



COUPLER DELINEATION OF IRAQ'S MARITIME BORDERS WITH THE IRANIAN SIDE BY USING GIS TECHNIQUES

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ABSTRACT

The demarcation of borders between two countries is very important, so that each one knows their territorial limits and their economic resources inside it. Therefore, through our research, that focused on the negative and positive aspects of the demarcation process between Iraq's maritime borders on the one hand and Iranian side. Using the satellite technology (landsat8) and geographic information systems (GIS) founded that there are many disadvantages in the demarcation processes, which led to many losses to Iraq. In terms of economic loss as well as the losses the part of its territory for the benefit of side Iran. In addition, is still losing over time due to natural and geological factors because of the failure to put Iraq's highest interest when the completion of previous international conventions (border demarcation agreements). Through this research, that found effective solutions and proposals for the process of demarcation of the maritime border, can be benefiting all parties (Iraq and Iran).

KEYWORD: demarcation maritime borders, GIS techniques, remote sensing, geometric correction, topology, Iraq, Iran.

INTRODUCTION

The problem of demarcation in the international borders (especially water borders) is one of the problems of great concern to the international community. As long as these problems and conflicts have been a major cause of international disputes and crises. Also in the outbreak of armed conflicts, therefore, the rules and principles of international law have been keen to find or codify specific legal mechanisms in this framework and have been known by countries for a long time. Moreover, recommended that the conflicting countries be guided, or guided by their provisions in the resolution, or settlement of any border disputes between them whether related to the demarcation of land, sea or river borders. By agreeing to enter into direct negotiations for reaching agreements or specific formulas on them with their will or choices based on the principle of the sovereign equality enjoyed by all States Members of the United Nations. On the other hand, by resorting to judicial arbitration to resolve these disputes^[1]. The demarcation of the border is carried out in accordance with agreements concluded between two parties and consideration of the Law of the Sea (1982) under which agreements are concluded between States^[2]. Taking account of the space and the economic and commercial need of each side and on the assumption that none of the parties will be defeated. Iraq has maritime borders on its southwestern side with the Kuwaiti side (Khour Abdullah). It's considered an exclusive economic zone because there are many Iraqi ports in this part (Umm Qasr, Khor al-Zubair and Faw ports). Located deep in Iraqi territory through Khor Abdullah, Khor Shitana and Khor al-Zubayr In addition, the Iraqi and Kuwaiti sides are competing for the construction of the most modern facilities in this area (Iraqi port Faw AL-Kabeer, Mubarak

Port of Kuwait) will be a promising economic zone if properly exploited.

As for the southwestern side, Iraq shares with the Iranian side maritime borders along the Shatt al-Arab waterway. It is also considered a promising economic zone cause of the existence of the most important industrial facilities and export and import ports for commercial goods. Iraq has important commercial ports located on the Shatt al- The most prominent of which are AL-Ma'aqal and Abu Flus ports.

Study area

The river boundary in the Shatt al-Arab area, starting from the confluence of land borders downstream. The low water level is at the eastern side of the silt when the sea is in the case of the islands, except the area opposite Abadan city, where the boundary line in that tape, which is about 1 km long, is the deep course of the line, (Taluk Line), this in the southeast with Iranian side.

Topographic changes of water (Shatt al-Arab):

The results showed that after the comparison of the Admiral maps of the years 2010 and 1964, there were different rates of erosion and sedimentation in these coasts. As there were sedimentation in the southern coast of Shatt al-Arab up to 385 meters and provide a line (Zero line) to the Iranian side during 46 years, ie 8.36 m / year^[3].

Data used:

- 1- Satellite image (landsat8) from USGS web site
- 2- GIS techniques Copyright Form

METHODOLOGY

Techniques used?

The entirety of this study was conducted using ArcGIS software specifically, remapping and topology the toolsets used for this project analysis, chose Point in the area,

selection by location, union, Path Distance, These techniques were chosen to provide the most optimal outcome for this site suitability analysis.

Geomatic correction

The image data acquired by remote sensing includes the considerable distortion portion made by the earth's curved surface. In order to OVERLAP, this distorted image with the existing topography map. Through this process can be transformed the satellite's image in the same size and projection value AS THE topographical map that called the geometric correction^[8]. Geometric correction is applied a number of given GCPs with the specific degree of the polynomial. The research objective is to determine the suitable number of GCPs with a degree of polynomial to get accurate results from available data ^[10, 11].

1 Two-dimensional transformation

2D transformation can be used to project image f (U v) coordinate on to the ground g (x y) coordinates. The transformation involves scale factors in x and y directions, two translations from the origin and a rotation of x and y-axes about the origin.

2. Two-Dimensional Polynomials Transformation

This search had been oriented to get the suitable requirements for geometric correction (rectification) for a two-dimensional image using GCPs and the first order transformation of the polynomials.

The mathematical model of the first-order polynomial that is known as affine transformation equation has six unknowns which need the minimum of 3 GCPs as shown in Equation (1).

$$\begin{aligned} x &= a_0 + a_1 X + a_2 Y \\ y &= b_0 + b_1 X + b_2 Y \end{aligned} \quad (1)$$

Where: x, y = image coordinates X, Y = reference coordinate

$a_0, b_0, a_1, b_1, a_2, b_2$ = translation, rotation and scaling parameters.

$$\begin{aligned} x &= a_0 + a_1 X + a_2 Y + a_3 XY + a_4 X^2 + a_5 Y^2 \\ y &= b_0 + b_1 X + b_2 Y + b_3 XY + b_4 X^2 + b_5 Y^2 \end{aligned} \quad (2)$$

Where: x, y =image coordinates X, Y = reference coordinate

$a_0, b_0, A_1, B_1, A_2, b_2, a_3, b_3, a_4, b_4, a_5, b_5$ = translation, rotation and scaling parameters.

The minimum number of selected GCPs depends approximately the polynomial, as three points define a plane. Similarly, the equation used in a second order transformation is the equation of a PARABOLOID; at least six points are required^[5]. Equation (3) shows the mathematical relation between the minimum numbers of required ground control points and a transformation of order t.

$$\text{Min. Number of required GCP} = \frac{(t+1)(t+2)}{2} \quad (3)$$

Where: t= is the order of polynomial equation used.

3. Topology

It is a central, defining feature of geographical information systems (GIS) The advantages of topological data structures are that data storage for polygons is reduced because the boundaries between adjacent polygons are not stored twice, explicit adjacency relations are maintained, and data entry and map production is improved by providing a rigorous, automated method to handle artefacts of digitizing. However, what explains the resurgence of non-topological data structures, and why do contemporary desktop GIS packages support them? The historical development of geographical data structures is examined to provide a context for identifying the advantages and disadvantages of topological and non-topological data structures. Although explicit storage of adjacent features increases the performance of adjacency analyses, it is not required to conduct these operations. Non-topological data structures can represent features that conform to planar graph theory (*i.e.* non-overlapping, space-filling polygons). A data structure that can represent proximal and directional spatial relations, in addition to topological relationships is described. This extension allows a broader set of functional relationships and connections between geographical features to be explicitly REPRESENTED ^[9]. See fig (1-A, B, C, D) Models on topology.

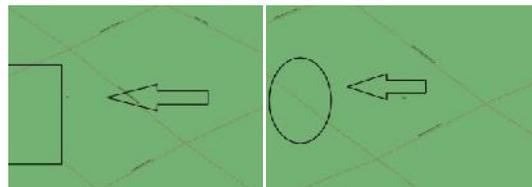


FIG. (1-A) Before Topology FIG. (1-B) After Topology

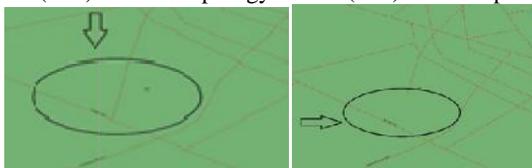


FIG. (1-C) Before Topology FIG. (1-D) After Topology

RESULTS AND DISCUSSION

Demarcation of the border between Iraq and Iran

Determine their land boundary according to the line "AL taluk" (the main line of the main navigable channel when

reducing the level starting from the point where the land border in the Shatt al-Arab to the sea). As shown in the fig (2) where three circles are represented (Shatt AL-Arab path).

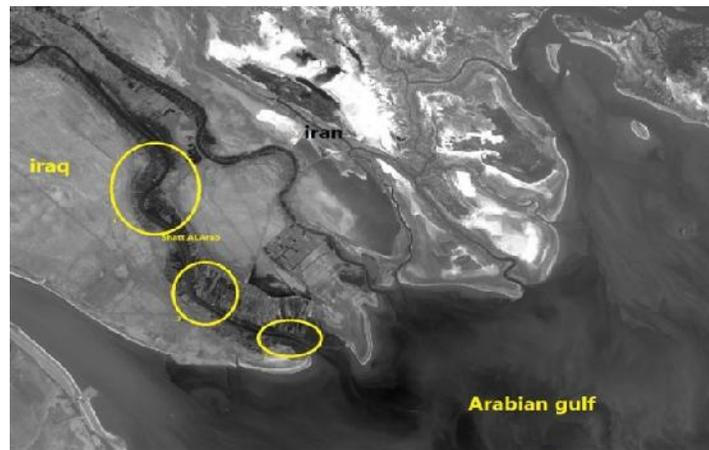


FIG. 2: Satellite Image (Landsat8) Focuses on the Shatt Al-Arab (Representing the Maritime Border between Iraq and Iran)

The second circle can be taken from fig (2) which is representing the Siba area to make a deep comparison of the study, see fig (3). Geographical coordinates according to latitude and longitude have corrected this map, see table

(1). Specific areas are taken and highlighted for comparison as fig (4).

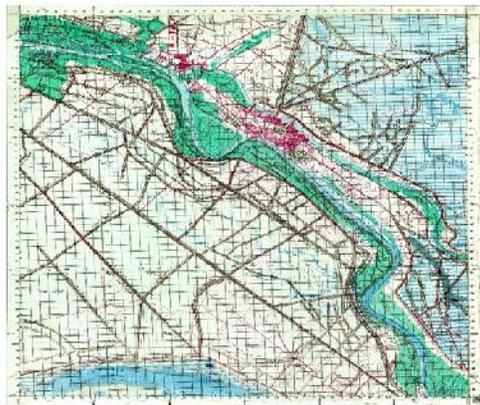


FIG 3: Original Map of Siba Area (Admiral Map)

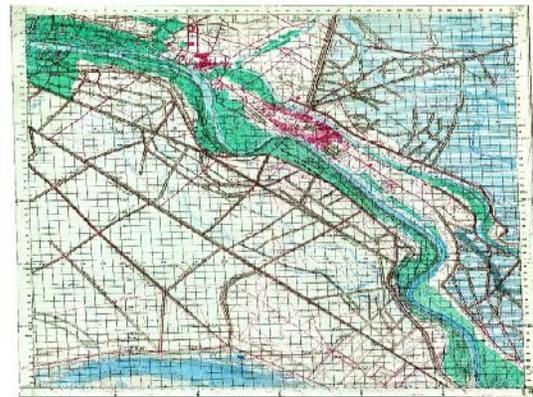


FIG 4: Corrected Map of Siba Area

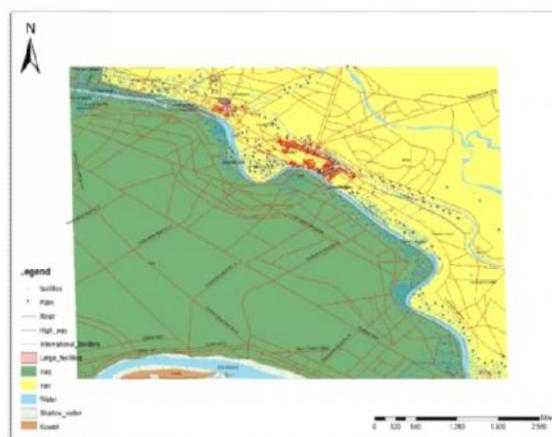


FIG (5-A): A Redesigned Map of the Siba Area

By GIS, techniques remap the Siba area to form a clear idea about the nature of demarcation of the maritime border between Iraq and Iran. Which is based on the Teluk line (the deepest point in the waterway will be the midpoint between the two sides), show fig (5-A). As Iraq

fought, previous wars and siege for a decade led to neglect its own coast. Which led to the accumulation of caravans and remnants of war inside the coast From viewing fig (5-A), the boundary line was seen between the two sides that notice how the Teluk line on which based on and how it

traces to the Iraqi coast, see Fig (5-D).

In figs (5-B and 5-C), can be observed that the midline is close to the Iranian coast and the demarcation order impact on them. Nevertheless, what happened was the opposite. The proximity of the border to the Iranian coastline came

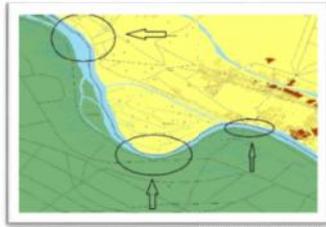


FIG. (5-B) Taluk Line near Iranian Side

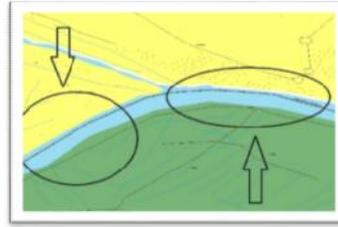


FIG (5-C) Taluk Line near Both Si

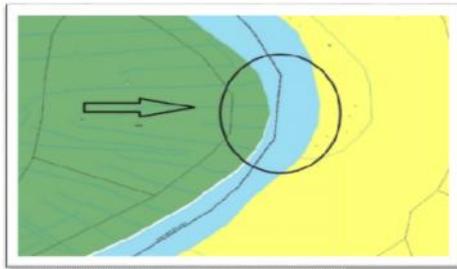


FIG. (5-D) Taluk Line near Iraqi Sid

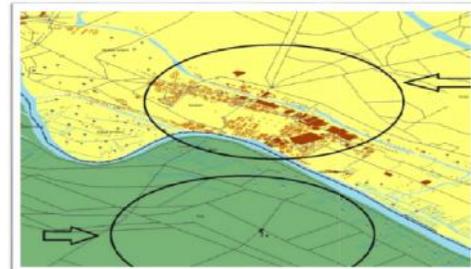


FIG. (6): Representing the difference in industrial facilities and residential complexes between the Iranian city Abadan and Siba area in Iraq

After reviewing the satellite image of the Siba area, as fig (1) and comparing it with the real maps, it notes how the Iranian side has exploited this waterway to its fullest advantage through the establishment of industrial facilities and residential complexes, show fig (6). The fact that the side obtained after the Algiers Agreement (1975) allows them to receive all the giant merchant ships without problems. This agreement led to the reduction of the ports of Iraq (the port of the ALMaqal and the port of Abu Flus) overlooking the Shatt al-Arab coast deep into Iraqi territory.

The Algiers agreement 1975 and its result

The Algiers agreement was signed between the Iraqi and Iranian sides in 1975. It included several points about border Demarcation. We will take the side of the demarcation for the maritime border between the two sides. Their land boundary was determined by the "Talok" line (the main line of the main navigable channel, which was delineated by the deepest points between the two sides starting from the point at which the land boundary in the Shatt AL-Arabs to the sea). The existence of the Algiers Agreement (1975), which did not take the basis of natural changes that occurred in the Shatt al-Arab channel, where the crawling of the territory of Iraq and add to the area of Iran about 32 km². Therefore, according to these data, Iraq will lose much and the first loss of the port (Khour al-Amaya), which will be within Iranian border. The port of "Khour al-Amaya " is an Iraqi oil port dedicated to the production of oil along with the port of Basra oil. It is located to the southeast of the Al Faw Peninsula Gulf region. It is one of seven ports in the province of Basra, including five commercial ports and two oil ports.

down to their benefit because the water channel at these points is close to their coasts. This is why the viewer can see how the area was flourishing and developed. They built the industrial and residential cities currently known in the Abadan region. See fig (6).

That "the Algeria agreement (1975), can be fair, but the condition of Iraq's adherence to the coordinates and natural changes that took place in the entrance of the channel Shatt al-Arab and that the channel Shatt al-Arab crawled and changed its features and ate and sculpted in the Iraqi shelf.

CONCLUSION

1. The territorial water and the border areas of Iraq are located in the study area
2. The maritime boundary between the two sides has been determined
3. Through the (GIS) program, it was determined how the demarcation process was done according to the Taluk line
4. Some border points were taken, and we talked about the economic benefits to both sides
5. After viewing the satellite image (landsat8) and topographic maps. A comparison was made between Iraqi city (Siba) and Iranian city (Abadan)
6. We have determined that the delineation process according to the Taluk line has not landed on Iraq with the desired economic benefit
7. Suggestion "new terms with Iran in the Convention, taking into account environmental damage Caused by Iran to Shatt al-Arab and its industrial waste in the course of the canal.
8. Demanding Iran to open the river (Karun) because the Iranian closure caused a high rate of salinity in the Shatt al-Arab, and deprived many areas of Basra province of drinking water.
9. To establish a formula of understanding between the

two sides (Iraq and Iran) through common interests and be in one of the three ways:

- Establish a joint stock company (jointly managed by the two parties) to manage the waterway (Shatt al-Arab) and distribute the financial imports equally between the two sides.
 - Contract with a specialized international investment company to be a third party between the two sides (the mission of this company management and development for the waterway as well as the management of the financial side and the distribution of financial imports equally between both sides after deducting the percentage of the investment company.
 - New agreement to demarcate the boundary between the two Parties taking into account the geological and natural changes of the continental shelf of both Parties.
10. Iraq should continue to reject the railway project with the Iranian side through Basra. Because it would cause the loss of Iraq 50% of the revenues of the ports overlooking the Shatt al-Arab.
 11. The way of understanding with the Iranian side, making the approval of the rail link with them with conditional to return of the Shatt al-Arab to before 1975 disastrous agreement. In addition to the reopening of the water, outlets that were closed by Iran after 2003 and the return of the course of the Karun River and stop the dumping of Iranian Pond water in the Shatt al-Arab. I do not want to say that Iran will agree to the conditions above, but make them an initial demand for the Iraqi negotiator even if we get a part of it better than not and agree to all their conditions, "humiliated" without any compensation.

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discuss the problem of demarcation between Iraq and Iran, in addition to developing solutions for this problem.

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