P: ISSN No. 0976-8602 RNI No. UPENG/2012/42622 VOL.-10, ISSUE-4, October 2021

E: ISSN No. 2349-9443 Asian Resonance

The Impact of Flood in the Area of Thar Desert of Rajasthan

Paper Submission: 10/10/2021, Date of Acceptance: 20/10/2021, Date of Publication: 21/10//2021

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Abstract

The western part of the Rajasthan state in India called the Thar Desert, is characterized by a desert environment with low and erratic rainfall and sandy soil. Relentless rainfall leads to flood in the Thar Desert. It is commonly found that if the desert received more than 100 mm rainfall per day then consequent circumstances emerged as a flood. In 2006 the chronically drought affected districts of Jaisalmer and Barmer received very high monsoon rainfall from June to September. Jaisalmer's seasonal mean rainfall is 150 mm however against this within 12 days district received 477 mm rainfall whereas Barmer's seasonal mean rainfall is about 238 mm but 22 days received 714mm rainfall. The region faced the worst flood situation in the last 100 years and many hamlets and villages were wiped out. In August 2006, the usual drought prone Barmer district was hit by flash floods causing the death of nearly 104 people and lots of flora and fauna, mainly in the village of Kawas and Malwa. In the region without any effective drainage system and negligible downward percolation of water, the situation aggravated and took the shape of a catastrophe. Waterlogging is a major problem in this area because of the presence of bentonite and gypsite. Before the flood said areas are rich with local vegetation and fauna and a well-developed town of Barmer district. The whole ecosystem of the Kawas area changed after this deluge. Impact of flooding include loss of human beings life, damage of property, destruction of crops, loss of livestock and communication links like roads and railway lines are damaged in Kawas. The impact on land use was that the whole cultivated area of more than 30 Km turned barren. Natural vegetation was completely spoiled. Normal soil converted into saline soil. It is observed that from the time of deluge to present day the entire ecosystem of the area changed. The sudden dramatic change in the soil texture ecology and soil salinity affects the natural vegetation where different plant species like *Prosopis* sps., *Tecomella* sps., *Acacia* sps., Salvadora sps., *Ziziphus* sps. Etc. is disappearing whereas *Tamarix* spp. and Farash like salt loving tree species introduced in the region.

Key words: Barmer, ecosystem, fauna, flood, flora, kawas, saline soil, Thar Desert.

Introduction

Rajasthan is the largest state of India, covering an area of about 342,239 square Km, which is situated on the western side of the country. This princely state is famous for its historical values, vibrant culture and it attracts tourists across the globe. While Rajasthan does have a vast desert known as the Thar Desert. The principal rainy season when the Rajasthan state receives 91% of its annual rainfall is during the southwest monsoon. 34% of the annual rainfall, each July to August are generally the rainiest months. The most significant characteristics of desert climate are low precipitation and intense temperature.

Review of Literature

Despite harsh conditions, it is interesting the note that west Rajasthan is the most densely populated region in the world (Rekhecha, 2018). The western districts of Rajasthan in India receive very low rainfall and are therefore prone to frequent drought (Mishra and Liu, 2014). Even so, Rajasthan has witnessed flood events due to utmost precipitation in recent years (Ray et al., 2019). Recent years have witnessed flood events over Rajasthan due to changing precipitation patterns possibly induced by climate change (Mishra and Liu, 2014). A flood is a situation occurring over an area in a year when the rainfall is more than 125% of the normal rainfall. If the rainfall is more than 125-150% of normal, it is called severe flood rainfall. On the basis of this criterion, the rainfall of each year in west Rajasthan was classified as moderate or severe flood rainfall during the period 1871-1994 (IMD, 1971). Observing rainfall data of the last two decades, it is noticed that the western area is getting more rainfall than the eastern part of the state. The magnitude of rainfall in the western desert districts is increasing, whereas it is decreasing in the eastern districts. Except for the years when rainfall was low throughout the country,

there are an increase in rainfall in the desert area especially, Barmer and Jaisalmer districts (Bhardwaj et al., 2014). Ceaseless rainfall is not very common in the Thar Desert but whenever it occurs the dry sand-bed streams swell sharply and it leads to floods and consequent human sufferings. The flood events are almost always followed by narration on how the stream overtopped their bank and then searched out new courses, causing immense distress to the inhabitants and loss of life and property. Rapid reconnaissance of the flood affected terrain after some flood events (Phir et al., 1982). The surge of floodwater through paleochannels was also noticed during 2006 in the drier Barmer district. In 2007 it happened in the middle Luni basin where a century-old embankment across the Luni River was breached after a single day's rainfall in the catchment. After the breach, the huge rush of water through the Luni was found on the abandoned channel and got partly diverted along with it, which saved many villages from a disaster (Kar et al., 2007). Decade-wise flood frequency for the region has shown that broadly 3 out of 10 years is flood year. The maximum flood years per decade during the last one hundred years, a major flood in the desert occurred during 1967, 1975, 1979, 1983, 1990 and 2006. In1979 and 1990 floods caused immense loss of life and properties in the Luni basin while the 2006 flood wreaked havoc in the drier western district of Barmer (Kar, 2011). Flash flood in the desert in 2006 with the global warming by saying the inundate in the desert was caused by a low pressure zone over the area, itself a result of intense heat condition, expert note. Low pressure area in the desert that results from extreme heat is referred to as thermal low in meteorological parlance. Such circumstances could be caused by global warming. The thermal low caused southwest monsoon to bring rain over Barmer and Jaisalmer (downtoearth.org.in). Most of the Thar Desert Barmer district of Rajasthan, the worst hit, is struggling to cope with the flash floods in which 300 folk are believed to have died. Barmer looks like a cluster of lakes. At Kawas Sub- Division, the roof of a railway station jutting out of about 15Ft of water. The flood was described as one of the worst tragedies witnessed by the state in recent decades (Hindustan times, 2006). After the stagnant rainwater had receded a rapid assessment of the change in ecological values of the area was made. The sudden dramatic change in the soil texture ecology and soil salinity affects the natural vegetation where different plant species like *Prosopis* sps., Tecomella sps., *Acacia* sps., *Salvodora* sps., *Ziziphus* sps. Etc. is disappearing whereas *Tamarix* and Farash like tree species introduced in the region. Salt cedar (Tamarix Spp.) trees are aggressive plants known for consuming a large amount of water with a recorded amount of 200 gallons per day in an area. Salt cedar leaves and stem secrete a high concentration of salt into the ground around them preventing the growth and development of native plants. Wildlife is also affected by the salt cedar due to a lack of protein found in the plant rendering it unfit for consumption (Anderson and Omhart, 1977). Obviously, such floods like natural disasters cannot be stopped but proper monitoring of these events can be very useful in mitigation and adoption strategies to minimize the damage.

Area of study

Barmer is positioned in the western part of the state and also forms a part of the Thar Desert. The district has a border with Jaisalmer district in the north, Jalore district in the south, Pali district and Jodhpur district in the east, and Pakistan in the west. The total area of the district is 28,387 square kilometers (10,960 sq. mi). Barmer is the third largest district of Rajasthan and also the fifth largest district of India. The district is located between 24, 58' to 26, 32'N Latitudes and 70, 05' to 72, 52' E Longitudes. The variation in temperature in varied seasons is pretty excessive because of the arid Thar barren region and sandy soil. Desert showing great variation in seasonal temperature where in summer season soars up to 46^0C-51^0C and in winter it plummets to 0^0C(41^0F). Primarily Barmer district is a barren region in which the average rainfall in a year is 277 mm. However, immoderate rainfall of 549 mm rain between 16 - 25 August 2006 left many dead and massive losses due to flood in a close-by metropolis Kawas and whole town submerged. As many as twenty new lakes shaped, with six covering a place of over 10 km^2. Poorly planned and rapid urbanization has increased Barmer's vulnerability to flash flooding. The local ecology and soil kind are not ready to address sudden or excessive water accumulation, which causes quick- and long-time period harm. Other areas suffer the slow effects of 'invisible disasters', which also threaten the lives and livelihoods of the locals and local vegetation of the area.

P: ISSN No. 0976-8602 RNI No. UPENG/2012/42622 VOL.-10, ISSUE-4, October 2021
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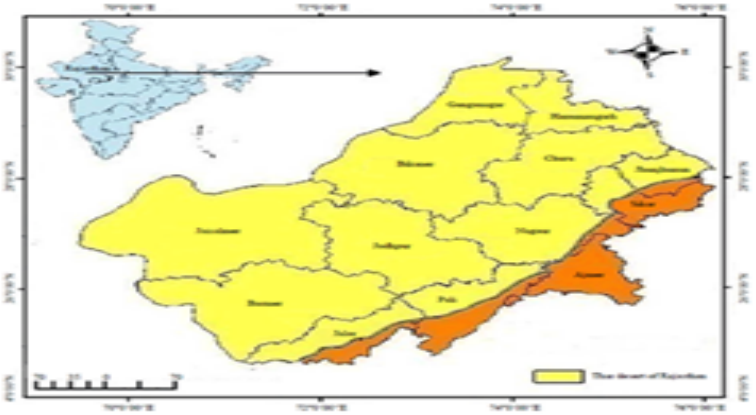

Methodology

The research component of the research paper included a survey of flood affected and unaffected areas of Thar Desert, as well as a focus on group discussions, key informant interviews, various stakeholders' consultations and different articles and research papers on flood impact on the Thar Desert. The techniques employed for data collection were semi structured interviews, group discussion, guided field walk and observations with the participants. Semi structured interview was undertaken based on checklist of questions prepared in English and translated into “Rajasthani language” the language of local people (Appendix A).

Result and Discussion

More significant than the loss of life and damage of property is the sense of insecurity and fear in the mind of people living in the flood plains. The most effects of floods such as the non-availability of essential commodities and medicine, loss of dwellings, making floods the most feared of the natural disasters faced by humankind. After the stagnant rainwater had receded, a rapid assessment of the change in ecological values of the area was made. As the water was drained out by various methods the flood affected area turned into a saline wasteland due to change in soil and water quality so various marshy and water loving plants grew in this area (Fig-A). Especially *Tamarix* species was dominant over all other plants, including *Climax* species and *Burgeria* species. The problem of flooding in the desert area does not seem feasible but the geology of the area is varied in nature. Extraction of groundwater has increased local flora and fauna are shrinking because of uncontrolled growth of weeds and shrubs. Because of flood change in soil texture, increasing the amount of salt in soil (Fig-B) and halophytes like *Tamarix* spp. grows (Fig-C) in the dense canopy in the said area and the same result was also found by Rawat (2008). *Tamarix* also known as salt cedar, it is a tall tree with feathery green or blue-green foliage. In flood affected areas of the Thar Desert, *Tamarix* is the arch-enemy invasive species. It grows fast and forms thick stands creating large areas of dense shade. This, shade discourages native seedlings from trees to grasses, decreasing the diversity of plants and animals in the ecosystem of Thar Desert (Fig- D). It increases fire frequency, changes streambed hydrology, lowers water tables and increases soil salinity. So due to this reason in the flood affected area of Thar Desert decline the number of indigenous species (Table-1). The most recent deluge that occurred in 2006 in the Thar Desert may be viewed as the key parameter of microclimatic alteration taking place here. Meteorological Department data also supports that heavy rainfall is the intermittent phenomenon in the Thar Desert that also supports the argument that microclimatic changes are ongoing in the said area, and also similar observations observed by Purohit (2018). The consequent higher moisture content of the soil creates the situation for the growth of wild breeds of fauna as well as cultivation. Increasing magnitude of rainfall, change in soil texture, rapid succession in vegetation, non-movement of sand dunes and increase in green cover are the key events that indicate the Thar Desert's environmental circumstances are changing with time in a particular manner. The overall changes are so complicated that they need intense studies to understand and come up with remedies. The changing environmental situations in the desert are certainly required concentration on this issue by both governments as well as environmentalists. The changes are not only in rainfall but also in flora,

fauna and soil moisture content and economic occupations including a boom of tertiary occupations in the area. As a consequence of the inundate the changes taking place in the desert, especially increasing moisture content and salt in the soil, growing alien breeds of natural vegetation which are adversely affecting the growth of originally inhabited breeds, growing vegetation cover along with rapid succession and anatomical adaptation in plants are indicating that there is a need to review the developmental efforts and planning approach along with re-enlisting of priorities on a real basis, rather than political. There is an urgent need to review the development strategies to strengthen productivity and to optimize the use of ongoing natural and manmade alterations in the Thar area.

Acknowledgment

The authors are highly thankful to the principals of Government College Jaisalmer and MLV Government College Bhilwara for providing the facilities. The authors are also thankful to the local people of the area as they provided information regarding the affected area.

Table 1: Dominant plant species of flood unaffected area of Thar Desert

Sr. No.	Botanical Name	Local Name	Family	Habit
1	Acacia jacquemontii	Bu-banwa li	Fabaceae	Shrub
2	Acacia leucophloea	Urajio	Fabaceae	Tree
3	Acacia nilotica	Banwal	Mimosaceae	Tree
4	Acacia Senegal	Kumta	Fabaceae	Tree
5	Achyranthes aspera	Kaito bhurtiyo	Amaranthaceae	Herb
6	Aerva lanata	Chottii bui	Amaranthaceae	Herb
7	Aerva persica	Buari	Amaranthaceae	Herb
8	Amaranthus viridis	Chauli	Amaranthaceae	Herb
9	Azadirachta indica	Neem	Meliaceae	Tree
10	Brachiaria ramose	Murat	Poaceae	Herb
11	Calotropis procera	Aak	Asclepiadaceae	Shrub
12	Capparis decidua	Ker	Capparaceae	Shrub
13	Cenchrus biflorus	Bhurat	Poaceae	Herb
14	Cenchrus ciliaris	Dhaman ghas	Poacee	Herb

15	Ziziphus nummularia	Bordi	Rhamnaceae	Shrub
16	Citrullus colocynthis	Tumbo	Cucurbitaceae	Climber
17	Leptadenia pyrotechnica	Kheep	Apocynaceae	shrub
18	Salvadora persica	Peelu/jal	salvadoraceae	Tree
19	Clerodendrum phlomidis	Arni	Lamiaceae	Herb
20	Tecomella undulate	Rohida	Bignoniaceae	Tree
21	Prosopis cineraria	Khejri	Fabaceae	Tree
22	Crotalaria burhia	Siniya	Fabaceae	Herb
23	Convolvulus pluricaulis	Shankh pushpi	Convolvulaceae	Herb

Fig- A

Fig- B

Fig- C

Fig- D

Fig- E

Plate-1 Fig- A Flood affected area. Fig- B Soil of the flood affected area. Fig- C Dense canopy of *Tamarix* Species of flood affected area. Fig- D *Tamarix* spp Fig- E Flood unaffected area.

Conclusion

Flood in the Thar desert area has raised many challenges. It is time to learn from the recent incidents and reframe over planning approaches and also increase our efforts on a priority basis. When it is being planned to extend the Indira Gandhi canal to Thar Desert districts, it is essential to construct outlets so that during any emergency outflow of excess water is assured. There is an urgent need to study the terrain and topography of the area to develop its drainage system and for its rehabilitation. Some of the changes taking place in the area, especially increasing moisture content in the soil, growing foreign breeds of natural vegetation which are adversely affecting the growth of originally inhabited breeds, growing vegetation cover along with rapid succession, and anatomical adaptations in plants are

indicating that there is a need to review the developmental efforts and planning approach along with re-enlisting of priorities on a real basis, rather than political. Despite all these indicators, spatial planning is still desert oriented. Substantial funds every year under the Desert Development Program are consumed without considering the geographical changes taking place in the area. Casual meetings to frame and review development plans for the desert can't be appropriate unless the occurring changes and challenges are also taken into care and utilization of funds and grants are judiciously consumed. There is an urgent need to begin a new draft of planning, deciding priorities and limitations. For this purpose, it is again necessary to involve local people to strengthen the outputs of the plans.

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