GREEN CAMPUS

PROPOSAL

to the

Arab Academy for Science, Technology and Maritime Transport (AASTMT)
Grants

Carbon Footprint Estimation and Reduction in the AASTMT Campus Towards developing a Model for Promoting Sustainable Development Goals

(Green Campus)

March

2021

Table of Contents

1 Proposal Details

Title: Carbon Footprint Estimation and Reduction in the AASTMT Campus towards developing a Model for Promoting Sustainable Development Goals.
Short Title or Acronym: Green Campus.
Keywords: Carbon footprint, Climate Change, Energy Efficiency, GHG Emission.
Funding and Duration: 200,000 to 500,000 pound per proposal and period of 6 to 12 Months for the CRP,

Total cost: 333,500 EGP.

Research Theme: 1- Energy, 2- Climate change and Environmental Sciences.

2 Proposal Summary: English and Arabic (max. one page each)

Egypt is expected to face serious problems due to climate change if effective adaptation methods are not applied. The carbon footprint (total amount of greenhouse gases produced to directly and indirectly support human activities) measurements are needed for any adaptation strategy. Thus, the research team aims to estimate Carbon Footprint (CFP) in the Arab Academy for Science, Technology and Maritime Transport (AASTMT) Campuses in Alexandria and Aswan together with identifying the stressors. Alexandria and Aswan campuses were selected among the other AASTMT due to the geographical location and highly human activities.

The methodologies for carbon footprint calculations are still evolving, but there is little coherence in definitions and calculations of carbon CFP among the studies. Thus, the research team will develop an accurate model to estimate CFP for the studied AASTMT campuses.

The used methodology will separate the emissions into three scopes: 1) direct, 2) indirect, and 3) other indirect emissions. The carbon footprint of AASTMT Alexandria and Aswan campuses product will be verified by external reviewers. In general, CFP balance to the ASSAMT studied campuses will be performed from 2018 to 2021 to characterise the impact of the digital transformation after Covid-19 on the carbon footprint.

Based on this background and in recognition of the environmental responsibilities for AASTMT, it is therefore pertinent to have an accurate estimation of CFP in order to support AASTMT policymakers to draw a climatic policy to :

1. be an eco-friendly body through reducing CO2 emissions.
2. Increase stakeholder’s awareness towards environmental issues.
3. manage climate risks more effectively.
4. achieve AASTMT social responsibility.
5. identify economic opportunities.
6. inspire partners and motivate others.
7. Transforming AASTMT Alexandria and Aswan campuses towards achieving the Sustainable Developmental Goals (SDGs) and Egyptian 2030 visions especially SDG7 which argues for clean energy, and SDG13 which argues for Climate change.

3 Proposal Summary: English and Arabic (max. one page each)

تُعد مصر واحدة من البلدان المتأثرة بتغير المناخ ومن المتوقع أن تواجه مُشكلات خطيرة بسبب تغير المناخ في حالة عدم تطبيق أساليب التكيف الفعالة. وتعتبر البصمة الكربونية (الكمية الإجمالية للغازات الدفيئة المنتجة لدعم الأنشطة البشرية بشكل مباشر وغير مباشر) ضرورية لأي استراتيجية للتكيف. ومن هنا، يهدف فريق البحث إلى تقدير البصمة الكربونية (CFP) في حرم الأكاديمية العربية للعلوم والتكنولوجيا والنقل البحري (AASTMT) بالإسكندرية وأسوان جنبًا إلى جنب مع تحديد عوامل الإجهاد. تم اختيار حرم الإسكندرية وأسوان من بين فروع الأكاديمية الأخرى بسبب الموقع الجغرافي والأنشطة البشرية العالية.

ولا تزال مناهج حسابات البصمة الكربونية قيد التطوير، إلا أن هناك القليل من الاتساق في تعريفات وحسابات البصمة الكربونية بين الدراسات. وبالتالي، سيطور فريق البحث نموذج دقيق لتقدير البصمة الكربونية لحرم الأكاديمية محل الدراسة.

سيفصل المنهج المستخدم الانبعاثات إلى ثلاث نطاقات: ١) مباشرة، ٢) غير مباشرة، ٣) انبعاثات غير مباشرة أخرى. سيقوم طرف ثالث بمراجعة البصمة الكربونية المحسوبة لكلًا من حرم الأكاديمية في الإسكندرية وأسوان. بشكل عام، سيتم إجراء توازن للبصمة الكربونية في الحرم الجامعي المدروس بالأكاديمية من عام ٢٠١٨ إلى ٢٠٢١ لتوصيف تأثير التحول الرقمي بعد كوفيد-١٩على البصمة الكربونية.

بناءً على هذه الخلفية وإدراكًا للمسؤوليات البيئية للأكاديمية، فمن المتوقع التوصل لتقدير دقيق للبصمة الكربونية لدعم صانعي سياسات الأكاديمية لرسم سياسة مناخية من أجل:

١. أن تكون هيئة صديقة للبيئة من خلال تقليل انبعاثات ثاني أكسيد الكربون.
٢. زيادة وعي أصحاب المصلحة تجاه القضايا البيئية.
٣. إدارة مخاطر المناخ بشكل أكثر فعالية.
٤. تحقيق المسئولية الاجتماعية بالأكاديمية.
٥. التعرف على الفرص الاقتصادية.
٦. إلهام الشركاء وتحفيز الآخرين.
٧. تحول حرم الأكاديمية في الإسكندرية وأسوان نحو تحقيق أهداف التنمية المستدامة (SDGS) ورؤى مصر ٢٠٣٠ خاصة الهدف السابع من أهداف التنمية المستدامة الذي ينادي بالطاقة النظيفة والهدف ١٣ الذي ينادي بالعمل المناخي .

4 Introduction/background (max. three pages)

The Intergovernmental Panel on Climate Change (IPCC) in its fourth assessment report has strongly recommended limiting the increase in global temperature below 2˚C as compared to pre-industrial level (i.e., measured from 1750) to avoid serious ecological and economic threats. A rise in temperature by 0.74˚C has already been recorded and hence climate scientists are focusing on an urgent action to curb global warming (IPCC 2007; Kerr 2007). The imbalances caused in natural systems due to warming are already being signalled in extreme weather events and climate change.

In General, the world including Egypt is expected to have an extreme warming trend during the near future that will mostly threaten life and health (IPCC, 2012; Portier et al., 2010). In addition, the expected warming trends up to 2050 will have a negative effect on the tourism sector (UNWTO, 2003), the transportation sector (Chapman, 2007) and the agriculture sector (Nastis, 2012; Ledo et al., 2020). Thus, strong and immediate local to international actions are thus needed to stabilise emissions in a justified manner. As the understanding of the science and consequences of global warming grew, the concern for preventing disastrous climate change led to a substantive action in the form of endorsement of “Kyoto protocol” in 1997, requiring developed economies or economies in transition listed in its annexure I to reduce the collective emissions of six important greenhouse gases (GHGs), namely carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), set of perfluorocarbons, and hydrofluorocarbons by at least 5.2% as compared to1990 level during the period 2008–2012 (UN, 1998). The gases covered under the Kyoto protocol are referred collectively as “Kyoto gases” (WRI/WBCSD, 2004).

Kyoto protocol, however, has not received equal support from all the nations and some did not ratify it, giving reasons that their economies may suffer loss. However, acritical review over the impacts of acting or not acting against climate change carried out by Stern (2006) led to the conclusion that “the benefits of strong early action considerably outweigh the costs.” It was predicted that not acting immediately will cost at least 5% of global gross domestic product (GDP) loss annually, while annual investment equivalent to 1% of global GDP may limit temperature rise below 2°C. Otherwise, it would be impossible to revert the changes. Emissions of Kyoto gases need to be cut by 25% below the current level by 2050, not compromising countries' growth.

4.1 Greenhouse Gas Emissions Effect

The Earth's temperature is maintained by a balance of incoming and outgoing energy. Solar radiation from the Sun is absorbed by the Earth, then reemitted into the atmosphere where it is partly reflected to Earth. Greenhouse gases (GHGs) in the atmosphere absorb and emit radiation in random directions, so when this radiation is reflected downward, it intensifies the warming of the Earth’s atmosphere. This is called the greenhouse effect, as the atmosphere acts similarly to the glass of a greenhouse trapping in heat. This temperature balance is disrupted when high concentrations of GHGs are added to the atmosphere.

GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), water vapour (H_2O), and fluorinated gases. The atmospheric concentrations of CO_2, CH4, and N_2O have increased to levels that have not been measured in the last 800,000 years (Specifically, CO_2 concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel combustion (Stocker et al., 2013). Combustion occurs when fossil fuels react with oxygen (O_2) to give off heat. Fossil fuels are made up of carbon and hydrogen and are consequently

considered hydrocarbons. When burned, hydrocarbons produce CO_2 and H_2O as their products. The reactions for CH_4, ethane (C_2H_6), propane (C_3H_8), and hexane (C_6H_{14}) are shown below and will be used in later analysis.

$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O\ (g) \text{ ---------- (1)}$$

$$2C_2H_6(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(g) \text{ ---------- (2)}$$

$$C_3H_8\ (g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g) \text{ ---------- (3)}$$

$$2C_6H_{14}\ (g) + 19O_2(g) \rightarrow 12CO_2(g) + 14H_2O(g) \text{ ---------- (4)}$$

Since the beginning of the Industrial Revolution, atmospheric concentrations of CO_2 have risen rapidly from about 280 parts per million (ppm) to over 408 ppm (Baumert et al., 2005) and (NOAA, 2017). Anthropogenic GHG emissions have steadily increased, spurred by growing economies, technology, and population growth. Between 1750 and 2011, cumulative anthropogenic CO_2 emissions to the atmosphere grew to about 2,040 gigatonnes (Pachauri et al., 2014). About half of the anthropogenic CO_2 emissions between 1750 and 2011 have occurred in the last 40 years (Pachauri et al., 2014). Since emissions from fossil fuels and cement alone have grown from 9.6 gigatonnes CO_2 in 2012 to nearly 9.8 gigatonnes CO_2 in 2014 (CO2 Earth, 2017). About 40% of these emissions stayed in the atmosphere, while the rest has been removed from the atmosphere and stored in the ocean or land-based plants and soil (Pachauri et al., 2014). Thus, these GHGs that would not otherwise be in the atmosphere trap heat, causing a change in the Earth's climate. This swift rise in GHGs from human activity and the associated rise in global temperature is known as the "enhanced greenhouse effect" (Pandey et al., 2011). The Intergovernmental Panel on Climate Change (IPCC) stated that these increased GHGs emissions coupled with other anthropogenic drivers are extremely likely to have been the dominant cause of the observed global warming since the mid-20th century (Stocker et al., 2013).

4.2 Egypt GHG Inventory

The GHG inventory (GHGI) has been prepared according to the 2006 Intergovernmental Panel on Climate Change (IPCC) GHGI Guidelines for the time series between 2005 (last year covered by the TNC GHG Inventory) and 2015. As per IPCC guidelines, the GHGI covers four sectors: i) Energy, ii) Industrial Process and Product Use (IPPU), iii) Agriculture, Forestry, and Other Land Use (AFOLU), and iv) Waste. It includes a breakdown of Egypt's anthropogenic GHG emissions by the source of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), per-fluorocarbons (PFCs) and sulphur hexafluoride (SF_6) as well as precursors (NOx, CO, NMVOCs, SO_2).

Egypt's GHG emissions for 2015 totalled 325,614 Gg CO_2e. The breakdown by gas is 237,871 Gg CO_2e from CO_2 emissions, 41,483 Gg CO_2e. from CH_4 emissions, and 38,574 Gg CO_2e. from N_2O emissions. Total GHG emissions have increased by 31% from 2005 to 2015, with an average annual growth rate of 2.35%. GHG emissions from the Energy, IPPU and Waste sectors have increased by 40%, 49%, and 34%, respectively, while the AFOLU sector's emissions have decreased by 7% over the same period.

4.3 Motivation

AASTMT participates in the Times Higher Education World University Rankings that assess universities against the United Nations' Sustainable Development Goals (SDGs). These challenges require AASTMT to measure and report their GHG emissions, take immediate actions to reduce them and develop and implement a plan to become climate neutral. To accept this challenge, AASTMT must commit to: (1) creating institutional structures to guide the implementation of a plan; (2) complete a comprehensive inventory of all GHG emissions; and (3) develop a plan to become climate neutral, including benchmark targets and dates. This research was motivated to focus on (2) creating a transparent inventory of GHG emissions from AASTMT Alexandria and South Valley campuses, which can serve as the foundation to meet the other objectives. Therefore, this research is motivated to create a foundation to assess the current state of AASTMT's GHG emissions. This research may then be used as a baseline to compare alternatives to the system and compare AASTMT against other universities.

Students in higher education should be educated on sustainable development and sustainable practices. The universities imparting education on sustainability should be concerned with their students' good practices and the impacts of their activities. The Sustainable Green Campus is an initiative that recognises the importance of developing greener practices within university campuses, with the intent to engage students and staff in a constructive environmental dialogue.

The university campus should promote its environmental policy, which establishes practices and improvements in relation to energy and water efficiency issues, waste, habitat protection and biodiversity, and the promotion of interdisciplinary research associated with sustainable development. One such institutional action has been measuring the carbon footprint (CFP) within its different campuses. It is hard to establish a metric for sustainability efforts. There are many indicators to measure the effects of society´s action on the environment. Ecological footprint (EFP) is one of them. EFP considers energy consumption, food consumption, waste disposal, water supply, transportation, and paper consumption. EFP estimates the "minimum land necessary to provide the basic energy and material flows required by the economy."

As a contribution to the subject's efforts and to address AASTMT's GHG reduction efforts, this research evaluates AASTMT's operational activities that emit GHGs. The cumulative contribution of these activities creates the AASTMT's carbon footprint. This research aims to identify which products and processes are the most significant contributors to the CFP and then provide recommendations to decrease emissions. One such recommendation is the implementation of a renewable electricity source. Accordingly, this study's third goal is to create a map to depict campus rooftops suitable for solar photovoltaic arrays.

5 Questions and Objectives (Max. three pages)

5.1 Main objectives

A carbon footprint offers a means to identify carbon emission sources and evaluate progress in reducing these emissions. In AASTMT's case, a principal objective of the study is to calculate a transparent CFP of AASTMT's Abu Kir and Aswan campuses from 2018 to 2021 together with identify the role of COVID-19 on CFP of AASTMT and develop information that can be used to mitigate climate change by reducing AASTMT's greenhouse gas emissions. A second important objective is to strengthen the university's finances for the long term by permanently reducing its appetite for carbon-based energy sources like natural gas, electricity, gasoline, and diesel fuel that must be purchased from third parties. Finally, our footprint study is designed to provide a replicable model and methods that other higher education institutions can adopt in the MENA region to calculate and evaluate their own carbon emissions.

5.2 Specific Objectives:

1. To calculate and reduce the AASTMT Alexandria and Aswan campuses' carbon footprint based on the following academic years 2018/2019, 2019/2020, and 2020/2021.

2. To raise the environmental awareness of individuals, institutions and promote the use of green environmental practices.

3. To report the needed items to improve the AASTMT Alexandria and Aswan campuses' climatic and sustainability options.

5.3 Research questions:

- How should the University Campus calculate its carbon footprint?
- To what extent should simplifying rules/calculations be used?
- How can emissions be allocated to the various objects that cause CO2 emissions?
- What a digital transformation after Covid-19 affect AASTMT carbon footprint?
- Should the green accounting rules be the same for all organisations?
- Could CFP become an element for raising environmental awareness within the organisation?
- How will the CFP estimation support decision-maker in AASTMT establish a climate policy valid for transferring AASTMT into a green establishment with economic and sustainability options (adaptation plan)?

6 Project Description (max. six pages)

6.1 Importance to Study Carbon Footprint at AASTMT

Generally, measuring the CFP is necessary for AASTMT to define targets and keep track of their progress to reach their targets in reducing their emissions. AASTMT will get benefits from keep track of their CO_2 emissions; 1) reduce costs by reductions in energy and material usage, 2) improve reputation and out of a pure sense of responsibility to prove that reductions of CO_2 emissions are reached; 3) determine AASTMT environmental performance, 4) have several financial benefits of a good environmental performance for companies.

De Vries (2011) stated that the economical option is associated with being a green establishment. First, when companies are careful about using resources. This can lead to ~~a~~ higher eco-efficiency. This means that companies can provide more products and/or services with fewer resources. Second, good environmental performance positively influences the reputation of a company. This could attract more customers and work positively on other stakeholders like media, governmental institutions, employees, investors, and potential partners. Third, ~~a~~ superior environmental performance may lead to a competitive advantage. Competitive advantage can be gained by being a leader in the market first movers' advantages (Porter & van der Linde, 1996). Fourth, it can lead to fewer lawsuits and other legal conflicts because ~~a~~ good environmental performance limits the risk of environmental 15 malpractice. Fifth, government cooperation is easier to get when environmental performance is good; for example, access to permits can be easier. Sixth, superior environmental performance may increase job attractiveness; it results in less employee turnover because it makes people prouder of their work.

Moreover, reductions in CO_2 emissions can be paired with financial benefits. For example, less CO_2 is emitted if less electricity is used and if employees use less paper. Furthermore, a lower CO_2 emission can result in a better image of the University for Students, employees, and other universities.

6.2 Problem Statement

Rising greenhouse gas (GHG) emissions from human activities have created international concern due to their global warming implications. This has sparked a movement to reduce emissions that nations have joined, cities, corporations, and higher education institutions. AASTMT is one such intuition that has pledged to reduce its emissions, and to do this, they need to build a comprehensive GHG inventory. Carbon footprints are widely used as a measure of the impact of human activities on global warming. A carbon footprint calculates net greenhouse gas (GHG) emissions over time, typically one or more years. The World Resources Institute (WRI, 2011) describes the term as “a representation of the effect you, or your organisation, have on the climate in terms of the total amount of greenhouse gases produced (measured in units of carbon dioxide).

6.3 AASTMT Overview

The Arab Academy for Science, Technology and Maritime Transport (AASTMT) was founded in 1972 as one of the Arab League affiliations to provide educational and training services in various disciplines, sciences, and technologies. The AASTMT carries out its activities in education, training, and research in its headquarters in Egypt in the cities of

Alexandria, El Alamein, Cairo, Port Said and Aswan (South of the Valley). AASTMT inaugurated has branches in Latakia in Syria and Sharjah in UAE.

The calculating and reducing of the AASTMT's Abu Kir (Alexandria) and Aswan campuses CFP is essential, and the Sustainable Green Campus is an initiative that recognises the importance of developing greener practices within university campuses, with the intent to engage students and staff in a constructive environmental dialogue.

The university Campuses should promote its environmental/climate policy, which establishes practices and improvements in relation to energy and water efficiency issues, waste, habitat protection and biodiversity, and the promotion of interdisciplinary research associated with sustainable development. One such institutional action has been measuring CFP within its different campuses. CFP measure the amount of GHG emissions associated with human activities. CFP of higher education institutions is currently an underdeveloped research area despite a growing movement to reduce GHGs from these systems. As a contribution to efforts on the subject and to address AASTMT's GHG reduction efforts, this research evaluates AASTMT's operational activities that emit GHGs the cumulative contribution of these activities creates AASTMT's carbon footprint.

Table 1: Colleges in Abu Kir Campus

	ABU- KIR CAMPUS IN ALEXANDRIA
1	College of Maritime Transport & Technology
2	College of Engineering & Technology
3	College of Computing & Information Technology
4	College of International Transport & Logistics
5	College of Fisheries Technology & Aquaculture
6	College of Pharmacy

Table 2: Colleges in South Valley Campus

	SOUTH - VALLEY CAMPUS IN ASWAN
1	College of Engineering & Technology
2	College of Management and Technology
3	College of Computing & Information Technology
4	College of International Transport & Logistics
5	College of Archaeology & Cultural Heritage

In addition to the state-of-the-art classrooms and laboratories, the campuses comprise the following facilities:

Table 3: AASTMT Services Centres

	AASTMT SERVICES CENTERS
1	International Forum for Maritime Transport
2	China-Arab Technology Transfer Centre
3	Information & Documentation Centre
4	Computer Networks & Data Centre
5	Career Development Centre
6	Centre Of Entrepreneurship
7	Quality Assurance Centre
8	Regional Informatics Centre
9	Multimedia Centre

Table 4: AASTMT Other Services

	AASTMT OTHER SERVICES
1	Authentications of the Foreign Affairs Ministry
2	Real Estate Registration Services
3	Accommodation & Dorms
4	Civil Affairs Services
5	Bus Transportation
6	Banking Services
7	Food Services
8	Sport Services
9	Libraries

7 Research Design and Methods:

7.1 GHG protocol separates emissions into three scopes:

- Scope 1: direct emissions from activities owned or controlled by the organisation (e.g., own vehicle fuel, possible GHG leakage from cooling systems).
- Scope 2: indirect emissions associated with purchased electricity.
- Scope 3: indirect emissions from centre activities that occur at sources outside its control and are not classified as scope 2 (e.g., transport, business travel, hotel stay, material consumption, and waste).

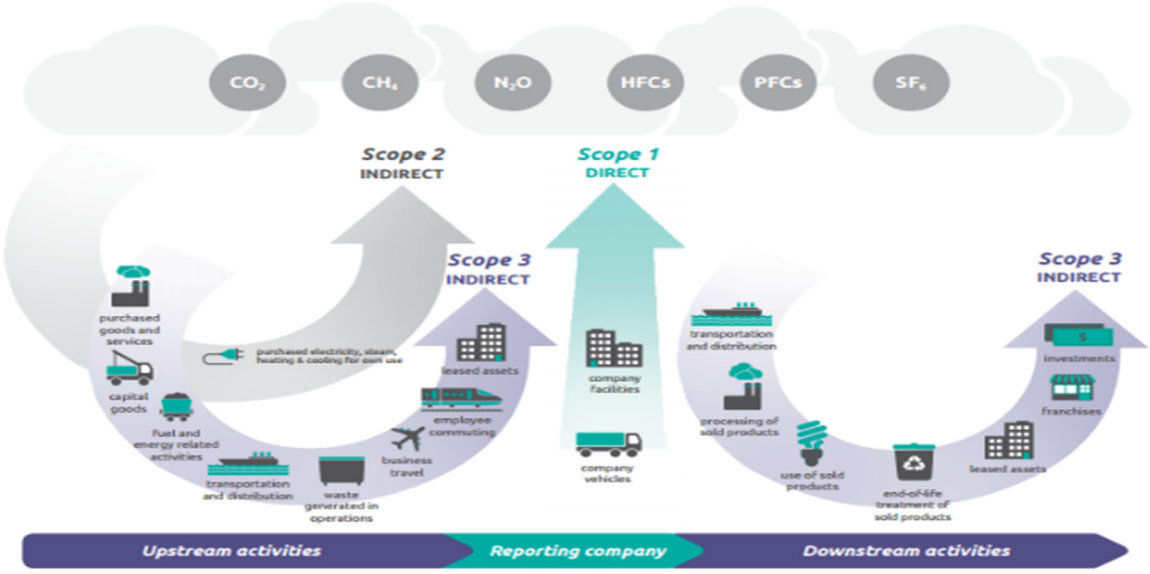

Figure 1: GHG protocol separates emissions into three scopes.

https://ghgprotocol.org/review-service

There are a few emission categories that consider mandatory to include in the CO2 calculation for each university: electricity, heat, employee commuting, paper and employee travel, including emissions of student commuting, waste, water, other on-campus stationary sources, water, and direct transportation (Sprangers 2011).

7.2 The GHGP provides a number of steps to assess the carbon footprint:

7.2.1 Data Used:

The data will be collected through observation, interviews, documentation, and reviewing campus documents or archives and literature. The literature review, especially reports of universities that had calculated their CO2 emissions, was done to understand how a carbon footprint can be calculated. We found that the Greenhouse Gas Protocol is usually used in calculating universities campuses carbon footprint.

7.2.2 The Greenhouse Gas Protocol (GHG):

The Greenhouse Gas Protocol (GHGP) categorised emissions into:

1- Scope 1 (direct GHG emissions)

2- Scope 2 (electricity indirect GHG emissions)
3- Scope 3 (other indirect GHG emissions) .

Scope 1 and 2 are mandatory for companies to comply with the standard (WBCSD & WRI, 2003). Different types of emissions can be attributed to these three different scopes. The following emissions are emissions of scope 1 (Schmitz et al. 2004):

- Generation of electricity, heat, or steam
- Physical or chemical processing
- Emission resulting from the combustion of fuels in company-owned/controlled mobile combustion sources used for transportation of materials, products, waste, and employees.
- Fugitive emissions. These fugitive emissions are the result of certain emission releases of the organisation, like air-conditioning or refrigerators.
- Scope 2 contains purchased electricity used as a "shorthand for electricity, steam and heating/cooling". Scope 3 contains the following activities according to the GHGP (Schmitz et al. 2004):
- Extraction and production of purchased materials and fuels
- Transport-related activities
- Electricity-related activities not included in scope 2
- Leased assets, franchises, and outsourced activities
- Use of sold products and services
- Waste disposal

When looking at scope 3, similar things are listed as in scope 1. The difference between scope 1 and 3 is that scope 1 is about emission sources that the company owns, and scope 3 is about emission sources that the company does not own. According to the GHG Protocol, reporting scope three emissions is not mandatory (Schmitz et al., 2004). Furthermore, some emission sources may be present in both scope 1 and scope 3. For example, scope 1 emissions include emissions from the combustion of fuels in cars, while scope 3 includes emissions of the production of purchased fuels that may be used for cars.

Greenhouse Gas Protocol (GHGP) provides a number of steps to assess the carbon footprint:

1- Identify GHG emissions sources.
2- Select a GHG emissions calculation approach.
3- Collect activity data and choose emission factors.
4- Apply calculation tools.
5- Roll-up GHG emissions data to reach the overall level.

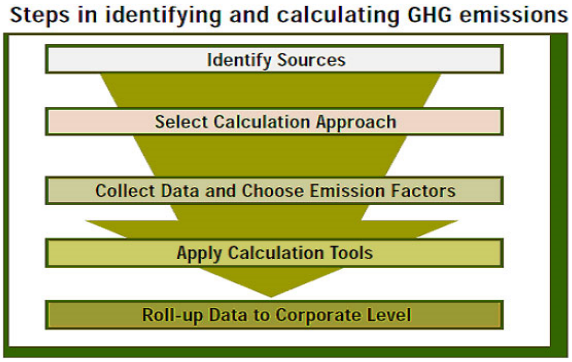

Figure 2: steps to assess the carbon footprint.

https://ghgprotocol.org/review-service

Emission sources must be identified, categorised into scope 1, scope 2 and scope 3 emissions. Combustion of fuel in boilers and furnaces can be included in the assessment (in

scope 1 or 3, depending on the organisation that is the owner of the boilers and furnaces). In scope 1, business travel and commuting in company-owned vehicles is included. Scope 3 also includes “incineration of office waste or decomposition in a landfill when the facilities are not owned by the reporting organisation” and emissions of outsourced activities. After the identification of emission sources, a calculation method should be chosen. Calculation methods can range from using direct monitoring to using generic emission factors. Each organisation should determine what is most appropriate for them. Activity data has to be collected, and emission factors have to be selected by the organisation. (Sprangers, 2011).

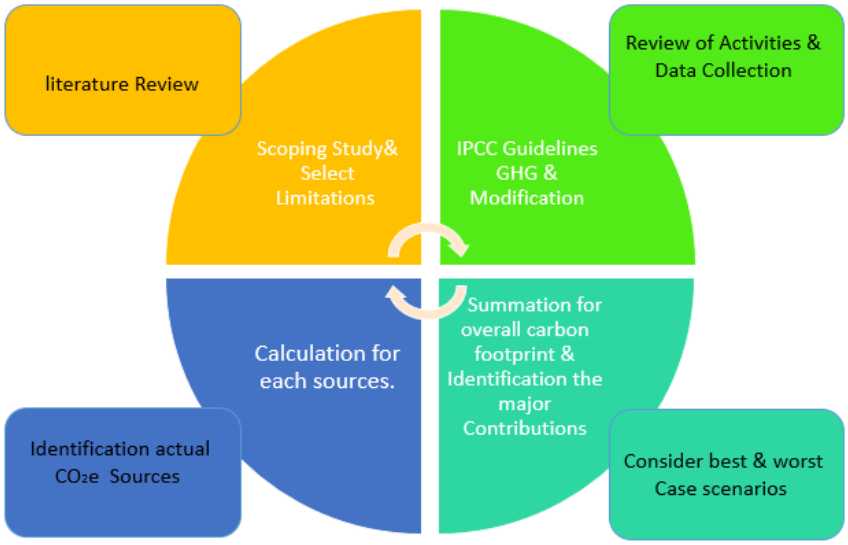

Figure 3: Carbon footprint assessment procedure Steps (Filimonau et al. 2020.Lamsairhri 2017)

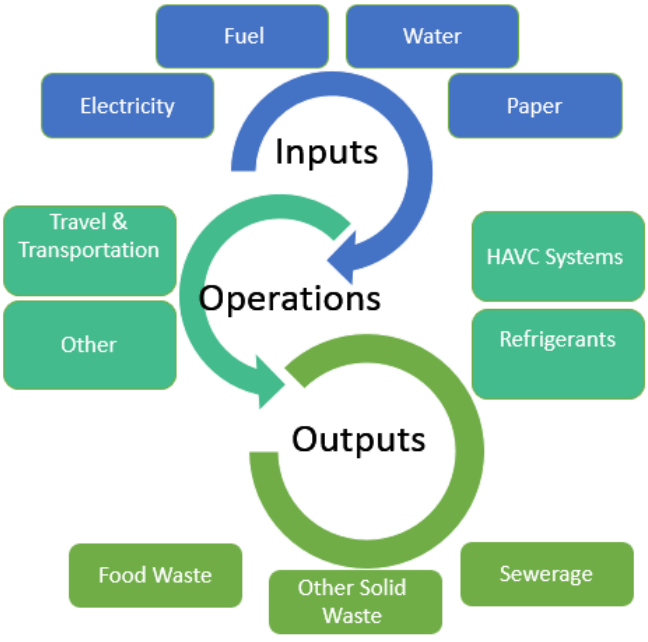

Figure 4: university main emission Sources (AUC 2016, Sprangers 2011)

7.2.3 Advantages:

GHG Protocol publishes the world's most widely used greenhouse gas accounting standards. These standards are often the basis for accounting resources designed by organisations or consultancies, such as sector-specific guidance, calculation tools, and reporting programs. The "Built on GHG Protocol" mark is a way for GHG Protocol to recognise products that have been developed in conformance with a GHG Protocol standard. Those that acquire the mark will benefit from the GHG Protocol's reputation as the gold standard for GHG accounting. GHG accounting and reporting should be based on the following principles: Consistency, Completeness, and Relevance. https://ghgprotocol.org/review-service

8 Anticipated Results and Evaluation Criteria (Max. three pages)

The research team will understand each campus's emissions status quo with a visualising trend during the research project. Besides, the project will recommend a clear road map for the AASTMT for emission reduction implementation. Furthermore, the measures which will be carried out in the initial survey for the GHG gases carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), per-fluorocarbons (PFCs) and sulphur hexafluoride (SF6) will Identify the rank and prioritise the GHG gases according to their presenting percentages and will direct the research team for the suggested remedial measures according to the project research three scoops. There are expectations to reduce the university's required power, both sites for buildings and workshops, minimising the electricity bills, improving the air quality, better health for staff and students, and cutting medication costs. Reducing the Campuses CFP will help AASTMT show more responsibility towards environmental issues and enhance AASTMT reputation as an environmental committed university.

Currently, a terminal consumption analysis method based on the IO analysis is the major method for organisational carbon footprint evaluation. The key steps in calculating an organisational carbon footprint are shown in Figure 5:

1- Defining organisational boundaries: It is necessary to set clear, explicit boundaries on which parts of the organisation are included in the organisational carbon footprint. Meanwhile, an organisation may comprise one or more facilities, which usually apply control and equity share approaches to consolidate facility-level GHG emissions and removals at the organisation level.
2- Establishing operational boundaries: The operational boundary determines which emission sources will be quantified. It should include the full range of emissions from activities under operational control. All material Scope 1 and 2 emissions should be included, but Scope 3 emissions can be chosen to include [14]. (Scopes 1, 2 and 3 are shown in Figure 2).
3- Calculating carbon footprint: The footprint's accuracy relies on collating consumption data for all of the emission sources within the established boundary. It is essential to clarify any gaps in the data and list any assumptions that have been made in calculating the footprint. The carbon footprint is typically calculated using activity data collated multiplied by standard emissions factors. However, there are other calculation methods, such as calculation of the use of models or measurement.
4- Reporting and verifying: Organisations should prepare a report to facilitate inventory verification, participation in a GHG program, or inform external or internal users. Meanwhile, third-party verification of carbon footprint was suggested to be carried out to add credibility and confidence to carbon reporting for public disclosure.

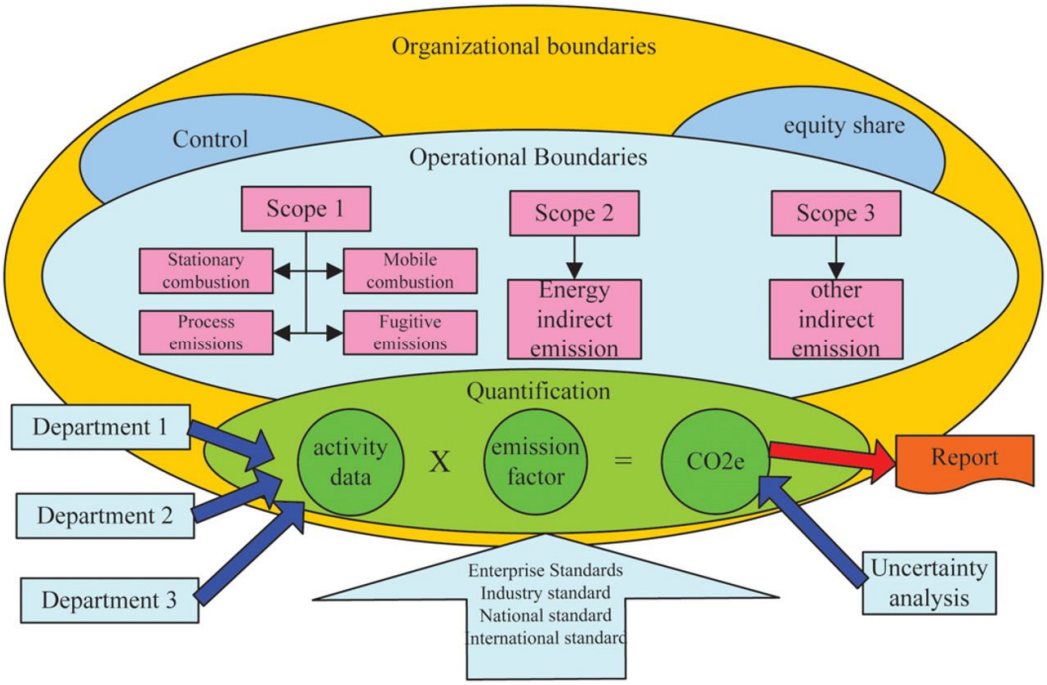

Figure 5: Assessment procedures of the organisational carbon footprint

Int J Low-Carbon Tech, Volume 9, Issue 3, September 2014, Pages 237–243, https://doi.org/10.1093/ijlct/ctt041

9 Expected Project Outcomes and Impact to AASTMT (Max. two pages)

Education: University will conduct research on carbon footprint, which will help to get the comparison between before and during Covid-19. The results of this study are expected to support the AASTMT for greener learning and teaching activities.

The project will serve AASTMT's participation in the Times Higher Education World University Rankings which assess universities against the United Nations' Sustainable Development Goals (SDGs). These challenges require AASTMT to measure and report their GHG emissions, take immediate actions to reduce them and develop and implement a plan to become climate neutral.

The university campus should promote its environmental policy, which establishes practices and improvements in relation to energy and water efficiency issues, waste, habitat protection and biodiversity, and the promotion of interdisciplinary research associated with sustainable development.

9.1 Overall Outcome:

1- It helps the AASTMT campuses to be eco-friendly by reducing CO2 emissions.
2- It will be considered as a small stepping stone towards mitigating the impacts of climate change. Further, to increase the staff's and student's environmental awareness.
3- Identify greater efficiencies and cost savings, and lower resource use.
4- Manage risks more effectively.
5- Demonstrate social responsibility.
6- Identify business opportunities.
7- Develop a competitive edge.
8- Inspire partners and motivate others.
9- Be transparent and communicate impacts to its customers.
10- Contribute more effectively to the campus's collective effort to reduce its missions and transforming the campus towards achieving the SDGs goals: the 2030 agenda for sustainable development, which seeks to strengthen the social, economic, and environmental dimensions of sustainable development.

9.2 Technical output and impact:

1- Analyse Alexandria and Aswan campuses carbon footprint .
2- It helps the AASTMT campuses to be eco-friendly by reducing CO2 emissions .
3- It is considered a small steppingstone towards mitigating the impacts of climate change.
4- Identify greater efficiencies, cost savings and lower resource use.
5- Contribute more effectively to the campus's collective effort to reduce its missions .
6- It will transform the campus towards achieving the SDGs goals: the 2030 Agenda for Sustainable Development which seeks to strengthen the social, economic, and environmental dimensions of sustainable development .

9.3 Patents:

-Estimate and modifying carbon footprint model for AASTMAT. The model will be designed and tested on the two campuses Alexandria and Aswan.

9.4 Publication:

- Two M.Sc. theses.
- Two International Publications:
    1. -Paper about combative before and during Covid-19 and studying the digital transformation for Alexandria campus.
    2. -Paper about combative before and during Covid-19 and studying the digital transformation for Aswan campus.

9.5 Financial feasibility & Socio-economic Impact:

1. Increase its awareness towards environmental issues.
2. Manage risks more effectively.
3. Be transparent and communicate impacts to its customers .
4. Demonstrate social responsibility .
5. Inspire partners and motivate others .
6. Identify business opportunities .
7. Develop a competitive edge.

10 Resources (Max. two pages)

10.1 Laboratory Space:

The research will be established as a shared project between Arab Academy for Science, Technology and Maritime Transport (AASTMT), Alexandria University (AU), the Egyptian Environmental Affairs Agency (EEAA) and Agriculture Research Centre (ARC).

10.1.1 AASTMT laboratory space:

CMTT Environmental Monitoring & Climate Change Laboratory is equipped with water and air quality equipment, besides climate modelling software to carry out the following activities and studies:

1. Environmental impact assessments,
2. Water quality analysis,
3. Wastewater analysis,
4. Meteorological and climate data collection,
5. The laboratory would provide community training in environmental monitoring and associated services.

10.1.2 AU laboratory space:

AdapTM and FishAqu laboratory in Faculty of Science, Oceanography Department, Alexandria University, will support the project by the equipment's needs for carbon/methane analyses together with a supercomputer for fast calculations and dealing with a number of terra bytes data. These two laboratories will be used for the following studies:

1. Climate modelling to predict the future climate.
2. Statistical Analyses.
3. Carbon and other greenhouse gasses analyses.

10.2 Personnel:

The research team has a multidisciplinary view in the fields of climate change, and environmental studies. Most of the research team has current funding from national/international organisation (ARCA – AASTMT – Erasmus+ - etc.). They will analyse the environmental factors to detect chemical components and pollution to ensure compliance with agreed environmental conditions and standards.

The research team consists of five researchers from two Egyptian institutes as follows: Four from (AASTMT) and two from (AU), with outstanding experience in conducting both international, local projects, in addition to continuous monitoring of climate change and the environment through institutes research strategies. AASTMT team is well qualified and experienced in climate change research, environmental risk assessment, data analysis and laboratory work. The AU's key investigators are experts in climate change and climate modelling; moreover, the master students have more than 6 years of experience working with analysing the carbon footprint and environmental monitoring during her work at the Egyptian Environmental Affairs Agency.

The research team consists of five researchers from four Egyptian institutes as follows: Three from (AASTMT) and two from (AU), with outstanding experience in conducting both

international, local projects, in addition to continuous monitoring of climate change and the environment through institutes research strategies. AASTMT team is well qualified and experienced in climate change research and environmental risk assessment.

10.3 Facilities:

1- The project will plan to take benefit from the Environmental Monitoring and Climate Change Lab, utilising the air and water quality equipment.
2- The project team will cooperate with AU to use the Central Lab in the Faculty of Science.

10.4 Office and Computer Facilities:

1- The project researchers will use their offices in their institutes freely to work with project management.
2- The project researchers will use their laptops and software's to perform the project analyses.

10.5 Major Equipment:

10.5.1 AASTMT equipment:

The main equipment needed for field collections of soil carbon are available: water quality (to measure physical and chemical properties), air quality (to measure Carbon dioxide, Chlorine, Carbon Monoxide, Hydrogen Sulfide, Ammonia, Nitrogen Oxides, Sulphur dioxide, Ozone, Volatile Organic Compounds, Dust: laser particle counter PM2.5 / PM10). In addition to statistical software used in data analysis.

10.5.2 AU equipment:

AU will support the project with a carbon analyser BIOBASE (BK-CSA6) High- frequency infrared Carbon and Sulphur Analyser, which determines the percentage of carbon and sulfur in solid material. Working Principle: High-frequency inductive combustion and infrared absorption system. Sample weight: Standard 0.5g. Accuracy: C/S: 0.1ppm. Analysis Time: 20-100s adjustable (normally: 35s). Moreover, AU will support the project with A supercomputer with 512 processors for fast calculating and running the software required for the current research about CFP.

11 Team Information (Max. of one page per team member)

11.1 Capt. Mahmoud El-Bawab (PI):

Mahmoud El-Bawab is a Senior Lecturer (professor) at the Arab Academy for Science, Technology and Maritime Transport (AASTMT), Egypt. Mahmoud El-Bawab received his master's degree in Maritime Safety and Marine Environmental Protection from the World Maritime University (WMU) in 2001. Also, he holds a Master Mariner Certificate, and he has more than 25 years' lecturing experience in various fields of Maritime Education and Training (MET).

Mahmoud participated in many field/research governmental and national projects in Egypt, regional and internationally. For the recent international project, he was a member of the main research team of the project of "Establishment of the Global Maritime Professional Body of Knowledge (GMP-BoK)" that was officially launched in the headquarter of the IMO, London (June 2020).

Since 2018, Mahmoud heading the working group of the Institutional Database of the IAMU (IDB). Currently, he is an official reviewer in the academic committee of the IAMU to assess research projects as well as scientific manuscripts to the annual international conference that held in different member universities successively.

Finally, Mahmoud has published many papers in the fields of Safety of Navigation, maritime safety, Search & Rescue (SAR), Marine Environment Protection and Climate Change.

Most recent projects:

1. Assisting in preparation of Egypt and AASTMT's files to the EU for the Updated requirements of the STCW Convention (as amended), Alexandria – Egypt, 2016.
2. Member of the IAMU-GMP Working Group (WG) assigned by the IAMU-IEB for establishing the Body of Knowledge "BOK" for the Global Maritime Professional, (April 2017 – March 2019)
3. Climate Change Management through Mitigation and Adaptation / (AdapTM), Project no. (585917-EPP-1-2017-1-ITEPPKA2-CBHE-JP), 15th October 2017-14th October 2020 for 770.788,00 Euro, to develop a master program in Environmental Science.
4. Head of the Institutional Database (IDB) Working Group of the IAMU, which is assigned by the IEB of the IAMU to establish a new Institutional Database for the member universities of the International Association of Maritime Universities (IAMU), (April 2017– Present) – "for the third successive Cycle".
5. Assisting in preparation of "Egypt" 's file that been submitted to the IMO according to the mandatory Independent Evaluation procedures to verify the requirements of the STCW Convention (as amended), Alexandria – Egypt, 2021.

Most recent publication:

1. IMO strategy to promote Safe, Secure and Efficient Shipping on Cleaner Oceans, International Conference (MARLOG 3), Alexandria – Egypt, 2013.
2. Important Role of the AASTMT in the International Maritime Industry, Arab Mariners Newsletter, IFMT, AASTMT, Alexandria, Egypt, 2016.
3. AASTMT, Maritime Center of Excellence "45 years of support MET in the Arab Region

and Africa", Resolving "Safety -Profit" tension, 4thworkshop, Svendborg (Denmark) Oct. 2016.
4. Legal Regime of Climate Change and Impact of International Maritime Transport Industry on Oceans and Marine Life, ADAPTM final text book (March 2021)
5. Towards Enhanced Maritime SAR Services in the East Mediterranean and the Red Sea, Maritime Scientific Research (MSR) Journal. (Submitted March, 2021)

11.2 Capt. Mohamed Rowihil (Co PI):

Captain Mohamed Rowihil is a Senior Maritime Lecturer at the Arab Academy for Science, Technology & Maritime Transport (AASTMT). Currently Head of the Maritime Cooperation Unit (MCU) at AASTMT, Capt. Rowihil maintains many valuable connections with international entities within the maritime field.

Captain Rowihil holds an MSc. Degree in Maritime Affairs specialized in Maritime Energy Management from the World Maritime University (WMU) in Sweden where he acted as President of the 2017 Student Council. Captain Rowihil is a recognized representative of the International Association of Maritime Universities (IAMU) at the IMO-MEPC meetings .

Captain Rowihil has actively participated in a number of international projects such as; the "Global Maritime Professional - Body of Knowledge (GMP-BoK)" of IAMU; the IAMU research project "Sustainable Development in Maritime Higher Education (SDiMET)"; the Erasmus+ project "Aggregation and Collaboration Tools to Enhance Cluster Network in the Maritime Sector"; and The Arab League project "The Arabian Science and Technology Network for Sustainable Development".

Most recent publication:

1. Impacts of Climate Change on Oceans and Coasts, Basic Physical and Chemical Phenomena Influence on Biological Processes and Fish Stocks while considering the Challenges and Prospects for the Maritime Industry
2. A Review of Egypt's Transition to LNG; Challenges and Recommendations
3. Sustainable Development in Maritime Education and Training; Trends and Challenges
4. A Proposed Framework for a Vessel Speed Reduction (VSR) System for Egyptian Ports.

11.3 Ms. Mennatullah Faheem:

Ms Mennatullah works as a communication officer in the Climate Change Information Centre and Renewable Energy (CCICRE) and Agriculture Research Centre (ARC). Also, she works as an environmental researcher for many national and international environmental NGOs and Initiatives that focused on climate change. Ms Faheem worked as a member in several projects one of them was a Member of the Project carbon footprint component in the SAIL project.

11.4 Dr. Mohamed Shaltout:

Dr Shaltout has many research activities in sea-level projection and ocean modelling, and different environmental issues. He has in-depth knowledge of specific oceanic conditions along the Egyptian Mediterranean coast obtained from his Master and PH. D thesis and other assignments. Dr Shaltout received his PhD from Alexandria University in 2008, and from 2009 he is a guest researcher in two of the highly world-ranked oceanographic institute; Earth

science Department (Gothenburg University, Sweden) and the Earth science Department (Abdus Salam International Centre for Theoretical Physics (ICTP), Italy). Dr Shaltout has studied climate change impacts on Egyptian coastal waters and the Mediterranean Sea and has lectured extensively on this subject. He is experienced in the use and application of remote sensing tools. Dr Shaltout is the recipient of several awards and grants for his work as an oceanographer since the early days of his career. He is a keen and experienced communicator with a vast curriculum as a lecturer in Egypt and abroad.

Most recent publication:

1. Eladawy, A., Nadaoka, K., Negm, A., Abdel-Fattah, S., Hanafy, A., and Shaltout, M. (2017). Characterisation of the northern Red Sea's oceanic features with remote sensing data and outputs from a global circulation model. Oceanologia Journal, 59 (3), 213-237 (http://dx.doi.org/10.1016/j.oceano.2017.01.002). (impact factor 1.5).
2. Shaltout, M., TonboL, k., and Omstedt, A. (2015). Sea-level change and projected future flooding along the Egyptian Mediterranean coast. Oceanologia Journal, 57 (4), 293—307 (doi:10.1016/j.oceano.2015.06.004, impact factor 1.1).
3. Shaltout, M. and Omstedt., A (2015). Modelling the water and heat balances of the Mediterranean Sea using a two-basin model and available meteorological, hydrological, and ocean data. Oceanologia Journal, 57 (2), 116—131 (http://dx.doi.org/10.1016/j.oceano.2014.11.001 , impact factor 1.1)
4. Shaltout, M. and Omstedt., A (2014). Recent precipitation trends and future scenarios over the Mediterranean Sea. Geofizika Journal, 31(2), 2014, 47–70 (DOI: 10.15233/gfz.2014.31.7 impact factor 0.73)
5. Shaltout, M. and Omstedt., A (2014). Recent dynamic topography changes in the Mediterranean Sea analysed from altimetry data. Current development in oceanography Journal, 7, 1-23. (impact factor 0.6)

11.5 Ms. Wafaa Elsayed:

Ms. Wafaa Elsayed, who works as a Director of Environmental Management, Sharkia & Ismailia Regional Branch Office, Egyptian Environmental Affairs Agency (EEAA), with extensive experience in environmental and social impact assessment, integrated solid waste management, environmental awareness and training, inspection, monitoring and protection regulations and laws. Also, act as a trainer of the NGOs in environmental rights and responsibilities within the project PRESSO's capacity-building component co-funded by the European Union (2012). Participated in the 9th International Conference “Natural Resources and Sustainable Development, at the Faculty of Science, Zagazig University (2014) “as a speaker and within a paper “The Initiative of Green Governmental Institutions “which applied in some Colleges of The University depended on calculating the carbon footprint from different activities, negative practices and implementation.

Name of Res. Team Member in English	Name of Res. Team Member in Arabic	University / Institute in English	Position / Title	% of time spent on project	No. of months	Incentive per month (LE)	Number of other projects and their IDs	Total % of time spent on other projects	Contact No
Mahmoud El-Sayed El-Bawab	محمود السيد البواب	Arab Academy for Science, Technology and Maritime Transport	Senior Lecturer (Professor)	20%	12	1,500			01001635111
Mohamed Rowihil	محمد رويحل	Arab Academy for Science, Technology and Maritime Transport	Third Lecturer	30%	12	1,000			0112 522 2896
Mennatullah Salah Eldin Faheem	منة الله صلاح الدين فهيم	AASTMT	Master Student	40%	12	500			01200847484
Mohamed Shaltout	محمد السيد شلتوت	Faculty of Science, Alexandria University	Professor	30%	12	1,000			01005255393
Wafaa Abdelshafy Elsayed	وفاء عبد الشافي عطية السيد	Faculty of Science, Alexandria University	Master Student	40%	12	500			01097239072

12 Project Management (Max. three pages)

The process of project management involves four interrelated phases: planning, organisation, management of activities and resources, quality assurance. Concerning the Management structure and procedures, a project management methodology will be adopted to ensure and equate time, activity and budget according to Project tasks.

The project coordinator coordinated the process of partner search in order to involve the most experienced organisations according to the proposal's main focus and objectives. Besides, the consortium participated in meetings and communications to exchange ideas and know-how on setting the project's framework, overall and specific objectives and activities' distribution, and a sound and coherent budget.

The consortium partners decided to grant AASTMT the function of the Project Coordination. Therefore, AASTMT took responsibility for management at the stage of the preparation of the project proposal. Firstly, effective communication among the partners has been established through emails and Zoom meeting. The project's vision has been clarified: all the partners contributed to the project's development, making it mutually beneficial and motivating. After the vision was defined, the main project aim was formulated with respect to AASTMT priorities and the objectives of Vision 2030. The AASTMT has defined the objectives and outcomes of the proposed project. As a result, the Gantt chart was generated. All the consortium partners have analysed the information in the Gantt chart and made their comments. After establishing the vision, aims, objectives and primary outcomes of the project, each partner has conducted a SWOT analysis of their expertise (programmes, staff, infrastructure, etc.) with respect to the project objectives and anticipated outcomes. That was done to identify each institute's possible contribution to the project activities and to efficiently share actively. The tasks were sent to all partners in order to get feedback from them.

Furthermore, the detailed budget calculations were done and discussed with the partners to get their approval. The budget, as one of the motivation tools, was based on objectivity and clarity. AASTMT collected the necessary documents from partners for the application submission.

Project management aims to ensure that the project meets its fundamental objectives on time, budget, and high-quality results. The project management complies with the following principles:

1) Creating an integrated project structure incorporating partner.
2) Coordination between stakeholders and establishing a commonplace business operation.
3) Reaching an agreement of all partners and guarantee a harmonised decision-making procedure. The project management staff will also ensure that crucial principles will be respected along with all the WPs, including sustainable development, equal opportunity and non-discrimination, equality between men and women, and environment protection.

The project includes four main tasks organised in eleven subtasks that develop over 12 months. The Project Coordinator (AASTMT) will supervise the overall project's progress (consolidating project planning, overall responsibility for progress and milestone reports, cost statements and budget overview, etc.). AASTMT will ensure that partners are aware of their responsibilities and reporting duties and will be in regular contact with each partner to ensure the timely completion of their tasks and provide any necessary support. In the event of any

upcoming risk or quality problems, the coordinator will act according to the risk and quality management plans. During the project, if a risk is realised or is expected to occur soon, operative contingency plans will be defined. Contingency plans may include the redesign of features, reallocation of resources, or reduced performance thresholds. AU, EEAA and ARC will be responsible for the sampling, data, and laboratory analysis.

Technical and financial reporting towards the AASTMT is the responsibility of the Project Coordinator. A mid-term report and a final report will be provided.

The project teams will correspond to the tasks defined in the Gantt chart, but other groups will be created to deal with specific issues:

Activity Name	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Main 1: Field sampling												
Sub 1.1: Preparation												
Sub 1.2: Sampling												
Sub 1.3:												
Main 2: Laboratory work												
Sub 2.1:												
Sub 2.2:												
Main 3: Data analysis and reporting												
Sub 3.1:												
Sub 3.2:												
Sub 3.3: Reporting												
Main 4: Results dissemination												
Sub 4.1:												
Sub 4.2: Research papers												
Sub 4.3: Seminar												

13 Allowable Project Costs (Max. two pages)

Table of Eligible Cost

Budget Table (during the period of the project)

Eligible costs	AASTMT support (L.E.)	%
(A) Staff Cost	**66,000**	**19.8%**
(B) Equipment	**195,000**	**58.5%**
(C) Expendable Supplies & Materials	**0**	**0%**
(D) Travel	**16,000**	**4.8%**
(E) Other Direct Costs	**56,500**	**16.9%**
(G) Total Project Cost	**333,500**	**100%**

14 Breakdown of Costs Other Grant(s) (Max. two pages)

Eligible costs	Breakdown				AASTMT support (L.E.)
(A) Staff Cost	**Team member**	**% of time spent on the project**	**Monthly incentive**	**No. of months**	
	Mahmoud El-Sayed El-Bawab	20%	1,500	12	18,000
	Mohamed Rowihil	30%	1,000	12	12,000
	Mennatullah Salah Eldin Faheem	40%	500	12	6,000
	Mohamed Shaltout	30%	1,000	12	12,000
	Wafaa Abdelshafy Elsayed	40%	500	12	6,000
	Climate Change Consultant	15%	1,000	6	6,000
	Renewable Energy Consultant	15%	1,000	6	6,000
	Total incentives				**66,000**

Eligible costs	Breakdown			AASTMT support (L.E.)
	Quantity	**Items/Types**	**Unit Cost (LE)**	**Total Cost (LE)**
(B) Equipment	1	Dust Particles Measuring Equipment	170,000	170,000
(B) Analysis	10	Air emissions measurements (CO2, Cl2, CO, H2S, NH3, Nitrogen Oxides, SO2, O3, VOCs and PM) (Alexandria & Aswan)	2500	25000
	Total equipment costs			**195,000**
(C) Expendable Supplies & Materials			0	0
	Total expendable supplies & materials			
(D) Internal Transportation from Alexandria to Aswan and back	4 Persons		1,000	4,000
(D) Accommodation	4 Persons / 3 Nights		3,000	12,000
	Total travel			**16,000**
(E) Other Direct Costs				
	1 Reports preparation, drafting & printing		1,500	1,500
	2 Proofreading and publishing costs		15,000	30,000
	1 Workshops organisation and Training		25,000	25,000
	Total other direct costs			**56,500**
(G) Total Project Cost				**333,500**

15 Plans for Disseminating Research Results / Sustainability of the action (Max. three pages)

It is anticipated that the research project will present some worthy scientific products as a detailed report at the end of the project duration showing all the research's stages and results. Besides, the project will enable two scientific researchers working in the project team to produce two master's theses based on primary research. Moreover, the project's team will publish two research papers in international scientific journals at an impact factor equals to one at least.

To guarantee the project's sustainability and maximise its benefits, the project will propose an agreement to carry out intermittent measurement of CFP to all AASTMT headquarters and campuses, whether inside or outside Egypt. However, AASTMT shall cover the costs of calibration and periodic maintenance of measuring instruments and team transportations. In addition, there will opportunity in the future "project's second phase" to study the likelihood of inaugurating a way to provide the CFP measuring service to other private or government universities at a minimal expense to maintain the AASTMT's pioneering environmental role in the areas of headquarters existence, also, to study the provision of the same service to companies in the future.

15.1 Sustainability of the action:

1- Green campus results will give a scientific baseline for Alexandria and Aswan campus greenhouse gases. The team plan to provide the estimated carbon footprint to AASTMT management to support the University for More Sustainable Actions.
2- Green campus results will support AASTMT to reduce the campuses production of greenhouse gases.
3- Green campus results will support AASTMT in making decisions for university adaptation and mitigation plans.
4- Green campus is expected to continue working and calculating the campuses carbon footprint through the estimated model.

16 Key Publications and references (Max. two pages)

Abutaleb, Khaled Abubakr Ali, Asmaa Hassan El Sayed Mohammed, and Mahmoud H. Mohame. Ahmed. 2018. “Climate Change Impacts, Vulnerabilities and Adaption Measures for Egypt’s Nile Delta.” Earth Systems and Environment 2(2):183–92.
Article Carbon Footprint Estimation in a University Campus: Evaluation and Insights Sustainability 2020, 12, 181; doi:10.3390/su12010181 www.mdpi.com/journal/sustainability
The World Bank, 2010. Development and Climate Change. edited by W. Bank. washington.
CO2 Earth, "Annual Global Carbon Emissions," 2015. [Online]. Available: https://www.co2.earth/global-co2-emissions. [Accessed July 24, 2017].
Core Writing Team, R. K. Pachauri and L. A. Meyer, "Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the" IPCC, Geneva, Switzerland, 2014.
D. Pandey, M. Agrawal and J. S. Pandey, "Carbon footprint: current methods of estimation," Environmental monitoring and assessment, vol. 178, no. 1, pp. 135-160, 2011.
Edurne Loyarte-López, Mario Barral , Juan Carlos Morla Methodology for Carbon Footprint Calculation Article Towards Sustainable Innovation in Intangible Assets Sustainability 2020, 12, 1629
http://www.aast.edu/en/campuses/#
https://ghgprotocol.org/review-service
https://issuu.com/ge3s/docs/ghg_protocol_and_carbon_footprint
International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Published by, www.ijert.org RACEE - 2015 Conference Proceedings Carbon Footprint of an Academic Building - A Case Study
IPCC. 2007. Climate Change 2007: Impacts, Adaptation and Vulnerability. Panel, The Intergovernmental Change, Climate Nations, United Programme, Environment IPCC, The Report, Fourth Assessment Report, The Change, Climate.
K. A. Baumert, T. Herzog and J. Pershing, "Navigating the Numbers: Greenhouse Gas Data and International Climate Policy," Washington, DC, 2005.
Kalkstein, L. S. and K. E. Smoyer. 1993. “The Impact of Climate Change on Human Health: Some International Implications.” Experientia 49

Lotfy, Wael M. 2014. “Climate Change and Epidemiology of Human Parasitosis in Egypt: A Review.” Journal of Advanced Research.

NOAA, "Trends in Atmospheric Carbon Dioxide," Earth System Research Laboratory, June 2017. [Online]. Available: https://www.esrl.noaa.gov/gmd/ccgg/trends/monthly.html. [Accessed June 16, 2017].

Pandey, Divya, Madhoolika Agrawal, and Jai Shanker Pandey. 2011. “Carbon Footprint: Current Methods of Estimation.” Environmental Monitoring and Assessment 178

Qafisheh, Nida, Makhtar Sarr, Umm Amara Hussain, and Shikha Awadh. 2017. “Carbon Footprint of ADU Students: Reasons and Solutions.” Environment and Pollution

Raey, Mohamed El. 2010. “Impacts and Implications of Climate Change for the Coastal Zones of Egypt.” International Institute for Environment and Development

Schmitz, Simon, Brian Dawson, Matt Spannagle, Fraser Thomson, Jasper Koch, and Rebecca Eaton. 2004. “The Greenhouse Gas Protocol - A Corporate Accounting and Reporting Standard, Revised Edition.” The GHG Protocol Corporate Accounting and Reporting Standard

Shaltout, Mohamed, Ahmed El Gindy, and Anders Omstedt. 2013. “Recent Climate Trends and Future Scenarios along the Egyptian Mediterranean Coast.

Sprangers, Stefan. 2011. “Calculating the Carbon Footprint.” Erasmus School of Economics

Stefan
Sprangers Erasmus SCHOOL OF ECONOMICS ERASMUS UNIVERSITY ROTTERDAM

Calculating the carbon footprint of universities Master’s Thesis Economics & Informatics

Sturges, Michael. 2008. Carbon Footprinting. Vol. 51.

T. F. Stocker, D. Qin, G.-K. Plattner, M. M. Tignor, S. K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P. M. Midgley, "Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change," Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2013.

UNPD. 2013. Potential Impacts of Climate Change on the Egyptian Economy

World Resources Institute (WRI), Safe Climate, http://www.safeclimate.net/calculator/, viewed in November 2011.

Xiwang Li , Hongwei Tan , Adams Rackes

Carbon footprint analysis of student behaviour for a sustainable university campus in China Journal of Cleaner Production journal homepage: www.elsevier.com/ locate/jclepro

17 Declaration of original submission and Other Grant(s) (Max. one page)

جامعة الإسكندرية
ALEXANDRIA UNIVERSITY

مكتب العميد
Dean's Office

كلية العلوم
Faculty of Science

15 March 2021

Dear Sirs,
Arab Academy for Science, Technology and Maritime Transport (AASTMT)

I'd like to express my support of the project proposal entitled: **"Carbon Footprint Estimation and Reduction in the AASTMT Campus Towards developing a Model for Promoting Sustainable Development Goals"** being submitted to AASTMT Call for Collaboration Research and Innovation Project by Capt. Mahmoud El-Bawab.

I fully support the efforts of the research team from the Faculty of Science, Alexandria University (AU) **Prof. Dr. Mohamed Shaltout.**

As they seek external funding to implement their research work articulated in the submitted proposal.

Sincerely,

Dean of Faculty of Science
Alexandria University
15/3/2021
Prof. Amany Abdelhamid Ismael

Fax: 203/3911794 - Tel: 203/3921595 ١ شارع بغداد - محرم بك ص.ب: ٢١٥١١ - الإسكندرية مصر
Moharam Bey - P.O.Box 21511, Alexandria - Egypt
Sc-dean@alexu.edu.eg

Acknowledgement Form

By signing below, I acknowledge that I have read, understand, and accept to comply with all the terms of the foregoing application, mentioned in AASTMT general conditions and guidelines for submitting a research proposal, including, but not limited to:

- The total number of the application pages should not exceed **30 pages** excluding a cover page, as well as all sections of the proposal (as mentioned in AASTMT General Conditions and Guidelines for Submitting Research Proposal).
- At any time, a contracted AASTMT project team member should only be participating in a maximum of 3 projects (or a maximum of 2 projects as a PI).
- Allowable budget maximum limit should be strictly adhered to in the project proposal. In all cases, the requested budget has to be justified in detail.
- AASTMT guidelines, IPR rules, code of ethics, etc. (www.aast.edu) should be read carefully and adhered to. These are integral parts of the contract.
- All proposals – in addition to PI and other data - must be uploaded to the AASTMT website by the designated deadline. Uploaded PI data should conform to the corresponding data in the application form. The PI must be a PhD holder.

Applications will not be considered eligible and will be discarded in the following cases:

- Proposals submitted by email or sent as hard copies or uploaded to the AASTMT website after the deadline.
- Proposals were not conforming to the designated format.
- Proposals whose uploaded PI data does not conform to PI data in the proposal file.
- Proposals in which the allowable budget maximum limit has been exceeded.
- Proposals in which maximum allowable contracted AASTMT project participation limit has been exceeded.
- Proposal letter does not include a scanned copy of the signed and stamped PI institution endorsement letter in case of team member work outside AASTMT.
- Submitted applications will be evaluated and the applicant will be informed with the evaluation result of his/her proposal within 3-4 months.
- AASTMT technical decisions made by remote reviewers are final.
- Proposal does not include a scanned copy of the signed acknowledgement form.

Date & Signature:  15/03/2021