



**Project Completion Report:**  
**Jodhpur, Pali, Balotra Industrial Waste Management**



**Project Details:**

Location	Jodhpur, Pali and Balotra Rajasthan, India
Contaminant	Industrial Byproducts in the Water, Soil, and Underground Aquifers
Project Duration	August 2008—November 2009
Project Cost	\$15,000
Implementing Partners	Centre for Environment Education

**Performance Metrics:**

Toxin	Dye and Printing Byproducts
Affected Population	Jodhpur—846,408 Pali—187,571 Balotra—61,724

## ○ **Background and Scope:**

Textiles form an important economic sector in Rajasthan. In April 2008, Blacksmith Institute and the Centre for Environment Education (CEE) assessed Pali, Jodhpur and Balotra. They are cities in the western part of Rajasthan State, which is the biggest bloc of manual processing, textiles, dyeing and printing industries. Various mechanical processes and chemical/synthetic dyes are used and considerable wastewater discharged from these textile units contains about 20% of the dyes, which has caused degradation of water quality in this water-scarce, semi-arid region of the country. The synthetic dyes used are designed to resist bleaching by UV-light and chemicals to improve the quality of the textiles, and as such, are persistent in the environment as well. Some can be biologically modified into carcinogenic compounds.

During the initial visits, the following pollution related problems were noticed:

- 1) The seasonal rivers/surface water bodies such as Jojari in Jodhpur; Bandi in Pali & Luni in Balotra are at the receiving end of wastewater discharges from these industries and untreated or partially untreated wastewaters from the Common Effluent Treatment Plants (CETPs).
- 2) The contaminated soils surrounding the canals carrying wastewater to the CETPs or illegally bypassing and used for irrigating the nearby agricultural areas. A few dumps of untreated sludge were also reported.
- 3) The untreated acidic effluents from the industries and CETP have leached much below the surface and have also contaminated underground wells and aquifers in the surrounding villages.

**Jodhpur:** Jodhpur is the largest district in Western Rajasthan with a population near 900,000. There are 21 Industrial areas at different places, which have been developed and managed by Rajasthan Industrial Infrastructure Corporation (RIICO). There are 16 large & medium scale units and 19,539 small scale and cottage industrial units registered with District Industries Center. There are near 215 Total Textile Industries in Jodhpur. The textile industries of Jodhpur mostly deal with screen-printing processes. The finished products in 60% of industries are printed fabric, whereas 40% have dyed and bleached fabrics. There are other industrial units in the area engaged in manufacture of cement, industrial gases, textiles, derivatives of Gaur Gum, chemicals, plastics, electronics, electrical, mineral based, etc. There are 62 rolling mills engaged in processing stainless steel Sheets and Patta. There are also large number of handicraft units engaged in production of items of white metal, wooden toys, and decorative luxury items. A large number of artisan-based industries are engaged in screen-printing of cloth, shoe embroidery, dyeing and printing of clothes, salt making, etc.

### ***Pali:***

Pali is the administrative block of Pali District, situated at the banks of Bandi River, about 72 km from southeast of Jodhpur. There are 3,422 industrial units in Pali District. The industries established in Pali are based on agriculture, mineral-chemical processing, construction materials and leather. Major identified units however are tie and dye, textile processing and chemical industrial wastes are the main sources of the water pollution, industrial wastes are discharged into drains and finally into the Bandi River. As a result, the river water has an organic, pungent smell, dark color, high alkaline pH, very low

dissolved oxygen, high BOD and COD, and high amounts of total suspended, dissolved, and volatile solids. The wastewater in the drain also contains phosphates, sulphates, sulphides and chlorides.

**Balotra:**

Balotra is a city in Barmer district, about 100 km from Jodhpur. The industrial estate developed by RIICO at Balotra has been demarcated in three distinct sections. All these sections have approximately 800 industrial units. The majority of the industries practiced are cotton textile processing units, comprised mainly of dyeing and printing factories. This leads to the generation of large quantities of wash water, which is polluting both the water and soil in the area. Balotra Water Pollution Control & Research Foundation Trust was established during September 1995 for the purpose of construction, operation and maintenance of the Common Effluent Treatment Plant (CETP) in the territorial jurisdiction of Balotra Municipal Board. There are 4 CETP in Balotra. Their capacity is as under:

Jasol-2.5mld  
Bithuja-30 mld  
Balotra-12mld, 6 mld

About 40-45 industries affiliated with CETP-I and II have converted to synthetic processing in lieu of cotton processing, and as a result, their effluent has gotten more acidic. Since the present CETPs are not able to process such acidic effluents, small drains are dug which pours into the Luni River directly. About half a million families in Balotra are affected due to contamination from effluent. The contaminated water has destroyed various crops like jowar, wheat, vegetables, and fodder, which all used to grow earlier.

○ **Solution Implemented:**

The initial strategy of the project was to involve key players (industries, regulators, researchers, and local representatives) in the region to form a stakeholder group that would periodically consult and assess the area, identifying the pollution related issues and then establishing strategies to solve the problems. Hotspots of dumping and active contamination were identified, which could be worked on through certain remediation efforts. The various approaches for remediating previously contaminated soil to make it usable for safe agricultural practices had also been discussed with stakeholders.

Questionnaires were developed to understand the point--sources of pollution and to prepare the economic profile of the cities under examination. The processes and raw materials in steel and textile industries, the most water-involved industries, were also analyzed. Complete processing of various CETP was also studied under the project. The non-point sources of contamination, i.e. the household dye industries, were also studied to analyze the extent and magnitude of contamination through unregulated sources.

○ **Project Performance:**

**1)Stake-holders mapping & organization of Stake-holders groups**

Stakeholders from various departments were invited, communicated and contacted for their active participation in the endeavors of the project for suggestion and sharing views on remediation of environmental degradation caused by indiscriminate contamination of water and soil by industrial units, CETP's and household cottage industries in the study

2014 5<sup>th</sup> Avenue, New York, NY 10001—t: 212.647.8330—f: 212.647.8334

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area. The following were the stakeholders involved:

- Pradusan Nivaran Trusts (CETP) of Jodhpur, Pali and Balotra.
- Industrial Associations of Jodhpur, Pali and Balotra
- Marudhar Industrial Association Jodhpur. And Pali
- The Rajasthan Stainless Steel Re-Rolling Association-Jodhpur. Textile Association, Jodhpur
- Rajasthan Textile Hand Processors Association, Pali
- State Pollution Control Board (SPCB & R.O.) at Jodhpur and Pali
- Municipal Corporation Jodhpur (J.D.A.), Pali and Balotra
- Central Arid Zone Research Institute
- Arid Forest Research Institute
- Desert Medicine Research Centre
- Public Health and Engineering Department, Jodhpur and Balotra.
- Sambal NGO, Jal Bhagirathi Foundation, Kisan Paryavaran Sangharsh Samiti
- Animal Husbandry Department
- Agricultural Department
- State Remote Sensing Department, Jodhpur
- Universities J.N.V.U., KN College, Lachoo Collge of Science & Technology, M.B.M. Engineering College-Jodhpur.

○ **Outcomes and Follow Up:**

Parameters	Pali	Balotra	Jodhpur
<b>No. of CETPs</b>	4	3	1
<b>Industries Catered</b>	500	614	343
<b>Plant</b>	Treatment P/S, Pilot RO	P/S	P/S (Tertiary RO Plant planned)
<b>Scale of Catered Industries</b>	Medium/Small	Small	Medium/Small
<b>Capacity</b>	I—5.2 MLD II—8.4 MLD III—9.08 MLD IV—9.0 MLD	I—6.0 MLD II—12 MLD III—30 MLD IV—2.5 MLD	12 MLD
<b>Operational</b>	I—1883 II—1997	I—1991 II—2006 III—Dec. 2006	Dec. 2004
<b>Area</b>	25,000 sq meters	I & II—35,000 sq meters III—60,000 sq meters	9 acres
<b>Establishment Cost</b>	I—4,900,000 INR II—5,000,000 INR	I—3,000,000 INR II—7,000,000 INR III—11,500,000 INR	10,000,000 INR
<b>Running Cost</b>	3,800,000 INR/month	1,800,000 INR/month	2,200,000 INR/month
<b>Solid Waste</b>	I&II—8-10 tons/day	8-10 tons/day	15 tons/day

<b>(Dry)</b>	III—3 tons/day		
<b>Disposal of Solid Waste</b>	Ramky's secured landfill, cement industry	Ramsky's secured landfill	Ramky's secured landfill
<b>Cost of Disposal</b>	900 INR/metric ton	900 INR/metric ton	900 INR/metric ton
<b>Liquid Waste</b>	12-13 MLD	18 MLD	11 MLD
<b>Color of Effluent</b>	Light Green	Light Green	Light Brown
<b>Final Disposal of Treated Effluent</b>	River Bandi	Luni River	RICCO drains, which leads to River Jojari
<b>Water Used</b>	50,000 L/day	50,000 L/day	50,000 L/day
<b>Polyelectrolyte Used</b>	1 ton/month	NR	700 kg
<b>Chemicals Used</b>	1034 tons/month	NR	250 MT/month
<b>Training and Awareness of Pollution</b>	Yes	Yes	Yes
<b>Recovery of Metal/Chemicals</b>	No	No	No
<b>Water Reuse</b>	Yes	No	No
<b>Regular Environmental Testing and Monitoring</b>	Yes	NR	No
<b>Accident Reported</b>	Yes	No	No
<b>Use of Protected Gears</b>	Yes	Yes	Yes
<b>Health Problem to Workers</b>	No	No	Some complaints of irritation on eyes and skin while managing waste

This information is significant in highlighting the up-gradation of CETPs capacity to treat the wastewater, increase the efficiency, decrease the load of sludge, appropriate method of disposal of treated water and sludge and minimize/abolish contamination caused by it in the area. It also emphasizes the need of process modification, raw material substitution at the production levels.

### **3) Demo-workshop by Technical Expert using Bio-filter to remove heavy metals & colour from the effluent:**

A demo and workshop with all the stakeholders of the region was arranged after the organization of Stakeholder group and identification of pollution problems in the area.

The successful trials at lab conditions by the biofilter developed by IIT Kanpur were shared with the stakeholders from Jodhpur, Pali & Balotra jointly at one location. The response, especially from the industry, was so overwhelming that everyone agreed to do a trial at the Jodhpur CETP. Fresh sample testing of effluent & sludge from the CETPs from these 3 places were done and bio-sorbents were developed using some natural dyes waste to filter the heavy metals & reduction of color in the wastewater.

The filter were installed and tried at Jodhpur. Unfortunately, the high TDS (Total Dissolved Solids) in the wastewater lead to the choking of the filters, hence the failure of the experiments

#### **4) Study of Non-point sources of contamination conducted**

In Rajasthan, people have a fascination with colorful dresses, which were dyed and printed with herbal dyes by hand process in cottage industries. Now-a-days, mechanical process and chemical dyes are used, which generate pollution of water. At places like Pali, Balotra, Jasol, Bithuja Jodhpur, Sanganer & Bagru, there are concentrations of a large number of small scale units for textile dyeing and printing, where discharged water contains chemical pollutants rendering the surface water and groundwater unpotable and harmful for human consumption, as well as affecting the land close to the disposal points or those irrigated with contaminated water. These are small, illegal textile cottage industries, which are not even registered under the district industry centre. The effluent and contaminated, colored water generated by the single industry of such nature may be small, but considering the fact that these industries are numerous in all three areas of study, their extent of contamination to the ground water and other natural source of water through these non point source can not be ignored.

#### **5) Assessment of 7 contaminated villages from the Industrial Effluents**

The population of the studied villages ranged from 1,200 to 100,000. The average number of wells contaminated in Pali villages surveyed was reported around 68, that of Balotra were in the range of 1,700, whereas in Jodhpur the averages were about 25.

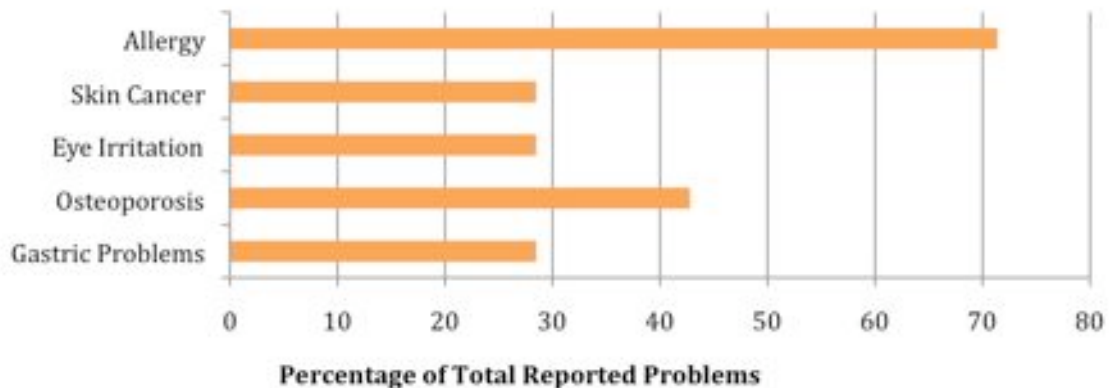
The villages surveyed were spread to a distance of 0.5 to 13 kms from the industrial area (source of contamination) of their respective regions. Most of the wells of the surveyed communities were used for irrigation and bathing/washing purposes, not as drinking water. The communities of the regions complained of suffering from allergies, cases of skin cancer, and eye irritation after using the contaminated well water. Osteoporosis and gastric diseases were also reported common ailments in the affected communities.

In Pali, the villagers reported to have around 13,500 hectares of land contaminated by industrial effluent, whereas in Balotra around 400 Bigha of land have been contaminated and made useless for agriculture because of polluting industrial effluents. None of the community is at present planting vegetables for commercial purposes. The communities of Pali and Balotra have reported that their agricultural production/yield has decreased to a highest extent over last 15 years, but in the case of Sangria village at Jodhpur, the communities mentioned increase in wheat production after using the industrial effluent for irrigation purpose. The community of the Balotra and Pali were very much upset with the government's passivity in solving their problem and compensating the losses of

agriculture/wells.

The High court has directed the state government to conduct a survey of the extent of health and land losses being incurred by the affected villages. The Government has given this task to National Productivity Council, but the report is not heard of at present. Few of the community leaders have filed RTI (Right to Information Acts) to know on the status of the report and the outcome of the study.

## Reported Health Problems from Contaminated Water



### **6) Training & education for community awareness:**

Various community meetings has been held in the Sangria, Nagori gate and Tanawara village of the region to make the community aware of the health impacts of the industrially contaminated water and the need to report the same to the health authorities. The education material in Hindi/local language is being developed for the cottage dye industries' workers. The education material aims at bringing the awareness of the worker to the kinds of dye they use, their chemical constituents, and possible health and environmental impacts of these dyes.

The biggest achievement of the project has been the meeting of all concerned at one forum and agreeing to address the pollution problem in the area in a collaborative manner. During the formal meetings, many ideas & technically feasible solutions for various problems were discussed not only by the technical experts from Institution but also the government regulatory body. A couple of project proposals were also submitted and need to be discussed further with our TAB.

The stakeholders especially the Industry has requested for the following:

- Metal recovery from the waste stream
- Acid recycle and reusing process
- Alternative process/ technology for pickling/annealing
- Waste minimization
- Process modification
- Durability of pickling bath
- Cutting down the cost/consumption of acid
- Effective way of sludge utilization