QUANTIFYING THE DIVERSITY EXPOSURE IN DIRGH LAKE, ESTABLISHING UTILITY OF MULTI-SPECTRAL IMAGERIES, DISTRICT KAMBER SHAHDADKOT

NAILA PARVEEN ABBASI*, MUHAMMAD SAJJAD**, AIMAN SHAHANI***
GHAZALA PARVEEN ABBASI****
Department of Geography, Shah Abdul Latif University Khairpur
Asia-Pacific Climate Impact Center (GCACIC), City University Hong Kong
Department of Geography, University of Karachi
Department of Education, SMBBGC, Larkana, Sindh.

ABSTRACT

Exploring and classifying disparities, across the timespan is the spontaneous primary step in the direction of classical typology. The contemporary understanding is directed to be more manipulative the diversity exposure in Dirgh Lake which is, located at a distance around 29 km in the west of district Larkana and 7km from district Kamber Shahdadkot. About an extent of 4,803 acres and 6.23 Miles. Dirgh Lake is gazetted as a "Biota" (Flora, Fauna) nature preserve in 1972. For this intent the key motivation is the use of multi-spectral imageries for the year of 2007, 2012 and 2017, quantified the inconsistency in Dirgh Lake. And another target was explored and classified the variation in dry land and vegetation around lake and catchment expanse of lake for revealed years. Furthermore, evaluated lake water comparison of 2007, 2012 and 2017 through NDWI.

For this investigation, Geo informatics techniques supported to categorize the realities and records near this revision, remote sensing and Spatio-temporal GIS have been use to catch out geographic variety and diversity in lake. Further the ground survey has been done in study area. The change in catchment area has been observed greater in the year of 2017, about 37% as compared to 2007 and 2012 respectively. Definitely grounded on outcomes of this research, it will be constructive in collective and improving attention around the preservation and protection of this natural reserve.

KEYWORDS: Area Change detection, Catchment area, Classification, Geoinformatics/RS and Lake,

1. INTRODUCTION

Local lakes display an exceptional importance surrounded by the worldwide fresh water sources. Contain greater than 90% of whole the liquid fresh water on the surface of earth, they upkeep a sort of human engagements, including agricultural, commercial, transportation, recreation, travel, nutrients plus energy invention. They moreover provides significant habitation for a varied group of organisms. It is due to their important significance that should be must improve regulate of lake pollutions and assimilate lakes loaded with contaminants, so as to bring back their ecology

amenities for the growth of environmental development. [17]. Spotting lake changing aspects is required to permit supportable supervision of water sources. In accumulation, lake outward ranges, specifically closed lakes, remain identified for their sensitivity to natural fluctuations and therefore can help as main alternatives for local ecological plus universal climate variations. Fluctuations in the areal range of Lake Surfaces might arise owing to many influences counting unconventional infilling of the lake basin by deposits, weather changes, or the enlargement of drainage structure. Sensing and describing the variations over time is the natural primary pace towards the classifying the driver of the changes also thoughtful the variation mechanism. Fluctuations in lake level or comparative water deepness stay mutually purposes of Lake Surface remain important. [2].

In direction to understand the aim, progress and implementation of multi-disciplinary expertise must be stimulated. Amongst these skills, Remote Sensing paying attention progressively thoughtfulness in the arena of the variety observing in lake features [17]. In the emerging states, millions of people hang on wetlands for their livelihood.

Satellite imageries views regulatory method envisioned for the exploration, design plus detecting ground outward things. This technique take changes near to the vital plus increasingly additional figurative used for the motive of that is the brief satellite exposure overhead excessive areas explanation and its rate and time effectiveness. in adding, in area which remain difficult to contact, over this method is feasibly the solitary system to obtain the important data extra powerfully and rapidly [13]. This is important diversity of procedures and sets of directions to perform for the differentiate variations can be well-matched by means of the distinctiveness of the earth external objects. Thus, proposed for effective variation exposure exploration, the choice of appropriate change exposure method can be too important characteristic. The choice is dependent on the potential and ability of the techniques [11]. Through the support of imageries monitring the influence valuation of water scarceness, vegetation, anthropoid/ marine, life plus ecological change exposure in Dirgh Lake extent by use of remote sensing and "GIS" tools. [7

1.1 Study Area

The Lake Dirgh set in district Kambar Shahdadkot, Sindh. The lake is on distance from Larkana approximately 29 km about 7km on the distance from Kambar Town. Outward zone of Lake Dirgh is covered by 4,803 acres. The Lake is minimal, a little saline aquatic in growing of stalk

swamps plus rich aquatic vegetation found in the Indus Mudflat. An important wintering also breeding in place of great diversity of water birds, regular support approximately 20,000 birds, commonly Anatidae. The lake is set in an area of cultivated grasslands, mostly shared into slight fields for rice farming for the reason that the area of the lake is encouraging for rice production. Dry sub-tropical cool winter and monsoonal climate with very hot summertime. As the yearly precipitation is close 175mm. Temperature outspreads of 49 during summer. The natural flora is nearby spaces remain dense growing of aquatic flora counting Cyprus alternifolius,Hydrilla verticillata, Najas minor,Scirpus littoralis, Lpomoea aquatica, Juncos articulatus,J.maritimus, Nymphaea lotus, potamogeton pectinatus,Typha angustata and Tamarix dioica. [3].

Originally, lake stayed well-known such as a shooting backup in mid of 60s. Then afterwards, by the key exertions of the department of Sindh Wildlife, the lake stayed noticeable as the Sanctuary. The midpoint facts, hideouts for the birds a small rest home made and for viewers and guests as well. The Lake acknowledged as wildlife sanctuary (182 ha) in October 1972, underneath the section 14 of the Sindh Wildlife Protection ordnance 1972.The sanctuary was registered as wetland of worldwide significance underneath the Ramsar agreement in July 1976. Managing strategy set by Conder covers a number of endorsements for enhanced managing with the structure of an edges round reservation over the streams for help to regulate of level of water also facility of surveillance to the another conveniences for visitants. As diversity of inhabitant in adding to seasonal birds commonly feat short-term besides or stable water forms of Pakistan and set up a plant of its ecology. [3]. Here is some important information regarding the irrigation canal and streams which are flowing surrounded the lake and the areas which are populated around the lake have been shown in table 1, along the figure 1 and 2 which are showing the study area and DEM of study area the dark blue areas have been sown as high value about 51 and the areas in light blue shown with low value about 37 for lake.

Irrigation Canal	Stream	Populated Surrounded Areas
Warah Branch	Raj Wah, Shaikh Jo Wah	Drib Mitho, Pingar Goth, Khuda Yar Khan Pathan Qaim Khan Shaikh, Sumar Chandio, Puna, Hani, Nur Muhammad Shaikh, Mohbat Khan Buldi, Kanwar, Wah Phatuha, Kario Murad Ali, Pohar, Kosa, Dari, Ali Muhammad Buhar, Pahwaro, Kahi Mehu, Lakhtia, Rashan Ali Khan, Daffar, Ghulam Hussain Burdi, Bundan jo Goth, Thorhi, Garhi Khair Muhammad, Acha Pir, Gada, Shabrani, Ghazi Khan

Table 1: Source: SAROH, 2012
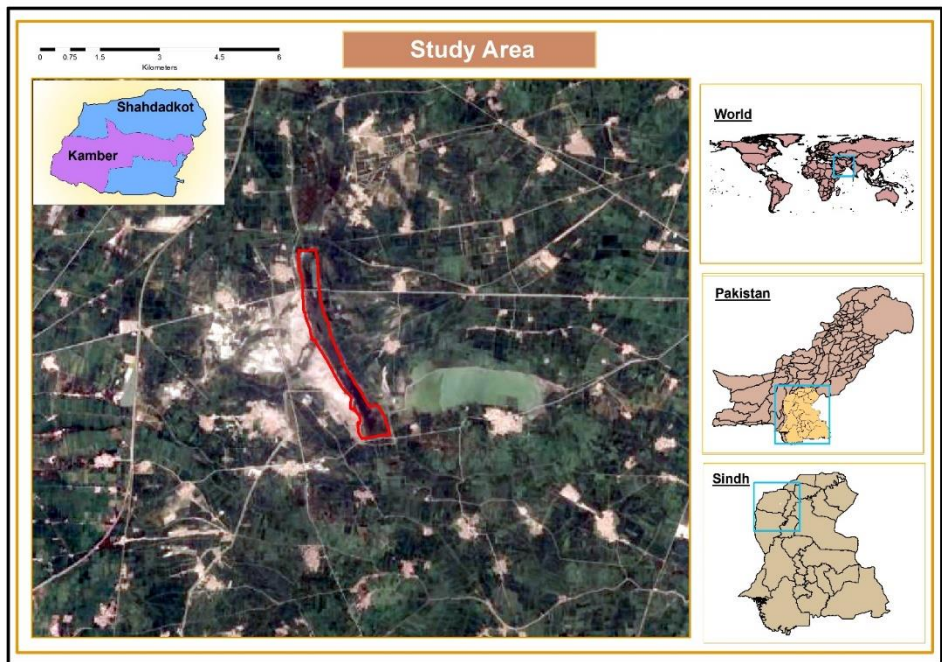
Figure 1: Study Area (Source: Authors)

1.1. Objectives

For evaluating at all method of investigation a small number of plans of objectives are very important and for leading this revision the main aims are:

1-To observe the temporal change of Lake Area through satellite imageries of Lake, in 2007, 2012 and 2017.

2-To develop maps of the study area and identified dry land and vegetation through classification.

3-Calculate the catchment area changes by the help of maps and graphs.

2. METHODOLOGY

Methodology is a proper method to clip the path and bring about the requirements to all-general the study and reach the purposes. Planetary Capability, (GIS) and Remote Sensing (RS) previously been comprehensively pre retained in land cover extents such as the identifying water and catchment areas, in hydrological expansion. In this revision the Landsat, DEM and Google Earth Pro images are used for the finest conclusions of evaluation through classification and area calculation in change exposure of lake diversity.

For facts attainment there were two key fact bases data of gathering remained used. Major significant base is prime source of figures i.e. data of imageries, which is the core piece used for the investigation. Secondary base of facts composed through printed sources. The satellite records was transferred by way of certified earth explorer USGS sharing linkage (earthexplorer.usgs.gov) marked by reference point revision. Single cover from the Worldwide Reference System (WRS-2) [12]. The interpretation was founded on three sorts of data as system data source, containing remote sensing data, grounded observation data and ecological contextual data. Seeing the possibility of local lake and observing period, the google earth pro image data aid as the chief source of remote sensing records in the method plus its methodological description of change exposure in lake [5]. The available exploration work from diverse related articles is used to catch the direction for this reading. After group of records, the utilization of platforms remote sensing and GIS used aimed for the exploration and additional conversion. ArcGIS 10.1. RS and GIS systems were used to examine and done to acquire the outcomes, later than development and taking out of area of attention from the image through [12], ERDAS 9.6 used for stack layers of multi-bands of landSAT 8 images. Commonly the procedures for the change exposure can be divided into two most main sets through classification order year wise, through Arc GIS 10.1 and Obia softwere have been used for this purpose. The motivated usually on the variations in the change in area wise and

land covers changes in lake [4]. Un-supervised classification and Obia classification is well-defined easily as the method of by sections of un recognized character to classify pixels of recognized character. Sections of un recognized characters are pixels found within training areas. Just the once training areas are nominated, image procedureing software is used to catch out the numerical parameters for each facts class. The image is then classified by inspecting the reflectance for each pixel and creating a result nearby which of the information class it would be similar to the most. There are many possible bases of errors related with un supervised classification. Initial, the analyst-distinct classes may not equal the natural classes that occur within the data, and as a result may not be different or well distinct. Next, these classes remain founded on informational class and spectral properties of the image. Classes may not be illustrative of settings come across through the image so the predictor can have problematic in identical potential classes as distinct on maps [12]. Well ahead than enhanced the images, then raster images were extending, than to decrease geometric error via study plan and survey, used Ground control points (GCP) to upsurge the image precision. For the resolve imagery was parting/ covered extent of exploration. The examination images from 2007, 2012 and 2017 were grip mark nearby the change exposure, vegetation, water and dry/ barren lands revealed in (Figs 3,4 and 5) in view of that. NDWI has been done through Arc GIS 10.1. As the table 2 has been shown the images which have been used for this study.

Table 2: Details of Satellite data.

S.No	Date of Acquisition	Satellite Images	Sensors	Bands	Resolution (m)
1	04-08-2017	(DEM)	Data Provider	1	30
2	2007,2012,2017	Google Pro	Data Provider	3	15
3	06-08-2017	LANDSAT-8	Data Provider	11	30

Ground survey have done, that was exactly important to well acknowledge ground realities in land cover of the study area. The ground-founded observational records comprise a diversity of the water and lake monitoring signs on the fact brought by conservational security departments.

These ground-centered observational records is used to form the model of water lake ecology sign observing grounded on remote sensing data on

the one hand and to the repetitive watching of variation in water
enclosed sign on the fact. The ecological contextual records is a data fixed
that covers ecological numerical facts, land use and cover change data,
vegetation data, hydrological data and important geographical facts data
in the methods [18]. A figure of variation uncovering methods have been
familiarized to detect fluctuations in surroundings with remote sensing
data [14]

3. RESULTS AND DISCUSSION

The results bring current standings of change in water cover for lake
diversity. Exploration and description of truths are very commanding parts
in methodological investigation.

3.1. TEMPORAL CHANGE IN LAKE 2007-2017

In 1977, the mud plus silt soil of an area remained greatly permeated by
saltish resulting heavy overflowing. Monsoonal rains fed to the lake, a
number of minor streams inflowing beside east part plus water
commencing a minor canal towards the northern part and nearby no one
exit waterway is there. The dry-pre monsoonal time starts from early
summer throughout the season, so the few portions of lake become
dryer. As (figure 2) is showing the temporal change in lake area year wise
from 2007, 2012 and 2017, as the lake looked diverse in extent in current
years the outcomes of the deviation of flood water used for irrigational
purpose and presently just about the entirely over progress within
growing flora part, mostly Tamaris and Typha. As the level of lake have
been perceived through satellite imageries as in 2007 it was about 34% it
was greater due to change in terms to the rainwater accessibility plus
29% in 2012 due to nearly dry out totally throughout the waterless
period. Though, additional aspects may perhaps affects lake apparent
dynamic forces. This comprises anthropogenic events i.e. irrigational
system sideways the river. Concentrated irrigational actions takes beside
the river which drain to the Dirgh Lake. The discharge deposit the basin of
lake, it might be one of the motives meant for the drop of surface water
in 2012. Then over in 2017 it has been more in extent about 37% due to
entirely renew subsequent of rainfall measures or high water flow in
streams related with lake. And drained with tube wells water to river and
other tributaries linked to lake. Land cover of the study area separated
into six different classes as shown in figure 3, 4, and 5. Most significantly,
the variation in water, vegetation, salinity, barren soil and dry land of the
lake were consequent. These all were taken out the classified image of

year 2007, 2012 and 2017. The time-based variations in among these classes remained known through the classified images and graphical representation.

As the deep water in 2007 about 16.5% and it decreased due to the fluctuation in water availability in 2012 about 1.3% while, 5.2% in the year of 2017. In another way, afterward a lesser age of 5 years, a major changes shown the diversity in shallow water it was 18.3% in 2007 and 12.1% in the year of 2012.

Figure 2: Temporal Change in Lake Catchment Area Source: Authors
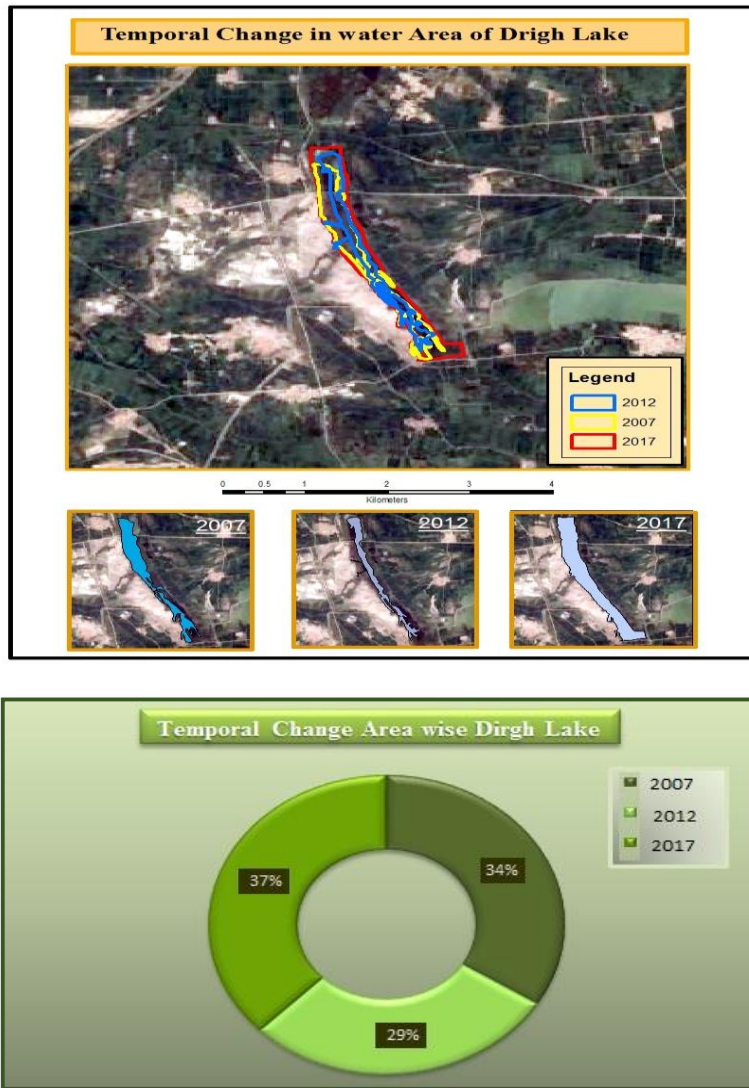
Figure 2: Temporal Change in Lake Catchment Area Source: Authors

Similarly, in 2017 it remained greater as 22.3% may be due to the sediments flows through streams and anthropogenic activities may be the cause of increasing shallow water and decreased of deep water in Lake Dirgh. Light shallow water is the water which is slightly surface water which have been observed about 53.9% in 2007, but it has been decreased as 9.9% in 2012 and 6.9% in 2017.
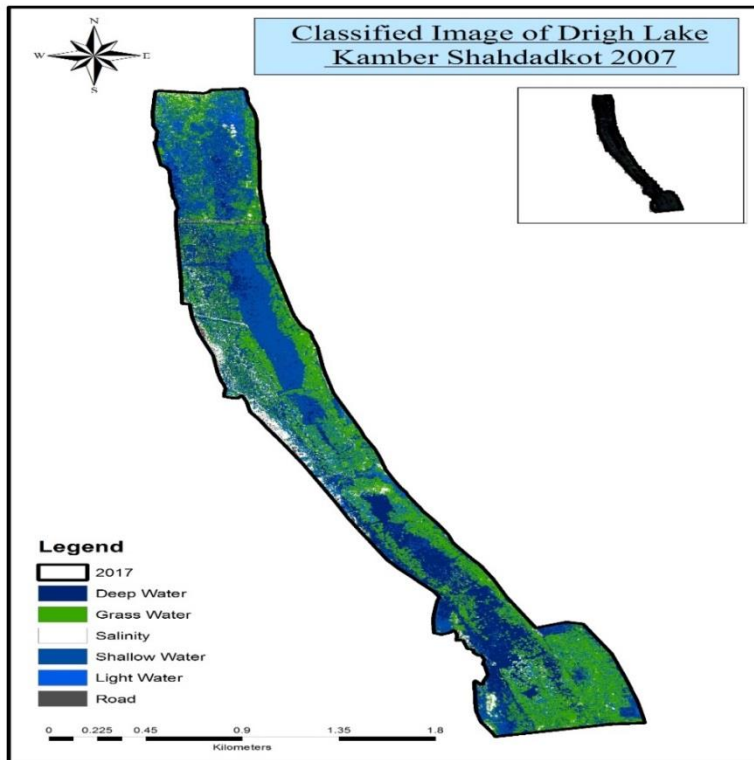
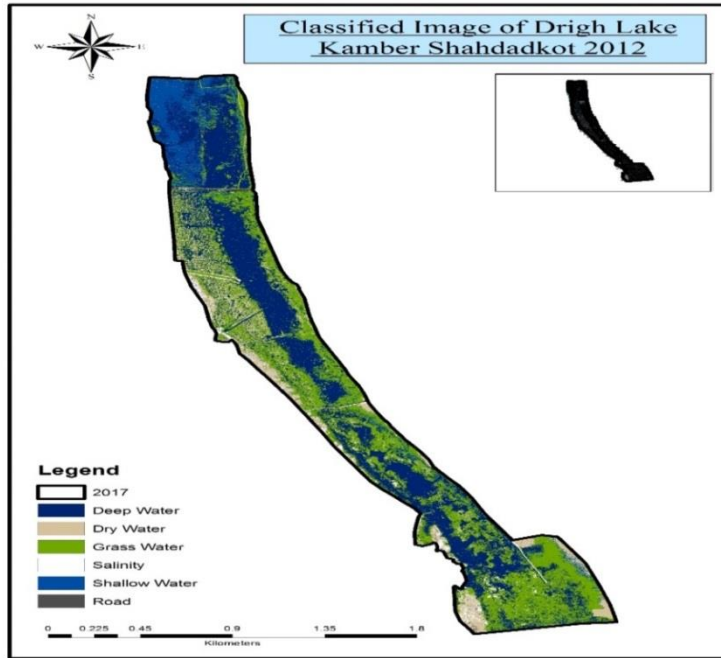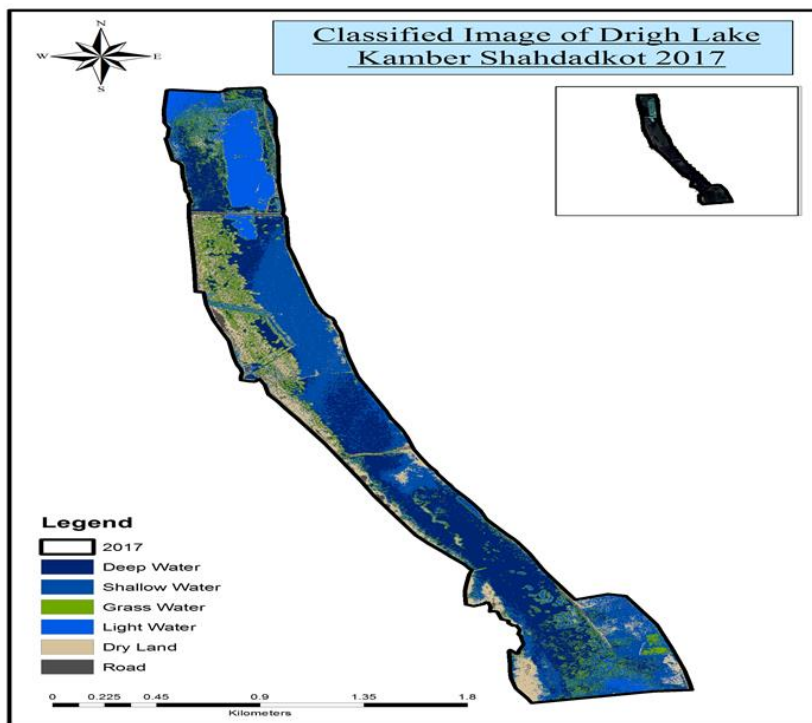**Figure 3:** Classified Image of Dirgh Lake 2007, Source: Authors

Figure 4, 5: Classified Image of Dirgh Lake 2012 & 2017, Source: Authors
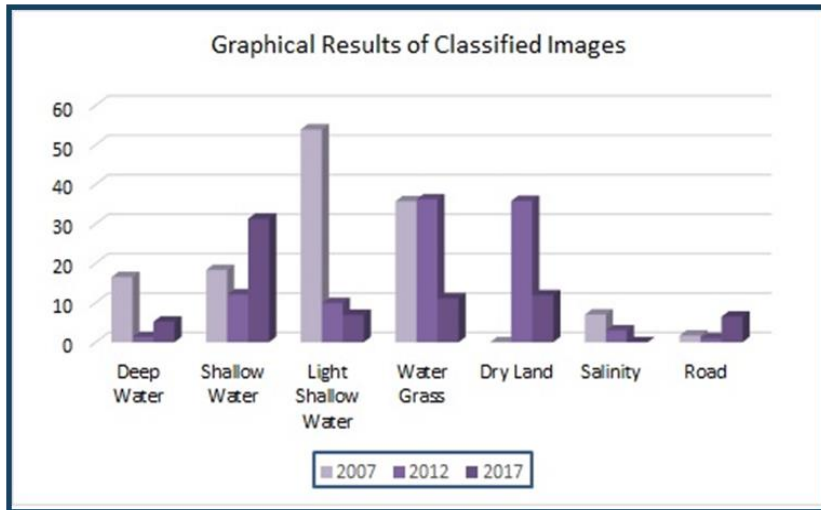
Figure 6: Graphical Representation of

Classification, Source: Authors

The water with grass and field water with full of vegetation have been observed about 8.3% in 2007 while it has been increased about 24.5% due to the increase of vegetation in lake in 2012 similarly, in 2017 the increase of lake grass water have been observed around 38.1% in lake. Dry land have been observed in 2012 about 35.8% and 15.9% in the year of 2017 due to increase of water level. Barren soil in the year of 2012 was about 12.1%. As salinity have been observed in 2007 about 18% around the lake area.

3.2. CHANGE IN CATCHMENT AREA OF LAKE 2007, 2012 AND 2017

The drainage infrastructure comprises of warah branch from east to south and dhamraho waah from warah canal and many small streams flowing from western side around the lake, which also drain the lake [10].

Though, in this revision we look a simple mode to calculate and attain water source dynamics form slighter as well as shallow western streams and monsoonal rainfall, Smaller and shallow western streams are main sources of water in Dirgh Lake and it also drain with water of tube wells. Valuations of stream tributaries are becoming progressively significant particularly in the time of quickly modification in area of lake. Water source dynamics satellite imageries provides pictorial imprint of the variations of water and an area on both spatial and temporal coverage of change in catchment.

As the basin area of lake has been observed in 2007 around 130km, and about 111km in 2012 it was reduced due to the decreased of water level because of high temperature in summer the evaporation rate remained high, similarly 142.5km in the year of 2017 it was increased due to the fluctuation in water in lake. For the measurement of catchment area of lake was 34% in 2007 and 29% in 2012 and 37% in 2017.Its drainage is ending in Jagir Mirpur area of Registan where it made delta. Most of the left tributaries of western streams served by an extensive surface drainage network that includes rate of water increased.

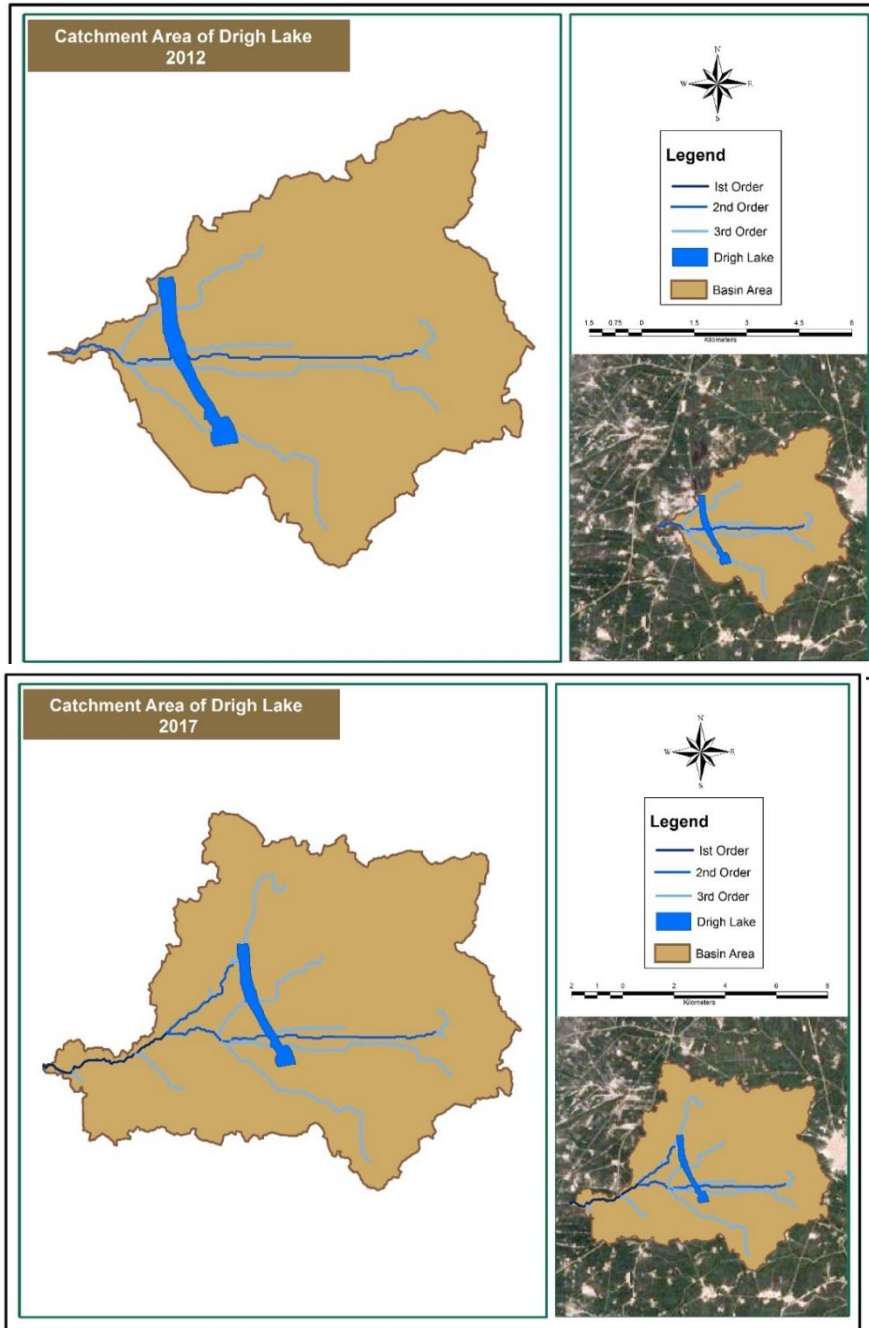**Figure 6:** Catchment Area of Dirgh Lake 2007 Source: Authors
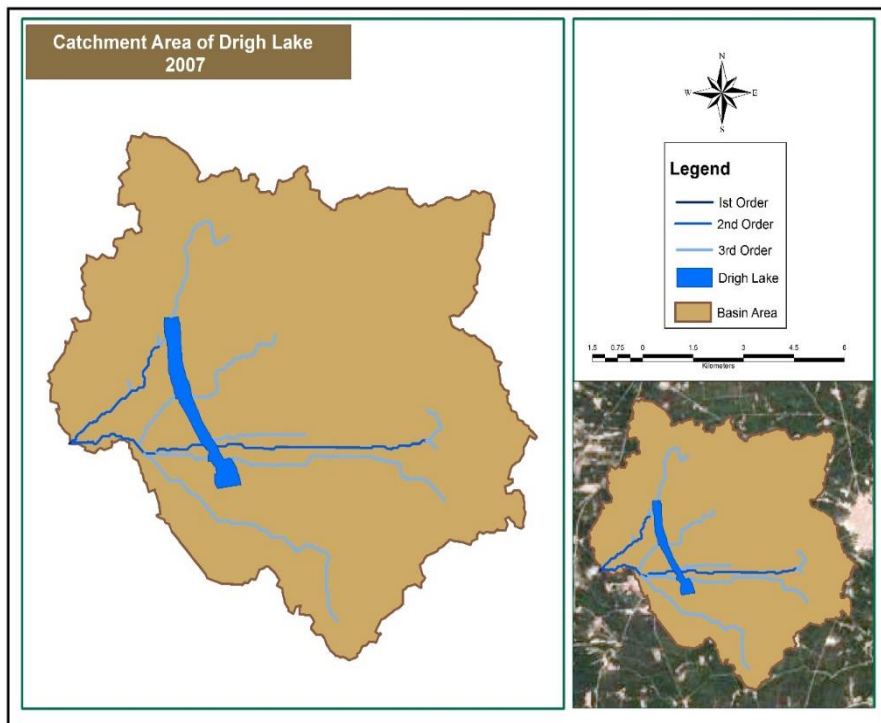
Figure 7, 8: Catchment Area of Dirgh Lake 2012 and 2017, Source: Authors
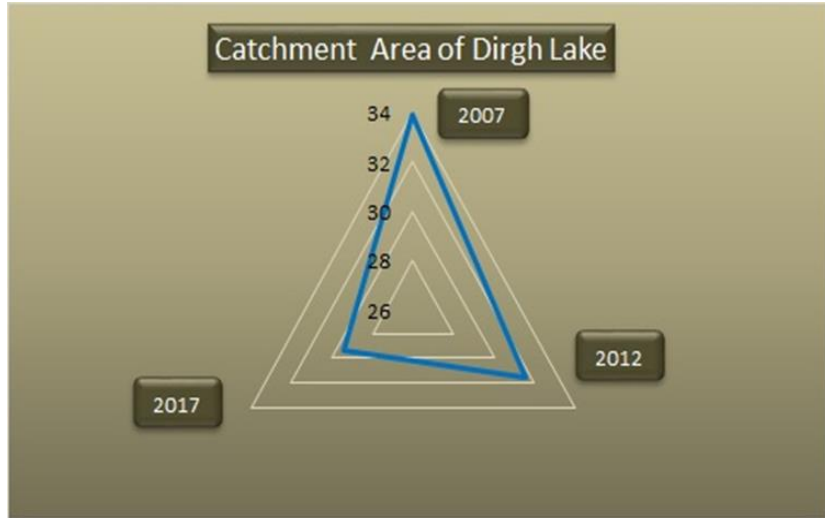
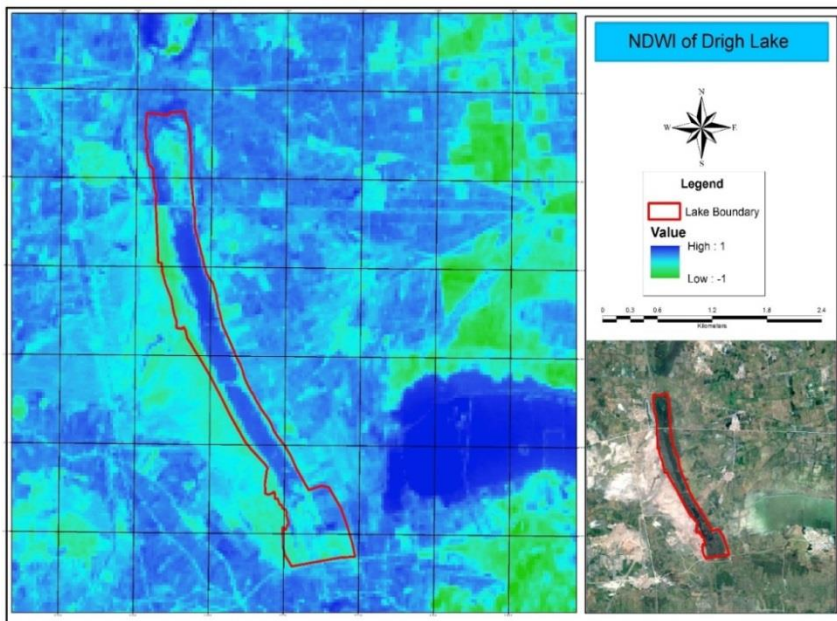**Figure 9:** Catchment Area of Dirgh Lake, Source: Authors

Figure 10: NDWI of Dirgh Lake 2017, Source: Authors

We calculated the concert of, NDWI for water surface mapping as shown in figure 9, water bodies remain distinct by index values between 0 and 1 but, here the both values has been shown as 1 but the high value is 1 with blue color means all blue color showing the water and low value shows the negative value -1 for lower areas around the lake. As signifying that NDWI is appropriate intended for the withdrawal of aquatic sorts. As this is similarly helpful for regular surface lake disparity investigation where by

the values contributes a comparable or varied inclination within the changing aspects of surface lake water. It was validate that NDWI is highest appropriate and at ease method for the explanation plus aquatic mapping variation even light, deep and small aquatic parts. Mostly, the outcomes demonstrated that remote sensing is an effective technique meant for the evaluating aquatic diversity within rural settings.

REFERENCES

1- Ashley, C., Goodwin, H., and Roe, D. (2001). Pro-poor tourism strategies. Making tourism work for the poor. A review of experience. Pro-poor tourism report No. 1. Overseas Development Institute (ODI) and International institute for Environment and Development (IIED), United Kingdom.

2- Deus. Dorothea, Gloaguen. Richard, Remote Sensing Analysis of Lake Dynamics in Semi-Arid Regions: Implication for Water Resource Management. Lake Manyara, East African Rift, Northern Tanzania.

3- Gabol.Karim, et.al; (2005). Distribution, Status of Migratory and Resident Waterflows of Dirgh Lake (Sindh) wildlife sanctuary. Volume 1, 37-40.

4- Herold, M., et.al; (2002). The Use of Remote Sensing and Landscape Metrics to describe Structures and Changes in Urban Land use. Environment and Planning, 34, 1443-1458.

5- http://www.cresda.com/n16/n92006/n92066/n98627/index.html.

6- https://www.scribd.com/doc/99575060/The-Profile-of-District-Kamber-Shahdadkot-Sindh-Pakistan-2012

7- H. U. Abbasi, et.al; Temporal Change of Mancher Lake through Landsat Satellite Imagery.

8- Lee. K. S., et.al; (1998), "determination of Land Use Change Categories Using Classification of Multi-temporal Satellite Image Data", Inha University, Dept. of Geo-informatics Engineering   253 Yonghyun- dong, Nam-ku, Inchon, 402-751, Korea.

9- Lohano D. Heman, et.al; , Impact of Nature-based Tourism on Local Livelihoods: Evidence from Keenjhar Lake in Pakistan.

10- Majeed. Sidra, et.al; (2010) Managing Natural Resources for Sustaining Future Agriculture Research Briefings. Natural Resources Division, Pakistan Agricultural Research Council, Islamabad, Pakistan Situational Analysis of Sindh Coast. Volume (2), No (11).

11- Mispan, R. M. et.al; (1997) "land Cover Change Detection Radio metrically-Corrected Multi-Sensor Data" Department of Geography, Univ. of Nottingham Univ. Park NG7 2RD Nottingham United Kingdom.

12- Rehman. et.al; Evaluation of Land Cover Changes at the Coast of Sindh through Successive Landsat Imageries. Volume 7, Issue 1

13- Silva. R. (1996), "Monitoring of Land use Changes" center for remote sensing, survey department of Sri Lanka, GIS-development, AARS, ACRS, land use.

14- Singh, A. (1989), "Digital change detection techniques using remotely sensed data", International Journal of Remote Sensing, volume 10(6), 989–1003.

15- UNWTO (2011). UNWTO Tourism Highlights, 2011 Edition. United Nations World Tourism Organization.

16- van der Duim, et.al; (2007), Wetlands, poverty reduction and sustainable tourism development, opportunities and constraints. Wetlands International, Wageningen, The Netherlands.

17- Wuhan Declaration, Rehabilitate the Lake Ecosystem: Global Challenges and the Chinese Innovations. The 13th World Lake Conference. Wuhan, China, 2009.

18- ZHOU. Zheng, et.al; Research on the Water Quality Monitoring System for Inland Lakes based on Remote Sensing, School of Remote Sensing and Information Engineering, Wuhan University, Luoyu Road No.129, Wuhan, China.