.

**Literature Survey:**
The first MOOC phenomenon was introduced by George Siemens, Stephen Downes and David Cormier called as Connectivism and Connective Knowledge 2008 (CCK08). In international level the major players like Cousera, Udacity and Edx witness high number of enrollments from India. Coursera i.e. consider as a standard MOOC (sMOOC), introduced its official mobile app for iPhone on December 17, 2013. edX: edX offers interactive online classes and MOOCs from the world’s best universities. Its online courses are from MITx, HarvardX, BerkeleyX, UTx and many other universities.

In national market, a MOOC on software architecture and cloud computing was conceptualized and offered IIT, Kanpur, in conjunction with the Commonwealth of Learning in Vancouver, recently completed the delivery of its second MOOC entitled, “Mobiles for Development”, or M4D. The course material was offered at three levels: one, it was open for anyone to browse; two, learners would need to register to attempt the assignments; and three, the learners would need to pay a registration fee of INR 900 to get a certificate. IIT Bombay from July 2014 and BITS Pilani from August 2014 are offering courses using the edX platform. Looking to the educational industry, NIIT Limited India lunched its Interactive Classrooms @ Home - a unique technology enabled learning solution unveiled by NIIT Mind Champion Vishwanathan Anand in Pune.

However no such visible MOOC in Odia language like any other Indian languages are seen in market to attract the large scale motivated students. Hence the systematic architecture to Indian languages for massive open online course to our future generation is very much essential in order to fill the gap.

**SAIL-MOOC:**
On the basis of basic concept of MOOCs, here is an online course called “SAIL-MOOC- Systematic Architecture to Indian Languages Massive Open Online Course”. It aims at large-scale participation and open (free) access via the internet. SAIL-MOOC emphasizes on the education to be provided in different Indian Languages primarily started from a classical regional language Odia and to be offered to other Indian Languages in latter stages. Odia Language course content will be useful to the language dependent user.

SAIL-MOOC provides customizable education in which participants are free to select any of the subjects and can create their own customized course. Participants are free to complete this course in any way they would like it to be. It provides open access to the participants. For academic credits participants have to pay the fees depending upon the collaborating universities providing the credit. There is openness in sharing the work between each other for better understanding.

SAIL-MOOC is a cloud based online course. So it provides high scalability in terms of resources at any situations. On demand access are fulfilled by the cloud services which the users can use anytime anywhere.
Salient Features:
To blend the goal of attaining higher education the described system aims to incorporate the goal of facilitators, to include the role of university, to provide maximum benefit for the student and nothing but the least to empower the nation using mother tongue. Except this the other salient features of the system are:

- Understand the unique situations of learners through continual cognition.
- Accessible through different means of communication from desktop to Mobile.
- Try to solve the learners query beyond the syllabus.
- Proper management of the volume of learners.
- Resource Pooling.
- Increase the storage dynamically.
- For learners better understanding, video-graphs in 3-D effect and technology.

How to participate in an SAIL-MOOC?
To participate in SAIL-MOOC, participants have to complete online registration process. After the registration participants are provided with the workspace. Participants have been made available to all the details like the procedures, rules, list of courses and subjects available etc. Each course available will be open to all the participants irrespective of their age, qualification background etc. Participants will be provided with the information regarding the premium courses sponsored by Universities which offers Academic Credits to the participants.

The course material, reference material for particular course in Textual, Audio, Video form are available for free to all the participants. They can be easily downloaded. Schedules of live lectures, updates regarding the selected course like assessment test, assignments etc are updated time to time to the participants on their workspace.

How SAIL-MOOC Works?
The whole process of course SAIL-MOOC is a circular and continual knowledge grown model. The model is divided into four different steps. These steps are prepared after understanding the students’ requirements and also considering the proper execution of educational cycle for the subject.

The four steps are as follows —
- Flip Teaching (F-MOOC)
- Interactive Teaching (I-MOOC)
- Participatory Learning (P-MOOC)
- Consolation Learning (C-MOOC)

1.1 Flip teaching
Flip education is exact opposite of the traditional education. In flip education, what used to be a class work is done at home and in class room and what used to be homework (assigned problems) is now done in class. In this step participants watch and listen to the pre-recorded lectures, can go through presentations and study materials corresponding to their selected course. SAIL-MOOC will have these study material and pre-recorded audio/videos for the reference to the participants. Through Flip education participant actually have the preface of the subjects. That will ease them in understanding the topic in next step of Live Education.

In our flipped classroom: (a) the participant can become hostage to the pedagogy. (b) Here Lecturers may be divided into micro segments that matched participant’s attention spans. (c) Students will all eagerly watch the videos and come to class ready to apply their knowledge in next level teaching.


1.2 Live Education and Interactive Teaching

In Interactive education, the system has a ‘web video conferencing tool’ to hold our classes remotely. In this, the Lecturers Teams got out of the building and spoke to a small group of students in weekly basis. Back in the weekly class, the subject specialist present their results in front of their fellow colleagues. When the subject specialist presentations over, again the course coordinator lectured to these remote students about next week’s objectives. Here our teachers and students to work together in small groups to solve a problem, a discussion ensues that not only serves in it to build more robust knowledge structures, but also to motivate. The teachers takes class, ask questions, giving something students to do, getting back what they done and assimilating himself in this web class, so that the pupil can decide what would be best to do next.

1.3 Participatory Learning

In order to encourage participatory teaching learning method, the ‘SAIL-MOOC’ constituent group takes a broad look at MOOCs as a paradigm of learning communities and open education. Participants are encouraged to share experiences, ideas, and challenges relating to large-scale, open, online learning experiences. Key topics would include distributed as well as centralized approaches in pedagogy and instructional design perspectives.

By getting a taste of what the participants experience, the ‘SAIL-MOOC’ better able to understand what might keep them from fully participating in the class and what it can do to overcome these apprehensions. Here, the customers involved himself as a harmonious participant through different means of participation forum like blog, chart and group mail etc in a closed pedagogical discussion environment.

And the system though its inherent model case question strategies (a) geared to an online environment as an active participant (b) facilitate and debrief the case discussions within an LMS (Learning management system) (c) share testimonials and examples of successful strategies.

So the participatory teaching-learning circle encourages students to work cooperatively to construct meaning from what they have read and avoid focusing on a ‘correct’ interpretation of the text. The detail architecture of Participatory MOOC is given at Fig No.1

1.4 Consolation Learning:

Consolation Learning is not only an evaluation of learner knowledge acquisition component in the platform but also it broadly focuses on community and emergent learning. However, the system adopts automated testing, by way of multiple-choice quizzes, and peer reviews method by Crowd marking. By this, the participants work on a project (or projects) throughout their involvement in the MOOC. The projects receive student comments by peers designed around improvement or they are evaluated by a team. After the process the through the process of ‘Crowd marking’ (an online collaborative grading platform) the Consolation MOOC of SAIL-MOOC solves the midterm assessment bottleneck plaguing the education system.

However as more schools move toward offering credit for these vast online courses, the final set of examination of 'SAIL-MOOC' accepts a number of problem sets: implement a function to do this-or-that within certain design parameters.
SAIL-MOOC Consolation module includes a number of modular environments for final assessment of participant’s knowledge acquisition and to ensure the MOOCs business quality. These are: (a) Homework gradation, (b) Exams feedbacks, (c) Number of feedback received through participatory education (d) Free version Certification receiving.

Challenges
The system would provide educational opportunities for Education through online mode for a large segment of the population. Irrespective of flexibility in of Age, Study Center, Time limit, Examinations, the system would raise its helping hand to those who are unable to afford Traditional University Education. Except this, the language department users and other stake holders also become beneficiaries to this system. However, lots of challenges are there to this system. In this system:

- Participants have to create their own content according to their course selection
- Digital literacy is necessary for participating to any course
- As the courses are customized there is no fixed time and duration specified for the completion of course so time and effort are required from participants
- It is organic, which means the course will take on its own trajectory
- Participants must self-regulate and set their own goals for the better understanding as well as completion of course.

Except this Course Contents, Infrastructure, Ensuring the accuracy of the cognitive query, evaluating learners understanding, and Availability mode of accessibility of devices a number of direct or indirect constraints would hamper the system performance in dynamic prospective.

Conclusion
There are many challenges that India has to come across while stepping ahead towards this innovation for local languages like Odia. So a strategic move, various new educational policies needs to be made. Further adopting the SAIL-MOOC architecture would help people to gain knowledge over a wide range of subjects. It narrows the educational barrier by providing course-contents in various Indian Languages. It provides unlimited availability of educational resources for better understanding. And the proposed Model has a vision to affect the Indian education system in localizing environment and resources.
Participatory MOOC as described refers to Fig No.1

Reference:
2. http://www.mooc.me/what-is-a-mooc.html
7. Aman Sharma, Rinkle Rani, Department of Computer Sc. & Engg., Thapar
A STUDY OF ATTITUDE AND AWARENESS TOWARDS RAIN WATER HARVESTING FOR INDORE CITY

SHARMA . S.
Govt. Girls P.G. College, Motitabela,
Indore (M.P.), INDIA

ABSTRACT
The current study is based on the city of Indore as the water scarcity is a common problem faced by the residents of the city. Rain water harvesting which is a technique to store and reuse the rainwater can be a good solution for the water woes of the locals. A survey was conducted to study the attitude and awareness of people towards rainwater harvesting. The survey was conducted on 50 college students. The study concluded that the people are well aware of rainwater harvesting technique and its benefits but they are not interested in investing in the technique.

INTRODUCTION

Indore is situated on the Malwa plateau at an altitude of 1860 ft. above the sea level on the banks of two small rivers – The Saraswati and the Khan. Indore receives an average of 966mm of precipitation annually. The city with a population of 3.2 billion approx has a population growth rate of 4.6%. The city meets its needs by Narmada River. Currently Indore has to bear a 16% gap in demand and supply of water. The mayor urged the people not to waste water and to adopt rain water harvesting methods.
Rainwater harvesting is the accumulation and deposition of rainwater for reuse on-site, rather than allowing it to run off. Artificial recharge to ground water is a process by which the ground water reservoir is augmented at a rate exceeding that obtaining under natural conditions for replenishment. Any man-made scheme or facility that adds water to an aquifer may be considered to be artificial recharge system.

RAINWATER HARVESTING TECHNIQUES:
There are two main techniques of rain water harvesting, storage of rain water for future use and recharge to ground water.

The storage of rainwater on surfaces is a traditional technique and the structures used were underground water tanks, ponds, and check dams.
Recharge to ground water is new concept and the structures used are:

- **PITS**: recharge pits are constructed for recharging the shallow aquifer. They are constructed 1 to 2 cm wide and up to 3 m deep which are filled back with boulders, gravel and coarse sand.
- **TRENCHES**: These are constructed when the permeable stream is available at shallow depth. Trench may be 0.5 to 1 m wide, 1 to 1.5 m deep and 10 to 20m long depending on availability of water.
- **DUG WELLS**: existing dug wells may be used as recharge structure and water should pass through filter before going into the wells.
- **HAND PUMPS**: existing hand pumps may be used for recharging the shallow / deep aquifers if the availability of water is limited. Water should pass through filter medium before going into the hand pumps.
Recharge Wells: Recharge wells of 100 to 300 mm diameter are generally constructed for recharging the deeper aquifers and water is passed through filter medium to avoid checking of recharge wells.

Methods of Artificial Recharge in Urban Areas:
- Recharge through pits, trenches, wells.
- Rooftop collection of rainwater
- Road top collection of rainwater
- Induced recharge from surface water bodies
- Water spreading

Benefits of Rainwater Harvesting:
- Helps to meet the increasing demands of water
- Improves quality and quantity of groundwater
- Reduces flooding
- Saves expenditure on water
- Prevents soil erosion
- Promotes both energy and water conservation
- Lessens the dependence on municipal water supply
- Aids ecological conservation

Review
Rainwater tanks are a simple water supply infrastructure that can be integrated into new and existing developments (Vale & Ghosh, 2006). Rainwater tanks offer a number of direct benefits for urban communities, such as: capital cost savings through delaying or eliminating centralized infrastructure development, reducing operating costs of existing infrastructure, reducing the ecological impact upon surrounding catchments and minimizing the waste of potable water (Lawton & Birchfield, 2008).

Rainwater tanks provide individuals with a direct connection to their freshwater supply. Mithraratne & Vale (2007) suggest that rainwater tanks instigate behavioral changes provided they are the sole water supply for a household. Dual supply systems that use both rainwater tanks and mains supply do not provide much prerogative for individuals to change behavior. Furumai (2008) also suggests that rainwater use can not only act as an alternative water source, but has the potential to impact on behavior by acting as a kind of environmental education tool. Behavior based solutions to water management are based on emphasizing the need for social and institutional changes to advance environmentally responsible behavior (Goodwin et al., 1997 in Thogersen & Oolander, 2002).

Objectives
To study the attitude and awareness of residents of Indore city towards rain water harvesting.

Methodology
The study was conducted on 50 college students. The survey was conducted by a self developed questionnaire. For statistical analysis percentage was used.

Results

<table>
<thead>
<tr>
<th>QUESTIONS</th>
<th>% YES</th>
<th>% NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you ever faced water shortage</td>
<td>66</td>
<td>34</td>
</tr>
<tr>
<td>Do you think it is</td>
<td>96</td>
<td>4</td>
</tr>
</tbody>
</table>
important to conserve water

<table>
<thead>
<tr>
<th>Question</th>
<th>Agree (%)</th>
<th>Disagree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you know about rainwater harvesting</td>
<td>84</td>
<td>16</td>
</tr>
<tr>
<td>Do you practice rainwater harvesting</td>
<td>12</td>
<td>88</td>
</tr>
<tr>
<td>Do you think rainwater harvesting is a good technique to prevent water shortage</td>
<td>88</td>
<td>10</td>
</tr>
<tr>
<td>Do you think you can use stored rainwater</td>
<td>82</td>
<td>18</td>
</tr>
<tr>
<td>Do you think rainwater is safe to use</td>
<td>54</td>
<td>46</td>
</tr>
<tr>
<td>Do you think rainwater harvesting is an economically feasible technique</td>
<td>56</td>
<td>44</td>
</tr>
<tr>
<td>Would you invest in rainwater harvesting</td>
<td>34</td>
<td>66</td>
</tr>
<tr>
<td>Do you have objections towards rainwater harvesting</td>
<td>6</td>
<td>94</td>
</tr>
</tbody>
</table>

DISCUSSION

Around 66% of participants reported having faced water shortage while 34% haven’t faced water shortage. Almost 96% of the participants feel the need to conserve water while only 4% of them don’t feel so. 84% of them are aware about rainwater harvesting but only 12% of them practice it, while 16% don’t know about rainwater harvesting. 88% people agree that RWH is a good technique to conserve water while 12% don’t agree. 82% participants think they can used stored rainwater for purposes like cleaning, washing etc. but 18% of them can’t. Almost 54% feel that rainwater is safe to use while 46% don’t think so. Around 56% of them feel that RWH is an economically feasible technique but 44% feel otherwise. 34% of participants think they would invest in RWH in future but 66% don’t think the same. 96% of the people don’t have any objections towards RWH while 6% may have.
Face water problems
Think conservation of water is important
Know about rain water harvesting
Practice rainwater harvesting
Think RWH is a good technique to reduce water shortage

Can use stored rainwater
Think rainwater is safe
Think RWH is economically feasible
Would invest in RWH
Have objections towards RWH

Number of people (% who:)

- Face water problems: 11%
- Think conservation of water is important: 6%
- Know about rain water harvesting: 1%
- Practice rainwater harvesting: 11%
- Think RWH is a good technique to reduce water shortage: 17%
- Can use stored rainwater: 9%
- Think rainwater is safe: 15%
- Think RWH is economically feasible: 2%
- Would invest in RWH: 15%
- Have objections towards RWH: 10%
CONCLUSION
The study concludes that many people face water crisis in Indore city. A large number of them know the importance of water conservation. Majority of them are aware about the Rainwater harvesting techniques and feel that it a suitable method to overcome water shortage. Though very few practice it but lot of them are in favor of using rainwater for purposes like cleaning, gardening, flushing etc. overall it can be said people are in favor of RWH but they don’t think that it is economically feasible and very few would like to invest in it.

REFERENCES

2. Divesh M., Jeremy G., and Sam T. “Transforming the values and behaviors for the sustainable futures: the role of rainwater tanks and the importance of experience” SB10 New Zealand

3. Angela B.N., “Community perception on rainwater harvesting systems for enhancing food security in dry lands of Kenya” Faculty of Natural Resources and Agricultural Sciences.

4. Attitudes towards Rainwater Harvesting, ERB IC18 – CT98 – 0276

5. Akil A., Nathalie P., Joginder P.S., “Rainwater harvesting, alternative to the water supply in Indian urban areas: the case study of Ahmedabad in Gujarat”
Management of E-Resources in Academic Libraries
Shail Shrivastav
Librarian & Head
Dept. of Library and Information Science
Govt. Gitanjali Girl’s (Auto) PG College Bhopal

ABSTRACT
The development of information and Communication Technology and their application to library services, have given new dimensions to the entire spectrum of information management. Libraries in this new environment demand more sophisticated services not only with print material that library holds but also E-Resources such as e-journals, e-books, e-databases and Web-resources. The present paper highlights the e-resources collection and their need, purpose, types of e-resources collection and their management in academic libraries.

INTRODUCTION
The development of Information technology and the dissemination of web-environments have a dramatic effect on the user behaviors in information usage. The Technological development in library, electronic resources during 20th century was intended to make access to resources more direct, convenient, and timely for the user. The implementation of electronic resources made the library a growing organism.

What is E-Resources – Any electronic product that delivers a collection of data, it may be full text databases, electronic journal, image collection and other multimedia collection. These may be delivered on CD-ROM on tap via the internet, www and on a high speed multimedia personal computer that has more power than the early main frame computers.

Purpose and use of E-Resources:-
The main purpose of using e-resources is to improve the efficiency of library, to render services to end users, and to provide effective information services to faculty, research scholars and students in achieving their goals, the transition of research articles, books and journals has compelled to use latest technologies in, libraries. E-Resources have become one of the most important aspects of a digital libraries, which change the format of documents from a type paper to electronic form e-resources play a vital role in creation and dissemination of Knowledge.

Needs of E-Resources:-

- Easy to access
- Fast speed of publication
- No necessity of space, shelving cost. It can be read anywhere in the world
- Increasing tendency to use e-information sources in academic libraries.
- Increasing Interdisciplinary research.
- Application of academic activities such as syllabus, teaching and learning,

Types of E-Resources:-

E-Books :- An E-Book is an electronic version of tradition print book that can be read by using a personal computer or using by e-book reader also, users can download file of the E-books from a websites to be read from the user’s computer or reading devices.

E-Journals :- This is the most widely used digital resources, Hundreds and thousands of e-journal available by the commercial agencies, academic institutions and the agencies promoting open
access initiative simple and advanced search facility is the most useful features of e-journals. The whole contents of the journal including the back files could be search for any topic. They are available instantly and could be browsed in the 24x7 modality.

**E-Databases:** Today there are number of database available on the network they are either free or with the charges. E-Databases is on organize collection of information of a particular subject (or multi disciplinary subject area) areas. Information sources within e-databases can be search and retrieved electronically.

**CD-ROM:** Electronic information resources in CD format include abstracting and indexing services, encyclopedias, dictionaries, yearbooks, back volumes and many other references works.

**DVD-ROM:** Digital video disc with high data storage capacity has made it possible to include more multimedia elements like video and sound and to integrate many reference sources on a single disc.

**E-Thesis and E-Dissertations (ETD):** Electronic theses and dissertations is provides a technologically advanced medium for collecting thesis and dissertation in electronic format.

**E-News Paper:** Electronic newspaper is a self contained, reusable and refreshable version of a traditional newspaper that acquires and holds all information in the news paper electronically.

**E-Magazine:** Electronic magazines is also called web-Zine. The articles that are stored of a file server may be distributed or accessed via computer network.

**Management of E-Resources:**

Management of electronic resources has become comparatively easier with the development and application of information technologies in libraries. Now a days library can manage its e-resources effectively by adopting one or more methods. With growing emphasis on use of technology, libraries have undergone major structural change in terms of their collection, organization and services. Some of the issues are as follows:-

- **Budget:** Acquisition of re-resources involves allocation of budget not only for the content but also for the access, which is technological dependent various option of e-resources are available in remote online and CD-Rom options with easy to update.
- **Quality of the Product:** Quality should be primary object in choosing the product. Library should have a continuing and effective programme to evaluate the e-resources and online data bases both quantitatively and qualitative, it is necessary to confirm whether the acquired e-resources are relevancy to curricular and research need.
- **Technological Obsolescence:** It is crucial issues for all the librarians. The Hardware includes readability, upgrade ability, maintenance, compatibility with peripherals, flexibility for networking and security from theft and tampering.
- **License Agreement:** Restrictions on the use of data with regard to copying, printing or downloading from database without any license agreements comes under licensing agreement. These agreements should be carefully reviewed by the library staff before the product is purchases.
- **Copyright:** E-resources should be purchase without any violations of legal rights of the creator of works recognized and protected buy law for a monetary gain.
- **Human Resources:** The library staff needs to constantly upgrade skills and
knowledge to learn at out using new technologies and employ new techniques.

- **Authorized users:** In general e-resources are subscribed and made available on the campus network and or wide area network which are IP enabled. There is need to define the authorized user in order to prevent the E-resources from misuse.

- **Monitoring and Evaluation:** In order to evaluate the e-resources, the library should obtain usage statistics, feedback from faculty, end users.

- **Trail Access:** Vendors and aggregators are coming out newer marketing techniques such as providing trail access of the resources with nominal fee or free of many times.

- **Users Feed-Back:** Since the e-resource subscribed is meant for use, feedback from users is a vital input in the decision making process.

**Searching Facilities and Techniques of E-Resources:**

Internet has thousands of data bases containing millions of pages of information in them. All the databases have been using different techniques of indexing there are various types of search option to search the electronic databases some of these are

- Simple search
- Direct search
- Advanced search
- Search within the results
- Federated search

**Legal Issues During Information use:**

- The systematic reproduction is not allowed.
- Re-selling or Sub-licensing is not allowed
- Distribution or systematic supply of the subscribe electronic contents in any form to anyone other than to member of the institution is not allowed.

**Conclusion:** Today library and information professionals are normally stressed with user demands regarding availability, storage and access of e-resources. Use of information technologies has marked a tremendous impact of the all function and services created by the traditional library and information professionals. Emergence of internet and www has provided a platform to display these resources globally. The e-resources is becoming more important for the academic community in accessing information at the right time and in right from. However in order to meet the ever increasing demand of the user community in digital environment, libraries have to develop ways to manage access to materials available in Electronic format and to effectively share than much as they have shared print resources for over a century through inter-library lending.

**References:**

centers, Annals of library science documentation, 46(3),
121-125

Sharma, H.P.(2008). Moving beyond library automation: Role of e-resources in academic library University news, 46(34), 6-10
ABSTRACT
Zeolites are microporous crystalline aluminosilicate minerals. Due to some special properties zeolites are useful in many areas like medicine, industry, agriculture and in catalysis. To determine its efficiency and applicability, different experimental techniques are used for the characterization like IR, Nitrogen Adsorption, DTA, TGA, DSC, SEM, AFM. These methods give information about zeolite structure, different groups present in zeolites, binding sites, size and shape of pores, thermal stability, and surface area.

INTRODUCTION
Zeolites are micro porous hydrated alumino silicate mineral that contain different metal ions in its cavities. Their framework composed of [SiO₄]⁴⁻ and [AlO₄]³⁻ tetrahedral in which corner share to form different open structures. The tetrahedral are link together to form cages connected by pore opening of different sizes. The pore size ranges from 0.3 – 1 nm. A general formula for zeolite may be written as $M_{x/n}$: $Al_2O_3$: $xSiO_2$: $yH_2O$. Where M is the charge balance cation, n the charge of cation, x is generally ≥ 2, and y is no. of water molecules in the voids of zeolites. (G.Gottardi, 1986)
Natural Zeolites are formed as a result of chemical reaction of volcanic ash and alkaline water. Synthetic zeolites are produced in lab by different methods according to need. About 50 natural zeolites are known and 150 have been synthesized. Zeolites are largely distributed in Deccan traps of India. (R.N.Sukheswala et al, 1974)
Ion exchange process in zeolite is reversible. Due to this property zeolite behaves as a filter for dust, toxin removal and as catalyst in many chemical reactions. Zeolites are very efficient and cost effective minerals with high usability in many fields. To study the zeolites properties and applicability, its characterization is most important.

CHARACTERIZATION
Different experimental methods like Infrared Spectroscopy (IR), X-Ray diffraction (XRD), Nitrogen adsorption, DTA, TGA, DSC, SEM and AFM are used to identify the structural group crystal structure, acidity, binding sites and trace elements in zeolites. $N_2$ Adsorption is used to determine the pore sizes of zeolites. (R.Panek et al, 2014)

INFRARED SPECTROSCOPY
Major structural groups present in zeolite are detected by Infrared Spectroscopy. Especially mid IR region [4000 – 200 cm⁻¹] is used for the determination of zeolite structure type and groups. (K.S.Prasad et al, 2007)
Fingerprinting region of zeolites ranges from 1500 – 400 cm⁻¹ in infrared spectroscopy.
Classes of vibrations: - Zeolites give 2 types of vibrations in the IR region between 1300 – 400 cm⁻¹, which are as follows:-
1. Few vibrations are caused by internal vibrations of $TO_4$, these vibrations belong to Primary Building Units (PBUs) in all zeolite frameworks, and these are sensitive to change in framework structure.
2. Next types of vibrations are related to external linkage between tetrahedral units. These are depending on the secondary Building Units and building blocks of polyhedral which are connected to pores and form rings.

![IR Spectra of 4=1 Zeolite group (W. Mozgawa et al., 2011)](image)

**FIGURE.1** IR Spectra of 4=1 Zeolite group (W. Mozgawa et al., 2011)

<table>
<thead>
<tr>
<th>Different vibrations and assigned IR frequencies</th>
<th>Internal tetrahedral</th>
<th>Assignment(cm⁻¹)</th>
<th>External tetrahedral</th>
<th>Assignment(cm⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymm. Streching</td>
<td>1250-950</td>
<td>Double ring</td>
<td>650-500</td>
<td></td>
</tr>
<tr>
<td>Symm.Streching</td>
<td>720-650</td>
<td>Pore Opening</td>
<td>420-300</td>
<td></td>
</tr>
<tr>
<td>T-O bending</td>
<td>500-420</td>
<td>Symm.Strech.</td>
<td>820-750</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Asymm.Strech.</td>
<td>1150-1050</td>
<td></td>
</tr>
</tbody>
</table>

and external linkage in zeolite gives different peaks in Infrared region. By analysing these spectra we can identify the zeolite. (K. Byrappa et al, 2007)

**N₂ ADSORPTION – Nitrogen Adsorption/Desorption**

Applicability of zeolites in different areas mostly depends on pore size and structures. Nitrogen adsorption/desorption is commonly used to characterise the pore structures, the pore size distribution and surface area of pores in the zeolites. (M. A. A. Musa et al, 2011)
According to the diameter, pores are classified as follows:-

<table>
<thead>
<tr>
<th>Type of Pore</th>
<th>Diameter range(In nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micropore</td>
<td>d≤ 2 nm</td>
</tr>
<tr>
<td>Mesopore</td>
<td>2 nm &lt; d &lt; 50 nm</td>
</tr>
<tr>
<td>Macropore</td>
<td>d&lt; 50 nm</td>
</tr>
</tbody>
</table>

By the study of nitrogen adsorption and desorption isotherm, we can determine the presence and shape of the mesopores and micropores.

The presence of hysteresis loop indicates the presence of mesopores in zeolites. The shapes of hysteresis loop indicate the shape of mesopores.

FIGURE. 2 IUPAC Classification of hysteresis loops (K.Kaneko, 1994)

According to the IUPAC, pores are classified as macropores for pore widths greater than 500 Å, mesopores for the pore range 20 to 500 Å and micropores for the pores in the range less an 20 Å. Whereas mesopores show type IV and type V sorption isotherms, microporous materials exhibit in ideal case type I isotherms. The characteristic feature of a Type I isotherm is a long horizontal plateau, which extends up to relatively high P/P0.

The main feature of a Type I isotherm is the long plateau, which is indicative of a relatively small amount of multilayer adsorption on the open surface. Micropore filling may take place either in pores of molecular dimensions at very low P/P0 or in wider micropores over a range of higher P/P0.

A type II isotherm is normally associated with monolayer-multilayer adsorption on an open and stable external surface of a powder, which may be nonporous, macroporous or even to a limited extent microporous.

Type III isotherms are confined to a few systems in which the overall adsorbent-adsorbate interactions are weak in comparison with relatively strong adsorbate-adsorbate interactions. Isotherms of this kind are not common.

Characteristic features of the type IV isotherm are its hysteresis loop, which is associated with capillary condensation taking place in mesopores, and the limiting uptake over a range of high P/P0.

The type V isotherm is uncommon; it is related to the type III isotherm in that the adsorbent-adsorbate interaction is weak but is obtained with certain porous adsorbents.

The type VI isotherm, in which the sharpness of the steps depends on the system and the temperature, represents stepwise multilayer adsorption on a uniform non-porous surface. Among the best examples of type VI isotherms are those obtained with argon or krypton on graphitized carbon blacks at liquid nitrogen temperature.

- A vertical hysteresis loop indicates cylindrical mesopores.
- A horizontal loop indicates inkbottle type mesopores.
SCANNING ELECTRON MICROSCOPY

For morphological studies of zeolites SEM is a powerful tool, which gives a complete knowledge of surface structure and distribution of particle size. In SEM different images of zeolites are taken by the help of different signals which are produced by various energy sources like Backscattered secondary and auger electrons and X-Ray fluorescence photons etc. These energy sources produce different images of surface which give a broad idea of morphology and distribution of particles. Energy dispersive X-Ray spectroscopy provides elemental information of the zeolites. (F.A.Mumpton et al, 1976)

Information gathered from the SEM pictures of zeolites include:

- Crystal form i.e. type of zeolite and and form and size of crustal
- External surface such as relative roughness
- Purity of phase i.e. presence of other zeolites

On the basis of above figure following observations are made:-

- The NaY zeolite without mesopore will give a type I isotherm.
- After formation of mesopores a combination of type I and IV isotherm is found which we can see for three USY samples.
ATOMIC FORCE MICROSCOPY

AFM technique also has been used for study the structure of the zeolites. It is focused on crystal growth processes in open framework of zeolites studied by AFM. The zeolite crystal growth experiment is important to enhance the understanding of growth of zeolite crystals and nucleation, and controlling the defects in zeolites.

AFM is a versatile tool to investigate topography of surfaces, properties of surfaces, properties of single molecules and forces within zeolite structure. AFM data provide the positions of framework oxygen and extra-framework cations, and orientation and surface images of different zeolites.

FIGURE 6 AFM image of zeolites (D. Fuoco, 2012)

AFM allowed the detailed observation of nanometer-size events at crystal surfaces. In addition, the images showed layer growth of the zeolite crystal and the height of terraces. Two-dimensional AFM images (Fig. 1.a) showed hexagonal structure which is in good agreement with the TEM results (Fig. 2). Furthermore, Three-dimensional structure of the zeolite crystal (Fig. 1.c) obtained by AFM (not possible by TEM) indicated hexagonal layers. In addition, Figure 3 exhibits the aggregation of zeolite L crystals.

FIGURE 7 AFM images of synthesized zeolite L. (a) two dimensional image of the crystal after 24 h and (b) its cross section,
FIGURE 7 AFM images of synthesized zeolite L
(c) three dimensional image of the crystal after 160 h (S. S. Hassani, 2010)

FIGURE 8 Tapping mode AFM images of sub-microscopic Co precipitates on the heulandite (010) surface (crystal size 20–90μm). (A. Godelitsas et al, 2003)

THERMOGRAVIMETRIC ANALYSIS AND DIFFERENTIAL SCANNING CALORIMETRY

TGA and DSC methods are widely used to study the thermal stability and dehydration process in the zeolites. (F. Pechar et al, 1985)

In TGA technique the mass of a substance is measured as a function of temperature while the substance is subjected to a controlled temperature programme.

Zeolites have water molecules in the cavities. These water molecules can be remove by heating. The place of water can be occupied by any fluid or compounds. This modification process is used in different areas like medicine formation and catalysis.
In zeolites, “zeolitic water” is found in channels formed by the SiO$_4$ and AlO$_4$ tetrahedra, where it can move more-or-less freely. Relatively free movement is possible in wide channels, whereas narrower channels or capillaries impede movements, and water is adsorbed on the surface, e.g. mainly bound to the AlO$_4$ tetrahedra, partly in the form of OH-groups. The escape temperature of the latter is higher, than that of molecular water. The nature of the internal space depends on the system of interconnecting channels.

Three types of channel systems are identified from this point of view —

I TYPE- One-dimensional system not permitting the intersection of the channel (for example analcime).

II TYPE- Two-dimensional systems (for example natrolite, mordenite).

III TYPE- Three-dimensional system type has two variants.

In one type, channels are equidimensional; free diameter of all the channels is equal (for example: chabasite). The second type consists of three-dimensional intersecting channels, but the channels are not equidimensional; the diameter depends upon the crystallographic direction. Internal spaces may be capillaries of extensive internal surfaces, and in this case capillary condensation plays a prominent role in water binding. These surfaces are covered by an H$_2$O monomolecular layer, which often belongs to the neighbouring surfaces. In such cases water is bound relatively stronger to the polar solid surface. Zeolites with high kinetic diameter (for clinoptilolite 3.5 Å, free aperture of main channels for mordenite 6.7×7 Å, for chabasite 3.7–4.2 Å, for stilbite 4.1×2 Å) have the main dehydration temperature lower than 200 °C and at zeolites with low kinetic diameter (for example analcime and natrolite 2.6 Å), the dehydration temperature is higher than 250 °C (Figure 34). Zeolitic water is bound in adsorptive way and has no structure determining role. Most zeolites may be dehydrated without the major alteration of their crystal structure. The loss of adsorbed water from the internal spaces due to heating is not an equilibrium reaction and the dehydration curves from quasi-isothermal heating techniques are always non-isothermal essentially.
FIGURE. 10 Dehydration temperature and “PA curve” of different kind of zeolites, (clinoptilolite □, mordenite □, stilbite □, chabasite □, analcime □, natrolite □) (M. Foldvari,2011)

FIGURE.11 Calorimetric experiment on natrolite conducted at 412 K. (Jie Wang ,2006)
Simultaneously-recorded TGA and DSC signals for natrolite as a function of temperature. The first derivative of the TG curve is given by the curve labeled dTGA. Region of the gray box denotes initial equilibration of sample at experimental temperature under dry N2. The rest of the experiment was conducted in the presence of a flow of humidified N2.
These methods give information about zeolite structure, different groups present in zeolites, binding sites, size and shape of pores, thermal stability, and surface area.
REFERENCES

- A. Godelitsas, T. Armbruster, 2003 Microporous and Mesoporous Materials, vol.61, pp 324,
- D. Fuoco; 2012 Nanomaterial, Vol.2, pp 79-91,
- J. Wang; 2006 Thermodynamics of dehydration and hydration in Natrolite and Analcime, pp 43-59,
- K. Kaneko; 1996 Journal of Membrane Science, Vol.96, pp 59-89,
- M. Chouhan; 2014 Chemical Science Transactions, Vol. 3(4), pp 1455-1459,
- M. Foldvari; 2011 Handbook of thermogravimetric system of minerals and its use in geological practice, BUDAPEST, pp 36,
- W. Mozgava, M. Krol and K. Barczyk; Chemik, 2011 Vol. 65(7), pp 667-674, 2011
Morphometric analysis of Karondiya Watershed using Remote Sensing and GIS Method
DEVENDRA RAJPUT, *VARSHA WAIKAR, ** D. R. TIWARI
* Motilal Vigyan Mahavidyalaya, Bhopal M.P. (India)

ABSTRACT
Quantitative analysis of the drainage basin plays a fundamental role to evaluate, recognize and determine the characteristics of the watershed. The exploration, assessment and management of surface and sub surface water are the challenging issue which requires greater attention. In the present study, morphometric analysis carried out using remote sensing and geographic information system (GIS) technique to evaluate the geohydrological characteristics of Karondiya River sub-basin which is one of the tributary of Narmada River basin to grassroots development of the area. It has an area of 92.27 sqkm to perform the morphometric analysis. SOI toposheet has been used as base map and recent changes are updated using Geoeye-1 multispectral satellite imagery of 0.5 m resolution with vintage 26Th Feb, 2011. Drainage maps are prepared using satellite imagery to understanding the watershed characteristics and suggesting suitable plans for the development of the area. Strahler, 1964, stream ordering method is used for stream ordering of the watershed.

INTRODUCTION
For the present study Remote Sensing and Geographical Information System (GIS) has been used as tools to managing and analyzing the spatially distributed information. Arc GIS is powerful software to analyze, visualize, update information in geographical manner and create quality presentations that brings the power of interactive mapping and quantitative analysis. Morphometric analysis using remote sensing and GIS technique has been well attempted by Srivastava and Mitra, 1995; Srivastava, 1997; Nag, 1998; Agarwal, 1998; Joshi, 2004; Mishra, 199; Mangrulkar, 1993 and all concluded it as a powerful tool in the recent years. The study of the watershed morphometric analysis provides the beneficial parameters for the assessment of the ground water potential zones, identification of sites for water harvesting structure, water resources management, runoff and geographical characteristics of the drainage system. Morphometry is the measurement and mathematical analysis of the configuration of the earth’s surface, shape, dimension of its landforms (Clarke, 1966). The morphometric analysis comprises of linear, aerial and relief aspects.

Karondiya River sub-basin also known as Maheshari River in neighboring regions is one of the small tributary of the Narmada River basin, covering an area of 92.27 sq km in khargone and Indore district of Madhya Pradesh. its lies geographically between 22° 10' 13.461" to 22° 21' 55.35" N latitude and 75° 33' 49.45" to 75° 39' 21.00" E longitude. The area bears maximum elevation of 720.38 m above msl approximately 1 km western of Kaneriya village name. And lowest point is being 142.49 m above msl approximately 0.5 km western of Malharganj village near to Maheshwar. The geology of the study area comprises of flood basalt which is hard rock formation of igneous origin with deccan trap structure lacking in primary porosity thus requires greater attention for the study and management of ground water. Initial step involves basin boundary delineation from SOI toposheet year 1956, Number 46N/11.
and 46N/12 on the 1:50,000 scale, and farther updated interactively from contour, drainage and satellite imagery. The drainage map prepared using Geoeye-1 multispectral satellite imagery with the resolution of 0.5m in reference with SOI toposheet besides, toposheet is also used for contour map generation. These contour maps helps in better understanding the physiography of an area besides they also serves as a tracing path for the natural stream network of any area therefore, they play a greater role in morphometric study and analysis of the area.

2. Morphometric Analyses
Morphometry is the measurement and mathematical analysis and configuration of the Earth's surface, shape and dimensions of its landforms (Clarke, 1966). This analysis can be achieved through measurement of linear, aerial and relief aspects of basin and slope contributions (Nag and Chakraborty, 2003).

2.1 Linear Aspect:- Linear aspect involves the study of the linear features of the drainage network (i.e.) stream order, bifurcation ratio, stream length, stream length ratio, length of overland flow, etc. The linear characteristics of the drainage basin are discussed below (Ven Tee Chow 1964)

2.1.1 Stream Order:- Stream order has been defined in accordance with the methodology proposed by Strahler (1964) and the area bears VI orders. It has been observed that the maximum frequency is in the case of first stream order which, gradually decreases with the increase in the order.

2.1.2 Stream length:- It has great significance in hydrological investigation streams with longer length indicates flatter terrain. The study area bears stream length as illustrated in table 1.

2.1.3 Bifurcation Ratio:- Means bifurcation ratio calculated for the area is 6.23. It helps in determining the geological structures in the study area. It is calculated using the formula:

\[ \frac{N}{N+1} \]

where N is the number of streams and N+1 is the number of streams of next higher order.

2.1.4 Stream length ratio:- According to Horton (1945) length of ratio of streams of order (So) to the means (Lu) length of the stream of the next lower order (Lu-1) which tends to be constant throughout the successive order of the basin. (Refer table 1).

2.1.5 Length of Overland Flow:- It is an important independent factor affecting both hydrologic and physiographic development of drainage basin. It is determining the surface runoff as the surface runoff is directly proportional to
the length of overland flow and its value is 0.074.

**Drainage Pattern:** The study area bears dendritic drainage pattern with medium texture has been reported in this sub-basin. This drainage pattern is tectonically uncontrolled and forms v shaped valley.

<table>
<thead>
<tr>
<th>Stream order</th>
<th>No. of Streams</th>
<th>Length of Streams</th>
<th>Bifurcation ratio</th>
<th>Mean length ratio</th>
<th>Stream length ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>2444</td>
<td>327.58</td>
<td>5.49</td>
<td>0.13</td>
<td>2.61</td>
</tr>
<tr>
<td>II</td>
<td>445</td>
<td>125.38</td>
<td>4.68</td>
<td>0.28</td>
<td>1.97</td>
</tr>
<tr>
<td>III</td>
<td>95</td>
<td>63.79</td>
<td>4.75</td>
<td>0.67</td>
<td>1.86</td>
</tr>
<tr>
<td>IV</td>
<td>20</td>
<td>34.22</td>
<td>10</td>
<td>1.71</td>
<td>0.83</td>
</tr>
<tr>
<td>V</td>
<td>2</td>
<td>40.9</td>
<td>2</td>
<td>20.45</td>
<td>1.56</td>
</tr>
<tr>
<td>VI</td>
<td>1</td>
<td>26.3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.2 **Aerial aspect:** Similar to linear aspects aerial aspect is also considerably important because in this aspect terms like form factor, circularity ratio etc are calculated and discussed which helps in determining the shape and the age of the watershed.

2.2.1 **Form factor:** It is the ratio of the area of the watershed of the square of the length of the watershed. Form factor for the study area is calculated as 0.197 indicating it to be nearly circular in shape. Form factor helps in determining the shape of the watershed which in turn helps in run off estimation.

2.2.2 **Circularity Ratio:** It is the ratio of the area of watershed to the area of the circle having same circumference as the parameter of the watershed (youth mature or old). Value calculated for the circularity ration for the watershed is 0.37

2.2.3 **Elongation Ratio:** It’s the ratio between the diameter of the circle having the same area as the watershed and maximum length of the basin (Schumm, 1956). Elongation ratio helps in determining the shape of the watershed.

2.2.4 **Drainage density:** It is defined as total stream length of all order to the total area of the watershed. It is one of the most important factors for ground water potential mapping. The calculated value for the drainage density is 6.7

2.2.5 **Constant of channel maintenance:** The inverse of drainage density is the constant of channel maintenance. It is influenced by rock type, permeability, climate regime, vegetation, relief, duration of erosion and climate history.

2.2.6 **Stream Frequency:** Horton (1932) introduced stream frequency as stream segment per unit area. The value calculated for stream frequency is 32.589

2.3 **Relief Aspect:** It helps in understanding the denudation activity within an area.

2.3.1 **Watershed Relief:** It is expressed as (H) and is calculated by the difference between the highest elevation and the lowest point.

2.3.2 **Relief Ratio:** Schummm (1956) defined relief ratio as the total watershed relief
to the maximum length of the watershed for the study area relief ratio is 27.64

2.3.3 Relative Relief: It is the ratio of maximum watershed relief to the parameter of the watershed. Its calculated value is 13.11

2.3.4 Ruggedness Number: It is the product of the watershed relief and drainage density, Strahler (1964) value calculated for ruggedness number is 4007.605.

Table: 2. Different morphometric parameters of Karondiya River subbasin:

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area (sqkm)</td>
<td>92.27</td>
</tr>
<tr>
<td>Perimeter (km)</td>
<td>55.47</td>
</tr>
<tr>
<td>Highest stream order</td>
<td>VI</td>
</tr>
<tr>
<td>Maximum length of Watershed (km)</td>
<td>21.64</td>
</tr>
<tr>
<td>Maximum width of watershed (km)</td>
<td>7.98</td>
</tr>
<tr>
<td>Total stream length (km)</td>
<td>618.161</td>
</tr>
<tr>
<td>Total stream number</td>
<td>3007</td>
</tr>
<tr>
<td>Length of overland flow</td>
<td>0.074</td>
</tr>
<tr>
<td>Drainage density</td>
<td>6.7</td>
</tr>
<tr>
<td>Constant of channel maintenance</td>
<td>0.149</td>
</tr>
<tr>
<td>Stream frequency</td>
<td>32.589</td>
</tr>
<tr>
<td>Bifurcation ratio</td>
<td>4.155</td>
</tr>
<tr>
<td>Form factor</td>
<td>0.197</td>
</tr>
<tr>
<td>Circularity ratio</td>
<td>0.37</td>
</tr>
<tr>
<td>Elongation ratio</td>
<td>0.5</td>
</tr>
<tr>
<td>Total watershed relief</td>
<td>598.15</td>
</tr>
<tr>
<td>Relief ratio</td>
<td>27.64</td>
</tr>
<tr>
<td>Relative relief</td>
<td>13.11</td>
</tr>
<tr>
<td>Ruggedness number</td>
<td>4007.605</td>
</tr>
</tbody>
</table>

3. Conclusion
From the quantitative study it has been observed the basin forms the dendritic drainage pattern with medium texture, average bifurcation ratio for the watershed calculated is 3.7 stated least geological disturbances in the study area. Drainage density for the study area is calculated to 4.96 indicated the area being impermeable with greater runoff. The elongation ratio is the 0.53 indicating that the watershed is elongated in shape drainage frequency calculated is 20.12 reflecting high number of streams carrying the runoff indicating the low infiltration rate. Relief study states that the study area has relative relief 10.07 and relief ratio calculated is 28.39 indicating greater degree of slope with greater runoff with lesser runoff time. The morphometric analysis results in dimensionless parameters for the watershed. This helps us in establishing a comparative account between different watershed and thus help in decision making for the construction of hydraulic structures to combat erosion and flooding.

Graph: - plot of the logarithm of stream length vs. stream order (Linear pattern reveal the homogeneous rock material subject to weathering)

4. References
of the Geological Society of America, 56, pp275-370,

Strahler A N (1964) Quantitative Geomorphology of Drainage Basin and Channel Networks. Handbook of Hydrology (edited by Ven Te Chow) Mc Graw Hill, Section 4-
Green Communication: Current Scenario with special reference to Mobile Industry-Growth and Potential
*Roli Shukla  # Pavni Shukla
*Professor Deptt. Of Chemistry Govt. M.V.M. Bhopal

ARTICLE
In the past two decades, mobile industry has grown rapidly, today providing network coverage to more than 90% of the world’s population and connecting more than 4 Billion people. The mobile industry is forecast to invest $ 800 billion during the next five years, out of which $ 550 billion of this is earmarked for mobile broadband, potentially connecting 2.4 billion population to the internet.

Globally, the ICT sector contributed 16% of GDP growth from 2005-2011 & sector itself has increased its share of GDP world wide from 5.8-7.8% the ICT sector’s share of the economy is predicted to jump further with the introduction of 4G & 5G.

We can say we are developing & growing, but have we forgotten something? Indeed yes, interdependent & mutually reinforcing pillars of sustainable development, social & economic development along with ENVIRONMENT PROTECTION.

ICT SECTOR V/S ENVIRONMENT
Climate change is fundamentally altering the planet- The earth has warmed by 0.7 oC since around 1900 & will warm even more in the coming decades due to past emission.
- Impact of more extreme weather events on the reliability of telecommunication network.
- Increasing cost & scarcity of energy to power ICT equipments.
- Increasing the energy efficiency of telecommunication networks through digitisation.
- Manufacturing more energy efficient ICT products.

CARBON EMISSION & ENERGY CONSUMPTION
Currently the ICT sector globally accounts for 0.9 metric gigatons of GHG emissions annually. By the year 2020, total carbon emissions globally from ICT sector is expected to rise up to 1.43 metric gigaton, accounting for around 3% of total emission of green house gases. These emissions include emissions from both the embodied devices and components during manufacturing, as well as from the use of devices and equipments.

ICT in India accounts for 1.5% of India’s total energy bill, which is expected to go up to 2.7% by 2020.
The very noticeable point is that, there are about 3,00,000 towers in India which consume an estimate of 3.2 billion liters of diesel annually resulting in 5360 tonnes of CO2 emission per year, making the ICT sector to be the second largest consumer of diesel & of course carbon emitter after the Railways.

Each tower consumes 3-5 Kw for equipment air conditioning & generators with BTS alone consuming 1.3-2.5 KW.

Measures For Reducing The Telecom Sector Footprint

1. Network Planning
   - Development of energy efficient networks.
   - Designing low energy base station sites.
   - Adopting distributed and integrated central office approach.
   - Use of intelligent shutdown technology.
   - Reducing the number of separate hardware components which would lead to reduction in energy utilization.
2. Infrastructure Sharing

- Tower sharing can save utilization of various resources like steel, cement, concrete, zinc besides optimising the use of power.
- Antenna systems, transmission systems and sharing of base station equipment will allow operator saving to an additional 40% on top of available savings from passive infrastructure sharing.
- Reduction in the number of generator sets resulting in less energy consumption besides reduction in noise, air & visual pollution.

3. Adoption of Energy efficient Technologies

- Improving power amplifier efficiency, raising the base station working temperature, Radio technique, use of single RAN.
- Use of device pool solutions such as MSC pool, SGSN pool, etc. will not only increase the network reliability, but will also increase the usage rate of equipment & reduction in the overall energy consumption.
- Reducing mobile device cycle emission through design and recycling.

4. Improvement in Grid power supply.

- Use of alternative & non conventional energy sources like solar/wind/ fuel cells may form an important source of energy for powering base station which may not altogether remove the requirement of DG sets, but would definitely reduce dependence on them. Due to precarious power situation, about 70% of telecom towers have grid/electricity Board power availability of less than 12 hours.

5. Use of Alternate Energy sources.

- The move from diesel to solar energy source could result in savings of $1.4 billion operating expenses besides a total cut down in carbon emission.
- Wind powered radio base station does not require any feeders and cooling systems, resulting in upto 40% low power consumption.
- Natural gas usage based generation sets, is also a viable solution.
- Fuel cells, the most promising for telecommunications is PEMFC (Proton Exchange Membrane Fuel Cell) which operates at lower temperature & runs at 40-60% efficiency.

Utilization of e-Waste:

Utilization of e-waste by recycling & re-utilization of phone casings, batteries & charges etc. can reduce the manufacturing cost besides saving the environment not only from deployment of resources in the manufacture of new devices but also will save it from the harmful effects of these pollutants.

Conclusion

ICTs are part of solution, not part of problem, & there should be enormous gains through the smart use of ICTs in virtually every single sector.

The whole idea is't about the choice between using or not using technology, the challenges is to use it right.

Green peace is calling on the telecom industry to usher this change proactively & lead the way to a sustainable future. Because,

" We do not inherit the earth from our ancestors, We borrow it from our children."

REFERENCES

1. Guide to Greener Electronics v 16.0
2. Cool IT leader Board version 4
5. Power for the People article aug 14.
ABSTRACT
Mental retardation is a serious handicap in a society. Development of a child with mental retardation depends on the type of disorder, associated disabilities and other factors like family background and environment.
This research aims at studying mentally retarded children in details and to know every aspect of their life and personality. For this a study was conducted. Parents of 21 children filled the case study form by L.N. Dubey.
A detailed analysis on the basis of the form has been done and presented in the paper.

INTRODUCTION
There is a branch of psychology known as abnormal psychology that studies the symptoms, causes and cures of abnormal behavior. One of the major fields in this branch is mental retardation. Mental retardation refers to weakness or deficiency in mental power. People with below or average intelligence are incapable of managing their lives at their own are included in the category of mentally retards. Mental deficiency has some symptoms like limited intelligence, limited attention span, social insufficiency, inadequate personality, defects of emotions.
Several psychologists have considered heredity as the main cause of mental deficiency. As there are many causes of feeble mindedness, a large number of cases result from the interaction of two or more contributory factors. Birth abnormalities associated with birth include infectious diseases, endocrine imbalance, epilepsy and other neurophysiologic disorders account for about 25% of the causes.
Mental deficiency is not a disease that can be cured by any drug or training yet it is necessary to take steps towards the prevention and treatment of the same. Almost all the feeble minded individuals can be trained but the precondition of success is that the training should begin in infancy. By the time the child reaches the chronological age of 6 it becomes easier to assess them and to teach them. They can also be sent to special schools running with special curriculum for them. For all this training to be conducted it is important to know about the child. The aspects that need to be known are his details regarding his birth, his emotional aspects, behavior at home, behavior at school, attitude towards teachers and classmates. His IQ and other personality traits need to be studied. All this information helps to know where the problem lies and how a teacher can help the child, with adequate social and professional training and with a healthy domestic environment the child can be nurtured to become independent.

METHODOLOGY
The tool used in the research is ‘case study form’ by L.N. Dubey. The form consists of detailed questions about the child to be assessed. For statistical analysis average and percentage was used. The study was conducted on 21 subjects at Gandhi Bal Bhavan, Indore.
DISCUSSION

<table>
<thead>
<tr>
<th>Factors</th>
<th>%yes</th>
<th>%no</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child has normal habits</td>
<td>85</td>
<td>15</td>
</tr>
<tr>
<td>Child has speech related problems</td>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>Child is hyperactive</td>
<td>45</td>
<td>55</td>
</tr>
<tr>
<td>Child has emotional difficulties</td>
<td>38</td>
<td>62</td>
</tr>
<tr>
<td>Child has problems in adjusting with the family</td>
<td>23</td>
<td>77</td>
</tr>
<tr>
<td>Child is weak in studies</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>Child has positive attitude towards school</td>
<td>85</td>
<td>15</td>
</tr>
<tr>
<td>Child has healthy relations with family</td>
<td>93</td>
<td>7</td>
</tr>
<tr>
<td>Child has a good self image</td>
<td>93</td>
<td>7</td>
</tr>
</tbody>
</table>

1. RELATED TO BIRTH: Most of the children were born under proper medical care. The condition of the mother and the child during birth were normal. There was no mishap or accident during the child birth. The average weight of child during birth was 6.6 lbs.

2. PHYSICAL CONDITIONS: general health of the children was good. Average height was 3’5” and average weight was 24kg. In most of the cases there was a speech problem and vision defects in some cases.

3. HEALTH: most of the parents did not report any illness, any accident, any surgery or treatment of illness.

4. DEVELOPMENT: most of the children were fed with mother’s milk. Few had other sources of milk. The age to start sitting ranges from 8 months to 1 year. The age of walking was between 10 months to 2.5 years. Begin of conversation ranges from no speech at all to 4 years of age. Most of them found problem in bowel control and self dressing. The delay is up to 6 years. This reflects the overall delay in the development milestone.

5. HABITS: All the subjects had normal habits. They did their routine timely. Most of them played with the children of their age.

6. DIFFICULTIES RELATED TO SPEECH: more than half of the children studied face speech problems like stammering and stuttering. Most of the parents reported difficulty in speaking difficult words. The children in most of the cases did not find difficulty in repeating the words when taught.

7. EMOTIONAL DIFFICULTIES: Most of the children were silent and quiet by nature but they were not gloomy. They were found hyper active. Most of them were good tempered but they got frightened easily. Most of them were reported to be sensitive and aggressive by their parents. Majority of them could not perform any task of responsibility. A mixed response on spontaneity and stubbornness was found. Most of the children were not cruel, revengeful. Most of them were non-destructive. In the school all of them behaved well and were reported to be obedient.

8. DIFFICULTIES RELATED TO ADJUSTMENT: Most of the kids adjust well with the family and are loved by their parents. They have healthy relations with siblings and are friendly towards other kids. Most of them
lack leadership qualities and are hesitant to participate much in the school activities.

9. INTERESTS: Music, dance and playing was found to be a common interest of most of the subjects. They like to play indoor as well as outdoor games. Most of them like to collect objects like pencils, toys etc.

10. DETAILS: The average age of the children to admission to school was 7.5 years. The children study mathematics, drawing and Hindi language. Most of them showed keen interest and enjoyed drawing. They do not like writing. Their performance was reported to be slow and below average. Most of them are regular to school. They are friendly and helping towards their classmates.

11. PERSONAL ABILITIES: The average IQ of the children under the study was found to be 40. Most of them had abilities in drawing, art, dancing and sports. They were found to be quite weak in math and logical reasoning.

12. CHILD’S SELF IMAGE: most of them considered themselves to be normal and on an average had a good self image.

13. OPINION OF COUNSELOR: Very few of the participants had consulted a counselor. They were informed that child had poor concentration, logical reasoning and lack of abstract thinking. The root cause being genetic. Some suggestions were given to the parents like to give the child a positive environment also some activities were suggested to the parents to help the child’s development.

CONCLUSION

All the children who underwent the study had poor concentration skills, low level of logical reasoning and abstract thinking. The study concluded that 15% of them did not have normal habits. 30% of the children had speech related problems. 45% of them were hyperactive. 38% children had emotional difficulties. 23% had problems in adjusting with their families. It was found that 80% of them were weak in studies but a positive factor was 85% of them had a positive attitude towards their school and they felt free with their teachers and were friendly with classmates. 93% of the participants had a good self image.

REFERENCES

2. J. Prakash, S. Sudarshan and H.R.A Prabhu (2007 )“study of behavioral problems in mentally retarded children” Delhi psychiatry journal Vol. 10 No.1 April
Indian Women’s Fiction in Translation
Prachi Pabra¹, Vinita Singh Chawdhry²

¹Research Scholar
²Professor, Department of English
Govt Hamidia Arts & Commerce College
Bhopal, INDIA

ABSTRACT
Literature is the source of life giving power which can transform people and societies. Where literature exists, Translation exists. Translation transports the masterpieces from one language into another. It does a great service to any literature as it is a source of linguistic as well as cultural expansion. Much of the world literature had been subjected to patriarchal domination and women were either banished to the background or kept to the brim. This canon dismissed women’s writing two centuries ago. But after dark its dawn; the women’s perspective on the world gradually emerged with women writers and this prompted their counterparts to redefine their constructs of female identity. Indian women writers have won critical appreciation for their stimulating literary daringness and making social issues an important part of their literary work. There are Indian women writing in regional languages as Hindi, Bengali, Tamil, Malayalam, among others and have been acclaimed worldwide. This is been possible with a strong and growing market for quality Indian fiction in Translation. Indian literature is generally believed to be the oldest in the world. With vast cultural diversities, there are around two dozen officially recognized languages in India. Over thousands of years, huge literature has been produced in various languages in India. In this era of literary globalisation it is imperative to project the genuine and true picture of India to the world and it is possible only through English Translation. The present paper draws a study on Indian women’s fiction in English translation in multilingual India representing the heterogeneity of women experience and the culture of India.

INTRODUCTION
Literature is commonly seen as offering its own unique insights into a period; as it is rightly called the mirror of the society. These unique insights come as much from women writers as from men. Women writers pen themselves into their own history: they articulate differences in a narrative which is also expressed in their own terms of reference and which highlights ignorance from within the majority and minority communities.
Women literature in India has long been criticized by the commemoration of the traditional ‘sita savitri’ stereotype. Women were encouraged to devote themselves to their husbands through loyalty and self sacrifice. Ancient societies the world over had been subjected to patriarchal domination. The first generation writers of Indian Fiction reflecting the contemporary social practices portrayed women in their traditional subservient roles. The woman’s perspective on the world gradually emerged with the arrival of women writers on the scene and this prompted the male writers to rethink and redefine their constructs of female identity. The last four decades of the twentieth century, since India’s independence, witnessed burgeoning of women writers that disapprove the hegemonic myth which makes literary
creation a male domain and literary discourse a patriarchal privilege. Since then the enduring, self-sacrificing image of the woman of the old world has been replaced by that of the independent woman in control of herself and her life.

Where literature exists translation exists. The very novelties of literature would be incredible without translation. In the post-independence era it is the need of the hour to project the genuine and authentic image of India to the outside world and it is possible only through English Translation.

Women and translation have been relegated to the same position of discursive inferiority. The common context of marginality makes women's writing relatively tradition bound or less privileged in English translation. As feminisms gradually democratised public and private life, some of the women were able to publish their works. Although this required a going through hardships and breaking away from their culture. A gender approach reveals that the works of male authors were favoured to the affliction of women authors, whether they were classical or contemporary, from nearby cultural systems or from more remote ones. As a result, many works by these writers have been lost. There are many women authors who have not been translated in spite of having written important works. According to feminisms, these would have been translated if they had been written by male author. In this sense Translation Studies have primal role to play, by inquiring what is to be translated, and the basis of this selection, and what criteria are used to make such choices, as the first step towards putting an end to this discriminatory attitude. India is linguistically fragmented and translation becomes the main communicative medium. Multilingualism is all pervading in the subcontinent, where more than 1600 languages are spoken, and eighteen are recognised in the constitution. In India, after all pluralism is organic and translation is an inevitable way of life.

Discussion

India has a rich history of ancient civilisations such as the Harappa and Mohenjodaro, and of matrilineal societies in the south, but no written records of women's literary gallantry exists predating the 6th century BC. The emergence of the first body of literature by women in India could be attributed to the advent of Buddhism. Perhaps it was the freedom offered by the religion, the way of life it offered to women, and the principle of equality that it propagated which allowed women to pen their thoughts for the first time. The earliest known anthology of women's literature in India has been identified as those belonging to the Therigatha nuns, the poets being contemporaries of the Buddha.

But focussing on the fictional developments of Indian women we date the same to the twelfth century A.D., when India's history witnessed invasion and gradual settlement by the Persian Empire. The rise of Islam, not only as a religion but also as the framework of the Mughal dynasty that ruled India for almost three centuries thereafter, brought a new set of experiences and influences to women's literature in India. Muslim women had to be literate to comply with the requirements of the Holy Koran which made it mandatory for every Muslim, male or female to pray. Women made use of this rule of the religion to write about themselves and their experiences. One of the earliest to write was Princess Gul-Badan Begum who in 1587 completed the Humayun Nama which details the life and history of one of India's most powerful Mughal kings. She wrote so 'beautifully' in Persian that when translated into English in 1898, her translator Annette
Beveridge described it as the first novel-biography ever written by an Indian woman.

Around the 18th century, however, a combination of factors led to the decline of women writing in India. The East India Company, established in 1600, whose initial purpose was to trade, gradually took over as rulers and thereafter the British government established its rule in India. Its repercussions let the princes and kings lose their kingdoms, and being restricted by a small privy purse, there was loss of patronage to women in courts. Since these were women with education, the association of educated woman with 'bad' women became common. This led to the loss of education for women and the production of women's literature almost came to a standstill.

The trend of educating women began again in the late 19th century with the rise of the reformist movement in India which saw more women's participation in rebelling against British rule. This led to a new stage in the development of women's literature in India. The earliest woman writing during the reformist period was Savitribai Phule, who along with her husband championed the cause of women's education. The novel was not at first a common form, perhaps because the majority of women had less access to education than men. English education was introduced to India in the nineteenth century, serving as an ideological force behind social reform and control. Thomas Babington Macaulay’s Education Minute of 1835 is regarded as a crucial document in this history. The most important literary event that revolutionised literature was the emergence of literary prose in all the modern Indian languages, and the advent of the printing press, under the patronage of an Englishman, William Carey (1761-1834), at Serampore, Bengal.

The institutionalization of translation took place in independent India in 1947. As a sovereign nation-state, India felt the need to devise, accentuate and confer common symbols upon a conglomerate of different linguistic states. Issues of translation in post-independence India are intricately connected with the new identities that emerged in the light of the bifurcation of the Indian landscape along linguistic lines. Translation of Indian literature in English comes in the midst of a translation boom which has gone on for the latter part of the last century. Pioneering volumes of women’s writing from India have been published within the last decade, most notably The Inner Courtyard: stories of Indian women (1990) edited by Lakshmi Holmstrom, Women Writing in India: 600 BC to the Present (2 Vol., 1993) edited by Susie Tharu and K. Lalita, Aasha (Hope/faith/trust) : Odyssey-ii Short Stories By Indian Women Writers edited by Divya Mathur, Stree and Kali for women undertake translation on a wide scale as a means to access women’s voices. Urvashi Butalia and Ritu Menon set up Kali for Women in 1984, arguably the first Indian publishing house dedicated to publishing on and for women. In 2003, the founders decided to part ways, with Butalia setting up Zubaan Books in partnership with Penguin in 2004, and Menon founding Women Unlimited. They were followed by other Indian presses concerned with gender and social issues such as Bhatkal and Sen who publish the imprints Stree and Samya and Tulika Books. Truth Tales: Contemporary Stories by Women Writers of India edited by Laura Kalpakian, Meena Alexander (Introduction), there is an ancient tradition of women’s writing in India, and each of these stories draws on a different linguistic tradition: Bengali, Gujarati, Marathi, Hindi, Tamil, Urdu and English – the last one of the languages of postcolonial India.
Women's writing in the 20th century moved towards a medium of modernism in which womanist and feminist statements were combined with political messages. Women writers such as Mahashweta Devi combined women's causes with political movements. In Draupadi she creates a world of tribal rebels whose fight against a political system of enforced capitalism has driven them to become Naxalites. It’s hard to pick just a few from Mahasweta Devi's corpus of writing, her works; Titu Mir, Rudali, Breast Stories, Mother of 1084 are all translated in English by Rimi B Chatterjee, Anjum Katyal, Gayatri Chakravorty Spivak and Samik Bandopadhyay Amrita pritam is a prolific writer and a versatile genius. Her essays, short stories and novels written in hindi and Punjabi have been translated into more than thirty regional and foreign languages. Among the contemporary Indian writers she occupies a unique position. This “uniqueness” arises because of her foray into both lovely and harsh visionary world which apart from being confessional outpouring of a sensitive soul, is also a reflection on the patriarchal social constraints. Gaura Pant better known as Shivani, a winner of Padma Shri, was one of the popular Hindi magazine story writers of the 20th century and a pioneer in writing Indian women based fiction. Her Works in Translation include Trust and other stories, Krishnakali and other stories, translated by Masooma Ali. Janaki Srinivasa Murthy, who writes under the pseudonym Vaidehi, is one of Kannada literature’s most talented contemporary writers. Janaki Srinivasa Murthy, who writes under the pseudonym Vaidehi, is one of Kannada literature’s most talented contemporary writers. Her work has a strong social focus, especially the condition of women in modern society. Her trademark style is best captured in the title story from Gulabi Talkies translated by Tejaswini Niranjana, where a town deals with the loss of its midwife, Lillibai, when she decides instead to run the only-for-women cinema, Gulabi Talkies. These sharp, contemporary stories slice up the world as seen through the perspective of women, and claim very wide ground. Women writers like Mridula Garg, and Salma have had to weather attacks from the (chiefly male) literary establishment in their respective states, for their “bold” writing. Salma’s women, trapped in the cloistered world of a small town in Southern India, do not always find redemption or escape. Her Work The Hour Past Midnight translated by Lakshmi Holmstrom is critically acclaimed. C.S. Lakshmi, one of modern Tamil literature’s most acclaimed women writers, has written numerous stories under the pseudonym Ambai. The English translation of her collected stories was published under the title, The Purple Sea. C.S. Lakshmi is also one of India’s most respected experts in women’s studies and was the founder-trustee of Sound and Picture Archives for Research on Women (SPARROW), of which she is the current Director. Krishna Sobti works Mitro Marjani, Ei Ladki translated as To Hell With You, translated by Gita Rajan and Raji Narasimhan is richly comic and showcases dark explorations of sexuality and the need for freedom. Kiran Nagarkar’s Saat Sakkam Trechalis translated as Seven Sixes Are Forty-Three by Shubha Slee. Ashapoorna Devi’s Pratham Pratisruti translated as The First Promise by Indira Chowdhury is one of the few novels by the prolific and highly regarded author available in translation, this follows the evolution of Satyabati, a child bride who grows up to demand much more of her new life in a changing but still hidebound Calcutta. There is long list of Indian Women’s fiction in translation; the above works present a small picture from the larger collage. The fact that texts written by women are translated between different languages and
cultures will allow the experiences of very different women to be gathered together; this will help to put an end to the patriarchal supposition that man is heterogeneous and woman is homogeneous, showing that gender is not a unifying principle for all women, but rather it shapes their identity together with other variables. Furthermore, if we refer specifically to the translation of feminist works, Translation Studies could analyse the extent to which translation has contributed to the expansion of feminist movements around the world by means of renderings that established a connection between different methodologies that were previously unknown to each other. In her book Tejaswini Niranjana has pointed out that in the opinion of western literary critics at least since the renaissance translation has been performing "the noble task of bridging the gap between people as the quintessential humanistic enterprise."

Conclusion

By choosing to translate from the regional languages into English, that enjoys a hegemonic status as a world language, we were addressing issues of power, and writing from the periphery to the centre. In the twenty first century, in an era of literary globalisation, fiction stands out as an instance of the possibility of communication. Translation can help to transform the contemporary literary heritage by openly choosing to recover the works of Indian women writers. A group of works that will irradiate the social conditions, in which women wrote, bring more revealing women’s writing to light; and help us capture what is hidden because it does not fit the criteria laid down by the patriarchal canon. Translation is a process of widening the border of Indian Culture. The only way to let western people look inside the Indian culture is through the rendering of it into a major language like English, and thus translation plays an essential role.

Bibliography


Husain, Intezar. A chronicle of peacocks—stories of partition, exile and lost memories. New Delhi: OUP.


Assessment of Bore wells water quality, Evaluation with special reference to seasonal variation in urban area of Bhopal city, Madhya Pradesh.

Bhadoriya Rani, Kataria H.C2 And Gupta D.K3
1,3 Department of chemistry, Govt MVM, Bhopal, India
2 Department of chemistry, Govt Geetanjali college, Bhopal, India

ABSTRACT
Bore well water quality was carried out in and around Hoshangabad road, urban area of Bhopal city, MP. Bhopal is situated close to the geographical center of the country between 23035’N Latitude and 77023’E Longitude about 285sq km with maximum Altitude of 625 above sea level. Acceptable standard method of sampling and analysis was used. 20 samples was collected randomly from different colonies i.e. residential areas were collected, analysed and compared with the water quality standards of BIS:10500 and WHO. Sampling point location & elevation were obtained using G.P.S. In this study all parameters are within permissible limit except Turbidity and water quality is fit for drinking purpose.

INTRODUCTION
Water is an elixir of life, which is required for most of the human activities like drinking, bathing, cooking, washing, agriculture, industries, recreation etc [4]. Ground water may be considered as one of the most precious & one of the basic requirements for human existence and the survival of mankind providing him the luxuries and comforts in addition to fulfilling his basic necessities of life [5]. The main reason of water contamination is urbanization and industrialization [7]. Municipal corporation of Bhopal facilities drinking water in limited area in alternate to this people keeps option as hand pumps and bore well. Due to poor knowledge of Ground water quality by the inhabitant of this area this study was investigated.

Study area:-
This study concentrates on Hoshangabad road, urban area of Bhopal city, MP. This area is about 72km and densely populated having population about 90,000.

Materials & Methods:-
In this study acceptable standard method of sampling and analysis was used [1]. About 20 water samples were collected from sampling station (map1) in pre-monsoon, post-monsoon & monsoon in 2012. The collection of samples were Randomly. Sampling point location were obtained using G.P.S to get the latitude & longitude of points as well as elevation of sampling points. The depth of well were using measuring tape. The water samples collected were stored in clean jerry canes. The pH value is measured by PC-DPL-Kota made digital pH meter in the laboratory. EC in centimeter (µmhos/cm) with the help of Elico made conductivity meter. Turbidity by digital water kit. Alkalinity was determined by volumetrically by silver nitrate titration methods using potassium chromate as indicator. Total Hardness, calcium, magnesium were measured by EDTA Titration methods. Sulphate was determined Nepthalometrically. Chloride by Argentrometric method. Fluoride...
by spectrophotometer. All the parameters were compared with the BIS:10500 and WHO. Analysis were done for physico-chemical analysis shown in Table1. GIS version 9.3 is used to generate the map of location of sampling points.

![Map of sampling stations](image)

**Table No.1 - Location of Sampling Station**

<table>
<thead>
<tr>
<th>S.no</th>
<th>Locality</th>
<th>Depth</th>
<th>Elevation</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Saket Nagar</td>
<td>482</td>
<td>23°13'06.07&quot;</td>
<td>77°27'28.81&quot;</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Baghsewaniya</td>
<td>477</td>
<td>23°12'00.81&quot;</td>
<td>77°27'36.37&quot;</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Baghmughaliya</td>
<td>467</td>
<td>23°11'27.66&quot;</td>
<td>77°28'23.01&quot;</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Nirupam Estate</td>
<td>478</td>
<td>23°11'30.35&quot;</td>
<td>77°27'03.09&quot;</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Vidya Nagar</td>
<td>482</td>
<td>23°11'44.51&quot;</td>
<td>77°26'52.59&quot;</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Nikhil Homes</td>
<td>474</td>
<td>23°11'10.20&quot;</td>
<td>77°27'15.02&quot;</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Kunjan Nagar</td>
<td>480</td>
<td>23°11'10.64&quot;</td>
<td>77°27'19.77&quot;</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Harbanshvihar</td>
<td>475</td>
<td>23°11'09.31&quot;</td>
<td>77°27'14.89&quot;</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Danish Nagar</td>
<td>471</td>
<td>23°11'05.40&quot;</td>
<td>77°27'33.99&quot;</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Unique Residency</td>
<td>467</td>
<td>23°11'16.25&quot;</td>
<td>77°27'50.33&quot;</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>RajatVihar</td>
<td>469</td>
<td>23°11'14.31&quot;</td>
<td>77°27'30.16&quot;</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>JyotiNagar</td>
<td>468</td>
<td>23°10'59.68&quot;</td>
<td>77°27'45.64&quot;</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>ChinarUpwan</td>
<td>471</td>
<td>23°11'01.96&quot;</td>
<td>77°27'32.01&quot;</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>SurendraLandmark</td>
<td>472</td>
<td>23°10'52.37&quot;</td>
<td>77°27'23.35&quot;</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Chinar Fortune</td>
<td>470</td>
<td>23°10'42.26&quot;</td>
<td>77°27'23.95&quot;</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Akshat Homes</td>
<td>497</td>
<td>23°12'59.79&quot;</td>
<td>77°26'24.56&quot;</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Shalimar evenGarden</td>
<td>468</td>
<td>23°10'46.57&quot;</td>
<td>77°27'35.89&quot;</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Nirupam Royal</td>
<td>464</td>
<td>23°10'46.55&quot;</td>
<td>77°28'16.55&quot;</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Mohnideep</td>
<td>497</td>
<td>23°13'01.12&quot;</td>
<td>77°26'25.70&quot;</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Shriram Colony</td>
<td>468</td>
<td>23°10'15.59&quot;</td>
<td>77°27'35.43&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**Table No.2 - Physicochemical analysis of parameters in 2012.**

---

Corresponding Author: email: ranirajput18985@gmail.com
**Result And Discussion:**

The detail of finding is shown in Table 2. The pH value of drinking water is an important index of acidic, alkalinites. The pH of study areas lies between 6.4-7.8, 6.1-7.6, 6.6-7.9 in pre-monsoon, monsoon, post-monsoon values are well within the safe limit for drinking purposes.

EC measurement is an excellent indicator of TDS, which is a measure of salinity that affects the taste of potable water. The EC of study areas lies between 160-399, 150-390, 161-399 mg/l in pre-monsoon, monsoon, post-monsoon values are well within the safe limit for BIS10500.

The Turbidity is an expression of certain light scattering and light absorbing properties of water samples of bore wells. The Turbidity of study areas lies between 6.0-14.0, 5.0-13.0, 9.0-14.5 mg/l in pre-monsoon, monsoon, post-monsoon values are above the desirable limit of BIS and WHO.

Alkalinity is the quantitative capacity of an aqueous media to react with Hydrogen ions. The Alkalinity of study areas lies between in 165-425, 161-421, 190-425 mg/l in pre-monsoon, monsoon, post-monsoon values are well within the desirable limit.

Calcium is a major constituent of igneous rocks. The range of calcium content in ground water is largely dependent on the solubility of calcium carbonates, sulphide and rarely chloride. The Calcium Hardness of study areas lies between 135-171, 132-169, 140-179 mg/l in pre-monsoon, monsoon, post-monsoon values are well within the desirable limit.

Magnesium is an important constituent of basalt. It’s solubility in water is around five times that of calcium. Calcium and Magnesium together cause the hardness of water. The Magnesium Hardness of study areas lies between 62-99, 61-98, 69-99 mg/l in pre-monsoon, monsoon, post-monsoon values are well within the the desirable limit.

Total Hardness is often referred to as the soap consuming property of water. Hardness may be divided into two types, carbonate and non-carbonate. Carbonates hardness includes portions of calcium and magnesium, and certain amount of bicarbonates. The Total Hardness of study areas lies between 204-259, 202-250, 216-268 mg/l in pre-monsoon, monsoon, post-monsoon values are well within the desirable limit.

The higher values of Phosphate are mainly due to use of fertilizers and pesticides by the people residing in this area. If phosphate is consumed in excess, phosphine gas is produce in gastro-intestinal tract on reaction with gastric juice. This could eve lead to the death of consumer. The Phosphate of study areas lies between 1.5-4, 1.2-3.7, 1.54-4.30 mg/l in pre-monsoon, monsoon, post-monsoon values are well within the the desirable limit.

Nitrate nitrogen is one of the major constituents of organisms along with carbon and hydrogen as amino acid, protein and organic compounds present in the bore well water. This may be due to the excess use of fertilizers and pesticides in this area. The Nitrate of study areas lies between 16-28, 15-26, 20-28 mg/l in premonsoon, monsoon, post-monsoon values are well within the desirable limit.
Domestic and agricultural seepage responsible for the higher level of sulphate in the ground water. The sulphate of study areas lies between in 105-191, 1.4-181, 105-200 mg/l premonsoon, monsoon, post-monsoon values are well within the desirable limit.

The Chloride ion is predominant natural form of chlorine and is extremely soluble in water. The major sources of chloride in natural water are sedimentary rocks particularly evaporates. Other sources are industrial and domestic wastewater. The Chloride of study areas lies between 79-156, 70-146, 79-160 mg/l in premonsoon, monsoon, post-monsoon values are well within the desirable limit.

The main source of fluoride in the ground water is fluoride bearing rocks from which it get weathered and/or leached out contaminated the water. The fluoride of study areas lies between 0.1-0.9, 0.12-0.97, 0.1-0.91 mg/l in premonsoon, monsoon, post-monsoon values are well within the desirable limit. This shows that all samples are existed between the desirable limit of BIS10500.

### Conclusion:

Finding of this study depict that quality of bore well water varies from place to place and based on the nature of human activities & human structural concentration. In this study all parameters were found within permissible limit except turbidity due to geological strata of the study area.

<table>
<thead>
<tr>
<th>PARAMETERS / UNITS</th>
<th>PRE-MONSOON</th>
<th>MONSOON</th>
<th>POST-MONSOON</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6.4-7.8</td>
<td>6.1-7.6</td>
<td>6.6-7.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>PRE-MONSOON</th>
<th>MONSOON</th>
<th>POST-MONSOON</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC (µmhos/cm)</td>
<td>160-399</td>
<td>150-390</td>
<td>161-399</td>
</tr>
<tr>
<td>TURBIDITY (NTU)</td>
<td>6.0-14.0</td>
<td>5.0-13.0</td>
<td>9.0-14.5</td>
</tr>
<tr>
<td>ALKALINITY (Mg/l)</td>
<td>165-425</td>
<td>161-421</td>
<td>190-425</td>
</tr>
<tr>
<td>CALCIUM HARDNESS (Mg/l)</td>
<td>135-171</td>
<td>132-169</td>
<td>140-179</td>
</tr>
<tr>
<td>MAGNESIUM HARDNESS (Mg/l)</td>
<td>62-99</td>
<td>61-98</td>
<td>69-99</td>
</tr>
<tr>
<td>TOTAL HARDNESS (Mg/l)</td>
<td>204-259</td>
<td>202-250</td>
<td>216-268</td>
</tr>
<tr>
<td>PHOSPHATE (Mg/l)</td>
<td>1.5-4</td>
<td>1.2-3.7</td>
<td>1.54-4.30</td>
</tr>
<tr>
<td>NITRATE (Mg/l)</td>
<td>16-28</td>
<td>15-26</td>
<td>20-28</td>
</tr>
<tr>
<td>SULPHATE (Mg/l)</td>
<td>105-191</td>
<td>1.4-181</td>
<td>105-200</td>
</tr>
<tr>
<td>CHLORIDE (Mg/l)</td>
<td>79-156</td>
<td>70-146</td>
<td>79-160</td>
</tr>
<tr>
<td>FLUORIDE (Mg/l)</td>
<td>0.1-0.9</td>
<td>0.12-0.97</td>
<td>0.1-0.91</td>
</tr>
</tbody>
</table>

Table No.2 - Physicochemical analysis of parameters in 2012.

### References:

3. Kar, D.K & Sahoo, H.K ( 2012. ) Hydro geochemical evaluation and ground water pollution studies around kalinganagar industrial complex, odisha Env.geochemistry (ISSN 0972-0383), Vol.15, No.1, pp. 25-30,

