



Saudi Arabia

Ministry of Education / Sabya

search title

Light pollution and its impact on the environmental system in the city of Sabya.



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Date / 2024 AD

Abstract:

This study aims to identify the phenomenon of light pollution, its causes, the importance of prevention, why it has a stronger effect in large cities than rural cities, and its impact on the environment in the city of Sabya. Hence, we began to suggest the following: Research questions and hypotheses:

-Does light pollution affect the environmental system in the city of Sabya?

Hypothesis:

- There is an impact of light pollution on the environmental system in the city of Sabya.

procedures:

We used the observational and descriptive survey method . A questionnaire was distributed to a random sample, and we used a light pollution map, a camera, a computer, pen and paper, a reflective astronomical telescope, and a GBS device, the GLOBE environmental site.

Results:

Light pollution has an impact on the ecosystem, and there is a big difference between light pollution in large cities and rural cities, and there is a positive relationship between light pollution and the environmental system.

Conclusions:

- Light pollution affects the ecosystem and there are also ways to reduce it.
- This study helps to reduce light pollution, so it will have a positive aspect in terms of the ability of living organisms, and the eyes in particular, to relax and calm down, as well as for astronomical observation.

Terms:

Light pollution: It is the discomfort caused by abnormal artificial lighting, which leads to a change in the color and contrast of the night sky, which affects human health and the world of animals and plants.

Environment: It is the totality of things that surround us and affect the existence of living organisms on Earth.

Glow: A large area of the sky or parts of it that is illuminated at night.

Ecosystem: It is the community in which living organisms interact with the environment, as well as with biotic and abiotic elements.

content list :

Abstract	2
Research questions and hypotheses	4
Introduction	5
Steps of the experiment	7
Analysis and results	10-15
Conclusions Discussion.....	16
Thanks and appreciation	18
Badges:.....	19
References	20

Abstract :

This study aims to identify the phenomenon of light pollution and its impact on the environmental system in the city of Sabya, its causes, the importance of prevention, and why its effect is stronger in large cities than in rural cities. The contrast of the night sky and artificial lighting causes disruption of the circadian rhythms, which work to regulate sleep time, for most living organisms, which affects the environment, energy resources, wildlife, humans and astronomy research, and the risk of light pollution increases with the increase in the demand for artificial lighting every year.

Light pollution is not a new phenomenon. Over the past 50 years, the speed of urbanization has increased, which in turn has increased the demand for artificial lighting, causing widespread light pollution not only in cities, but also in suburbs and rural areas. And through our study and observation of its impact on the ecosystem...

We are beginning to suggest the following:

Research questions and hypotheses:

- Does light pollution affect the environmental system in the city of Sabya?
- Is there a relationship between light pollution and the environmental system in the city of Sabya?

Hypothesis:

- Light pollution affects the environmental system in the city of Sabya.
- There is a relationship between light pollution and the environmental system in the city of Sabya.

Variables:

The Independent: Light Pollution.

Affiliate: the ecosystem.

research aims:

Identify the damages and causes of light pollution and its impact on the environmental system in the city of Sabya, and identify ways to reduce it and reach results.

research importance :

Contribute to the knowledge of light pollution and its impact on the environmental system and ways to reduce it in the city of Sabya.

search limits:

Objective: Light pollution and its impact on the environmental system in the city of Sabya.

Temporal: 2023-2024 AD

Location: Sabya city.

Search terms:

Light pollution: It is the excessive or indirect use of artificial outdoor lighting, as it leads to a change in the color and contrast of the night sky, which has negative effects on environmental systems and human health.

Ecosystem: It is the community in which living organisms interact with the environment, as well as with biotic and abiotic elements.

Environment: It is the total things that surround us and affect the existence of living organisms on the surface of the earth, including water, air, soil, minerals, climate and organisms.

Heavenly glow: A wide area of the sky or parts of it that is illuminated at night. It is the main source of light pollution that accumulates until it becomes a huge glowing halo that can be seen miles or kilometers away and from high altitudes in the sky.

Introduction:

Light pollution means the disturbance resulting from unnatural artificial lighting at night and disturbs the ability of living beings to relax and calm down. each other, which gives us something like a network of electrons, and these electrons are very strong and in a state of increasing, especially at night, because the lights are in a state of continuous illumination This results in the release of more charges, which causes us to not see the stars more clearly and affects astronomical observations, such as the lack of clarity of meteors and asteroids heading towards the Earth, and even caused the

killing of some types of birds, bats, and some insects, and also causes the air to be impure.

Effects of light pollution on the environment:

It affects the physiology of plants and animals, it can disturb the movement of animals, change competitive interactions, change predator-prey relationships, and lights on tall structures can confuse the directions of birds, causing an imbalance in the ecosystem such as the disappearance of bats and the death of frogs, which causes an imbalance in the environmental rhythms that God created ; He created all creatures and made them functions in life, for example frogs They eat insects, and this helps prevent the spread of diseases such as dengue fever and malaria. Also, bats eat insects that attack agricultural crops, which helps reduce the use of pesticides on plants. Among the damages of light pollution is the spread of depression, tumors and diabetes because it affects the functions of our body and is one of the most important causes of air pollution, and this indicates the extent of its seriousness.

Previous studies :

Based on previous studies, researchers at Pense University in Vienna confirmed in 1999 that children under the age of two years who sleep with the light coming from lit streets are exposed to myopia during childhood and adolescence.

- A 2017 study published in Nature indicates that artificial light also has negative aspects as it affects pollinators at night, and works to reduce the impact of pollinators on flowers, which ultimately causes a decrease in fruit production, and this threat is of deep concern.

- Another study in Europe in 2022 AD stated that the blue light emitted from electronic device screens has many health risks to humans, including insomnia.

Materials and method (procedures):

Tools :

❖ GLOBE equipment (GPS) light pollution map - pen - paper - computer - camera - reflective astronomical telescope - GLOBE environmental site.

❖ Resolution

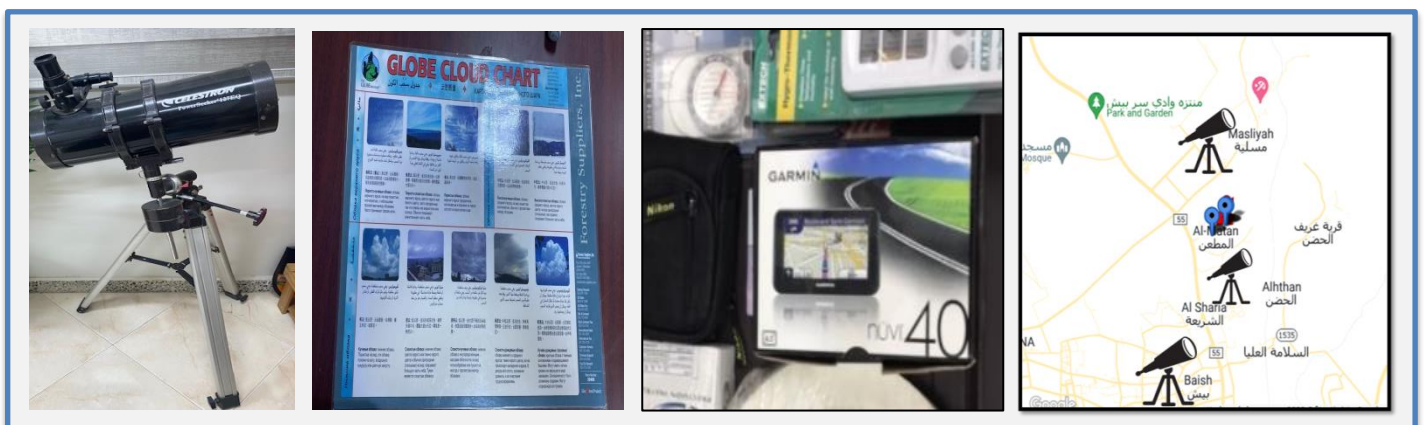
A- Preparing the study tool: The research questionnaire was built, and it consisted in its final form of (7) paragraphs. The questionnaire was distributed to a random sample.

B- The validity of the research tool: the researchers presented the questionnaire to a random sample to express their opinion on this test in terms of: its suitability for the research topic, its comprehensiveness, and the adequacy of the number of elements to enrich the research. And its approval became in its final form.

C - The stability of the research tool: The stability of the research tool (the questionnaire) has been confirmed, and the stability rates are high for all areas of the questionnaire, and the research tool has stable results if it is re-applied to the research sample again, which confirms its validity for field application.

Steps: We used observation and descriptive survey method.

We used GLOBE devices to determine the position and the reflecting astronomical telescope (Fig. 1).



A picture of the telescope and GLOBE devices and the location of the area on the map (Fig. 1)

- Then we used observation while we were out and took some pictures in different places and separate parts of the Sabya area in order to see the degree of clarity of the stars and planets. We compared the degree of light pollution in a rural village (Musliya Village) and an urban city (Bish City), so we took a picture of Saturn in the village Figure (2) and the city of Bish, Figure (3), then we took a picture of the stars in the village of Kadra in Sabya Governorate, Figure (4), then we took another picture of the stars in the city of Bish, Figure (5).



Saturn in a rural village (Melyah village) Figure (2).



Planet Saturn in an urban city (Bish City) with light pollution Figure (3).

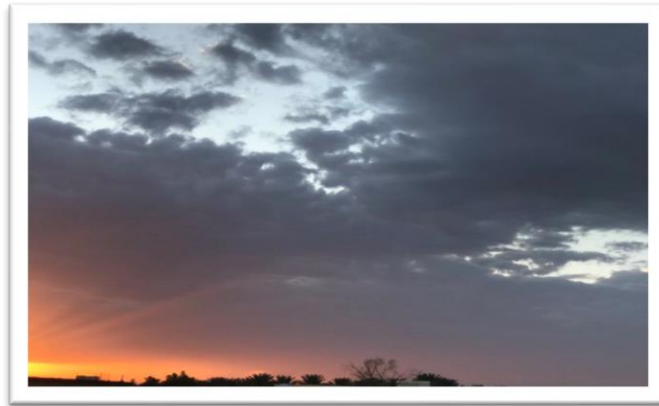


A picture of the stars in a rural village (Kadra village), Figure (4).



A picture of the sky in the city of Bish with light pollution, Figure (5).

- Then we took pictures showing the effect of light pollution on the clouds



Pictures showing the effect of light pollution on clouds, Figure (6)

- Then we took several pictures of animals that died due to light pollution



.a bat. bird. frog. Bees

A picture of dead animals in the city of Bish due to light pollution, Figure (7).

- Then we used the questionnaire.

Show results:

Statistical methods:

To achieve the objectives of the research and analyze the collected data, the arithmetic mean was used to find out the trends in the responses of the research sample members.

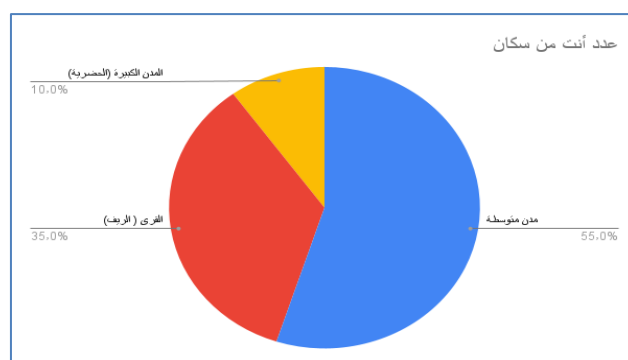
Percentages and frequencies: One of the important steps in the preparation of scientific research is defining the research sample.

Table No. (1) Distribution of respondents according to the area of residence

population	Repetition	percentage
big cities (urban)	2	10%
Medium cities	11	55%
small (rural) villages	7	35%
the total	20	100%

– It appears from Table (1) that the percentage of the distribution of the respondents according to the variable of the residential area was 10% (large (urban) cities), 55% (medium cities) and 35% (small villages (rural)).

Figure No. (1) Distribution of respondents according to the area of residence



Analysis and results:

From the table and the statistical drawing, we can note the percentage of the degree of approval in the questionnaire study tool

Table No. (2)

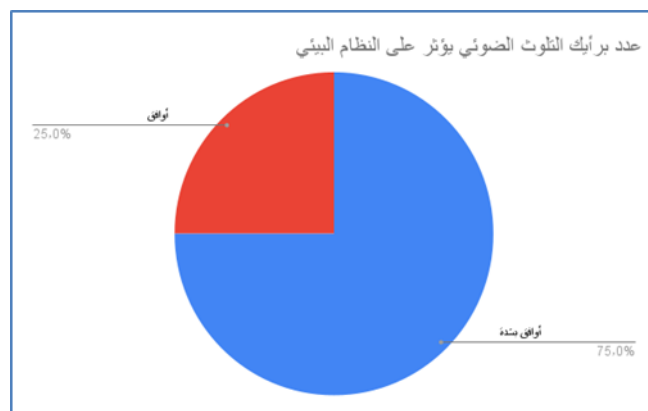
	paragraphs	descent				SMA	Total
		I totally agree	I agree	neutral	disagree		
1	In your opinion, light pollution affects the ecosystem	75%	25%	0%	0%	80%	100%
		High	medium,	non-existent	non-existent		
2	There is a relationship between light pollution and human health	55%	45%	0%	0%	80%	100%
		High	medium	non-existent	non-existent		
3	By observing the sky in your city at night, you noticed that the stars are not clearly visible	45%	45%	5%	5%	80%	100%
		Medium	Average	Weak	Weak		
4	Commercial billboards in cities cause of light pollution	50%	25%	20%	5%	80%	100%
		average	medium	average	poor		
5	Increasing community awareness reduces light pollution	75%	20%	5%	0%	80%	100%
		High	Medium	Weak	None		
6	Light pollution increases in urban cities while it decreases in rural cities	80%	15%	0%	5%	80%	100%
		High	Medium	Low	Weak		
7	I no longer see the stars and the Big Dipper constellation as before.	75% %	15%	5%	5%	80%	100%
		high	medium	weak	weak		

Discussion and explanation of reasons:

From the tables and graph, we conclude that:

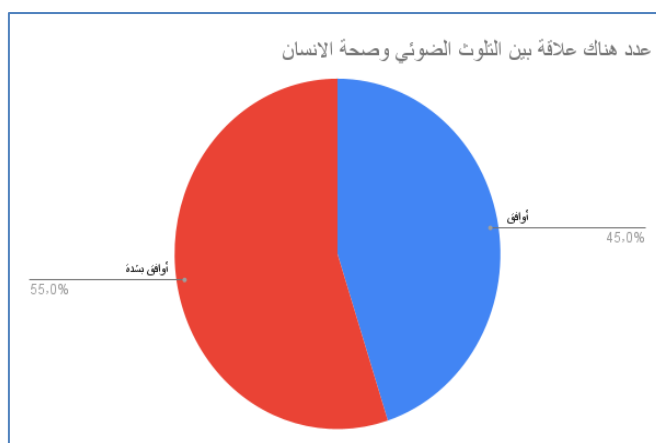
Percentage of answers and opinions of the first paragraph: In your opinion, light pollution affects the ecosystem

Figure No. (2)



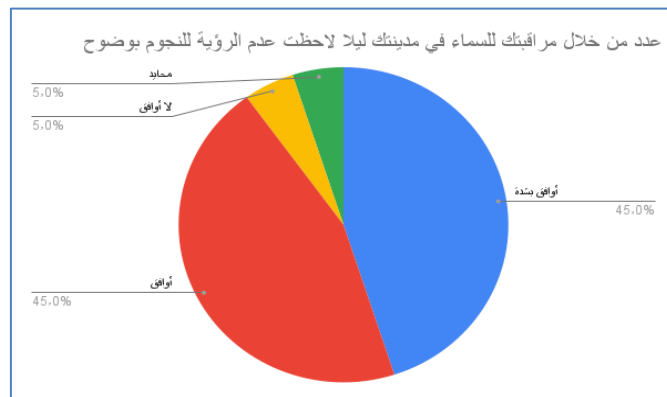
Percentage of answers and opinions of the second paragraph: There is a relationship between light pollution and human health

Figure No. (3)



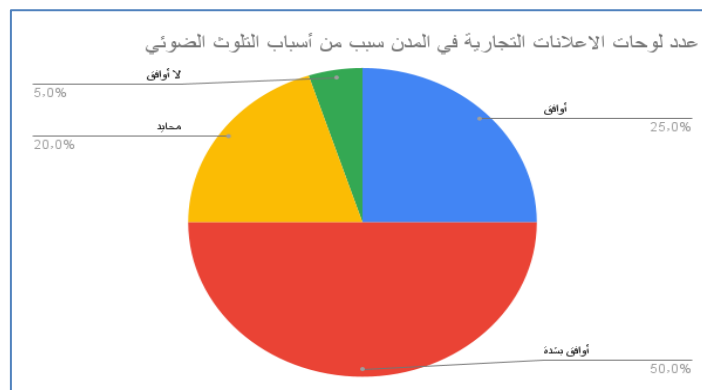
Percentage of answers and opinions of the third paragraph: By observing the sky in your city at night, you noticed that the stars are not clearly visible

Figure No. (4)



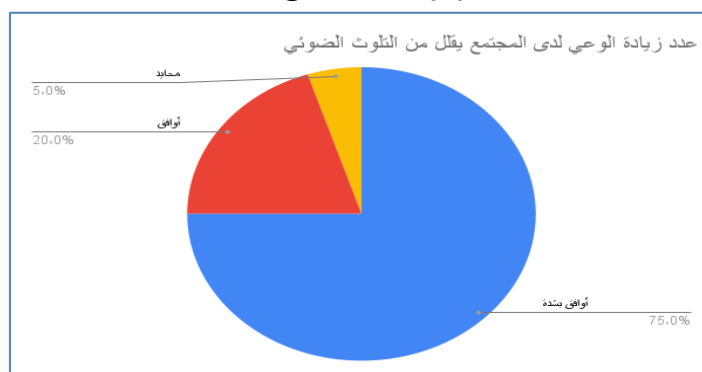
Percentage of answers and opinions of the fourth paragraph: Commercial billboards in cities are one of the causes of light pollution

Figure No. (5)



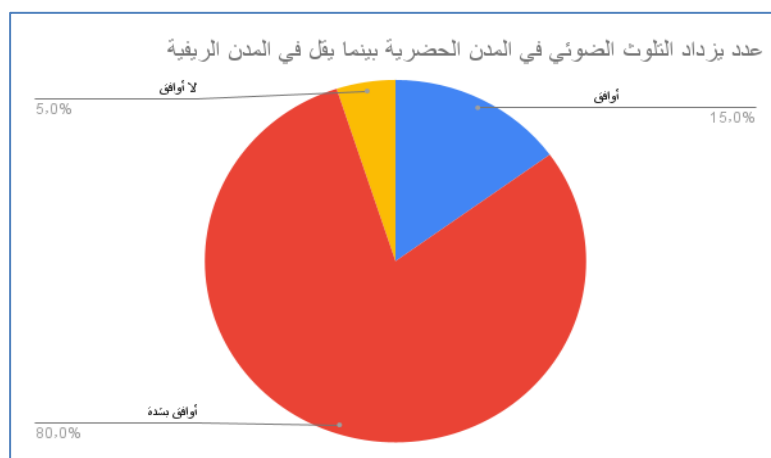
Percentage of answers and opinions for the fifth paragraph: Increasing awareness among the community reduces light pollution

Figure No. (6)



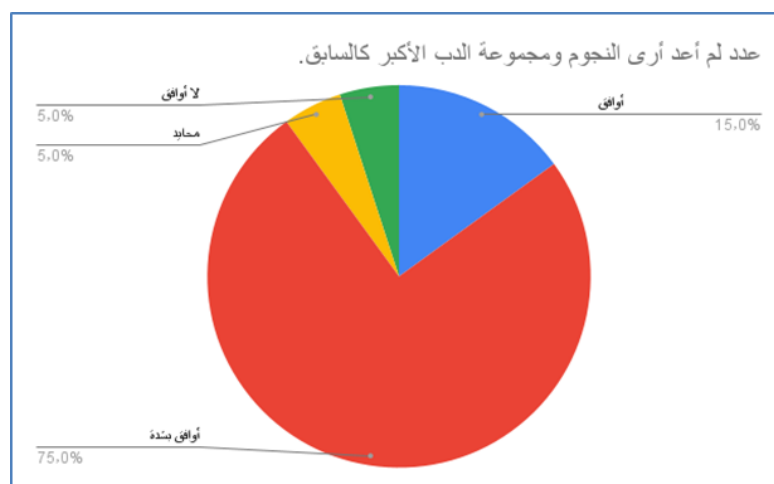
Percentage of answers and opinions for the sixth paragraph: Light pollution increases in urban cities, while it decreases in rural cities

Figure No. (7)



The percentage of answers and opinions of the seventh paragraph: I no longer see the stars and the Big Dipper group as before.

Figure No. (8)



The results during the statistical analysis highlighted some important issues:

The percentage of approval in all paragraphs was between the answer (strongly agree - agree) was between high and medium, and the percentage of disapproval was very weak and non-existent.

The approval rate also showed strongly that light pollution affects the ecosystem by 75%, while the disapproval rate was non-existent.

The two researchers found a high percentage of support that there is a relationship between light pollution and human health, estimated at 55%.

Strongly agree, 45% agree, and the percentage of disagreement is non-existent.

The analysis data showed that 45% of the residents of medium cities, when observing the night sky, do not see the stars clearly, while the residents of urban cities do not see the stars and the vision is non-existent, while the residents of rural areas and villages have clear vision.

It was found that commercial billboards in cities are one of the causes of light pollution, where the approval rate was estimated at 50%.

It was found that increasing awareness among the community reduces the risk of light pollution.

The analysis data showed that there is a direct relationship between light pollution and the environmental system. The greater the light pollution, the more the ecosystem is affected, as living organisms such as humans, plants and animals are affected.

And the approval rate showed strongly at 80% that light pollution increases in urban cities, while it decreases in rural cities, where there is no vision of the stars and the Big Dipper group in urban cities, and it is still seen in rural villages at a high rate.

And based on the observations and pictures that were taken, form (photos No. 2, 3, 4, 5), it becomes clear to us that the degree of light pollution and the difference between them, and that the percentage of light pollution is high, as there is no vision in cities and it is clear in rural villages.

Based on the observations and pictures taken (Figure 6), it becomes clear to us that light pollution has an effect on clouds. It does not only negatively affect living creatures such as humans and animals, but it also negatively affects clouds and climate changes such as increased acidity in rain. Also, the conflict of charges inside the clouds causes the clouds to scatter, which often

causes less rain and increased desertification. What we aspire to do is to try to use natural sources and reduce manufactured sources so that we can preserve our environment and our planet from increasing light pollution.

From the figure (Photo No. 7), they noticed the impact of light pollution and its danger to living organisms.

Conclusions:

In this study, we concluded that light pollution affects the ecosystem and varies from one region to another.

And that there is a direct relationship between light pollution and the environmental system, so the more light pollution increases, the more the ecosystem is affected, as living organisms such as humans, plants and animals are affected.

There is a relationship between human uses and the occurrence of light pollution that occurs in the ecosystem, as it affects and is affected by it.

This study helps to develop solutions and emphasizes the importance of studies and research to obtain solutions and results that help reduce the risk of light pollution on the ecosystem.

Discussion:

There are many studies that prove the damages of light pollution to the environment and the ecosystem in agreement with our current study, but the purpose of this study is to reduce this phenomenon in the Sabya region and other regions. Some studies have proven that light pollution or increased artificial light contributes to an increase in acid rain.

In this study, we came up with solutions to reduce this phenomenon, and among these solutions and recommendations:

1. Turn off the lights when not needed.
2. Use warm and smart lighting.
3. The use of sensors, so that they are lit when needed.

4. Using light reflectors to mark the path of the road, instead of lighting the entire road.

5. The shape of the lighting is designed to be directed downward.

6. Participate in reducing light pollution so that it is not limited to the home, but even in the school and other places.

This study helps to reduce light pollution, so it will have advantages in terms of human health and the world of animals and plants, and it will help in astronomical monitoring, and see the sky clearly.

Difficulties:

- Unavailability of some devices and data in the Globe program related to the search.

Acknowledgments:

Thank you to our family who pushed us forward, and to my country, and to Globe Environmental teacher Faiza Ibrahim Bahri, a geography major, for helping us and training us on the correct way to prepare the research, and special thanks to Dr. Abadi Muhammad Mishlawi, assistant professor of entomology at Jazan University, and Dr. Osama Muhammad Hassan Aboul Gheit is an assistant professor of entomology at Jazan University, and the teacher is Kamila Muharraq, specializing in English, to translate the research. The biology teacher is teacher Awali Atiyah, the teacher is Ashwaq Sabi, who specializes in physics, the teacher is Fatima Wafi, who specializes in chemistry, and the laboratory preparer is teacher Hanan Kharmi, for assistance and guidance, and a female teacher. Environmental Globe from Baish Third Secondary School, where she was inquired about some information from Globe and the supervisor, Najla Khawaji, in the management of Sabya Education, to our school, which gave us support and for the Globe program

Badges:

1- Collaborator:

This research was prepared in a participatory manner in all its procedures and stages, and we also cooperated with Ms. Faizah Ibrahim Bahri, majoring in geography, for training on the method of preparing the research, Dr. Abadi Muhammad Mishlawi, Assistant Professor of Entomology at Jazan University, and Dr. Osama Muhammad Hassan Abu Al-Gheit, Assistant Professor of Entomology at Jazan University. and Ms. Kamila Muharraq, specializing in English for translating the research, and the science teacher, Ms. Awali Attia, majoring in biology.

In addition to cooperation with Ms. Naglaa Khawaji, supervisor of scientific activity in the Department of Education for a boy. And cooperation took place between the students / Jude Moghni - Iman Degassi in translating the research into English. Writing the research paragraphs, searching and reading on the subject of the research, making and distributing the questionnaire, conducting observation and collecting data.

2- Problem solver:

The research addresses an environmental problem, which is light pollution and its impact on living organisms and the ecosystem.

3-Society effect: Research in brief studies is a real problem that the local community suffers from, and it tries to answer questions in order to reach specific results that are expected to lead to actual solutions, and this is what we recommended at the end of this research and we aspire to it. To be able to generalize the proposed solutions and results on a community scale and then global to all countries.

4-STEM (Science, Technology, Engineering and Mathematics):

In this research, the teacher and trainer, Ms. Bahri has a bachelor's degree in geography for training in the method of research preparation, a professor of computer science at the school. Fawzia Al-Zahrani to supervise the research, as well as Professor of Science a. Awali Attia, majoring in Biology, and Professor Kamila Muharraq, majoring in English, translated the research. and father, Dr. Qasim Ahmed Moghni .

5-STEM storytellers: We shared our experience with many of our colleagues at the school level, in addition to creating a survey and publishing it on social media to reach the largest possible segment of society to know their opinions.

6- Data scientist: To answer the research questions, we relied entirely on the data we collected, analyzed it, compared it, then drew conclusions from it, and finally came up with results that can be generalized, as well as developing future and recommendations.

The reviewer:

- [2022 – Detroit, Michigan, USA \(23rd\) – GLOBE.gov](#)

-Light pollution

https://www.gov.il/ar/departments/guides/types_of_lights

-The Caravan Magazine from Aramco

[التلوث الضوئي وفقدان الظلام | مجلة القافلة \(qafilah.com\)](#)

- [مشكلة التلوث الضوئي وتأثيرها على حياتنا](#) YouTube Dr. Nidal Qassoum

_The concept of the environment and the ecosystem.

<https://mawdoo3.co>



<https://drive.google.com/drive/folders/1VAVXc-ntW8myfuZ2xiNM1beME7BBLExH?usp=sharing>