



# Integrated strategy to promote Pro environmental behavior in University Campuses

## Case study of American University in Cairo New Campus

### استراتيجية متكاملة لتحفيز السلوك البيئي داخل البيئات الجامعية دراسة حالة حرم الجامعة الأمريكية الجديد

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#### KEYWORDS:

*AUC campus,  
Pro-environmental  
behavior,  
Strategy, Sustainability*

*المخلص العربي:- ان الدافع وراء هذه الدراسة هو استكشاف العلاقة بين السلوك البشري والممارسات المستدامة، حيث ان اغلب المشاكل البيئية هي نتاج السلوك بشري ضار بالبيئة. عادة ما تركز الدراسات حول استدامة الحرم الجامعي على الجانب البيئي للاستدامة مع اهمال اهمية الجانب التعليمي والتوعوي لها. وترتكز هذه الدراسة على دور الحرم الجامعي المستدام في تعزيز السلوك البيئي بين الطلاب، ومن ثم نشر ثقافة الاستدامة في المجتمع المصري. يقوم البحث باستعراض وتحليل استراتيجيات الاستدامة المتكاملة لتحفيز السلوك البيئي داخل حرم الجامعة الأمريكية في "القاهرة الجديدة"، مع التركيز على إشراك الطلاب في هذه الممارسات وأثره على نشر الوعي البيئي وتحفيز السلوك البيئي للطلاب. وتخلص الدراسة بنتيجة هي ان البيئات المستدامة تساعد المستخدم في الحياة والعمل بطرق مستدامة، من خلال تشجيعهم على القيام بذلك. فالجمع بين التصميم الأخضر والوعي البيئي، يمكن ان يكون له تاثير عميق على سلوك المستخدمين.*

*Abstract*—The motivation behind this study is to explore the relation between human behavior and sustainable practices, as almost all environmental degradation is a result of some kind of harmful human behavior. Studies about sustainability on campuses usually focus on the environmental benefit of sustainability strategies taken by the university, while the educational and awareness effects of these strategies are

neglected. This study focuses on the role of sustainable campus in encouraging and promoting pro environmental behavior among students, thereafter spreading the culture of sustainability in Egyptian community. The research aims to review and analyze integrated sustainability strategies to stimulate pro environmental behavior at the American University in New Cairo campus, focusing on engaging students in these practices and its effect on spreading environmental awareness and stimulating pro environmental behavior. The study comes up with the result that sustainable environments can enable people to live in sustainable ways, by encouraging them to do this. When green design is combined with environmental awareness, it can have a great impact on users' behavior.

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**I. INTRODUCTION**

There is a great influence between a person's behavior and his surrounding environment, whether natural or built. Sustainability is becoming more and more important in Egypt, due to its severe social, economic and environmental challenges, threatening its long-term ability to support life. Social scientists are drawing the attention to the importance of "human" variables in any potential solution to environmental problems. Not only technological solutions have the energy saving potential, as behavioral change has a comparable, and in most cases, higher potential. As R. Buckminster Fuller said:

*I made up my mind.... that I would never try to reform man... that's much too difficult. What I would do is to try to modify the environment in such a way as to get man moving in preferred directions. [1]*

This research is interested in studying the interdisciplinary

$$Behavior = Function (Personality * Environment)$$

$$b = f(p * e)$$

approach between humans surrounding environment and behavior. The study introduces the concept of sustainability on campuses, shedding the light on the role of universities in promoting a culture of sustainability within their communities, taking AUC new campus as a case study.

**II. HUMAN BEHAVIOR AND SURROUNDING ENVIRONMENT**

*A. Field Theory for Kurt Lewin*

To understand and predict human behavior, scientist viewed the whole psychological field within which the person acts. People depend closely on their conditions and surroundings. In Kurt Lewin's words:

*To understand or to predict behavior, the person and his environment have to be considered as one constellation of interdependent factors*

Thus, the word 'field' in his famous "Field Theory" refers to all aspects of humans, in relation to their conditions and surroundings; which influence specific behaviors at a specific point in time.[2] He began studying the impact of the environment on behavior, or what is called now environmental psychology.[3] He argued that:

Behavior (b) determined by the personality (p) and the environment (e) so the equation becomes:

*B. Environmental Behavior studies (EBS)*

The number of scientists doing research and professional work on the relationship between architecture and human behavior has grown rapidly, that there is now an interdisciplinary field called *Environmental Behavior studies (EBS)*. The founding of the field was in 1968 when a number of scientists formed the *Environmental Design Research Association* comprised of architects, planners and social scientists.

Environment-behavior studies in architecture and urban planning deal specifically with applications interested in user needs of behavioral insights into the design process. Seen from both sides (architects and social scientists), EBS can be defined as:

*A systematic study of the relationship between the physical environment and human behavior, and applications to environmental problem-solving through architecture and urban planning. [4]*

*C. Pro Environmental Behavior*

When a person takes into his consideration the environmental impact of his/her action, we are speaking about "Pro Environmental Behavior".

"Pro-environmental behavior" simply means behaviors which consciously aim to minimize the harmful effect of one's actions on the natural world, such as:

- Minimizing energy consumption (on air conditioning-transportation fuels...).
- Using non-toxic materials.
- Limiting waste production.
- Gray water treatment.
- Recycling waste.
- Reducing water consumption.
- Using environmental friendly alternatives (bikes instead of cars, solar energy instead of diesel...).

**III. HOW CAN SUSTAINABLE SETTINGS ENCOURAGE PRO ENVIRONMENTAL BEHAVIOR**

A broader question is, how can one's external environment influence his/her behavior? What features have been found to be very effective? How can we utilize those features to encourage pro environmental behavior?

This is exactly what 'green' or sustainable architecture should be trying to do. Built environments should not only enable people to live and work in sustainable ways, they should also encourage them to do this. They should be able to alter occupant behavior, for example, passively cooled and naturally ventilated buildings enable people to experience the outside environment and be closer to natural environments.

Built environments that allow people to walk or cycle instead of having to use a car for everyday activities allows them to exercise and interact with other people in a range of different settings.

Green design combined with environmental awareness can have a profound impact on users' behavior. Good daylight design in buildings will encourage users to use less artificial light, and smart metering is helping people to visualize their consumption and reduce unnecessary usage, all leading to sustainable behavior. While urbanization is rapidly increasing, the design process of new sustainable buildings can be useful in creating new sustainable norms, essential to obtain pro environmental behaviors.

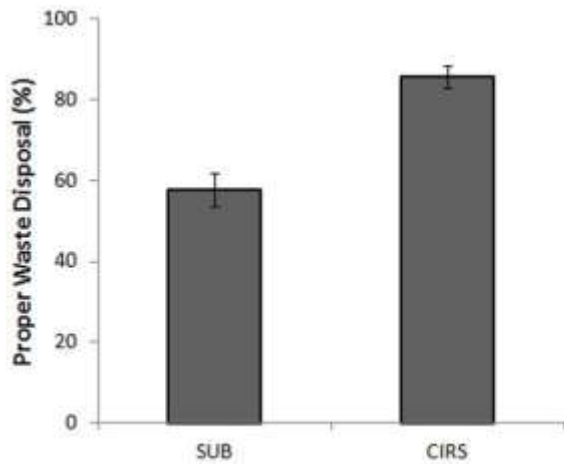


Fig. 1. Percentage of proper waste disposal. [6]

David W. L. Wu in his research tested whether simply being in a green building can elicit pro environmental behaviors. They examined the hypothesis by comparing food disposal activities in two buildings:

- 1- A green building: The Centre for Interactive Research on Sustainability (CIRS).
- 2- A traditional building: The Student Union Building (SUB).

He found support for his hypothesis, that people are more likely to choose the proper disposal bin correctly (garbage, compost, recycling) in a green building, compared to a traditional building. [6]

#### IV. THE SUSTAINABLE CAMPUS

According to academics and researchers:

*A sustainable university should develop from a system or holistic perspective, perceiving the campus as a 'learning laboratory', a 'model sustainable community', a 'sustainability life world' or as a 'learning organization' with regard to sustainability. [7]*

In other words, a sustainable university is an institution that represents sustainability in all its functions, collaborates with local and regional communities, involves students and faculty in all parts of the educational process. [8]



Fig. 2. Learning pillars for the Twenty-first century. [9]

TABLE I

DEFINITION OF THE TWENTY-FIRST CENTURY LEARNING PILLARS. [9]

<b>Learning to know</b>	Practices that help people to experience and transform knowledge for making sustainability a way of life and being
<b>Learning to be</b>	Processes that lead to human to have a sense of self-regulation regarding being versus having
<b>Learning to live together sustainably</b>	Practices that lead to a peaceful human co-existence with the natural world and non-discriminatory society
<b>Learning to do</b>	All processes that lead to merging action with knowledge to build a sustainable future
<b>Learning to transform oneself &amp; society</b>	Practices to transform unsustainable values and behaviors to engage in changing society towards sustainability
<b>Learning to give &amp; share</b>	Caring attitudes that meet human needs, while learners gain purpose for their learning and civic engagement

#### V. THE AMERICAN UNIVERSITY IN CAIRO NEW CAMPUS

The AUC new campus has been recognized locally and internationally for its forward thinking and environmental action, for example:

- It was one of two universities from Africa featured in the United Nation's Greening Universities Toolkit as a leading example of low-carbon campuses.
- Placed in the top third of 300 global universities in the University of Indonesia's 2014 Green Metric World University Ranking.
- Was named in The Princeton Review's 2015 Green College Guide as the only higher education institution outside of North America.
- As a member of AASHE, AUC is preparing a submission to STARS.
- Is the only campus in Egypt that is fully embarking sustainability initiatives, whether in building design and operations, curricula, student activities, orientation... etc.[10]

##### Sustainability Vision

AUC commitment to promoting the three principles on the environment is reflected in both the academic and administrative operations of the University. The Office of Sustainability established in 2011, to address AUC's environmental challenges, such as resource scarcity, waste management, climate change and pollution. The Office manages the campus sustainability operations, with collaboration with the School of Science and Engineering and the Architecture Department. [10]

The next part analyzes AUC's initiatives towards sustainability regarding student involvement and behavioral change.

##### 1. Curriculum

###### a. Academic Courses

*Sustainability Undergraduate course offerings:*

- SCI 1099- Sustainable Living in Cairo from Theory to Practice.
- ARCH 3554- Sustainability for Architectural Design.
- MGMT 3101- Business Environment and Ethics.

- ECON 5257- Economic Strategies for Sustainable Development.

TABLE 2  
COMMUNITY-BASED LEARNING COURSES AT AUC. [11]

CBL Activities	AY2018
Num. CBL courses offered	31
Num. enrolled students/CBL	933

*Professional Courses sample:*

- Leadership in Energy and Environmental Design (LEED) Exam Preparation. [10]

*Sustainability Academic Programs:*

- Sustainable Development M.Sc. Degree
- Soon with a dual degree option in Engineering with Politecnico di Milano.
- Environmental Science Minor.
- Community Based Learning.
- Professional Pro-Green Diploma.
- Engineering and Science Services.
- John D. Gerhart Field Station, El Gouna. [12]

*b. Learning Outcomes*

*Co-Curricular Transcript:*

For AUC students a lot of their formative learning experiences take place outside the walls of the classroom. It is called Extracurricular Student Activities or Co-Curricular Transcript (CCT) which was launched in spring 2013. [13] It is an official record for the extracurricular activities and competencies that a student enrolled in or achieved during their years of study at AUC. [14]

*The Academic Community Engagement Program (ACE):*

Helps organize community engagement activities for the AUC community, and developed the Co-Curricular Transcript. It focuses on Community-Based Learning (CBL), an educational approach included in several courses. Students apply course content onto community-based activities, which reflects on how they and the community are transformed. Students gain the experience to learn in real life contexts and eventually develop community engagement skills. [11]

*c. Immersive Experience*

AUC’s faculty housing has a green roof, which is part of the LEED lab initiative and LEED Certification Program, both parts of the “Sustainability in Architecture Design” course. The faculty housing acts as an educative model and an open classroom. [15]



Fig. 3. Faculty housing’s green roof. [16]

*d. Campus as a Living Laboratory*

A concept promoted by RISE, to work with student’s expertise, from different disciplines, in providing solutions to

the university, especially in creating a sustainable, energy-efficient environment and minimizing waste [17]. These projects include the design of a solar roof for parking areas, the maintenance of plants and vegetables on the University’s first green roof; a solar-powered greenhouse; and the monitoring of water quality on campus. Through these projects, students get a hands-on appreciation of sustainability in their everyday lives. [12] It is offered in blocks of certain hours throughout the semester. Labs frequently utilizes RISE’s waste water analysis laboratory, green roofs, climate-controlled greenhouses and solar panels. [18]

*2. Research*

*a. Academic Research*

*Research Institute for a Sustainable Environment (RISE):*

RISE is a multidisciplinary institute devoted to promote research in sustainable environment in Egypt and the region. It is committed to sustainable education and research, including rural and urban, desert and temperate. [17] The institute’s research focuses on projects in Egyptian, for example:

1. Water: groundwater Nile water, brackish water, treated wastewater...etc.
2. Land: desert land, valley and delta land.
3. Plants: predominately agricultural, ornamental and landscape plants.
4. Solid waste for recycling or reusing.
5. Renewable energy sources: wind, solar and bio-fuels. [19]

*Water-Energy-Food Nexus Laboratory (WEF Nexus):*

The Center for Sustainable Development (CSD) established the WEF Nexus lab, which generates electricity and powers a modern hybrid desalination unit for brackish and sea water. The lab makes use of sunny Egyptian weather and produces energy, which prepares the water needed for food production, all with zero waste and zero harmful environmental impacts. The research includes the interconnections between water, Energy and food and how and where these three systems intersect. [20]

*b. Support for Research*

*The Office Undergraduate Research (OUR):*

OUR. supervises activities in order to support and promote student research, for example:

- Undergraduate support grants, which consists of travel, thesis-support, research internship, and mini grants.
- Excellence in Undergraduate Research, Entrepreneurship and Creative Achievement (EURECA) annual conference, all integrated in AUC Research Week.[17]

*Research Week:*

An event which combines different research activities. It aims to enhance interdisciplinary research, knowledge-sharing, and projects of community and/or economic value. Faculty, graduate and undergraduate students share research and innovation in sciences, humanities, arts and business. [21]



Fig. 4. Student share their research.[21]

### 3. Campus Engagement

#### a. Student Life

##### *The Office of Sustainability:*

The Office of Sustainability's mission is to promote social and environmental sustainability into the culture of the University. It aims to reduce the campus's use of natural resources and operating costs, and works closely with RISE to encourage sustainable practices and behavior among the students. [17]

##### *Student Engagement Sustainable Campus Committee:*

The Committee meets biweekly to organize, brainstorm, and plan activities promoting sustainability at AUC. Past events have included Earth Week, Farmer's Markets, and water shortage awareness days. [10]

##### *The Sustainable Campus Committee:*

This committee consists of students, faculty and staff, all committed to share and develop ideas regarding the environment and sustainable living. It has six booths in the plaza in front of Cilantro, which offer:

1. Making recycled paper from seeds that can be planted.
2. Signing the sustainability art posters which will be displayed in the library.
3. Learning about RISE, the Office of Sustainability, and pick up the AUC's Carbon Footprint report.
4. Getting information about composting at AUC.
5. Learning how to sort garbage.
6. Knowing how RISE is working with AUC Food Services to make food outlets more sustainable and encourage people to use reusable containers.
7. A lecture titled "Understanding AUC's New Carbon Footprint" explains the report and educate the community about ways to reduce the University's carbon footprint. [22]

##### *'Keep It Green' Dorm Students Recycling Campaign:*

The campaign, which started as a low-budget project making use of empty chip cartons, grew into a big recycling initiative led by students. Students worked with the Sustainable Campus Committee, the Clean and Green Committee, who are a group of staff and faculty committed to sustainable waste management practices. The committee helped them with more effective garbage bins and put up flyers to educate the campus community on sustainability efforts regarding recycling. The project has developed into an awareness campaign. [23]



Fig.5. Collecting plastic in the New Cairo campus dorms. [23]

#### b. Student Orientation

##### **Earth week:**

Every April, Earth Week is an opportunity to increase AUC's users' sustainability awareness by educating people on concrete ways to help the campus become more green. Companies and professionals working in energy, environmental, and/ or sustainability sectors are invited to host a career panel for students. They answer questions from the audience on the future of green initiatives and their personal experiences. "Tea chats" are also an opportunity for students to have one-on-one chats with a professional working in sustainability. [10]

The event includes activities like a children's day, an art competition, lectures and a farmers' market. [22]



Fig. 6. Farmers market and recycling booth at AUC's 5<sup>th</sup> Earth Week, April 2017.[24]

##### *Sustainable Transportation Week:*

The objective of the Sustainable Transportation Week is to encourage AUC community to take the transportation survey, and to promote greener transportation options such as carpooling and buses. [10]

##### **Community Day:**

RISE and the Office of Sustainability organized the Community Day on the New Cairo campus, which brought students, alumni, faculty and staff together. Fun was mixed with information when the community was invited to play a trashketball game, learn about AUC's changed policies, reduced waste and saved energy. The School of Sciences and Engineering displayed AUC's hybrid electric car which was in 2016 Global Hybrid Electrical Challenge, held in Soma Bay for Egyptian universities. [25]



A





Fig. 7 (A&B). Trashketball and Hybrid Electric Car at Community Day.[25]

4. Public Engagement

a. Community Service

*The Cairo in the Curriculum program:*

Ensures that each major offers at least one course every semester to take students into the local community for study, research or service, which integrates Cairo in the curriculum. [26]

*Center for Sustainable Development:*

The center's mission is to guide the efforts of sustainable development in Egypt, through academic programs, interdisciplinary research and community services, in order to improve livelihoods, while preserving our natural resources for the future. CSD is committed to promote integration of SD concepts into teaching practices and skills of school teachers. [11]

b. Community Partnerships:

*Education for Sustainable Development beyond the Campus (EduCamp):*

EduCamp is an initiative which brings together schools and universities to introduce Education for Sustainable Development (ESD) into public schools across Egypt.[27]



Fig. 8. Presentations during Meeting El Warraq, Giza.[27]



Fig. 9. AUC student teach school students about compost.[28]

*Kids' Environmental Education Program:*

In the year-round program, which is available for ages 6 to 12, children learn about different aspects of the environment. The program arranges field trips to the AUC New Cairo gardens, Saturday programs, intensive courses and a week's length interactive program with the following topics:

1. Soil types and soil formation.
2. Ecosystems and environment.
3. Energy and global warming.
4. Waste management and recycling.
5. Water and water management.
6. Nutrition and how to prepare healthy.[18]

*Student Community Projects:*

The projects are an important part of the sustainable development program. Students work in groups and select a real-world problem from the surrounding community, to develop their own community-based project. Through the project, students identify the problem, set objectives and milestones to be achieved, set a time-plan, distribute responsibilities, implement solutions and lastly assess impact. The interdisciplinary project teams developed different projects, from community schools to carpooling to recycling applications and more. [11]



Fig. 10. Student Community Projects.[11]

5. Air & Climate

a. Greenhouse Gas Emissions

In order to reduce its energy use, AUC is conducting its "Annual Carbon Footprint Report", which is a self-audit report about its own carbon emissions. [15]

Since April 2015, AUC is publishing an annual Carbon Footprint Report, which showcases trends about its emissions for the past three years. [10] The report is a collaboration between different schools and departments, as the university's mission is to achieve a healthier, greener and more resource-efficient campus.[29]

6. Buildings

a. Building Design and Construction Master Plan and Passive Design:

The campus reflects the board of trustees' wish to become a teaching tool, providing a stimulus for learning, community



Fig. 11. Compact building clusters and courtyards.[31]

interaction, and lessons in environmentally responsive design through the use of passive measures. [30]

The architect's mission was to develop methods and strategies to maximize cooling and natural ventilation. The design depends on clusters of compact buildings, oriented as East/West. The heavily planted garden on the north side of the campus forms a cool, low reservoir. Northern summer winds move through the garden and bring moist, cool air into buildings. A shelter belt is planted on the Southwest side of the campus, to filter windblown sand and block winter winds.[32]

The site was broken into morphological units, each based on internal courtyards of various sizes which all act as reservoirs for the cool night air that is typical in this desert area. They also ensure a constant flow of cooler air from exterior to interior, upward through each building to openings at the top of the roof, to allow air to escape as it heats up.[33]

Shaded courtyards and open-air corridors create natural “thermal units” which are better than mechanized ones. Tunnels connect buildings and plazas, generating air movement and increasing thermal comfort in outdoor spaces, and reduce operating costs for interior spaces. [30]

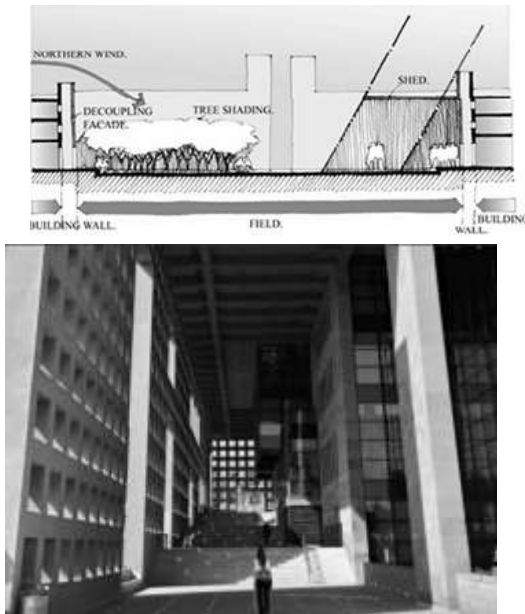


Fig. 12. Using shade and buildings closeness to create thermal comfort inside and outside buildings.[33]



Fig. 13. The Campus combines Egyptian architectural traditions with modern design.[34][35]

## 7. Dining Services

### a. Food and Beverage Purchasing

#### Farmers Market:

An annual Farmers Market is hosted in the plaza by the Sustainable Campus Committee. Shoppers can find different kind of vendors selling organic vegetables and fruits, dates, pickles, olive oil, vegan food and fruit smoothies. [22]



Fig. 14. Farmers market at AUC's 5<sup>th</sup> Earth Week, April 2017.[24]

### b. Low Impact Dining:

On Earth day Cilantro Café offers 10% discount for customers on orders, as an incentive for bringing and using their own reusable mug. [22]

## 8. Energy

### a. Building Energy Consumption

To benchmark the findings, AUC's compared its energy use intensity (EUI), which is a widely used measure for energy performance, to the EUIs of eight American universities with similar size and climate. [36] Comparatively, AUC's energy use is less than most of them.[37]

### b. Clean and Renewable Energy

AUC signed a contract with GasCool, an Egyptian company for refrigeration with natural gas.

GasCool has built and operated an on-campus central utility plant with a floor area of 5,781 m<sup>2</sup>. The plant produces all the chilled water needed for air conditioning, most of the hot water needed for domestic uses, all hot water used for heating and 80% of the electricity used on campus in AY 2016. It is built to be energy efficient in two ways:

1. The used fuel is natural gas, which is a relatively clean-burning fuel that is extracted in Egypt.

2. The plant uses co-generation, which is capturing and recycling waste heat from electricity generators, in order to produce half of the hot water used on campus without burning natural gas. Between AY 12 and AY 16, about 12% of the New Cairo campus electricity consumption have dropped.[36]



Fig. 15. Cooling towers at AUC's central utility plant.[36]

9. Grounds

a. Landscape Management

In managing landscaping needs, AUC uses a mixture of organic fertilizer, which comes from compost produced on campus (landscape waste) and purchased synthetic fertilizer. Compost can:

1. Lower carbon emissions when used as fertilizer.
2. Improve soil quality, as it increases water retention, thus reducing water needed for irrigation.
3. Help avoid of carbon emissions from landscape waste, in the case of organic waste decaying naturally. [36]

b. Biodiversity

Abdelhalim treated the campus as an oasis in the desert due to the stark landscape it is located in. [33] The architect designed a series of small, sheltered courtyards, based on Middle Eastern design elements, within the academic core.

These distinct in character courtyards, feature palms, flowering shrubs, vines, groundcovers, small pools and fountains, [31] All plants were grown at AUC's Desert Development Center. Also the campus's 2,000-plus parking places are shaded with these trees. [38]

10. Transportation

a. Campus Fleet

The campus owns a fleet of 92 vehicles for transporting university personnel and daily operations (64 gasoline cars, 28 diesel light duty vehicles). [36]

b. Support for Sustainable Transportation:

Carpooling:

A carpooling campaign launched by the Office of Sustainability in AY 15 is another commuting option that is more sustainable than driving alone is carpooling. It has one car do the work of two, three, or even four. The Office of Sustainability is exploring ways to incentivize carpooling among AUC community, such as developing an official AUC carpooling website, to easily connect drivers and riders. In waiving AY 12, the University set a new policy of waiving on-

campus parking fees for carpoolers. [36]

Walking friendly Campus:

The key element for AUC's walking friendly new campus is the 1.6 kilometer service tunnel, running beneath its central avenue. This tunnel makes the campuses overall pedestrian nature possible. Service vehicles access the campus through the tunnel, such as delivery trucks and pickups from campus buildings. [29]

Online transportation survey:

To collect data about AUC community members commute methods, an online transportation survey was designed, to ask them about their opinions regarding their commute to and from the new campus.

With the help of collected information from this survey, the University can modify their bus fleet service and better understand the reasons behind an increased carbon footprint regarding transportation. [40]



Fig. 16. AUC looking like an oasis due to use of native plants, palm trees and water fountains.[31][39]

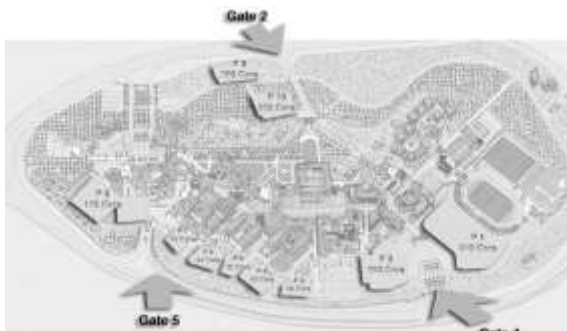


Fig. 17. Carpooling website and free parking.[12]

11. Waste

a. Waste Minimization

The Clean and Green Committee:

The committee is a group of faculty, staff, professors, and maintenance personnel, whose mission is to promote sustainable solid waste management practices through education, training, and recycled product development. [17]



*Dorm Students Spearhead Recycling Campaign:*

In 2015, dorm students organized a full-fledged recycling initiative, with a future plan for green initiatives. Omar Ihab, computer engineering senior student explained:

*We didn't have a big budget, so we used chips cartons from the super market and manufactured makeshift bins, which were placed on each floor of the dorms. We wanted to show that no matter where you are, you could still help raise environmental awareness, and every individual's involvement is essential to maintaining and enhancing green initiatives on campus.*

The students are already looking for maintaining and expanding recycling in the dorms. They hope they can broaden the range of materials recycled at AUC, such as papers and other materials, besides just plastic. [23]



Fig. 18. Main & Mini Sorting Stations and Campus compacting stations.[10]

*b. Waste Diversion*

The campus upgraded its waste sorting bins in 2016, to improve the recycling system. AUC has now 13 full sized sorting stations and 30 mini-bins across its new campus, with separated bins for trash, cans, food, and plastic. An on-campus compacting station has been constructed by the Office of Sustainability, to compress the separated paper, cans and plastic. AUC sells the compressed waste to commercial recyclers, and uses the profit to fund other sustainability-related projects. AUC donates used paper for recycling NGOs and the Zabaleen community. [17]

*12. Water*

*a. Water Use and Wastewater Management*

Between AY 12 and AY 16 AUC introduced a number of conservation measures for domestic water and treated waste water through various projects such as low flow showerheads,

irrigation with treated wastewater, timed sprinkler systems, smart flushing technology, and water-efficient plants in campus landscaping. CO<sup>2</sup>e emissions attributable to supplying water to the campus decreased by 101 MT CO<sub>2</sub>e (14%) from AY 12 to AY 16. Much of this reduction resulted from switching from domestic (drinking quality) water to treat wastewater for irrigating campus landscaping. [29]

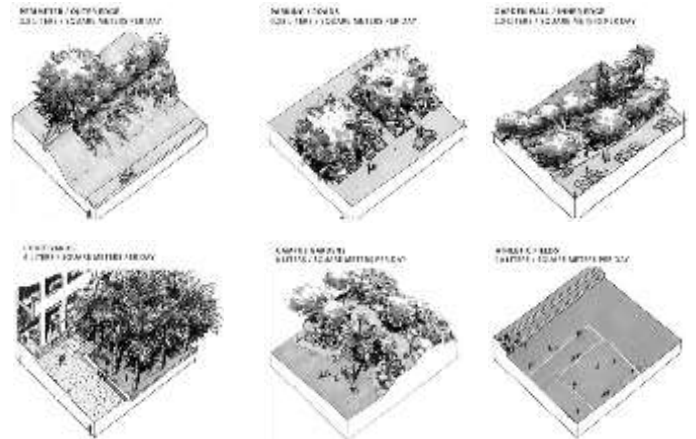


Fig. 19 landscape planting and irrigation needs [31]

**VI. CONCLUSION**

Today, the majority of empirical data collection in built environments focuses on physical attributes and environmental performance, such as energy or water consumption. While the information about the experience of people in and around built environments lags far behind.

Sustainable environments can enable people to live and work in sustainable ways, by encouraging them to do this. When green design is combined with environmental awareness, it can have a profound impact on users' behavior. When this principle is applied in campuses the spreading of sustainability culture and behavior becomes very easy.

The University as an institute provides a benchmark for other buildings to follow, as a model of sustainable living and working. Each higher education institution in Egypt should play a role as a key reference for sustainable development, as a deliverer of change, as a community leader, as a response to societal need, as a social entrepreneur and as a tool for contributing to global, regional and community sustainable development.

This paper analyzed and reviewed sustainability initiatives done by AUC, which have an impact in educating students about sustainability, thereafter encouraging pro environmental behaviors. It suggests the idea of a new line of interdisciplinary research, to bring design, psychology and policy-making together, in an attempt to understand how the human environment can be designed and used as a powerful yet subtle tool to encourage and achieve aggregate pro-environmental behavior.

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