PALAEOCHANNELS OF THE THAR DESERT MAY BRING PROSPERITY FOR ITS INHABITANTS, RAJASTHAN, NW INDIA.

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ABSTRACT: The Thar Desert exists mainly in western part of the Rajasthan state of northwestern part of India. The state occupies an area about two third of the total area of the desert. Because of scarcity of rain fall in the desert, the frequency of occurrence of draughts is very high. The inhabitants of the desert are bound to migrate in search of water, food and fodder frequently.

There are a number of palaeochannels exist in the Thar Desert of the western Rajasthan. The presence of these palaeochannels have been proved through study of remote sensing imageries and it is inferred that sometime in the past a very mighty Himalayan river and its tributaries were flowing through western Rajasthan and meeting Arabian Sea.

India plans to transfer water from the water surplus regions of the north and north-east to the water scarce regions of western and southern India. The plan is called the National River Linking Project (NRLP). If the rivers of Himalaya are linked to Palaeochannel of the Thar Desert through canals, it will thrust up the economic condition of desert residents by increase of crop sowing area, tree plantation and fish production from aqua-culture.

When water will flow through these pre-existing river courses in the desert, it will be available for irrigation, forestation, cultivation of grasses, aqua-culture, drinking and for industrial supply. Due to increase of greenery the moisture will increase in environment which will increase precipitation in the desert. Increased precipitation will reduce frequency of draught and will also put check on further extension of the desert.

This paper will deal with general description of palaeochannels, river linking possibilities and use of palaeochannels to bring prosperity in its inhabitants.

Introduction

The Thar Desert lies right along the borders of India and Pakistan. It is a huge desert 800 km long and 400 km wide and popularly known as the Great Indian Desert. The desert lies mostly in the Rajasthan state of India and partly covers eastern Sindh province and some area of Pakistan Punjab too. The Thar Desert's name derives from the word *thul*, the general term for the region's sand ridges. It is the world's 18th largest desert, and the world's 9th largest subtropical desert**.**

The total surface area of the desert is around 200,000 sq. km of which around 50,000 sq. km falls in the Pakistani territories; almost two-third of which lies in Rajasthan. The Thar Desert embraces mainly Jaisalmer, Barmer, Bikaner and Jodhpur districts of Rajasthan state. Thar is among the most populated deserts of the world (83 people per sq. km). The Sahara desert has one of the lowest population densities (1 person per sq. km).

General climate of the Thar is hard. It is dry and hot. Very little rainfall is experienced in the desert, with average rainfall less than 250 mm per annum. The period of monsoon over this region is shortest (two months) in the whole country. Rain is distributed erratically, and occurs mostly between July and September. The average temperature ranges from 24-26°C (maximum 50°C) in summer to 4-10°C (lowest -4°C) in winter. The strong radiations of the sun reach 200-600 cal/cm^2 /per day and velocity of winds during the summer reach a total of 40 km/hr.

The Thar Desert slopes imperceptibly towards the Indus plain and surface unevenness is mainly due to sand dunes having an average elevation of about 225 m above the mean sea. In the west the average elevation drops to about 150 m close to the India-Pakistan boundary (Roy and Jakhar, 2002). The soils of this region are sandy to sandy-loam in texture. Some of these soils contain a high percentage of soluble salts in the lower horizons, turning water in the wells very salty.

Despite harsh living conditions these desert areas are also inhabited by a significant number of peoples and livestock. The desert peoples mostly lead a semi nomadic life and are on the continuous move from one place to another in search of water and fodder for their animals. Generally prevalence of poverty is high and resources are scarce among desert dwellers.

There are number of palaeochannels exist in the Thar Desert. Various type of studies carried out on palaeochannels by different scientist on their existence. Present study was concentrated on multiple use of palaeochannels of the Thar desert for upliftment of its inhabitants by linking of the Himalayan rivers to these palaeodrainages.

Age and Origin of the Thar Desert

The age of the Thar Desert is a topic of great controversy, though most geologists agree that it is somewhere in the region of 4000-10,000 years old, whereas others state that aridity started in this region much earlier. It has been observed through remote sensing techniques that Late Quaternary climatic changes and neotectonics have played a significant role in modifying the drainage courses (Roy and Jakhar, 2001, 2002).

Most of the studies share the opinion that the palaeochannels of the Sarasvati coincide with the bed of present day Ghaggar and believe that the Sutlej along with the Yamuna once flowed into the present Ghaggar riverbed. It has been postulated that the Sutlej was the main tributary of the Ghaggar and that subsequently the tectonic movements might have forced the Sutlej westward and the Yamuna eastward, causing the Ghaggar to dry up.
At present, sometimes there is no rain for years together. It is because the rain laden monsoon winds coming from the Arabian Sea pass over this desert unchecked. There are no high hills which may force the monsoons to cause rain. The Aravali ranges which are parallel to the direction of these winds do not stand as a barrier. The monsoon winds which come from the Bay of Bengal loose almost all the moisture by the time they reach here. As a result this part remains dry and has no rains. It has turned this fertile land into a barren desert. There are no rivers. The river Luni which flows through this land remains dry for most of the part and ends up in sand. All above stated conditions are responsible for origin of the Thar desert

Interlinking River Project

India's National Water Development Agency has suggested the interlinking of rivers of the country. This proposal is better known as the Inter-River Linking Project. It is a mega project that engages money, resources, engineering, management and human understanding. All interlinking schemes are aimed at transferring of water from one river system to another or by lifting across natural basins. It is designed to ease water shortages in western and southern India and aims to link 30 major rivers. The Ghagra, Sarda and Yamuna rivers are planned to be linked for western India. Their water can be brought to palaeochannels of the Thar desert through canals.

There is a severe problem of lack of irrigation in the desert and water logging problem in river dominated areas. Damage to crops due to drought and pitiable drainage facility could be managed by linking rivers. In the desert a number of palaeochannels are delineated by many workers. These palaeochnnels are good geomorphic features to receive excess water of other rivers. (Mehta and Mehta, 2013; Joshi, 2013).

Palaeochannels in Rajasthan

It has been inferred that ten thousand years ago the desert was a green and fertile land recharged by a very mighty Himalayan river "Sarswati' flowing through western Rajasthan and meeting Arabian Sea. Sarswati is described as a mighty and holy river of India in the Vedic period literature like Rigveda, Yajurveda, Ramayana, and Mahabharata etc. (Kochhar, 1997). It has flowed between 6000 and 4000 BC as a great river and great civilizations developed on its bank. Some six thousand years later, Saraswati dried up due to some natural events. The river become extinct about 1500-2000 B.C. (Kalyanraman, 1999). Sarswati along with its several other tributaries shifted their courses or were 'pirated' by neigbouring rivers due to tectonic activities (Roy and Jakhar 2001 & 2002; Rajawat *et al*., 2003, *Sankaran*, http://www.iisc.ernet.in/currsci). Due to this event the greenery of Rajasthan was lost, replaced by an arid desert where winds piled up dunes of sand and the prosperous civilizations slowly vanished. As per geological standard the earth has witnessed in its long 4.5 billion years history many such changes, even most of the present continental part of northwestern India was under sea during Jurassic and Tertiary time. Similarly long before ago at place of the Himalayan mountain the Tethys sea was existing.

Numerous workers have worked on palaeochannels of the Sarswati and its tributaries in western Rajasthan (Kar, 1988, 1999; Roy & Jakhar , 2001 & 2002; Bhardwaj, 1987; Bhadra *et al.*, 2009, Bhadra, 2016; Valdiya, 2002; Kar, & Ghosh, 1984; Ghosh *et al*., 1979; Yashpal *et al*., 1980; Bakliwal, & Grover, 1988; Sahai, 1999; Gupta *et al*., 2003 & 2004; Rajawat *et al*., 2003 & 1999, Rajawat, 2014, Sinha *et al*., 2012; Saha *et al.*, 2016 and Poonia & Mathur 2016) . They have been recognized by various agencies and scientist of different disciplines on basis of data gathered by them including remote sensing imageries, climatological, geophysical, geological, geomorphic features, occurrence of fluvial deposits and ground checks. The palaeodrainage map prepared with help of satellite imagery by Regional Remote Sensing Centre, Jodhpur is shown in figure 1 and 2. The former courses of Sarswati River System delineated by Rajawat *et al* 2003 in the Thar area is also shown in figure 3.

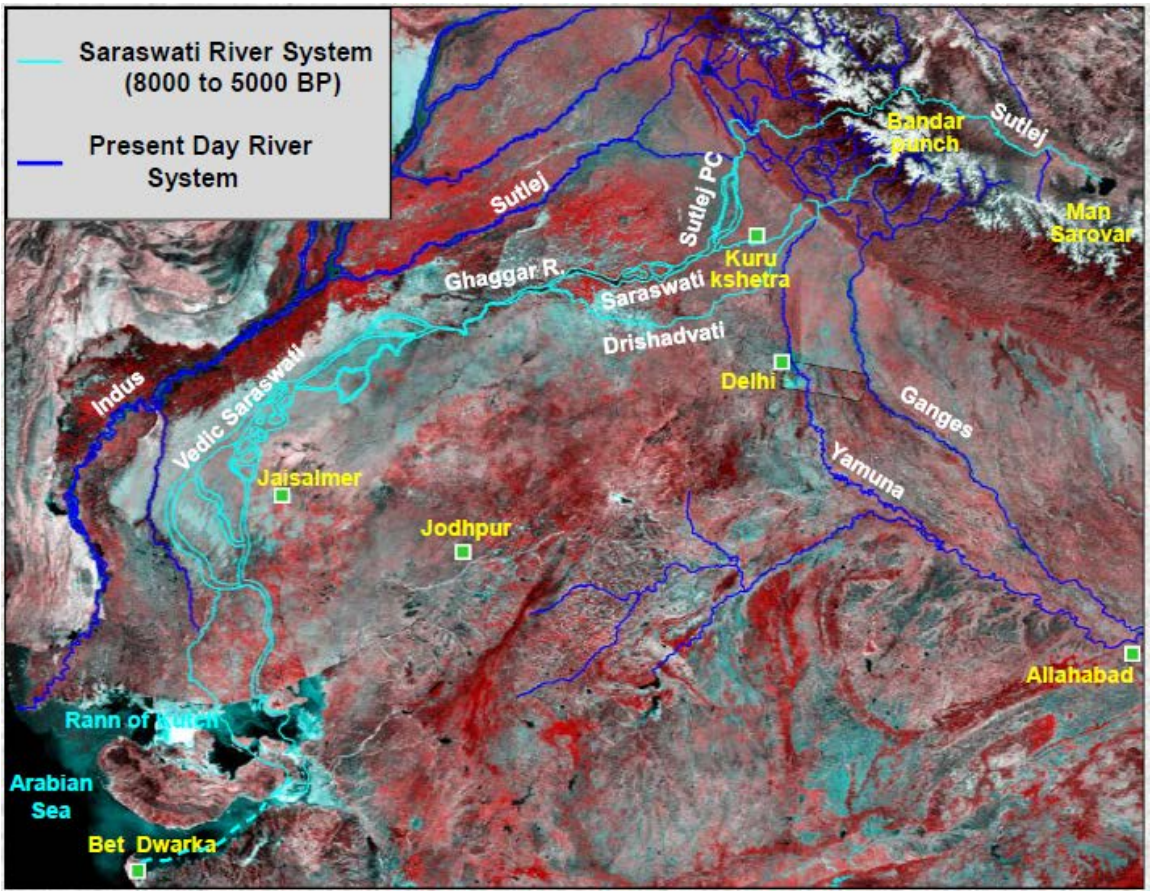

Figure 1 .Simplified map of Palaeochannel of past river Sarswati from Himalayan Mountain to Arabian Sea, (Sharma and Bhadra, 2014).

Palaeochannels and their use

Himalayan rivers water may be brought to desertic terrain through canals upto palaechannels and than may be allowed for free flow through natural gradient in palaeochannels. The paleochannels are good site for farming, cultivating grasses for fodder, tree plantation and for aqua culture. The orientation of the drainage of the some palaeochannels is NNW-SSE direction (Fig. 4A & B) i.e. almost right angle to the path of Arabian monsoon which is trending in NE-SW direction. Increased density of trees in these palaeochannels may help in increasing humidity (Spracken *et al*., 2012) of the area which will arrest Arabian monsoon to increase precipitation in the desert. Due to high precipitation forest will grow which will check further extension of the desert. We may also select trees from which we can get fruits, seeds, animal fodder, beverage, medical value, timber, firewood, craft wood, fiber for making paper and cloths, resin/gum/latex, honey etc. It will definitely increase prosperity graphs of villagers residing in the course of the palaeodrainage. It will not only be good for human beings but they will provide shelter and food for wild animals too. In addition to this few ponds may be developed in course of the river for fisheries and aqua culture. It will reduce the losses of the crops occurring because of extreme draught and will increase agricultural production by an additional land irrigation area. It will also solve the water crisis situation by providing alternative, perennial water resources. Not only this it will also increase groundwater level which will be available for irrigation and drinking during non-availability of water in canals. Ultimately cumulative effect of all these processes will boost up the annual average income of farmers which will make their life easy.

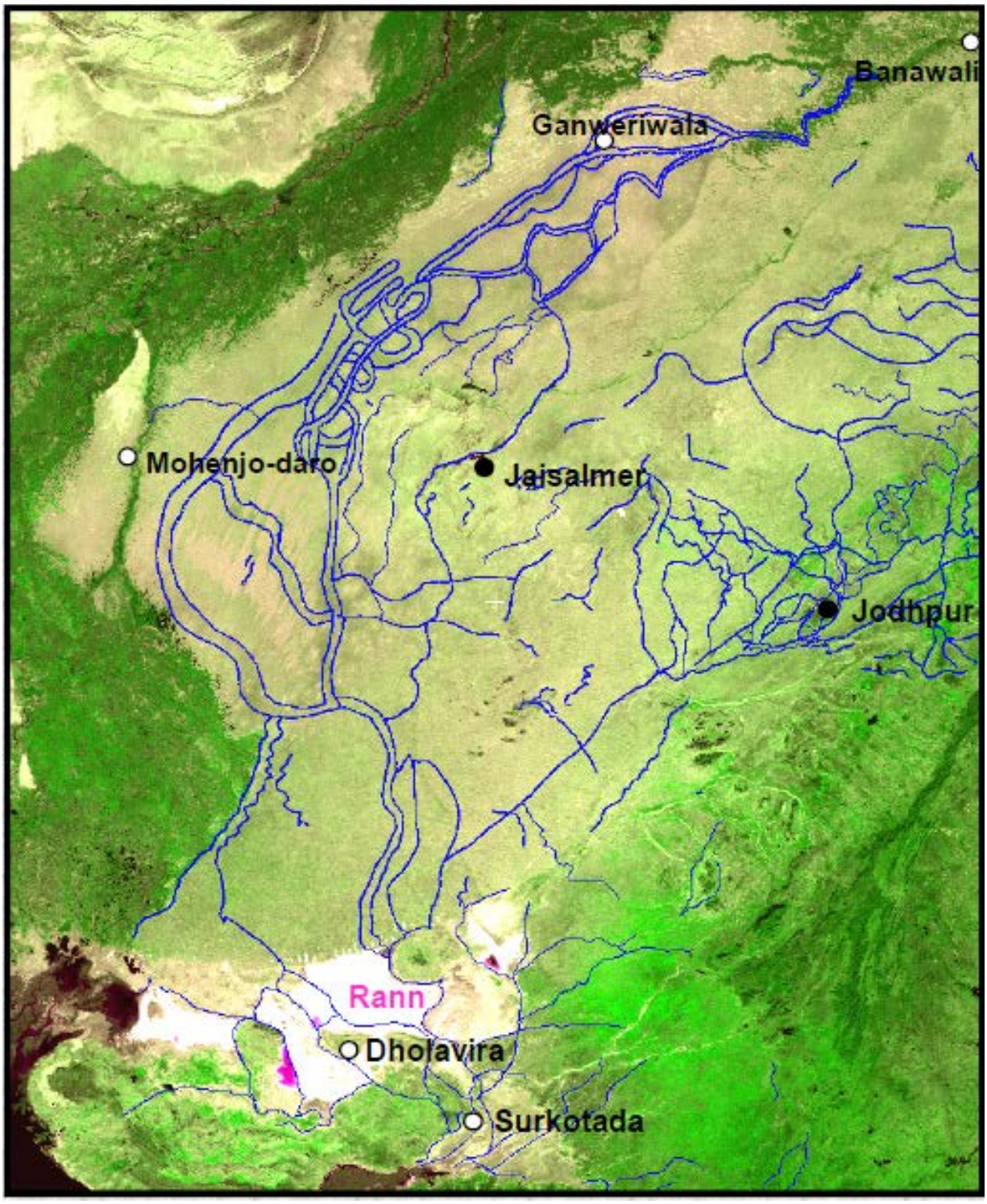

Figure 2. Palaeodrainage map of the Thar Desert area (Sharma and Bhadra, 2014).

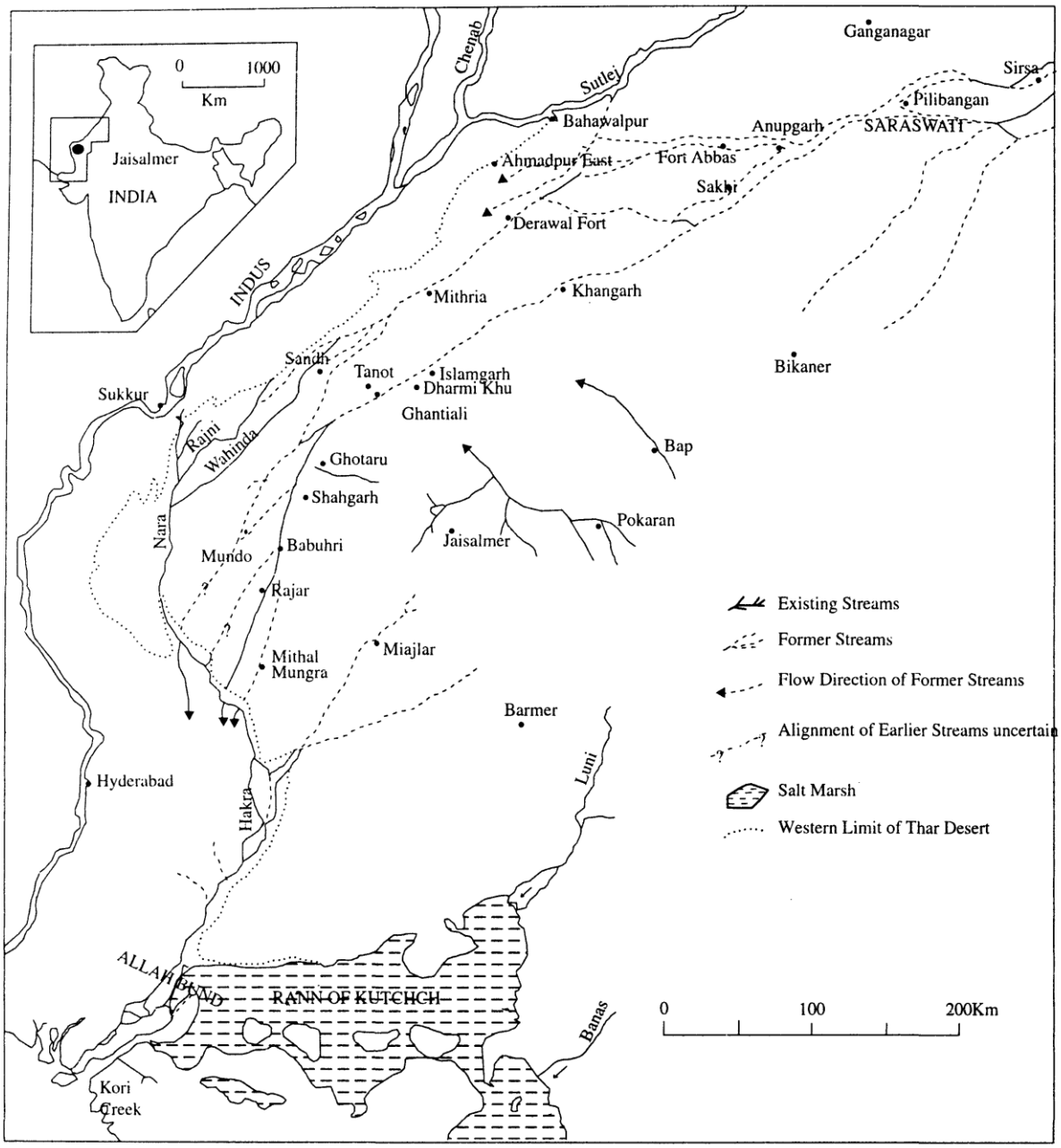

Figure 3. Former courses of Sarswati River System in the Thar Desert (Rajawat *et al.*, 2003).

Start with Dessicated Lik River

The Lik river is a western tributary of the ephemeral Luni river and it is a very suitable site for experimental work of plantation in the desert. It originates from village Bhaniyana of Jaisalmer district (Jakhar, 2010) and traverses more than hundred kilometers distance to join the Luni River near Balotra in Barmer district (Fig. 4A & B). This is desiccated river and has not witnessed continuous water flow in the living memory of human being. With lapse of time the meandering river lost its identity as its course is obstructed by the moving sand dunes. If water is released at village Bhaniyana in the river then it will flow upto Balotra through natural gradient of the river. On availability of thick forest, the plants through their transpiration process will increase content of water vapour in the atmosphere which will be leading to more precipitation (Spracken *et al.*, 2012) in the desert (Jakhar, 2016). The increased rain will reduce frequency and intensity of draught and ultimately further check on extension of the desert.

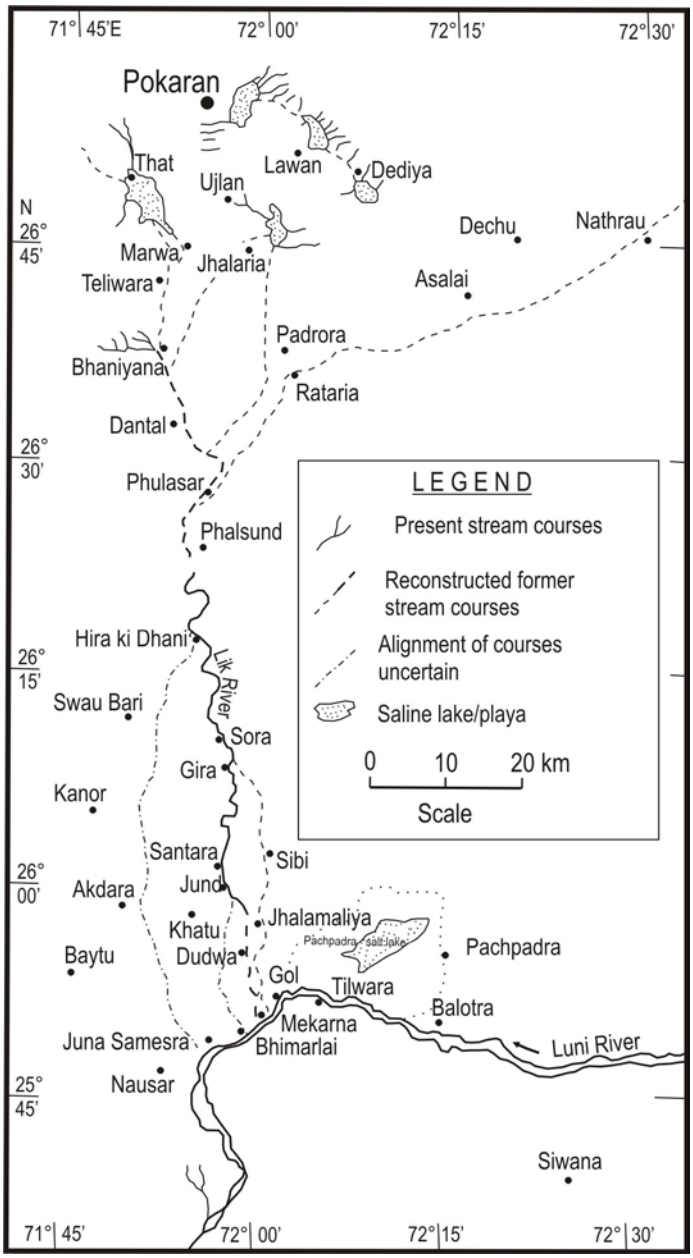

Figure 4A. The map showing course of the Lik River (modified after Kar, 1988).

Figure 4B. The course of the desiccated Lik River, marked as dotted line in satellite imagery (Google earth and Jakhar, 2010).

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