

**Land use mapping of Tikrit city by using
Remote sensing data**

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ABSTRACT

The remote sensing data with combination of computer soft wares can produce a valuable information on land use and land cover. Land use/land cover mapping leads to monitor the change over a period of time, as well as environmental change. climate change and political changes can affect the land use and land cover.

In this work the ERDAS Imagine v.8.3, Arc view GIS 9.2, Map Window and Global Mapper computer soft wares were used to develop a land use map for city of Tikrit within Salah Al-Din province.

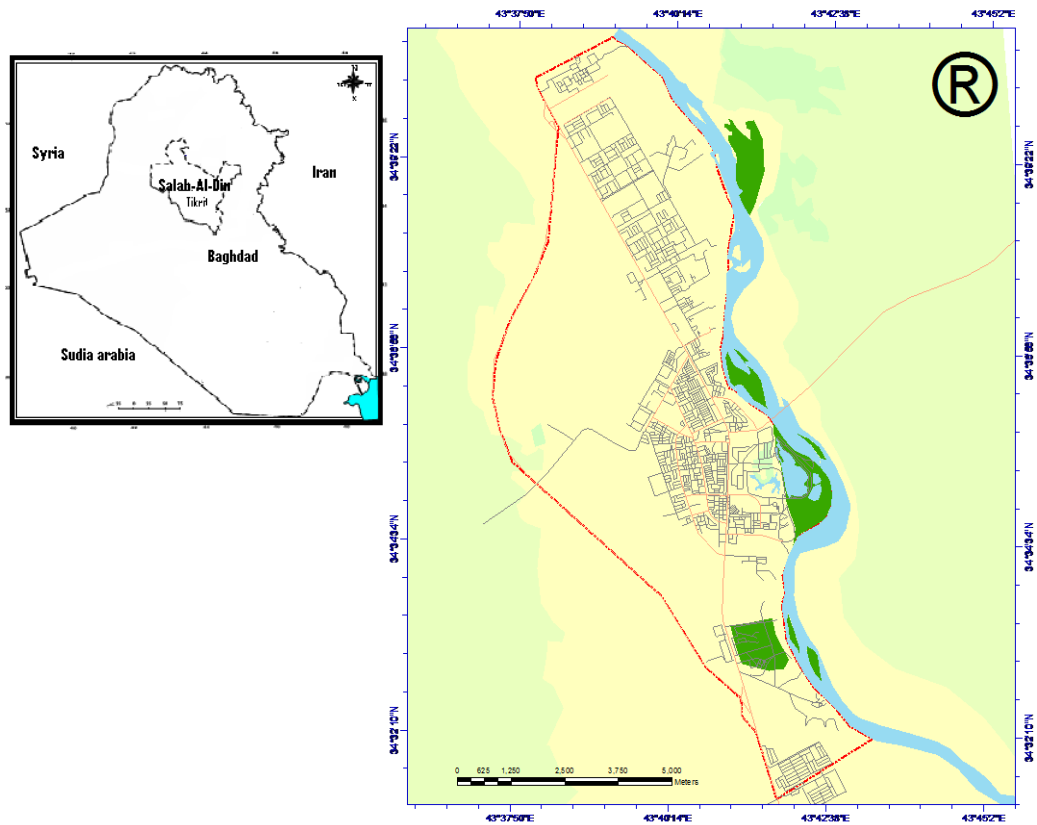
Using Google Earth program images. City of Tikrit classified in to (4) significant land use of level I which are urban or building, agriculture, water and bare land in addition to the level II and level III classification which included (9) different land use maps for the Tikrit city.

Keyword: Land use, land cover, Tikrit city, classification system, satellite data, Soft wares programs.

Location of study area

Tikrit city is located between longitude (43° 36' 52 -43° 00 43') east and latitude (34° 31' 42"-34°40' 12) north. Tikrit city is located within Salah-Al-Din province which is north Baghdad about (180) Km. and the area of Tikrit city is approximately (24.73)km². Tigris river bounds the city from the east and arid area from the west

which characterized by number of valleys directed toward the river
Figure (1).



Tikrit City / Salah Al-Din Province

Figure (1) Location map of the study area.

Aim of study

Mapping the land use and land cover of Tikrit city by using the remote sensing data and techniques.

Introduction

A modern nation must have adequate information on many complex interrelated aspects of its activities in order to make decisions. Land use is only one such aspect, but knowledge about land use and land cover has become increasingly important as the Nation plans to overcome many problems. (Anderson et al., 1976).

The evolution in technology of remote sensing has caused it to become one of the most commonly used techniques in the world. (Martinez, 2005).

The land use is important to the program of developing and growth of the city in future especially from the point of environmental change and the scientific use of the land.

The surface cover of Tikrit soil characterized by recent soil which deposited during the last two million years which represent the Quaternary period and as a result of older rocks such as Miocene deposit which exposed to the north and west of Tikrit city, this soil is rich with gypsum fragments which ranges between (20%-58%) (Hussain, 1996 and Suliaman et al., 1996) and that causes many problems for the land uses different purposes. In addition to the presents of sand dunes and their resources around the city of Tikrit.

Remote sensing techniques and data are becoming increasingly important for mapping land use and land cover. (Sabins, 1987)

The study area is threatening by a major problem of dust and sand storms which caused by sand dune that extending through the borders and the city of Tikrit which leads to desertification especially during the last few years as a result of arid conditions and the hard use of the land for agriculture purposes. Desertification and

other improper land use facts makes monitoring land use changes important in urban development planning.

Therefore land use data are needed in analysis of environmental processes and problems.

Climate condition

Iraq is located as arid to semiarid region by using various climatic elements such as rainfall, temperature, relative humidity, wind velocity according to (Peliter,1950, Karbal,1986,Alshalash,1987). Iraq in the summer months is very hot and very dry, with hardly a cloud in the sky. Winters are milder, often cool central and north. Rainfall amounts in the summer months are non-existent. The highest amounts of precipitation occur in late winter.

Tikrit city is recognized as rainless hot in summer which maximum temperature reaches 45° C in July, with annual average of maximum temperature (29.5)° C and annual average of minimum temperature (18.8) °C short and cold winter with minimum temperature reaches 8° C in January. Lower value of relative humidity in summer reaches about 24% and highest value about 75% with high evaporation which reaches (412.5) mm in summer, annual rainfall reaches (220.7)mm. (Al-Kaisy,1992).

Methodology

Land use describes how an area is used such as for agriculture, residences or industry and land cover describes the materials such as vegetation, rocks that are present on the surface. Accurate current information on land use and cover is essential for many planning activities.

Based on Anderson system of land use classification as presented in U.S. Geological Survey Circular 671 in 1976. have been carried out to produce the land use map of Tikrit city.

The U.S. Geological Survey recognized the need for a multilevel classification system that would enable the user to select the type and scale of image that suits the objectives of the survey.

Table (1) lists the image systems and image scales employed for each of the four classification levels. For example, the level-I classification is suitable for an entire state, whereas level III is suitable for a municipality.(Sabins, 1987)

Table (1) Images employed in multilevel classification (Anderson et al. 1976).

Level	System	Image scale
I	Land sat MSS images	1:250,000 and smaller
II	Land sat TM images and high-altitude aerial photographs at (12,400m) or above.	1:80,000 and smaller
III	Medium-altitude aerial photographs Data taken between (3,100 and 12,400).	1:20,000 to 1:80,000
IV	Low-altitude aerial photographs Data taken below (3,100m).	Larger than 1:20,000

Using remote sensing techniques to develop land use classification mapping is a useful and detailed way to improve the selection of areas designed to agricultural, urban and/or industrial areas of a region.(Selcuk, 2003).

In this study remote sensing techniques used such as ERDAS Imagine 8.4, Arc GIS 9.2 , Map Window GIS V.4.5.5 and Global Mapper.

Because of the unavailable data such as satellite images and the high expenses of the remote sensing data this study depend on (Map Window GIS V.4.5.5) as shown in Figure (2) . Map Window

GIS V.4.5.5 which acquires images from Google Earth program as a various view of the study area on a constant elevation with its longitude and latitude coordinates and saved in the computer memory in a sequence views with its coordinates and data with a required elevation which gives a high resolution to distinguish the different earth surface features to develop a land use and land cover classification.

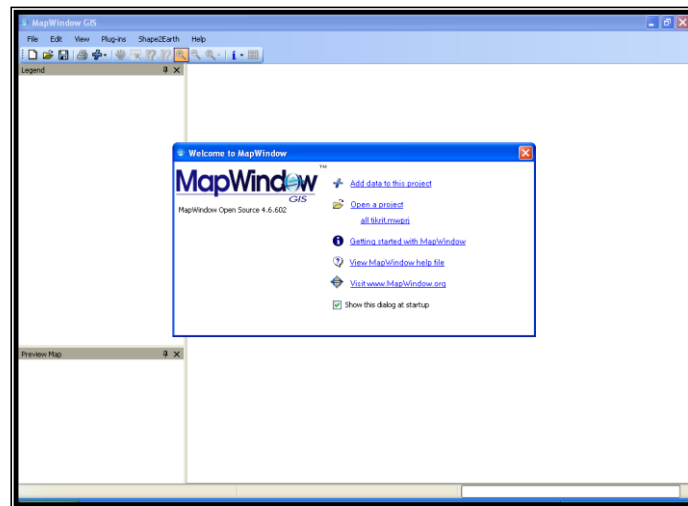


Figure (2) Map Window GIS V.4.5.5.

This program is effective by adding (shape2earth-1.46) command which imports various views from (Google Earth) which must be effective at the same time with exact coordinate of the required view and on proper altitude to distinguish earth surface features with different land use. Figure (3).

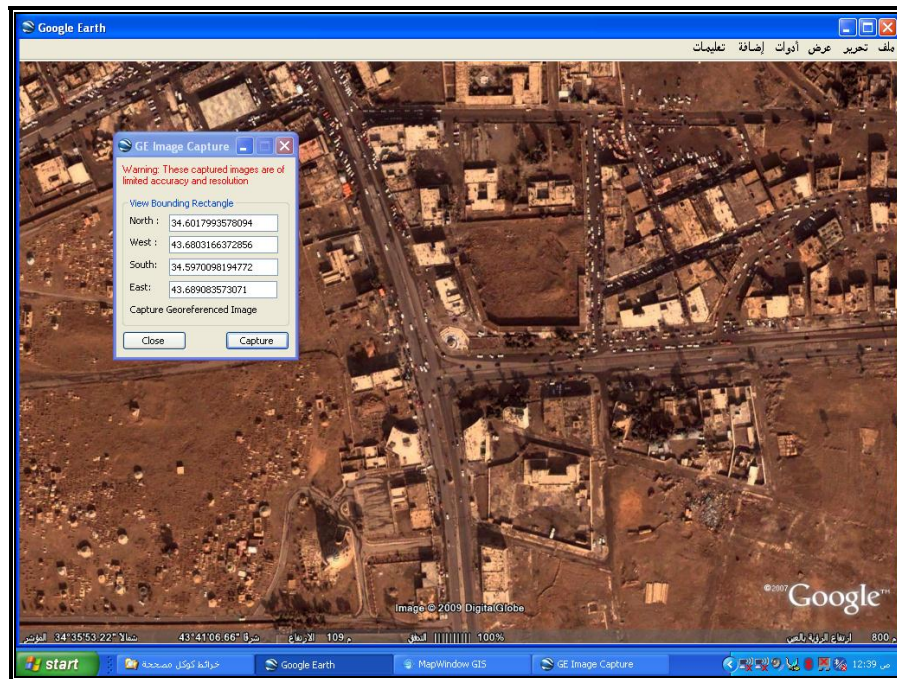


Figure (3) (Map Window GIS) program for importing satellite images of Tikrit city from (Google Earth) program as it is shown with the right coordinate of the city site in the programs window.

This technique is equivalent to the high resolution satellite images. Each desired coordinated image constructs the desired image with correct characteristics and coordinates. The present study captured (325) view of the Tikrit city upon the altitude of (800)m. Figure (4)

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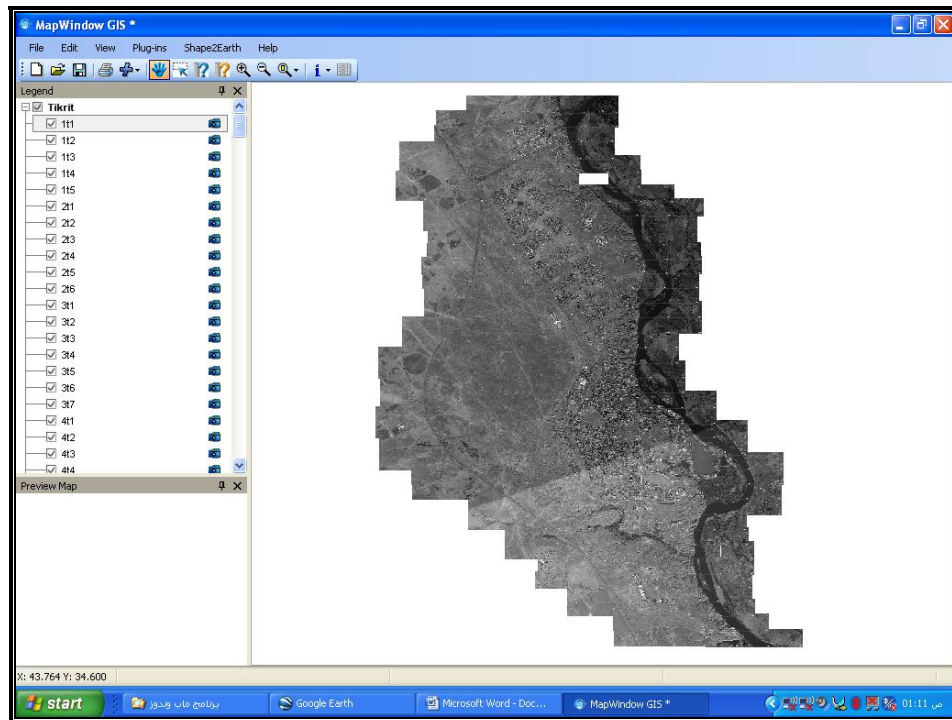


Figure (4) Using Map Window GIS program for collecting (mosaic) various views for the final Tikrit city satellite image.



Figure (5) Image of Tikrit city as imported and collected from (325) view by Map Window GIS program.

Classification of Land use

The image of Tikrit city (Figure 5) was interpreted according to basic elements of interpretation used by (Zudium and Zudium, 1978), which includes (Tone, Size, Shadow, Pattern, Shape, Site and Association), and classified according to (Anderson et al., 1976) system for land use as following:

The study area is divided into (4) important land use and land cover types which include urban/building, water body, agriculture and bare land.

Urban or Built-up (100)

This category comprises areas of intensive land use where much of the land is covered by structures and streets. (Sabins,), it is included the residential areas (110) which is obvious almost a straight line parallel to the Tigris river as shown in figure (6) and figure (7) shows the names of the different residual areas in the study area, which was a small semi-circular pattern in 1937 and grew in to almost in 1972 and 2009 as shown in figure (8). This class is comprises mostly of single unit medium density (112) to multiple dwelling two stories or less (115).

It is found that the commercial and services are distributed in the study area with a intensive existence in the city center, figure (7). From the figure (8) it is found that the industrial uses is in middle of the city in a small area.

Figures (9,10,11,12 and 13) represents the different types of urban uses such as commercial, industrial transportation, institutional and medical uses.

Agricultural

The agricultural area in Tikrit city is recognized on the image by rectangular patterns near the Tigris river which represents forests, cropland and orchard land as shown in Figure (14).

Barren land

Barren land has a limited ability to support life and in the study area it is limited and made up of gravel and sand of quaternary sediments near the river banks which is shown in Figure (14).

Water

It is a basic type of land use which make up the fundamental structure of land use maps and are an important element of base maps.(GIS development,1989). In the study area it included Tigris river, canals,lakes and ponds as shown in Figure (10).

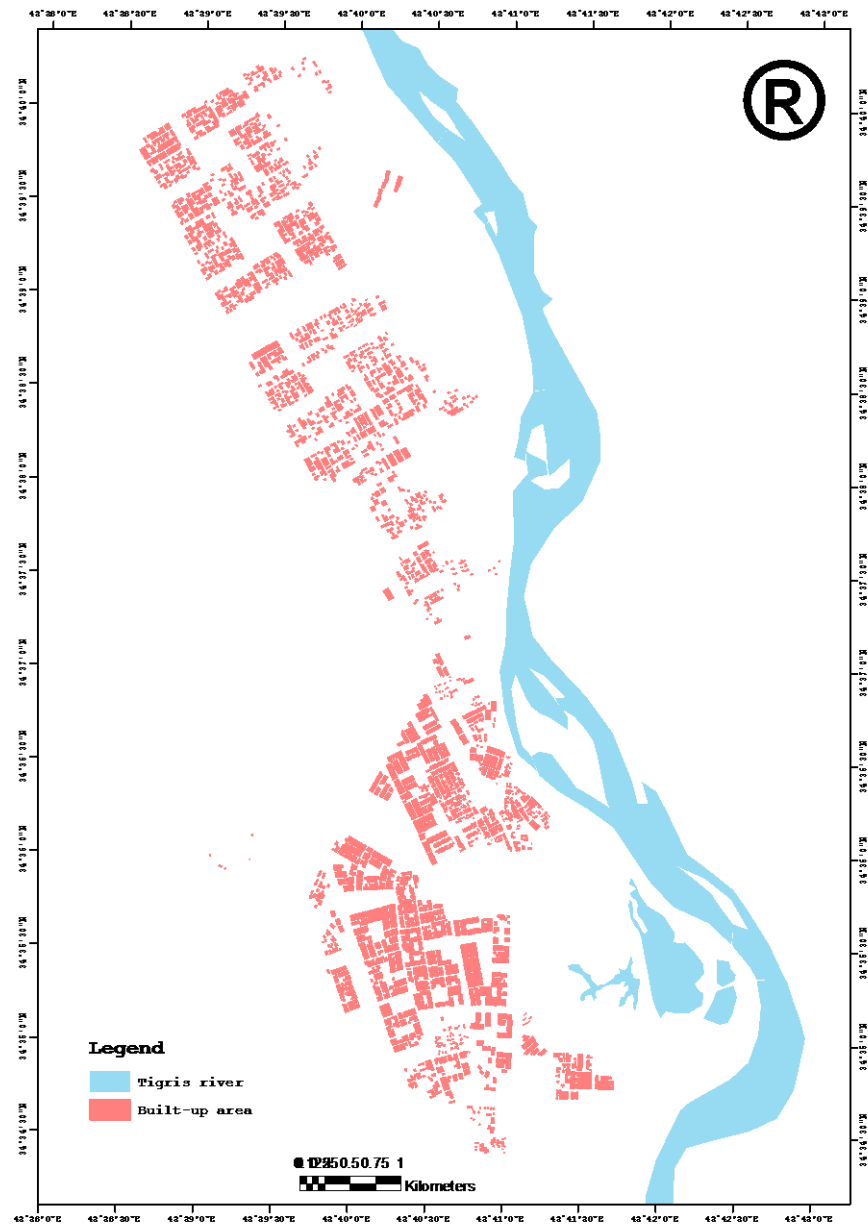


Figure (6) Map shows the residential use of the studied area.

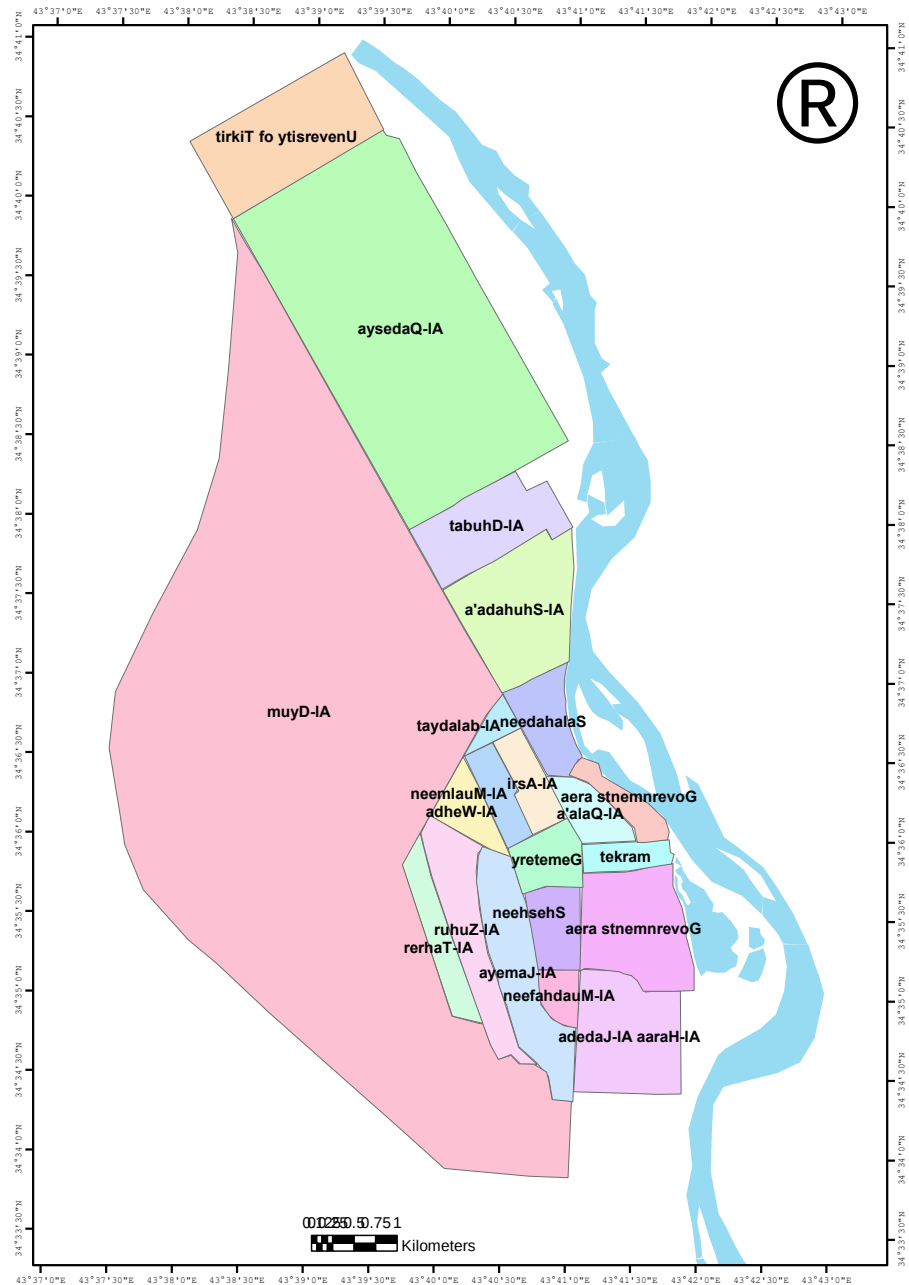


Figure (7) Name of the residential area.

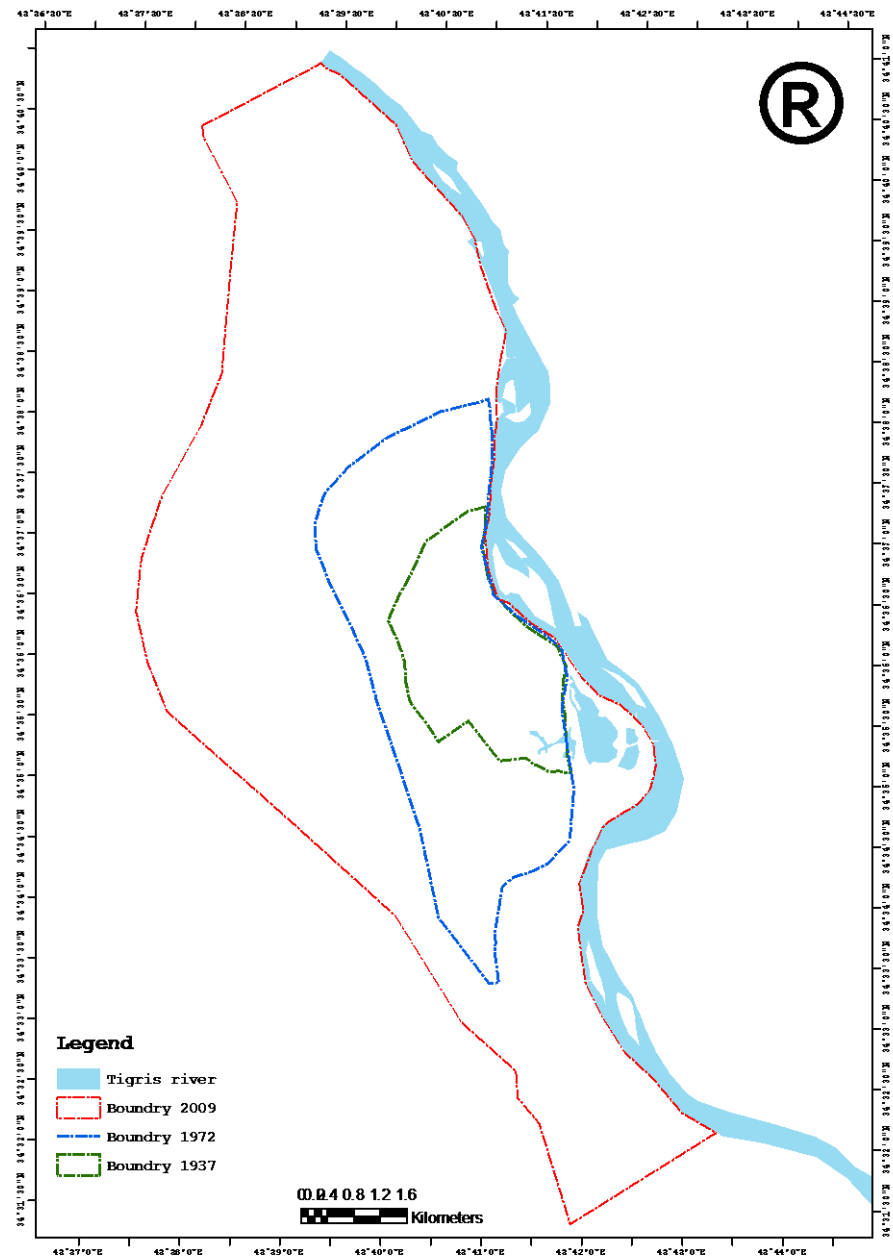


Figure (8) Growth of the city development for years 1937, 1972 and 2009. boundaries

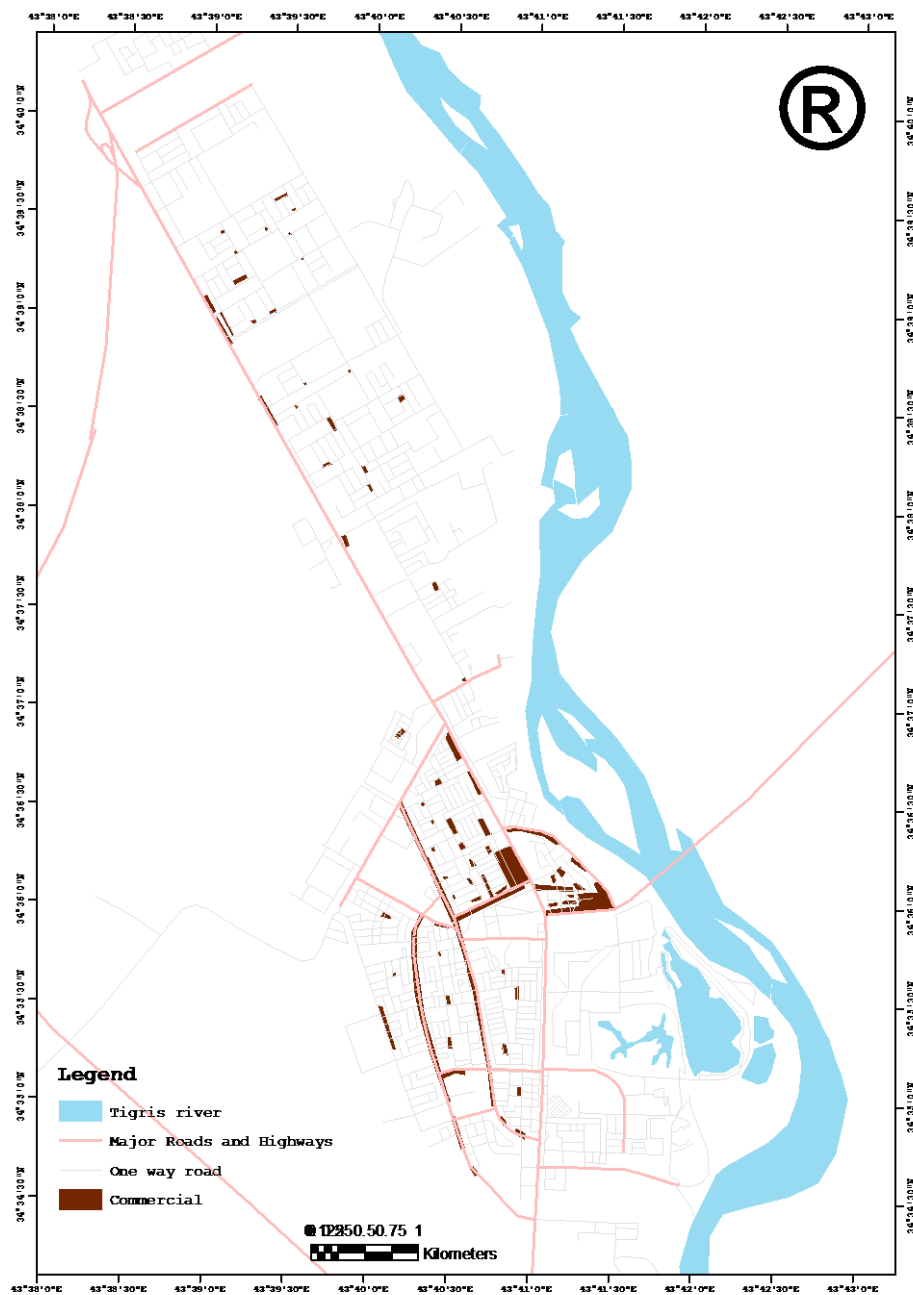


Figure (9) Commercial and services uses in the studied area.

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Figure (10) Shows the industrial uses area in the studied city.

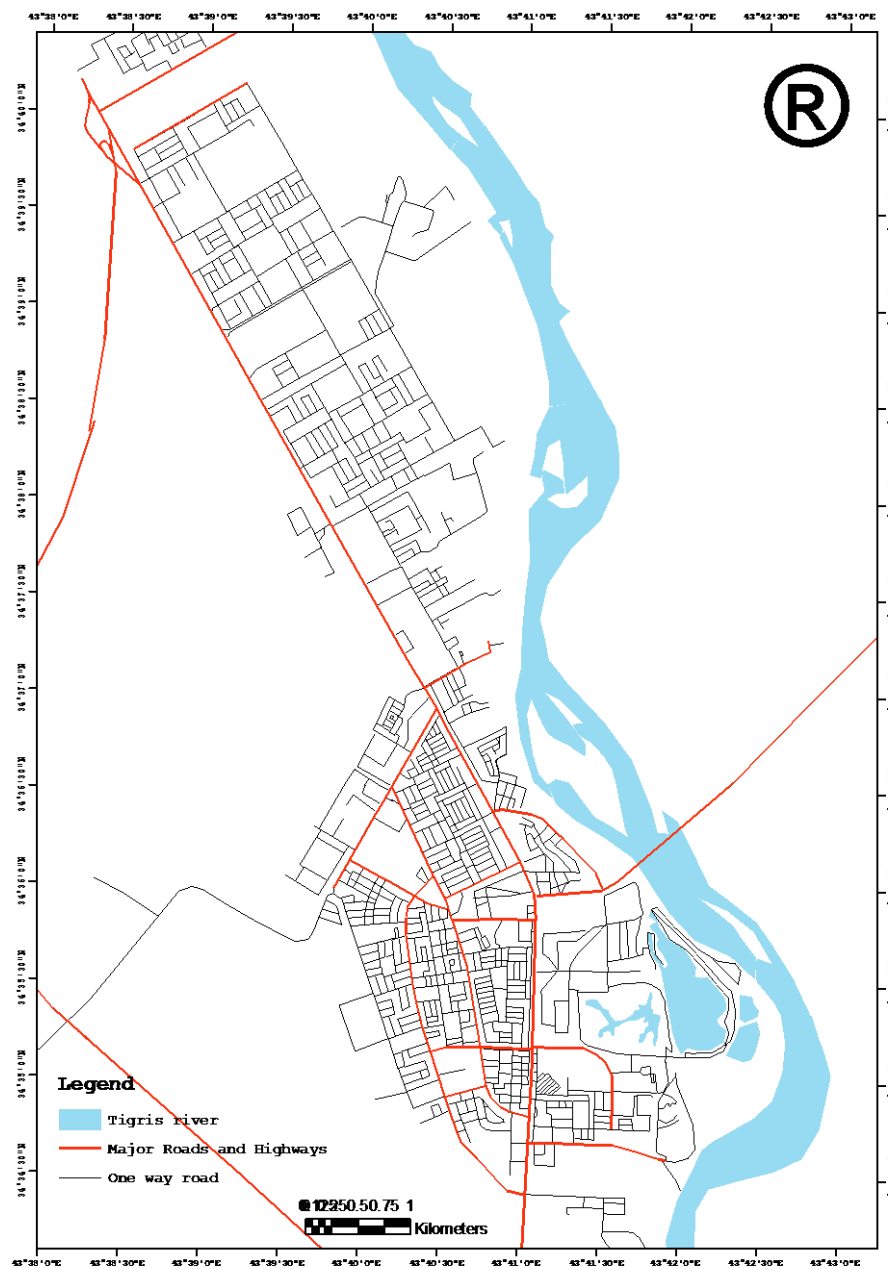


Figure (11) Transportation use

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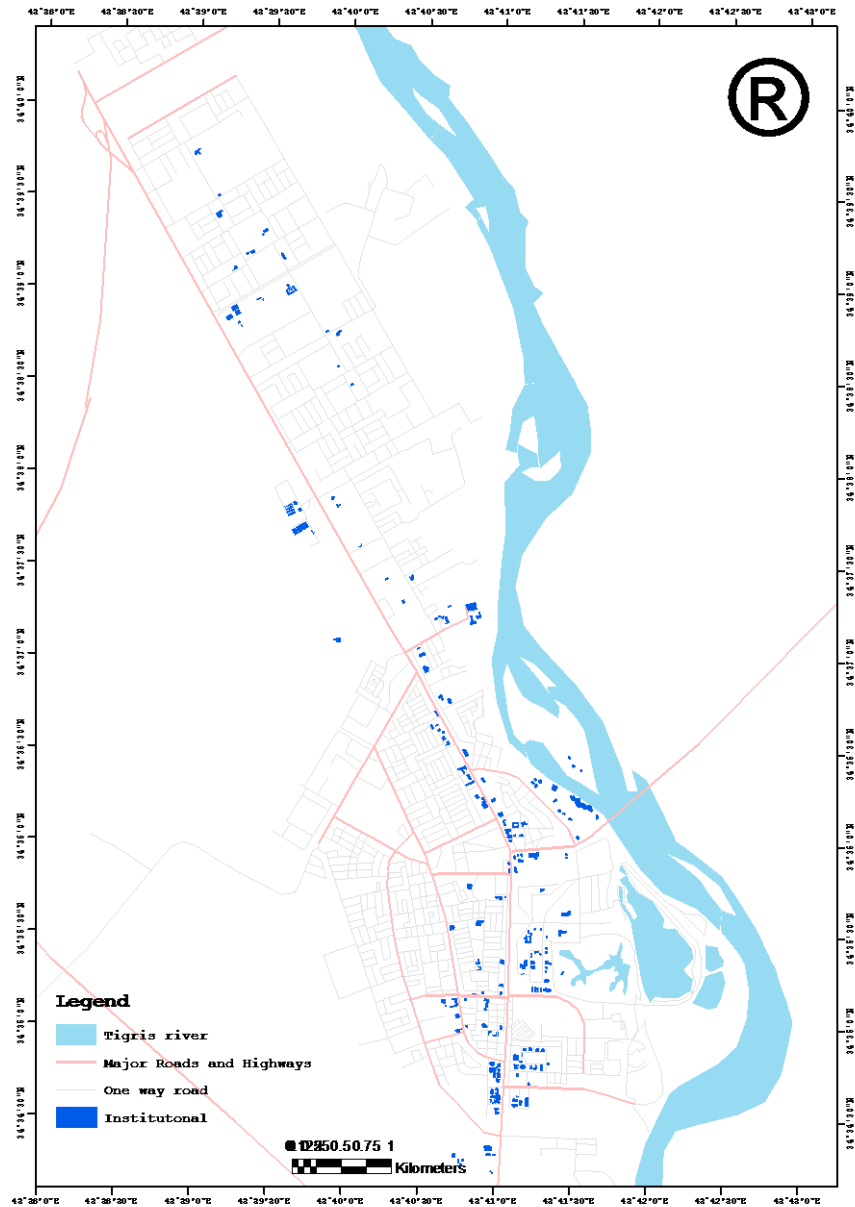


Figure (12) Shows distribution of the Institutional use.

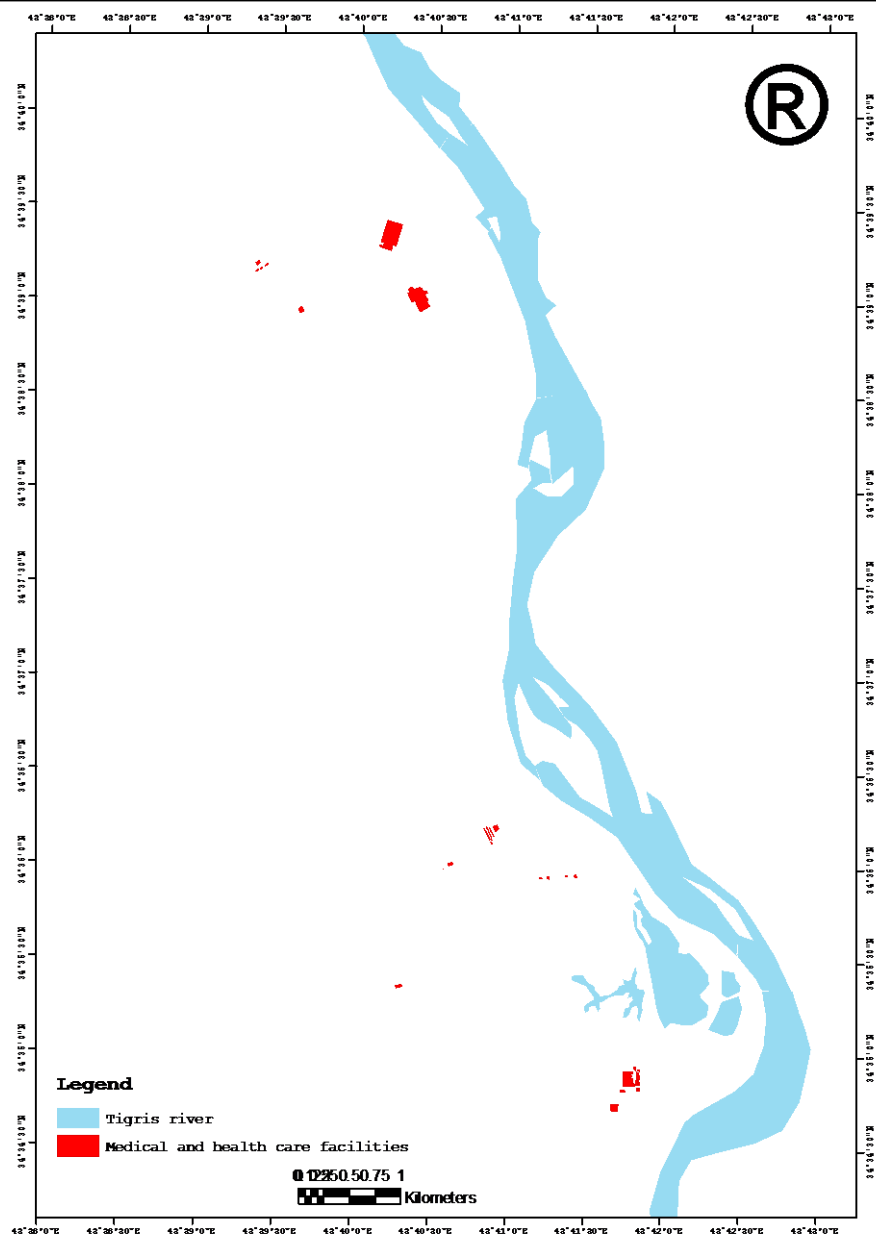


Figure (13) Medical uses.

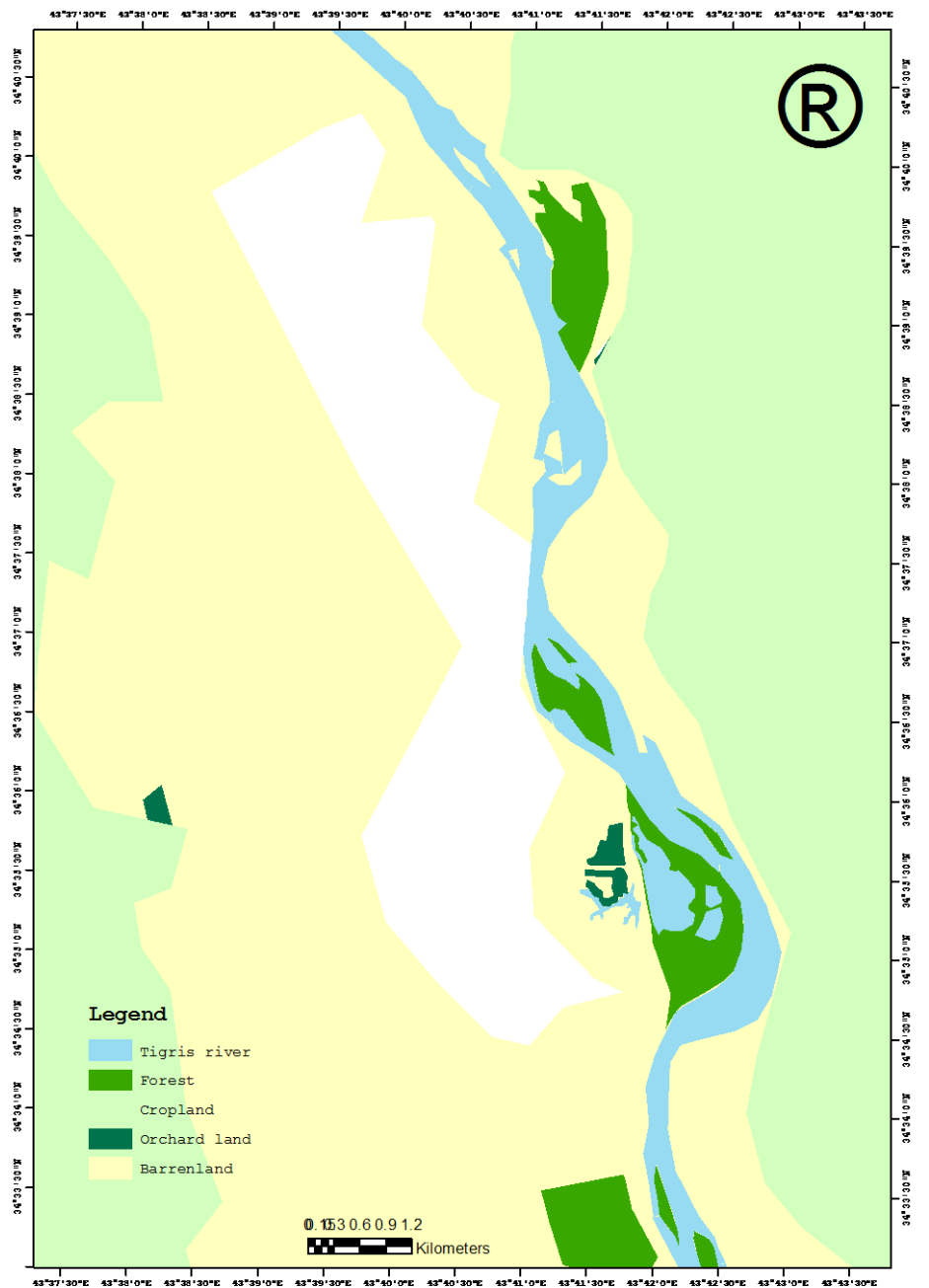


Figure (14) Agriculture use.

Conclusion

- 1- Using the Arc GIS 9.2 to perform a land use and land cover map is recommended for better monitoring land use /land cover changes.
- 2- Land use/land cover change is concerned with the developing plans, political and economical changes, environmental change as climate change including temperature, rainfall,...etc.
- 3- A land use and land cover map have been prepared which shows the(four) different categories including urban/building, water body, agriculture and bare land.

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المستخلص

تعتبر معطيات الاستشعار عن بعد مع التقنيات الحديثة من الوسائل المثمرة للحصول على معلومات حول استخدامات الأرض والغطاء الأرضي. إذ تم إعداد خارطة استخدامات الأرض والغطاء الأرضي لمدينة تكريت في محافظة صلاح الدين وذلك باستخدام برامج مختلفة منها:

- ERDAS Imagine v.8.3.
- Arc view GIS 9.2.
- Map Window.
- Global Mapper .

وتم تحديد أربعة أصناف ذات المستوي الأول من الغطاء والاستخدامات الأرضي التي تشمل النطاق الحضري للمدينة بمختلف استعمالاته من الاستعمال السكني والحكومي والتجاري والصناعي والصحي وغيرها بالإضافة الى توزيع المناطق الزراعية، والمسطحات المائية والمناطق الجرداء، وكذلك تحديد الأصناف ذات المستوى الثاني والثالث من استخدامات الأرض والتي شملت اعداد (٩) خرائط للمدينة للاستعمالات المختلفة.