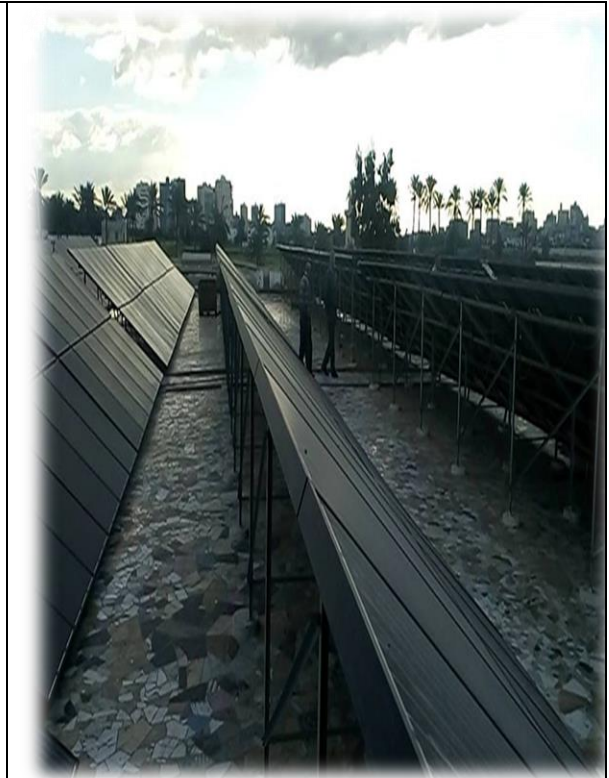


**Greenhouse gas emission reduction program**



1. LED lighting and lamps (Abis Campus, Alexandria University)



2. Renewable energy (Solar Energy Center at the Faculty of Agriculture, Alexandria University)



3. Ride Share using the University Shuttle (Alexandria University)



4. Solar Energy Center at the Faculty of Science (Alexandria University)



5. BIPV Roof Pergola, Faculty of Science in Moharram Bek (Alexandria University)

6. BIPV Garden Pergola, Faculty of Science in Moharram Bek (Alexandria University)

**Description:**

**Table: Greenhouse gas emission sources at Alexandria University Campus**

	<b>Emission data</b>	<b>Definition</b>
<b>Scope 1</b>	Stationary combustion	Stationary combustion refers to the burning of fuels to produce electricity, steam, and heat in a fixed location, such as boilers, burners, heaters, kilns, and engines.
	Mobile combustion	Burning of fuels by institution-owned transportation devices
	Process emissions	Direct greenhouse gas (GHG) emissions from physical or chemical processes rather than from fuel combustion
	Fugitive emissions	Hydrofluorocarbon releases during the use of refrigeration and air conditioning equipment and methane leakage from natural gas transport
<b>Scope 2</b>	Purchased electricity	Indirect GHG emissions result from the generation of the electricity purchased and used by the institution

<b>Scope 3</b>	Waste	Indirect GHG emissions resulting from the incineration or landfill of your institution's solid waste
	Purchased water	Indirect GHG emissions resulting from the generation of water supply purchased and used by the institution
	Commuting	Indirect GHG emissions resulting from regular commuting from and to institutions by students and employees (i.e., reducing regular commuting by using shared vehicles, carpooling)
	Air travel	Indirect GHG emissions resulting from air travels paid by institutions (i.e., reducing the number of staff air travel opportunities)

**Elements of Green Building Implementation as Reflected in all new construction and renovation policies:**

**Scope 1, Stationary combustion and Mobile combustion:** These GHG sources are reduced by Ride Share using the University Shuttle and Carpool, by the decrease of burning of fuels. In addition, the use of bicycles reduces the GHG source.

**Scope 1, Fugitive emissions:** All new buildings in Abis campus are designed with large windows to get maximum benefit from daylight and natural ventilation. In addition, all University buildings have good natural ventilation and daylight. This will reduce the use air conditioning equipment and accordingly decrease GHG.

**Scope 2, Purchased electricity:** As for energy, all the new buildings in Abis Campus have solar energy generation cells to provide part of the building's needs, which are estimated at about 45%, in addition to using energy-saving lamps (LED). In addition, the public site lighting poles are powered by solar energy.

All the faculties and institutes of the university realize their own energy-saving potential by means of LED lighting and the deployment of sustainable technology. Alexandria University have generalized this initiative in some of the faculties of Alexandria University in gradual stages.

Alexandria University Program to reduce Electricity consumption from Air Conditioners and electric devices such as Computers, printers, lab apparatus.

1. All newly purchased AC are inverter AC to reduce the electricity consumption.
2. The new electric devices such as Computers, printers, lab apparatus are energy efficient devices.
3. All electronic devices must be shut down at night, when not used.
4. Regular Maintenance of all devices.
5. The thermostats of the air conditioner are set at 25°C, and direct sunlight is avoided by using sun protection curtains

**Scope 3, Waste:** Alexandria university program to reduce the use of paper and plastic in campus.

- 1) Development of electronic archiving system; the university faculties and the main campus are moving toward the electronic archiving system to reduce paper consumption.
- 2) University decrees to reduce the use of paper in the campus:
  - 2.1: The president decree to use the e-mails for communications inside the campus and between the university main campus and all the other campuses.
  - 2.2: In the situations, the university or any of its faculties need to print the official documents; this has to be on recycled paper (2 faces copy).
  - 2.3: The University formulated a community for administrative reform to minimize the administrative processes and decrease the use of papers except in who are relevant to financial process.
- 3) Digital transformation toward electronic exams to reduce paper consumption.
- 4) Digital transformation toward electronic course to reduce paper consumption and books printing.

5) Electronic administration of student courses by about 50% instead of written administration to reduce paper consumption.

**Scope 3, purchased water:** The University has applied a strategy in the faculties to decrease water consumption through installation of special parts on water taps, showers, toilette, and bathroom bidet which can conserve about 50% of water consumption. Water saving devices are used instead of traditional devices. For example, the use of a hand-washing faucet with automatic control via a sensor, and high-efficiency bathroom devices. Supplying water taps with water conservation units. Adopting a mechanism to maintain water pipes to prevent waste resulting from leaks.

In addition, a policy for the reduction of purchased water was implemented in Abis Campus 1) Water-saving plots are used, which will reduce water consumption by about 30%. The sewage water will be treated and reused in the irrigation of green areas in the project. 2) Rainwater is collected in the main lake and used for irrigation. 3) The use of plants with few water rationed plants to reduce irrigation needs in addition to absorbing quantities of rainwater to reduce the severity of rain spells.

**Scope 3, Commuting:** These GHG sources are reduced by Ride Share using the University Shuttle and Carpool, by the decrease of burning of fuels. In addition, the use of bicycles reduces the GHG source.

**Scope 3, Air travel:** The University usually support the travel of Faculty members and student once every two years for attending conferences. Lately, since the covid 19 pandemic, and the increase in air travel Tickets, the support of travel was stopped.

Alexandria University intends to realize further energy savings by paying close attention to energy management. All the faculties and institutes of the university realize their own energy-saving potential by means of LED lighting and the deployment of sustainable technology.

**Alexandria University Project on using LEDs as Energy-Efficient Bulbs (2019-2022):**

Within the framework of the University’s keenness to transform into a green, environmentally friendly university that works to enhance its resources and rationalize energy consumption, the Department of Community Service Development has launched a project for the total transformation of the used LED bulbs instead of the fluorescent ones. The light-emitting diode (LED) bulbs are more efficient, and energy-saving compared to fluorescent bulbs, with a relatively longer life span.

The project has been implemented in phases since 2019 based on the preparation of an inventory of the total numbers needed for all faculties and institutes of the university. The first quarter, the numbers required, which represents the types of 60 cm, 120 cm and 9 watts’ bulbs, has been spent and installed, which are almost 30%. In parallel, appropriate measures were taken to dispose of the lost fluorescent lamps through one of the companies concerned with safe disposal. The second step required the purchase and transformation of 37% of the total needs of the faculties and institutes of the university.

During the current phase we are processing the third step of purchasing and transformation of around 92% of the total needs of the faculties and institutes of the university (attached pdf file).

The Table below summarizes the total number of LED bulbs that are required for complete transformation into using green energy source along with the percentage of the bulbs that were already replaced over the last 3 years.

LED 60 cm

LED Lamps	Total Number required	Total number energy Efficient appliances (replaced)	Percentage
2019	39198	10142	25.9%
2020		12504	31.9
2021		12900	32.9%
		<b>Total Percentage</b>	<b>90.7%</b>

LED 120 cm

LED Lamps	Total Number required	Total number energy Efficient appliances (replaced)	Percentage
2019	30799	9874	32.1%
2020		12500	40.6%
2021	...	6221	20.2%
		<b>Total Percentage</b>	<b>92.9%</b>

#### LED 9 watts

LED Lamps	Total Number required	Total number energy Efficient appliances (replaced)	Percentage
2019	5190	1678	32.3%
2020		1998	38.5%
2021	...	1282	24.7%
		<b>Total Percentage</b>	<b>95.5%</b>

#### **Alexandria University Program to reduce Electricity consumption from Air Conditioners and electric devices such as Computers, printers, photocopiers, surveillance cameras.**

6. All newly purchased AC are inverter AC to reduce the electricity consumption (attached pdf file).
7. The new electric devices such as Computers, printers, photocopiers, surveillance cameras are energy efficient devices (attached pdf file).
8. All electronic devices must be shut down at night, when not used.
9. Regular Maintenance of all devices.
10. The thermostats of the air conditioner are set at 25°C, and direct sunlight is avoided by using sun protection curtains

#### **Solar Energy Center at the Faculty of Agriculture (Alexandria University)**

Hybrid Renewable Energy Systems to Supply Services in Rural Settlements of Mediterranean Partner Countries.

#### **The services provided by the center:**

- 1) **Research and development:** Encouraging applied research on renewable energy at AU and through collaborations with other national and international universities. Development of hybrid systems in renewable energy and its uses in water pumping and water desalination and development of remote and desert areas. Development of research in energy from biomass and waste. Development of thermal uses of solar energy.
- 2) **Consultations:** Various consultations in renewable energy systems, especially hybrid systems, drying and solar heating.
- 3) **Education and Training:** Supporting the renewable energy education at AU. Developing and delivering courses, e-learning, workshops, training courses, and conferences on various renewable energy systems.
- 4) Serving the Egyptian community by providing all renewable energy information to the public.

#### **Equipment at the center:**

- 1) The center has many devices for different applications of renewable energy.
- 2) A hybrid system to generate electricity from the sun with a capacity of about 130 kilowatts.
- 3) E-learning courses on the site.

System Application	Solar System power kWp	Air Turbine power	Energy (kWh)
Wadi El-Natroon 1, Photovoltaic cells	7		7000
Wadi El-Natroon 2, Photovoltaic cells	50		50,000
Wadi El-Natroon 1, Air turbines		5	5000
Wadi El-Natroon 2, Air turbines		50	50,000
Abis Campus			130
University Main building			20
	Total Power (kWh)		112,150

### The Faculty of Science:

**Research Project:** Development and implementation of decentralized solar-energy-related innovative technologies for public buildings, in the Mediterranean Basin

System Application	Number of modules	Solar System kWp	Power (kWh)
BIPV façade brise-soleil	120	17.28	26350
BIPV garden pergola	90	8.1	23270
BIPV roof pergola	30	4.1	
	Total Power (kWh)		49,620

### University administration building

The project of "supplying, installing and operating the photovoltaic solar plant with a capacity of 20.1 kW above the administration building of Alexandria University in Shatby was launched by the Arab Renewable Energy Company, on 2/14/2020. The capacity of the station per month is 20.1 kW, while the capacity consumed from the building is 255 kW / month, meaning that the station provides within 8% of the total monthly consumption. Total Solar energy per year = **241.2 KWh**.

### Higher Institute of Public Profession

The Institute has two initiatives to exploit solar energy at the Institute through two units of photovoltaic cells (50 watts each) that are currently installed and are exploited to provide the electrical energy necessary to operate the Ultra-Filtration unit located in one of the laboratories of the Department of Materials Science for educational purpose. Moreover, five units of photovoltaic cells (260 watts each) were installed to operate the discussion room at the Institute and to provide it with sufficient energy for lighting purposes and to operate its display device. Total Solar energy per year = **360 KWh**.

### Ratio of renewable energy production divided by total energy usage per year

No	Renewable Energy	Production (in kWh)
1	Solar panel	57,150 + 49,620 + 241.2 + 360
2	Windmill	55,000
	<b>Total</b>	<b>162,371.2</b>

### **SCOPE 1**

**Electricity produced by renewable energy:  $162371.2 * 0.5791$  (conversion factor ) = 94029.1619 CO<sub>2</sub> e**  
**Percentage of renewable energy production to the total energy usage /year =  $162371.2 / 710664 = 22.847\%$**

**Alexandria University** have generalized this initiative in some of the faculties of Alexandria University in gradual stages.

**Additional evidence link:** <https://alexu.edu.eg/index.php/about-us-ar>

**Link for LED lighting:**

[https://alexu.edu.eg/index.php/?option=com\\_content&view=article&id=5935&catid=21&lang=ar-AA](https://alexu.edu.eg/index.php/?option=com_content&view=article&id=5935&catid=21&lang=ar-AA)

**Link for Solar Energy:**

[https://alexu.edu.eg/index.php/?option=com\\_content&view=article&id=5936&catid=21&lang=ar-AA](https://alexu.edu.eg/index.php/?option=com_content&view=article&id=5936&catid=21&lang=ar-AA)

**Link for Sustainable Development:** <https://alexu.edu.eg/index.php/en/sustainable-development>

**Link for Green University:**

[https://alexu.edu.eg/index.php/?option=com\\_content&view=article&id=5932&catid=21&lang=ar-AA](https://alexu.edu.eg/index.php/?option=com_content&view=article&id=5932&catid=21&lang=ar-AA)

**Document prepared by Prof. Sherine Khattab**

### Statement of the colleges and institutes' consumption of electricity water and paper

No	college or institute	Electricity(kilowatt)	Water(cubic meter)	Gas(cubic meter)	Gasoline(liter)	Diesel(liter)	Paper(package)
1	Faculty of Law	238855	5836	0	1550	1350	3237
2	Faculty of Arts	275000	14030	0	3000	0	4000
3	Faculty of Commerce	7906	19233	0	4884	0	1774
4	Faculty of Science	274701	86361	1293	10000	5000	2000
5	Faculty of Medicine	647408	65605	0	1666	0	7385
6	Faculty of Pharmacy	500101	15436	1034	1820	360	2500
7	Faculty of Engineering	1100585	41871	22	8640	0	4295
8	Faculty of Agriculture	1731321	99534	3700	8710	0	1429
9	Higher Institute of Public Health	97237	1386	0	2000	0	575
10	Faculty of Education	1677	1677	0	2500	2000	2136
11	Faculty of Dentistry	16327	27326	0	1126	245	1335
12	Medical Research Institute	229780	73621	0	750	400	3881
13	Veterinary Medicine	210716	81755	0	2526	2850	500
14	Institute of Graduate Studies and Research	949	8313	-	260	-	650
15	Faculty of Tourism and Hotels	400	3052	0	957.75	0	820
16	Faculty of Fine arts	4842	23451	0	40	0	1124
17	Physical education for boys	455160	89994	0	2500	60	1000
18	Physical education for girls	604725	48209	0	1000	0	899
19	Agriculture of Saba Pasha	174272	11263	1022	210	520	695
20	Faculty of Nursing	242764	22263	0	70	0	2888
21	Faculty of Specific Education	400	3248	0	1000	0	450
22	Faculty of Early childhood education	400	2954	0	3920	0	664
24	University Administration	291115	12880	0	0	0	3674
	<b>Total</b>	<b>7106641</b>	<b>759298</b>	<b>7071</b>	<b>59129.75</b>	<b>12785</b>	<b>47911</b>

*adm*





Carbon emissions in CO2e for electricity, water and paper

	Value	Conversion factor	CO2e	Scope emissions
Electricity (kilowatt)	7106641	0.591	4200024.8	1 &2
Gasoline(Liters)	59129.75	0.2408	14238.4438	1 &2
Diesel (Liters)	12785	0.3696	4725.336	
subtotal			4218988.58	1 &2
Water (cubic meters)	759298	0.5791	439709.4718	3
Paper (packages)	47911 (*0.75km)= 3533.25 kg	2.8	9893.1	3
subtotal			449602.572	3
Total			4668591.15	

Carbon emissions in CO2e for electricity, water and paper

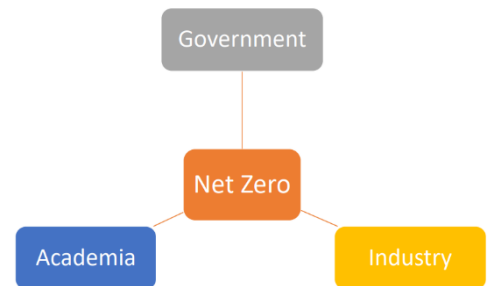
	Value	Conversion factor	CO2e	Scope emissions
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Paper (packages)	47911 (*0.75km)= 3533.25 kg	2.8	9893.1	3
subtotal			449602.572	3
Total			4668591.15	



## A Road Map

### Towards Net Zero Emissions through Synergy Between Academia, Government and Industry

- Roadmap Towards Net Zero Emissions
- Alexandria University Climate Change Strategy Map
- Alexandria University Climate Change Projects
  - Green Hydrogen
  - Electric Vehicles
  - Alexandria Water and Energy Services Company (AWESCO)
  - Suez Canal Impact on Shipping Emissions
  - Egypt as an International Energy Hub and Enhancing its Energy Mix
  - Egypt as a World Hub for Electronics Design and Manufacturing
  - Coastal Protection and Flood Management for Alexandria Governorate
  - Alexandria Sustainable Development Center of Excellence (ASD)
  - Alexandria Center for Greener Blue Economy



## ALEXANDRIA UNIVERSITY COP27 STRATEGY MAP



## Activity 1 SCOPE2

Alexandria University is working with its partners from Academia and industry to transform Kima Fertilizer company to a green company for the production of Ammonia. The hydro power plant technology

## Activity 2

Alexandria University is working with its partners from Academia and government and private sectors to develop a powertrain control system to support group transportation buses.

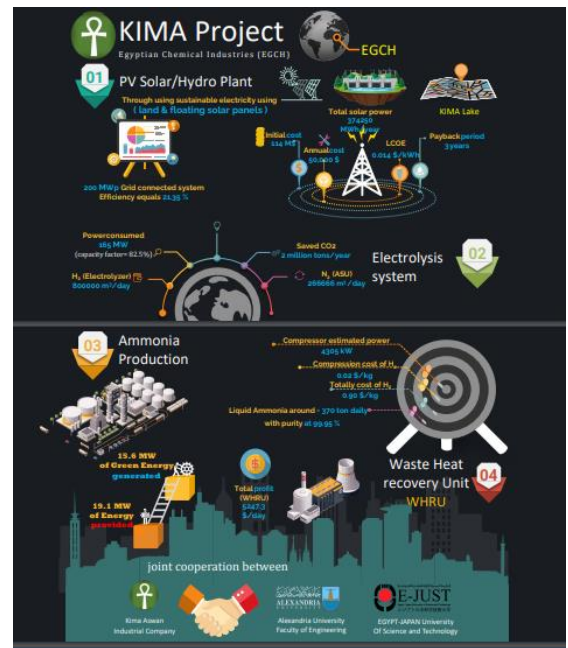
### DECARBONIZATION OF THE FERTILIZER INDUSTRY EGYPTIAN CHEMICAL INDUSTRIES - KIMA

- Hybrid renewable energy production from solar power/hydro power.
- Green hydrogen production by water electrolysis.
- Pressurized tank design for green hydrogen storage.
- Green ammonia production from green hydrogen.



**Industrial and Academic Partners**

**Featured In**



### AN ELECTRIC POWERTRAIN FOR CITY BUS TRANSPORT VEHICLES

- The goal of the project is to develop a configurable powertrain control system that can support different categories of transportation buses.
- The developed powertrain will be used to convert a 12m bus into a fully electric bus.
- The project is sponsored through ITIDA – Ministry of Communications (5 million EGP).
- Project delivery date is February 2023.

**Sponsor**

**Industrial and Academic Partners**

## Activity 3 SCOPE1

Establishment of an Energy service company owned by Alexandria University to operate in the field of energy and water resources. The company will include members from stakeholders who contribute to the high energy consumption. The main objective of the company is to reduce the carbon footprint and implementing the concept of Energy performance contracting

### Mission & Vision

- ✓ To make Egypt's Built Environment & Industry a leading example of Energy Efficiency
- ✓ Help Alexandria to be a Green & Sustainable City
- ✓ Lower the carbon footprint of the Region
- ✓ Introduce and implement the concept of Energy Performance Contracting



Blower Door Model



Combustion Analyzer



Duct Blaster System



Thermal Infrared Camera

Energy Audit Team

### Project outlines

Alexandria University is planning to establish an "ESCO" Energy Service Company to operate in the fields of Energy and Water Resources under law 23 y2018

The company will be owned by Alexandria University with members of the board from several reputable stakeholders

Simply define the current energy profile for buildings or industrial activities, propose energy retrofitting techniques with acceptable payback times.


These studies will be used to convince funding agencies to fund the proposed optimization strategies in order to reduce overall energy consumption and carbon footprint and will be paid back by energy savings from utility bills over the time indicated by the study. AWECO will act as the third party for all Energy contracting practices.

## Activity 4 SCOPE2


Alexandria University work collaboratively with the Suez Canal Maritime transport to reduce the impact of Suez Canal due to carbon emissions. The main goal of the project is to reduce the emissions nationally and globally.


### SUEZ CANAL IMPACT ON THE REDUCTION OF SHIPPING EMISSIONS

- Maritime transport is the backbone of international trade and the global economy.
- Over 80% of the volume of international trade in goods is carried by sea (UNCTAD, 2018).
- Suez Canal is a strategic nexus for global supply chains and among the world's most significant trade chokepoints.
- 18,880 vessels passed via SC in 2019 with a total deadweight of about 1 billion tons.
- That represents about 10% of the world's trade volume passed via SC.
- The distance saved reached about 10,000 miles (18,000 Km) on certain voyages which contributes to immense fuel and emission savings, in addition to the contribution to the global economy.



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## Activity 5: Energy Hub SCOPE1

Alexandria University is working nationally to establishing Egypt as an international energy hub to secure energy from multiple sources. The main aim is to reduce emissions and logistics of energy transportation.

### EGYPT AS AN INTERNATIONAL ENERGY HUB AND ENHANCING ITS ENERGY MIX

#### International Energy Hub

- › Establishing Egypt as an international energy hub between the current producers in Asia and the industrialized countries in Europe to reduce the costs, emissions and the logistics of energy transportation.
- › Securing energy for Egypt from multiple sources.
- › Trade income.
- › Increased ship movement with possible addition of services
- › Effective utilization of Egypt LNG resources (2 plants)

#### Enhancing Egyptian Energy Mix

- The future energy strategy should be based on a balanced energy mix of all sources of energy.
- Innovation and Investment into reducing the harmful emissions from fossil fuels to make them cleaner.
- Efficiency of existing energy systems should be increased by a combination of technological solutions, improvement of building codes and implementation of regulations and effective audits

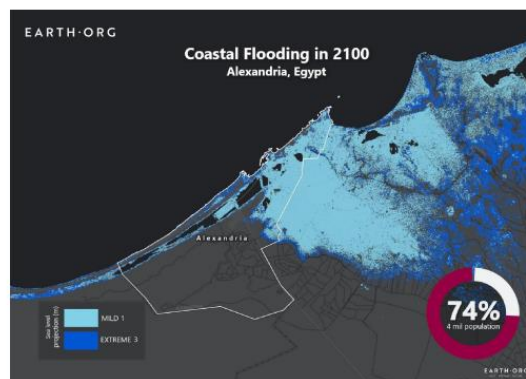
## Activity 6 Coastal Hazards SCOPE3

A Road Map for

1)creating a reliable risk assessment map for

Alexandria that involves identifying the study area along the coastline of Alexandria, 2)Providing the local authorities and policy makers with updated data for the vulnerable areas subjected to flooding. 3) Accurate prediction and enabling readiness facing sea-level-rise under extreme events. 4) Increase the public awareness of the sea-level-rise and extreme events. 5) Preparing a hydrodynamic model resulting in selection of the appropriate needed coastal and shoreline protection structures. 6) Use of permeable pavement to reduce the risk of flood in a pilot area in Alexandria

### CLIMATE CHANGE AND ITS EFFECT ON ALEXANDRIA DUE TO SEA LEVEL RISE



- Several studies conducted regarding the vulnerability of Alexandria Governorate, indicated that in the event of a rise in sea level of half a meter, it is expected that 30% of the city will be inundated, which will lead to displacement of nearly 1.5 million people or more, 195,000 jobs will be lost, and land and property losses estimated to be \$30 trillion.
- Results of 0.5m SLR scenario in Alexandria predicted losses of 45% of recreational areas, 13% of residential area, 12% of industrial area, 30 % of the services, and 21% of tourism attractions, if no precautionary actions are taken.

## Activity 7. SCOPE3 Building Materials, Construction, Infra Structure, Industry, Energy & Resources

Aims to : Provide a hub to cooperate with relevant industry, & research entities to provide access & dissemination of needed knowledge & practices & adaptation of appropriate technologies.

- o Partner with government, industry to help overcome resourcing challenges, towards greener technologies & sustainable strategies.

Stakeholders: Manufacturing companies of cement, concrete, steel, ceramics, bricks, asphalt; petro-chemicals, fertilizers, gases, textiles, paper...etc.

- o Building & construction sector.
- o Transportation & energy sectors.
- o Ministries, government agencies & code development entities

**ALEXANDRIA SUSTAINABLE DEVELOPMENT CENTER OF EXCELLENCE (ASD)**  
 Green Campus – Alexandria University



**SOLE**  
High Energy efficiency for the public stock Buildings in Mediterranean



Project funded by the  
**EUROPEAN UNION**

**Industrial and Academic Partners**






Establishment of a 200 kW solar power plant in the Faculty of Engineering – Alexandria University

## Activity 8 SCOPE3: Alexandria centre for greener blue economy

**ALEXANDRIA CENTER FOR A GREENER BLUE ECONOMY**

**THE BLUE ECONOMY**



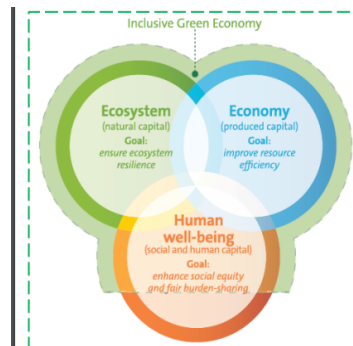
Blue Economy - Definition

Sustainable use of ocean, sea and river resources for:

- o Economic growth.
- o Improved livelihoods.
- o Job creation.
- o Mitigation of the impacts of climate change.
- o Meeting the food needs of a growing global population.

Blue Economy - Challenges

- o Frequent flooding.
- o Marine pollution.
- o Lack of trained personnel.
- o Over-exhaustion of resources.
- o Lack of regional cooperation.



Green Economy - Definition

Low carbon, resource efficient and socially inclusive economy in which growth is driven by investment in:

- o Infrastructure and assets that allow reduced carbon emissions and pollution.
- o Enhanced energy efficiency.
- o Prevention of the loss of biodiversity and ecosystem services.

Blue Economy vs Green Economy

- o Green economy tends to focus on sectors of energy and transport, while blue economy tends to focus on marine and coastal resources.
- o Both incorporate climate change mitigation and adaptation strategies.
- o Regional cooperation in implementation of both types of economies would lead to prosperity growth for all countries involved while preserving their resources.

Vision

Towards a greener blue economy for the benefit of the citizens of all Mediterranean countries

Mission and Goals

- o Conduct studies about the challenges of merging green economy requirements into blue economy applications.
- o Offer solutions to assist in the development and sustainability of resources that comply with standards of efficiency, effectiveness and prosperity.
- o Achieve just distribution of wealth among successive generations of our region.
- o Formulate strategies to mitigate and adapt to the negative effects of climate change and reduce the emission of greenhouse gases.
- o Incorporate cultural, civilizational and social aspects within the sustainable blue economy strategies.

**Center Services**

Research	Training	Consultation
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- o Ten scholarships offered by Alexandria University to graduate students from the Mediterranean Region.
- o Scholarships to be also offered by partner Euro-Mediterranean Universities.
- o Strategic partnership with ASCAME and scholarship offering with scheduled start date of Spring 2023.

**Strategic Partners**

