Environmental Change Detection of the Main Drain Area, Iraq

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***Abstract*— Main Drain is a longest canal constricted from the middle to the southern parts of Iraq for transporting the agricultural and saline waters of the areas between Tigris and Euphrates Rivers via well- linked drainage networks. Multi-temporal satellite Images of the periods, 1990, 2001 and 2013are used for assessment the environmental change detection of the area restricted between Tigris and Euphrates Rivers, where the used indicators includes: Normalized Differential Vegetation Index (NDVI), Normalized Differential Water Index (NDWI), and Salinity Index(SI). ERDAS V. 11.1 and ARC GIS-10 software's are used to conduct and process all the required calculations. NDVI and NDWI results show similar behavior where they explain decreasing patterns at the year 2001 and then slightly increasing at the year 2013, this is due to the decreasing of the available water quantities and hence the vegetation cover at 2001due to the drought condition at that year. Salinity Index (SI) shows growing increase reflecting the continuous deterioration of agricultural land in the study area. The drought conditions, misuses of the irrigation water, and mismanagement of some secondary drains considered as the main degrading factors affecting the Main Drain area. Protecting of the Main Drain and surrounding areas by completing the lands reclamation plan in association with a proper operation scheme of the Main and secondary drains is of prime importance in this regard.**

***Index Terms*—Iraq, Main Drain , Change detection, NDVI, NDWI, SI, TM, ETM, OLI8.**

I. INTRODUCTION

Image classification is one of the most important steps in processing remote sensing imagery and provides important input data for Geographic Information Systems (GIS). Land cover characteristics are utilized to assess the environmental impact resulting from the development of energy resources, also to manage wildlife resources and minimize man- wildlife ecosystem conflicts, in addition to preparing the current environmental influence statements and predict future impacts on environment. The land cover monitoring is the registration process variables that occurred over long-time period. This monitoring represents the important factors required for natural resources management and development operations manager of any area [1].

Change detection is the process of identifying differences in the state of an object or phenomenon by monitoring that object at different times [2]. It involves the ability to quantify temporal effects using multi-temporal data-sets [3]. Remote sensing has the capability of capturing such changes, where extracting the change information from satellite data requires effective and automated change detection techniques [4].

II. STUDY AREA

The Main Drain is located in the middle of the Mesopotamia and limited by the coordinates: latitudes (30°2̀336.098"E) (33°5́447.421"E), and Longitude (43°5́57.918"N) (47°5́21.706"N) with total area of 60340.590km^2,(Figure.1).Iraq's Main Drain Project (Third River) was considered as one of the most important strategic projects as a downstream drainage line designed primarily to wash the salty soils of the Mesopotamia, and to transport the drainage waters from the catchment area between the Tigris and Euphrates Rivers, and as a border/barrier against the expansion of sand dunes towards the irrigated lands. Additionally, it acts as a navigable waterway for inland transportation between the Gulf and Baghdad, [5].This water course has, in fact, caused significant changes to the environmental, hydrological, and hydrogeological conditions in the areas along its way.

The total length of the Main Drain is about 565 km and consists of Northern, Middle, and Southern main sectors. The pumping station near Nassiriya City is designed for twelve pumps, ten of them operate at a time and two are in standby. The flow through the siphon was by gravity, to be of at (80-110m^3/Sec). Then, it was under rehabilitation since 2005 and then completed in 2009.The Main Drain water is therefore discharged to the nearby marshes by the emergency outlet, where a discharge of approximately 25-30 m^3/Sec was released through the (Dutch canal) which is connected to one of the branches in Gelween and then released to Al-Hammar marshes in Mujammar[5].In order to benefit from the Main Drain water, it has been linked to Al-Hammar marsh to avoid its drying again by Al-Khamisiyah Canal in which its entrance located at 140 km from the Main Drain. This canal has been implemented at the end of year 2009 with a capacity of (40 m^3/Sec) [6]. One of the best ways for studying the above mentioned changes along the Main Drain canal is by using of satellite imagery and classification of these images. In this respect, the change detection procedure is the main tool for observing the temporal and spatial changes of the land cover and other geological phenomena.

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