WATER QUALITY IN RAJASTHAN: ISSUES AND CHALLENGES

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RAJASTHAN

It covers an area of 342,239 square Kilometers with 33 districts

Also known as the gateway of thar desert as most of the northwestern part of Rajasthan is covered by thar desert

Famous for its printed textile in various forms like, *sanganeri* prints, *bandhej*, block prints etc.

Largest producer of marble and limestone
MAJOR ISSUES

Scarcity of surface and groundwater

High TDS in groundwater

High Fluoride Content in groundwater

Heavy metal contamination in surface and groundwater
### Fluoride Contamination

| 16,560 fluoride endemic habitation | 50% districts are highly affected by fluoride | It ranges between 0.03 ppm to a high as 82 ppm in most of the places in Rajasthan | Prevalence of Fluorosis is reported in more than 45% of population of Rajasthan |
CAUSES FOR HIGH FLUORIDE

• Presence of rocks like Pegmatite, Gabbros etc. containing minerals like Fluorspar, Fluorite, Lepidolite, Tremolite

• Presence of calcite and dolomite which accelerate the leaching of fluoride to the groundwater

• The arid climate with high evaporation and insignificant natural recharge increase fluoride concentration in the groundwater
HIGHER AFFECTED REGIONS

Northern Region
Jaipur

Southern Region
Bhilwara and Bundi

Eastern Region
Dausa

Western
Ajmer
EFFECTS OF FLUOROSIS

Rural people are highly affected due to lack of information and reach of technology
High Total Dissolved Solids

- Aquifer structure in most places of Rajasthan affect the quality of water with respect to hardness, alkalinity and TDS

- Mineral composition of aquifers is Ca-Mg Cl SO4 NO3 type

- Thus Sulphate, Calcium, Magnesium, Chloride and nitrate ions are dominant increasing the Hardness, Alkalinity and TDS of water
Rajasthan has clusters of textile printing units emitting wastewater containing dyes leading to heavy metal pollution of surface and groundwater.

*Jaipur, Pali* and *Bhilwara* are the major hubs of textile printing units in Rajasthan.
WATER QUALITY ISSUES IN SELECTED DISTRICTS OF RAJASTHAN
JAIPUR

Capital city of Rajasthan known as the PINK city

Famous for Sanganeri block print textile
A cluster of 865 Textile printing units in Sanganer area of Jaipur
MAJOR ISSUES

• Large quantities of wastewater generated from the textile printing units

• Effluent Treatment plants are of low capacity as compared to the wastewater generated

• Wastewater disposed off without treatment in to Amahnisha Nalla
AMAHNISHA NALLA

- Amahnisha Nala runs approximately 35 km across the city of Jaipur

- In 1874 water of *Amanishah Nala* supplied to Jaipur city through network of pipeline

- Soon after the damming of the *Amanishah Nala*, low inflow and silting of the dam reduced its capacity but was still a source of surface water transporting water through a canal and collecting this water into kunds

- At present drainage canal with cocktail of chemicals
Untreated Wastewater directly dumped into *Amahnihsha nalla* by textile units
Polluted water in *Amahnisha nala*
Various studies on Wastewater analysis from *Amahnisha nalla* shows high levels of toxic metals

<table>
<thead>
<tr>
<th>Metal</th>
<th>Concentration</th>
<th>Permissible limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>2.01-6.35 mg/l</td>
<td>0.1 mg/l</td>
</tr>
<tr>
<td>Zinc</td>
<td>3.5-5.8 mg/l</td>
<td>5.0 mg/l</td>
</tr>
<tr>
<td>Chromium</td>
<td>4.5-7.63 mg/l</td>
<td>0.05 mg/l</td>
</tr>
<tr>
<td>Cadmium</td>
<td>2.3-8.62 mg/l</td>
<td>0.05 mg/l</td>
</tr>
<tr>
<td>Copper</td>
<td>5.1-7.54 mg/l</td>
<td>1.0 mg/l</td>
</tr>
</tbody>
</table>

## EFFECT OF HEAVY METALS ON HUMAN HEALTH

<table>
<thead>
<tr>
<th>METAL</th>
<th>EFFECTS</th>
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</table>
| Cadmium    |  - Kidney Damage  
            - Adversely affects the production of progesterone and testosterone  
            - Bone Damage(low grade of bone mineralization, high rate of fractures, increased rate of osteoporosis, and intense bone associated pain  
            - Carcinogenic                                                                 |
| Chromium   |  - Hexavalent chromium is a human carcinogen  
            - Chronic exposure causes adverse effects on Liver, Kidney, gastrointestinal and immune system  
            - Mutagenic                                                                 |
| Nickel     |  - Mutagenic  
            - Interfere with the metabolism of iron, calcium, magnesium, or manganese to produce its toxic  
            - Carcinogenic                                                                 |
| Lead       |  - Encephalopathy in children  
            - Peripheral neuropathy, chronic nephropathy, and hypertension in adults  
            - Adversely affects gastrointestinal, immune, skeletal and reproductive system  
            - Disrupts heme biosynthesis  
            - Carcinogenic                                                                 |
“Groundwater near Amahnisha Nalla not fit for irrigation”

“Vegetables grown in 20 km area near amahnisha nalla contains toxic metals (poison)”
Pumps used to apply wastewater directly from the Amahnisha nala in the agricultural Fields
Agricultural fields near Amahnisha Nalla
INDUSTRIAL WASTEWATER

- Wastewater directly used for agriculture
- Heavy metals are transferred to higher trophic levels
- Groundwater contains toxic chemicals
- Soil is losing its fertility due to toxicity caused by metals
- Coloured water in wells and handpumps near textile printing units

Groundwater contains toxic chemicals

Soil is losing its fertility due to toxicity caused by metals

Coloured water in wells and handpumps near textile printing units

Heavy metals are transferred to higher trophic levels
Common vegetables like Spinach, Brinjal, Mint, Lady Finger grown on waste water irrigated agriculture fields

Concentration of heavy metals like Pb, Cr, Ni found above permissible limits in vegetables
BHILWARA

Bhilwara is a city in the Mewar region of Rajasthan

Also known as manchaster of Rajasthan

About 500 synthetic textile units in outskirts of bhilwara on chittorgarh, Gangapur and Mandal road which are the main water guzzelers
• 500 units require 24.80 million liters of water per day (Mewar Chamber of Commerce and Industry)

• Processing units use around 80% of water

• Untreated wastewater is disposed in the nearby Kothari river
• According to a study conducted by PHED, open wells in the villages near the Kothari river flowing besides industrial belt showed high levels of Chromium, Lead, Iron Zinc and Sodium much above the permissible limits set by Bureau of Indian standard.
• Effluent treatment plant are non functional as the treatment costs approx Rs. 4.5 lakh per day for three stages of effluent treatment

• Untreated effluents are dumped in the Kothari river

• After order of Zero discharge from Rajasthan pollution control board eucalyptus trees are grown in the area using untreated waste water thus injecting the wastewater in ground
Partially treated wastewater in Kothari river
Toxic effluent released from the textile units in Kothari river
Toxic effluents allowed to percolate through the sandy bed
Distribution of Cr in the industrial belt of Bhilwara, Rajasthan (GSI report, 2014)
Distribution of Na2O in the industrial belt of Bhilwara, Rajasthan (GSI report 2014)
Distribution of Zn in the industrial belt of Bhilwara (GSI Report 2014)
• Water in open wells have turned blue green in colour and water from hand pumps have smell and taste of chemicals(CSE report 2014)
Polluted ground water is not anymore used by the industries itself due to its poor quality.

Industries get water from outside city in tankers.
HIGH PREVALENCE OF HEALTH ISSUES

- Gastroenteritis
- Stomach disorders
- Skin diseases
Pali district is 70 km east of Jodhpur and on the bank of Bandi river

11,562 registered textile printing units in Pali

Common effluent treatment plant of capacity 34.86 million liters a day is installed for treating alkaline effluent
Due to changing market trends industries replaced cotton fabric with synthetic fabric. Effluent thus became acidic in nature which could not be treated in the existing CEPT.

Untreated wastewater discharged in the seasonal river Bandi and Nehra dam with no flow in lean period.

Wastewater has contaminated groundwater along adjacent banks of Bandi river up to 55 km downstream (CSE report 2014).
• Chloride, sulphate, dissolved soilds and heavy metals (lead, arsenic, chromium and nickel) above permissible limits (CSE report 2014)

• Chloride ions ranged between 1027 to 2020 mg/l and fluoride ranged between 2.1-3.6 mg/l in Bandi river
# Water quality of wastewater from textile industry in Pali

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Concentration</th>
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<tbody>
<tr>
<td>ECµS/cm</td>
<td>8210</td>
</tr>
<tr>
<td>BOD mg/l</td>
<td>28.4</td>
</tr>
<tr>
<td>COD mg/l</td>
<td>314</td>
</tr>
<tr>
<td>Cl⁻ mg/l</td>
<td>1507</td>
</tr>
<tr>
<td>NO₃⁻</td>
<td>405</td>
</tr>
<tr>
<td>SO₄²⁻</td>
<td>1540</td>
</tr>
</tbody>
</table>

Source: Rathore, J (2012)
Pali textile units have turned water toxic, unusable: CSE
Polluted *Bandi* River at Pali
“Poisonous water flowing in the Bandi river”
NEED OF THE HOUR

• Development of low cost effluent treatment plants
• Cost effective Technologies for use of natural dyes in textile printing industries
• Development of technologies for remediating the polluted surface and ground water
BIBLIOGRAPHY

• CSE Study: Evaluation of Water Pollution due to Textile Industries in Pali, Rajasthan (2013)
• Rathore, J (2012). Studies on pollution load induced by dyeing and printing units in River Bandi at Pali, Rajasthan, India International Journal Of Environmental Sciences volume 3(1)
• The Times of India, City (2015). 893 textile units in Sanganer, Jaipur served closure notices.
• The Times of India. (2014). Over 500 textile units in Pali pollute water
THANK YOU