Pakistan Geographical Review, Vol.72, No2, December. 2017, PP 112-121

THE LOSS OF FRESH WATER RESOURCES: A GEOGRAPHICAL ASSESSMENT OF LYARI RIVER THROUGH HISTORY

YASMEEN ANIS*, SHEEBA AFSAR* AND NADIA ASAD SIDDIQUI **

yasmeen_rehan@yahoo.com,

Department of Geography, University of Karachi-75270, Pakistan

sheebanaeem@hotmail.com

Department of Geography, University of Karachi-75270, Pakistan

nakhtar_khan@hotmail.com

Sui Northern Gas Pipeline Limited, Lahore-54000, Pakistan

ABSTRACT

Population growth and the extra-ordinary exploitation of resources are two common phenomena observed simultaneously especially in the developing countries. This population growth can easily be seen in the form of urbanization brought up mainly by in-migration in search of work or by natural increase of population. This unorganized and unplanned expansion of urban areas may lead to the deterioration, contamination and sometimes disappearance of the resource completely. For instance, occupancy of floodplains, removal of agricultural lands or forests etc. Such cases are common in the developing countries of South Asia, South East Asia, South America and Africa. Among the South Asian Countries; Pakistan is also facing such problems of squatter settlements.

Karachi is Pakistan's fastest growing urban center and is also the large regional hub of economic activities. Therefore, millions of people from other parts of country move to the city in search of work. The city was historically a fishing village originated along a fresh water river though seasonal –The Lyari River. The origin of present Karachi is mainly evolved around Lyari River because the fishing village gained importance during the British rule when the port was constructed in order to get link to the British Crown through water ways. The old colony of this port was actually resided around the Lyari River. Now Lyari River is badly contaminated and in fact transformed into a major sewage drain from a fresh water river that once was supporting local agriculture as well as replenished underground water table. Still its water is being tapped through underground resources for drinking and other purposes, the quality of which is not fit for human consumption.

The study basically focuses upon the transformation of this fresh water river into an obnoxious sewage drain. It involves appraising sharp changes of Lyari River course during various years through satellite images and evaluation of its past conditions through historical maps and review of ancillary information, evident of its deterioration.

KEY WORDS: Karachi, Fresh Water River, GIS, Population Growth, Sewage Drain, Contamination.

INTRODUCTION

Population growth and increasing urbanization give rise several problems in which indifferent exploitation and in fact depletion of resources is one of the major problems especially in the under developed world where

Prior planning is not a matter of concern. More than half of the world's population was residing in urban areas in the year 2008 (UN 2007) and until 2014 the proportion was 54 percent that was expected to increase up to 66 percent until 2050 (UN 2014). The depletion of resources include the removal of vegetation cover, conversion of arable land in to residential land, occupation of dried river beds and even the active flood plains of perennial rivers that results in calamities during the rainy seasons and often. Such problems are quite common in the South Asian countries like India, Pakistan and Bangladesh comprising of large river systems of Indus, Ganges and Brahmaputra. Transformation of dried river beds and arable land into residential area is common in many urban areas that comprises of seasonal rivers instead of perennial rivers. Depletion and demolition of resources with the increase of population is more common in urban areas as compared to rural areas where population is more dependent upon the machinery and electronic gadgets rather than the works of nature. Since ecosystems in urban areas are strongly influenced by anthropogenic activities, considerably more attention is currently being directed towards monitoring changes in urban land use/land cover (LULC) (Stow & Chen 2002).

Karachi the major urban center and economic hub of Pakistan epitomize such cases of transformation of land use and vegetative land cover to build up areas. More over the seasonal river channel have been completely converted to sewage drain, as is the case of Lyari River.

Karachi comprises of the two seasonal rivers: Malir and Lyari and in fact it was Lyari upon whose plain Karachi was established. The two rivers were the fresh water river which was used for drinking and supporting agriculture fields along the banks. In fact most of the Karachi industrial areas of Korangi and Landhi were once the active flood plains of Malir River and the residential areas of Liaquatabad and Lyari itself were the lush green fields along the banks of Lyari River that are now completely transformed in to urban structures. According to Pithawala & Kaye most of the Karachi's built up area occupies the flood plains of Lyari River with the supply of fresh water being extracted from the alluvium of Lyari River for several years. Even the fields were supported by the wells all along the river banks other than the drinking purposes in the villages (Pithawala and Kaye 1946). Although the two rivers were seasonal but they were the main sources of agriculture and even fishing especially the Lyari River but now the Lyari River along with its tributaries has been completely converted to main sewage drain. The population increase was tremendous especially after the independence in 1947 due to the influx of migrants from India. The heavy urbanization transformed river's ecology and it gradually continued to discharge waste water, sewage and industrial effluents.

One reason behind the heavy urbanization of the city is its coastal location. A considerable proportion of the world population is situated along or near the coasts, which is about 10 % of the earth's land surface (Hinrichsen 1998). This shows enormous pressure of population on coastal lands and round the world coastal lands are highly preferred lands. The population of Karachi increased abruptly due to the influx of migrants after the independence in 1947. But yet it kept on increasing overwhelmingly much after it i.e., during 1980's and onwards just because huge amount of population from rural and other areas of Pakistan move to the city in search of jobs. The fact is visible in the [Figure 1.1] showing the population of Karachi since 1941. Though the population increased in 1951and 1961 as compared to 1941 attributed to influx of migrants from India but if 1972 is compared to 1998, the increase is much greater.

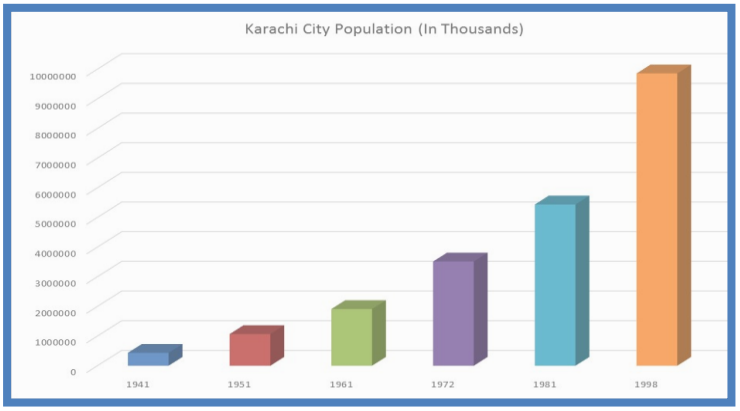

Figure 1: Karachi City Population (in Thousands) 1941- 1998
Source: Federal Bureau of Statistics Division, Government of Pakistan.

STUDY AREA

The Study Area is basically focused upon Lyri River, its catchment area and its plain, - either cultivated or populated. Lyari River is a seasonal river with substantial catchments area that starts from as back as Badra ranges 100 Km from the city of Karachi. Basically, main Lyari channel forms with the confluence of Mauri River, Gujjro Nala and Lyari itself. [Figure-1.2]

Lyari River originates from the desert south of the Pab Ranges and enters from north east of the city at the Super Highway bridges at Sohrab Goth to the center. From this location it flows in the south west direction towards Manora Channel or Baba Channel (Haq 1971). This is the main area that comprises the major populated areas of major urban center of Karachi.

Most of them were previously the cultivated lands along the banks of fresh Lyari River.

METHODOLOGY

In the current study a panchromatic image of Corona for the year 1964, and several multispectral satellite images of LandSat for the years 2000and 2015, SPOT for the year1986 and QuickBird were acquired as well as historical map of Karachi Harbour for the year1774 (after Pithawala 1946). Showing old Karachi city was utilized. All the satellite images and map were geometrically corrected and the images were geo-referenced on a single projection UTM WGS 1984. Image enhancement has been performed through ERDAS Imagine in order to make the images interpretable. Since the basic purpose was to document the changes in the main Lyari River and the associated agricultural activities through time, vector layers for different land uses and the main Lyari channel has been extracted through on screen digitization in ArcMap environment. The landuse classification has been arbitrarily modified since the purpose is to show the areas built up by population of the city; therefore all types of landuses, except the agriculture and industrial, are shown as built up class. Later the maps were compared and analyzed to extract the changes occurred in the main Lyari River channel and its associated activities.

RESULT AND DISCUSSIONS

The agricultural potential of Lyari's plains can be analysed from the 1774 Karachi Harbor map that shows the a major cultivated belt upstream, starting from the confluence of main Lyari tributary and Gujjro River, extending along the both the banks of Lyari River and continue northward. The approximate area of the belt is more than18 square kilometers. Other minor cultivated areas include sewerage farm and a small cultivated area downstream along the west bank of Lyari River [Figure-1.2]. The cultivation was actually carried out mainly by the well water situated on the alluvium of the Lyari. Its water was also used for drinking purposes as described by Pithawala (1946). Population cover seems too sparse in the map. The 1774 map gives us the clue that cultivation has been practiced in Karachi along the Lyari River until 18th century -when Britishers took control in 1838-39 and constructed the Port.

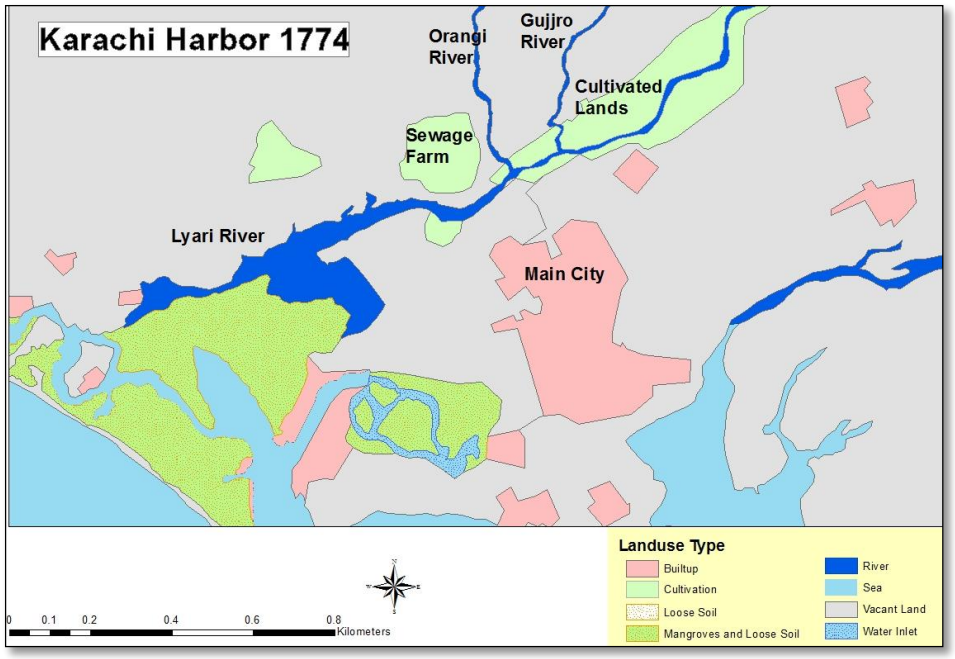

Figure 2: Karachi Harbor 1774 showing cultivated area along Lyari River**.**

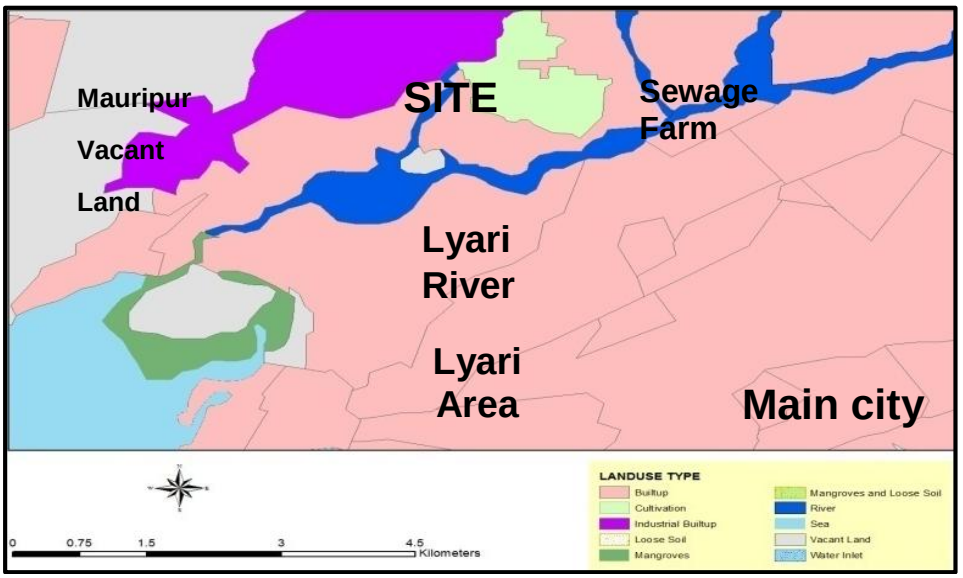

Figure 3: Karachi 1966 showing residential areas along Lyari River.

On the other hand, if the images are analyzed after the independence of Pakistan, it can be easily inferred that cultivation was vanished until the independence. As 1966 image of Karachi focusing Lyari River [Figure.1.3], gives us the idea that although the rain fall was sufficient but the lands were replaced by settlement instead of cultivation. The wider channel of the river and the rainfall statistics also revealed that initially it was not the declination of rainfall behind the removal of agriculture but the growing demand of land for the growing population.

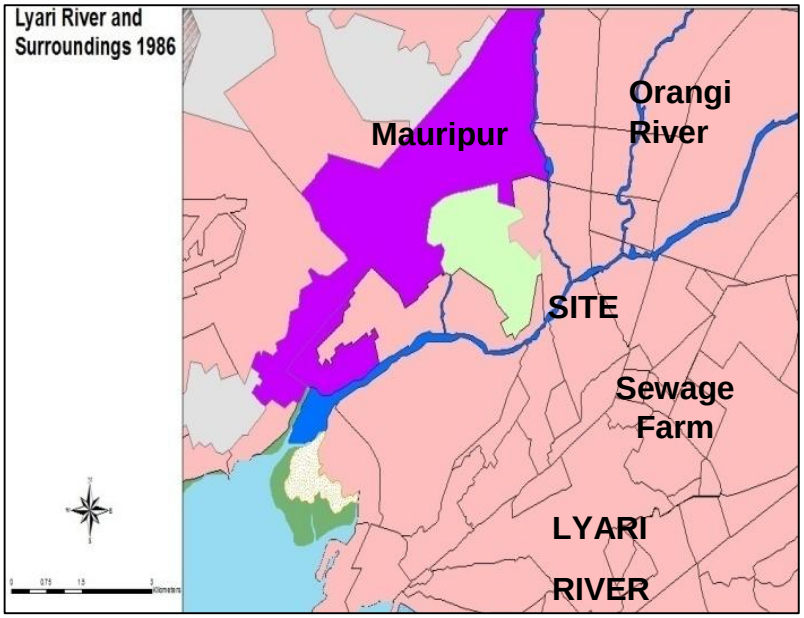

Figure 4: Karachi 1986 showing residential areas along Lyari River.

Further analyses of the images for the years1986 and the 2018 [Figures.1.4 and 1.5], gives us the picture of decreasing rainfall and the resultant contracting channel of Lyari that is intervened by several industrial sector and squatter settlements *(Katchi Abadis).* The Lyari River which was once a fresh water river has now been converted to sewage drain which is also a potential environmental hazard. Even its tributaries Orangi River and Gujjro River are contributing sewerage water. The wells which were situated on its banks and once provide water for agriculture and drinking still exist and being utilized by local residents but the water may be contaminated and their replenishment is suspicious.

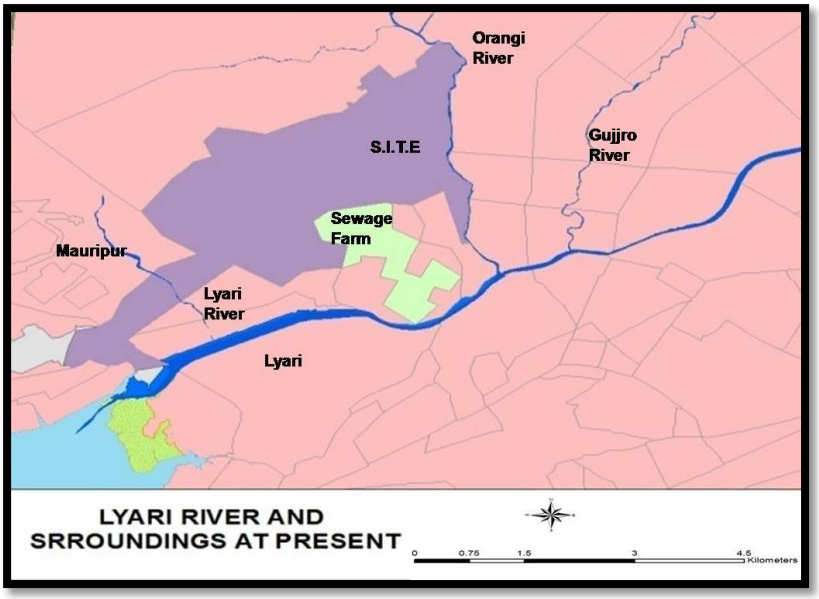

Figure 5: Karachi 2018 showing residential areas along Lyari River

.

Table1: Major Changes in Land Use and Land cover

Year	Industrial Built-up	Agriculture	Mangroves or mouth of the river	Main City	Lyari River and its channel
1774	_____	1) Sewage farm on the lower right bank 2) Fields along the main Lyari channel upstream and at the confluence of Gujjro and Orangi Nala	Lyari River with a wider mouth, almost half of the lyari colony was covered with mangroves in the the south west	Situated far inland away from the eastern bank	Lyari River with its tributaries. Main channel gets wider downstream near its mouths.
1966	A large SITE area starting from orangi west bank	Only Sewage farm on west bank,	Mouth of Lyari confined to the	City fully occupy the land reaching	River Channel still wider even

	but confined to northern Mauripur.	while other fields replaced by built-up land.	coast, with limited mangroves. Inland area occupied by Lyari built-up area. Salt quarries to the west emerged. The Keamari port with East and West wharf developed.	the banks of Lyari, Gujjro and Orangi river, its complete catchment area. Mauripur Air base developed surrounded by vacant land.	upstream; showing flood conditions. A small out shoot from main lyari channel to the west of sewage farm can be seen.
1986	SITE area reaching the mouths of Lyari River; north of salt quarries	Sewage farm becoming narrow	Settlement encroached in to the mouths of Lyari River. A little portion of mangroves and swampy land.	Built-up area heavily occupied the land, the Mauripur and squatter settlements encroached into the river channel and the mouths of the river.	Main River channel as well as the tributaries contracted; and converted to sewage drain.

2018	SITE area encroached into the mouths of Lyari.	Sewage farm intervened by the squatter settlements. The fields either dried up or transformed to other landuse.	Whole mouth of the lyari completely converted to builtup land (squatter settlement)	Squatter settlements completely occupy the mouths of the river. Even no vacant land left in Mauripur area.	Thin channels of Lyari, Orangi and Gujjro mainly comprise of sewage water.

CONCLUSION

Lyari plains are sandy and at places high embankments indicate the past heavy discharge of river. Its catchments are covering an area of 700 km^2 out of which approximately 150 km^2 lies in the metropolitan area (Mansoor and Mirza 2007).

As a fresh water river and even as a drain nala carrying flood water, it was a source of replenishing underground water resources, which are now being contaminated due to ever increasing population and high rate of urbanization (Table 1.0). Lyari River accommodates approximately 0.8 million people in near about 50 *Katchi abadies* along both sides of its banks (Mansoor and Mirza 2007). The cultivation which was practiced once along the banks of Lyari has been abandoned at the expanse of urbanization. A major industrial area of SITE is also present in its proximity. More than 10 million population of Karachi including major and small industries lying therein discharges about 244 MGD of untreated effluents through Lyari River into the sea (MP & ED Plan 1999-2000). These effluents are the main cause for the pollution of south-eastern creeks. During northeast monsoon when current moves in anticlockwise direction, this contaminated polluted water also pollutes the main picnic spots at Manora, Sandpit, Hawks-bay and Paradise Point (Mansoor and Mirza 2007). Lyari that was once a resource supporting agriculture now become a major environmental hazard.

REFERENCES

Stow. D.A and Chen. D.M, 2002 "Sensitivity of Multi-Temporal NOAA AVHRR Data of an Urbanizing Region to Land Use/Cover Changes and Misregistration" *Remote Sensing of*

Environment, 80: 297-307. https//: doi:10.1016/S0034-4257(01)00311-X.

Haq. E Ul 1971 "Landform Drainage System Basin in Karachi Region" *MP& ED Report, KDA MP-Rp-9 dated 31/3/71, Karach: Pakistan*

Hinrichsen. D, 1998 "*Coastal Waters of the World: Trends, Threats, and Strategies*" Island Press, Washington D.C.

MP & ED Plan, 1999-2000 "Karachi Coastal Recreation Development Plan" *Karachi Development Authority, Pakistan.*

Mansoor. A, Mirza. S 2007 **"**Waste Disposal and Stream Flow Quantity and Quality of Lyari River" *Indus Journal of Management & Social Sciences,* 1(1): 70-82 (https://core.ac.uk/download/pdf/6671820.pdf

Pithawala. BM, Kaye. MP, 1946 "Geology and Geography of Karachi and Its Neighbourhood. Daily Gazette Press, Karachi, 6.United Nations News, 2014 "Global Perspective Human Stories" https://news.un.org/en/story/2014/07/index.html. Accessed 1st July 2018

United Nations Population Fund, 2007 "The State of World Population: Unleashing the Potential of Urban Growth" United Nations Publications, Chapter 1.