

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal) | Impact Factor: 7.249|

Visit: www.ijirset.com

Vol. 8, Issue 10, October 2019

Luni Drainage System and Its Impact

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ABSTRACT: The Luni is the largest river in the Thar Desert of northwest India.^[1] It originates in the Pushkar valley of the Aravalli Range, near Ajmer, passes through the southeastern portion of the Thar Desert, and ends in the marshy lands of Rann of Kutch in Gujarat, after travelling a distance of 495 km (308 mi). It is first known as Sagarmati, then after passing Govindgarh, it meets its tributary Sarasvati, which originates from Pushkar Lake and from then on it is called Luni.^[2]

In 1892, Maharaja Jaswant Singh II of Jodhpur constructed Jaswant Sagar in Pichiyak village between Bilara and Bhawi of Jodhpur district. It is one of the largest artificial lakes in India and irrigates more than 12,000 acres (49 km²).^[2] It is one of the internal drainage rivers in India; it does not meet with Arabian Sea. It is drained before it reaches the Arabian Sea.

KEYWORDS: Luni, drainage, system, impact, thar, desert, Arabian, sea

I. INTRODUCTION

The Luni is also known as the Lavanavari or Lavanavati, which means "salt river" in Sanskrit, due to the high salinity of its water.^[2]

Overview

The Luni River basin is 37,363 km², which includes all or part of the Ajmer, Barmer, Jalore, Jodhpur, Nagaur, Pali and Sirohi districts of Rajasthan and the Banaskantha and Patan districts of northern Gujarat. Its major tributaries are the Sukri, Mithri, Bandi, Khari, Jawai, Guhiya and Sagi from the left and the Jojari from the right.^[1]

The Luni River begins near Ajmer in the Pushkar valley of the western Aravalli Range at an elevation of about 550m. At this point, the river is also known as the Sagarmati. The river then flows in the southwest direction through the hills and plains of the Marwar region in Rajasthan. The river flows south-west and enters the Thar Desert before dissipating into the Rann of Kutch, traversing a total of 495 km. In spite of the high salinity, it is a major river in the region and serves as a primary source of irrigation. The Luni is not saline until it reaches Balotra,^[3] where high salt content in the soil impacts the river.^[1]

The Luni may have been the southern portion of the historic Ghaggar-Hakra river channel.^[1]

Tributaries

The Jawai, Sukri, Guhiya, Bandi and Jojari rivers are the main tributaries of Luni river. The Jojari is the only tributary that merges to the right-bank of the river while other 10 tributaries reach its left bank. All the tributaries except Jojari originates from the Aravalli hill.^{[4][5][6]}

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Dams and irrigation

The dams in Luni river are:^[4]

- Sipu dam
- Jaswant Sagar Dam - built in 1892 by Maharaja Jaswant Singh. It is one of the largest artificial lakes in India.

The two major irrigation projects on Luni river are Sardar Samand and Jawai dam.^[4] Sardar Samand dam was constructed in 1905.

Flash floods

Flash floods have occurred in the Luni river as the river flows on a shallow bed and the riverbank soil is easily flattened by the rain water.^[4]

The worst flood happened in 2006, when the desert region received heavy rain. The water levels rose to 15–25 feet submerging the surrounding region. The 2006 flash floods caused water levels to rise to as high as 15–25 feet submerging many parts along the river in the Barmer district. A large number of people and animals died in the flood.^[4]

In 2010, another flood occurred but there were less casualties.^[4]

Industrial Pollution Impact

The degradation of the Luni River's water quality is primarily attributed to the discharge of hazardous pollutants by textile industries located along its banks, including Balotra, Bithuja, Jasol, and Pali. The pollution has resulted in the loss of the river's natural flow, transforming freshwater into saline water as it reaches Balotra. This pollution not only affects the river itself but also contaminates groundwater and surface water bodies in the surrounding areas.

Efforts to Combat Pollution

Several individuals and organizations have been actively involved in combating the pollution of the Luni River. The 'Pradushan Niwaran and Paryavarn Sanrakshan Samiti,' a voluntary organization, has been at the forefront of the fight against river pollution. Their efforts include advocating for the enforcement of green norms, raising awareness about the issue, and pushing for compensation to farmers whose crops have been damaged due to contaminated water.¹

Legal Interventions

The National Green Tribunal (NGT) and the Rajasthan High Court have played significant roles in addressing the pollution problem. The NGT, in response to a public interest litigation, declared the Luni water unfit for irrigation due to pollution from textile dyeing units. The court ordered the shutdown of around 800 textile units for violating green norms, and subsequent assessments were conducted to monitor the situation.

Ongoing Challenges

Despite legal interventions and efforts by various stakeholders, challenges persist in addressing the pollution of the Luni River. Textile industries continue to discharge pollutants into the river, and encroachments in the catchment area exacerbate the problem. The lack of full compliance with environmental quality standards by some industries and the failure to achieve zero liquid discharge (ZLD) remain areas of concern.²

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Fish diversity

The fish diversity assessment of Luni river led by ICAR-National Bureau of Fish Genetic Resources, Lucknow from October, 2018 - November, 2018 reported the occurrence of 27 species belonging to 22 genera, dominated by Cyprinids. The highest fish diversity of 12 species was reported in Samdhari and Gandhav. In this study, the wide distribution of Invasive Fish Species such as African Catfish (*Clarias gariepinus*) and Mozambique tilapia (*Oreochromis mossambicus*) were also reported from the river Luni.^[7]

II.DISCUSSION

Luni is the only river basin of any significance in Western Rajasthan, which form the bulk of arid zone. Luni originates from western slopes of the Aravalli ranges at an elevation of 772 m above m.s.l. near Ajmer flowing in South West direction and traversing a course of 511 km in Rajasthan, it finally flow into the Rann of Kachchh. Most of its tributaries drain the steep north west of Aravalli hills and join it on left side. Its total catchment area falls in Rajasthan. Luni basin is situated in between 24^o 11' to 26^o 43' North latitude and 70^o 37' to 74^o 39' East longitude approximately. The peculiarity of this river is that it tends to increase its width rather than deepening the bed ³because the banks are of soils, which are easily erodible whereas beds are of sand. The floods develop and disappear so rapidly that they have no time to scour the bed. The Aravalli ranges form its East boundary whereas main course of river in Barmer district itself forms North boundary and mostly Banas and initial reach of Chambal River form its Southern boundary.

Description of river system

Luni receive alol the main tributaries on its left bank except one i.e. Jojari (Mithri) on the right bank. Luni receives ten tributaries namely Lilari, Guhiya, Bandi (Hemawas), Sukri (Hemawas), Sukri, Mithri, Jawai, Khari Bani Sukri Bandi and Sugi. Hence the drainage on the left bank of Luni is, therefore, more extensive than on right bank. The Luni drains an area of 32879 sq.km. in Rajasthan state only.

The catchment area of the basin upto Chittalwana is 32661 sq.km. The remaining catchment area of the Luni basin below Chittalwana and upto Rann of Kachchh is only 218 sq.km. which is delta where the water spreads out and does not contribute any runoff. The total available runoff from entire Luni basin is 788 Mcum, out of which Guhiya, Jojari(Mithri), Bandi(Hemawas) and Jawai tributaries contribute runoff of 116 Mcum, 64 Mcum, 64 Mucm, 120 Mcum and 125 Mcum respectively. The catchment area, length and elevation of source of important tributaries are shown below:

S.No	Name of river	Bank	Elevation of Source above m.s.l. (m)	Length (km)	Catchment are (sq.km)
1	Luni	Main	737	511	32879
2	Jojari (mithri)	Right	312	83	1060
3	Guhiya & Sukri (Hemavas)	Left	237	125	4126
4	Lolari	Left	731	60	1611
5	Bandi(Hemavas)	Left	935	135	3016
6	Sukri	Left	955	140	3280

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S.No	Name of river	Bank	Elevation of Source above m.s.l. (m)	Length (km)	Catchment (sq.km)	are
7	Mithri	Left	459	71	2637	
8	Jawai	Left	1099	145	2701	
9	Khari Bandi	Left	701	84	2671	
10	Sukri Bandi	Left	588	85	1161	
11	Sugi	Left	688	80	1370	

The important irrigation schemes in Luni Basin are Jawai Dam, Jaswant Sagar dam, Hemawas, Sardar Samand. CWC is maintaining two H.O sites namely Gandhav (GD) and Balotra (GD)⁵

The Luni River is a significant river in the western part of India, primarily located in the state of Rajasthan. It originates in the Aravalli Range near Ajmer and flows through the desert regions of Rajasthan and Gujarat before draining into the Arabian Sea. The river has a total length of about 500 km and a catchment area of approximately 43,000 km².

The Luni River is an important water source for the people living in the region, providing irrigation for agricultural lands and supporting livestock rearing. The river also has significant ecological, cultural, and historical importance. Many ancient civilizations such as the Indus Valley Civilization and the Harappan civilization developed along the banks of the Luni River.

The Luni River is a significant especially for candidates appearing in the geography and environmental studies paper. The exam tests the candidates' understanding of the geographical and hydrological features of the Luni River, its historical and cultural significance, and its ecological and environmental issues. Therefore, a comprehensive understanding of the Luni River and its importance is essential.⁷

III.RESULTS

Aspect	Information
Location	Western India, flows through Thar Desert in Rajasthan and Gujarat
Length	Approximately 500 km
Course	Westward through Rajasthan and Gujarat, passing through districts in both states

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Aspect	Information
Drainage basin	Covers about 43,000 sq km in Rajasthan and Gujarat
Tributaries	Sukri, Jawai, Khari, Bandi, Sagi rivers
Water flow	Seasonal and highly variable, swells during monsoon
Water quality	Western India, flows through the Thar Desert in Rajasthan and Gujarat
Natural resources	Rich in salt, gypsum, and minerals

Geographical Features of the Luni River

1. **Location:** The Luni River is located in the western part of India, mainly flowing through the Thar Desert in the states of Rajasthan and Gujarat.
2. **Length:** The Luni River is approximately 500 kilometers long, from its source in the Aravalli Range near Ajmer in Rajasthan to its mouth in the Arabian Sea.
3. **Course:** The river flows westward through Rajasthan and Gujarat, passing through the districts of Ajmer, Nagaur, Pali, Jodhpur, Barmer, and Jalore in Rajasthan, and the districts of Kutch and Banaskantha in Gujarat. The river's course is mainly through the Thar desert, which makes it a seasonal river and dry for most of the year.
4. **Drainage basin and catchment area:** The Luni River has a drainage basin of about 43,000 square kilometers, covering parts of Rajasthan and Gujarat. The catchment area includes the Aravalli Range, the Rann of Kutch, and the Thar Desert.
5. **Tributaries:** The Luni River has several small tributaries that join the main river during the monsoon season. The major tributaries of the Luni River are the Sukri, Jawai, Khari, Bandi, and Sagi rivers.
6. **Water flow:** This is a seasonal river and has a highly variable flow depending on the monsoon rains. The river's flow is almost negligible during the dry season, and the riverbed is mainly a series of shallow pools and sandbars. During the monsoon season, the river can swell to a considerable size and cause flooding in the surrounding areas.
7. **Water quality and pollution issues:** The Luni River water quality has deteriorated over the years due to various human activities, including agricultural runoff, industrial pollution, and domestic sewage. The high level of salinity in the river water also limits its usability for agricultural purposes.
8. **Natural resources:** The Luni River valley is rich in natural resources, including salt, gypsum, and minerals. These resources are extracted and used for various industries and purposes.

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9. Biodiversity: The surrounding areas are home to several species of flora and fauna, including several endangered species. The river supports several aquatic and semi-aquatic species, including various fish, crocodiles, and turtles. The surrounding desert regions also have a unique ecosystem, including several endemic species of plants and animals.

Left and Right Tributaries of Luni River

The Luni River has several left and right tributaries that join the main river during the monsoon season. Some of the major left and right tributaries of the Luni River are:

1. Left tributaries:

- Sukri River: The Sukri River originates in the Aravalli Range and joins the Luni River near Sujangarh in Rajasthan.
- Jawai River: The Jawai River originates in the Aravalli Range and joins near Sanderi in Rajasthan.
- Khari River: The Khari River originates in the Aravalli Range and joins near Jodhpur in Rajasthan.
- Bandi River: The Bandi River originates in the Aravalli Range and joins near Balotra in Rajasthan.^{2,3}

2. Right tributaries:

- Sagi River: The Sagi River originates in the Aravalli Range and joins the Luni River near Sirohi in Rajasthan.
- Masuda River: The Masuda River originates in the Aravalli Range and joins near Sanchores in Rajasthan.
- Morel River: The Morel River originates in the Aravalli Range and joins near Jalore in Rajasthan.
- Jojari River: The Jojari River originates in the Aravalli Range and joins near Jalor in Rajasthan.

These tributaries play a significant role in the Luni River's hydrology and ecology, and their management is crucial for the sustainable management of the Luni River basin.

Dams on the Luni River

There are several dams and barrages constructed on the Luni River and its tributaries for irrigation, hydroelectric power generation, and water supply. Some of the major dams of the Luni River are:

1. Bisalpur Dam: The Bisalpur Dam is located on the Banas River, a tributary of the Luni River, near Deoli-Banagher in Rajasthan. The dam has a storage capacity of 1,260 million cubic meters and supplies water for irrigation, drinking, and industrial purposes.^{5,7}
2. Jawai Dam: The Jawai Dam is located on the Jawai River, near Sumerpur in Rajasthan. The dam has a storage capacity of 480 million cubic meters and provides water for irrigation, drinking, and industrial purposes.
3. Taknet Dam: The Taknet Dam is located on the Taknet River, a tributary of the Luni River, near Sirohi in Rajasthan. The dam has a storage capacity of 90 million cubic meters and provides water for irrigation and drinking purposes.
4. Dantiwada Dam: The Dantiwada Dam is located on the Sabarmati River, another tributary of the Luni River, near Dantiwada in Gujarat. The dam has a storage capacity of 3,226 million cubic meters and supplies water for irrigation, drinking, and industrial purposes.

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These dams have played a significant role in enhancing the water availability and the socio-economic development of the Luni River basin. However, their construction and operation also have several environmental and social impacts, and their sustainable management and operation are crucial for the sustainable development of the region.

Historical & Cultural Significance of the Luni River

1. Ancient civilizations: The Luni River valley is known to have been inhabited by several ancient civilizations, including the Indus Valley Civilization and the Harappan civilization. Archaeological excavations in the region have revealed several artifacts and remain from these ancient civilizations.
2. Trade routes: Played an important role in the historical trade routes connecting the Indian subcontinent with the Middle East and Central Asia. The river's strategic location made it an essential water source for traders and travelers crossing the desert regions.
3. Religious significance: The River is considered sacred by many local communities, and several temples and shrines are located along the river banks. The river is also believed to have healing properties and is used for various religious rituals and ceremonies.
4. Agricultural importance: The Luni River is a crucial water source for agriculture in the region. The river provides irrigation for the crops and supports livestock rearing in the surrounding areas.
5. Traditional crafts: The Valley is famous for its traditional crafts, including pottery, weaving, and leatherwork. The river's availability of clay, sand, and water has made it an ideal location for these traditional crafts to flourish.
6. Folklore and legends: The River has inspired several folklore and legends in the local communities. These stories depict the river as a powerful and benevolent force that sustains life in the harsh desert regions.
7. Tourist attractions: The River and its surrounding areas are popular tourist attractions, attracting visitors from around the world. The river's scenic beauty, historical significance, and cultural diversity make it a must-visit destination for many travelers.⁷

IV.CONCLUSION

In conclusion, the Luni River is an important geographical, hydrological, historical, and cultural feature of western India. The river's origin, course, and tributaries, along with its drainage basin and catchment area, make it a vital water source for agriculture, industry, and human settlements in the region.

The river's historical and cultural significance, including its role in ancient civilizations, trade routes, and religious practices, adds to its importance. However, the river also faces several challenges, including water pollution, salinity, and degradation of natural resources, which require urgent attention and management. Overall, the Luni River represents a complex and interconnected system of human and natural factors, and its sustainable management and preservation are crucial for the well-being of both people and the environment.⁷

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ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal) | Impact Factor: 7.249|

Visit: www.ijirset.com

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