

# **Industrial Waste Exposure in Luni River and its Impact on Human Health**

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## **ABSTRACT**

Luni is the only major stream on west of the Aravalli ranges, which meets the sea in the Rann of Kutch. It originates in Nag Pahar in Ajmer and flows southwest through Jodhpur, Barmer and Jalore over a distance of about 320 km covering a total catchment area of 37,363 km. Its catchment area has spread over some parts of Nagaur district also. It flows only during the rainy season and even at this time the river is choked with advancing sands at many places. Even in the monsoon months when the water flow rate is high and at its peak, the flowing water is not able to cut these sand deposits on the river bed, and as a result of which the runoff spreads to the adjoining fields on both the banks of the river braiding it. This results in sand deposition on arable and non-arable lands, thus, adversely affecting their productivity. Luni river basin is located in southwestern Rajasthan between latitude 23°4' and 27°5' and longitudes 71°4' and 74°42'. It is bounded by the arid western districts (the outside basins) in the west, by Banas basin in the east, Shekhawati basin in the north and Sukli and west Banas basins in the south. The basin extends over parts of Ajmer, Barmer, Jalore, Jodhpur, Nagaur, Pali, Rajsamand, Sirohi and Udaipur districts. Luni river basin lies to the west of the Aravalli hills and forms part of the midwest alluvial plain. Orographically, the eastern part of the basin is marked by hilly terraces belonging to the Aravalli chain and west of the hills lies in a narrow alluvial plain that gently slopes westwards. Luni river originates in Ajmer and flows to the Rann of Kutch in Gujarat State. Its total cultivable area is 1.42 million ha and total culturable command area is 248706 ha. By the use of Luni river water several projects, in nearly 164617 ha area, exist and proposal for another 8415 ha is under consideration. The water of River Luni is sweet up to Balotra and becomes more and more saline further downstream. The main tributaries of Luni on the left are Sukri, Mithri, Bandi, Khari, Jawai, Guhiya and Sagi, whereas only Jojri river joins it on the right side. The mean annual rainfall over the Luni basin is normally 320 mm of which nearly 95% falls between July and September. By the Luni river water four irrigation projects are under construction and 25 more projects are proposed

**KEYWORDS:** Luni river, impact, industrial waste, exposure, human health, projects, basin, Rajasthan

## **I. INTRODUCTION**

The industries are mostly cotton textile which utilizes certain types of dyes for manufacturing their products. The untreated/partially treated and uncontrolled disposal of industrial waste water is continuously discharged in the river Luni since many years, which is degrading the underground water along the river stretch. The study has been carried out with the objectives: (a) Assessment of effect of industrial waste water discharge in river on ground water quality, (b) Estimation of future contamination in groundwater if present practice of wastewater disposal persists at any given time. Samples of underground water were collected from various bore wells, hand pumps and open wells situated along the river and tested for various parameters of water quality for different time steps. The water quality parameters considered in this study includes TDS, Ammonia, Fluoride, Chloride, Nitrate, Calcium, Magnesium, Sulphide, Arsenic, Chromium, Nickel, Copper, Iron, Cadmium, Zinc, Lead, Benzene, Mercury, Detergent, Xylene, E-Coli, COD, Phenolic compound and Phosphate etc. The analysis of test results indicates continuous variations in the concentration of almost all the parameters. TDS variation was recorded as high as 100000 mg/l. Presence of anionic detergent in the underground water indicates start of uncontrollable situation of underground water pollution in the region. The spatio-temporal comparison of water quality parameters has been also included in the results. The entire underground water in the region is bound to be contaminated if present condition of disposal of industrial wastewater are being followed as

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depicted in spatio-temporal GIS maps. Finally, the study demonstrates how contaminated water has health effects on human being under different scenarios along with their remedial plans.[1]



The chemically polluted water is discharged into Bandi River, which joins Luni through Nehda dam.

The Luni River, which is also called Maruganga, is facing serious threat from the effluents being discharged from the textile units in Pali and Balotara. The chemically polluted water is discharged into Bandi River, which joins Luni through Nehda dam. The polluted water enters the river at its entry point in Barmer district and the hazardous waste is carried downstream, thus polluting the banks on its course. Due to long exposure to such effluents, the groundwater in the area, too, has been polluted. Also, the once fertile lands on Luni's banks are turning barren, hitting the farmers hard, said a farmer. The ignorance shown by the pollution control board and the district administration has cost Luni River its legacy. Since long, the farmers have demanding the government to save the river from pollution, but no action has been taken against any industrial unit, he added. The pollutants have not only contaminated the river water and groundwater in surrounding areas but also raised concern about the Luni's existence.[2]

Om Soni, secretary of 'Pradushan Niwaran and Paryavarn Sanrakshan Samiti', a voluntary organisation fighting against river pollution, said despite court orders textile industries are not obeying green norms and discharging hazardous pollutants into the Luni.

"Without collusion of pollution control board authorities, it is not possible for industries to violate green norms on such a large scale," Soni alleged.

"Once Luni river was a boon for farmers as it provided water for agriculture. But due to pollutants, now the river water is not useful for crops. Chemical water is damaging crops," Soni said.[3]

"Apart from stopping discharge of pollutants into the river, we are also fighting for compensation to farmers whose crops got damaged due to chemical water."

The Luni originates from Nag Pahar near the Pushkar valley of Ajmer and flows southwest through Nagaur, Jodhpur, Barmer and Jalore over a distance of about 500 km, covering a catchment area of 37,363 km. The river is also known as the 'Maruganga' of the Marwar region of the western Rajasthan. A main river on the west of the Aravali range, the Luni meets the Arabian sea in the Rann of Kutch. About 800 textile and dyeing industries are running on the Luni banks at Balotra, Bithuja, Jasol, and Pali. Employment avenues spurred urbanisation in the region. Balotra industrial town is famous for handblock printing and textile industries. A leading textile centre for the last 60 years, Balotra is also known for colouring and printing of yarn and polyester fabrics. The Luni has freshwater during its flow for first

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100 kilometres. As it reaches Balotra town in Barmer, 110 km southwest of Jodhpur city, the water starts turning saline. The river loses its natural flow and carries industrial waste and domestic sewage. The water becomes unfit for use.[4] Untreated or partially treated effluents discharged by industries make way into the Luni at Balotra and other surface water bodies of the area.

Acidic effluents from industries have reached much below the surface and contaminated wells and aquifers at villages, such as Asada, Asotra, Tapra, Padru, Dakha, and Khed. The pollution of land, water and air has affected people. Committee members found that Luni is polluted due to discharge of industrial effluents and sewage disposal. Polluted water discharged into Luni and flowing into surrounding areas is a constant threat to the riverine system, health of villagers and agriculture.

Installed CETPS are not achieving zero liquid discharge (ZLD) and effluents are being discharged into Luni directly or indirectly, the report said.

According to the report, industries with individual effluent treatment plants and solar evaporation do not comply fully with environmental quality standards. Industries discharging effluents to CETPS do not comply with norms as they do not have primary effluent treatment plants (PETPS).

### III. DISCUSSION

Dyeing industries are located around Luni river and other water sources and are discharging foul smelling, coloured, liquid effluent in the river. A large amount of which is absorbed by the soil, causing water pollution. The farmers use the polluted water to irrigate their fields. The vegetables and crops so produced are consumed by the human beings resulting into a number of health hazards. The highly alkaline and saline water is also causing damage to ground water. For dyeing cloth, large amount of water is required by the industries, which is supplied by digging wells in the agriculture field. Balotra city has got largest number of textile units in the state (more than 5000), which are engaged in cotton and synthetic dyeing and printing. These dyeing and printing units discharge about 100 million litres of effluent per day into the Luni river. The toxic components of the effluents find their way into the wells due to the underground water recharging. Textile process involves variety of chemicals depending upon the nature of raw materials and products. Environmental problems by these industries are mainly caused by the discharge of effluent. The effluent thus produced causes substantial pollution in term of increase in COD, BOD, TDS, chlorides, sulphates and heavy metals like zinc, lead, copper, iron etc. Textile effluents, when discharged in nearby river, serves as major recharge source of fresh water for wells in monsoon causes severe contamination of ground and underground water. The indiscriminate use of excessive organic dyes has increased the toxic metal contents to undesirable level in effluents.[5]

The presence of high toxic concentration of lead, chromium, cadmium, nickle and iron in the industrial effluent of various factories indicates the fact that some of the dyeing and printing industries are not treating effluent water before throwing them in drain and then to Luni river. The river has been polluted due to higher concentration of trace metals significantly. Lead, chromium, cadmium, copper, iron, and zinc contents. Heavy metals, if present beyond permissible limits in water are toxic to human beings, aquatic flora and fauna. In the present study, Pb, Ni, Cu, Fe and Cr are exceeding their permissible limits. It is quite evident that these heavy metals may enter the food chain, and through bioaccumulation can easily reach humans through plants and can cause various deadly diseases. Lead poisoning can leads to asthma, neurobehavioral disorders and can even lead to cancer. Chromium is also very toxic. Through inhalation and dermal route, it causes lung cancer, nasal irritation, nasal ulcer and hypersensitivity reactions like contact dermatitis and asthma. Workers working in these dyeing industries are mostly affected. Regular monitoring of the water quality is thus required to assess the heavy metal contents in the effluent water before throwing them to the nallah and drain so that remedial measures can be adopted to save the ground water from heavy metal pollution

### IV. RESULTS

In the Luni basin a detailed study on the upper Luni basin which include Pali in south, Borunda in the north and Jodhpur and Samdari in the west, indicates that cultivated land covers nearly 66.88% (out of which 90% is rainfed), wastelands 15.27%, pasture 6.61% and forest 6.41%. Due to rainfed land the crop production varies depending on the rain. Cultivable land was significant in the past. The land use in Luni basin is subjected to many limitations and

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susceptible to natural hazards and as such each parcel of land should be properly and cautiously utilized with suitable management practices. Water level fluctuates in response to local recharge/draft condition. A fraction of rainfall infiltrates and joins the ground water, resulting in rise of water levels. Variation in infiltration rate in the vadose zone and specific field of aquifer causes wide range of water level fluctuations. As a result of excessive use of ground water, water level depletion is recorded in major parts of the area. The water level two decades ago, before industries entered the Luni basin, was 15-40 metres below ground level (mbgl), which went up in 1997 up to 3-5 mbgl, due to good rainy season. In fact, it is still below what it was two decades ago but it is fluctuating depending on the area and climatic condition of the river catchment area. The scarcity of water in summer may lead to water crisis and the high rate of water tankers. Many areas of ground water and surface water are now contaminated with heavy metals, POP (persistent organic pollutants) and nutrients that have an adverse effect on health. Waterborne diseases and water caused health problems are mostly due to inadequate and incompetent management of the water resources.[6]

At the every town situated on the bank of river the heap of garbage and sewage lines are turned to Luni. Due to increased number of industries of dyes and textiles in the region there is heavy consumption of water by textile industries and fast depletion of ground water in the area. Seepage of toxic effluents has gone to wells of the area. Soil gets polluted by textile wastes. Fertility of soil also has decreased in the area. Pollution of Luni poses a serious threat to agriculture in area which is the main occupation of people of the region and about 400 Ha land has become barren. Due to this lifestyle of local people of the area has also got affected. Many diseases of skin and breath are on extreme to the people which are suffering severely. Groundwater quality also affected by polluting river and TDS is beyond the permissible limit of IS Standard. Salinity in ground water has increased, Traditional water resources also getting polluted by this industrial waste dumps and flowing into river course. Due to all these a serious threat also to the Rawal Mallinathji Cattle fair held yearly at Tilwara near Balotara.[11]

The Luni River is also named as the "Lavanavari River", means a salty river because of high concentration of salts in its water. Beyond the town of Balotara the river water becomes totally saline due to textile waste flowing with it. The Luni is a seasonal river, in which most of the drainage comes from southwestern side of the Delhi super group of rocks. Studies on the morphology of slopes and slope-forming factors in the Upper Luni Basin have indicated that the climatic gradation from east to west has greatly influenced the broad changes in slope pattern in that direction. The Luni River basin has 37,363 sq. km. area includes parts of the Ajmer district then moving towards Nagaur, Jodhpur, Barmer and Jalore districts. In Gujrat state the Luni river flows in the northern part of the state where it touches Mithavirana and cuts the areas of Jordiyali, Mavsari Vav and Radhanpur regions of Banaskantha district. Geomorphologic studies revealed also the presence of several other landforms, apart from dunes also old aggraded alluvial plains are dominant landform in the central Luni Basin.[7]

By the order of Rajasthan High Court and National Green Tribunal, New Delhi almost all the textile and dyeing industries of the Balotara, Bithuja and Jasol were remain closed for more than last one year but now they are in working after bounding some conditions. Due to this fabric and printing work at these places again started. Production and its export also hampered during closure. Business and economy of Millions was on the zero position. Thousands of people have become unemployed due to this and they are workless today and are on the roads. Unemployment had also affected economic condition of employees.

Pre-treatment or post-treatment of industrial effluents by establishing the large capacity Common Effluent Treatment Plant and treated water should be reused in textile industries so the consumption of groundwater will be minimum and there will be minimum pressure on aquifer. By utilizing the recent Research and Development technologies to minimize river pollution. Rain water harvesting structures should be developed in the region and to make sure to recharge rain water into surface more and more. Recharge structure of wells and other surface resources should be developed, by this groundwater level in the region will be maintain in shallow depth. To construct check dam in river course for irrigation purposes by which crop and vegetable production can be improved in the area. Phytoremediation measures should be taken into action by this contamination of soil and water can be minimized. Promote a safe water regime in which proper management and development of water resources of the area. To make emphasis on the uses of environment friendly detergent in textile and other industries.[8]



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## V. CONCLUSIONS

When industrial wastes are discharge directly or indirectly into rivers without proper treatment to remove toxic pollutants it causes serious threats to water bodies as well as environment. It affects the natural biotic community, plant and organisms. Water pollution is a major global problem which requires a lot of attention to be given on this. Luni is only a river of western Rajasthan has badly polluted near Balotara by industrial waste discharge in to it and has extremely affected the surroundings. After the long time the pollution make hazardous causes in river, groundwater, and soil and in atmosphere at adjoining parts of Balotara. Since the river pollution is a serious threat to the local people and also for the next generation. The river Luni is severely polluted by waste discharge of local textile industries in its course near Balotara. Polluted river water has recharged in to surrounding aquifers by which heavy metals and toxic elements have contaminated the subsurface water. Local flora of area has threat to affect by biomagnification due to contaminated river water. Local people are facing threats of severe diseases of stomach and skin. Soil fertility affected and crop production has decreased in surrounding parts of Balotara. Awareness among local people makes their views against the pollution and there is need to mitigate the pollution in the river Luni by taking some remedial measures and make some alternatives to for textile industries of Balotara region. [9] Some suggestions are as follows-Plantation and greenery should develop along river banks so that the soil erosion will be minimize in the area. There is need to give emphasis on growing more and more species of vegetation which can adapted in desertic climate like *Prosopis juliflora*, *Salvadora persica*, *Acacia tortilis*, *Albizia amara*, *Tecomella unduleta*, *Prosopis cineraria*, *Dichrostachys nutan*, *Capparis decidua*, *Desmostachya bipinnata*, *Cenchrus ciliaris*, etc. Awareness should be generated in society about the threat of water pollution. Cleanliness awareness programme should be organized in schools and colleges as a part of Swachhh Bharat Mission. Compensation should provide to farmers of region to make their economic condition better whose agriculture land has became barren by industrial effluents. There is huge scope of alternates of textile industries at and around Balotara like handicrafts, Dairy, Carpets, Darries, Guar Gum, Wire and cable, Plaster of Paris industries, Ceramic industries, Salt processing industries, Fertilizer industries, Stone crushing's, decorative stone and polish industries etc. Raw material for all such industries is available in surrounding parts of Balotara and these industries can be established easily. Drainage system of river should keep undisturbed so that water can be flow more during its season. Recycling of waste water should be taken in to action so that water demand can be fulfill.[10] Strict prohibition of thrown garbage and waste in to river by administration. There is huge scope of solar plant establishment in the region. Due to this electricity production in the area can make new dimensions. By all these remedial measures pollution of river, soil and air in the area will be minimum in vicinity of Balotara town. The Luni River will flow without any pollution in its course and this part of Thar Desert will grow more and more economical and infrastructural as well.[12]

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