

Beni-Suef University (BSU): Climate Action Plan



1. Introduction:

Beni-Suef University (BSU) is an Egyptian University that has three campuses; the main university campus, 320 acres complex and the Industrial Education Complex. The main university campus as well as some separated buildings and faculties in nearby regions were established as a branch of Cairo University in the city of Beni-Suef in 1981 [https://www.usnews.com/education/best-global-universities/egypt?name=]. The Beni-Suef branch became independent from Cairo University and became a separate university according to Republican Decree No. 84 of 2005. The university has 33 faculties and institutes including unique interdisciplinary ones in Egypt and the Middle East. The main campus of the university is located at the entrance to the city of Beni-Suef and is about 110 km (70 miles) south of Cairo.

BSU is a place for knowledge collection, studies, research, and knowledge transfer based on morality and academic excellence. Graduates from BSU emphasize self-training in order to become knowledgeable, thoughtful, and practical persons, as well as being able to manage themselves and other people, with work ethics and social awareness.

BSU focuses on having a green atmosphere and spaces within the university, to provide students and staff with a good quality of life by living in a beautiful environment with good air quality. Moreover, the university places great emphasis on reducing all kinds of pollution and at the same time increasing energy conservation both inside and outside the university's buildings. The university emphasizes the activities that everyone can participate in. In addition, to attempting to reduce the amount of garbage, the university conducted many researches on environmental sustainability for the benefits of the community. BSU is continuously working to reduce the effects of global warming and to be a green and healthy University through supporting sustainability projects and stimulating different aspects of sustainability within the curriculum.

The past years have witnessed remarkable international interest in the issue of sustainable development, and the interest with the concept of sustainability in education has prevailed with the aim of building a future generation capable of dealing with sustainable development. One of the main strategic goals of sustainability is the lives of future generations, quality of life, and creating a society capable of understanding and working to protect natural resources.

One of the BSU primary goals is to be a globally distinguished university in its educational programs and innovative research to contribute effectively to achieve the sustainable development goals of Egypt's Vision 2030 and Government Strategy for the Development of Higher Education in Egypt 2015-2030.”. Whereas, BSU provides creative solutions to national challenges and contributes effectively to build a balanced national economy to achieve sustainable goals and improve the quality of life for Egyptians. Also, BSU seeks to reduce the negative environmental, economic and societal impacts on health to a minimum through using its resources and basic functions of teaching, research and awareness and cooperative protocols, in order to help the community shift towards sustainable life models

2. The Global Climate change:

Climate is not the same as weather, but the two phenomena are closely related. While weather refers to short-term conditions that can change quickly, climate determines the long-term character of a given place.

The Earth's climate is changing and the global climate is projected to continue to change over this century and beyond. The magnitude of climate change beyond the next few decades will depend primarily on the amount of greenhouse (heat-trapping) gases emitted globally and on the remaining uncertainty in the sensitivity of the Earth's climate to those emissions. With significant reductions in the emissions of greenhouse gases (GHGs), global annual averaged temperature rise could be limited to 2°C or less. However, without major reductions in these emissions, the increase in annual average global temperatures, relative to preindustrial times, could reach 5°C or more by the end of this century.

The global climate continues to change rapidly compared to the pace of the natural variations in climate that have occurred throughout Earth's history. Evidence suggests that the main causes of this environmental change are the intensive use of fuel, urban expansion, and forest removal. Trends in globally averaged temperature, sea level rise, upper-ocean heat content, land-based ice melt, arctic sea ice, depth of seasonal permafrost thaw, and other climate variables provide consistent evidence of a

warming planet. These observed trends are robust and confirmed by multiple, independent research groups around the world. United Nations reports have shown that billions of people are negatively affected by climate change.

3. Egypt and Climate Change

Although Egypt accounts for only 0.6 percent of annual global carbon dioxide (CO₂) emissions, it is becoming one of the most heavily affected by extreme weather patterns. Divided into two unequal sections by the Nile River, the country consists mostly of a hot desert climate with very hot, dry summers and mild winters. The extreme sensitivity of the Nile River flow to heat waves and sea level rise makes Egypt's population of more than 100 million people particularly susceptible to climate change.

By one measure, Egypt ranks as the 83rd most vulnerable country facing the threat of climate change and 63rd when it comes to lack of preparedness to face climate. Among the elements of climate change, heatwaves can have adverse impacts on many spheres, including water stress, sea levels, biodiversity, livestock, food security, land use, urban development, tourism, and public health. Also, Egyptian labor productivity is at risk due to heat stress and worsening air quality. Additionally, the changes in Egypt's climate have negative impacts on children nutrition and growth while controlling for all other socio-economic variables. Higher average temperatures will have a negative influence on Egypt's GDP growth, but the simultaneously increasing economic activities are contributing to increasing CO₂ emissions.

Therefore, Egypt has shown commitment to the climate agenda by hosting the United Nations Climate Change Conference of the Parties (COP27), by recently finalizing the National Climate Change Strategy (NCCS) to support its 2030 Sustainable Development Agenda, and by updating its Nationally Determinant Contributions (NDCs). However, Egypt's focus should turn from managing climate change risks to capturing opportunities associated with climate change and catalyzing the private sector to contribute broadly to delivering green transition.policymaker.

4. Universities and their roles in Sustainability and climate change

Universities are playing a crucial role in alleviating climate change impacts throughout their efforts in education, research and community outreach programs. Nevertheless, universities are also large organizations with significant greenhouse gas emissions (scope1, 2 & 3). They produce emissions on their buildings and campuses through using electricity, fuel consumed from cars and buses traveling from and to

universities, etc. Thus, they have responsibilities in reducing their greenhouse gas emissions as well as their carbon footprints and plan actions to stop impacts of climate change. Universities should report and cover their ‘scope 1’ and ‘scope 2’ emissions in their buildings and campuses. Scope 1 (direct GHG emissions) accounts for GHG emissions from sources owned or controlled by the organisation, Scope 2 (electricity indirect GHG emissions) accounts for GHG emissions from the generation of purchased electricity consumed by the organisation and Scope 3 (other indirect GHG emissions) is an optional reporting category that includes emissions that are a consequence of the activities of the organisation but occur from sources not owned or controlled by the organization. (Figure 1)

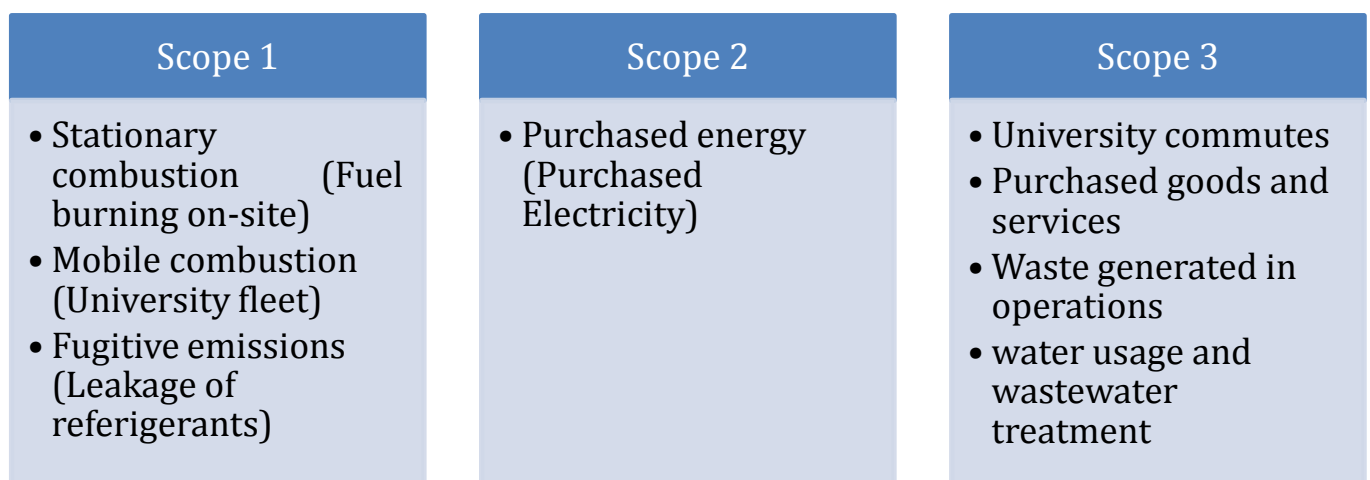


Figure 1. Sources of emissions for BSU

5. Sustainability Strategy of Beni-Suef University 2020-2030

5.1. Egypt Vision 2030

Egypt's Vision 2030 is a national agenda launched in February 2016 that reflects the country's long-term strategic plan to achieve the principles and goals of sustainable development in all fields, and to localize them in the various Egyptian state agencies. Egypt's Vision 2030 is based on the principles of "comprehensive sustainable development" and "balanced regional development". Egypt's Vision 2030 reflects the three dimensions of sustainable development: the economic dimension, the social dimension, and the environmental dimension.

The sustainable development strategy, as Egypt's Vision 2030 represents, is a milestone in the comprehensive development process in Egypt. From this point of view,

and in light of the directives and directives of our wise leadership during the era of the President of the Republic, President Abdel Fattah El-Sisi, the importance of this strategy comes, especially in light of the current conditions that Egypt is going through with its local, regional and global dimensions, which require a reconsideration of the development vision to keep pace with these developments and to develop the best ways to enable the Egyptian society to rise from its stumbling block and move to the ranks of developed countries and achieve the desired development goals for the country.

Therefore, the university has taken this strategy as a general framework intended to improve the quality of the university and the external environment in Beni Suf Governorate, in a way that guarantees the rights of future generations to a better life, and then the concept of development adopted by this strategy is based on seventeen goals.

5.2. Government Strategy for the Development of Higher Education in Egypt 2015-2030.”

It has been launched by The Ministry of Higher Education and Scientific Research. It is based on several important pillars, including: providing education for all citizens without discrimination, improving the quality of the educational system in line with global education systems, improving the competitiveness of Egyptian education systems and their outputs, and attracting prestigious foreign universities to establish branches in Egypt. The strategy also aims to develop the scientific research and innovation sector and to motivate faculty members towards more scientific and research publishing, through analyzing the current situation and adopting a clear vision, mission and values for the upcoming period. The Strategy included implementation plans to achieve its goals.

5.3. The Vision of BSU

Towards a distinguished university in the world in its educational programs and innovative research to contribute effectively to the investigation Sustainable Development Goals for Egypt Vision 2030.

5.4. The Mission of BSU

The University seeks to; i) provide programs and advanced educational services and scientific research innovative in accordance with international standards; ii) To enhance its services community and provide creative solutions to national challenges; iii) To contribute effectively in building a balanced national economy; d) and to achieve the goals of sustainable development and improve quality of the life of the Egyptians.

5.5. Sustainability concepts in the Strategic plan

BSU pays a great interest in supporting sustainability through research, education and application of sustainability in its plans and activities. BSU also helps decision-makers to acquire knowledge and skills, through the inclusion of sustainability issues in their curricula that can be done through the following:

1. Inclusion of sustainable development in all aspects and systems.
2. Linking the goals of sustainable development in an integrated manner by interdisciplinary faculties and institutes.
3. Encouraging research in the field of sustainable development.
4. Directing campus operations for sustainability.
5. Cooperation with other universities in the field of sustainability.
6. Cooperation with policy makers, governments, NGOs and entrepreneurs to achieve sustainability.

5.6. Sustainability committee to set policies and goals

Beni-Suef University has a sustainability committee to set policies and goals in light of the mission of the university and follow-up on the goals that have been achieved. Hence, the university holds periodic meetings with the sustainability committee to promote environmental sustainability and to discuss the energy and water saving plans for the upcoming academic years and regularly supervise and review the implementation of the campus plans. The committee is comprised of members of the Office of International Ranking and Sustainable Development and of Center for the Development of Means of Preserving the Environment to discuss reports and discuss proposed recommendations about the goals of sustainable development, to identify environmental problems, to combat their causes, and to show monitoring reports and referring violations of the environment.

5.7. The sustainable Beni-Suef university model

Figure 2 demonstrates BSU's sustainable model, which disseminates a set of sustainability principles in key areas for the university, as following:

- 5.7.1. **Education:** it deals with issues of sustainability and directs students for the positive deal with the environment.
- 5.7.2. **Scientific Research:** it deals with sustainability issues and develops solutions for them.
- 5.7.3. **Community service:** through the raising of awareness of the importance of sustainability and defining the principles and goals of sustainability.
- 5.7.4. **Sustainable Campus:** Campus operations aim to limit the environmental impacts for various activities.

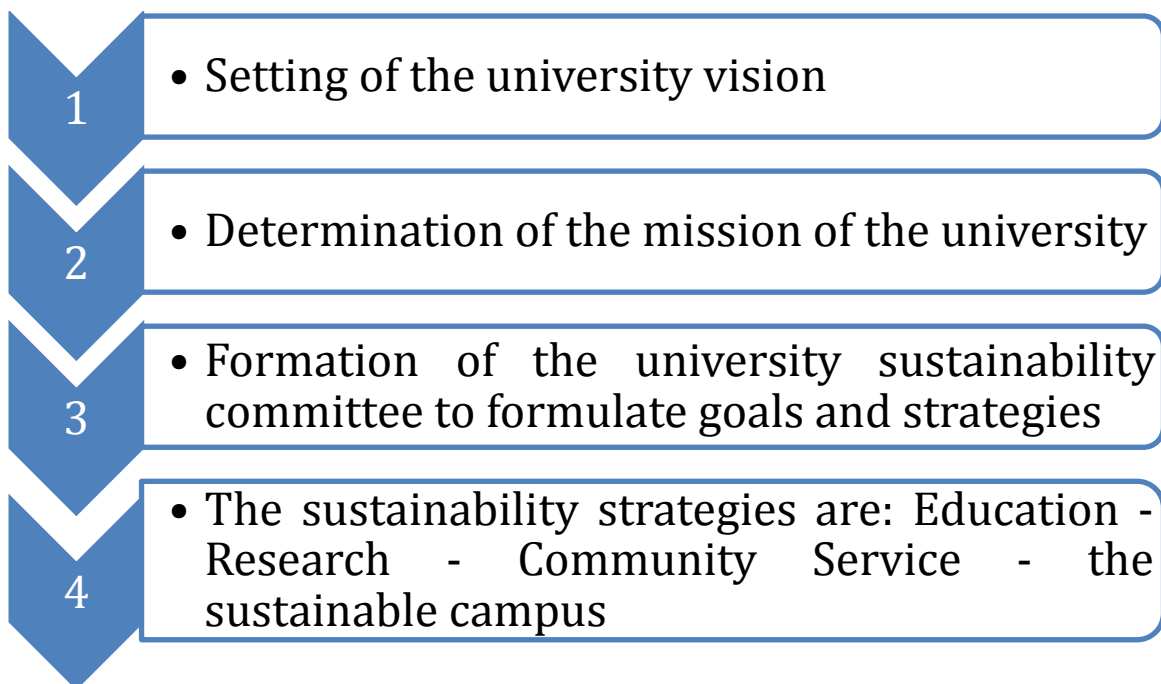


Figure 2. The Sustainable BSU Model

5.8. The reflections of the university's strategy

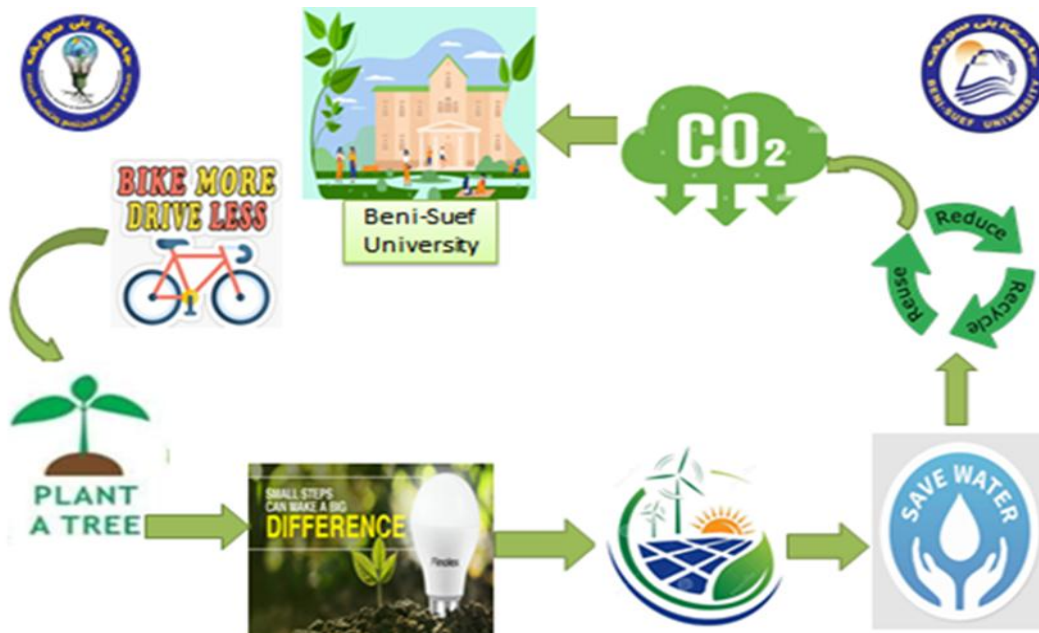
The most prominent reflections of the university's strategy are to take the following sustainability factors into consideration:

- 5.8.1. Strengthening community services to achieve both the social and environmental dimensions.

- 5.8.2. Building an integrated system for digital transformation to become a smart university.
- 5.8.3. Building a sustainable development research database.
- 5.8.4. Sustainable university – Promoting Green Courses.
- 5.8.5. Construction of new buildings and development of old buildings on green foundations (smart building).
- 5.8.6. Linking the goals of sustainable development in an integrated manner through the overlapping disciplines in the faculties and interdisciplinary institutes at BSU.
- 5.8.7. Continuous improvement for health services.
- 5.8.8. Human Resource Development.
- 5.8.9. Support and development of own resources for the university to enhance its educational, research and societal capabilities.
- 5.8.10. Providing of all educational, research and social services for people with special needs.
- 5.8.11. In 2021, Beni-Suef University Council has reviewed a set of General government's regulations and policies on environmental protection and energy and water conservation that have been implemented on campus for many years. They must be fully complied with when refurbishing old buildings or constructing new buildings on campus. They aim to save energy and improve energy efficiency standards for older buildings and all new buildings are required to meet energy efficiency standards. These policies and regulations stipulate the following;
 - a. Setting the necessary rules and procedures to develop and encourage the production and use of electricity from renewable sources, and raise the efficiency of use of electrical energy.
 - b. When selecting work sites, establishments and their branches, and granting their licenses, the requirements of environmental protection shall be taken into account in accordance with the provisions of Legislation issued in this regard.
 - c. Coal-traded companies and establishments and port authorities are subjected to the provisions of environmental monitoring and the environmental record stipulated.
 - d. The University Council for Environmental Service and Community Development is responsible for studying and proposing the general policy, plans and programs that ensure the achievement of the

university's role in community service and environmental development.

6. The target data of the BSU strategy to achieve the carbon neutrality in 2030



Overview of Green Strategies and Technologies implemented at Beni-Suef University to combat Climate Action

BSU has key implementation points to promote carbon reduction that focus on clean transportation, renewable energy, pollution prevention and waste management,

7. Impactful university program(s) on climate change

7.1. BSU has several research programs aiming to deal with energy and climate change by reduce greenhouse gas emission, such as:

7.1.1. Using nanotechnology and plastic waste to produce renewable energy with the participation of a Solar Energy Technology and Fuel Production Company. The burning of plastic waste negatively affects the surrounding environment and public health, and the exploitation of these wastes in the production of economic fuel cells limits the harmful impact of waste and maximizes the use of it.

7.1.2. Winning of a number of research projects in the projects of young researchers - the fourth stage that contribute in CO2 emission reduction.

- 7.1.3. Performing a project entitled ((Carbon sequestration by genetically modified microalgae for Biofuel production)). The project aims to develop an algae strain capable of fixing carbon dioxide with a higher efficiency. Cultivating these algae in highly polluted areas helps to reduce global warming.
- 7.1.4. Finishing and implementing of the funded research project entitled ((invention of a new catalyst for the economic CO2 conversion into fuel).
- 7.1.5. The participation of students in competitive master's scholarships from the Center of Excellence for Water in cooperation with the American University in Egypt.
- 7.1.6. Getting an Egyptian-French research project entitled “Nanometric Compounds of Pure and Grafted perovskite and Their Use in Energy Applications.” The project falls under the Imhotep protocol between the Academy of Scientific Research and Campus France, and the project includes the preparation of some nanometric materials and their use in fuel cells to produce energy. The project includes visits exchanged between the research team of the project from the Egyptian side and the principal researcher, Dr. Pierre Mellet, professor at the University of Paris-South in France.
- 7.1.7. International cooperation and exchange agreements of Beni-Suef University with French, Spanish and Japanese Universities. Where, some students traveled to the Spanish University of Vigo and University of Jaen to study solar energy.
- 7.1.8. Scientific cooperation programs between Egypt and Italy under the auspices of the Science, Technology and Innovation Funding Authority in fields of renewable energy, materials science and engineering and environmental sciences.
- 7.1.9. A protocol of cooperation with the universities of Toliara in Madagascar and Dakar in Senegal in the scientific fields, and the expansion of the establishment of new programs in various projects and activities. **It aims to;**
- Engineering consultancy services in the fields of renewable energy and water.
 - Enhance cooperation in fields of education and scientific research, academic programs and degrees.
 - Organizing joint conferences, seminars and workshops..
 - Integrating laboratories between the two universities
 - Engineering consultancy services in the fields of renewable energy and water.

7.2. Faculty of Postgraduate studies for Advanced Sciences is characterized by the presence of a strong infrastructure of integrated devices and laboratories and it has different innovative programs and plans concerning renewable energy as shown:

- 7.2.1. The faculty includes a Department of Renewable Energy Science and Engineering, which is the first of its kind to integrate energy sciences, is concerned with manufacturing materials used in energy storage and conversion with engineering manufacturing of energy tools from solar energy, batteries and fuel cells, to contribute to alternative solutions for electricity and fuel.
- 7.2.2. It has a central lab for thin film protection used in solar cell applications. The current generated can be used to power various appliances or it can be stored in batteries to be used when required.
- 7.2.3. Cement manufacture contributes greenhouse gases and cement sector is the third largest industrial source of pollution, emitting more than 500,000 tons per year of greenhouse gases. Hence, the Faculty of Postgraduate studies for Advanced Sciences offers cement chemistry and technology program as a distinct and unique program that is the only one in Egyptian universities. This program aims to improve cement characters and to put different pathways for low-carbon cement production.
- 7.2.4. Environmental and Energy Department is concerned with giving many master's and doctorate degrees as well as diplomas in more than 10 programs specialized in fields of energy, environment , climate change, cement chemistry and technology and quality control.

7.3. The Water Studies and Research Center at Faculty of Earth Science.

It is one of the specialized centers at the level of Egyptian universities in conducting all studies related to the sustainable management of water resources (conventional and Unconventional, renewable and non-renewable) in terms of exploration, evaluation and purification and treatment and reuse as well as desalination, control and quality assurance for all Processes. Where it is concerned with the following strategic goals;

- 7.3.1. Conducting studies on rising groundwater levels and their negative effects on the surrounding environment and infrastructure, as well as the quality of agricultural soil.
- 7.3.2. The evaluation of several sewage treatment plants in Beni-Suef, Governorate.

- 7.3.3. Making the necessary environmental measurements for many factories in Beni-Suef Governorate.
- 7.3.4. Making an integrated environmental record for the University (making environmental measurements for the various faculties of BSU from classrooms, student laboratories, research laboratories, service units) and providing recommendations and proposals with periodic follow-up every 6 months.
- 7.3.5. Make a plan to educate citizens on how to rationalize the consumption of water resources and make good use of them, provided that the university members implement this plan during the summer vacation in some villages of Beni-Suef Governorate.

7.4. Presence of Center for the Development of Means of Preserving the Environment at BSU, that meets the following;

- 7.4.1. It can identify environmental problems in the province and work to solve them in a scientific manner to reduce them.
- 7.4.2. It also establishes close cooperation with advisory offices, governmental and industrial bodies, and community and scientific institutions, to solve environmental problems and provide specialized technical advice.
- 7.4.3. In addition, it actively contributes to the development and implementation of policies, whether at the governorate or national level.

7.5. The implementing of the center for environmental monitoring and limiting the risks of climate change at Beni-Suef University will be completed by next year.

It will be a unique center at the level of Egyptian universities that will strength the university's role in facing climate changes and in order to achieve the principle of sustainability and Egypt's vision of 2030. It will aim to the following;

- 7.5.1. Monitoring all environmental problems in Beni-Suef Governorate.
- 7.5.2. Determining the type and sources of these problems, and their relationship to potential climate changes.
- 7.5.3. Providing appropriate scientific solutions according to the type of each problem.
- 7.5.4. Making a map of climatic challenges and all risks that threaten water and agricultural resources and air pollution.

- 7.5.5. Creating a database of problems which results in negative effects on the environment and directing them to be enrolled in master's and doctoral degrees.
- 7.5.6. Establishing a number of environmental monitoring stations in cooperation to monitor carbon emissions.
- 7.5.7. Providing scientific advices in the field of wastewater treatment, and assessing the environmental impact of all development activities and projects at the governorate level.

8. Conclusion

Building on the implemented energy and water savings and carbon reduction policies over the next 7-8 years, by 2030, BSU Campuses are expected to reach carbon neutrality on 2030 or earlier.