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Geographical analysis of the change of urban sprawl areas in Dallowiya district for the period 1977-2021 using Geographic Information Systems (GIS)

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Abstract---This study deals with the environmental effects of the problem of urban sprawl, which faces agriculture in Dulwa district, one of the districts of Salah al-Din Governorate. This problem affected land and agricultural production in the judiciary through the decrease in the size of cultivated areas, which was accompanied by the decrease in production quantities as well as the change in crop composition. There are many The reason for the increase in the risks of urban sprawl is due to the influence of geographical factors, whether they are natural surface, climate, soil and water resources, or human factors whose impact was very large, represented in the increase in the population and their needs for services and infrastructure, as well as government policy, the economic level and social factors.

Keywords---urban sprawl, stages, changes.

Introduction

The problem of urban sprawl is one of the serious problems facing agricultural land in the world, including the Arab world, including Iraq, which has become a threat to food security, the future of the population and future generations because it has greatly affected the decrease in the volume of cultivated areas in various agricultural crops and thus led to a decrease in the quantities of agricultural production. We mean urban sprawl, increasing construction on agricultural land and exposing the population to food shortages, which is a threat to agricultural production because it works to reduce agricultural and other lands

due to urban expansion and the construction of industrial and commercial facilities and the rest of the infrastructure of cities and agricultural villages.

The increase in the population in Iraq, including Salahuddin province and the district of Al-Rakouiya, which is one of the districts of agricultural density and high population, has increased the pressure on agricultural land, especially during the past four decades, after the population at the beginning of the establishment of the district (later judiciary) in (1962) does not exceed 10.000 people, their number became 13.687 in (1977) and rose to 56.986 people in (2007) and their number at presently reached 73.702. As a result of family fission, the demand for housing has increased after the area allocated for residential use 2.293 acres in (1997) reached the year (2007), and 3.476- 6.555 acres (2017) and 8.108 acres in (2021). In addition to the need of the residents of the residential study area, there are other coordinates needed by the population such as health and educational services and markets as well as infrastructure. These urban expansions have affected agricultural land in the judiciary, as well as their direct.

The problem of the study is based on the saying that the study area (Al-Dulawiya district) suffers from a great acceleration in urban expansion of all kinds, and this has led to a significant decrease in the size of land fit for agriculture, lack of diversity of agricultural crops and low production quantities. This has been reflected in the food supply for the study area in particular and the rest of the province and the provinces of Iraq in general. As for the hypothesis of the study, it is based on the saying: The geographical factors represented by natural factors (location, surface, climate) as well as human factors represented by accelerated population growth, displacement and migration to the city, as well as high land prices and the lack of strict administrative determinants stand in the face of urban expansion and its great impact on accelerating urban decreasing the size of agricultural land suitable for agriculture, the lack of production quantities and the lack of diversity of agricultural crops in the judiciary using geographic information systems. With regard to the limits of the study area.

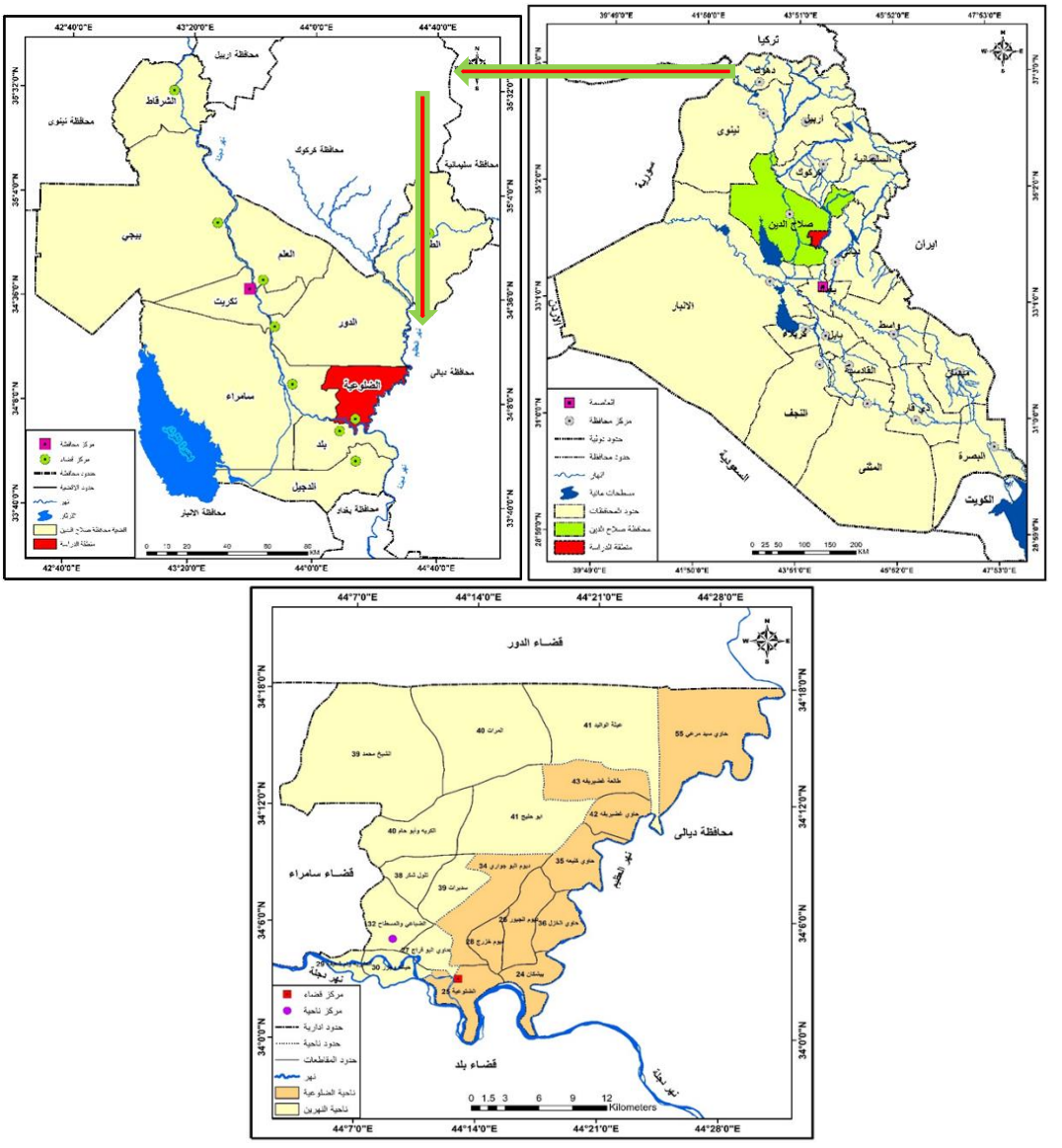
Dhuluiya District is located in the southeastern part of Saladin Governorate, 80 km south of the center of the province, within the northern parts of the sedimentary plain between the Tigris River and the tributary of the Great River[(1)]. It is located coordinateally between longitudes (44, 07 – 44, 28) east and two latitude circles (34, 00 – 18, 34) north, mab (1), which is one of the districts of Salah al-Din province, which is bordered on the north by the north by the district of Al-Dur district, on the west by the district center of Balad From the south, the Yathrib sub-district, which belongs to the district of Balad, and from the east, the Azim River, which marks the border with the governorate of Diyala, and the district includes two administrative units, the center of the Dhuluiya district and the Nahrain district. These units include (21) agricultural districts, and the area of the district is about 62.798 km^2, table (1), which is equivalent to 319.000 dunams, and in relation to the time limits of the study, the study period was divided into four time periods (1987-1997), (1997-2007), (2007-2017) and (2017-2021).

Regarding the methods, tools and methodology of study, quantitative methods, statistics and digital data have been used in a mapped manner that helps to understand the phenomenon under study accurately and with the use of geographic information systems (GIS) and the space heats of the satellite (Landsat-8,5) of the study area for the years (1987-2021), as well as the use of functional and descriptive methodologies and field study of the study of the study area. The study included several axes dealing with the first axis, the introduction of the study, its content of the problem, hypothesis and the most important objectives of study and methodology and methods of study. The second axis dealt with the geographical characteristics of the study area, while the third axis dealt with geographical analysis of the stages of change in urban expansion areas in the study area for the period (1987-2021).

Table 1
The provinces are famous for their area and population for 2021

District number	District name	Area km^2	%	Populations 2021	%
25	Dallowiya	21.77	2.73	31495	42.7
24	Bishkan	17.24	2.16	2802	3.8
26	Diom Al-Jubour	24.63	3.08	1405	1.9
27	Hawi Albu Faraj	13.41	1.68	15704	21.3
28	Diom Khazraj	11.84	1.48	47	0.1
29	Al-Abouriya and Um Shuaifa	6.75	0.85	4750	6.4
30	Hayalla and Jazar	14.46	1.81	7430	10.1
32	Al-Dhaibi and Al-Mistah	26.59	3.33	5091	6.9
34	Diom Albu Jawari	40.42	5.06	706	1.0
35	Hawi Kalaya	24.05	3.01	349	0.5
36	Hawi Al-khazel	17.2	2.15	375	0.5
38	Talul Shukr	17.44	2.18	64	0.1
39	Sderat	21.13	2.65	130	0.2
39	Sheikh Mohammed	134.07	16.79	137	0.2
40	Al-Kariya and Abu Ham	41.02	5.14	150	0.2
40	Al-Marrat	89.72	11.23	174	0.2
41	Abu Halij	67.39	8.44	77	0.1
41	The Walid's Etha	83.95	10.51	631	0.9
42	Hawi Ghadrifeh	18.39	2.30	389	0.5
43	Talleah Gudhireve	28.71	3.59	288	0.4
55	Hawi Sayed Marei	78.43	9.82	1508	2.0
Total		798.61	100	737.2	100

Source: 1-Ministry of Agriculture, Directorate of Agriculture of Salahuddin Governorate, Division of Agriculture of Dhlouia District, Planning and Follow-up, Areas and Fame of Agricultural Provinces, Salahuddin 2021 (unpublished data).
2- Ministry of Planning and Development Cooperation, Central Bureau of Statistics and Information Technology, estimates of Salahuddin governorate and administrative units, unpublished data, 2021



Map 1. Location of the Study Area for Iraq and Salahuddin Governorate for 2021
Source: Researcher based on the map of Iraq and Salah al-Din administrative, the Directorate of Agriculture of Salah al-Din Governorate, the Division of Agriculture of the Dawlawiya district, planning and follow-up, index and fame of agricultural provinces, Salah al-Din, 2021 and the ARC GIS V10.3 program

First: Geographical characteristics of the study area

The study area is characterized by distinguished geographical characteristics that made it one of the most important agricultural areas in Salahuddin Governorate, as well as the spread of agricultural stables in its various agricultural provinces. Among the most important geographical characteristics affecting agricultural production and urban expansion are:

- Surface: The surface of the study area is characterized by extroversion like the rest of the parts of the sedimentary plain and is interspersed with some simple hills that do not exceed only a few meters. The river terraces are spread on the banks of the Great River and the height of the study area ranges from less than 35-86 meters above sea level.
- Climate: The climate of the study area is characterized by the continental, similar to that of other governorates of Iraq, as the daily and annual thermal range expands, and is characterized by cold rainy winters and dry hot summers, and the characteristics of the elements of the climate vary from one season to season and from year to year. Temperatures are characterized by rising in summer, reaching 43.5m in August, while they drop to 4,1 m in January[2]. As for rainfall, especially rain, the study area is characterized by the lack of rainfall and fluctuation from year to year. Other elements of climate that affect the uses of agricultural and urban land is the element of wind, which is characterized by moderate speed, but it greatly affects the agricultural provinces north of the study area, which is characterized by the presence of large areas of sand dunes that greatly affect agriculture and urbanization as well as the effects of dust storms.
- Soil: This factor is one of the main factors affecting the uses of the land in the study area, whether for the purposes of agriculture, housing and the rest of other services. The soil of the study area is characterized by its spatial variation, as the soil of riverbeds prevails on the banks of the Tigris River and the tributary of the Great River, while the soil of the ancient gravel and submerged river plains prevail in the central provinces, while the northern provinces have sand and groove soils, salt desert swamps and parts of the soil of the ancient gravel river plains and submerged with.
- Water Resources: The study area is characterized by the multiplicity of water sources in it if the Tigris River passes in the western parts and the Great Tributary forms its eastern border, from which it forms a peninsula. In addition, it is characterized by the presence of a network of irrigation projects represented by (lead irrigation, northern and southern part). Another source of water is groundwater, although of little importance, is due to the high percentage of salts in it, and rain is the third source of water that help water crops, reduce the amount of irrigation, as well as its role in the growth of natural plant and the formation of natural pastures.
- Human characteristics: Man is the main driver of the agricultural process in any geographical area as well as his role in the development of infrastructure and services, and one of the most prominent human characteristics affecting agriculture and urban sprawl in the study area.
  - Population: The study area was characterized by its large population growth, after its population was not more than 21.652 people in (1987), it reached 42.403 people in (1997) and rose to 56.986 people in 2007 and then reached 737.702 people in the year (2021) [3]. This has been reflected in the increasing need for large numbers of housing units as well as the health, educational, religious, recreational and transport services needed by the population. It therefore affected the decrease in the cultivated areas and the map shows the distribution of the population at the provincial level for 2021.
  - Transport routes: The study area is characterized by the wideness of the transport network and in its various agricultural provinces, especially

during the last phase (2017-2021). The total length of roads reached 536km, or the equivalent of more than 1.300 acres of agricultural land[4].

- Government policy and economic level: These two factors are geographical factors affecting urban sprawl and the change in the high population and the accompanying significant change in the increase in the size of the area deducted from agricultural land. This is represented by the State's distribution of agricultural land as agricultural contracts or the distribution of plots of land to employees, and the provision of other agricultural supplies. The economic level also affects the phenomenon of urban sprawl. The high population and family fission, as well as the transfer of large numbers of agricultural workers to other jobs represented by government jobs, government, service and industrial works, which led to a rise in sources of Income for the population, and its impact on the demand for the purchase of agricultural land, the construction of housing and the establishment of factories, factories and shops.

Second: the environmental effects of urban sprawl on agricultural land in the study area

The problem of urban sprawl is one of the serious problems facing agricultural land because of its serious effects in the short and long term, although it has some positive effects represented in finding new housing areas for the population and providing the services and infrastructure they need. But its negative effects are usually more and more prominent because this uncontrolled or unplanned growth, usually around large or dense cities suffering from lack of services. Its provision leads to the deduction of large areas of agricultural land or farms, and this is what the study area suffers from. The effects of this problem were not limited to the decrease in the size of agricultural land, but also reflected in other effects represented by changing crop composition and environmental effects represented by changing climate characteristics, pollution of the environment, and the emergence of informal areas that have emerged or are expected to appear in the future.

The environment is defined as that part of the world in which man influences and is affected, that is, the part that he uses, exploits, influences, and adapts to it. It is the environment in which man lives and living organisms that consist of (water, air, soil, and earth). The environment is the field of activity of man and other organisms. And it is entrusted with its preservation by God Almighty and responsible for its reconstruction, but what happens during the previous three centuries reflected the harm of human activity of the population to sabotage the environment and increase environmental risks in it. The most prominent of these risks is the great pollution caused by man because of the economic activities it practised, including urbanisation and industrial activity, which led to serious pollution of soil, water and air alike, Iraq, including the study area, from places affected by environmental pollution as a result of the large urban sprawl on agricultural land [5].

This problem is one of the most serious problems facing agricultural lands in many countries of the world, including Iraq, resulting from the urban sprawl that

led to a significant expansion in the uses of various land, whether residential, infrastructure or services needed by the population. Pollution means changing the natural, chemical and vital properties of the components of the environment surrounding the human being, represented by air, water and soil. It may cause damage to human life or other plant and animal organisms or cause damage and disturbance in living conditions in general [6]. The great expansion of urban sprawl areas in the study area, which increased tenfold compared to the beginning of the study period (1000) dunums in 1977, increased to reach more than 10085 dunums in the year (2021), had a great impact on the pollution of the environment of the study area resulting from excessive use of services. The types of environmental pollution as follows:

Soil pollution: Soil is one of the elements of a balanced ecosystem, which is the disjointed layer of the earth's surface. Arable soil is an important source of food production, which is increasing in demand day by day as a result of the large population. The study area is one of the agricultural areas where the soil has been exposed to the risk of pollution, whether for natural causes represented by the impact of climate and water resources or through human misuse of soil and water, as well as the use of erroneous agricultural methods of excessive use of fertilisers, pesticides, sewage and over-irrigation [7]. Soil pollution is defined as corruption that affects land. Agricultural in its natural, chemical or life characteristics in a way that affects directly or indirectly everyone who lives on its surface, including humans, animals and plants [8]. The most important sources of soil pollution in the study area are the following:

- Establishing sewage tanks in agricultural areas that are exposed to leakage inside the soil, which leads to their pollution and the contamination of water with toxic substances.
- Establishing blacksmithing shops, fat exchange, car washing, dyeing and trading shops, as well as droppings from restaurants and shops that are exposed to deep soil, especially during the rainy season.
- Municipal units dump various waste and heavy water into homes directly on agricultural land without being treated, which leads to their leakage to the depths of the soil and then their pollution, and this was seen during the field study.
- The use of contaminated water leaking from the main streams of Al-Arwa projects in the study area.
- Soil salinisation and watering resulting from the excessive use of water in watering crops, as well as the influence of the climate factor through high temperatures and increased evaporation.

The problem of soil salinisation is one of the most serious problems facing agricultural lands in Iraq, including the study area, as it is one of the products of soil pollution or its water, whether that water is caused by excessive watering in irrigation projects or through sewage that leaks to the depths of the soil surface because of the nature of the mixture soil with good tissues that facilitates leakage. The seriousness of this problem lies in the leakage of this water into the soil layers and its access to groundwater sources in those lands. The use of these water by farmers will lead to serious problems represented by the pollution of agricultural land, as well as the high toxicity of foodstuffs obtained by the farmer

and its impact on human health, who consumes agricultural products that rely on groundwater contaminated with toxins. To address this problem, the following means can be followed:

- Establishing sewage treatment stations away from residential and agricultural areas and preventing the dumping of waste and sewage in agricultural land.
- The need for the municipality of the judiciary to choose suitable places for throwing and treating waste well and to take appropriate safety and security measures.
- Address the problems of desertification, especially salinisation and watering of soil within the lands of water projects in the study area.
- Establishing complexes for industrial workshops of all kinds, car fat exchange shops, and their maintenance shops in areas far from residential neighbourhoods and agricultural areas.

Sewage treatment plants: sewage is the most important negative output in various urban agglomerations that affect public health. Sewage stations dispose of sewage from collection through lifting to treatment [9]. In most cities of the world, sewage is diverted to water stations, including seas and rivers. Most factories near these areas receive waste there [10]. This is what is happening within the provinces of the study area, as the lack of sewage networks and treatment plants has led to this water being thrown directly into the Tigris River, which surrounds large parts of the agricultural provinces south of the study area, as in the provinces (25 Al-Dahlawiya, 27 Beşkan, 29 Al-Aberiya and Umm Shuaifaifa). Farmers discharge domestic sewage towards the river and its branches, as in the eastern branch of the Tigris River adjacent to the Judicial Centre, and the branches of the western branch of the Tigris River within the provinces of Al-Aabaria, Umm Shuaifah, Juizrat and Al-Buffraj containers). These pollutants, as well as their serious effects on the pollution of drinking water, water, and soil alike. They hinder The movement of water, which leads to an increase in the volume of deposits and weedsses, which have become a suitable environment for rodents, insects and dangerous animals, as is the case with pigs, which have become present in large numbers, and represent a great danger to the lives of the population, as well as their great role in the destruction of crops of all kinds, whether

Veterinary units and Al-Qasbah shops: Veterinary units provide veterinary health services for animals and poultry. Massacre also carry out the process of legal slaughter of animals [11]. These units aim to treat animals and then to protect humans from joint diseases until their enemies move from animal to human. There are several veterinary clinics in the study area as well as the veterinary centre for the treatment of animals of all kinds. What increases the island' risk of livestock and poultry is the dumping of waste of these animals near the areas of their islands, which leads to soil pollution.

Landfills and landfills and waste: The issue of waste and garbage is one of the eternal issues that accompanied the existence of man. Many materials called (waste and garbage) must be abandoned from him and from his daily dealings and activities. With industrial and agricultural activities in light of the excessive population increase, waste and garbage have become causing many

environmental problems that affect people's health in a negative way, if they are not dealt with in a conscious and systematic scientific manner [12].

Public landfills are one of the oldest methods of disposal of garbage and waste in the study area. Waste is one of the prominent environmental problems addressed by researchers and those interested in the environment to provide sound environmental methods and solutions to benefit and dispose of. This is due to the increasing types and quantities of waste in a way that threatens human health and life [13]. Waste is defined as solid, liquid or leaving them in open piles leads to severe environmental pollution by microbes, flies, mosquitoes, mice and stray animals found in this garbage as a hotbed and a suitable environment for reproduction and causes the spread of many infectious and endemic diseases and epidemics among the people living near it [12].

The accumulation and accumulation of waste in agricultural land leads to soil pollution, as well as the deposition of decomposed materials from these wastes to the depths of the soil and groundwater, especially after the rainfall during the winter. In addition, the primitive incineration carried out by municipal cadres in the study area leads to the pollution of the air with toxic substances resulting from the crafting process for various types of domestic, industrial and commercial waste. This was seen during the field study at the landfill site north of the centre of Dhalouia district in the province of (Hawi Al-Khazal). These waste covered arable areas that can be invested in the cultivation of various agricultural crops. It is estimated at more than From 30 dunums of arable land.

Industrial uses and workshops, the presence of some industrial uses within urbanisation and the residential mass helps to maintain air and water haloquility and chaos, as is the case in some factories in the study area, especially bricks and gas plants, but they directly affect the environment within the study area. The disposal of solid waste leads to water pollution by disposing of them in water drains. The presence of wooden workshops and others within the residential mass also results in chaos pollution of the population. The number of shops reached (1700) shops for various types mentioned above. The expansion area for the purposes of industry, trade and services reached in 2021 (5.253 acres) [14]. This was shown through the field study, as a significant overlap was observed in land uses in the study area. For example, we find workshops, poultry farms, houses, bricks, gravel, sand, gas plants and stores, which greatly affected the decrease in agricultural area, especially orchids and palm trees within the agricultural provinces surrounding the Tigris River and the tributary of the Great River. To deal with the effects of this problem, the following means can be followed:

- Transfer all workshops and industrial laboratories of all kinds from population and agricultural communities to one area of Dhalouiya district centre and Al-Nahrain district away from water sources to avoid the dangers of industrial pollution.
- Not to give a license to practice the profession to those who open workshops and laboratories inside residential neighbourhoods and agricultural areas.
- Impose hefty fines for people who violate the instructions to open the workshops above.

- The commitment of the owners of workshops and industrial laboratories to adhere to safety and safety procedures and dispose of waste properly does not lead to pollution to the environment.

The impact of urban sprawl on the climate of the study area: The multiplicity of the phenomenon of urban sprawl and logging of different types is one of geographical factors that led to a significant change in the climate, because overpopulation causes an increase in pollution and poor sanitation, as well as a cause of cutting forests or orchard trees, and an increase in the concentration of greenhouse gases in the atmosphere and thus affect the climate [(14)]. Another factor that causes climate change in the study area is the number of transport vehicles to increase significantly, causing an increase in greenhouse gas emissions by (15-20%) each year. The combustion of fuel used to release very large amounts of carbon dioxide into the atmosphere leads to a significant impact on global warming and a significant and rapid increase in temperatures.

It was found through the field study that large parts of the vegetation cover represented by orchards to cover very large areas of agricultural provinces south of the study area and on the banks of the Tigris River and tributary to the Great River, more than 80% of which were removed for housing and the rest of the uses of land and infrastructure. Another factor that affected the climate of the study area is the existence of many factories and workshops, which emit harmful gases and chemicals. The most prominent of these factories is the Daluaooq factory, a gas filling plant, blacksmith and trade workshops, as the number of industrial workshops reached (75) workshops, ovens (13) ovens and wood shops (17 shops (17 shops Car fat exchange shops are a shop. These shops and workshops are distributed to the agricultural provinces in the centre and south of the study area [(15)].

One of the most prominent signs of climate change in the study area is high temperatures, as temperatures and wind speed vary between areas planted with ores and palm trees and between exposed areas free of cultivated plants. This is evidenced by the perceived variation in temperatures between them, as in the provinces of the south of the study area. The temperature decreases by an average of 1-3 degrees, as in the agricultural provinces (39 Sheikh Mohammed, 40 times, 55 containers of Mr. Marei). This was measured through the field study. In addition, wind speed varies between exposed areas in North of the study area or the central provinces that were exposed to devegetation between urban sprawl and the last end or lack of water. It was found that the exposed areas were greatly affected by this factor. This was noted during the field study. Sand dunes and dust storms flooded large areas of agricultural land and even housing, as in the northeastern and western provinces of the Sometimes to soften and lower temperatures, and in some times the wind brings dust and dust in the study area, as vegetation-free areas lead to the wind carrying of many dust, while areas with dense trees help repel the wind and the lack of access of dust or dust to it, as in the agricultural provinces (25 Al-Dulwaiya, 27 containers of Al-B To provoke dust and sand dunes that affect the lives of residents and their farms and animal wealth alike, as well as limit urbanisation, because they are repellent areas of the population because of the pollution of their environment with sand and dust storms. To address this problem, the following means can be followed:

- Pay attention to the green cover and green belts around the city and in exposed areas within the northern and central provinces of the study area.
- Address the problem of sand dunes and lands that are exposed to erosion in the north of the study area through soil stabilisation and replantation processes with various agricultural crops, as well as trees and plants that withstand desert conditions.
- The need to reduce the sources of pollution inside the city that cause high temperatures represented by car exhaust and polluted air resulting from factories and industrial workshops.

Conclusion

Through the study, it was revealed the impact of urban sprawl on the environment of the study area, represented by the pollution of soil as a result of sewage tanks and the leakage of contaminated water towards resonry projects, as well as the impact of industrial, commercial and service activity in increasing the amount of solid and liquid waste and its impact on all components of the environment. Sanitary landfill carried out by municipal units and residents has contaminated large areas of agricultural land. The rapid urban sprawl on agricultural land led to a significant change in the crop composition as well as a decrease in the number of agricultural workers. After the number of agricultural workers was more than 9,000 people in 1997, it decreased to 5065 people in 2021. The continuous cutting of fruit and palm trees has contributed to changing the characteristics of the climate in the agricultural provinces south and centre of the densely populated study area. This represents the relative rise in temperatures as well as the exposure of these provinces to dust storms from the northern provinces and neighbouring areas. Finally, we recommend the need to emphasise the establishment of good sewage tanks in residential neighbourhoods and agricultural areas and not to dump sewage residues on agricultural land. The owners of workshops, laboratories and service shops should be emphasised to adhere to safety procedures and dispose of waste appropriately. The need to urgently address the problem of desertification and establish green belts around the city.

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