

ENVIRONMENTAL EDUCATION FOR SUSTAINABLE DEVELOPMENT IN ARAB COUNTRIES

2019 Report of the Arab Forum for Environment and Development



ENVIRONMENTAL EDUCATION FOR SUSTAINABLE DEVELOPMENT IN ARAB COUNTRIES

ENVIRONMENTAL EDUCATION AT A GLANCE

Evolution

- Environmental Education has its origins in the mid-18th century, with philosophers and educators who believed that students should "study nature, not books".
- Environmental Education gained impetus with the birth of the United Nations Environment Programme (UNEP) at the conclusion of the first UN Conference on Human Environment in 1972. It became popular after the UN Intergovernmental Conference on Environmental Education in Tbilisi, Georgia, in 1977.
- The strong correlation between environment and development in education gained momentum after the Rio Summit on Environment and Development in 1992, which led to Agenda 21, suggesting education as the main tool to implement sustainable development, encompassing preserving the environment.
- The process of integrating environment in sustainable development was expedited after the UN Conference on Sustainable Development in Johannesburg in 2002. This was soon reflected in education, and culminated with the introduction of the Decade for Education on Sustainable Development (DESD) in 2005. At the conclusion of the Decade in 2014, 10 Arab countries out of 22 had been involved in its programs, namely Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Oman, Palestine, Tunisia and the United Arab Emirates.

Arab Universities

- AFED survey of 57 top-ranked universities in the Arab region identified 221 degree programs on environmental topics, consisting of 71 bachelor's degrees, 102 master's degrees, 36 PhD degrees and 12 technical diplomas.
- 55 of the environment-related programs are offered by universities in the Levant (Iraq, Jordan, Lebanon, Palestine, Syria), followed by 42 programs in the GCC countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, UAE), 39 programs in North Africa (Algeria, Libya, Mauritania, Morocco, Tunisia), 26 programs in the Nile Valley (Egypt, Sudan), and 3 programs in the African Horn (Comoros, Djibouti, Somalia).
- There is a higher prevalence of scientific and technical degrees over economics, law, education and policy-related ones. The highest frequency is in Environmental Sciences (34 degrees), followed by Environmental Engineering (30 degrees), Water Resources (29 degrees), and Renewable Energy (19 degrees).
- Research on environmental sciences constitute 7 percent of the total published by Arab researchers. The highest increase in environmental research was recorded in Egypt and Saudi Arabia.

Arab Schools

- Pollution, environmental health, nature and biological diversity still represent the common elements in school curricula across the Arab countries. Other issues started to be incorporated, to a lesser extent, in the last 20 years, such as climate change, green economy, green jobs, renewable energy green buildings, ecological footprint.
- Waste is often included only under pollution, but not in the context of waste management, including reduction, reuse and recycling.
- Food and water security, plastic pollution and resource efficiency are absent from school curricula in about 70 percent of the Arab countries.
- The trend of incorporating environment topics in all courses, including languages, literature and history, rather than only science, geography and civics, is gaining grounds across the Arab region.

Arab Forum for Environment and Development (AFED) is an international not-for-profit, non-governmental, membership-based organization headquartered in Beirut, Lebanon. Members include corporations, universities, research centers, media networks, and civil society alongside government entities as observers. Since 2007, AFED has been a public forum for influential eco-advocates. Over the last eleven years, it has become a major dynamic player in the global environmental arena.

The flagship contribution of AFED is an annual report written and edited by experts on the state of Arab environment, tracking developments and proposing policy measures. Other initiatives include a regional Corporate Environmental Responsibility (CER) program, capacity building, public awareness, and environmental education.

AFED enjoys Consultative Status with the United Nations Economic and Social Commission (ECOSOC), and has an observer member status with the United Nations Environment Program (UNEP), the League of Arab States (LAS), and many other regional and international organizations and conventions. As an Arab think tank, it has played a major role in international negotiations on environment and development, including advising governments and regional organizations on matters such as climate change, green economy and sustainable development.

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المنتدى العربي للبيئة والتنمية
ARAB FORUM FOR
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Dedicated to

Dr. Abdulrahman Al-Awadi
1936-2019

Chairman of AFED Executive Committee and Founding Board Member

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Preface

Environmental Education for Sustainable Development in Arab Countries is the topic of the 2019 annual report of the Arab Forum for Environment and Development (AFED). It provides the first comprehensive survey of environmental contents in school and university curricula across the Arab countries, in view of identifying gaps and recommending pathways to enhance the role of education in advancing environmental protection and implementing the Sustainable Development Goals (SDGs).

This report comes as a natural continuation of the series of annual reports on the state of the Arab environment, launched by AFED in 2008. It highlights the role of education in building new generations empowered with adequate knowledge, which enables them to address the challenges that emerged from the eleven previous reports. AFED's first annual report in 2008, entitled *Arab Environment: Future Challenges*, became a major reference in its field and was the launching pad for the reports that followed, covering ten topics: *Climate Change* (2009), *Water* (2010), *Green Economy* (2011), *Ecological Footprint* (2012), *Sustainable Energy* (2013), *Food Security* (2014), *Sustainable Consumption* (2015), *Sustainable Development in a Changing Arab Climate* (2016), *Arab Environment in 10 Years* (2017) and *Financing Sustainable Development* (2018). Implementing solutions to the challenges traced in the reports requires enhanced public awareness and sufficient scientific knowledge, which is exactly where the role of education comes into play.

The report found that during the last decade, Arab universities witnessed a rapid increase in programs related to the environment and sustainable development. Collectively, the 57 universities surveyed offer 221 degree programs on environmental topics. Postgraduate programs are typically research-oriented. Saudi Arabia and Egypt have been found to be the most active in environmental research output. The report noted that Arab universities can further accelerate their contribution to sustainability by integrating all of the SDGs into their learning and teaching activities, research, and community initiatives, observing specific weakness in the domains of environmental law and green economy. One pivotal recommendation of the report is offering an introductory course on environment and sustainability to all fresh university students.

An AFED survey of school textbooks and curricula found that environmental topics most popular in Arab schools are ecosystems, natural resources, pollution and sustainable development. In contrast to the inclusion of the rather new topic of sustainable development, the survey found that climate change was absent or not adequately discussed in 40 percent of the countries. Some countries, which developed the most comprehensive programs to integrate environment in school curricula, were, paradoxically, slow in implementation, such as Egypt and Lebanon. In general, lack of coordination between ministries of environment

and education was observed, which often resulted in overlapping programs. The report recommended that big challenges facing the region, such as water scarcity, desertification, drought, marine pollution and dangers of sea-level rise due to climate change, have to become a central part of the curricula.

Education is a major driver for a shift to a more sustainable lifestyle that ensures harmony with nature and a balanced use of resources. It also equips those entrusted with executing change with the necessary working tools and appropriate knowledge. Education has the power to nurture empowered, engaged and skilled citizens who can map the way towards a balanced, greener and safer planet.

Human behavior has led to environmental crises with various outcomes, including overpopulation, unsustainable lifestyles that consume more resources than what can be replenished, and individual behavior that harms the environment such as using polluting forms of energy or producing excessive waste. Environmental education has a key role in addressing those environmental challenges. It can be used to mitigate specific environmental issues and respond to their impact, but also to address the behavior that causes them. It can influence individual and collective environmental behavior, it enhances people's resilience to climate-related risks, and it also encourages their support for and involvement in mitigation actions. However, Environmental Education not only increases knowledge and awareness but also improves skills and enables individuals to make better, more environmentally informed decisions and devise solutions based on solid science.

AFED wishes to thank all institutional partners who made this report possible, by sharing their experiences and work in the domain of Environmental Education. Our academic partners included the University of Bahrain, Institute of Environmental Studies and Research at Ain Shams University, American University of Beirut, Arabian Gulf University and University of Petra. Chemonics Egypt joined as main research partners. Other institutions contributed case studies and papers, including the United Nations Environment Programme (UNEP), the Organization for Economic Cooperation and Development (OECD), the Union for the Mediterranean (UfM), the Mediterranean Action Plan (UNEP-MAP) and the Lebanese Center for Educational Research and Development

Special thanks go to the sponsors who supported the production of the report and the annual conference, mainly the Islamic Development Bank (IsDB), the Kuwait Foundation for the Advancement of Sciences (KFAS), the Food and Agriculture Organization (FAO), the Kuwait Fund, and Bank Audi, alongside media partners.

This report uses science-based evidence to trigger a needed policy debate on the urgency of reforming the Arab education systems in order to mainstream environmental issues in their curricula. It is thus hoped that it will assist in enhancing the role of education as a driver for better environmental management, as well as for advancing sustainable development in the Arab region.

Beirut, 14 November 2019

Najib Saab
Secretary General
Arab Forum for Environment and Development (AFED)

INTRODUCTION

ENVIRONMENTAL EDUCATION FOR SUSTAINABLE DEVELOPMENT IN ARAB COUNTRIES

2019 Report of the Arab Forum for Environment and Development (AFED)

I. OVERVIEW

When discussing environmental changes and challenges, and their relation to sustainable development, the role of education cannot be underestimated. This report on Environmental Education for Sustainable Development in the Arab Countries aims at encompassing both Environmental Education (EE) and Education for Sustainable Development (ESD), by increasing knowledge and awareness about the environment and its interconnectedness with social and economic factors. Beyond enhancing the level of scientific knowledge, it serves as a catalyser for participation and positive action. There are signs that the Arab world has begun to appreciate the key role that the environment should claim in its education systems. The next step is its effective and region-wide implementation into school and university curricula.

Although a strong trend can be seen in the inclusion of environmental topics in curricula, progress remains uneven across Arab countries and educational institutions. More so, it is evident that there is a clear gap between the Arab region and other parts of the world when it comes to environmental education. This report notes that many of the plans announced by various countries to include environmental education in the curricula have not been implemented. In part this is due to the ongoing unrest and conflict in some Arab countries, besides not considering environment a high priority area. Another problem is the lack of funding for national and regional initiatives to promote sustainable development topics at schools and universities. As most initiatives are dependent on international donors, they are largely not sustainable.

There has been a rapid increase in programs and plans related to environment and sustainable development in the Arab region over the last ten years. This momentum should now be used to trigger a much needed policy debate on the urgency of further reforming education systems in order to mainstream environmental issues in Arab curricula. Moreover, funds should be raised independently of international donors in order to enhance both the quality and evidence base of environmental topics.

II. FROM ENVIRONMENTAL EDUCATION TO EDUCATION FOR SUSTAINABLE DEVELOPMENT

Environmental Education (EE) has several definitions, perhaps the most comprehensive of which was adopted by UNESCO: “A learning process that increases people’s knowledge and awareness about the environment and associated

challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action.” It is a multidisciplinary field of learning that includes biology, chemistry, physics, ecology, earth and atmospheric science, mathematics, and geography. With the current global environmental challenges and the emergence in 2015 of the 2030 Sustainable Development Goals (SDGs), Environmental Education has gained prominence. It now fulfills the important role of delivering the necessary knowledge, skills, values, and attitudes in order to adapt to, or mitigate, environmental changes. The foundations of EE begin with awareness, knowledge, attitudes, and skills and end with participation.

Environmental Education predates Education for Sustainable Development (ESD), which started to gain prominence after the United Nations Conference on Environment and Development in Rio de Janeiro in 1992. The aim of ESD was to modify education to create a better understanding of the complex and interrelated economic, social and environmental dimensions of sustainable development and their ecological footprint on Earth’s biocapacity to regenerate its services for human well-being, by encouraging positive change in knowledge, skills, values and attitudes. There is no single definition of ESD, but most definitions today encompass integrating sustainable development in interdisciplinary learning pedagogy, covering social, economic and environmental aspects of formal, informal and non-formal curricula in order to safeguard the wellbeing of present and future generations.

Initial inspiration for Environmental Education came in the 18th century, when philosophers and educators such as Jean-Jacques Rousseau and Louis Agassiz respectively wrote on nature and the importance of learning about nature and the environment. But it was not until 1948 that the term ‘environmental education’ was first used publicly. From the 1960s until 1989, the concept of EE gained popularity through policies, conferences held by the United Nations, and national responses to suggested paths. This includes major events such as the UN’s first major international conference on “Human Environment” in 1972, which culminated in the Stockholm Declaration in the right to healthy environment, and the birth of the United Nations Environment Programme (UNEP).

It was in Agenda 21, which emerged from the Earth Summit in Rio in 1992, that a path for implementing sustainable development through education was suggested. Moreover, it was then that Environmental Education first began to be viewed as being contained within sustainable development. Today, ESD is seen as a key enabler for sustainable development and an integral element of quality education. According to UNESCO, the purpose of ESD in the long run is an ultimate transformation of the educational systems in such a way as to reorient societies in the direction of sustainable development. In line with this goal, the UN declared the Decade of Education for Sustainable Development (DESD) from 2005 to 2014. By the end of the decade, a deeper and richer understanding of ESD was attained, and incorporating sustainable development in all learning became the new goal, rather than treating it as a stand-alone subject.

The complexity of environmental sustainability and its strong correlation to society and economy has led to Environmental Education evolving to become an integral part of ESD. Higher education has begun offering academic programs that not only relate to the environment as a function and a process, but also programs that deal with the complexity of environmental sustainability such as renewable

energy, environmental health, environmental economics, environmental law and environmental policies. These specialties can allow new generations to develop alternative ways of sustainable living.

Despite the global responsiveness towards ESD since the 1960s, Arab countries only started taking note of it in the early 1980s, and started to be introduced slowly over the past ten years. In many Arab countries, the emergence of ESD has provided a stimulus to reform Environmental Education, and in some countries where there was no tradition of EE yet, or where it was marginally present, the ESD movement provided an opportunity for a jumpstart.

While significant progress in implementing ESD has been reported from the Arab region, the range of implementation activities varies greatly among countries. For example, ESD is now integrated into early childhood care and education in Kuwait and Oman, and Kuwait also reports a full integration of ESD in government education programming. Promising progress has also been reported in Jordan, Lebanon, Egypt, Qatar and Oman, including training on integrating ESD themes into curricula, incorporating ESD in university courses, and funding ESD-related scholarships and programs. On the other hand, ESD is only included in selected courses in Qatar and is rarely mentioned explicitly in education curriculums in Morocco.

Overall, despite promising achievements in ESD activities in the Arab countries on both the national and regional levels, the region seems to be lagging behind other parts of the world when it comes to the implementation of ESD. This is in part due to the dependence on international donors for the vast majority of the national and regional ESD initiatives and projects, rendering them unsustainable. A lack in regional and sub-regional cooperation and collaboration between Arab states on ESD is also evident. Addressing these challenges should be a priority for Arab countries aiming to move forward with transformative and impactful ESD, incorporating EE as a strong component.

In a report on issues and trends pertaining to ESD, published by UNESCO in 2018, six key themes were chosen to be discussed in detail, namely climate change, biodiversity, disaster risk reduction, poverty reduction, sustainable production and consumption and global justice. While climate change and biodiversity are significant environmental issues, certainly there are many more which cannot be neglected, such as water, energy, land-use and air quality. To avoid burying environment under other issues, it is necessary to treat the environmental contents of ESD in their own right, by preserving EE as a full-fledged component of ESD and not eliminating any reference to it.

III. ENVIRONMENT AND SUSTAINABILITY IN ARAB UNIVERSITIES

Universities in Arab countries are playing an increasingly important role in achieving the Sustainable Development Goals (SDGs) through their academic programs and research activities. Recently, several Arab universities ranked among the top 500 universities globally for their contributions towards the SDGs. During the last decade, Arab universities witnessed a rapid increase in programs related to environment and sustainable development. However, universities can further accelerate their contribution to sustainability by integrating all of the SDGs into their learning and teaching activities, research, and community initiatives.

In order to identify strengths and weaknesses of academic education on topics relating to the environment and sustainable development, a survey was conducted by AFED in the first half of 2019 to track environment-oriented university programs in the Arab region. The survey has covered the top-ranked universities at the national level in each of the 22 Arab countries, and included undergraduate, postgraduate, and other technical programs. It revealed that most Arab universities offer undergraduate and postgraduate environmental programs. Collectively, the 57 universities surveyed offer 221 degree programs on environmental topics.

In order to determine the distribution of the academic programs throughout the region, results were grouped into the five Arab sub-regions. This revealed that the highest number of environment-related programs (55) are found in the Levant (Iraq, Jordan, Lebanon, Palestine, Syria), followed by 42 programs in the GCC countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, UAE) and Yemen, 39 programs in North Africa (Algeria, Libya, Mauritania, Morocco, Tunisia), 26 programs in the Nile Valley (Egypt, Sudan), and 3 programs in the African Horn (Comoros, Djibouti, Somalia).

Academic programs related to the environment at Arab universities are distributed among various disciplines, ranging from Environmental Engineering and Water Resources Management to more policy-related disciplines such as Environmental Education, Environmental Law, and Environmental Policy. There are more scientific and technical degrees than degrees related to economics, education and policy. Most degrees were grouped under Environmental Sciences (34 degrees), followed by Environmental Engineering (30 degrees), Water Resources (29 degrees), and Renewable Energies (19 degrees).

At the bachelor's degree level, there is a general shift from classic Environmental Science that focuses on physics, chemistry, biology and math to a multidisciplinary approach that integrates engineering and health sciences. Only 23 percent of bachelor's programs fall under general Environmental Sciences. Other courses are titled with more specialized majors such as Environmental Engineering, Water, Energy, Agriculture and Geology.

Postgraduate programs are typically research-oriented. At higher levels of education, research becomes the tool to gain the skills as well as the deep knowledge necessary for Environmental Education and Sustainable Development. This reflects an emerging understanding that it is essential to promote scientific research to solve national and regional environmental problems. Arab universities are involved in sustainable development through a variety of postgraduate programs related to environment and sustainable development, most of which are offered by universities in Egypt, Lebanon, Jordan, Syria and the UAE.

The research output of Arab universities and research centers on environmental sciences makes up around 7 percent of the total output. Saudi Arabia and Egypt have been found to be the most active, both witnessing an increase in research output. In Saudi Arabia, published studies in environmental science have increased from 3.8 percent for the period 1999-2008 to 6 percent for the period 2009-2018. In Egypt, an increase was observed from 5.4 percent to 6.4 percent in the same period.

The environmental, social, and economic dimensions of sustainable development are all interconnected. It is important to integrate these three pillars of sustainable

development in the university programs. There is also a need to strengthen topics such as Environmental Law in law schools, and Green Economy in faculties of economics. Additionally, Ecological Footprint and Natural Capital Accounting could be included in economics studies. Such topics would enable graduates to increase their understanding of environmental management and policies.

Despite the increase in programs related to environment and sustainable development at Arab universities, more inter-academic and multi-disciplinary cooperation between different faculties of the same university and among different universities can further strengthen their roles in addressing environmental challenges. Student exchanges and more scientific collaboration programs between universities and research institutions could, for example, be initiated. Cooperation between educational institutes and other sectors, such as industry and business, is also needed, in order to effectively contribute to the Sustainable Development Goals.

In order to offer general information to fresh university students, and provide those who consider selecting a specific specialization related to the environment with adequate knowledge which might inform their choice, AFED report incorporates a syllabus for an introductory course on Environment and Sustainability. The syllabus, designed for first year students of all faculties, has been developed in cooperation with universities from across the Arab region.

IV. ENVIRONMENTAL EDUCATION IN ARAB SCHOOLS

Environment is quickly becoming an integral part of education in schools across the Arab region, with varying success in different countries. The emergence of new environmental challenges at an unprecedented rate in recent years has also led to the inclusion of new concepts and approaches in the curricula of Arab schools. Based on a survey carried out by AFED on school textbooks and curricula, it can be said that the role of education in protecting the environment and preserving natural resources is being more recognized. Pollution and waste gained more prominence, for example, and the management of dwindling natural resources led to the introduction of new concepts such as ecological footprint, at limited scale.

While sustainable development has become a standard topic in textbooks of most Arab countries, topics such as green economy and green growth are generally lacking. Still, such concepts have been spotted in certain countries, such as ecological footprint as part of the geography curriculum in Syria, and green economy as part of the new high school programs in Lebanon.

The AFED survey found that the environmental topics most popular in Arab schools are ecosystems, pollution, natural resources and sustainable development. In contrast to the inclusion of the rather new topic of sustainable development, the survey found that climate change was absent or not adequately discussed in 40 percent of the countries covered. Natural disasters, which are impacted by changes in environmental conditions and themselves exert critical impact on the environment, were virtually absent from the curricula of half of the countries, and weak in the other half where the concept was covered. Classes in which environmental concepts were covered most were grade 5 – the last of the elementary level – and grade 11, before the last year at the high school level.

Grade 6, the first intermediate class, was the weakest in coverage of environmental concepts.

Interestingly, across the region, environmental topics are no longer restricted to science, geography and civics books, but have started to become part of other subjects including languages, literature, history and economics. In most cases, curricula covered aspects of personal action to protect the environment and to preserve and enhance natural resources, such as instructions to consume water and electricity in a sensible manner, recycling and tree planting. Fieldwork and nature expeditions have started to be part of environmental education in some Arab countries, and students are encouraged to engage in community work to champion environmental causes.

To conclude the survey on Arab schools' curricula and textbooks, an analysis was prepared to identify the areas of strength and weakness, in view of bridging the gaps and enhancing the system. The analysis covered the status of eight main environmental topics in Arab school curricula, namely: ecosystems, pollution, natural resources, climate change, solid waste, biodiversity, sustainable development and natural resources. All in all, it can be said that environmental concepts have been gaining ground, although big differences exist among countries regarding topics included, the depth of the content covered, and methods of delivery.

The environmental content of school curricula needs to be strengthened in depth and breadth. Environmental aspects in school curricula should be discussed in the context of the Sustainable Development Goals (SDGs), in such a way to relate environment to the social and economic aspects. Sound management of natural resources, to achieve sustainability, should be given priority. This can be achieved through the introduction of the concept of ecological footprint, alongside options for green growth, with a focus on Arab countries. Extracurricular activities and community work should also be enhanced.

V. CONCLUSION AND RECOMMENDATIONS

The Arab region is faced with many environmental challenges including the management of available natural resources, the extraction and production of oil and gas, water shortages, aridity and drought, various types of pollution, as well as climate change and its impacts. Education is a key tool in tackling these environmental issues, by promoting knowledge on environment and sustainable development, which can lead to action. While it is necessary to approach environment in the broader context of sustainable development, the specific topics of Environmental Education should not be lost. After all, concern about the environment was the main factor that triggered the concept of Sustainable Development.

An introductory course on environment and sustainability should be offered to first year university students from all faculties. Interfaculty programs need to be developed to reflect the complexity of environmental challenges in relation to social and economic factors. Evolving issues should be integrated into university studies, such as environmental law in law schools, and green economy, incorporating ecological footprint, in economics. Universities should help in setting criteria to incorporate natural resource accounting in the national accounts and budgets, and introduce the concept in public administration and development economics

studies. Furthermore, academic research on environment and sustainability should connect more to the business and industry.

It is critically important that Arab school curricula are designed to stimulate student discussions about environmental issues and the effects of human behavior on the natural environment and sustainable development. Contents of school curricula need not to be restricted to nature, pollution and health-related issues, but should go beyond to cover resource management in its broader sense, and strongly include cross-cutting issues such as climate change and sustainable consumption. Environmental education needs to be integrated with all topics of sciences, including applied and social sciences, alongside humanities, at all levels, starting from early childhood. It should be designed to adequately prepare students to be responsible citizens, and to provide them with sufficient knowledge to place them on the right path for higher education and professional work situations.

To attain the above goals, the Arab region must encourage Environmental Education with additional funding, research and means of implementation. Academic programs should accelerate scientific research that provides solutions to regional environmental challenges. Moreover, assessments of environmental initiatives should be performed in order to address shortcomings and improve the quality of environmental education programs. Ultimately, Environmental Education should be encouraged in such a way that it will become a core and inherent part of all Arab curricula rather than an optional and rare elective.



ENVIRONMENTAL EDUCATION AND EDUCATION FOR SUSTAINABLE DEVELOPMENT: EVOLUTION AND GLOBAL TRENDS

AHMED GABER, DJIHAN HASSAN, HAYAM EL SHERBINY, MARIAM WILLIAM



I. INTRODUCTION

Environmental Education (EE) has several definitions, perhaps the most important of which was given by UNESCO: “A learning process that increases people’s knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action” (Borah, 2007). Today, a distinction is rarely made between EE and Education for Sustainable Development (ESD), where both terms are used interchangeably with little note to their fundamental meanings and the differences between them. Arguably, there are many similarities between EE and ESD, particularly with reference to their purpose, mechanisms and the direction of their evolution. However, while in its strictest terms EE encompasses issues related to natural resources such as water, energy, agriculture, biodiversity, rural development, sustainable urbanization and disaster prevention and mitigation, the environmental aspect is only one dimension of ESD. ESD also encompasses socio-cultural issues that tackle human rights, peace and human security, gender equality, cultural diversity, and others, in addition to economic issues that address poverty reduction, corporate responsibility and accountability and re-orienting the market economy.

EE predates ESD and is a term used to identify the process through which individuals get to explore issues on the environment in an interactive and objective manner. EE can be considered a continuous process of open education in order to respond to the world’s growing awareness about environmental problems. The term is often used to imply education within the schooling system, from primary to post-secondary. It is also sometimes used in a broader sense to encompass all efforts made to educate the public and other audiences (Karama, 2016). This chapter presents the history of EE, its development as well as its evolution to be an integral part of ESD.

The aim behind ESD was to modify education to enable a more sustainable and just society for all, by encouraging positive change in knowledge, skills, values and attitudes. There is no single

definition of ESD, but most definitions today encompass integrating sustainable development in interdisciplinary learning methodologies, covering social, economic and environmental aspects of formal, informal and non-formal curricula in order to safeguard the wellbeing of present and future generations. ESD supports holistic and transformational education, but it has not always been understood in such terms and has evolved since its initiation in the late 1980s/early 1990s, going through several key changes and milestones over the years. The history of ESD, along with the major milestones, is discussed while addressing global trends.

This chapter aims at providing an understanding of EE and ESD, their evolution through the years, their incorporation in education systems, as well as current trends. This chapter thus presents, discusses and analyses the following topics:

- EE and ESD and their evolution throughout the years, including key milestones worldwide.
- The relationship between EE and ESD, as well as successful case studies.
- Current trends in ESD, education content and competency based education, including the various pillars for achieving sustainable performance.

II. ENVIRONMENTAL EDUCATION AND ITS EVOLUTION

According to the United States Environmental Protection Agency (EPA), EE is a process that allows individuals to explore environmental issues, engage in problem solving and take action to improve the environment. This ultimately helps individuals gain a deeper understanding of environmental issues. EE consists of five main components:

- Awareness and sensitivity to the environment and environmental challenges.
- Knowledge and understanding of the environment and environmental challenges.
- Attitudes of concern for the environment with a motivation to improve environmental health.
- Skills to identify and resolve environmental challenges.
- Participation in activities that help resolve environmental challenges.



Some EE experts agree that EE may have its origins in the 18th century, starting with philosophers such as Jean-Jacques Rousseau (1712-1778) who felt that education should focus more on the environment. Shortly after, came educators such as Louis Agassiz (1807-1873) who believed that students should “study nature, not books” (McCrea, 2006). Today, some environmental scientists and engineers consider these as milestones for the development of EE.

Other EE experts believe that EE started during the movement to study nature, which started in the early years of the 20th century, or as a result of the 1930s’ education program on the conservation of the environment called the “Dust Bowl” era; both originating in the USA (McCrea, 2006). Researchers in the field often refer to this era (that covers the mid-decades of the 20th century) as the era of conservation. From that point forward, the movement on EE kept growing and developing diversely. It is important to note that EE was primarily an American concept that gained international traction with time, particularly in the 1970s, when the United Nations Education,

Scientific and Cultural Organisation (UNESCO), in cooperation with the United Nations Environment Programme (UNEP), held an intergovernmental conference on EE in Tbilisi, the Republic of Georgia, in 1977.

The evolution of EE can be addressed by discussing four main eras:

A. Initial inspiration (18th century to 1920s)

Starting from the 18th century until the 1920s, philosophers and educators such as Jacques Rousseau and Louis Agassiz respectively wrote on nature and the importance of learning about nature and the environment. Another significant author, Wilbur Jackman, wrote his book *Nature Study for the Common School*, where the movement on nature study was first defined by the end of the 19th century (1891) (McCrea, 2006).

With the start of the 20th century and specifically in 1905, the use of the term ‘environmental

education' was first rejected in the USA by Liberty Hyde Bailey, a noted botanist, writer, college administrator, and educator, "because he thought it was imprecise, theoretical, pompous, and would always need to be explained" (McCrea, 2006). A significant movement by John Dewey was recognized at that time, which promoted learning by experience. The goals and mechanisms suggested by Dewey, were the same as the ones promoted and reinforced in EE and later in ESD.

In 1908, another movement sprang with Bailey, who established the American Nature Study Society and became its first president. Later in the 1920s, the field of Ecology, or the study of nature, became a scientific field of study (McCrea, 2006).

B. Conservation education era (1930s to 1954)

During the early 1930s, the US experienced an environmental crisis known as 'Dust Bowl', a name that was given to a state of drought that struck the region after several years of over-

cultivation in the 1920s and improper land management. Dust storms swept the country, causing wind erosion that forced thousands of families to leave, especially during the 'Great Depression' (early and mid-1930s) (McCrea, 2006). Consequently, the need for better natural resource management arose, which emphasized the importance of the concept of 'conservation'.

In 1935, the National Education Association presumed a leading role in school education on conservation. At that time, the state of Wisconsin became a role model for schools nationwide and required its pre-service teachers to have suitable backgrounds in conservation education. In 1946, the University of Wisconsin offered a degree in conservation (McCrea, 2006).

In 1948, the term 'environmental education' was first used publicly by Thomas Pritchard at the International Union for the Conservation of Nature in Paris. By the 1950s, the concept of conservation had spread, and conservation education seemed to be taking a more formal role in the Americas, leading to the launch of the



Association of Interpretative Naturalists (what is today known as the 'National Association for Interpretation') in the US (McCrea, 2006).

C. The foundation for modern EE

The 1960s mark the beginning of the modern era, which continued until 1989. During this period, the concept of EE gained popularity through policies, conferences held by the UN, and nations' responses to suggested paths. The following are considered to be the most significant events/initiatives that led to changes in the perception, spread and evolution of EE during the modern era (McCrea, 2006):

- In 1969, the National Environmental Policy Act was passed in the USA (P. L. 91-190) which aimed to: "Encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality." At the same time, the Journal of Environmental Education was founded, and the term "environmental education" was given a formal definition.
- In 1970, the National Environmental Education policy act was redeveloped and passed by the US congress (P. L. 91-516). It created the institutional infrastructure within the USA to support integrating EE in the education system. Additionally, in 1971, the National Association for Environmental Education (now the North American Association for EE) was founded (McCrea, 2006).
- In 1972, the UN held the first major international conference on "Human Environment" in Stockholm, Sweden, which demonstrated a major drift in the development of policies related to global environmental issues. The conference resulted in the Stockholm Declaration, which was made up of 7 proclamations and 26 principles, meant "to inspire and guide the peoples of the world in the preservation and enhancement of the human environment". Moreover, the Belgrade Charter

(1975) resulted from the International Workshop on EE built on the Stockholm Declaration and added goals, objectives and guiding principles for EE programs.

- In 1975, UNESCO and UNEP led the international EE programme, which ended in 1995.
- In 1976, soon after setting out a vision and giving practical guidance on how to mobilize education for environmental awareness, UNESCO launched the EE newsletter.
- In 1977, another major international conference was held by UNESCO in cooperation with UNEP on EE. This was the first in a series of International Conferences on EE (ICEE) in Tbilisi, Georgia, and resulted in the Tbilisi Declaration. Essentially, the Tbilisi Declaration updated and clarified the Stockholm Declaration and the Belgrade Charter, by including new goals, objectives, characteristics and guiding principles for EE (McCrea, 2006).
- 1987 witnessed two major events: The first was the formal introduction of the concept of sustainable development (SD) in the Brundtland Report by the World Commission on Environment and Development (WCED), entitled "Our Common Future". The report made clear that SD entails environmental conservation, social development, and economic development (WCED, 1987). In this sense, it created the first inexplicit link between EE and what will later be termed ESD. The introduction of SD became a turning point in the development of education, and this will be introduced in more details in section 3.1. The second event was the 2nd ICEE held in Moscow, organized jointly by UNESCO and UNEP. The conference covered the concept of EE and environmental training, and addressed the concept of SD that had been introduced in the Brundtland Report.

D. Present programs and building for the future (1992 to 2002)

Debates on environmental education started soon after the concept of sustainable development was formally introduced and continued to

WHAT PISA TELLS US ABOUT THE ENVIRONMENTAL AWARENESS AND OPTIMISM OF 15-YEAR-OLDS IN OECD COUNTRIES

Alfonso Echazarra and Francesco Avvisati

The Programme for International Student Assessment (PISA) tests the extent to which 15-year-old students, near the end of their compulsory education, have acquired key knowledge and skills that are essential for full participation in modern societies. The assessment examines how well students can apply their knowledge and skills in unfamiliar settings, both in and outside of school. In addition to the assessments in reading, mathematics, science and innovative domains, PISA asks students, school principals, parents and teachers to complete a background questionnaire. Students and parents answered questions about the environment in PISA 2006 and 2015 cycles.

As part of PISA, students were asked how informed they are about seven environmental issues: the increase of greenhouse gases in the atmosphere, the use of genetically modified organisms, nuclear waste, the consequences of clearing forests for other land use, air pollution, the extinction of plants and animals, and water shortage. On average in 2015, across the OECD countries, the share of students who reported that they are informed (“I know something about this and could explain the general issue”) or well-informed (“I am familiar with this and I would be able to explain this well”) was the highest for air pollution (83 percent) and the extinction of plants and animals (79 percent), and lowest for the use of genetically modified organisms (42 percent). Despite global efforts to address global warming, such as the Paris Climate Conference and agreement, only 64 percent of students reported to be informed about the increase of greenhouse gases in the atmosphere.

Comparing these results with those of PISA 2006 shows that environmental awareness is increasing moderately

among 15-year-olds. In the nine years from 2006 to 2015, and for three of the four environmental issues cited in both cycles of PISA, the share of students who reported that they are environmentally aware increased moderately. For instance, the percentage of students who stated that they are informed or well-informed about the increase of greenhouse gases in the atmosphere rose from 57 percent in 2006 to 64 percent in 2015, and a similar percentage-point increase was observed when students were asked about the use of genetically modified organisms.



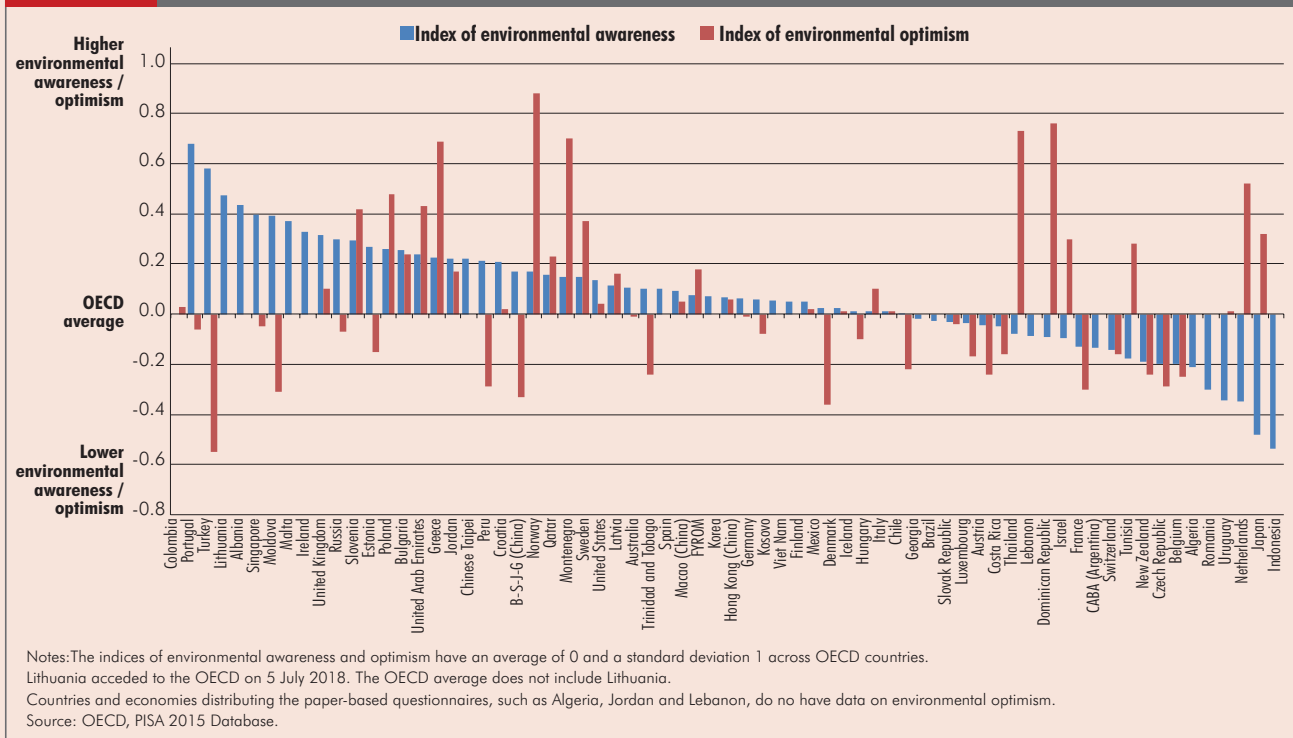
However, students are not much more optimistic about the environment today than they were a decade ago. Across OECD countries, the share of students who are optimistic about the fate of the planet – those who reported that the problems associated with environmental issues would get better over the next 20 years – remained relatively stable. In 2015, 15-year-olds were slightly more optimistic than their counterparts in 2006 about the problems associated with the clearing of forests, nuclear waste and air pollution, but more pessimistic about the availability of water in the future.

That a greater awareness has not led to greater optimism is hardly surprising given that students who reported being knowledgeable about environmental issues were considerably more likely to consider that these problems would get worse in the future. For instance, 15-year-old students who claimed to be informed about the increase of greenhouse gases, water shortages and air pollution were about 40 percent more likely to believe that these problems would worsen over the next 20 years.

While teenagers are not becoming more environmentally

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FIGURE B1 ENVIRONMENTAL AWARENESS AND OPTIMISM AMONG 15-YEAR-OLD STUDENTS, PISA 2015 (BASED ON STUDENTS SELF-REPORTS)



optimistic, they are more optimistic than their parents, at least in the majority of the countries/economies that distributed the PISA parent questionnaire. In all but three of these 15 countries/economies, PISA data show that students were more optimistic than their parents about people's ability to solve problems related to five major environmental issues. Only in Hong Kong (China) and Macao (China), students were more pessimistic than their parents about the environmental outlook over the following 20 years.

Environmental awareness and optimism is in many ways affected by the characteristics of students and schools. For instance, scientifically-minded students – that is, high-performing students who participate in science activities, expect to pursue a career in science and are interested in broad science topics – and those in schools offering science activities showed greater environmental awareness. For its part, boys were more optimistic than girls about the environment, and high-achieving students more pessimistic than low-achievers. The number of science activities in which students participate and their exposure to enquiry-based teaching were also positively related to environmental optimism. Most people agree that the environment has

deteriorated over the past few decades, even if there is an ongoing debate about the magnitude and consequences of this degradation. Fortunately, there are plenty of public and private initiatives to protect the environment, and students around the globe are increasingly aware of the most important environmental problems affecting the planet today. If we want to preserve the environment for future generations, it is essential that students become more aware of the threats to the environment and use this knowledge to adopt sustainable lifestyles, that we lower the cost of action and search for innovative solutions to environmental problems.

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spread. It was in Agenda 21 (that was published after the UN Conference on Environment & Development in Rio de Janeiro in 1992) that the means of implementing SD was suggested through education. Moreover, it was then that EE first began to be viewed as being contained within ESD (The United Nations Conference on Environment and Development, 1992).

Agenda 21 resulted in a conceptual shift in the understanding of EE from a stand-alone notion to one that can be fully integrated in ESD (presented in detail in section 3). The main reason is perhaps that ESD considers the environment as a “resource for economic development or shared resource for sustainable living” (Kopnina, 2012). ESD has since become the goal for global programs, such as the Decade of Education for Sustainable Development (DESD) spanning between 2005 and 2014. DESD was declared by the United Nations in 2002, resulting in a transformation from EE to ESD. But despite the fact that a global trend of convergence between EE and ESD can be seen, it has not been fully reflected in all global programs, projects and initiatives. Instead, it has been applied in varying degrees by different nations and regions. Figure 1 presents a timeline indicating key milestones for the evolution of EE.

III. EDUCATION FOR SUSTAINABLE DEVELOPMENT AND ITS EVOLUTION

Education was linked to sustainable development shortly after the introduction of the term and its most widely accepted definition, published in the Brundtland Report: “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987). The association between education and SD was not made right away, but was rather presented in terms of knowledge sharing, increasing public awareness, and innovation. This was clear in three out of 27 principles listed in the Rio Declaration on Environment and Development (1992) on sustainability:

- **Principle 10:** Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate

access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.

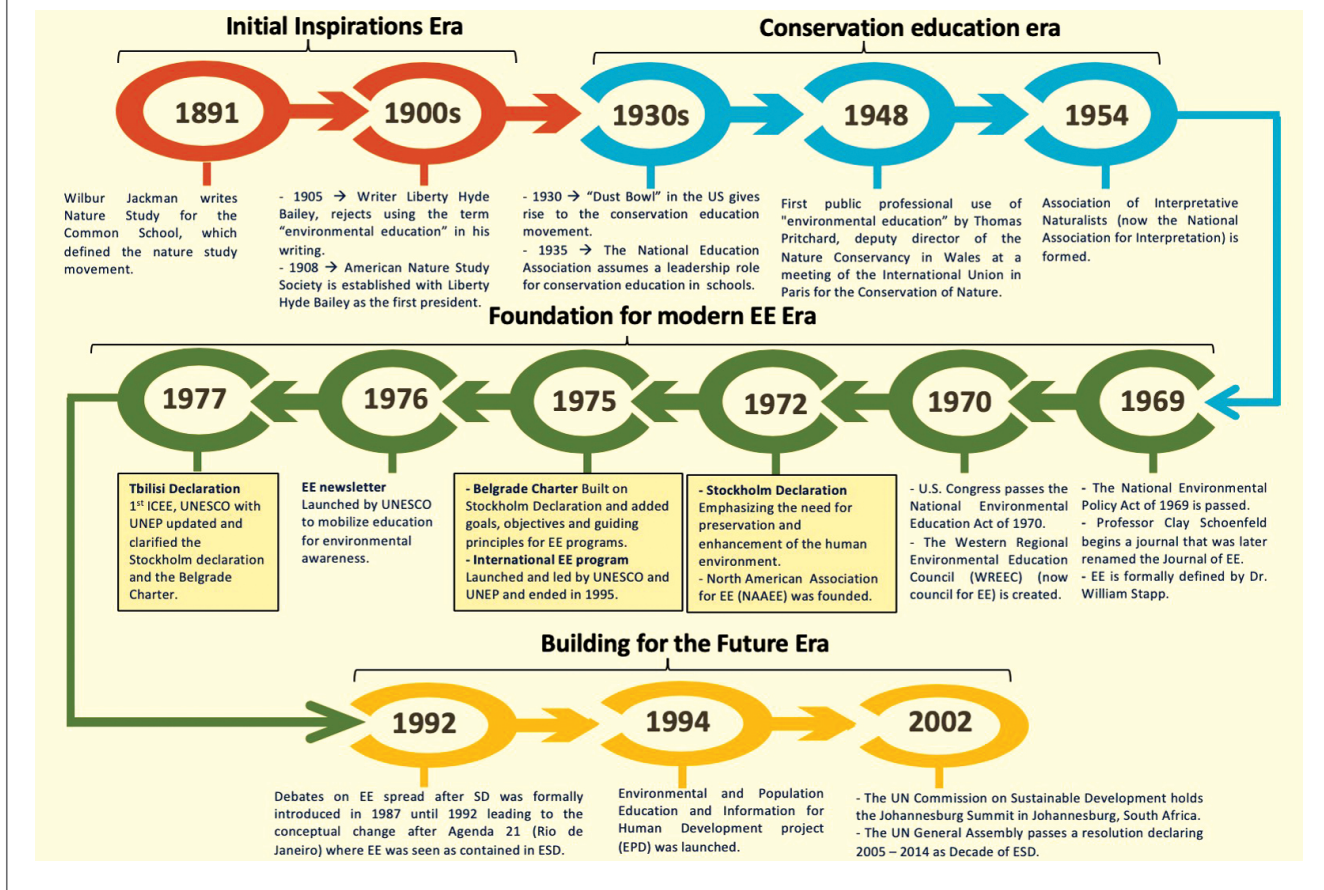
- **Principle 16:** National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment. Sustainable development requires better scientific understanding of the problems. Nations should share knowledge and innovative technologies to achieve the goal of sustainability.
- **Principle 21:** The creativity, ideals and courage of the youth of the world should be mobilized to forge a global partnership in order to achieve sustainable development and ensure a better future for all.

The document defines four drives of ESD as follows:

1. Improving access to quality basic education.
2. Reorienting existing education to address sustainability.
3. Increasing public understanding and awareness of sustainability.
4. Providing training for all sectors of the economy.

Many researchers believe that the SD concept can be transformed from theory to practice by integrating it into education. It is subsequently believed that SD calls upon the educational community to endorse SD as the concept that holistically incorporates environmental stewardship and other similar concepts (Venkataraman, 2009). In that issue, the UN has clearly addressed education as key for the implementation of sustainability in Chapter 36 of Agenda 21, released following the Rio Declaration (The United Nations Conference on

FIGURE 1 KEY MILESTONES IN THE DEVELOPMENT OF EE



Environment and Development, 1992). It was also stated in the identification of DESD that ESD can help all individuals reach the knowledge, prospects, values and skills they need to actively incorporate in the process of improving the quality of life both on the local and global scale. (DESD, 2008; Venkataraman, 2009).

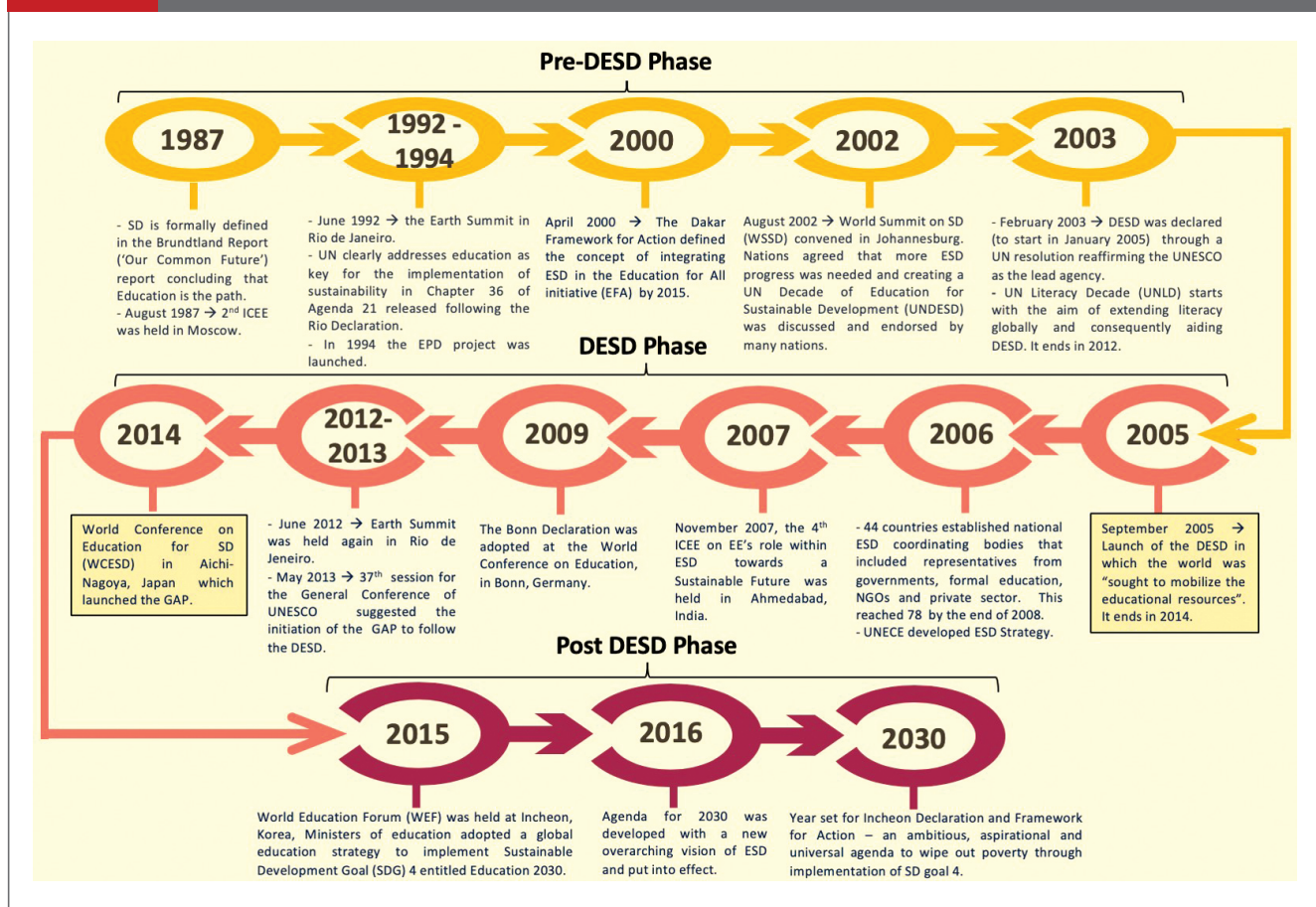
Today, ESD is seen as a key enabler for SD and an integral element of quality education. It is presented, explained and endorsed by many institutions and organizations, led by UNESCO (UNESCO, 2019). According to UNESCO, the purpose of ESD in the long run is an ultimate transformation of the educational systems in such a way as to reorient societies in the direction of SD. ESD cannot be seen as a mere add-on to existing curricula or educational practices, but should rather entail major adjustments in the teaching and learning systems and structures of education globally (Buckler & Creech, 2014).

Fourteen global milestones relating to the progress and development of the ESD have passed, which are discussed through three phases (Figure 2): pre-DESD i.e. the timeframe which predates the UN Decade of Education for Sustainable Development (DESD), the timeframe covering the DESD and the Global Action Program (GAP) and the timeframe after the DESD and GAP.

A. Pre-DESD (1989 – 2003)

- **1992:** According to the UN knowledge platform, more than 178 countries collaborated, through a global partnership, to follow Agenda 21 as a "comprehensive plan of action" achieving sustainable development in both human lives and the environment. This occurred in the Rio Earth Summit in June 1992, after which the UN Secretary-General then appointed the UNESCO responsible for Chapter 36 of Agenda 21. In the next few

FIGURE 2 KEY MILESTONES IN THE DEVELOPMENT OF ESD



years, UNESCO established the conceptual framework needed to reorient the currently existing education, public awareness and training systems entirely towards the concept of 'sustainable development', instead of merely adding 'sustainability' as another field or subject in education.

- **1994:** UNESCO launched a project titled *Environmental and Population Education and Information for Human Development* (EPD). EPD was planned with the aim of reaching "people-centred equitable and sustainable development, through an integrated approach to environment, population and development issues" (Leicht, er, & Julia, 2018).
- **1997:** The third ICEE conference was held in December 1997 titled *Environment and Society: Education and Public Awareness for Sustainability* at Thessaloniki, Greece. The conference resulted in a declaration which reaffirmed that sustainability could only be achieved through exerted efforts by involved sectors being co-ordinated, integrated, and directed towards the goal. Proper and quality education and public awareness are required to accomplish rapid and radical change of behaviour and lifestyle, which also includes alteration in the patterns of consumption and production. It was declared that education and public awareness are necessarily "one of the pillars of sustainability, together with legislation, economy and technology" (UNESCO, 1997).
- **2000:** The *Dakar Framework for Action, Education for All: Meeting our Collective Commitments* (2000) was published and adopted at the World Education Forum held in Senegal during April 2000. It is based on an

extensive evaluation of the state of basic education around the world.

- **2002:** The World Summit on Sustainable Development (WSSD) convened in Johannesburg, and since then it has been widely recognized that education plays a major role in the realization of the ‘vision of sustainability’, and through which the message of SD, including all its pillars, can be reached (UNESCO, 2015). Nations agreed that more ESD progress was needed, and creating a UN Decade of Education for Sustainable Development (UNDESD) was discussed and endorsed by many nations. In February 2003, the UN Decade (starting on 1 January 2005) was declared through a resolution by the UN General Assembly (57/254) reaffirming the UNESCO as the lead agency for promoting the decade, and entrusting it with developing a draft international implementation scheme, clarifying the relationship of UNDESD with existing educational processes, particularly the Dakar Framework for Action. As the decade neared its ending, nations called for UNESCO to design an enduring strategy that renders the continuation of the ESD work that had already started.
- **2003:** The UN, as proclaimed in its 56th session, launched The United Nations Literacy Decade (UNLD). The aim was to aid the DESD through “sustainable literate environments”, with a goal set that literacy ought to be extended globally through Education for All (EFA), a necessary step for ESD. Education was therefore to be provided to 860 million illiterate adults and the 113 million children not attending school, starting with the most disadvantaged groups. The UNLD ended in 2012 (UN Press Release, 2003).

B. DESD (2005 – 2014)

- **2006:** 44 countries had national ESD coordinating bodies that included representatives from governments, formal education, NGOs and in some cases the private sector. By the end of 2008, at least 78 countries had such bodies. The scope covered by these national coordinating bodies varied from country to country, and included coordinating ESD in formal primary and secondary education, streamlining it with existing EE programs, addressing non-formal and informal learning, professional development of teachers, etc. (Wals, Kieft, Tröften, & Westin, 2010). It is worth noting that even though this was considered a significant achievement in a short period of time, the presence or absence of national bodies did not necessarily correlate with a strong, non-existent or weak development of ESD.
- **2007:** In November 2007, the fourth International Conference on EE was held at the Centre for EE in Ahmedabad, India, sponsored jointly by UNESCO and UNEP. The conference aimed to track the development of EE since the Tbilisi conference in 1977 and its role within ESD. The Ahmedabad declaration was drafted in the context of DESD, with a ‘call for action’ and a banner of ‘education for life’. The UN International Implementation Scheme for DESD reinforced recommendations that had been reached in the third ICEE (SAGE, 2007). It is worth noting that the third ICEE focused on ESD in terms of a global roadmap/agenda with sectorial strategies and action plans to facilitate progress towards achieving the objectives of ESD. It created an effective forum for stakeholders to share their experiences and create wider and stronger networks.
- **2009:** The Bonn Declaration was issued after the World Conference on Education for Sustainable Development (WCESD) held in Bonn, Germany in 2009, endorsing ESD as a necessary shift for education to reach actual change. It was also highlighted that persistent global crises such as poverty, inequality, climate change and economic crises are still indicators of unsustainability, and ESD key to addressing such problems (SAGE, 2009).
- **2012:** UN member states agreed “to promote ESD and to integrate sustainable development more actively into education beyond the UNDESD” (UNESCO Member States, 2014).
- **2013:** In November 2013, UNESCO, as the lead agency of ESD, endorsed a follow-up educational program to the DESD, namely

UN ENVIRONMENT PROGRAMME PERSPECTIVE ON ENVIRONMENTAL EDUCATION

Sami Dimassi

The evolution of humankind is largely dependent on the quality of the environment and the resources it provides, with the natural environment playing a vital role in ensuring the survival of present and future generations. Our obligation as a society is to leave behind a better world for our children. At the UN Environment Programme, we believe that the best way to ensure a better, healthier planet is to equip today's youth with the knowledge and leadership skills to meet tomorrow's environmental challenges.

The 2030 Agenda for Sustainable Development, adopted by all United Nations member states in 2015, provides a shared blueprint for peace and prosperity to achieve a better and more sustainable future for all. The 17 Sustainable Development Goals (SDGs) underscore that improving health and education, reducing inequality, and spurring economic growth go hand in hand with tackling climate change and preserving our oceans, ecosystems and forests. It has become undoubtedly apparent that a vital aspect of this drive for a sustainable and prosperous future lies in the integration of environment and sustainability at all levels of education.

SDG 4 (Quality Education) stipulates that obtaining a quality education is the foundation to creating sustainable development and environmental security. In addition to improving quality of life, access to inclusive education can equip people with the tools required to develop innovative solutions to the world's greatest problems. With a world population of 7.5 billion and limited natural resources, we, as individuals and societies, need to learn to live together sustainably. We need to take action responsibly, based on the understanding that what we do today can have implications on the lives of people and the planet in the future.

Education on environment and sustainability empowers people to change the way they think and work towards a sustainable future. There is growing international recognition of environmental education being an integral element of quality education and as a key enabler for sustainable development. This can be seen in SDG Target 4.7, which commits that by 2030 "all

learners shall acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development". Moreover, SDG 12.8 aims to "ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature".

The environmental legacy of today's youth will be determined by the lifestyle choices they go on to make. This means that it is imperative that starting from a young age, Arab youth are encouraged to adopt behavioural changes through the integration of environment and sustainability into their education. This can be done by raising awareness on food waste reduction, the impact that single-use plastics have on our ecosystems, and the benefits of sustainable consumption and production. Importantly, this education needs to not only inspire a behavioural shift, but should enable it by teaching youth what to do and how to get there.

Some countries in the Arab region have already adopted the above approach in a multi-dimensional manner, allowing environmental education to benefit their economies and inspire their people. The United Arab Emirates, for example, recently announced a new program aimed at raising public awareness on preserving the local environment, with the joint objectives of ensuring the sustainability of its biological diversity and natural resources, whilst creating new economic growth by positioning the UAE as an important ecotourism destination globally. Additionally, UN Environment Programme worked with the government of Bahrain to integrate climate change and environmental education into the elementary level school curriculum. This was done in response to public opinion polls that found that 85 percent of the population believed climate change was a severe issue that deserved to be addressed, and that there was not enough public awareness on the phenomenon.

The integration of environmental education into school

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curricula will highly impact the growing youth population. One out of every five persons in the Arab region is between 15 and 24 years old, and more than half of the population is below the age of 25. This represents an important wealth for the region, especially if these young people can be equipped with the skills to engage with the growing green economy. UNEP has estimated that up to 60 million new jobs in the green economy could be created by 2030. Renewable energy generation, building and energy efficiency, roll out of electric vehicles and other low-carbon industries open up the potential for 24 million jobs for 2030. Opportunities in these sectors are predicted to offset job losses of 6 million in sectors like oil drilling and coal mining, creating a net gain of 18 million. On top of this figure, a further six million jobs are expected to result from the growth of the Circular Economy.

The promotion of environment and sustainability in tertiary educational institutions in the Arab region can provide an opportunity to address the youth employment challenge whilst simultaneously preserving the environment and increasing climate resilience. But a sustained and determined push is needed to achieve this goal. The quality of higher education in the Middle East and North African (MENA) region is amongst the lowest in the world. Only three Arab universities are on the list of the top 500 universities in the world, and none are in the top 200. Employers in the region complain that university graduates lack the skills needed to work in the global marketplace. As such, it is imperative that universities adapt and offer curricula that will prepare the future workforce with the skills and knowledge needed to pursue green jobs and boost the green economy through the integration of environment and sustainability into education.

UN Environment Programme has been working towards the integration of environment and sustainability into tertiary education systems for 30 years and has created a Global University Alliance, linking and supporting over 800 universities around the world. The Alliance creates and offers educational content, courses and materials that can be shared with student populations and technical staff. Regionally, the Youth and Education Alliance (YEA!), formerly known as GUPES, was launched in 2016 and offers great potential. The program, which aims to promote the integration of environment and sustainability concerns into teaching, research, community engagement, the management of universities, and the greening of university infrastructure



and operations, was developed in such a way as to allow regionally-specific thematic areas become priorities in implementation. For the Arab region, for instance, one of the core pillars within YEA! is 'Greening University Curricula'. It entails the coordination of environment and sustainability seminars for universities, business and industry communities with the aim of inspiring curriculum review and realignment towards sustainable development in response to job market demands for green skills. The tools are therefore available for the integration of environment and sustainability in education. What appears to be lacking in the Arab region is the sustained drive to make these changes.

Education on environment and sustainability is core to the United Nation's holistic approach to ensure a better and more prosperous future for all. Whilst the current trends displayed by policy makers and leaders within the Arab region are positive, the integration of environment and sustainability into education at all levels needs to be acted upon as an operational priority, with the understanding that the benefits it produces not only contribute to the global fight against environment degradation and climate change, but can also be felt at home with shrinking youth unemployment and growing national economies.

BOX 1

BRAZIL

In 1981, the Brazilian government issued the 'National Environment Policy', or Law 6938/81, which addresses EE stating that "EE at all levels of education, including community education, intends to enable them [Brazilian citizens] to participate actively in environmental protection" (Trajber & Mochizuki, 2015). Later in 1988, the Brazilian government declared, through Chapter VI and Article 225 of the Brazilian constitution, citizens' right to a healthy environment and a healthy living. It emphasized the role of the public authorities and the need for education to tackle the issues of a balanced environment and healthy living by promoting EE for public awareness.

In 1997 and 1998, the Ministry of Education implemented National Curriculum Parameters (PCN) for elementary and secondary education, in which environmental issues were highly recommended to be incorporated in all subjects covered under basic education in a "cross sectional" manner. This includes using interdisciplinary approaches with diverse themes so that all educators may share their experiences in the field and none would be left unaware or short of knowledge on all EE related issues and updates (Obara et al., 2015). Most importantly, in 1999, the National EE Policy, aka PNEA, was established by the Brazilian

government through Law 9795/99 in an effort to advance EE and with the aim of reaching sustainability through EE (Obara et al., 2015; Trajber & Mochizuki, 2015).

In addition to efforts exerted through legislation, action research was also implemented as an initiative to mobilize progressive advancements through education. In the period from April 2012 to December 2013, researchers and the State University of Maringa (UEM) graduate students launched the "program for communication, environmental education, and social mobilization" taking the river basins in Brazil as the theme. Three major goals were set for this program; 1) continuing education for teachers; 2) awareness and training of the various segments of society; and 3) preparation of teaching aids and promotional material (Obara et al., 2015).

Research on this program showed the urgent need for the education and necessary training of educators and civil society, for them to be actively involved in achieving progress. Nowadays, progress relating to EE and ESD in Brazil is perhaps correlated with initiatives in terms of policies, strategies, and plans intended to address the issue of climate change through EE and ESD.

the Global Action Programme (GAP). The GAP was coordinated by a large number of stakeholders, including professionals in education and SD, as a tool for nations worldwide to implement ESD. The Action Program was initiated in 2014 and approved by the UNESCO General Assembly in 2017.

- **2014:** At the World Conference on Education for Sustainable Development (WCESD) that was held in Aichi-Nagoya, Japan under the banner of *Learning Today for a Sustainable Future*, a declaration containing 360 commitments was adopted by ministers of education, calling for urgent action to mainstream ESD and to incorporate ESD in the post-2015 development agenda (Lotz-Sisitka, 2014). At this conference, UNESCO launched the Global Action Programme on ESD (GAP) stressing on five priority areas for action, namely policy support, whole institution approaches, educators, youth,

and local communities (UNESCO Member States, 2014).

Due to their importance in shaping ESD, both the DESD and the GAP are discussed in more detail in the following subsections.

i. Decade of Education for Sustainable Development

The UN declared the DESD as the ten years of global action from 2005 to 2014. It was the decade in which the world was "sought to mobilize the educational resources" in such a way as to reach a sustainable future worldwide (UNESCO, 2015). ESD at that time was primarily understood as changing curricula to contain sustainable development as a major topic. However, by the end of the decade, a deeper and richer understanding of ESD was attained and including SD as a stand-alone subject was no

BOX 2

DENMARK

The active commitment of Danish educational policy makers and teachers has greatly affected Danish education, making Denmark one of the lead countries in ESD today. In the early stages, and during the eras of EE, this was manifested by the involvement of autonomous teachers concerned with the environment who were able to convince other teachers to incorporate environmental issues in their objectives and curricula (Rolls, Madsen, Roug, & Larsen, 2015).

For EE to formally be at the core of education, relevant objectives and curriculum guidelines needed the backing and involvement of the Ministry of Education. In 1976, the Educational Act addressing curriculum guidelines for geography and biology stated: “The teaching shall contribute to students’ understanding of people’s living conditions and opportunities and in that way provide a basis for deciding about local and global environmental problems” (Rolls et al., 2015). Educational policy makers were concerned with exposing Danish citizens to Danish society and environment, emphasizing the need for collaborative decision-making. The same Act also introduced modern/contemporary studies as a subject, which addresses contemporary issues of high significance.

After the declaration of the DESD in the UN Summit in Johannesburg in 2002, the Danish government established its own national strategy for sustainable development, entitled A Shared Future — Balanced Development, in which the role of the educational sector in achieving SD in Denmark was outlined through progressive active involvement of educators in reaching the objectives of ESD. It also explicitly showed a slight drift from a prioritization of critical thinking and democratic learning to the teachers’ role (Rolls et al., 2015; The Danish Government, 2002).

Since 2005, SD has been incorporated through effective stakeholders in the Danish educational sector through revision of goal descriptions, curricula and guidelines for primary, secondary, and vocational educational and training programmes. These changes intend to strengthen “the pupils’ interest in the individual subjects and their mutual interconnection.” (The Danish Ministry of Education, 2009). In other words, teacher and educators in all education programmes must cover the concept of SD scientifically, socially, in a humanistic manner and from a democratic perspective Today, most Danish schools are recognized as ESD schools (Rolls et al., 2015; The Danish Government, 2002; The Danish Ministry of Education, 2009).

longer sufficient. Rather, incorporating SD in all learning became a new realisation: principles, values and practices of sustainable development need to all be integrated into all facets of the entire teaching and learning educational systems and structures. The struggle of the DESD instigated major behavioural changes among stakeholders in various societies with the aim of achieving “environmental integrity, economic viability and a just society for present and future generations” (Buckler & Creech, 2014; UNESCO, 2015).

ii. Global Action Program

With the DESD nearing its end in 2014, UNESCO introduced a Global Action Plan (GAP) to carry ESD into a next era. The GAP was formulated in coordination with the UN Member States as well as other stakeholders, addressing two major objectives (Buckler & Creech, 2014; UNESCO Member States, 2014):

1. To reorient education globally with the entire process of teaching and learning so that everyone worldwide gets “the opportunity to acquire the knowledge and skills, values and attitudes that empower them to contribute” to sustainable development.
2. To strengthen education and learning in all agendas, programmes and activities that promote SD. In other words, GAP aims at enhancing action worldwide throughout all levels of education with the help and cooperation of governments and societies in order to accelerate the process of reaching sustainability worldwide. Accordingly, the action within the GAP is centralised and focussed on *five action areas* called GAP strategic objectives, which includes policy support, whole institution approaches, educators, youth and local communities.

BOX 3

JAPAN

In 1947, Japan established the Basic Act on Education. Article 7 of this Act encompassed “social education”, specifying that “national and local governments shall encourage education (to be) carried out at home, in places of work and elsewhere in society.”(Ando & Noda, 2017) In 1949, the Social Education Act was established defining the concept of social education as “systematic educational activities targeting primarily youths and adults (including physical and recreational activities) outside of school curricula” (Ando & Noda, 2017). In parallel with the progress of education in Japan as such, studies and activities related to the conservation of nature were taking place in Tokyo (Ando & Noda, 2017).

EE became gradually functional in the 1980s with the lead of active NGOs, as corporatists with the government, aiming at the development of the state through education (Ando & Noda, 2017). Collaboration between NGOs and policy makers led to progressive arrangements and implementation of strategies to advance EE in Japan. These arrangements could be seen in the Environmental Agency’s first report on EE issued in 1988, titled *In Pursuit of a Better Environment Created by Everyone* (Ando & Noda, 2017; Environmental Education Committee, 1988). Later in 1990, the Society for EE was established with the same goal of progressing through advancements in EE and with the greater intention of institutionalizing

EE in Japan (Ando & Noda, 2017; Environmental Education Committee, 1988).

In 1993, the Basic Environmental Law that addressed the government’s intentions to actively collaborate with all citizens for environmental conservation through EE was issued (Ando & Noda, 2017). Soon after in 1996, the central government of Japan established the Ministry of the Environment’s Environmental Partnership Office (EPO) to involve citizens and NGOs in environmental issues (Nomura & Abe, 2009).

Finally, the Basic Act on Education was amended “to give the national government greater authority over education”(Ando & Noda, 2017). Although plans to promote education and sustainability have become a greater goal, these plans were not exactly directed towards reorienting education towards ESD (Ando & Noda, 2017; Nomura & Abe, 2009). Considerations were being made to minor elements in community-based ESD such as “systemic change, consensus building, and community empowerment”, (Ando & Noda, 2017) but progress in these sectors was made significant through NGOs. It can be realized, through this, that harmonious collaboration between policy makers in Japan with active groups in Japanese communities has brought distinctive legal and political transitions in Japan’s education.

C. Post-DESD (2014 – present)

- **2015:** The ministers of education adopted a global education strategy at the World Education Forum (WEF) held at Incheon, Korea, to implement the fourth Sustainable Development Goal dedicated to education (SDG 4, Education for All) by 2030. By merging the concepts of EFA and ESD, as was initially envisioned in Agenda 21 – both initiatives emerged simultaneously in different forums in the late 1980s – the new overarching vision of ESD was developed and detailed in the 2030 Agenda. At the WEF, ministers approved the yearly publication of the Global Education Monitoring Report (GEMR), requiring nations to submit annual reports on their progress regarding SDG 4 (York University, n.d.). Today, ESD
- is internationally recognised as being a fundamental pillar for the achievement of the 17 SDGs, while ensuring a sustainable future.
- **2016:** The UNESCO General Assembly requested a review on the implementation of ESD and the GAP. Following that request, surveys relating to the ESD and GAP were sent to key partners (90 stakeholders of high political influence and outreach) involved in the GAP. The Global Monitoring Report for 2016 was prepared based on their replies. The report found that there was a clear interconnectedness between education and other SD outcomes in the SDG Agenda, which demonstrates the necessity of integrating quality education in the Agenda for community development. It also found



that the scope of the Agenda needed to be reflected based on the suggested target outcomes (UNESCO, 2016).

- **2030:** Deadline for the implementation of the 2030 goals, including education. If proper guidance is provided, governments and partners can indeed implement the new education agenda and “translate into practice the commitments made at the country, regional and global levels” (UNESCO General Assembly, 2017). It can be interpreted that the agenda set for 2030 concerning education demands sustainable and committed action by all partners involved worldwide, to guarantee “inclusive and equitable quality education and promote lifelong learning opportunities by 2030” (UNESCO General Assembly, 2017).

IV. RELATIONSHIPS AND SELECTED CASE STUDIES

Even though ESD is connected to many global education initiatives such as EFA and UNLD, it also has a strong relationship with EE, as presented earlier in this chapter. In theory, EE and ESD can be integrated better, but in practice, the integration of the two has been trivial.

The way the relationship between EE and ESD is interpreted depends on whether the historic role of EE in a country is significant or insignificant, and on the way it is interpreted. Interpretation can be narrow by only including environmental aspects, or broad by also including socio-economic and political aspects. With this in mind, three models exist, as shown in Figure 3: The first occurs in countries with strong EE traditions that

ENVIRONMENTAL EDUCATION IN LEBANESE SCHOOL CURRICULA

Nada Oweijane

In 1994, Lebanon introduced a developed educational plan that aimed to build an integrated educational system, based on specific philosophy and objectives. The general educational curricula in 1997 and the environmental education curricula in 1998 confirmed the importance of sustainable development in general and environmental education in particular. The educational programs were meant to demonstrate competencies, achieve objectives and measure outcomes.

In 2012, the Center for Educational Research and Development (CERD) developed the National Strategy for Environmental Education in Lebanon, in cooperation with the Association for Forests, Development and Conservation (AFDC). CERD subsequently developed an environmental education curriculum for each of the first and second cycles of the basic education, and a knowledge guide that included concepts of environmental education and its techniques, in addition to a training document and assessment rubrics in 2014 and the paperless project in 2019.

In 2019, CERD set new standards for school buildings and classroom facilities, which are environmentally friendly and in line with a set of green school directives. CERD also launched the green demonstration project in the teachers' training center in Jounieh and reparations are underway to spread this project to other regions as well.

In 2018, CERD adopted a plan to integrate the Sustainable Development Goals (SDGs) and launched its vision towards Education 2030. This requires transformational approaches and the development of educators' skills, in addition to the development of partnerships between multiple and diverse stakeholders at the national and international levels to achieve the SDGs, namely those relevant to the environment: Goal 3 (Good Health and Well-Being), Goal 4 (Quality Education), Goal 6 (Clean Water and Sanitation), Goal 7 (Affordable and Clean Energy), Goal 11 (Sustainable Cities and Communities), Goal 13 (Climate Change), Goal 14 (Life Below Water), Goal 15 (Life on Land).

The basic approach of CERD to achieve the SDGs by 2030 focuses on the quality of education and providing

equal opportunities to enable learners to achieve all goals in a holistic way. This would allow them to become active citizens in the educational learning environment, as well as in the communities in which they live.

Environmental education seeks to enhance the overall individual learning vision within its surroundings at all levels. This requires concerted efforts, which are synchronized and consistent and that promote cooperation and partnership between different sectors including government institutions, public education, vocational education, higher education, parents and non-governmental institutions. This is necessary in order to prepare the learners to meet the requirements of the labor market and to devise effective solutions for environmental problems.

The CERD vision on environmental education is based on three assumptions:

1. Environmental education seeks to ensure people's well-being and to take care of their mental and physical health. This can be achieved by sensitizing and engaging learners, teachers, parents, society and government (LEPCG) to be responsible for the conservation of nature and increase the opportunities to access it.
2. Environmental education seeks to enhance the power of learners to solve life problems through the attitude of "building the leader within you". It provides people with the opportunity to explore the natural world and learn from it, and thus enables them to communicate their political voice and to look at matters from different perspectives.
3. Environmental education is best achieved through a triangle of partnership between school, community and government.

Based on these postulates and the belief that advocacy of the local and global environment is a public responsibility, it is imperative to transform environmental education into a culture that is reflected in the basic profile of children. It can then be passed on through socialization, and by integrating it into the general school curricula and extra-curricular activities.

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Vision and mission

CERD is responsible for the development of educational plans, curricula of public education, publications and educational approaches, in addition to training the workforce in the educational sector. It also handles research and educational statistics, school equipment and building specifications, among others.

CERD's vision focuses on the integration of environmental education into all the educational system components, in view of achieving a healthy society and a vigorous, open-minded and environmentally minded citizen.

The environmental mission of CERD is developing and updating green strategies for environmental education based on scientific research, as well as developing public education curricula and all supporting educational services to enhance the role of the green school in a flexible and sustainable manner.

This can be achieved through the dissemination of environmental education culture in the community and the development of comprehensive, interactive curricula. It can be additionally supported by extracurricular activities that integrate 21st century skills, lifelong learning for learners and teachers, and that provide quality education services for learners, teachers, parents and the community in order to achieve the desired educational goals.

Through the development of curricula, CERD seeks to develop a green citizen who is committed, an initiator, active, innovative, reflective, a critical thinker, researcher, cooperative, collaborative and an interrogative learner interlinked with his natural environment. This learner's

profile is paired with what environmental education seeks to achieve: an environmental proficient learner – a citizen who is environmentally knowledgeable and aware, and ultimately ready to translate these qualities into positive behaviour.

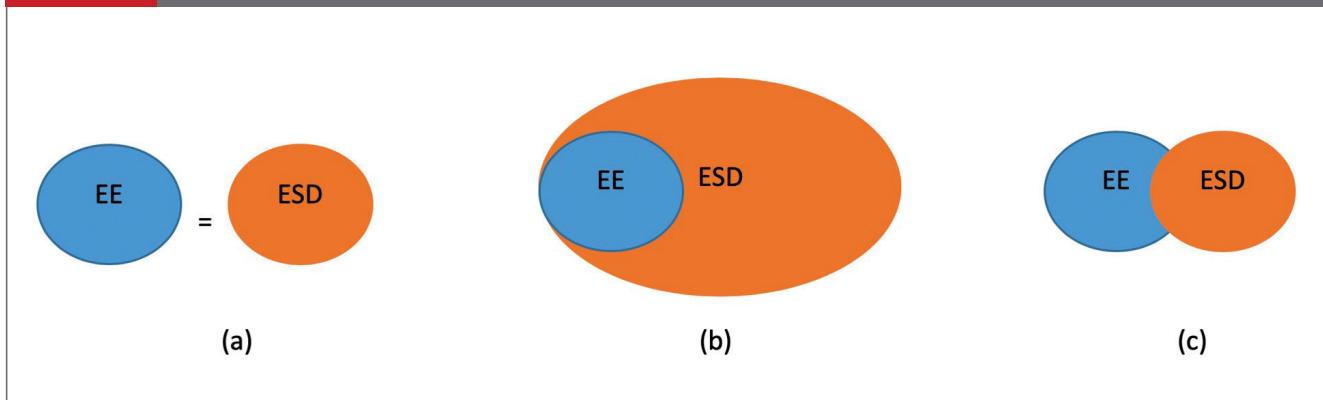
Education is the foundation of any development, based on the man's responsibility as a custodian of natural resources and protector of the environment. For this reason CERD finds it necessary to:

1. Develop the educational curriculum in all its components – including human resources and technical requirements – to be interactive and reflect the needs of the modern age, taking into account the standards of a green culture, green school environment, green society, and green citizen.
2. Develop purposeful programs, specialized training courses, learning guides and resources, and establish environment clubs to support this culture in schools.
3. Develop strategy and standards of the Green School, in cooperation with relevant institutions, to ensure the development of a safe environment that is in harmony with the needs of learners and society.
4. Place special attention to green culture in early childhood education.
5. Expand the experience of the prototype green demonstration room at the Teacher Training Center in Jounieh to other parts of the country.
6. Issue laws and operational decrees to ensure the realization of the above goals.

With the advances in the sustainable development concepts in education, the interconnection between school and the environment is no longer a luxury, but rather an educational necessity that requires a comprehensive approach based on the foundations of sustainability.

This approach involves a package of values, knowledge, skills and attitudes within activities and programs both inside and outside the classrooms, for all learners, families and the school staff. It brings multiple benefits, spanning from physical and psychological health, to the safety of the planet, based on safeguarding natural resources and rationalizing consumption patterns.

FIGURE 3 (A) MODEL 1; (B) MODEL 2; (C) MODEL 3 (UNESCO & WALS, 2009)



interpret it broadly and where EE is seen to be synonymous with ESD. There are two responses to this model: 1) EE continues to evolve since people can identify better with it than with ESD, such as in the United States or; 2) EE is integrated in ESD and thus terms such as EE for SD and EE for sustainable societies emerge as is the case in Taiwan and Brazil, respectively. The second model views EE as part of ESD, where EE is interpreted narrowly focusing on environmental issues with no reference to socio-economic, political and cultural dimensions. In this case, ESD replaces EE since it is seen as a more up-to date version, such as Denmark and Vietnam. It is worth noting that the shift from EE to ESD gives an opportunity for the development of new structures and potentially allows countries to ‘catch-up’ to countries that started implementing EE at an earlier stage (UNESCO & Wals, 2009). The third model acknowledges that EE and ESD have elements in common but are distinct. In this case, the old EE infrastructure will remain and government support for ESD is given, but not at the expense of EE. Consequently, parallel policy streams and support mechanisms exist such as in Canada, the Netherlands and Greece (Wals et al., 2010).

It can be seen that nations worldwide reacted differently to the concepts of EE and ESD, with some showing more levels of commitment and positive involvement than others. Also, as discussed, there are regional differences in the interpretation of the meaning of EE, ESD and their relationships and which and what should be strengthened. It has been reported that innovative and promising approaches to sustainability have emerged from institutions and schools, ranging from hybrid, cross-boundary forms of learning

around local issues, to educational sustainability applications for smartphones (Jickling & Wals, 2012). On the whole, successful progress demands practical approaches that result in major educational transitions. As an illustration, three case studies have been selected and presented in accompanying boxes.

V. THEMES AND TRENDS IN ESD

The adoption of the 2030 Agenda for Sustainable Development has made Education for Sustainable Development instrumental in accomplishing SDG 4. Under SDG 4, one of the most challenging targets, number 4.7, aims to: “By 2030 ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through ESD and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and nonviolence, global citizenship and appreciation of cultural diversity and of culture’s contribution to sustainable development.” With governments and international communities embracing these objectives, this creates an enabling environment for ESD. It is important to note that the 2030 goals are reinforced with strong policy support for ESD, resulting from the active involvement of education stakeholders in the process of their formulation and their concern for SD as well as its incorporation in education.

A. Educational content and key competencies

With the increasingly complex nature of world challenges such as climate change, there is a current trend for education stakeholders to pay

more attention to relevant education content that addresses contemporary challenges and not just focus on access to education and basic skills. This changes the notion of education from merely acquiring knowledge and skills, to one that focuses on teaching and learning as transformational tools, enabling people to implement SD concepts as an integral part of their daily lifestyle. Focusing on transferable/transverse skills and socio-emotional skills to achieve required outcomes and decrease social and educational gaps in society is an example.

Moreover, ESD does not only address the learning content; it also tackles outcomes, pedagogy and the learning environment. It creates a learner-centred, interactive environment that is competence based, utilises self-directed learning, is participatory and collaborative, problem-oriented, inter and transdisciplinary and links both formal and informal education (Leicht et al., 2018).

Many stakeholders, including the GAP and ESD researchers, emphasize key competencies (learning outcomes) that need to be present to enable individuals to transform their lifestyles towards sustainability. While there are differences between various presented models, most agree on the following eight competencies:

- Systems thinking competency: This includes the ability to understand relationships, analyse complex systems and deal with uncertainty.
- Anticipatory competency: The ability to understand and evaluate multiple scenarios including what is possible, probable and desirable, and create a vision for the future. This also includes applying the precautionary principle and to deal with risks and changes.
- Normative competency: The ability to understand the underlying principles and values that fuel peoples' actions, to negotiate SD values, principles, goals and targets in complex and uncertain contexts.
- Strategic competency: This includes the ability to create and implement innovative actions.
- Collaboration competency: This includes the

ability to learn from others, understand and respect their needs and views, be involved in collaborative and participatory problem solving and deal with conflicts in a group.

- Critical thinking competency: The ability to question practices and opinions, reflect them on personal principles and values and take a position in the debate.
- Self-awareness competency: This includes being aware of one's role in society and globally.
- Integrated problem-solving competency: This includes applying different problem-solving techniques to complicated sustainability problems to develop viable equitable solutions (Leicht et al., 2018).

To transform these learned skills into action, individuals require corresponding values and motivational drivers. Sustainability driven action can manifest in an individual's environment, i.e. when individuals find an opportunity for action to better the environment and act on it. By utilising sustainable, key competencies in the context of the environment (opportunity)

FIGURE 4 KEY COMPETENCIES AND PERFORMANCE OF SUSTAINABILITY (RIECKMANN, 2018)



THE ROLE OF NON-GOVERNMENTAL ORGANIZATIONS IN ENVIRONMENTAL EDUCATION

ALAA EL-SADEK

There is growing awareness about environmental issues amongst stakeholders, individuals and communities. This upsurge in knowledge and awareness has been, by and large, the result of campaigns and education programs run by major public interest groups concerned with the environment. These include NGOs at the international, regional and national levels, as well as organizations focused on the empowerment of marginalized groups in society and other community-based organizations. Such organizations have worked to foster grassroots-based approaches towards the protection and preservation of the environment. Much of this effort has been reinforced by NGOs, which are playing a critical role in disseminating environmental information. Moreover, environmental non-governmental organizations (ENGOs) are playing an important role in environmental education and they provide a very valuable channel for feedback.

Environmental education should provide opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment. It should be interdisciplinary in its approach and should include major environmental issues from local, regional

and national points of view to provide insight into environmental conditions in other geographical areas. Environmental education should also use diverse learning media and a broad array of educational approaches, including practical and extracurricular activities. Voluntary agencies can be helpful in this respect by aiding and advising the government, acting as the eyes and ears of the government, and by educating people to create general awareness in favor of conservation.

NGOs can be a valuable source of information on the state of the environment. They can also form action groups to help in the implementation of action plans, act as pressure groups to force action where the political and administrative systems are inactive or ineffective, can advise the government on the weakness of existing legislation and recommend measures for strengthening or improving these systems or their performance. One main role of NGOs is to bring environmental knowledge to the general public, and provide a range of educational and motivational aids.

All general education at the primary, secondary and higher secondary levels should inevitably have a strong component of environmental content. Such courses will provide awareness and sensitivity of environmental

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sustainable performance can be achieved. Figure 4 illustrates the inter-relationship between key competencies, knowledge and skills, values and motivations, and opportunities.

It is worth noting that efforts to prepare teachers to deliver/implement ESD have not advanced in-line with the other improvements in ESD. Thus, competencies for educators have not received as much attention as for those being educated, despite global demand, support and policies. Changes still need to be made to pre-service and in-service teacher education to align with the key competencies required for teacher educations with ESD as a core element.

E. Themes and topics

The choice of topic and content in ESD will greatly depend on the competencies that need

to be developed. While many agreements and programs provide information on important ESD topics – such as the United Nations Framework Convention on Climate Change and the Hyogo Framework for Action 2005 – 2015 – key ESD themes must align with SD processes, such as the 17 fields of action identified by the SDGs. Moreover, the GAP prioritises four key areas: climate change, biodiversity, disaster risk reduction and sustainable production and consumption (Buckler & Creech, 2014). The Bonn Declaration reiterates these topics and adds a few more, covering water, energy, climate change, disaster and risk reduction, loss of biodiversity, food crises, health risks, social vulnerability and insecurity (UNESCO, n.d.).

In a report on issues and trends in ESD, published by UNESCO in 2018, six key themes or topics were chosen to be discussed in detail,

problems. This will provide a basic understanding of the environment and associated problems, which will help social groups and individuals acquire the skills to identify and solve environmental problems.

Environmental education has its own importance in view of the present state of affairs, where human population is facing a great threat of environmental pollution and depletion of natural resources, which threatens survival itself. The situation in this regard has been well demonstrated in AFED's 2012 report on ecological footprint, entitled *Survival Options*. The report shows that Arab countries' consumption and waste production are twice what nature can locally regenerate and assimilate. NGOs can help disseminate knowledge on this matter to the public, to realize the enormity of various environmental problems in view of taking personal action to help alleviate the threats and support adequate policies.

Environmental sustainability education, comprising the dissemination of environmental education for sustainable development into the community, should be a lifelong process and not one restricted to a learner's years in higher education. Informal environmental sustainability education, including personal involvement in NGO environmental action, can be an effective way of increasing the understanding of environmental and sustainability

issues. NGO initiatives and field projects help provide practical environmental education to people who have built their careers in other areas. In the process, they help environmental awareness trickle into areas of life where it would not yet ordinarily impinge.

Engagement in practical work and action research may help overcome some of the negativity linked to many assessments of the human impact on the environment and, working together, universities and NGOs can more effectively 'think globally and act locally'. NGOs may provide the best hope for helping to change the destructive aspects of modern society, but they are vulnerable because of their financial dependency on sponsors, volunteers and donors.

Environmental research is another area in which NGOs can contribute usefully. The Arab Foundation of Young Scientists (AFYS) has been playing an important role in this respect, especially in the field of air, soil and water quality. AFYS has been established to enhance the voice of young scientists in decision-making and action for environmental education, science and society. The main goals of AFYS are to encourage environmental education, scientific research, increase the impact and utility of scientific knowledge, and to build a scientific network for young scientists to contribute to the advancement of environmental science and society.

namely climate change, biodiversity, disaster risk reduction, poverty reduction, sustainable production and consumption and global justice. Each of these was discussed in terms of their relevance to the theme for SD, linkages with SDGs, learning objectives including cognitive, socio-emotional and behavioural and how each theme can be integrated into education programs and practices. These topics/themes are demonstrated to be relevant worldwide, but will need to be tailored to each region and/or country, depending on local needs and requirements. These themes form the basis for the development of knowledge of the sustainable key competencies (shown in Figure 4). Furthermore, using the values framework for SD and sustainability strategies (efficiency, consistency and possibility for transformation), this knowledge can illuminate various perspectives and orientation possibilities for

transformation towards a more sustainable existence.

Moreover, whole-institution approaches are increasing and are helping learners to contribute to SD in their schools or institutions, communities and workplaces. Such approaches encompass mainstreaming sustainability into all aspects of the learning environment.

VI. CONCLUSION AND RECOMMENDATIONS

Environmental Education and Education for Sustainable Development have proved to be integral for the sustainable development of nations. While there are many similarities between them both in terms of their objectives, mechanisms and the direction of their evolution, both EE and ESD are not interpreted in the

same way across the globe. Each manifests itself differently depending on local histories and political and cultural traditions. Although contextual differences are likely to remain, there is still a need for inter-regional learning, as there are globalizing forces and systems that affect all regions. Those can be understood better when discussed inter-regionally.

There has been a clear effort to integrate EE and ESD into existing SD and SD-related national policies and legislation. However, few policies explicitly refer to ESD. Moreover, countries participating in the DESD reported a notable presence of ESD in national policy. These policies mainly address broadening participation in ESD and its integration in national educational policies and curricula, especially at the primary and secondary levels.

Many governments have committed themselves to supporting the inclusion of ESD in formal education, most notably in primary and secondary education. This involves the re-designing of curricula, teaching and learning, in addition to making adjustments to the existing system to create more space for sustainability issues. ESD in non-formal education and informal learning is on the agenda of most countries participating in the DESD. With regards to the integration of EE and ESD at the university level, several international pre-DESD meetings have been held to integrate sustainability on campus and in curricula, alongside involving the university communities. Still, there is much room for improvement, and the same applies to early childhood education, technical and vocational education (UNESCO, 2009).

In terms of educational content, a strong trend is seen in making education more relevant to the social, environmental, and economic challenges that the world faces today and in the future. The process of reorienting education policies, curricula and plans towards SD is well underway, according to the GAP progress reports, although progress remains uneven.

In most countries, the availability of public budgets and/or economic incentives for ESD is either non-existent or minimal. Similarly, ESD research and development does not receive much funding and is not very well developed



around the globe. The vast majority of countries do not provide ESD scholarships and do not report financial support for ESD innovation and capacity-building. The existing ESD-related research is mostly focused on formal education and on the policy and regulatory measures related to ESD implementation (UNESCO, 2009).

It is worth noting that to date there is not enough information on the quality of ESD programs, the degree of their implementation and their effectiveness in achieving the required outcomes. Assessments should be performed on several levels, including national, individual and large-scale assessments to monitor learning outcomes. This feedback will help improve performance and address shortcomings in order to enhance progress towards achieving the ESD goals.

EE and ESD-related professional development should focus on strengthening people's capacities



with a focus on teachers, managers and facilitators, to initiate and enhance new ESD-inspired forms of learning in schools, universities, workplaces and neighborhoods. With teacher education and training opportunities in place, there is also a need for strong educational leadership of principals and teachers, including high expectations towards teachers and management support (Laurie et al., 2016).

Raising funds for ESD activities and projects is key to ensuring the successful achievement of the ESD objectives. Support for ESD-related research is needed to enhance both the quality and the evidence base of ESD. The creation of ESD-related research funds with the help of international donors and national research foundations may help advance the quality and quantity of ESD research by both academics and practitioners. Furthermore, support should be given to initiatives that enable teachers to

become ESD researchers themselves in their own schools and classrooms. The provision of financial resources for ESD should not be left to governments alone. Multilateral and bilateral donors and the private sector can be significant contributors.

The way forward in all regions depends in part on the development and utilization of inter- and intra- regional networking. Current regionally networked ESD initiatives around the world need to be supported by active ESD focal points, ESD national coordinating bodies, the UNESCO Regional Bureaux for Education, UNESCO National Commissions and UNESCO Chairs, in collaboration with SD-oriented NGOs, the private sector and civil society. Furthermore, capacity-building for ESD policy development within all relevant ministries and at other levels of government is essential for realizing inter-sectoral synergy and improved coordination.

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EDUCATION FOR SUSTAINABLE DEVELOPMENT IN THE ARAB COUNTRIES

DJIHAN HASSAN, AHMED GABER, AND HAYAM EL SHERBIN



I. INTRODUCTION

As with several other parts of the world, there are many environmental challenges facing the Arab region. While some of these challenges relate to the mismanagement and inefficient and ineffective processing of available natural resources, others relate directly to the availability or scarcity of natural resources and the extreme climate in some parts of the region (AFED 2017). Moreover, pollution related issues, climate change problems and their mitigation and adaptation measures persist and require a systematic and robust approach. Such a system may require modified governance structures (including institutional, legal and regulatory reform), strategies, programmes and/or projects with quantifiable outputs. However, for the outputs to achieve the required outcomes, awareness, education and professional development activities must be incorporated. For these reasons, education has become a key factor for achieving and enhancing development worldwide, enabling nations to actively tackle national and regional challenges.

Despite the global responsiveness towards environmental education (EE) since the 1960s, the Arab countries only started taking note of EE in the early 1980s. Education for Sustainable Development (ESD) started to be introduced at a slower pace in the past ten years. According to Dr. Mohammed Selim, Professor of Political Science at Cairo University, it was not before then that policy makers in the Arab region had begun to enunciate the common apprehension about the environment. It was not before the 1980s that Arabic books were published expressing these environmental concerns to the Arab nations. The first of these books was published in 1976 by Al-Sharnouby entitled *Al-Insan wa Al-Bee'a* (Man and the Environment) (Selim, 2009). In many Arab states, the emergence of ESD has provided a stimulus for EE reform, and in countries where there was no tradition in EE or where it was marginally present, the ESD movement provided an opportunity for a jumpstart (UNESCO, 2009a).

Being the lead implementer of global ESD initiatives, UNESCO has developed strategies for ESD for different regions of the world, such as Latin America and the Caribbean, Sub-Saharan

Africa, Asia Pacific, and the Arab states. The strategies are tailored to each region and address different issues and needs. According to the regional guiding framework, ESD's meaning in the context of the Arab region encompasses "the acquisition and practice of knowledge, values and skills that ensure balance between the economic, social and environmental aspects of development and the observance of both individuals and society development and progress in life" (UNESCO Office Beirut, 2008). Hence, UNESCO's regional strategy of ESD for Arab states aims to address specific issues and challenges that face the region, which include the following:

- Poverty, unemployment and brain drain
- Agriculture and water scarcity
- Desertification and rational use of scarce water resources
- Health awareness
- Political security and demographic stability
- Environmental awareness
- Unsustainable consumption patterns
- Problems related to increase in pollution (water, air and soil) (OECD, 2019)

This chapter aims at providing an overview of ESD in the Arab region, the involvement of the Arab states in the Decade of Education for Sustainable Development (DESD) and the Global Action Program (GAP) through national and regional initiatives and programs. In this sense, this chapter presents, discusses and analyses the following:

- Arab states' involvement in ESD and its impacts when available. This includes global, regional and local strategies, policies, programs, projects and initiatives that Arab states are involved in.
- Good practices, strengths and weaknesses of ESD in the region, identifying trends and success stories, alongside relevant case studies

II. ARAB STATES' INVOLVEMENT IN ESD

The UN Decade for Education on Sustainable Development (DESD) was launched in the Arab region in September 2005, at a regional meeting in Bahrain, with experts, researchers and specialists in education and training. The meeting



was an opportunity to exchange experiences and dialogue to define roles of different stakeholders for the DESD and discuss a regional ESD strategy (UNESCO, 2014). Following this meeting, the Arab Conference on Education and Sustainable Development was held in Beirut, Lebanon in April 2006, which was attended by ministers and experts from countries in the region (UNESCO, 2007).

In May 2007, the UNESCO regional office for Education in Beirut, in cooperation with the DESD secretariat and UNESCO offices in Cairo, Doha, and Rabat, organized a regional workshop on enhancing teachers' competencies in sustainable development, which was held at Alexandria University in Egypt. The workshop included discussions and consultations on the regional strategy on the DESD for the Arab States region (UNESCO, 2007). Following the previous events, the Regional Guiding Framework of Education for Sustainable Development in the Arab Region was released in June 2008 in Beirut, which identified priority areas and challenges facing the active implementation of ESD in the Arab region. Most Arab States have participated

in the preparation of this document (UNESCO Office Beirut, 2008).

The Arab region has been involved in the DESD at different levels since its inception in 2005. Currently 10 out of 22 Arab countries are involved in the Global Action Program (GAP) for ESD, namely Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Oman, Palestine, Tunisia and the United Arab Emirates. At the beginning of the DESD, ESD primarily focused on environmental issues and had a stronger presence in formal education than in non-formal/informal education. However, by the end of the DESD in 2014, ESD started to align with more local pressing issues, which included access to quality education and gender equality (UNESCO, 2014).

While significant progress in implementing ESD has been reported from the Arab region, the range of implementation activities varies widely among countries. For example, ESD is now integrated into early childhood care and education (ECCE) in Kuwait and Oman, while Kuwait also reports a

full integration of ESD in government education programming (UNESCO, 2014). On the other hand, ESD is only included in selected courses in Qatar and is rarely mentioned explicitly in education curriculums in Morocco, whereby ideas related to sustainable development and an environment-friendly culture are introduced. With respect to technical and vocational education and training (TVET), some Arab states achieved significant advances such as Kuwait, Oman and Qatar, who indicated a full integration of ESD in TVET (UNESCO, 2014). Promising progress has also been reported in implementing ESD in higher education in Jordan, Lebanon, Egypt, Qatar and Oman, which include university staff member trainings on integrating ESD themes into curricula, incorporating ESD in university courses, and funding ESD-related scholarships and programmes (UNESCO, 2014).

The Arab countries' efforts in implementing ESD encompass national and regional level projects and/or initiatives. The following section details the regional and national ESD programmes, initiatives and strategies implemented in various Arab states, which have been made publicly available through published literature as well as on government and non/governmental organizations (NGO) websites.



A. Regional ESD Programmes and Initiatives

ESD programs, initiatives and strategies in the region started in the early 2000s. Some programs targeted the Arab region specifically, while others included some Arab states as part of other regions, such as the Mediterranean region. Programs such as the Regional Centre of Expertise on Education for Sustainable Development (RCE) and the UNESCO Associated Schools Project Network (ASPnet) are global programs involving all regions of the world, including the Arab region. The following subsections offer a brief summary on seven relevant regional programs and their impact, and Figure 3 shows a timeline for the regional initiatives involving the Arab region and how they fit within global and region-specific key ESD-related milestones.

i. Mediterranean Education Initiative for Environment and Sustainability (MEdIES)

The MEdIES is an initiative on ESD, launched in Johannesburg during the World Summit on Sustainable Development in 2002. It followed the implementation of the UNDES in Mediterranean countries, and currently follows several international post-UNDES initiatives, such as the Mediterranean Strategy on ESD and its Action Plan and the UNESCO GAP Programme. MEdIES aims to facilitate the educational community at large to contribute in a systematic and concrete way to the Sustainable Development Goals (SDGs), through the successful application of innovative educational programs in all countries around the Mediterranean basin, which include eight Arab countries, namely Egypt, Libya, Tunisia, Algeria, Morocco, Syria, Lebanon and Palestine. The main activities of MEdIES include the development of educational materials, conferences, trainings and a library of resources on the initiative's website (MEdIES, 2019b).

The main stakeholders of the initiative are the Mediterranean Information Office for Environment, Culture and Sustainable Development (MIO-ECSDE), UNEP, UNESCO and the Hellenic Ministry for the Environment, Energy and Climate Change. There are state partners from three Arab countries: Egypt, Tunisia and Palestine.

ii. Regional Centre of Expertise on Education for Sustainable Development Programme

In 2003, the United Nations University's Institute for the Advanced Study of Sustainability (UNU-IAS) launched the ESD project, with funding support from the Ministry of the Environment in Japan. The ESD project designs and implements research and development activities through two flagship initiatives: a global multi-stakeholder network of Regional Centres of Expertise on ESD (RCEs) and a network of higher education institutions called the Promotion of Sustainability in Postgraduate Education and Research Network (ProSPER). An RCE is a network of existing formal, non-formal and informal organisations that facilitate learning towards sustainable development in local and regional communities. This network involves school teachers, professors at higher education institutions, environmental NGOs, scientists, researchers, museums, zoos, botanical gardens, local government officials, representatives of local enterprises, volunteers, media, civic associations or individuals who work in the spheres of sustainable development.

RCEs play a crucial role in implementing ESD goals using their local knowledge and global network. As of December 2018, 168 RCEs on ESD have officially been acknowledged by the United Nations University worldwide. Each RCE is regionally-based and members bring in-depth knowledge of the challenges facing their villages, towns, and cities in their regions (Global RCE Network, 2019b). There are two RCEs in the Arab region, located in Egypt and Jordan, which serve Africa and the Middle East regions. RCE Cairo was launched in 2008 and it works throughout six governorates, including Cairo, Giza, Qalyubia, Sharqia, Helwan, and the 6th of October (Global RCE Network, 2019a). RCE Cairo's goal is to enable Egypt to implement the SDGs till 2030 and support the realization of GAP on the ground. The specific objectives of RCE Cairo are:

- To disseminate ESD nationwide in terms of enhancing learning environments, empowering the role of the youth, developing educators' capacity, advancing ESD policy, and accelerating sustainable solutions at local levels.

- To carry out applied research to support the implementation of the SDGs.
- Many ESD-related initiatives and projects in Egypt have been implemented through the Cairo RCE, such as:
 - Establishing seven centres of excellence on ESD at seven Egyptian universities in Egypt (three-year project).
 - Implementing ESD in slum areas as summer school projects (1-year project, GIZ Funding).
 - Developing ESD kits for grades 1-9 (three-year project, EU Funding).
 - Developing ESD kits available in iBook store with other international partners.
 - Developing MSc in sustainable development and two other green entrepreneurship MSc degrees (three-year project, EU funding).
 - Training many schoolteachers and university professors on ESD and integrating sustainability in existing curriculum (Global RCE Network, 2019a).

iii. Mediterranean Strategy on Education for Sustainable Development (MSESD)

The MSESD is the first regional strategy on ESD prepared on the basis of the ESD Strategy of the UN Economic Commission for Europe (UNECE), adopted in 2005 following the adoption of UN DESD (2005-2014). The Strategy was drafted through a participatory process carried out under the scientific and technical coordination of the UNESCO Chair on Sustainable Development Management and Education in the Mediterranean, with the support of the MEDIES. The process involved experts from universities, governments, non-governmental and civil society organisations, from the north and the south of the Mediterranean (UfM, 2014; UNEP, 2019). The MSESD included a mandate to develop an Action Plan for the MSESD to guide its implementation and to promote regional and sub-regional activities on ESD including capacity building activities at the national level (MEDIES, 2019a). The Strategy was endorsed

ENVIRONMENTAL EDUCATION FOR SUSTAINABLE DEVELOPMENT IN THE ARAB REGION

Ahmed Al Qabany

The world's economy today is more diverse and interconnected than at any other time in history, witnessing significant growth in trade, revenues, and consumption of resources. The natural environment and ecosystem have always provided the necessary resources to support livelihoods in the form of water, energy, food, land, and transport, among others. As economies and populations continue to grow, the pressure on natural resources and ecosystems are becoming increasingly apparent as witnessed through waste, land degradation, abiotic depletion, deforestation, and pollution.

In the context of sustainable development, economic growth should be coupled with minimal negative impact on the environment and natural ecosystems. Preservation of the environment is one of the key features of any type of sustainable development. This calls for concrete action at the global, regional, national and local levels to mainstream environmental considerations in development plans and goals. It also calls for enhanced awareness, knowledge and innovation in this mainstreaming process, which could be done through effective environmental education.

Environmental education is meant to connect us to the world around us, teaching us about both natural and built environments. It offers an opportunity to explore environmental issues, engage in problem solving and act towards improving and sustaining the environment for present and future generations. Environmental education also serves as a key driver of the effective implementation of environmental action plans. Societal ethics and actions form an integral part of environmental education, which holistically drive behavioral change towards sustainability.

Geographically, the Arab world covers a vast land area of more than 13.3 million km² in the Middle East and North Africa. The region is characterized by rich and diverse natural landscapes, resources and centuries of man-made imprints including a rich archaeological heritage, artefacts, ancient ruins and cities, vast deserts, plains, high mountains and coastal endowments. These natural and built environments are increasingly being threatened by natural and anthropogenic drivers such

as changing global climate regimes and increased human consumption caused by rapid population growth in the Arab world. The predominant environmental challenges in the Arab region include municipal waste management, depletion of water resources and pollution, high energy intensity and rapid changes in local and regional climate.

Although environmental awareness and action has increased significantly at the global level over the last two decades, more effort is needed towards increasing environmental awareness and education in the Arab region. Recent surveys conducted by the Arab Forum for Environment and Development (AFED) in 22 Arab countries in 2017 revealed that over 60 percent believe that the environment has deteriorated in their countries over the last ten years, while 95 percent think their country is not doing enough to tackle environmental challenges. This means there is an urgent need to educate the growing population in the region on the environment.

To achieve the sustainable development agenda in the Arab region by 2030, environmental education will remain essential, considering its rapidly growing population, increasing consumption patterns and the high dependence on natural resources. The goal of environmental education within the context of sustainable development is to make behavioral changes that drive sustainable practices. For sustainable behavioral change to take effect, the following actions could be considered:

Change of Environmental Education Approach:

Traditionally, formal learning institutions have often initiated environmental education initiatives, whereas non-governmental organizations (NGOs) would usually play a role in spreading environmental awareness. For environmental education to work for development, the traditional approach must be transformed to include broader, more comprehensive, participatory, all-inclusive and forward-thinking methods that accommodate all stakeholders including government, private actors, academia, financial institutions, organized private sector, non-governmental organizations, women and youth. The newly adopted approach should mainstream environmental education into school curriculums, private

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businesses, public and non-governmental organizations and civil society groups, among others.

Embrace Innovation/Digital Revolution:

For environmental education to effectively work for sustainable development, the region needs to capitalize on leveraging the potential contributions of digital technology and innovation. First, digital literacy needs to be a strategic area of focus for countries and stakeholders operating in the region. Digital literacy tools can thus be harnessed for environmental initiatives and actions needed to simultaneously address sustainability and human development in the region. Second, environmental education should embrace innovation as a key pillar for engagement in the region.

Increase Investment in Environmental Learning, Skills Enhancement and Capacity Development:

Education is essential to convert information and ideas into useable and applicable knowledge. The capacity development gap in the region needs to be urgently addressed. Despite the increasing interest in environmental learning, there is a need for conscious effort to target impactful initiatives that will support environmental literacy in all aspects of societal

endeavors. Dedicated financial and human resources will help boost efforts towards increasing knowledge of environmental issues regionally and globally.

Partnership: Partnership remains instrumental in achieving the objectives of the SDGs, as underscored by SDG 17 (Partnerships for the Goals). Hence, to achieve the objectives of increasing environmental education in the region, partnership for environmental education needs to be prioritized by various stakeholders. This includes multiple actors and stakeholders such as government agencies, international financial institutions, research institutions and agencies as well as the private sector.

Environmental education remains vital to build an effective and sustainable society. At the Islamic Development Bank (IsDB), we are complementing the numerous efforts made by countries in the region through capacity development for relevant stakeholders, investments in longstanding and impactful development interventions that would help address some of the critical environmental and development challenges faced by the region. In our effort to contribute towards environmental sustainability, the Bank established a dedicated climate change function that focuses on helping member countries mainstream climate change action into projects. In addition, the IsDB has recently increased its strategic contributions through tailored capacity development initiatives, implemented through local and regional workshops. In February 2019, the Bank released its first Climate Change Policy and it is expected to release its Environmental and Social Safeguards by end of 2019.

IsDB is also increasing its support to countries in the region to help enhance school curricula and pedagogical methods to include climate change and environmental education. In terms of resource mobilization for environmental and climate action, the Bank is partnering with numerous regional institutions and leveraging its international networks to mobilize resources to support climate, environmental and human development initiatives.

For these measures to work, as well as to effectively deliver the much-needed environmental education and start seeing its positive results in the region, genuine leadership is needed at all levels from all stakeholders. As countries in the region work on the development of their low carbon resilient development pathways and transitioning to green economy, it is the generation receiving this education that will ultimately ensure the Arab region achieves sustainable development by 2030 and beyond.

in 2014 by the Union for the Mediterranean (UfM) Ministerial Meeting on Environment and Climate Change. Its aim is to encourage countries of the Mediterranean develop and incorporate ESD into all relevant subjects of their formal educational systems, as well as in non-formal and informal educational systems.

iv. The UNESCO Associated Schools Project Network (ASPnet)

The UNESCO ASPnet links educational institutions across the world with the goal to build notions of peace in the minds of children and young people. There are over 11,500 ASPnet member schools in 182 countries, all of which work in support of international understanding, peace, intercultural dialogue, sustainable development and quality education in practice. ASPnet is recognized as an effective tool for reaching Global Citizenship Education (GCED) and ESD as part of the SDGs within Education 2030. The ASPnet Strategy for 2014-2021, Global Network of Schools addressing Global Challenges, identifies ESD as one of its two priorities (UNESCO, 2019). The 2030 Agenda specifically highlights how important it is for all learners to “acquire the knowledge and the skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles” (UN, 2015). The ASPnet schools adopt a “whole-

school” approach in their ESD activities, in which schools attempt to integrate local and global sustainability issues into the curriculum, while reinforcing interactive, participatory teaching and learning that foster critical thinking and bring about changes in attitudes. Examples of ESD projects implemented through the ASPnet in the Arab region include:

- Recycling: Solidarity in Action (Lebanon)
- Photographing the beauty of our environment (Oman)
- How to save water (Palestine)
- Recuperate rain water for growing medicinal plants (Tunisia)
- First ASPnet regional flagship project on water education in the Arab region (Egypt, Jordan, Kuwait, Lebanon, Libya, Oman, Palestine, Qatar, Syria, Tunisia, and UAE) (UNESCO, 2009b)

v. Regional Expert Meeting on Climate Change Education for Sustainable Development (CCESD) in the Arab region

The regional experts meeting on CCESD in the Arab region was held in Beirut from 5 to 7 May 2015. It was organised as part of the ESD work plan for 2014–2015 and was funded by the ESD Japanese Funds in Trust (ESD JFIT).

TABLE 1

ESD RELATED ACTIVITIES IN ARAB COUNTRIES BETWEEN 2016 AND 2019 UNDER THE SWIM AND HORIZON 2020 SUPPORT MECHANISM PROJECT

ESD Activity	Location	Date
SWIM-H2020 SM Training on ESD	Amman, Jordan	13-14 September 2017
	Ramallah, Palestine	17-18 September 2017
	Tunis, Tunisia	16-17 October 2017
	Tozeur, Tunisia	19-20 October 2017
Strengthening of public awareness and ESD in view of promoting: A shift away from the use of plastic bags; and/or the use of non-conventional water resources	Jordan	June 2017
Support in the implementation of ESD	Tunisia	October 2017
Effective design and implementation of ESD projects	Algiers, Algeria	12-13 November 2017
SWIM-H2020 SM training & consultation “Enabling Egyptian Educators to Implement in Practice ESD”	Cairo, Egypt	2-6 December 2018
Enhancing environmental awareness including of the media and support for implementing education for sustainable development	Palestine	March 2019

The meeting identified the main challenges that climate change poses to education systems in the Arab region and explored the role that education can play in climate change adaptation and mitigation. The main objectives of the regional experts meeting were to:

- Promote the important contribution education can make to climate change adaptation and mitigation in Arab countries, including infrastructure, management and resourcing.
- Further the effective integration of climate change issues and disaster risk reduction (DRR) into education programs and school curricula in the Arab region.
- Enhance the exchange of experiences and good practices on climate change education (CCE) among research institutions, ministries, educators, civil society organizations, multilateral agencies and young people.
- Identify opportunities for partnerships among ministries, schools, research institutions, NGOs, UN agencies and UNESCO networks to enhance formal and non formal education programs on CCESD.
- Develop regional/sub regional plans of action identifying key steps and regional recommendations for the development of CCE strategies, guided by the GAP on ESD (UNESCO, 2015c).

As part of the meeting, a team of experts in cooperation with the UNESCO working team (HQ and UNESCO field offices in Beirut, Cairo, Doha and Rabat) prepared four sub/regional studies on CCESD, which included:

- Mashriq countries (Beirut Office Cluster) Iraq, Jordan, Lebanon, Palestine, Syria (UNESCO, 2015d)
- Arab Gulf countries and Yemen (Doha Office Cluster) Bahrain, Kuwait, Oman, Saudi Arabia, Qatar, UAE and Yemen (UNESCO, 2015e)
- Red Sea (Wadi ElNile) countries (Cairo Office Cluster) Egypt, Libya, Sudan (UNESCO, 2015f)
- North Africa/Maghreb countries (Rabat Office Cluster) Algeria, Morocco, Tunisia (UNESCO, 2015g)

vi. Sustainable Water Integrated Management (SWIM) and Horizon 2020 Support Mechanism (SM) Project

The SWIM-H2020 SM Project is a three-year (2016-2019) EU funded project that aims to contribute to reduced marine pollution and sustainable use of scarce water resources in a select number of countries in North Africa and the Middle East (Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestine, Syria and Tunisia). The Project is the continuation and merging of two previous EU-funded service contracts, Horizon 2020 Capacity Building/ Mediterranean Environment Program (H2020 CB/MEP) (2009-2014) and the Sustainable Water Integrated Management Support Mechanism (SWIM SM) (2010-2015). The project provides tailored and targeted support to authorities and other stakeholders of partner countries in order to tackle the reduction of industrial emissions, municipal waste and urban wastewater into the Mediterranean Sea. It also ensures the sustainable use of water resources in an effort to facilitate sustainable development at country level (SWIM & Horizon 2020 SM, 2019a). Another goal of the project is to promote ESD through various trainings, consultations and workshops. Table 1 shows the ESD-related activities undertaken by SWIM-H2020 SM in Arab countries from 2016 to 2019 which were all implemented in collaboration with MEDIES (SWIM & Horizon 2020 SM, 2019b):

vii. UNESCO Regional ESD Flagship Training Program for Arab Youth

The UNESCO Regional ESD Leadership Training Program for Arab Youth was held in Beirut from 1st to 3rd August 2017. The training was organised by NGO Organization de Developpement Durable (ODDD), a UNESCO GAP on ESD key partner, in collaboration with the UNESCO Beirut office and the UNESCO Headquarters. The training programme was a project of the GAP on ESD which has five action areas, one of which is dedicated to mobilizing and engaging youth. The training was designed for young people aged 18-35 who are active leaders in sustainable development in their communities and regions. The training programme consisted of a three-day workshop where participants engaged with the theory and practice of ESD in order

TABLE 2 NATIONAL ESD PROGRAMS/INITIATIVES IMPLEMENTED IN THE ARAB REGION

Country	National Program / Initiative	Theme	Stakeholders	Date
	<u>Learning by Earning Recycling School:</u> Establishing the Mokattam Recycling School for Boys, who work as garbage collectors. The initiative aims to improve living conditions for the community through non/formal education (UNESCO, 2012c, 2015b).	Environmental education and poverty reduction	Organisers/implementers: The Spirit of Youth NGO, CID consulting, Procter and Gamble, the Bill Gates Foundation, the Hands on the Nile Foundation and the African Star Foundation <u>Funding:</u> UNESCO, P&G and Bill Gates Foundation <u>Target:</u> Young garbage collectors in Mokattam (Garbage City)	2001 - Present
Egypt	<u>The program aims at promoting and implementing ESD in Egypt (CSD/AUC, 2019)</u> <u>Educamp I:</u> Developed ESD resource kits and a teachers training program, in addition to seven Centres of Excellence in seven universities to promote the concept of ESD. <u>Educamp II:</u> Introduced ESD in informal areas (two schools in El Warraq) <u>Educamp III:</u> Transformed poor schools in Egypt into schools that meet the objectives of the country's Sustainable Development Strategy "Egypt 2030" (two schools in Boulaq El-Dakrour)	Environmental education	Organisers/implementers: The RWTH Aachen University in Germany, The Center for Sustainable Development (CSD) at the American University in Cairo, AlMofid Foundation for Development and Human Resources (NGO), Rowad El Ghad for Local Society Development (NGO) <u>Funding:</u> The EU and the German government <u>Targets:</u> <u>Educamp I:</u> Teachers and students <u>Educamp II:</u> Administration staff and teachers of the local schools, El Warraq community, other local NGOs, youth groups and local units of the Ministry of Education (MoE) <u>Educamp III:</u> Students from both schools, their teachers, administrators and ministry officials.	Educamp I started 2010, Educamp II started 2014, Educamp III started in 2017
	<u>International Conference on ESD in Egypt:</u> International conference on the role of education in supporting sustainable development and how to enhance education's contribution in Egypt (Institute of National Planning, 2017).	Education and sustainable development in Egypt	Organisers/implementers: The Institute of National Planning (INP) <u>Target:</u> Researchers from Egypt and other Arab and foreign countries as well as local, regional and international institutions concerned with education	6-8 May 2017
	<u>The 5-year Action Plan on ESD in Egypt:</u> Two trainings on ESD that aimed to raise awareness and contribute to building the capacity of formal and non-formal educators and Ministries Officers on ESD programs (MEDES, 2018).	Solid waste management (recycling, marine litter)	Organisers/implementers: Mediterranean Education Initiative for Environment and Sustainability, SWIM-Horizon 2020 Support Mechanism Programme, Egyptian Environmental Affairs Agency (EEAA) <u>Target:</u> Educators and ministries' officers on ESD	2-6 December 2018
Jordan	<u>ESD Biodiversity Initiative:</u> An initiative focusing on integrating biodiversity concepts including those related to herbal and medicinal plants in the national curricula in Jordan (UNESCO, 2012a).	Biodiversity	Organisers/implementers: The Royal Society for the Conservation of Nature RSCN (NGO), and the Ministry of Education - Directorate of Curricula and Textbooks <u>Target:</u> Students and teachers	2004-2008

Country	National Program / Initiative	Theme	Stakeholders	Date
	<u>Zikra for Popular Learning Program:</u> Zikra promotes alternative learning to empower people to reconnect with their local culture and traditions, and to utilize local knowledge to inspire sustainable solutions to the local community's most stressing social, economic and environmental challenges (UNESCO, 2018a).	Environmental education and sustainable development	Organisers/implementers: The local non-profit organization Zikra Initiative <u>Target:</u> The marginalized village of Ghor Al-Mazra'a in one of the poorest areas of southern Jordan.	2011 - Present
Jordan	<u>Queen Rania Teachers Academy (QRTA) ESD training program:</u> Aims to enhance the academic and professional capabilities of teachers by incorporating three of the most critical environmental risks in Jordan (water, energy and solid waste) into an inquiry based, interdisciplinary, project based training program (QRTA, 2019).	Water, energy and solid waste	Organisers/implementers: Queen Rania Teachers Academy (QRTA), and Public Action Project PAP (USAID funded) <u>Target:</u> Teachers in 50 schools across 6 directorates in the central governorates of Jordan.	2014 - Present
	<u>K-12 Arab Online Learning Platform:</u> Offers both sequential learning material, as well as student-centered inquiry based learning that allows users to search for concepts or skills without having to enrol in a predefined learning sequence. It will also provide key resources for use in the classroom and will eventually align with national curricula (UNESCO, 2018b).	Quality education, technology and innovation, sustainable development	Organisers/implementers: Google and Queen Rania Foundation <u>Target:</u> K-12 students and their educators across the Middle East and North Africa region.	Launched in 2017
Lebanon	<u>ESD in the Shouf Biosphere Reserve (Lebanon):</u> Education and raising children's awareness to protect the environment is an important task of the Reserve. Facilitators offer several educational workshops that focus on the role of a nature reserve, knowledge ecosystems, eco-citizen actions, and environmental pollution (UNESCO, 2013a).	Environmental education	Organisers/implementers: The Association of the Shouf Cedars (ASC), the Ministry of the Environment, the Canadian Embassy, <u>Funding:</u> International Organizations, donations, and entrance fees <u>Target:</u> Students in public schools	2011 - Present
	<u>Sustainability 4 Youth:</u> A series of experimental awareness workshops on SDG/ESD to enhance the skills of young people in Lebanon through developing, implementing and conducting ESD youth-led activities in various public and private schools across Lebanon (ODDD, 2017).	Environmental education, water conservation, permaculture, upcycling	Organisers/implementers: UNESCO Beirut office, Le Drageon, Friends of Nature NGO, Lebanese National Commission for UNESCO (LNCU), ODDD NGO <u>Target:</u> ESD youth leaders in Lebanon (UNESCO Flagship local youth participants) and school students age 8-12 in 11 schools	Oct- Dec 2017

TABLE 2(Cntd.) NATIONAL ESD PROGRAMS/INITIATIVES IMPLEMENTED IN THE ARAB REGION

Country	National Program / Initiative	Theme	Stakeholders	Date
	<u>Young Reporters for the Environment:</u> An educational program that aims to increase awareness of local environmental issues and empower young people to articulate these issues through the media of writing, photography or video (M6FE, 2019).	ESD	Organisers/implementers: Mohamed VI Foundation for the Protection of Environment (M6FE), The Foundation of Economic Education (FEE) <u>Target:</u> High School Students	Launched in 2002
	<u>Eco-Schools:</u> Aims at educating students about positive ecological principles so as to prepare them for some of the environmental issues that their schools might face with regards to water, energy and waste management (UNESCO, 2013b).	Environmental education, sustainability, recycling, and clean energy	Organisers/implementers: FEE, M6FE <u>Funding:</u> The EU <u>Target:</u> School students	Launched in 2006
Morocco	<u>National Program for Environmental Rehabilitation of Rural Schools:</u> The program has three main objectives: improving the infrastructure of rural schools, developing environmental clubs and libraries on environmental and SD topics, and supporting environmental clubs activities such as field visits and other environmental education activities (Ministry of National Education, 2019).	Water, energy and waste management	Organisers/implementers: The Ministry of Education, the Ministry of Energy, Mines, Water and Environment and municipalities <u>Target:</u> Rural schools and students	2006 - 2015
	<u>Functional Literacy Programme of Women of the Argan Cooperative through Amazigh (Berber) Language:</u> The main objectives of the programme are: Making the cooperative's women aware of the importance of environmental protection and preservation of the importance of the Argan Biosphere and what is at stake in the preservation of the Argan forest (UiL, 2015).	Environmental protection and sustainable development	Organisers/implementers: Association Ibn Albaytar (NGO), National Centre of Development and Literacy (Centre National de Développement et d'Alphabétisation – CNDA), Nutrition Act and the international cooperation of Monaco <u>Target:</u> Women in the Argan cooperative	Launched in 2008
Oman	<u>Workshop on ESD in a World of Cultural Diversity: Taking our Responsibilities for the Future</u> The workshop aimed at promoting ESD through the exchange of experiences between students and teachers from various cultures, and at preparing joint projects around the DESD (UNESCO, 2011)	Sustainable urbanization	Organisers/implementers: The Ministry of Education and the Oman National Commission for Education, Culture and Science in cooperation with UNESCO, the Islamic Organization for Education, Culture and Science, the German National Commission, the Kuwait National Commission for UNESCO and a number of private sector companies. <u>Target:</u> Students and teachers	Nov 2008

Country	National Program / Initiative	Theme	Stakeholders	Date
Oman	<p><u>Green Schools Initiative:</u></p> <p>The objective is to implement a number of activities, trainings and programs aimed at students and teachers and administrators in schools and parents to make them aware of the concept of sustainability and ESD as well as a way for inculcating new behaviour patterns and values based on the three Rs of sustainability: Reduce; Reuse and Recycle (UNESCO, 2015a) and (UNESCO, 2018d).</p>	Biodiversity, natural resource management, sustainable production and consumption	<p>Organisers/implementers: The Oman National Commission to UNESCO, the Specialized Centre for Professional Training of Teachers, Sultan Qaboos University/College of Education, the National Team for ESD, the Ministry of Education, Ministry of Environment, Ministry of Agriculture and Irrigation and the municipality.</p> <p><u>Target:</u> Students and teachers in schools throughout Oman</p>	Launched in 2015
Tunisia	<p><u>Re-greening Tunisia Project:</u></p> <p>The project works on educational establishments in two cities, Mareth and the ancient oasis of Zarat in the coastal zone of Gabès, notorious for pollution due to the production of phosphates. The project combines classroom study with field experience and offers practical ways to mitigate climate change and develop sustainable agricultural production. Students use old and new techniques to plant trees and re-green the country (UNESCO, 2018c).</p>	Climate change	<p>Organisers/implementers: ISSBAT (the Higher Institute of Applied Biological Sciences of Tunis), Eco-Conscience (a civil society association that raises awareness on environmental issues), and the Tunisian Permaculture Association.</p> <p><u>Target:</u> Students and teachers_</p>	Launched in 2013
UAE	<p><u>Shaheen's World Project:</u></p> <p>Shaheen's World is a publicly accessible online learning website that aims to enhance children's knowledge, skills and attitudes towards the environment and global issues through friendly online activities and games. Shaheen's website contributes not only to awareness raising among Emirati children but also community members such as consumers, business people and women (UNESCO, 2014).</p>	Environmental education, sustainable development, water, energy, waste, air and biodiversity.	<p>Organisers/implementers: The Environment Agency – Abu Dhabi (EAD)</p> <p><u>Target:</u> Children 6-16 years old</p>	Launched in 2009

TABLE 2(Cntd.) NATIONAL ESD PROGRAMS/INITIATIVES IMPLEMENTED IN THE ARAB REGION

Country	National Program / Initiative	Theme	Stakeholders	Date
	<p><u>Sustainable Schools Initiative (SSI):</u> An initiative which aims to strengthen the skills and leadership capacity among youth, to address the challenges of environmental sustainability. The programme strives to provide a platform that addresses students, parents, teachers, administrative staff and the non-teaching staff to gain hands on experience, knowledge and create change from within in their everyday behaviour and attitude for a sustainable future (EAD, 2019).</p>	Environmental education, sustainable development	<p>Organisers/implementers: The Environment Agency – Abu Dhabi (EAD), Centre for Science and Environment (CSE), the Department of Education and Knowledge <u>Sponsor:</u> British Petroleum (BP) <u>Target:</u> Intermediate and secondary school students.</p>	Launched in 2009
UAE	<p><u>ESD Climate Change Initiative:</u> The initiative included conducting workshops for teachers and students on ESD to enhance the knowledge and equip the educational segment of the society with the tools to combat climate change at the local level (UNESCO, 2012b).</p>	Environmental education, climate change, water conservation	<p>Organisers/implementers: Emirates Environmental Group EEG (NGO), local authorities, pre-school institutions, schools, higher education institutions, NGOs, private sector, media, intergovernmental and international institutions <u>Target:</u> Teachers/students from various schools and colleges in the UAE</p>	2010
	<p><u>Sheikh Zayed Desert Learning Centre (SZDLC):</u> The Sheikh Zayed Desert Learning Centre in Abu Dhabi is an educational facility combining knowledge and learning through interactive exhibits, multimedia and visual materials that are specially designed by world-class experts and specialists. The SZDLC creates an opportunity to teach students on sustainable living using low-carbon technologies, helps them examine their relationship with the environment and encourages them to adopt more sustainable lifestyles (UNESCO, 2018b).</p>	Environmental education and sustainable living	<p>Organisers/implementers: The government of the UAE <u>Target:</u> Students</p>	Opened in 2016

to build their capacity as ESD leaders. During the workshop, participants engaged with the theory and practice on the following different themes: sustainability, ESD, system thinking, conflict transformation, leadership, visioning, communication, facilitation, networking and monitoring and evaluation (UNESCO, 2017). The training's objectives were to empower youth leaders to inspire and mobilize others to take action towards building more sustainable,

just and resilient communities, and build a youth-led ESD network for exchange and collaboration.

B.National ESD Programs and Initiatives

Many national programmes, projects and initiatives targeting ESD have been initiated and have been or are still being implemented at the

EDUCATION FOR SUSTAINABLE DEVELOPMENT IN THE MEDITERRANEAN NEEDS MORE POLITICAL BACKING

Michael Scoullos

The Mediterranean Strategy on Education for Sustainable Development (MSESD) aims at assisting Mediterranean countries to develop and incorporate Education for Sustainable Development (ESD) into their formal education systems. It aims for ESD to be integrated in all relevant subjects, also in non-formal and informal education. The Strategy serves as a flexible framework for the countries to fulfill regional, global and national agendas, given that its implementation is driven by a country-specific approach.

MSESD responds to Target 4.7, under Goal 4 of the SDGs which focuses on quality education, and refers explicitly to ESD, stating that: "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development."

After being endorsed by the Union for the Mediterranean Ministers of Environment in 2014, MSESD was embraced as an integral part of the Mediterranean Strategy for Sustainable Development (2016-2025) of the MAP-Barcelona Convention system, under strategic direction 6.4 on education. At the 19th meeting of the Contracting Parties to the Barcelona Convention in Athens, MSESD was acknowledged as important to "enhance public awareness and promote sustainability and the implementation of the SDGs in the Mediterranean".

In line with promoting the action plan set for implementing MSESD, seven training of trainers workshops were organized over the past two years, in Algeria, Egypt, Jordan, Palestine and Tunisia. Supported by the EU SWIM-H2020 Support Mechanism a regional workshop was also convened in Cyprus in 2017, together with the first meeting of the Mediterranean ESD committee. The training sessions gathered some 400 ESD professionals with advanced capacities on the potential application



of AP/MSESD and ESD. The workshops were combined with inter-institutional consultation meetings to identify strengths, priorities and needs of countries for mainstreaming MSESD implementation.

Significant achievements were observed in many countries: Malta took into account the MSESD in the National Plan on Sustainable Management of Water; in Cyprus, the National ESD Plan was effectively linked with the Strategy; and Morocco is among the champion countries of the UNESCO Global Action Program (GAP) on ESD. The second Meeting of the Mediterranean ESD Committee convened in Greece in June 2019, combined with a regional workshop on ESD.

Although widely recognized as a prerequisite for the promotion of sustainable development and the SDGs, ESD does not yet receive the needed political backing and, therefore, is still not fully and homogeneously developed throughout the Mediterranean region. Better coordination is needed between formal, non-formal, and informal ESD initiatives, which are frequently supervised by different ministries, including those of education, environment, and health. Moreover, the availability of adequate human and financial resources is lacking, which hinders the much needed expansion of training and retraining programs of educators. The secretariat continues its efforts to attract more political support and mobilize resources for enhancing the implementation of the Strategy through its MSESD Action Plan.

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ENVIRONMENT IN MOROCCAN SCHOOLS AND UNIVERSITIES

Mohammed Tafraouti

Environment has been a part of the Moroccan educational curricula for decades, which has contributed to the formation of a new generation that has efficiently led environmental work at the governmental and civil levels. Morocco now has a national charter for education, which includes “the acquisition of principles for health protection, preservation of natural resources, and the discovery of basic concepts, systems and techniques applicable to the direct natural, social and cultural environment of the student”.

The Charter of Sustainable Environmental Development called for the need to create specializations in the field of environment and sustainable development, stressing that environmental conservation should be integrated into the knowledge systems and the practical and behavioral knowledge provided within these systems and programs. There are now many examples of environmental concepts that have been integrated into textbooks used at Moroccan secondary and elementary schools:

The textbook “History and Geography Manar” used in the first year of the Baccalaureate program, includes a chapter that explains the concept of sustainable development and examines the characteristics of the biosphere, natural resources and the requirements of urban and rural development. It also covers water and desertification issues in the Arab world, within the framework of sustainability.

The second year of the Baccalaureate program’s English course is partly devoted to sustainable development. Students are introduced to the vocabulary used in environmental care plans and international development goals. This section includes many activities and exercises that integrate the concepts of sustainable development into language teaching, which allows the students to improve their language skills while simultaneously learning about sustainable development.

The book “Al Mukhtar in Arabic Language”, for the first year of secondary preparatory level, includes a section

on natural balance and environmental protection. The Arabic language textbook for third year elementary students addresses the theme of population, environment and health.

The French language book for the fifth elementary level uses a selection of expressive environmental images. The book includes three texts in a special environmental section entitled “Encounter with Nature”, covering a range of environmental information through a text on “Living Nature” and a poem on nature by Paul Verlaine, entitled “After Three Years”. It also includes a text entitled “Underwater Explosion” designed to teach writing techniques by describing nature scenes.

The Arabic language book for fourth elementary students includes a chapter on “Natural Balance and Environmental Protection”, with texts dealing with pollution and humans and the environment.

Mohammed VI Foundation for Environmental Protection

The efforts of the Ministry of Education are supplemented by the work of civil society organizations at various levels. The Mohammed VI Foundation for Environmental Protection supports many activities and programs targeting young people, especially through the Eco-Schools program it sponsors. In 2014, the Foundation launched a digital environmental platform aimed at nurturing an emerging environmental culture, raising awareness and promoting environmentally friendly behavior. The digital platform equips school children with the necessary tools to acquire basic information about various environmental concepts, independently and interactively, through tests, fun games, and drawings. In the first phase, it focuses on the topics of energy and climate, especially renewable energy and efficiency, in the second it deals with water, and in the third phase it addresses the air quality and climate change. The foundation also produced an Eco-Schools Guide, which present the program’s various aspects and guides schools on using the portal.

The Moroccan program is similar to AFED Ecoschool (www.afed-ecoschool.org), the environmental

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education program launched by the Arab Forum for Environment and Development (AFED) in 1999. The AFED program comprises a comprehensive guide to environmental knowledge and activities, and a digital platform available to students and schools throughout the Arab world. Local editions of the AFED educational guide were published in several Arab countries including Algeria, Syria and the UAE.

Environmental Education at Universities

Most Moroccan universities have also incorporated the environment into their programs:

At Mohamed V University in Rabat, one of the oldest universities in Morocco, environment and development issues are taught at many faculties. The Faculty of Legal, Economic and Social Sciences offers a Master's program in Environment and Sustainable Development. Environmental and sustainable development subjects also overlap in the Master's programs in Geography, at the water, waste, coastal areas, biodiversity, energy, climate change and local development levels. The Center for Doctoral Studies includes a research body that focuses on education and communication in the fields of population and environment and development, where environment and sustainable development are integrated into subjects dealing with environmental citizenship and education for sustainable development.

Within a period of three years at the Earth and Life Sciences Department at the Cadi Ayyad University

in Marrakech, students have extensive exposure to environmental fields of learning. The curriculum covers topics including the adaptation of organisms to environmental factors, population dynamics, international environmental conventions and global impacts on social management. The two-year master's program covers overall ecosystems management including continental water systems, biological conservation, engineering and industrial environment management, sanitation engineering and environmental management.

At the slopes of the Atlas Mountains, Al Akhawayn University in Ifran covers issues of sustainable development from different perspectives, ranging from environmental chemistry to environmental biology, in its Master of Science in Sustainable Energy Management.

Sidi Mohamed Ben Abdellah University in Fez covers the various components of environment and sustainable development among a variety of disciplines including chemistry, biology and earth sciences. The university also conducts research on water and solid and industrial waste management. The Center for Excellence in Water, Environment and Sustainable Development was established at this university, with research teams working in the fields of functional ecology, geographic resources, renewable energies and intelligent systems, pathology and biomedicine. The university is also preparing a multidisciplinary masters program named Conservation of the Environment for Sustainable Development, which will be the first of its kind in Morocco.

The students of the Sociology Department at the at the University of Ibn Zahr in Agadir are offered a course entitled Environment and Development, which tackles the topics in question from the perspective of social philosophy, the theoretical trends of environmental sociology and applied models on environment and development in Morocco.

A Graduate Institute for Sustainable Development, founded by a group of Moroccan and Canadian researchers, called the Research and Sustainable Development Group, Morocco-Canada. The institute specializes in water sciences, environment and sustainable development, and offers a Master's degree in Water Sciences, Resource Management and Organization Management.

national level in some Arab countries. Table 2 presents a summary of the initiatives in Arab states that have been made publicly available through published literature, as well as on government and NGO websites. While most Arab countries have been involved in the DESD or the GAP, not all have managed to implement ESD projects or initiatives at the national level, and countries such as Algeria, Libya, Sudan, Iraq, Syria, Palestine, Bahrain, and Qatar, have only been part of regional ESD programs and/or initiatives undertaken by international organizations.

National ESD programs, projects and initiatives in Arab countries feature various themes such as environmental education, waste management, recycling, clean energy, water conservation, biodiversity, and climate change. Some projects or initiatives were implemented over multiple years, such as the EduCamp Project in Egypt which included three phases, and the National Program for Environmental Rehabilitation of Rural Schools in Morocco, a ten-year program that is part of Morocco's sustainable development strategy. On the other hand some programs, which involved workshops, conferences or trainings, were implemented over a few days such as the workshop on ESD in Oman titled "A World of

Cultural Diversity: Taking our Responsibilities for the Future".

Several stakeholders were involved in national ESD projects in Arab countries, as shown in Table 2. It can be seen that there is a high involvement of NGOs who worked in collaboration with different partners, such as government and private institutions, ministries and universities. Most of the funding originated from international organisations such as UNESCO and the EU. The main targeted audience in most of the national ESD programs were school students and teachers, through formal education, with a focus on primary and high school education. However, some projects targeted women and young adults through informal education.

C. ESD Impacts, Challenges and Opportunities

Some ESD projects in the Arab region gained international recognition as ESD success stories. Worthy examples are the Learning by Earning Recycling School in Makkattam, Egypt, which targeted young boys who work as garbage collectors, and the ESD in the Shouf Biosphere Reserve project in Lebanon. Moreover, "Zikra" programme for popular learning in Jordan is a UNESCO sustainability education award-winning project that promotes alternative learning to inspire sustainable solutions to the local community's most stressing social, economic and environmental challenges. In addition, the re-greening Tunisia project was one of the nominees for the 2018 UNESCO-Japan Prize on Education for Sustainable Development. The project combines classroom study with field experience and offers practical ways to mitigate climate change and develop sustainable agricultural. Both Zikra and the Recycling School projects, in Jordan and in Egypt respectively, targeted marginalized communities and aimed at improving living conditions for young people through non-formal environmental education.

Apparently, Egypt, Jordan, Lebanon, Morocco, Oman and the UAE are the Arab countries with the highest involvement in ESD initiatives on both the national and regional levels. Other Arab countries such as Syria, Iraq and Yemen have taken part in the DESD since 2005, but their involvement has been diminished in recent years due to ongoing conflict.



In most Arab countries, except for the Sultanate of Oman, there is no specific entity responsible for implementing ESD projects.

Oman was one of the first Arab countries to express a commitment to ESD, and accordingly formed a national ESD team and appointed a national coordinator to guide the ESD implementation process. The Ministerial Decision No. 78/2008, issued in April 2008, resulted in the establishment of an ESD national team, chaired by the Minister of Education, which includes representatives from the Oman National Commission for Education, Culture and Science (Focal Point), the Sultan Qaboos University, and the ministries of manpower, health, education, higher education, national economy, environment and climate affairs, agriculture, and social development. The objective of the national team is the coordination of policies, events and activities in the field of ESD at the country level. The ESD national team also delegates functions to other organisations and stakeholders from the private sector as well as NGOs with expertise on ESD domains. Furthermore, the ESD national team has participated in the development of a Draft DESD National Strategy for the Sultanate of Oman (UNESCO, 2011).

The Arab states' involvement in the DESD and then the GAP has generally shown consistent progress, which promises even more impact going forward after the GAP. UNESCO's Global Monitoring and Evaluation Framework (GMEF) has identified significant strengths for implementing ESD programs and initiatives in the Arab region, based on a questionnaire targeting 19 Arab countries. The global assessment of ESD provisions shows slow signs of a favourable trend in the Arab region, in which 4 out of 19 countries have a budget designated specifically to ESD. It is worth noting, however, that ESD legislation tends to target formal education. The key sustainable development themes addressed were peace and human security, conflict resolution, biological diversity and climate change, which were considered to represent the most pressing issues in the Arab region. Other strengths of ESD implementation in the Arab region included providing teacher training for ESD at primary and secondary levels of education and the availability of ESD tools for primary and secondary levels of education (OECD, 2019).

Despite the promising achievements in ESD activities in the Arab region at both the national and regional levels, there are still some challenges to the full integration of ESD. However, the region is confronted with many challenges related to education in general, such as:

- The difficulties in reaching full participation of all children and youth in the present education systems.
- The difficulties in providing the necessary resources for the development and implementation of high quality education.
- The lack of relevant, culturally appropriate educational materials (UNESCO, 2009a).
- Regarding challenges related specifically to ESD, the results of the UNESCO 2013 Arab States ESD consultation revealed that:
- Better coordination is needed between experiences with the DESD at the regional level versus at the national level.
- Stronger coordination between ministries of education and ministries of environment and sustainable development is crucial to be able to go forward with ESD (UNESCO, 2014).

According to the UNESCO's Global Monitoring & Evaluation Framework (GMEF) and the regional guiding framework of education for sustainable development in the Arab region, the challenges of implementing ESD programs and initiatives in the Arab region were identified as follows:

- The understanding of the wide concept of education for sustainable development and of its nature is a challenge as there is still a lack of differentiation between ESD and environmental education.
- The complex nature of ESD represents a great challenge in integration in school materials as it makes it overlap with other educational materials and activities.
- The Arab states' values and traditions (such as protecting the environment, rational consumption, and social cooperation) are not considered when planning and implementing ESD and are not used enough in the preparation of ESD curricula and teaching materials.
- The lack of regional and sub-regional cooperation due to the lack of previous experience in the Arab region.

EDUCATION AS KEY SHAPING FACTOR OF A COMMON AND PROSPEROUS EURO-MEDITERRANEAN FUTURE: THE UNION FOR THE MEDITERRANEAN'S PERSPECTIVE

UfM Secretariat

The Union for the Mediterranean (UfM) is an intergovernmental, Euro-Mediterranean organization that brings together all 28 countries of the European Union and 15 countries of the southern and eastern Mediterranean. It aims to enhance peace, stability and shared prosperity in the Euro-Mediterranean region, through the promotion of inclusive and sustainable development.

The activities of the UfM – as an organization uniquely positioned to bridge and strengthen dialogue across the northern, southern, and eastern Mediterranean – address a broad spectrum of shared strategic issues in the region such as water, environment, higher education, research and innovation, among others. They notably contribute towards the achievement of the Sustainable Development Goals (SDGs) in a crosscutting, results-focused, and consensus-based manner.

In order to fulfill this mission and promote inclusive and sustainable development in the region, the 43 UfM member states work on common agendas and portfolios of activities, on topics including higher education and environment. In particular, Education for Sustainable Development (ESD) and mobility play an essential role in achieving a positive agenda for youth in the Mediterranean. This is especially important in a region where almost 60 percent of the population is below the age of 30. In this context, the UfM works to guide and advance the member states' education and ESD-related objectives across all of its thematic axis.

Mediterranean Strategy on Education for Sustainable Development (MSESD)

ESD is at the core of the international and regional agenda and is the basis for sustainable consumption and behavioural change towards more sustainable lifestyles. These are goals that the UfM is deeply involved in and is currently promoting through targeted support. In pursuit of its mission and the will of its member states, the Mediterranean Strategy on Education for Sustainable Development (MSESD) was endorsed by UfM Ministers responsible for environment and climate change issues, in Athens on 13 May 2014¹.

The Strategy was developed under the framework of the UfM as result of a participatory process involving experts from universities, governmental institutions, non-governmental and civil society organizations. It was coordinated by the University of Athens/UNESCO Chair and Network on Sustainable Development Management and Education in the Mediterranean, and supported by the Mediterranean Educational Initiative on Environment and Sustainability (MEdIES) of the Mediterranean Information Office for Environment, Culture and Sustainable Development (MIO-ECSDE).

As education for sustainable development under the MSESD must take local, subnational, national and regional circumstances into account, it places varying degrees of emphasis on the different aspects of sustainable development depending on the country and the field of education. This Strategy will serve as a flexible framework for the countries of the region, given that the implementation of the MSESD is driven by countries' priorities, initiatives and specific needs and circumstances.

In response to the UfM-endorsed MSESD, the Action Plan of the Mediterranean Strategy on Education for Sustainable Development was shaped and presented at the high-level Ministerial Conference held in Nicosia (Cyprus) on 8-9 December 2016. The Action Plan is a "new generation" instrument, which incorporates all major international commitments of the countries of the region related to ESD in a way that it can be easily followed by national administrations, reducing unnecessary overlaps and repetitions.

The Action Plan targets priority thematic issues – one of which is sustainable consumption and production patterns – regarding ESD and promotes the development of regional programs and activities, either independently or in partnership with others.

The Action Plan is directly related to the two major, relevant regional Mediterranean processes, namely: the Mediterranean Strategy on Education for Sustainable Development, under the UfM, as well as the Mediterranean Strategy for Sustainable Development (MSSD) (2016-2025) of the Barcelona Convention, coordinated by the UN Environment Program/Mediterranean Action Plan



(UNEP/MAP). The Action Plan integrates other relevant provisions deriving from international conventions and important international developments that have occurred since May 2014, including the Regional Action Plan on Sustainable Consumption and Production for the Mediterranean and its Roadmap for implementation, and promotes the achievement of the SDGs.

Global University Network for Innovation (GUNi)

The UfM also takes part in and supports the Global University Network for Innovation (GUNi), as a network currently composed of over 210 members from 78 countries, which includes the UNESCO Chairs in Higher Education, higher education institutions, research centers and networks related to innovation and the social commitment of higher education.

Following the collaboration initiated during the GUNi International Conference on Sustainable Development Goals: 'Actors and Implementation', held in September 2017, GUNi and the UfM Secretariat established a cooperation framework in 2018 for the upcoming three years. Here, they signed a memorandum of understanding aimed at continuing to work together in accordance to the mission and objectives of both institutions.

Under this partnership, the UfM Secretariat and GUNi co-organised a first meeting of the Group of Experts

on Sustainable Development Goals and Higher Education, which aims to help higher education institutions, students and policymakers implement the SDGs, in synergy with the efforts undertaken within the Mediterranean Strategy on Education for Sustainable Development.

The UfM's perspective on coordinated action for education in the Euro-Mediterranean region is underpinned by a holistic and interdisciplinary approach, fully in tune with the current and future complex environmental, economic, and social challenges facing the region. ESD is a key driver of positive change and an essential prerequisite for a sustainable and prosperous future in the Euro-Mediterranean region.

Environmental education is a key element for ensuring that the new generations are aware of the sustainability needs of their region. Additionally, by mainstreaming environmental knowledge in curricula and specialized training, it could be easier to achieve a change of paradigm in economic growth through innovative small and medium-sized enterprises tackling environmental challenges as a way to achieve inclusive sustainable development.

Note:

1. http://ufmsecretariat.org/wp-content/uploads/2014/05/20140515_UfM_declaration_FINAL_compromiseeditorial-changes.pdf



- Lack of coordination between countries and institutions on ESD.
- The lack of necessary funding and training, and the promotion of the principle of equal partnership.
- Wars and conflicts still constitute a challenge not only for ESD but also for development in general.
- Non availability of resource materials in Arabic (policy development, curricula development and teacher training).
- Role of NGOs vis-à-vis ESD promotion is not well defined (OECD, 2019; UNESCO, 2008).

III. CONCLUSION AND RECOMMENDATIONS

The Arab region faces many environmental challenges, which require the active application of the concept of sustainable development in every sector. Environmental issues in the Arab region include the management of available natural resources, the extraction and production of oil and gas, water shortages, aridity and

drought, various types of pollution, as well as climate change and its impacts. Education is a key tool in tackling environmental issues through promoting environmental awareness and sustainable development. Arab countries have recognized the importance of education for sustainable development since the launching of the UNESCO-led DESD in the Arab region in 2005, which was followed by the release of the Regional Guiding Framework of Education for Sustainable Development in the Arab Region in 2008. After the conclusion of the DESD in 2014, ten Arab countries got involved in the GAP. Nevertheless, Arab countries had no major role in the initiation of the DESD before 2005, and it seems that with global initiatives such as EE and ESD, the Arab region tends to take part a few years after the concept has been globally recognized.

The Arab countries' efforts in implementing ESD encompass national and regional level projects and/or initiatives. Major regional programmes, initiatives and strategies related to ESD in the Arab region started in 2002, with the Mediterranean



Education Initiative for Environment and Sustainability (MEdIES), which included eight Arab countries. Other initiatives include the Regional Centres of Expertise on ESD in Egypt and Jordan, the UNESCO-Associated Schools Project Network (ASPnet), the Regional Expert Meeting on CCESD in the Arab region, The SWIM and Horizon 2020 Support Mechanism (SM) project, the Mediterranean Strategy on ESD, and the UNESCO's Regional ESD Flagship Training Program for Arab Youth. There are three Arab countries that are totally absent from all regional ESD projects and initiatives: Comoros, Djibouti, and Mauritania. Somalia's involvement has also been very limited. Other countries such as Algeria, Libya, Sudan, Iraq, Syria, Palestine, Bahrain, and Qatar, have only been part of regional ESD programs and/or initiatives undertaken by international organizations, and no data is available regarding ESD projects on the national level in these countries.

The Arab states' involvement in the DESD and the GAP has generally shown positive progress, which promises even more impact going forward

after the GAP. Some projects implemented in the Arab region have gained recognition and were considered case studies for good practice of ESD, such as the "Zikra" program for popular learning in Jordan and the Shouf Biosphere Reserve project in Lebanon. However, the range of implementation activities varies widely between Arab states. It seems that Egypt, Jordan, Lebanon, Morocco, Oman and the UAE are the Arab countries with the highest involvement in ESD initiatives on both the national and regional levels, while countries such as Syria, Iraq and Yemen have taken part in the DESD since 2005 but have witnessed diminished involvement in recent years due to ongoing wars and conflicts. In Kuwait and Oman, ESD is now integrated into early childhood care and education and some significant advances of ESD in vocational education and training have also been achieved. Qatar reports a full integration of ESD in vocational education and training and Kuwait reports a full integration of ESD in government education programming. Promising progress has also been reported in implementing ESD in higher education in Jordan, Lebanon, Egypt,

Qatar and Oman. On the other hand, ESD is only included in selected courses in Qatar and is rarely mentioned explicitly in education curriculums in Morocco.

Despite promising achievements in ESD activities in the Arab region on both the national and regional levels, there seems to be a clear gap between the Arab region and other parts of the world when it comes to ESD. As this chapter shows, the vast majority of the national and regional ESD initiatives and projects in the Arab countries are dependent on international donors and hence are largely not sustainable. Moreover, there is no solid ESD legislation or specific ESD allocated budgets, which are crucial steps towards establishing a consistent national ESD structure that is not dependent on external funding. It seems that the involvement of most Arab countries in ESD lacks a real commitment to adopt ESD beyond the UNESCO led initiatives. This commitment might have been hindered by the general education challenges confronting the region, such as the difficulties in reaching full participation of all children and youth in the present education systems, the difficulties in providing the necessary resources for the development and implementation of high quality education, and the lack of relevant, culturally appropriate educational materials (UNESCO, 2009a).

Furthermore, the Arab region is not utilizing its full potential as to what can be collectively done on a regional level to advance ESD, given the diversity in the region's resources. A lack in regional and sub-regional cooperation and collaboration between Arab states on ESD is apparent. In addition, the region lacks initiatives and programs that are directed to ESD research and development. Coupled with the lack of proper monitoring and evaluation, this situation threatens the potential for progress and impedes the impact of projects already in place. It is clear that the Arab region is faced with many challenges in the adoption of ESD, the most prominent of which are the lack of funding and the ongoing unrest and conflict in some Arab countries. Addressing these challenges should be a priority for Arab countries aiming to move forward with transformative and impactful education for sustainable development structures based on the Global Action Program.

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INTEGRATING SUSTAINABLE DEVELOPMENT INTO HIGHER EDUCATION: CHALLENGES AND OPPORTUNITIES

Farid Chaaban

Introduction

The challenge of recognizing the need to live within constraints and to ensure more fairness in access to limited resources for current as well as for future generations, lies at the heart of the concepts of sustainability and sustainable development (SD). The World Summit on SD in Johannesburg in 2002 has set the Agenda 21 as a tool for achieving SD (UN-GA, 1992; UN, 2010; UN, 2002). As a follow up initiative, the UN General Assembly adopted the 2030 Agenda for Sustainable Development in 2015, which provides a shared blueprint for peace and prosperity for people and the planet.

Higher Education Institutions (HEIs) should catalyze and accelerate a societal transition toward sustainability by raising awareness among young generations about the SD concepts and giving them the skills and knowledge for better dealing with relevant issues and challenges (Damaj & Chaaban, 2011). This paper is aimed at analyzing some of the fundamental obstacles that hinder, on a global scale, efforts to implement sustainability at universities. The results of an international study to investigate the difficulties encountered in overcoming these obstacles are discussed, and relevant initiatives at the American University of Beirut (AUB) are highlighted as a case study.

Higher Education and SD Goals

The UN Agenda for SD constitutes 17 SDGs, which are an urgent call for action by all countries, both developed and developing, in a global partnership (UN, 2019). The 17 Goals and 169 targets came into effect in January 2016, and set 2030 as the date for implementation.

SDG 4 is focused on quality education, and calls for ensuring affordable, inclusive and equitable education and promoting lifelong learning opportunities for new generations. Obtaining a quality education is sought as the foundation to creating sustainable development. In addition to improving quality of life, access to quality education can help equip communities with the tools required to develop innovative solutions to the world's problems.

Higher education can also contribute to most of the SDGs, particularly:

- Ending poverty (SDG 1);
- Health and well-being for all ages (SDG 3);
- Gender equality (SDG 5)
- Governance; decent work and economic growth (SDG 8);
- Responsible consumption and production patterns (SDG 12);
- Combating climate change and its impacts (SDG 13); and
- Peace, justice and strong institutions (SDG 16).

HEIs can implement sustainability concepts and translate them into practice through various curricular and extra-curricular domains such as education and curricula, research, campus operations, community outreach, and management (UNESCO, 2009). HEI objectives, two decades into the 21st century, are required to be in complete alignment with the UN's commitment to a Decade of Education for Sustainable Development 2005-2014, focused, amongst others, on promoting and improving quality education, at all levels. HEIs, at a global scale, are roughly grouped at three different levels of evolution:

Level 1: The principles of SD are yet to be universally understood, with no significant efforts towards promoting sustainability at university operations and no systematic initiatives for promoting SD concepts.

Level 2: The SD principles are widely understood and hence significant efforts are made towards promoting sustainability at university operations. In addition, various sustainability projects, alongside research and extension programs are being conducted.

Level 3: Universities that fulfill the level 2 requirements are further committed to sustainability on a long-term basis by means of relevant policies and projects, and by allocating senior staff to oversee its sustainability efforts. HEIs at this level have sustainability solidly embedded, both in terms of campus operations and in terms of institutional philosophy, academic programs, research, and in their way of thinking (Filho, 2010; Lozano et al. 2015).

Globally, the majority of HEIs are found at levels 1 and 2, and this illustrates the fact that there are many challenges still to be overcome before achieving a complete integration of SD in HEI structures.

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Challenges, Obstacles and Opportunities

According to UNESCO, higher education needs to be consolidated in all agendas, programs and activities that promote SD, by addressing the SDGs, particularly those on climate change, poverty and sustainable production. They must also promote the integration of these critical sustainability issues in local and global contexts into the curriculum. The UN has identified the following challenges:

- Going beyond environmental education to reach education for sustainable development.
- Drawing up an inventory of what has been achieved, as many countries have carried out education for SD programs or activities. These have to be identified, results evaluated, and information disseminated, to facilitate the integration of this new vision of education into national plans.
- Mobilizing the media: the media represents a powerful means of raising awareness and information dissemination about the SD principles and values, as well as about promising experiences.
- Establishing partnerships and creating synergies among the initiatives and programs on national as well as international level (UN, 2005).

A comprehensive and multinational study has been carried out to shed light on the fundamental obstacles that hinder efforts to implement sustainability at HEIs. The study consisted of both a qualitative and a quantitative approach (Filho et al., 2017). The qualitative analysis identified 25 obstacles while the quantitative approach was conducted with the participation of 269 experts from 47 countries from September to October of 2016. The respondents were asked to express the degree of relevance for the 25 obstacles, from 1 (lowest) to 5 (highest).

Results show that with the exception of the “lack of support

from the management” obstacle, most obstacles are considered in the same scale of importance, as shown in Table B1. The institutional reluctance to adopt SD initiatives is mainly due budget restrictions or lack of resources, despite that fact that various measures have been proven to provide a win-win opportunity such as reducing energy consumption in the campus.

Earlier investigations have been conducted in 2005 by Dawe et al (Dawe et al., 2005) to examine how different disciplines at HEIs have been contributing to the integration of SD into higher education. The five most common identified barriers are: crowded curricula, perceived irrelevance by academics, limited staff awareness and expertise, limited institutional commitment, and promotion criteria. These identified challenges also mean that many opportunities are presenting themselves, including:

- The sustainability debate has been supported by the climate change debate. The current degree of emphasis given to climate issues means that sustainability efforts may be regarded as an effective tool for combating climate change.
- Sustainability can be regarded as a uniting theme through which partnerships can be established between HEIs and government officials, local authorities, NGOs and the private sector.
- The UN Decade of Education for SD 2005-2014 offers an additional opportunity to integrate sustainability as part of the global efforts to improve the quality of HEIs.
- Developing programs that can prepare graduates with knowledge and values, critical thinking and the motivation to deal with diverse problems.
- Sustainability at HEIs facilitates interdisciplinary links, from health to ethics, from economics to social affairs, hence allowing a wider sense of awareness to be developed.

TABLE B1

SURVEY OUTCOMES

Obstacles Grouped	Score
Lack of support from upper administration	3.95
Lack of appropriate technologies, awareness, research and development, and green buildings	2.61 – 2.79
Lack of interest from academic and staff, government institutional and social barriers, lack of legislations, and lack of training, planning, and incentives, and lack of partnership with private sector	2 – 2.5
Lack of continuity and follow up, lack of commitment, and lack of integration in teaching and research.	1.8 – 1.97

- Attaining higher levels of sustainability would pave the way for HEIs to improve the quality of education which is best done through standardized accreditation processes (Filho, 2010).

At the programs level, three categories of response to SD by discipline are identified. In what follows is a listing of some majors, knowing that these are averaged results that could vary from one region to another.

1- Disciplines that have adopted a major process of embedding SD curricula into undergraduate and post-graduate programs. Examples include:

- Engineering, Design and Materials
- Industrial Processes
- English and other languages
- Geography
- Earth and Environmental Sciences

2- Disciplines that have made some limited progress in integrating SD into their curricula. Examples include:

- Biosciences
- Economics
- Hospitality
- Leisure
- Sport and Tourism
- Philosophy and Religious Studies

3- Disciplines that have an interest in SD, but find it difficult to adopt SD widely or deeply into their curricula. Examples include:

- Information and Computer Sciences
- Mathematics
- Statistics and Operational Research
- Performing Arts
- Psychology

Conclusion

The lack of support of the administration constitutes the greatest obstacle to SD in higher education institutes. HEIs could benefit from the relevance and usefulness of SD issues not only in campus operations, but also in connecting with the lifelong learning of their employees and in the acquisition of knowledge, skills and values. The implementation of SD at universities needs an adaptation or a wider re-orientation of their curricula to take full advantage of the opportunities that sustainability offers. It is important that universities advance in overcoming the obstacles to implementing SD. Challenges to developing sustainable education in the region are numerous and mostly match those faced by universities in other parts of the world.

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Environmental Education in Arab Universities

RIYAD Y. HAMZAH



I. INTRODUCTION

In the current era of extreme global environmental challenges that have risen due to massive industrial activities and rapid population growth, institutes of higher education face numerous challenges. Unprecedented changes in economics, environment, demographics, and advances in technology, as well as social and health issues and political instability have triggered these challenges. Universities need to be open to both the opportunities and risks posed by these issues, which are shaping the higher education sector. The Sustainable Development Goals (SDGs) have emerged as an integrated pathway towards a new generation of sustainable life. Environmental sustainability is intertwined with social and economic sustainability, as the challenges surrounding equitable and sustainable use of natural resources affect people's ability to lead prosperous and healthy lives.

Embarking upon the SDGs requires people to reflect upon the ultimate purpose of learning throughout life, as education has the power to

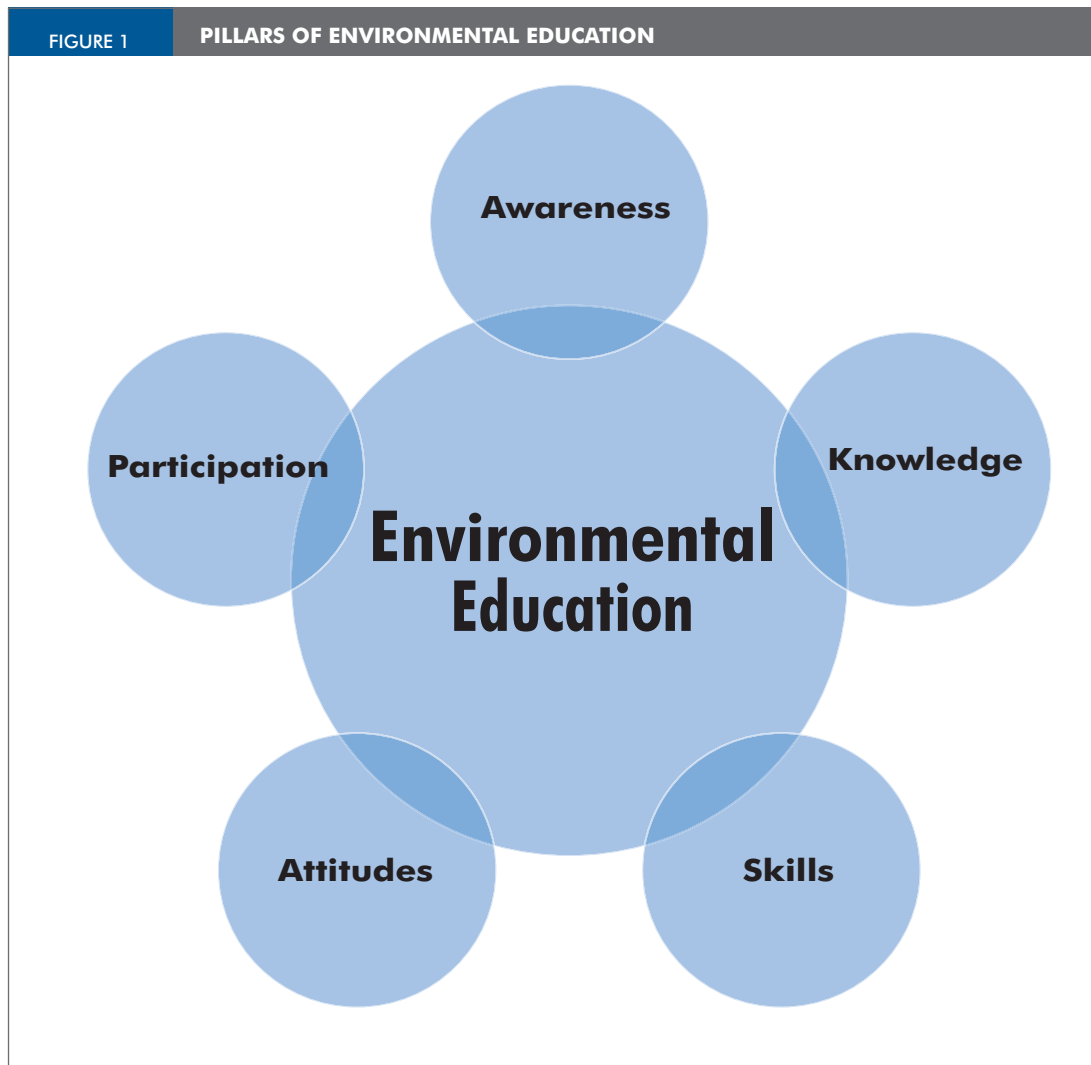
nurture empowered, engaged and skilled citizens who can map the way towards a balanced, greener and safer planet. Implementation of the SDG targets, and adhering to the indicators by identifying a suitable track to make them effective, are major challenges. These require changes in technologies, economies, policies and our way of life, which can be generated through educational systems. The United Nations Educational, Scientific and Cultural Organization (UNESCO) has emphasized the role of education in achieving sustainable development.

Environmental education (EE) has a key role to play in addressing environmental challenges. It can be used to mitigate specific environmental issues and respond to their impact, but also address the behavior that causes them. It can influence individual and collective environmental behavior, it enhances people's resilience to climate change-related risks, and it encourages their support for involvement in mitigation actions. Environmental education not only increases knowledge and awareness but also improves skills, and enables individuals to make better, more environmentally informed decisions.

Universities are considered a major driver to create a more sustainable future. This stems from the primary role of universities as knowledge producers. The concept of education for sustainable development has recently become one of the core educational initiatives to help address many of the problems associated with human development.

This chapter aims to report on the current situation of formal environmental education in the Arab countries, to map existing programs in Arab universities, to identify gaps that need to be bridged and to highlight success stories that others in the region could benefit from. The chapter also discusses the strides made in the Arab region since 2008 to effectively address environmental issues and to disseminate environmental awareness among students, universities, and communities at large. It surveys degree programs on environment and sustainability topics offered by top ranked universities at national levels in Arab countries. Additionally, the chapter highlights the role of research in addressing environmental challenges in Arab countries, and the contributions of Arab universities towards the SDGs.





II. WHAT IS ENVIRONMENTAL EDUCATION?

Environmental education (EE) aims to teach how natural environments function. It is a multidisciplinary field of teaching that includes the fields of biology, chemistry, physics, ecology, earth science, atmospheric science, mathematics, and geography. These fields are integrated to give a more complete understanding of environmental function and services. With the current global environmental challenges and the emergence of the SDGs, EE has gained prominence due to its important role in delivering the necessary knowledge values and attitudes to create solutions that adapt with environmental changes as well as mitigating them (Biasutti et al, 2016).

The foundations of environmental education

begin with awareness, knowledge, attitudes, and skills and end with participation (Figure 1). Awareness, knowledge and attitudes are very important to construct responsible behavior towards the environment that creates a desire to be involved more in environmental issues through higher education degrees (Leicht et al., 2018).

Environmental education can be also delivered to the public through media and campaigns, as it is beneficial to inspire parents to encourage their children to choose higher education routes that are related to environment (UNESCO, 2016).

III. EDUCATION FOR SUSTAINABLE DEVELOPMENT

UNESCO is providing global and regional

leadership in education, strengthening educational systems worldwide, and responding to contemporary global challenges through education, emphasising education for all (UNESCO, 2019).

The complexity of environmental sustainability and its strong correlation to society and economy promotes the role of EE. Nowadays, environmental education is mostly called environmental sustainable development, and according to UNESCO and UNEP Education for Sustainable Development (ESD) (UNEP, 2004; Leal Filho et al., 2015). In recent years, higher education began offering academic programs that not only relate to the environment as a function and a process, but also programs that deal with the complexity of environmental sustainability such as renewable energy, environmental health, environmental economics and environmental policies. These specialties can allow new generations to develop alternative ways of sustainable living (Figueiro and Raufflet, 2015).

The main aim of the SDGs is to achieve a better and more sustainable future for all people on the planet. These goals address the global challenges humans face including poverty, inequality, climate, environmental degradation, prosperity, and peace and justice (Figure 2), all of which can be influenced by education in terms of understanding, skills, and training (Table 1).

IV. ENVIRONMENT IN ARAB UNIVERSITIES

The pressure of economic growth against the volatility of oil prices means that economies and organizations of numerous countries in the Arab region need to be more dynamic, agile and productive than ever before. Yet the region faces dwindling natural resources, stretched public funding, and growing populations. An increasing shift to cities and towns is putting excess strain on infrastructure and creating overcrowded and unhealthy living conditions in many Arab cities.

The population of the countries of the Gulf Cooperation Council (GCC) alone has doubled over the past 20 years to 51 million in 2015. The GCC is one of the most highly urbanized parts of the world with 85 percent of its population living in cities, which is expected to rise to 90 percent by 2050 (PWC, 2017).

These issues are compounded by the environmental challenges that the GCC currently faces. The Middle East and North Africa (MENA) region as a whole currently faces significant environmental issues, water shortages, drought areas, air pollution, climate change and rising energy consumption. The lack of access to sufficient clean water threatens human security in many ways, and can lead to the spread of disease. Water scarcity and pollution threaten agriculture

FIGURE 2 SUSTAINABLE DEVELOPMENT GOALS (SDGS)



TABLE 1 **ROLE OF EDUCATION IN SUSTAINABLE DEVELOPMENT GOALS**

Goal 1	Education is critical to lifting people out of poverty.
Goal 2	Education plays a key role in helping people move towards more sustainable farming methods, and in understanding nutrition.
Goal 3	Education can make a critical difference to a range of health issues, including early mortality, reproductive health, spread of disease, healthy lifestyles and well-being.
Goal 5	Education for women and girls is particularly important to achieve basic literacy, improve participative skills and abilities, and improve life chances.
Goal 6	Education and training increase skills and the capacity to use natural resources more sustainably and can promote hygiene.
Goal 7	Educational programs, particularly non-formal and informal, can promote better energy conservation and uptake of renewable energy sources.
Goal 8	There is a direct link among such areas as economic vitality, entrepreneurship, job market skills and levels of education.
Goal 9	Education is necessary to develop the skills required to build more resilient infrastructure and more sustainable industrialization.
Goal 10	Where equally accessible, education makes a proven difference to social and economic inequality.
Goal 11	Education can give people the skills to participate in shaping and maintaining more sustainable cities, and to achieve resilience in disaster situations.
Goal 12	Education can make a critical difference to production patterns (e.g. with regard to the circular economy) and to consumer understanding of more sustainably produced goods and prevention of waste.
Goal 13	Education is key to mass understanding of the impact of climate change and to adaptation and mitigation, particularly at the local level.
Goal 14	Education is important in developing awareness of the marine environment and building proactive consensus regarding wise and sustainable use.
Goal 15	Education and training increase skills and capacity to underpin sustainable livelihoods and to conserve natural resources and biodiversity, particularly in threatened environments.
Goal 16	Social learning is vital to facilitate and ensure participative, inclusive and just societies, as well as social coherence.
Goal 17	Lifelong learning builds capacity to understand and promote sustainable development policies and practices.

Source: Leicht et. al., 2018

and food production. The Arab Forum for Environment and Development produced a report discussing these challenges to be faced by the region in the next ten years (AFED, 2017).

Considering these regional environmental issues, universities in the region need to comply with international and environmental requirements, including policies towards reducing the carbon footprint, by moderating carbon emissions and energy consumption, controlling the waste generated, smarter use of air conditioning, promoting recycling as good practice, and introducing transport regulations on student and faculty car usage (endorsing public transport). Moving forward, it is critical that universities take

responsibility for their environmental footprints and that they aspire to integrate environmental management good practice into daily business.

In order to identify strengths and weaknesses of academic education on topics relating to the environment and sustainable development, a survey was conducted by AFED in the first half of 2019 to track environment-oriented university programs in the Arab region. The survey was conducted at the top-ranked universities at the national level in each of the 22 Arab countries, and included undergraduate and postgraduate degree programs and other technical programs. All information related to these programs was collected from the websites

THE ENVIRONMENTAL HEALTH PROGRAM AT THE AMERICAN UNIVERSITY OF BEIRUT

Rima Habib

The Environmental Health (EH) Department at the American University of Beirut is hosted within the Faculty of Health Sciences, and offers several bachelor's and master's degrees, in addition to a PhD degree. The EH Department offers an undergraduate program in Environmental Health and awards a Bachelor of Science (BS) in Environmental Health. It also offers an undergraduate minor in Environmental Health. Moreover, as part of the Interfaculty Graduate Environmental Science Program (IGESP), the department awards a Master of Science (MS) degree in Environmental Science.

The undergraduate program in Environmental Health, which was established in 1961, extends over three years and one summer following the completion of a freshman year at university or its equivalent. The program prepares professionals in the various disciplines of the major through rigorous theoretical and practical training. It aims at graduating professionals able to (1) apply contemporary knowledge and technical skills to analyze, prevent and remediate environmental problems, (2) plan, administer

and implement community-based environmental health programs, (3) disseminate knowledge to promote public and environmental health awareness and (4) exhibit high principles of character, a sense of civic and moral responsibility, and a commitment to basic values of human life and ecological well-being.

Throughout the three years of study, students take courses that provide them with fundamental knowledge of environmental health with emphasis on evaluation, prevention and control of major environmental problems at the local, regional and global levels. These courses expose students to the areas of (1) water and wastewater quality and control, (2) solid waste management, (3) indoor and outdoor air pollution, (4) occupational health and safety, (5) toxicology and risk assessment, (6) food safety, (7) environmental microbiology, (8) environmental economics, (9) environmental ethics, and (10) environmental management. In addition to the above mentioned major courses, the core program includes courses in general education (natural sciences, social sciences, humanities, quantitative thought, languages), public health and a variety of free electives, which all

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of the selected universities. Detailed information about universities, degree titles, colleges and departments that offer environmental programs can be found in Appendix Table (p 96).

The survey revealed that most Arab countries offer undergraduate and postgraduate environmental programs in their universities. Collectively, the 57 universities surveyed offer 221 degree programs on environmental topics, consisting of 71 bachelor's degrees, 102 master's degrees, 36 PhDs and 12 technical diplomas. Most Arab countries offer a minimum of one program directly related to environment (Figure 3). Table 2 shows detailed information about universities, degrees titles, colleges and departments and website links in all Arab countries

In order to determine the distribution of the academic programs throughout the region, results were grouped into the five Arab sub-

regions (Levant, GCC and Yemen, Nile Valley, North Africa and African Horn). The highest number of environment-related programs (55) are found in the Levant (Iraq, Jordan, Lebanon, Palestine, Syria), followed by 42 programs in the GCC countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, UAE) and Yemen, 39 programs in North Africa (Algeria, Libya, Mauritania, Morocco, Tunisia), 26 programs in the Nile Valley (Egypt, Sudan), and 3 programs in the African Horn (Comoros, Djibouti, Somalia) (Figure 4).

Academic programs related to the environment, which are offered by Arab universities, are distributed among various disciplines ranging from Environmental Engineering and Water Resources Management to more policy-related disciplines such as Environmental Education, Environmental Law, and Environmental Policy (Figure 5).

contribute to providing a well-rounded educational experience.

The program also provides students with insights and skills into the application of environmental health principles to real-world problems through the practicum/internship course. In the summer of their junior years, students register for the practicum/internship course, which provides them with the opportunity to supplement their theoretical and laboratory experience with practical field experience. During the internship, students assist in ongoing tasks at the site, under close supervision and guidance of field supervisors in pre-approved environment-related work settings. This experience sharpens students' writing, technical and analytical skills and develops their ability to successfully complete well-defined tasks within a limited time frame.

Students interested in pursuing a medical degree can choose to join the environmental health pre-medical track. This track allows students to sit for the Medical College Admissions Test (MCAT) and apply to the medical school at AUB or elsewhere. As such, throughout their three years of study at the EH department, students following this track register for the pre-medical courses in parallel with other major courses.

At the environmental health department, the diverse student body enriches the class discussions and students' experiences. Students are well rounded as they have the

opportunity to study and work closely with a committed faculty that is actively engaged in research covering a wide scope of environmental hot topics to advance knowledge in their disciplines. Moreover, students are continuously advised in their choice of courses and are closely followed up in terms of academic performances and progress.

On average 20 students graduate from the program per year, many of whom occupy key positions in several local and international organizations. These experts work in assessing, managing, controlling and preventing environmental risks through research, field work, advocacy and interventions. After the completion of the undergraduate environmental health program requirements, students can either pursue graduate studies in environmental science, public health or any other field, or they can join the workforce.

For an environmental health graduate, the job market is wide, diversified and non-crowded. With a degree in environmental health, graduates can have satisfying and rewarding careers in the (1) private sector (e.g., industries, hospitals & health centers, construction firms, water companies), (2) public/governmental sector (e.g., ministries, water authorities, petroleum administrations), (3) United Nations Agencies (e.g., UNDP, UNICEF, UNRWA, UNFPA, WHO, ILO), (4) international & national non-governmental organizations (5) research institutes and research centers.

As indicated, there is a higher prevalence of scientific and technical degrees over economics, education and policy-related ones. The highest frequency is in Environmental Sciences (34 degrees), followed by Environmental Engineering (30 degrees), Water Resources (29 degrees), and Renewable Energies (19 degrees).

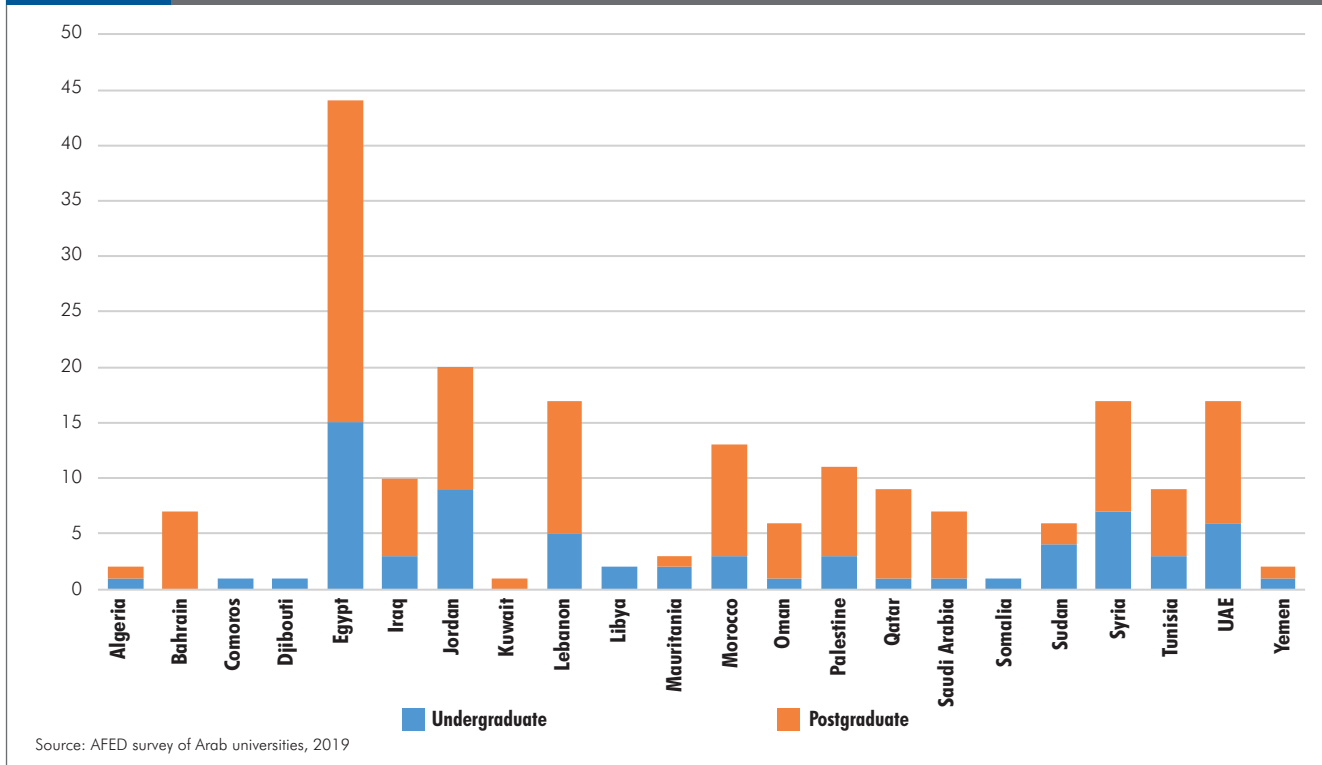
In the Nile Valley region, there is a lack of academic programs concerning Green Economy, as well as of Environmental Education. Environmental Policy degrees are also quite rare in Arab universities, with only two programs registered in the survey. It is also found that the number of postgraduate programs is higher than undergraduate ones. Master's degrees are the most frequently offered programs, followed by bachelor's, PhD, and diploma programs, respectively (Figure 6).

Undergraduate programs related to the

environment, particularly bachelor's degrees, are available in most Arab countries. The quantity of these programs depends on the need of the national market in each country. In terms of the specializations of Bachelor's degrees, there is a general shift from classic Environmental Science that focuses on physics, chemistry, biology, and math to a multidisciplinary approach that integrates engineering and health sciences. Figure 7 shows the major disciplines of bachelor's programs offered by Arab universities. Only 23 percent of the courses are under general environmental sciences. Other courses are titled with more specialized majors such as Environmental Engineering, Water, Energy, Agriculture and Geology.

19 percent of the bachelor's program disciplines are grouped under "others" and are related to environmental economics, environmental education and media, environmental health,

FIGURE 3 ACADEMIC PROGRAMS RELATED TO THE ENVIRONMENT OFFERED BY UNIVERSITIES IN ARAB COUNTRIES IN 2019



environmental planning and management, and environmental legislation and policy. Such programs enable graduates to gain a better understanding of environmental management and policies based on economic theories and models. However, effective collaboration is needed between the market and educational institutions to achieve integrated sustainable development goals in the Arab region.

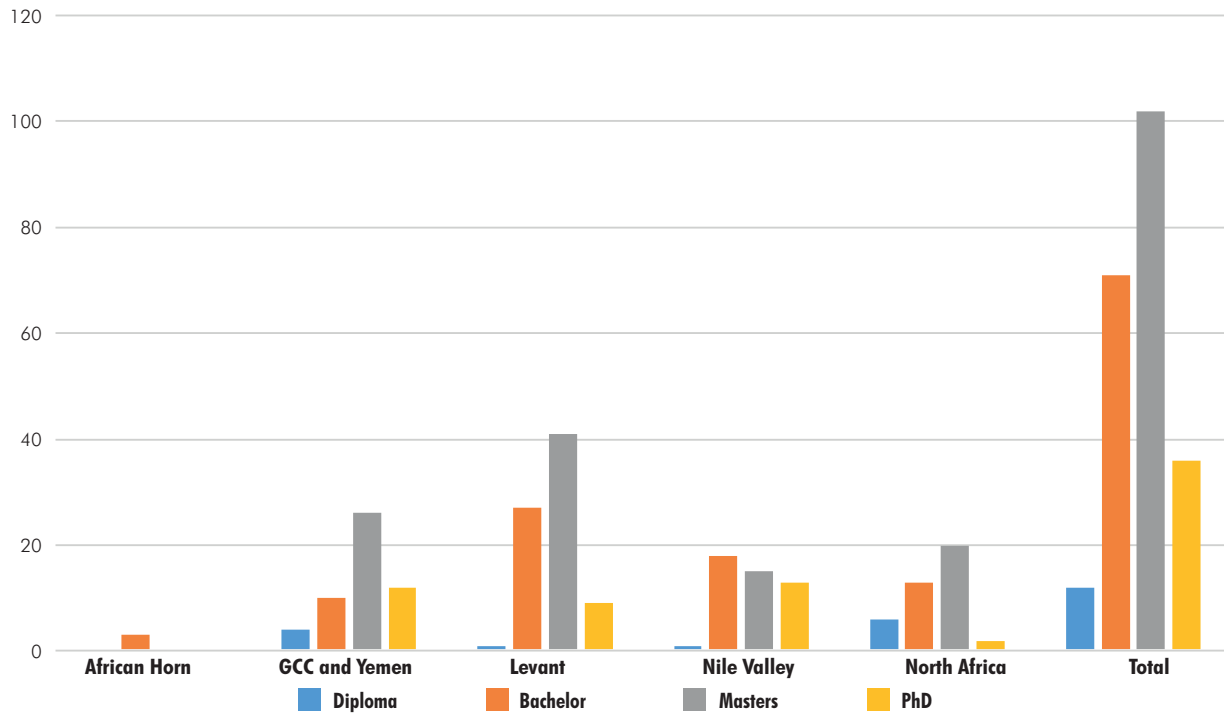
Postgraduate programs are typically research-oriented. At higher levels of education, research becomes the tool to gain the skills as well as the deep knowledge necessary for environmental education and sustainable development. It is essential to promote scientific research to solve national and regional environmental problems. Arab universities are involved in sustainable development through a variety of postgraduate programs related to environment and sustainable development. The emphasis that Arab universities place on research in sustainable development is evident from the large number of postgraduate programs they offer. These programs cover a wide range of specializations, including Sustainable Development,

Engineering, Environmental Sciences, Water, Energy, Geology and Earth Science (Figure 8). Most are offered by universities in Egypt, Lebanon, Jordan, Syria and UAE.

V. RESEARCH TO ADDRESS MAIN ENVIRONMENTAL CHALLENGES IN ARAB COUNTRIES

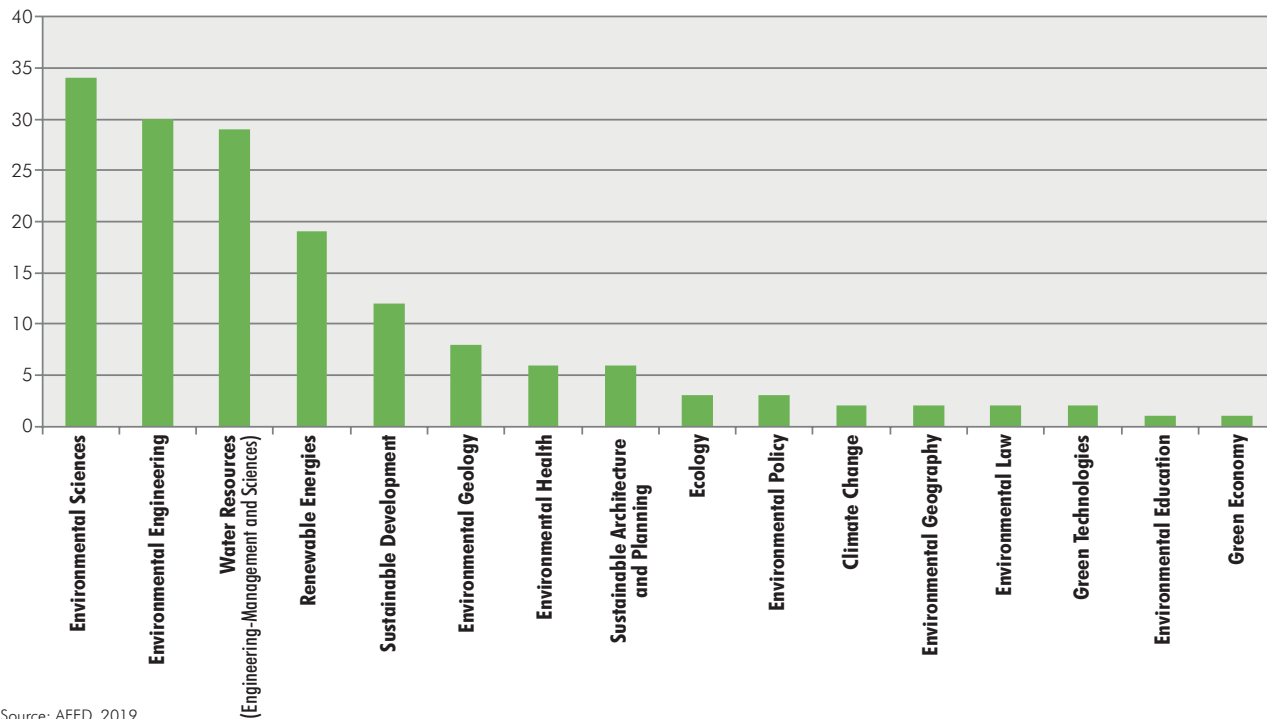
Several regional and international reports, including the AFED report on Arab Environment in 10 years (AFED, 2017) and Global Environment Outlook for West Asia and Africa (GEO-6, 2016a) and (GEO-6, 2016b), highlight the major environmental challenges facing Arab countries. Rapid population growth, political unrest and environmental degradation are identified as prime challenges for sustainable development in the Arab countries. Dimensions of environmental challenges in Arab countries can include, among others, climate change, quality of air and water, deterioration of marine resources, desertification, waste management, and energy production and consumption.

FIGURE 4 DISTRIBUTION OF ACADEMIC PROGRAMS IN ARAB UNIVERSITIES PER SUB-REGION



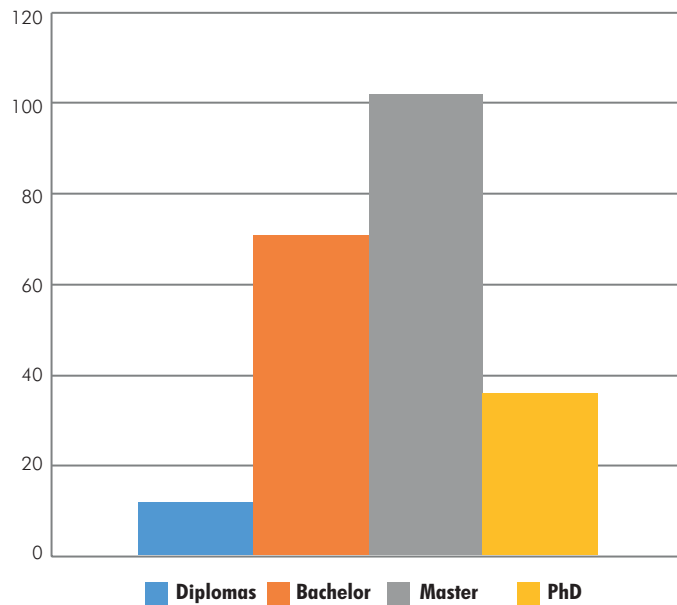
Source: AFED, 2019

FIGURE 5 DISTRIBUTION OF OFFERED ACADEMIC PROGRAMS AMONG ENVIRONMENTAL DISCIPLINES IN ARAB UNIVERSITIES



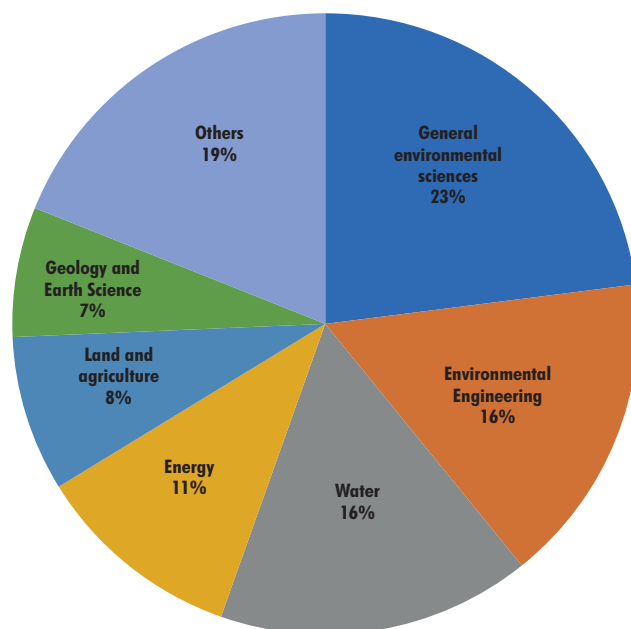
Source: AFED, 2019

FIGURE 6

DISTRIBUTION OF ACADEMIC PROGRAMS RELATED TO THE ENVIRONMENT OFFERED BY ARAB UNIVERSITIES AS PER ACADEMIC LEVEL


Source: AFED, 2019

FIGURE 7

MAJOR DISCIPLINES OF BACHELOR'S DEGREES RELATED TO ENVIRONMENT OFFERED BY ARAB UNIVERSITIES


Source: AFED, 2019

With increasing emission of greenhouse gases (GHG), global temperature is rising. This creates a particular challenge for Arab countries, as most

of them lie within the warmer temperature zones. Depletion of water resources, unpredictable extreme events such as floods and sandstorms, and rising sea levels, especially for low-lying islands in the Arab region (UNEP, 2018), are all consequences of climate change. Although some Arab countries have implemented policies and strategies to mitigate climate change, the adoption of new technologies that use renewable energies are needed (AFED, 2016). One of the targets of SDG 13 (Climate action) is to improve education and raise awareness related to climate change. A recent survey by AFED showed that 84 percent of the Arab public believes that climate change imposes a serious challenge in Arab countries. However, education and awareness related to climate change was found to be lacking, despite being one of the most important measures for climate change adaptation (AFED, 2017).

Air quality is highly affected by the increase of gas emissions from industry and the dependence on fossil fuel and other non-renewable resources in producing energy. Climate change also causes extreme sand storms that carry pollutants and debris, posing serious health concerns that require continuous research and health systems that can adapt to changing needs (AFED, 2009).

In the last ten years, Arab countries have experienced a rapid depletion in water resources – including both surface and ground water resources – due to rapid population growth and intensive agricultural activities, which are considered the main causes for increased water consumption (AFED, 2017). As a result, Arab countries are moving towards desalination and water treatment as good sources of fresh water. These technologies, however, are typically energy and cost intensive. With the intensive use of desalination, especially in the GCC countries, it is essential to further develop technologies that reduce the costs and energy used for water desalination and treatment. This requires intensive research focusing on characterization of the current situation of water resources (Amer et al., 2017) and finding solutions for sustainable water availability.

Renewable energy is a critical issue for both the MENA region and globally. GCC countries have seen rapid economic diversification and have become major energy consumers in their

own right. Regional electricity consumption is growing at almost 8 percent a year, meaning generating capacity has to be doubled every decade. Gulf countries will require 100 GW of additional power over the next ten years to meet demand.

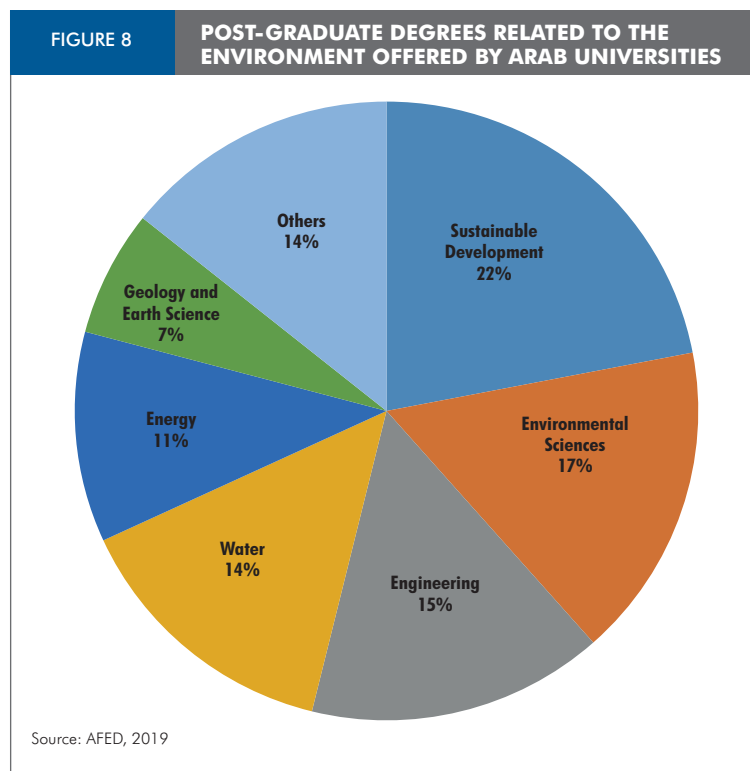
Renewable energy offers Gulf countries a proven, homegrown path to reducing CO₂ emissions. The six GCC countries are in the top 14 per capita emitters of carbon dioxide in the world (PWC, 2017). Renewables offer a financially viable way to change that, and represent real potential for large-scale development projects in the region. Middle Eastern economies are now beginning to turn to new, more sustainable means of meeting their nations' increasing energy needs.

Faced with volatile oil prices and international demand, the market for alternative energies is only going to increase. As projects in the Gulf take off, demand for both investment and the best energy professionals is expected to be high, especially in solar energy, in which the region has an obvious advantage.

Changes in the energy sector on a global basis, which include regulatory pressures for green generation, a push to harness energy in the most efficient way, supply constraints and the ever-growing demand by consumers for lower cost, are currently driving a rise in the development of new technologies with the ultimate aim of providing a regional and global clean energy network that is more robust and secure than ever before.

Innovative technologies such as smart meters and battery storage are becoming an everyday feature for the commercial and residential customer. From data analytics to virtual power plants, there are big changes taking place in the way energy is distributed and consumed. As the pace of change accelerates, governments, universities, and the private sector will be under pressure to spread their investment.

Universities and their affiliated research centres play a critical role in addressing environmental challenges and contributing to sustainable development in Arab countries (Zyoud et al., 2017), with several tackling important research areas such as water resource management, seawater desalination, and renewable energy. A



good example for university affiliated research centers is the King Abdullah University of Science and Technology (KAUST) in Saudi Arabia. KAUST has three specialized research centers, which are dedicated to providing solutions for adaptation and mitigating current environmental problems, particularly in the GCC countries. The centers focus mainly on desalination, marine environment and energy efficiency.

The desalination center at KAUST is dedicated to studying new optimized methods to increase the efficiency of the desalination processes. This is being tackled by addressing problems of the current desalination technologies and trying to come up with suitable solutions. The KAUST solar center focuses on creating innovative solutions related to solar energy. The Red Sea Research Center focuses on a wide variety of knowledge and innovative research on the current situation of the Red Sea's marine environment. The KAUST research profile, as it appears in the Elsevier indexing website 'Scopus', includes engineering and material science, with growing research in environmental sciences.

Scientific research carried out by universities and research institutions can contribute to providing

ENVIRONMENTAL EDUCATION AT THE ARABIAN GULF UNIVERSITY

Mohammad Abido and Ahmed El-kholei

The Arabian Gulf University (AGU) is a regional institute based in the Kingdom of Bahrain. Established in 1980 by the six GCC countries, the mandate of the university is to orient its programs and curricula to the cultural, scientific, and occupational needs of the member states. The university fulfills this mandate by educating and training scholars and specialists, as well as by conducting research in the different fields of development and contributing to the emergence of appropriate applied scientific solutions.

In line with the university's mission, the Desert and Arid Zones Sciences Program was established in 1985 within the College of Graduate Studies to educate students in scientific research and management of soil, water and plant resources in the desert environment. The unprecedented rate of socio-economic development and urban sprawl in the GCC countries prompted the need for further development of the program to accommodate the management of environmental resources and their protection from the consequences of this intensified development. Moreover, multilateral agreements such as the Rio Conventions of 1992 accelerated the university's transition in dealing with multi-dimensional environmental issues from a disciplinary to a trans- and interdisciplinary approach.

Realizing the importance of the AGU mission and its programs, Sultan Qaboos Bin Said of Oman sponsored an Academic Chair in Desert Agriculture in 1994. This had been followed by the establishment of the Emir of Qatar Shaikh Hamad Al Thani Academic Chair in Geographic Information Systems and Remote Sensing in 1997, which are considered the most critical tools in environmental and natural resources research and management. In the same year, the Sheikh Zayed Academic Chair for Environmental Sciences was created, adding another dimension to the environmental education programs at AGU. These Chairs enabled the administrators of the programs to further develop the curricula, expand research and intensify the program's extension work. Furthermore, under the umbrella of these academic chairs, the AGU established a network of collaborators from national

universities, local and regional research institutes inside and outside of the GCC to address pressing environmental issues facing the region.

Currently, the backbone of environmental education in AGU is offering innovative solutions to the most pressing environmental issues of the region, promoting interdisciplinary learning, and collaborating with environmental policymaking organizations at the regional and global level. This type of learning is reflected in the expansion of the desert program into several more specialized programs in the Environmental and Natural Resources Department to address the needs of the GCC countries. These programs include Environmental Sciences, Environmental Management, Water Resources Management, Desert Farming Techniques and Soilless Agriculture.

One of the most important contributions in the field of environmental education and research is the cooperation with the UN Environment Program (UNEP) since 1995. AGU faculty and students have been involved in the preparation of the Global Environment Outlook reports and the related Integrated Environmental Assessment (IEA) training programs. This significantly contributed to the development of the curricula and the emergence of a new paradigm of environmental education and thinking at AGU. In this regard, several courses have been introduced at the Master and Doctorate levels to strengthen the interdisciplinary approach of the learning process. These courses cover topics such as environmental education and awareness, disasters and risk management, water security, and environmental policymaking.

Training programs and research topics have also changed to cope with the needs of Gulf countries in dealing with the environmental impact of industrialization and urban development. Currently, the core focus of applied research topics is sustainability issues in the region. This includes a focus on the water-energy-food nexus, green energy, vulnerability to climate change and mitigation and adaptation issues, and the implementation of environmental conventions within the context of local socio-economic development. To date, more than 200 Masters and



solutions for environmental problems. The number of studies published in international databases can be considered an important indicator for scientific research outputs (AFED, 2008). Accordingly, educational academic programs on environment in Arab countries should accelerate scientific research that provides solutions to regional environmental challenges. The published research shown in the Elsevier indexing website 'Scopus' by Arab universities and research centers on environmental science during the last two decades has been analyzed in this section (<https://www.scopus.com>). Although environmental research applications can be categorized under several disciplines such as chemistry, agriculture, earth science and energy, the category of environmental science was selected to provide an indication of published research related to environmental aspects in the Arab region.

The analysis for Arab universities and research

centers research output on environmental sciences indicates that the overall percentage of environmental science research to the total research is around 7 percent. From the environmental science research analysis, Saudi Arabia and Egypt are the most active research countries, and in both countries a general increase was observed in these studies. In Saudi Arabia, published studies in environmental science have increased from 3.8 percent for the period 1999-2008 to 6 percent for the period 2009-2018. In Egypt, an increase was observed from 5.4 percent to 6.4 percent during the same time periods.

The figures above are consistent with a more comprehensive and detailed analysis presented earlier by Gaber, et. al. for the period 1996-2015 using Scopus-SCImago search engines (AFED 2017). In this bibliographic review for Arab countries, scientific research in general

TABLE 3 Top 20 Arab universities ranked in Times Higher Education University Impact Rankings 2019 by SDG

Rank	University	Global Ranking	Country	SDGs			
1	King Abdulaziz University	54	KSA	10	11	9	17
2	Kuwait University	84	Kuwait	16	10	11	17
3	Ain Shams University	101-200	Egypt	3	4	5	17
4	Alfaisal University	101-200	KSA	9	4	3	17
5	University of Babylon	101-200	Iraq	16	13	11	17
6	Kafrelsheikh University	101-200	Egypt	10	4	12	17
7	King Saud University	101-200	KSA	9	3	5	17
8	Alzahra University	201-300	Iraq	11	13	5	17
9	American University of Beirut	201-300	Lebanon	16	11	5	17
10	Assiut University	201-300	Egypt	9	5	3	17
11	Aswan University	201-300	Egypt	4	5	3	17
12	University of Bahrain	201-300	Bahrain	4	5	8	17
13	Beni-Suef University	201-300	Egypt	13	16	12	17
14	Khalifa University	201-300	UAE	8	10	9	17
15	Mansoura University	201-300	Egypt	3	4	5	17
16	Minia University	201-300	Egypt	8	4	10	17
17	University of Mohamed Boudiaf at M'Sila	201-300	Algeria	10	4	12	17
18	Pharos University	201-300	Egypt	5	8	3	17
19	Qatar University	201-300	Qatar	3	5	4	17
20	University of Sharjah	201-300	UAE	4	16	13	17

Source: Times Higher Education, 2019

and in environment-related fields, Saudi Arabia and Egypt were found to be ranked at the top in terms of number of publications and their citation impact. The state of research in the field of environmental science has been highlighted in several reports by AFED in 2008 and 2017. These reports provide recommendations and suggestions to improve research within the field of environmental science in the Arab countries.

Although there is a substantial increase in environmental programs related to environmental sciences, there is a need to increase the overall research related to the environment. This could be achieved by adopting regional research strategies to solve current and emerging environmental problems in the Arab region, with Arab universities and research institutions focusing more on addressing national and regional challenges.

VI. CONTRIBUTIONS OF ARAB UNIVERSITIES TO SUSTAINABLE DEVELOPMENT GOALS

The Sustainable Development Goals are directly linked to education, since the latter provides a bridge to the SDGs through knowledge and innovative solutions to the current environmental challenges (SDSN, 2017). The aims of incorporating the SDGs in education are:

- To provide students with the knowledge, skills, and motivation to understand and address the challenges of the SDGs
- To empower and mobilize young people
- To provide in-depth academic or vocational training to implement SDG solutions
- To enhance opportunities for capacity building of students and professionals from developing countries to address challenges relating to the SDGs

THE WATER LEARNING CENTER AT ARABIAN GULF UNIVERSITY

Waleed Al-Zubari

The Arabian Gulf University in Bahrain offers the Water Learning Center Program (WLC) in coordination with the United Nations University Institute for Water, Environment and Health (UNU-INWEH). Their cooperation is based on common principles, complimentary objectives and a mutual interest in close collaboration in education and capacity development related to Integrated Water Resources Management (IWRM). The regional center was established in July 2007 and funded by the Arab Fund for Social and Economic Development.

AGU was selected to host the WLC serving the Arab region due to its expertise and experience in post-graduate education, training, research, and contractual studies in the water-related fields. The university has two specialized graduate programs in hydrogeology and water resources management.

The objectives of the regional WLC at AGU are to improve water resources management and water services and to develop and enhance the individual capacities of the water sector in the Arab region. The Center offers a core curriculum in IWRM customized to the Arab region's water conditions. It trains students, trainers and decision makers in water resources management within an IWRM framework, identifies regional and country needs in water resources management and establishes a regional electronic network of young water professionals.

The targeted participants of the program are water resources professionals working in water-related agencies and the private sector in the Arab countries. The program was officially launched in November 2007, and the first batch of trainees enrolled in the IWRM program in 2008. Since its establishment, six batches of students have graduated, with a total of 79 students from Arab countries. The seventh batch of 13 participants is expected to graduate in November, 2019. (For information on the students and their research project abstracts: <http://www.agu.edu.bh/wvlc/index.asp>)

The IWRM diploma consists of ten courses, which include 250 hours of presentations (equivalent to lecture

time) and are conducted in a mixed mode system (i.e., face-to-face and distant learning). The IWRM Overview course and the final Applied Session are delivered at the Water Learning Center at the AGU campus. During the period of the last course, the final comprehensive exam is administered and students are required to present and defend their research project in front of a panel of the program's instructors, as well as the other students. Moreover, students are to make a mid-program visit to AGU to take an exam and present their research proposals with their assigned supervisors. The rest of the courses are delivered as distance education courses, with participant-instructor interaction made by e-mail and through a web-based conferencing system.

The IWRM program's courses include:

1) An Introduction to IWRM: IWRM concepts, state of water resources management and main issues and challenges in the Arab region, hands-on dynamic simulation of a water system (using WEAP software) showing the integration concept in the management of water resources.

2) Water Transfer: natural components and processes of the hydrologic cycle, basic hydrological concepts such as climate change, erosion, infiltration, run-off, streamflow, baseflow, water storage, riparian functions, water budgets and modeling surface and ground water.

3) The Terrestrial Ecosystem: basic elements of terrestrial ecosystems, impacts of land use on terrestrial ecosystem, agriculture, mining, dams and diversions, urbanization and transportation, elements of conservation, economics and planning.

4) The Aquatic Ecosystem: basic elements and processes of aquatic ecosystems, analytical approaches and procedures related to understanding the structure and function of the aquatic ecosystem.

5) Aquatic Ecosystem Health and Impact Assessment: aspects of anthropogenic impact and change to the physical, chemical, biological and ecological components of the aquatic environment, biological monitoring processes, restoring aquatic ecosystems, restoration, toxicology,



Participants in WLC meeting

and ecological risk assessment (ERA).

6) Water Use: consumptive and non-consumptive water use, agriculture, industrial and public water use.

7) Non-Conventional Water Resources: desalination in the Arab region, technologies, issues and challenges (financial, economic and environmental); wastewater in the Arab region, technologies, issues and challenges.

8) Governance and Community Based Approaches: legislative, regulatory, community and individual responsibilities and arrangements of IWRM, demand management, economics, pricing policies, subsidies and incentives, and private participation.

9) Organizational Infrastructure and Management: organizational and management structures for IWRM, financing, policies, management & operations,

laboratory & information management, public health administration.

10) Applying IWRM: students' research projects, including a scientific integrated approach to a water problem in their own country, a literature review, problem statement, objectives, methodology, results and discussion, conclusion and recommendations.

Research topics of students include: impact of climate change on water resources; social, economic and technical constraints in treated wastewater reuse; assessment of environmental impact of desalination; lifecycle assessment of tap water vs. bottled water; irrigation efficiency enhancement;; characterization and management of the water-energy-food nexus; pricing of agricultural water. For research abstracts: http://www.agu.edu.bh/wvlc/pdf/IWRM%20Booklet_Final_18122018.pdf.

Additionally, research is considered a key element for achieving the SDGs. In particular, SDGs 2, 3, 7, 9, 12, 14 and 17 are directly related to research, as is demonstrated in their indicators. SDG 17 calls for triangular regional and international cooperation and access to science, technology and innovation and enhanced knowledge sharing on mutually agreed terms.

SDGs assist universities by creating opportunities for collaboration and funding and for assessing universities' impact. Times Higher Education (THE) recently published the world's first university impact ranking based on universities' contributions towards the SDGs, showing that Arab universities have secured good positions. The top 20 universities in the ranking, along with their top scored SDGs, are shown in Table 3.

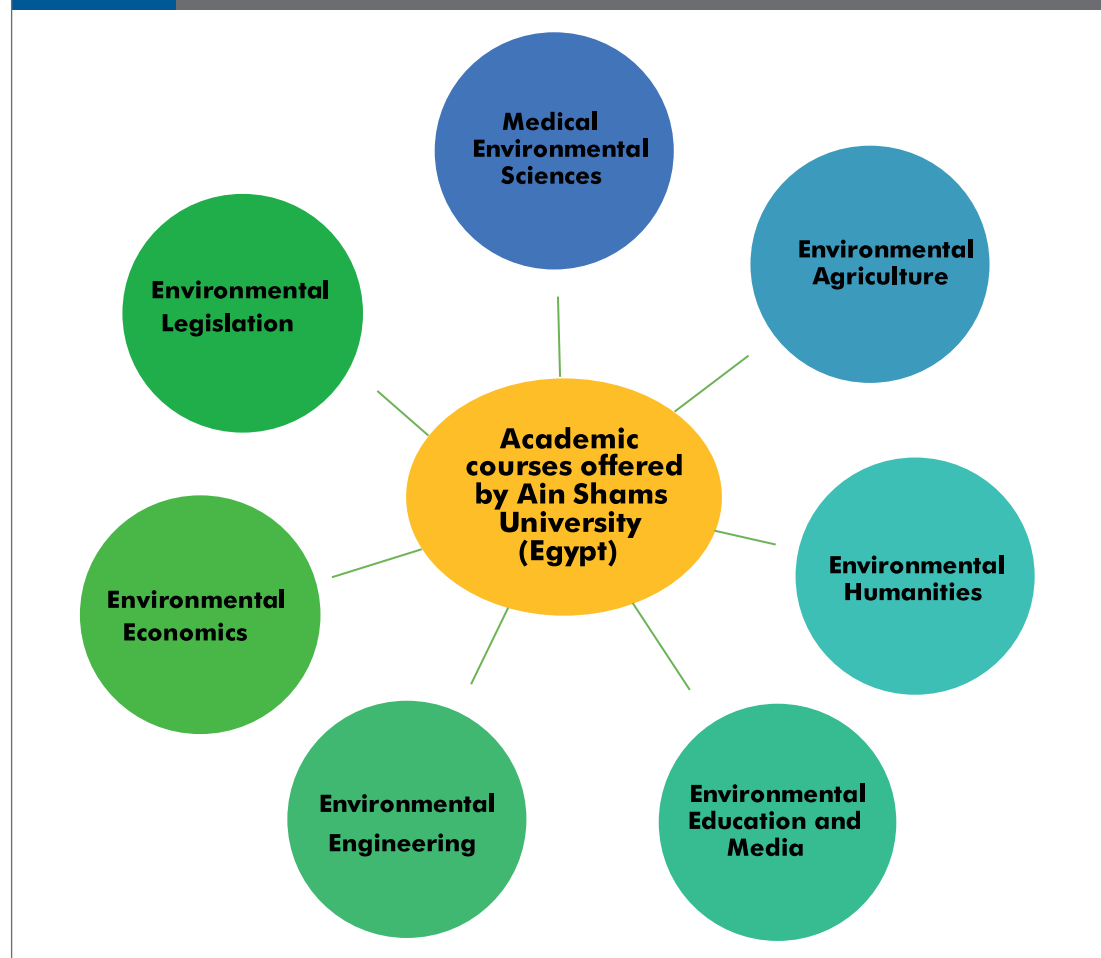
In addition to Goal 17, which is considered the main parameter, most of the ranked Arab universities have shown high scores in SDGs 4, 5, and 3, which are related to education, gender equality, and health, respectively.

However, the Arab universities have fewer contributions towards SDGs related to the environment, such as climate change and responsible consumption. There is limited contribution on SDGs related to energy, life on land, and life at sea. Among the top 20 universities, six universities adopted the SDGs that are directly linked to the environment, such as SDG 13, which focuses on climate change, and SDG 12, which is concerned with responsible consumption and production.

The following are selected examples of the top 20

FIGURE 9

UNDERGRADUATE AND POSTGRADUATE ACADEMIC PROGRAMS OFFERED BY AIN SHAMS UNIVERSITY



Arab universities that ranked in the Times Higher Education for their contributions towards the SDGs.

Ain Shams University, Egypt

Ain Shams University in Egypt, which is well known for its medical school and intensive publications, was ranked third amongst the Arab universities. According to the ranking, the university achieved its highest score in SDGs 3, 4 and 5, representing the university's role in improving health and wellbeing through research and education. Scopus statistics show that the largest portion of Ain Shams University research is focused on medical research (17 percent). The university also contributes to other disciplines, including engineering, physics, chemistry and environmental sciences.



Ain Shams University runs a variety of academic environmental programs through the Institute of Environmental Studies and Research, which offers programs at undergraduate and postgraduate levels. The programs include medical environmental sciences, environmental agriculture, environmental economics, environmental engineering, environmental education, environmental humanities and environmental legislation. All these programs support and incubate innovation for sustainable development solutions for the current global and regional challenges (Figure 9).

King Saud University, Saudi Arabia

King Saud University is one of the Arab universities that demonstrated a rapid increase in scientific research. Based on the THE Impact Rankings 2019, King Saud University is ranked ninth in the Arab region. The university is dedicated to providing high quality varied scientific research that is indexed in Scopus. The scientific research output of the university includes a wide variety of fields. Research in environmental sciences is included and accounts for approximately 6 percent of the university's total documents, as per Scopus statistics. The university also offers one bachelor's degree program in Natural Environment in the Department of Geography. The degree mainly focuses on understanding the environmental

ecosystems within the current environmental changes. The program includes courses in environmental sustainability and the relationship between the environment and human wellbeing. The same department also offers two master's degree programs in Environment and Natural Resources and Sustainable Regional Development. These courses focus on addressing current environmental problems such as climate change and use research tools to find solutions that can be applied regionally.

American University of Beirut, Lebanon

The American University of Beirut (AUB) offers a variety of academic programs in sustainable development that focus mainly on environmental health, environmental technologies and environmental policies. Specific courses such as environmental health, that focus on current challenges and issues in the region, are offered in both undergraduate and postgraduate programs. Other courses include Management of Domestic and Hazardous Wastes, Water and Wastewater Quality Control, Quality Determination of Water and Wastewater, Indoor and Outdoor Air Pollution, Food Safety, Environmental Management Tools and Applications and Environmental Economics.

The university offers a MSc degree in Health and Sustainable Development in collaboration with

UNIVERSITY OF BAHRAIN ENVIRONMENT AND SUSTAINABLE DEVELOPMENT (ESD) POSTGRADUATE PROGRAMS

Mohammad El-Hilo

1. MSc Program in Environment and Sustainable Development (ESD)

The University of Bahrain and the Prince's Foundation (UK) jointly offer a Master's program in Environment and Sustainable Development (ESD). The Prince's Foundation is one of the international establishments specialized in design, planning and urban development that contributes to postgraduate studies in sustainable urbanism in partnership with universities in the UK and abroad. The ESD program is designed to boost students' professional practice skills, to enhance their career prospects in environmental science, sustainable development and sustainable urbanism. Moreover, the Master's program attracts a lively and engaged group of students who combine postgraduate study with their professional lives.

The curriculum of the ESD Master's program is designed to give students diverse educational skills. It involves various learning methods including lectures, field visits, self-study, multidisciplinary projects, and case studies. Students' research projects for the ESD thesis can focus on almost all areas of environmental protection and sustainable development such as energy, water, waste, transportation, pollution, radiation protection and measurements.

Instructors across the University of Bahrain and the Prince's Foundation deliver the courses, in collaboration with various governmental and non-governmental organizations. As specialized environmentalists, ESD program graduates will be able to guide their communities in order to promote sustainable development.

Program Objectives

- Providing graduates from diverse disciplinary backgrounds with a high level of knowledge of the most recent and emerging concepts surrounding the environment and sustainability.
- Training of highly qualified policy decision-makers and environmental managers who will be involved in assessments and the design and implementation of environmental policies.

- Developing a theoretical understanding of the economic forces that contribute to the development of settlements, including the cycles of urban growth, maturity, decay and renewal, and economics for community cohesion and robustness.
- Developing students' appreciation of the range of problems caused by an excessive reliance on fossil fuel-powered energy and solutions.
- Allowing students to develop a comprehensive understanding of sustainable environment issues
- Promoting the use of proper research methodology and tools to related to environment and sustainable development.
- Providing graduates with basic skills for implementing scientific research strategies including collection, evaluation, and interpretation of environmental data.

Program Structure (33 Credits)

Stream 1: Environmental Science and Development

Core Courses (18 credits)

ESD 501	Environmental Science
ESD 502	Environmental Law
ESD 503	Environmental Economics
ESD 547	Research Methods
ESD 504	Resource Management and Technology
ESD 511	Energy and the Environment

Research Project (6 Credits)

ESD 548	M.Sc. Thesis
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Three Elective Courses (9 credits)

ESD 505	Environment and Society
ESD 507	Environmental Pollution
ESD 519	Biological Biodiversity
ESD 522:	Land Use & Management
ESD 524	Environmental Law in the Gulf States
ESD 526	Environmental Impact Assessment
ESD 527	Environmental Data Analysis
ESD 531	Environmental Microbiology
ESD 534:	Marine Pollution
ESD 542	Environmental Radiology

Dr. Mohammad El-Hilo is Dean of College of Science at University of Bahrain.

Stream 2: Sustainable Urbanism

Core Courses (18 credits)

ESD 501	Environmental Science
ESD 502	Environmental Law
ESD 503	Environmental Economics
ESD 547	Research Methods
ESD 550	Concepts of the City and Environmental Change
ESD 551	Place-making and Urban Design

Research Project (6 Credits)

ESD 548	M.Sc. Thesis
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Three Elective Courses (9 credits)

ESD 552	Sustainable Transport
ESD 553	Urban Design
ESD 554	Urban Regeneration
ESD 555:	The Representation of Cities
ESD 556:	Cities and the Environment
ESD 527	Environmental Data Analysis

Courses (18 credits)

2. PhD Program in Environment and Sustainable Development (ESD)

The University of Bahrain's PhD program in Environment and Sustainable Development focuses on environmental sustainability, with an emphasis on the 2030 Sustainable Development Goals. The program equips students with the knowledge and perspectives needed to answer important questions about diverse environmental problems.

Nearly all colleges at the University of Bahrain, including their adjusted research centers, are engaged in this program since it adopts an interdisciplinary approach to solving intractable sustainability problems. Students in the program also have the opportunity to work with a multidisciplinary faculty and researchers in numerous research fields. Additional partners include the United Nations University, the United Nations Development Program (UNDP), the United Nations Environmental Program (UNEP) as well as the Prince's Foundation (UK).

Program Objectives

- Training of highly qualified policy decision-makers and environmental managers who will be involved in assessments and the design and implementation of environmental policies.



- Providing advanced scientific training to allow students to identify and analyze the problems of sustainability, provide answers, and design and implement innovative solutions based on multidisciplinary research.
- Participating in national and international research teams, thereby facilitating students' integration into the global network of scientists in overlapping fields of study.
- Enabling students to develop new companies and businesses, particularly by promoting the link between ESD activities and the economic and business work environments.

Program Structure (75 Credits)

University Requirements Courses (12 credits)

ESD 791	Applied Research Methods
ESD 792	Applied Statistical Techniques
ESD 793	Special Topics and Reading
ESD 794	Graduate Seminar

Program Requirements: SDGs (9 Credits)

ESD 795	Sustainable Development Goals I
ESD 796	Sustainable Development Goals II
ESD 797	Sustainable Development Goals III

Research Project (54 Credits)

ESD 798	PhD Thesis
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EARTH University in Costa Rica. AUB also offers a minor specialization in Urban Planning and Environmental Engineering, which concentrates on challenges of urban regions and provides solutions to current problems facing cities. It is estimated that around 50 percent of the scientific publications by the American University of Beirut are related to medicine and computer science. Environmental science research accounts for 3.7 percent of all publications. The University Impact Rankings 2019 showed that the highest scored SDGs by the American University of Beirut were SDG 11 for sustainable cities and communities, 5 for gender equality, and 16 for peace, justice, and strong institutions.

University of Bahrain, Kingdom of Bahrain

The University of Bahrain (UoB) is the national university of the Kingdom of Bahrain. In 2002, the university launched a master's program supported by the UNESCO Chair for Environment and Sustainable Development. In 2017, the program was restructured into two streams – Environmental Science and Sustainable Urbanism – in cooperation with the Prince's Foundation, UK. Recently, a PhD program in Environment and Sustainable Development was launched with the objective of providing deep knowledge and research about the current challenges in the region, particularly in the

GCC. Within the first two years of launching the program, thirty students were enrolled, most of whom are employed in key institutions. Their research projects investigate problems related to their professions and institutions.

In 2016, UoB began to subscribe to the GreenMetric World University Ranking and ranked 307 globally in 2017 (Green Metric, 2017). They did this in order to monitor their own progress through key performance indicators towards becoming an environmentally friendly campus (Hamzah et al., 2018).

In 2018, UoB signed collaboration agreements with the University of Oxford in the UK to cooperate in water desalination research. Additional collaboration agreements were also created with the University of Loughborough and the University of Aston in the UK. These collaborations are directly involved in research through research centers and academic programs, and all focus on finding solutions for regional Arab environmental issues such as energy efficiency, water desalination, and renewable resources. The combination of top expertise in the world with local expertise is expected to contribute to finding more efficient and valid solutions that can be implemented locally and regionally. These expanding research opportunities at UoB contributed to its standing in the University Impact Rankings 2019, with the university

ranked at 213 in the world and twelfth among Arab universities. The efforts exerted by the University of Bahrain also contributed to its high percentage scores in SDGs 4, 5, and 8.

UoB, as the leading research institute in Bahrain and one of the regional leaders in the area of clean energy and water resources, has a critical role in supporting the government to achieve national renewable and energy efficiency targets. UoB's ambition is to go beyond targets, and through sustainable partnerships, to develop innovative solutions that have an impact on the environment, society, and the economy.

The key deliverables of current collaborations are:

- Capacity building by establishing University of Bahrain renewable energy labs, and preparing technicians and researchers.
- Research activities in the areas of energy and renewable energy, and water desalination and treatment.
- Training and workshops to disseminate knowledge to society and those interested in the field of renewable energy from the private and public sectors.

VII. CONCLUSION AND RECOMMENDATIONS

Compared to 2008, the last decade has witnessed a rapid increase in programs related to environment and sustainable development in the Arab region. 57 top-ranked universities at the national level in the 22 Arab countries offer 221 degree programs on environmental topics, both at the undergraduate and post-graduate levels. The growth of such programs can contribute to creating and disseminating knowledge related to the environment and its sustainability. However, more inter-academic and multi-disciplinary cooperation and exchange programs between different faculties of the same university, national universities and universities can further strengthen their roles in addressing environmental challenges. For instance, student exchanges and further scientific collaboration programs between universities and research institutions could be initiated.

The environment, the social, and the economic dimensions of sustainable development are all



interconnected. It is important to integrate these three pillars of sustainable development in the offered programs. An introductory course highlighting this interconnectedness of the environment with the social and economic dimensions of sustainable development, which can be open to students from all disciplines, is recommended. There is also a need to strengthen topics such as Environmental Law in law schools, and Green Economy in faculties of economics. Additionally, Ecological Footprint and Natural Capital Accounting could be included in economics studies. Such topics would enable graduates to increase their understanding of environmental management and policies.

Further bridges between educational institutes and other sectors such as industry and economy are needed. For instance, there is a need for effective collaboration between local markets in countries and their educational institutions in order to effectively contribute to the Sustainable Development Goals.

Universities in Arab countries are playing an increasingly important role in achieving the SDGs through their academic programs and research activities. Recently, several Arab universities ranked among the top 500 universities globally for their contributions towards the SDGs, according to the University Impact Rankings 2019. Arab universities can accelerate their contribution to sustainability by integrating all of the SDGs into their learning and teaching activities, research, and community initiatives.

TURNING UNIVERSITY OF PETRA INTO A FRIENDLY GREEN CAMPUS

Adnan Badran

The University of Petra (UOP) in Amman, Jordan, has embarked on providing sustainable campus for its 8000 students, in addition to about 600 faculty members and staff, on a floor-built area of 140,000 m². Measures include generating all UOPs needs of electricity from the sun, recycling wastewater, and creating a car-free campus.

Reduction of paper use

In 2013, UOP made a strategic plan to reduce the consumption of paper, utilizing electronic communication between colleges and departments, in addition to the introduction of electronic exams and electronic minutes of meetings and memos.

Natural zones

Half of the total area of the university campus is kept, or made natural, zones. The university has planted nearly 10,000 trees to reduce carbon dioxide emissions, and created green areas around all colleges, alongside introducing a botanic garden

Energy management

UOP has taken a number of measures to reduce dependence on fossil energy and replace it with renewable energy. The university initially changed lighting to LEDs at all university buildings and achieved a 30 percent decrease in consumption. In 2016, it installed photovoltaic (PV) solar system on rooftops of its buildings and parking lots, with 1.5 MW AC (3 GWH annually). Additional PV panels have been installed in 2019, increasing the production by 1.5 megawatts to a total of 3 MW AC (6 GWH annually). Cost of electricity was reduced to zero, with some excess production sold to the public network.

The cost of stage 1 was JD 1.5 million (2,115,675 USD), with a 2-year payback period on investment. Stage 2, built after 3 years with a similar extra capacity of 1.5 MW, cost 800,000 JD (1,128,360 USD), bringing the payback period down to just 1.5 years, reflecting the rapid decrease in the price of PV panels



Water management

Jordan is considered one of the most water-stressed countries in the world. The amount of rain-water fall on UOP campus is around 500 mm per year. UOP has its own underground water-well, fed by an aquifer 350 meters deep, which is recharged from annual rainfall. The quality of water is good, but the quantity is not sufficient to irrigate the green areas of the campus. This has prompted the implementation of a policy to optimize water consumption, through introducing efficiency measures and recycling water. A treatment station of 200 m³per day capacity has been built on the lowest spot of the campus, to collect waste water, which is treated and used to irrigate all the lawn, gardens, shrubs and trees, utilizing drip-irrigation, to maintain a green campus. Also, the university is in the process of building a 50,000 m³ reservoir under the stadium, to harvest campus rain-water by gravitation.

Electric cars and train

Main campus is car-free, with only electric cars, provided by the university, to be used when absolutely necessary. The university has procured electric trains to move students on the ring- road between buildings, keeping parking spaces on the periphery. Besides creating a safer pedestrian-friendly campus and reducing noise, these measures help to reduce carbon dioxide emissions, with a target to achieve zero-emission shortly.

Dr. Adnan Badran is Chancellor of the University of Petra and Chairman of Board of University of Jordan and former Prime Minister of Jordan

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APPENDIX TABLE

AFED SURVEY OF ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT ACADEMIC PROGRAMS IN MAJOR UNIVERSITIES IN THE ARAB COUNTRIES* (SOURCE: AFED, 2019)

	University	Program	Degree	Faculty and Department	Website
Algeria	Ourgala University	Renewable Energies	Bachelor's and Master's	Faculty of Hydrocarbons, Renewable Energies, Earth and Universe Sciences - Department of Renewable Energies	https://fherstu.univ-ouargla.dz/ar/2013-05-05-09-08-43/2013-12-18-11-15-44.html
Bahrain	Arabian Gulf University	Environmental sciences and natural resources	Diploma, Master's and PhD	College of Graduate Studies - Technical Studies	http://www.agu.edu.bh/english/colleges/grad_programs.aspx
		Environmental Management	Post-graduate		
		Water Resources Management	Post-graduate		
	University of Bahrain	Environment and Sustainable Development (Joint Program with Prince's Foundation for Building Community)	Master's	College of Science	http://www.uob.edu.bh/en/index.php/colleges/college-of-science/260-environment-and-sustainable-development
		Environment and Sustainable Development	PhD		http://www.uob.edu.bh/en/index.php/colleges/college-of-science/304-ph-d-in-environment-and-sustainable-development
Comoros	Université des Comores	Environmental Sciences	Bachelor's	Faculty of Science - Department of Earth and Environmental Sciences	http://www.univ-comores.km/composante.php#
Djibouti	Université de Djibouti	Environmental Chemistry, Biodiversity and Climate Change	Bachelor's	Faculty of Science	http://www.univ.edu.dj/?p=654
Egypt	Ain Shams University	Environmental Sciences	Bachelor's, Master's and PhD	Institute of Environmental Studies and Research	http://iesr.asu.edu.eg/
		Medical Environmental Sciences	Bachelor's, Master's and PhD		-
		Environmental Agriculture	Bachelor's, Master's and PhD		-
		Environmental Humanities	Bachelor's, Master's and PhD		-
		Environmental Education and Media	Bachelor's, Master's and PhD		-

APPENDIX TABLE AFED SURVEY OF ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT ACADEMIC PROGRAMS IN MAJOR UNIVERSITIES IN THE ARAB COUNTRIES* (SOURCE: AFED, 2019) (CNTD.)				
	Environmental Engineering	Bachelor's, Master's and PhD		-
	Environmental Economics	Bachelor's, Master's and PhD		-
	Environmental Legislation	Bachelor's, Master's and PhD		-
Alexandria University	Environmental Sciences (General and Special)	Bachelor's, Master's and PhD	Faculty of Science - Department of Environmental Sciences	http://sci.alexu.edu.eg/index.php/en/
	Environmental Sciences and Chemistry (General)	Bachelor's		
	Environmental Sciences and Biochemistry (General)	Bachelor's		
American University in Cairo	Environmental Science Minor	Bachelor's	Interdisciplinary - Departments of Biology and Chemistry	http://catalog.aucegypt.edu/preview_program.php?catoid=27&poid=4771
	Environmental Systems Design	Master's	School of Sciences and Engineering	http://catalog.aucegypt.edu/preview_program.php?catoid=27&poid=4772
	Environmental Engineering	Master's and PhD		http://catalog.aucegypt.edu/preview_program.php?catoid=27&poid=4770
	Sustainable Development (Dual Degree with Politecnico di Milano)	Master's		http://catalog.aucegypt.edu/preview_program.php?catoid=27&poid=4870
Cairo University	Environmental Planning	Bachelor's	Faculty of Regional and Urban Planning - Department of Environmental Planning and Infrastructure	https://www.frup.info/academic-programs/undergraduate-programs/environmental-planning-courses/
	Environmental Planning and Infrastructure	Master's and PhD		https://www.frup.info/academic-programs/postgraduate-programs/
Mansoura University	Environmental Sciences (Chemistry)	Bachelor's	Faculty of Science - Chemistry Department	http://scifac.mans.edu.eg

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AFED SURVEY OF ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT ACADEMIC PROGRAMS IN MAJOR UNIVERSITIES IN THE ARAB COUNTRIES* (SOURCE: AFED, 2019) (CNTD.)

		Environmental Sciences (Chemistry and Geology)	Diploma	Faculty of Science - Chemistry and Geology Departments	http://scifac.mans.edu.eg/en/postgraduate/conditions-terms/diploma
		Environmental Geology	Master's	Faculty of Science - Geology Department	http://scifac.mans.edu.eg/en/postgraduate/conditions-terms/master
		Geology of Environment	PhD	Faculty of Science - Geology Department	http://scifac.mans.edu.eg/en/postgraduate/conditions-terms/phd
Iraq	University of Babylon	Environmental Engineering	Master's	College of Engineering - Department of Environmental Engineering	http://en.engineering.uobabylon.edu.iq/graduate.aspx
	University of Baghdad	Water Resources Engineering	Bachelor's, Master's and PhD	College of Engineering - Department of Environmental Engineering	http://coeng.uobaghdad.edu.iq/?page_id=21797
		Environmental Engineering	Bachelor's, Master's and PhD	College of Engineering - Department of Water Resources Engineering	http://coeng.uobaghdad.edu.iq/?page_id=21809
		Soil Science and Water Resources	Bachelor's, Master's and PhD	Faculty of Agriculture - Department of Soil Science and Water Resources	http://coagri.uobaghdad.edu.iq/?page_id=15002
Jordan	Al al-Bayt University	Applied Geology and Environment Sciences	Bachelor's	Institute of Earth and Environmental Sciences	https://web2.aabu.edu.jo/faculties_site/index.jsp?site_no=100800#
		Water and Environmental Resources	Master's		
	Al-Balqa' Applied University	Water and Environmental Resources Management	Bachelor's and Master's	Faculty of Technological Agriculture - Department of Water Resources and Environment	https://www.bau.edu.jo/bauar/Colleges/Agr/Water_Resources.aspx
	Al Hussein Bin Talal University	Environmental Engineering	Bachelor's	College of Engineering - Department of Environmental Engineering	http://www.ahu.edu.jo/EN-category-498
	Hashemite University	Earth and Environmental Sciences	Bachelor's	Faculty of Natural Resources and Environment - Department of Earth and Environmental Sciences	https://hu.edu.jo/fac/default.aspx?facid=68000000
		Land and Environment Management	Bachelor's	Faculty of Natural Resources and Environment - Land and Environment Management	

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AFED SURVEY OF ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT ACADEMIC PROGRAMS IN MAJOR UNIVERSITIES IN THE ARAB COUNTRIES* (SOURCE: AFED, 2019) (CNTD.)

		Water and Environmental Management	Bachelor's	Faculty of Natural Resources and Environment - Water and Environmental Management	
University of Jordan		Environmental and Applied Geology	Bachelor's and Master's	School of Science - Department of Geology	http://science.ju.edu.jo/Departments/School_DeptHome.aspx?deptname=Geology
		Environmental Sciences and Management	Master's		http://science.ju.edu.jo/Lists/OurPrograms/School_PostGraduate.aspx
		Civil Engineering, Water and Environment	Master's	School of Engineering - Department of Civil Engineering	http://engineering.ju.edu.jo/Lists/OurPrograms/School_Postgraduate.aspx
		Land, Water and Environment	Bachelor's, Master's and PhD	School of Agriculture - Department of Land, Water and Environment	http://agriculture.ju.edu.jo/Departments/School_DeptPrograms.aspx?DeptName=Land%20Water%20and%20Environment
		Integrated Water Resources Management	Master's	Water, Energy and Environment Center	http://centers.ju.edu.jo/en/weec/Pages/MasterProgram.aspx
		Renewable Energy	Master's	School of Graduate Studies	http://graduatedstudies.ju.edu.jo/Lists/OurPrograms/School_Master.aspx
		Environmental Technology and Climate Change	Master's		
Yarmouk University		Geology and Environmental Sciences (Minor)	Bachelor's	School of Science - Department of Earth and Environmental Sciences	https://science.yu.edu.jo/index.php/depts/departments-of-earth-and-environmental-sciences
		Environmental Sciences	Master's		
Kuwait	Kuwait University	Environmental Sciences	Master's	College of Graduate Studies	http://kuweb.ku.edu.kw/COGS/AcademicAffairs/Preparationandpublicationdepartment/Graduateguide/AcademicYear20182019/CollegeofGraduateStudies/index.htm
Lebanon	American University of Beirut	Global Master's in Health and Sustainable Development (Joint Program with EARTH University of Costa Rica)	Master's	Faculty of Health Sciences	http://www.aub.edu.lb/fhs/Pages/ms_gmp.aspx

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AFED SURVEY OF ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT ACADEMIC PROGRAMS IN MAJOR UNIVERSITIES IN THE ARAB COUNTRIES* (SOURCE: AFED, 2019) (CNTD.)

	Environmental Health (Interfaculty)	Bachelor's and Master's		http://www.aub.edu.lb/academics/pages/majors_programs.aspx
	Eco-systems Management (Interfaculty)	Master's	Faculty of Agriculture and Food Sciences - Department of Landscape Design and Ecosystem Management	
	Environmental Technology (Interfaculty)	Master's		
	Environmental and Water Resources Engineering	Master's and PhD		
	Environmental Policy Planning (Interfaculty)	Master's	Faculty of Arts and Sciences	
	Civil and Environmental Engineering	Bachelor's	Faculty of Engineering and Architecture - Department of Civil and Environmental Engineering	
	Green Technologies (Joint Program with American University in Cairo and Lebanese American University)	Diploma	Faculty of Engineering and Architecture	http://www.aub.edu.lb/msfea/PRGR/Pages/default.aspx
Beirut Arab University	Creative Sustainability (Architecture)	Master's	Faculty of Architecture - Department of Design and Built Environment	http://www.bau.edu.lb/Program/Architecture-Design-and-Built-Environment/MArch/Creative-Sustainability
Notre Dame University	Environmental Science	Bachelor's	Faculty of Natural and Applied Sciences - Department of Sciences	http://www.ndu.edu.lb/academics/faculty-of-natural-applied-sciences/sciences/environmental-science
	Sustainable Architecture	Master's	Faculty of Architecture, Arts and Design - Department of Architecture	http://www.ndu.edu.lb/academics/faculty-of-architecture-art-design/architecture/master-of-architecture-in-urban-design/-sustainable-architecture
University of Balamand	Environmental Sciences	Bachelor's and Master's	Faculty of Arts and Sciences - Department of Environmental Sciences	http://it.balamand.edu.lb/faculties/FAS/Departments/Pages/EnvironmentalScience.aspx
	Environmental Engineering	Master's	Faculty of Engineering - Department of Civil and Environmental Engineering	http://it.balamand.edu.lb/faculties/FOE/Departments/Pages/CivilEngineering.aspx

APPENDIX TABLE					
AFED SURVEY OF ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT ACADEMIC PROGRAMS IN MAJOR UNIVERSITIES IN THE ARAB COUNTRIES* (SOURCE: AFED, 2019) (CNTD.)					
	University Saint Joseph	Environment Sciences and Management	Master's	Faculty of Sciences	http://www.fs.usj.edu.lb/files/mastsge.html
		Geography - Environment and Land Use Planning	Bachelor's, Master's and PhD	Faculty of Human Sciences	https://flsh.usj.edu.lb/
Libya	Academy of Graduate Studies	Environmental Sciences	Bachelor's	Department of Environmental Sciences	http://www.alacademia.edu.ly/Specialization.aspx?Spe=3272
		Environmental Engineering	Bachelor's	Environmental Engineering Division	http://www.alacademia.edu.ly/Specialization.aspx?Spe=3271
Mauritania	University of Sciences, Technologies et de Medicine - Nouakchott	Water Management and Analysis Techniques	Bachelor's	Faculty of Sciences and Technologies - Department of Chemistry	http://www.ustm.mr/?Licence-Gestion-de-l-Eau-et-Techniques-d-Analyses-GETA
		Technologies of Renewable Energy Systems	Bachelor's	Faculty of Sciences and Technologies - Department of Physics	http://www.ustm.mr/?Licence-Professionnelle-Technologies-des-Systemes-Energie-Renouvelable-TSER
		Renewable Energies	Master's		http://www.ustm.mr/spip.php?page=sommaire
Morocco	Al Akhawain University	Sustainable Energy Management	Master's	School of Science and Engineering	http://www.aui.ma/en/sse/graduates/mssem.html
	Université Cadi Ayyad	Geo-environment and Natural Risk	Diploma	Faculty of Sciences	https://www.uca.ma/fr/departement?search=&site=44&type=1
		Energy Efficiency and Renewable Energies	Master's		
		Biotechnology and Sustainable Development of Agro-resources	Master's		
		Social Economy and Sustainable Development	Master's	Faculty of Legal, Economic and Social Sciences	https://www.uca.ma/fr/departement?search=&site=157&type=1
		Tourism, Heritage and Sustainable Development	Master's	Faculty of Human Sciences	https://www.uca.ma/fr/departement?search=&site=160&type=1#
		Water and Environment	Bachelor's	Faculty of Sciences and Technologies	https://www.uca.ma/fr/departement?search=&site=161&type=1
		Exploration and Valorization of Geo-resources (Option: Water and Environment)	Master's		

APPENDIX TABLE

AFED SURVEY OF ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT ACADEMIC PROGRAMS IN MAJOR UNIVERSITIES IN THE ARAB COUNTRIES* (SOURCE: AFED, 2019) (CNTD.)

	Metrology, Quality, Security and Environment	Diploma	Higher School of Technology	https://www.uca.ma/fr/departement?search=&site=166&type=1
	Renewable Energies	Diploma		https://www.uca.ma/fr/departement?search=&site=167&type=1
University Hassan I	Energy and Environment Engineering	Diploma	National School of Applied Sciences	http://www.uh1.ac.ma/formations/fili%C3%A8res
	Renewable Energies Engineering	Bachelor's	Higher School of Technology	
	Environment Protection	Bachelor's	Faculty of Sciences and Technologies	
University Mohammed V	Environment and Water Management	Diploma	Higher School of Technology	http://www.um5.ac.ma/um5r/content/dipl%C3%B4me-universitaire-de-technologie
	Renewable Energies	Master's	Faculty of Sciences	http://www.um5.ac.ma/um5r/content/master-fondamental
	Water, Energy and Environmental Sciences	Master's	École Normale Supérieure of Techniques	http://www.um5.ac.ma/um5r/content/master-sp%C3%A9cialis%C3%A9
	Environment and Sustainable Development Law	Master's	Faculty of Legal, Economic and Social Sciences	
	Geo-tourism, Eco-tourism and Sustainable Development	Master's	Faculty of Sciences	
University Sidi Mohammed Ben Abdellah	Renewable Energies and Energy Efficiency	Bachelor's	Higher School of Technology	http://www.usmba.ac.ma/~usmba2/affaires-academiques/licences/
	Geo-resources and Environment	Bachelor's and Master's	Faculty of Sciences and Technologies	http://www.fst-usmba.ac.ma/
	Ecology and Environment Preservation for Sustainable Development	Master's	Faculty of Sciences	http://www.usmba.ac.ma/~usmba2/affaires-academiques/masters/
	Natural Heritage and Sustainable Development	Master's		
	Natural Resources, Environment and Sustainable Development	PhD		http://www.fsdmfes.ac.ma/Formations/Doctorat

APPENDIX TABLE AFED SURVEY OF ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT ACADEMIC PROGRAMS IN MAJOR UNIVERSITIES IN THE ARAB COUNTRIES* (SOURCE: AFED, 2019) (CNTD.)					
Oman	Sultan Qaboos University	Civil Engineering (Option: Water Resources)	Master's	College of Engineering	https://www.squ.edu.om/ps/Programs/Programs
		Civil Engineering (Option: Environmental Engineering)	Master's		-
		Soil and Water Management	Master's and PhD	College of Agricultural and Marine Science	-
		Environmental Science	Master's	College of Science	-
	University of Nizwa	Environmental Technologies	Diploma	College of Engineering and Architecture	http://www.unizwa.edu.om/program_details.php
		Environmental Engineering	Bachelor's		
Palestine	Al-Quds University	Earth and Environmental Sciences	Bachelor's	Faculty of Science and Technology - Department of Earth and Environmental Studies	https://www.alquds.edu/en/faculty-of-science-technology/department-of-earth-environmental-sciences/754-study-plan.html
		Environmental Studies	Master's	Faculty of Science and Technology - Department of Environment and Applied Earth Sciences	https://www.alquds.edu/en/postgraduate/postgraduate-programs-at-faculty-of-science-technology/master-of-science-in-environmental-studies.html
	An-Najah National University	Energy and Environment Engineering	Bachelor's	Faculty of Engineering and Information Technology	https://www.najah.edu/en/academic/undergraduate-programs/
		Clean Energy Conservation Engineering	Master's	Faculty of Graduate Studies	-
		Environmental Sciences	Master's		
		Sustainable Engineering in Production	Master's		
		Water and Environmental Engineering	Master's		
	Birzeit University	Environmental Engineering	Bachelor's	Department of Civil Engineering	https://www.birzeit.edu/en/study/programs/environmental-engineering
		Sustainable Engineering in Production	Master's	Department of Engineering and Technology	https://www.birzeit.edu/en/study/programs/sustainable-engineering-production
		Water and Environmental Engineering	Master's	Institute of Environmental and Water Studies	https://www.birzeit.edu/en/study/programs/water-and-environmental-engineering

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AFED SURVEY OF ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT ACADEMIC PROGRAMS IN MAJOR UNIVERSITIES IN THE ARAB COUNTRIES* (SOURCE: AFED, 2019) (CNTD.)

		Water and Environmental Sciences	Master's		https://www.birzeit.edu/en/study/programs/water-and-environmental-sciences
Qatar	Hamad Bin Khalifa University	Energy and Resources	Master's	College of Science and Engineering	https://www.hbku.edu.qa/en/cse
		Sustainable Energy	Master's and PhD		
		Sustainable Environment	Master's and PhD		
	Qatar University	Environmental Science	Bachelor's, Master's and PhD	College of Arts and Sciences - Department of Biological and Environmental Sciences	http://www.qu.edu.qa/artsscience
		Environmental Engineering	Master's	College of Engineering	http://www.qu.edu.qa/engineering/graduate/master-env-eng
Saudi Arabia	King Abdullah University of Science and Technology	Environmental Science and Engineering	Master's and PhD	Biological and Environmental Science and Engineering Division	https://bese.kaust.edu.sa/study/Pages/EnSE.aspx
	King Fahd University of Petroleum and Minerals	Environmental Sciences	Master's	College of Petroleum, Engineering and Geosciences - Geosciences and Chemistry Departments	https://cpg.kfupm.edu.sa/program/m-sc-in-environmental-sciences/
		Renewable Energy Engineering	Master's	College of Engineering	https://engineering.ksu.edu.sa/ar/node/3314
	King Saud University	Natural Environment	Bachelor's	College of Literature - Department of Geography	https://arts.ksu.edu.sa/ar/node/3847
		Environment and Natural Resources	Master's		https://arts.ksu.edu.sa/ar/node/3850
		Sustainable Regional Development	Master's		
Somalia	Somali National University	Dry land Agriculture	Bachelor's / Lareat	Faculty of Agriculture and Environmental Science	http://snu.edu.so/index.php/agr/
Sudan	Sudan University of Science and Technology	Soil and Water Science	Bachelor's	College of Agricultural Studies - Soil and Water Sciences Department	http://agricultural.sustech.edu/index.php/College_of_Agricultural_studies/_Soil_and_Water_Sciences_Department/en/sections
		Water Resources Engineering	Bachelor's	College of Water and Environmental Engineering - Department of Water Resources Engineering	http://water.sustech.edu/index.php/College_of_Water_and_Environmental_Engineering/_Water_Resources_Engineering/en/sections

APPENDIX TABLE		AFED SURVEY OF ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT ACADEMIC PROGRAMS IN MAJOR UNIVERSITIES IN THE ARAB COUNTRIES* (SOURCE: AFED, 2019) (CNTD.)				
		Environmental Engineering	Bachelor's	College of Water and Environmental Engineering - Department of Environmental Engineering	http://water.sustech.edu/index.php/College_of_Water_and_Environmental_Engineering/Environmental_Engineering/en/sections	
	University of Khartoum	Public and Environmental Health	Master's and PhD	Faculty of Public and Environmental Health - Department of Environmental Health and Environmental Studies	https://health.uofk.edu/index.php/academic-program/postgraduate-studies	
		Environment and Ecology	Bachelor's	Faculty of Geographical and Environmental Sciences - Department of Environment and Ecology	https://fges.uofk.edu/index.php/en/#	
Syria	Damascus University	Environmental Sciences	Bachelor's	Faculty of Science - Department of Environmental Sciences	http://damascusuniversity.edu.sy/sci/index.php?lang=1&set=3&id=379	
		Planning and Environment	Bachelor's, Master's and PhD	Faculty of Architecture - Department of Planning and Environment	http://damascusuniversity.edu.sy/arch/index.php?lang=1	
		Renewable Energy Engineering	Bachelor's, Master's and PhD	Faculty of Mechanical and Electrical Engineering - Department of Electrical Power Engineering	http://damascusuniversity.edu.sy/fmee/index.php?lang=1	
		Green Economy	Master's	Faculty of Economics - Department of Business Administration	http://damascusuniversity.edu.sy/eco/index.php?lang=1	
		Tishreen University	Environmental Sciences	Master's	Higher Institute for Environmental Research	http://www.tishreen.edu.sy/ar/academics
		University of Aleppo	Environmental Engineering Technologies	Bachelor's and Master's	Faculty of Technical Engineering - Department of Environmental Engineering Technologies	http://bit.ly/2tF6eKW
			Water Resources Engineering	Bachelor's	Faculty of Technical Engineering - Department of Water Resources Engineering	
			Environmental Engineering	Bachelor's, Master's and PhD	Faculty of Civil Engineering - Department of Environmental Engineering	http://bit.ly/2ElyDur
			Water Engineering	Bachelor's and Master's	Faculty of Civil Engineering - Department of Water Engineering	
	Tunisia	Université Libre de Tunis	Renewable Energies and Energy Efficiency	Master's	Private Polytechnic Institute	http://www.ult-tunisie.com/masters
Université de Sfax		Environment Protection	Bachelor's	Higher Institute of Biotechnology - Department of Biotechnology and Health	http://www.isbs.rnu.tn/fra/pages/393/la-en-protection-de-lenvironnement	

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AFED SURVEY OF ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT ACADEMIC PROGRAMS IN MAJOR UNIVERSITIES IN THE ARAB COUNTRIES* (SOURCE: AFED, 2019) (CNTD.)

		Environmental Sciences and Technologies	Master's		http://www.isbs.rnu.tn/fra/pages/404/mp-en-sciences-et-technologies-de-lenvironnement
		Renewable Energies	Master's	Higher Institute of Biotechnology - Biomedical Department	http://www.isbs.rnu.tn/fra/pages/410/mp-en-energies-renouvelables
		Natural Resources and Environmental Engineering	Bachelor's	National School for Engineers	http://www.enis.rnu.tn/fra/pages/278/G%C3%A9nie-G%C3%A9ressources-et-Environnement
		Natural Resources Management and Environmental Engineering	PhD	National School for Engineers - Doctoral School	http://www.enis.rnu.tn/fra/pages/254/Formation-P%C3%A9dagogique?ml1=274
Université de Tunis El Manar		Water Engineering and Environment	Diploma	National School for Engineers	http://www.utm.rnu.tn/utm/fr/formation--diplome-national-d-ingenieur
		Environment Protection	Bachelor's	Faculty of Mathematics, Physics and Natural Sciences	http://www.utm.rnu.tn/utm/fr/formation--licence
		Environment Applied Geology	Master's		http://www.fst.rnu.tn/fr/fst-filieres.php
		Geo-resources and Sustainable Development	Master's		
UAE	American University of Sharjah	Environmental Sciences	Bachelor's	College of Arts and Sciences - Department of Biology, Chemistry and Environmental Sciences	https://www.aus.edu/programs/majors-Minors
		Environmental Policy (Minor)	Bachelor's		
		Environmental and Water Engineering (Minor)	Bachelor's	College of Engineering	
		Renewable Energy (Minor)	Bachelor's		
British University in Dubai		Sustainable Design of Built Environment	Diploma and Master's	Faculty of Engineering and Information Technology	http://www.buid.ac.ae/
		Architecture and Sustainable Built Environment	PhD		
Khalifa University		Sustainable Critical Infrastructure	Master's	College of Engineering - Department of Industrial and Systems Engineering	https://www.ku.ac.ae/academics/graduate-programs/

APPENDIX TABLE		AFED SURVEY OF ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT ACADEMIC PROGRAMS IN MAJOR UNIVERSITIES IN THE ARAB COUNTRIES* (SOURCE: AFED, 2019) (CNTD.)			
		Health, Safety and Environmental Engineering	Master's		-
		Water and Environmental Engineering	Master's	College of Engineering - Department of Civil Infrastructure and Environmental Engineering	
		Civil Infrastructure and Environmental Engineering	PhD		
Modul Dubai University		Sustainable Development, Management and Policy	Master's		https://www.modul.ac.ae/academic-programmes/graduate-msc
UAE University		Water Resources	Master's and PhD	College of Engineering - Department of Civil and Environmental Engineering	https://www.uaeu.ac.ae/en/catalog/graduate/programs/
		Environmental Sciences	Master's	College of Science - Department of Biology	
		Ecology and Environmental Sciences	PhD		
University of Sharjah		Environmental Health and Safety	Diploma	Community College - Department of Health and Medical Sciences	http://www.sharjah.ac.ae/en/academics/degree-program/Pages/Diploma.aspx
		Sustainable and Renewable Energy Engineering	Bachelor's	College of Engineering - Department of Sustainable and Renewable Energy Engineering	http://www.sharjah.ac.ae/en/academics/degree-program/Pages/UnderGraduate.aspx
		Environmental Health Sciences	Bachelor's	College of Health Sciences - Department of Environmental Health Sciences	
Yemen	Hadhramout University	Environmental Sciences	Bachelor's	College of Environmental Sciences and Marine Biology - Department of Environmental Sciences	http://hadhuniversity-001-site5.atempurl.com/Department/Index/10?parentId=5&entity=college
		Environmental Studies and Water Resources	PhD	College of Environmental Sciences and Marine Biology - Department of Environmental Studies and Water Resources	http://hadhuniversity-001-site5.atempurl.com/Center/Index/1015?entity=center

Source: AFED, 2019.

*The survey was conducted using the universities' official websites. Direct contact was made with universities where information needed to be verified.

AMERICAN UNIVERSITY OF BEIRUT: ENVIRONMENTAL APPROACHES

Fadlo R. Khuri

The motto carved on the Main Gate of the American University of Beirut (AUB)—That they may have life and have it more abundantly—is a biblical text that reflects the school's evangelical origins when it was founded in 1866. But like many profound statements, its meaning can adapt to new realities with the passage of time. The pursuit of a more abundant life continues to incorporate AUB's mission of providing excellence in education, advancing knowledge through research, and serving the region and beyond. For 152 years, our institution has fashioned individuals with a strong commitment to creative and critical thinking, life-long learning, personal integrity, civic responsibility, and leadership. However, to safeguard an abundant life in second decade of the 21st century, we are also in the process of steering the mission towards even greater efforts in environmental sustainability.

Excellence in teaching

Improving population health is at the heart of any effort to create a sustainable environment and AUB's environmental health undergraduate program, launched in 1961, is the oldest of its kind in the region. Hosted by the Faculty of Health Sciences, the pre-eminent public health school in the global south, the program's focus is on evaluating and controlling major environmental health problems in developing countries in such fields as water supply, waste disposal, food hygiene, occupational health, and air pollution. The Interfaculty Graduate Environmental Sciences Program which offers a master's of science (MS) degree in environmental sciences was launched in 1997 as a means of addressing salient issues on the environment and development in Lebanon and the Arab World using an interdisciplinary approach. AUB's school of engineering, which in a past life enabled the rapid development of petroleum and affiliated industries in the Persian Gulf, is now endowed along with architecture and design as the Maroun Semaan Faculty of Engineering and Architecture (MSFEA) with a new environmentally-friendly vision under the maxim of "a viable, livable, equitable world." Contemporary issues in energy systems are the focus of MSFEA's master's degree in mechanical engineering, aiming to find energy solutions that have a minimal impact on the environment. Meanwhile, the MS in energy studies engages students in

the development of energy initiatives needed in regional and international markets, and supports energy dialogue for the development of appropriate and informed public policies. A new online graduate diploma in building energy systems seeks to train professionals on effective ways to develop and advance sustainable energy solutions for improving building performance. AUB is also collaborating with other regional universities on an online professional diploma in green technologies in three concentrations—energy, buildings, and water.

Dedicated centers and units

The AUB Nature Conservation Center (NCC) is the only transdisciplinary academic center in the MENA region addressing nature conservation. It plays a major role in addressing challenges such as climate change, air pollution, water pollution and scarcity, and the consequent loss of crops and biodiversity, through raising awareness and designing holistic interventions and adaptation measures based on transdisciplinary action research. One project among many is the mapping of local environmental resources and assets with the help of rural communities to be used in eco-tourism and development of local micro-economical projects. The center has also engaged local stakeholders in assessing local water quality and co-creating solutions, as well as deriving pharmaceuticals and paramedical products from local endemic plants and promoting their cultivation as alternative crops. Every year for the last dozen years NCC has held the International Biodiversity Day at AUB (IBDAA) competition, which attracts contestants from across Lebanon to propose original and viable solutions to pressing environmental concerns in the country.

The Munib and Angela Masri Institute of Energy and Natural Resources is another dedicated university body which works on creating opportunities for top-quality research and teaching by promoting academic and professional collaboration. Interdisciplinary research is focused through support for targeted competitive projects with a view towards establishing a community of energy experts across the disciplines. Since its foundation, the institute has awarded grants to study energy technologies with an eye towards a sustainable energy future, focusing on the Lebanese context.

At the Faculty of Agricultural and Food Sciences (FAFS), the

Dr. Fadlo Khuri is President of the American University of Beirut (AUB).

Environment and Sustainable Development Unit (ESDU) is an inter-disciplinary research and development center specialized in community development and sustainable agriculture, in and around urban areas. It also offers a master's degree in rural community development, which is unique to the region. Among the many activities of this unit is the Eco MENA Initiative, which is a network of self-generative eco-communities based on indigenous knowledge and appropriate green technologies, and the Rural Empowerment and Entrepreneurship Forum, which gathers stakeholders for developing and implementing sustainable collective projects as well as linking rural communities with project implementers.

Knowledge creation

At AUB, we have ongoing research covering a wide range of fields. MSFEA research ranges from energy efficient systems and reducing energy use in buildings, to water pollution and how to prevent it, how pollution travels in the ocean and the atmosphere, and developing a sensor that estimates excess CO₂ emissions that result from poorly maintained roads. Researchers are also looking at pharmaceutical waste treatment solutions to reduce contamination of water supplies; biomass derived fuels; sustainable construction with a focus on waste management; organization-based shared mobility solutions in contexts which lack formal public transport; developing a new class of photovoltaic cells; the use of

microorganisms to degrade environmental pollutants such as sea water contaminated with crude oil; and sustainable architecture. Researchers have also invented a device to detect oil spills that is unique in its ability to operate while being dragged in open water in the presence of waves and under variable lighting and temperature conditions. The faculty also houses the Atmospheric and Analytical Laboratory that researches the interplay between human exposure, health and behavior in the field of air pollution and inhalable smoke particles, as well as emission sources and ambient pollution concentrations. At FAFS, research is being conducted into conservation agriculture; helping identify the public satisfaction from the progress of waste management initiatives; developing a scenario-based trade-off analysis tool for primary resource management; and pioneering a new paradigm in soil science that addresses the organization of soil landscape and the hierarchical internal organization of the soil medium.

Knowledge transfer and collaboration

AUB acts as a hub for addressing Lebanon and the region's local and global problems, and involving all stakeholders to find solutions. The university organizes and participates in various forums and collaborations that support knowledge dissemination and exchange and give the opportunity for students and professionals to develop and implement solutions for a sustainable future. For example, the Water-Energy-Food-Health



Nexus Renewable Resources Initiative was initiated at AUB, involving faculty members from across the university with the aim of achieving primary resources' security through transdisciplinary collaboration with other universities within Lebanon and the region. Recent conferences held at AUB include a policy dialogue to overcoming bottlenecks in water governance and a panel discussion about Lebanon's energy mix between oil and renewables. Faculties are also implementing and pursuing academic collaborations such as the new global master's in health and sustainable development with EARTH University in Costa Rica. The Issam Fares Institute for Public Policy and International Affairs has operated a dedicated program since 2008 called the Forum on Climate Change and Environment in the Arab World which leverages academics' technical expertise to answer socially driven questions on climate change and environment in order to fill policy gaps in Lebanon and the Arab World.

AUB believes in taking learning outside the classroom and into the world. That is why we encourage our students to work together and think in terms of practical implementation of their acquired knowledge. One of the most impactful and innovative projects by AUB students has been "Light up a Village". For this project, students take care of raising funds, working with suppliers, and collaborating with NGOs and local communities to install solar-powered streetlights in underserved Lebanese villages and to provide solar kits for some of the underprivileged homes. Student competitions are also held at AUB to encourage experiential learning, such as the "Climate Change and Water Scarcity: Exploring the Water-Energy-Food Nexus" and the "Climate Change and Land Degradation" competitions.

Community involvement and service

Through its Center for Civic Engagement and Community Service, AUB works closely with underserved communities to design and implement projects that tackle pressing environmental challenges, such as an urban agriculture model and training program informed by the aspirations of disenfranchised female groups, which was developed in Lebanon's Ayn El Helweh Palestinian refugee camp. AUB's Neighborhood Initiative is another entity that mobilizes the university's resources to serve the community outside its gates. One of its projects is a "Sorting at the Source" campaign establishing a network of buildings in the neighborhood committed to sorting recyclable

household waste. Urban Hives is another initiative currently being executed which aims to implement raised gardens above parking lots in Beirut to increase green public spaces in the city.

AUB is determined to maintain its role of modeling a better society, and taking the lead on important and forward-looking ideas. Our campus was designated as a botanic garden in 2016 underlining AUB's responsibility as a custodian of its natural environment in a city where green spaces are few and far between. AUB was also declared tobacco-free at the beginning of 2018, which has reaffirmed that instituting a tobacco-free policy on university campuses leads to few students taking up a lifetime of smoking.

Collection, recycling, management, and disposal programs are all being implemented at the university for different types of waste including batteries, chemical waste, bio-hazardous waste, radioactive waste, plastic, and other products. AUB is also constructing sustainable buildings with a focus on energy efficiency and emission reduction. Pilot projects demonstrate the important role of buildings for mitigation and adaptation to climate change, such as the Penrose Hall Dormitory which is being converted into a green building. Other environmental initiatives are the installation of photovoltaic cells on roofs for electricity generation, grey water collection, rainwater collection, controlled heating and cooling, planting native plant species to preserve on water consumption, using sustainable material and appliances, holding green-friendly events, and recycling and reusing existing material when possible.

Safeguarding an abundant life

If it is human action that has caused our looming environmental crisis, so too is it human action that can put us on a different path. The words of the author, activist, and role model Helen Keller, «Alone we can do so little; together we can do so much,» remind us that our ecosystem knows no campus walls, no political divisions, no national borders. We all breathe the same air, are all connected to the same soil and the same oceans. Therefore, responsibility lies with all of us to ensure our children will inherit an environment that supports life in all its diversity. As educators of the future leaders and creators of new knowledge, the higher education sector—with AUB at the forefront—can and must play a leading role in this effort, so that we may all enjoy more abundant lives.

ENVIRONMENT IN ARAB SCHOOL CURRICULA

REHAM REFAAT ABDELAAL AND CHARBEL MAHFOUD



I. INTRODUCTION

Environment is quickly becoming an integral part of education in schools across the Arab region, with varying success in different countries. Environmental concepts in schoolbooks have long been largely limited to personal and community cleanliness, general nature knowledge – mainly on animals, insects and plants – and some basic natural phenomena like the water cycle. But the emergence of new environmental challenges at an unprecedented rate in recent years, has led to the inclusion of new concepts and approaches in the curricula of Arab schools.

The role of education in protecting the environment and preserving natural resources has become more recognized. This mandated a new approach to old topics and the inclusion of new topics in school curricula. Natural resources, biodiversity and ecosystems reflected the interlinkages among various environmental challenges. Pollution and waste gained more prominence, and the management of dwindling natural resources led to the introduction of concepts such as ecological footprint into school curricula.

While the concepts of climate change and sustainable development have become standard in the textbooks of most Arab countries, green economy, green growth and ecological footprint are still lacking. Still, these concepts have been spotted in places where they might have been least expected, such as ecological footprint as part of the geography curriculum in Syria, and green economy as part of the new high school programs in Lebanon.

II. INTEGRATING ENVIRONMENTAL CONCEPTS IN COURSES AND CLASSES

Environmental knowledge and concepts are communicated to students in the formal classroom curricula, as well as through extracurricular activities. A survey carried out by Arab Forum for Environment and Development (AFED) during the first half of 2019, based on school textbooks and curricula supplied by Arab ministries of education, found that the environmental topics most popular in Arab schools are ecosystems, pollution, natural resources and sustainable development. In

contrast to the inclusion of the rather new topic of sustainable development, the survey found that climate change was absent or not adequately discussed in 40 percent of the countries covered. Natural disasters, which are impacted by changes in environmental conditions and themselves exert critical impact on the environment, were virtually absent from the curricula of half of the countries, and weak in the other half where the concept was covered briefly. Classes in which environmental concepts were covered most were grade 5 – the last of the elementary level – and grade 11, before the last year at the high school level. Grade 6, the first intermediate class, was the weakest in coverage of environmental concepts.

Geography, social sciences and civics courses included items on ecosystems, natural resources, biodiversity, sustainable development and pollution. These came mainly under the topics of family, good citizenship, environmental protection, impact of economic activities on the environment, demographic changes, water and waste management. The sequence of civics courses specifically tackled these issues under the general topic of social responsibility, including sustainable consumption.

Natural, earth and life sciences courses integrated ecosystems, pollution and climate change concepts in topics about health, nutrition, living organisms, energy, water and air. In several cases, natural resources were integrated in **mathematics** at the elementary level by utilizing examples like number of trees, volume of water and consumption of electricity in calculation exercises. **Health education** courses hosted items on food safety and pollution, under the topics of environmental health, health awareness and personal hygiene.

Language courses, mainly Arabic, English and French, were widely used to integrate a variety of environmental concepts, mainly those related to nature, pollution and environmental responsibility in general. Environmental texts are not limited to elementary reading books, but have also been spotted in literature textbooks, and selected texts were used in some instances for literary analysis, especially in Lebanon, Syria and Morocco.

Environment was covered in **religious studies** courses from the perspective of preventing

This chapter analyses data collected and compiled by AFED research team during the first half of 2019, based on textbooks used by schools in the Arab region, supplemented by detailed course curricula provided by ministries of education in 10 Arab countries. To facilitate comparison between countries, which use dissimilar names to identify different school grades and levels, we classified the grades in this chapter between 1 and 12. This comprises 3 general levels: elementary (1-5), intermediate (6-9) and secondary (10-12).



pollution and using natural resources in a sustainable manner, based on the belief that human beings are custodians of God's nature gifts, and should thus preserve them. It has been noted that environmental topics in religion courses were concentrated in the lower grades. Climate change and sustainable development are still absent from religion courses at Arab schools.

Based on the AFED survey of curricula and textbooks in schools in selected Arab countries, an analysis was prepared to show areas of strength and weakness, in view of bridging the gaps and enhancing the system. The analysis covered the status of eight main environmental topics in Arab school curricula, namely: ecosystems, pollution, natural resources, climate change, solid waste, biodiversity, sustainable development and natural resources.

1. ECOSYSTEMS

The common elements related to ecosystems in school curricula in the countries surveyed focused on plants, animals and nature reserves. They

mainly reviewed biotic and abiotic elements, sources of threat to the ecosystems, alongside the food chain and the food pyramid.

Shortcomings were observed in addressing issues such as oceans and global ecosystems, including the Polar Regions, as well as the lack of a balanced distribution of topics among scientific and literary courses and different grades.

At the country level, many components of ecosystems are addressed in the Egyptian curricula between grades 4 and 7 in social studies and science, grade 2 in Arabic and religious education, and in grade 12 in geology and geography. Among the most prominent titles related to ecosystems included in the Egyptian curricula are the mutual influence between man and the environment, the role of man in the emergence of environmental problems, classification of organisms, the energy pyramid and the food network.

In Lebanon, school curricula cover most aspects of ecosystems, evenly distributed among various grades and courses. They are addressed in grades

AL-BIA WAL-TANMIA MAGAZINE: A ROLE MODEL FOR ENVIRONMENTAL EDUCATION

Raghida Haddad

Al-Bia Wal-Tanmia (Environment & Development) magazine has changed public perception of the environment in the Arab world, fulfilling a great need for a credible source of environmental information in Arabic. Established by Najib Saab in 1996, as an independent private initiative, it was the first region-wide magazine on environment, with a monthly circulation of over 38,000 in 22 countries. Its articles were syndicated to 14 Arab newspapers, bringing environmental information to a wider spectrum of readers. In 2006, it was the initiation platform of the Arab Forum for Environment and Development (AFED), the regional organization with a mission to advance environmental policies and action in Arab countries, based on science and awareness. It eventually became AFED's official magazine.

In 2017, after 20 years of publication, Al-Bia Wal-Tanmia ceased the print edition and turned online. Alongside the monthly magazine, the internet portal www.afedmag.com publishes daily news and commentaries and hosts the complete archive of the magazine since 1996, in addition to AFED's annual reports on the State of Arab Environment, representing the largest reference on environment in Arabic. It also links to the magazine's environmental education website www.afedecoschool.org, which includes sections on key environmental issues, with audiovisual material that can be downloaded for use in schools.

The portal attracts over 1.5 million visits per month, and the magazine Facebook page has more than 1.3 million followers.

Although Al-Bia Wal-Tanmia has become a major reference for decision makers in Arab countries, its most prominent success was the environmental movement it created in schools, involving students in environmental action. The magazine is a main source of environmental information for students and educators, and its articles and commentaries are used in curricula and formal examinations.

AFED and Al-Bia Wal-Tanmia developed a comprehensive environmental education program, supported by the handbook *Environment at School*, available in print and online. The program includes developing national curricula and teacher training workshops. Building on this program, a new *Environmental Guidebook for Arab Schools* was developed in 2019, including emerging issues such as green economy, sustainable consumption and SDGs.

The magazine organized annual school competitions under the theme "A Better Environment Starts with You," involving more than 150,000 students and their teachers in environmental work. Training workshops on environmental education were organized for more than 2000 teachers in several Arab countries. This education program helped create hundreds of environmental school clubs.

Al-Bia Wal-Tanmia established the Youth Environment Parliament: 50 elected students from 50 schools, guided by a teachers committee, were involved in field visits, writing reports, and discussions with municipalities, officials and civil society for better environment in their communities.

The magazine produced a quarterly wall chart called *Green Bulletin*, distributed to schools free of charge. It also produced educational TV Programs and documentaries, and published environment books for different age groups.

Al-Bia Wal-Tanmia has won international environmental awards, including Global 500 from the United Nations Environment Program (UNEP) and Zayed International Prize for the Environment. UNEP citation stated that "this influential magazine is used in schools and universities and sponsors over 400 environment clubs. It created a pan-Arab environmental movement that accomplished what official bodies in the region could not develop over the years."

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2 and 5 in science and geography, grade 1 in English, grades 1, 10 and 12 in civics, grades 7 to 12 in earth and life sciences, and in grade 7 in physics and chemistry. The Lebanese curricula focus on forests in terms of their role and classification and the factors contributing to increased plant diversity, classification of animals, their habitat and extinction, and nature reserves. The wide variety of the curriculum is not complemented by enough experiments and extracurricular activities.

In Bahrain, the concept of ecosystems is addressed in four grades at the elementary and intermediate levels, in the subjects English and social studies. The most prominent topics are: forests, deserts, mountains, fauna and their habitat, seas and oceans, weather and global biodiversity.

Syrian curricula tackle ecosystems in science, social studies and geography in grades 2 to 10. Topics include conservation of the ecosystems and natural resources, livestock and nature reserves, alongside water and natural resources in general. Syrian curricula include ecosystems in the agricultural sciences for some grades.

The UAE curricula tackle ecosystems within the first three elementary classes in Arabic, social studies and civics. The focus is on animal and plant diversity in the UAE, nature reserves, climate and diversity of local habitat.

In Jordan, ecosystems are addressed in grades 2 to 8 in science courses, in grade 9 in physics, chemistry, earth and life sciences, and grades 10 and 11 in earth and life sciences. The curricula cover a variety of global topics, with a focus on the local ecosystems.

Ecosystems are strongly included in the science and English courses of the Tunisian curricula. This concept is taught in grade 8 within earth and life sciences, grade 10 in geography, and in grade 5 in general sciences. While local topics are adequately covered, there is shortage of material on the global status of ecosystems.

In Saudi Arabia, ecosystems are addressed in grades 3 to 6 in the science curricula. The most important topics are interrelations and cycles of ecosystems, especially water, biodiversity and soil. The concept of ecosystems is largely confined

to the science curriculum and not integrated in other courses. Practical activities are lacking.

Iraqi curricula address ecosystems in grade 7 in science, grade 10 in life sciences, grade 11 in social sciences, grade 1 in religious education, and grades 10 to 12 in art education, Arabic and literature. Focus is on the conservation of the marshlands, the Euphrates and other endangered local habitats. While these topics are evenly distributed and adequately addressed, other systems such as seas and mountains are weak.

The Moroccan curricula cover ecosystems in grade 12 in life and land sciences, grade 10 in history and geography, and between grades 4 and 10 in Arabic and French. Ecosystems are intertwined with biodiversity, and some topics are not treated in a comprehensive manner.

2. POLLUTION

Four basic aspects about pollution have been emphasized in the curricula of the countries covered in the study: definition of pollution and its types, sources and causes of pollution, and how individuals can help to fight it. Types covered mainly include air, water and soil pollution, and to a lesser extent food, noise, plastic and radioactive pollution. Some topics are insufficiently discussed, and the distribution among various courses and grades is not balanced.

At the country level, the Egyptian curricula deal with pollution in grade 6 in social studies, grade 9 in science, grade 5 in religious education, grades 7 to 10 in English, grade 12 in geology and environmental sciences, and in grade 11 in geography. Pollution issues in the Egyptian curricula are linked to the local situation, mainly related to the impact of rapid population increase, causing air pollution from traffic jams, water pollution due to excessive discharge of waste, and soil pollution due to intensive food production practices. Some types of pollution, such as radioactive, biological and chemical, are not sufficiently addressed.

In Lebanon, pollution is included in grades 1 to 6 in the science curricula and in geography for most grades. Texts on pollution are included in Arabic, French and civics for most grades, as well as in earth and life sciences. Pollution of water,

GREEN SCHOOLS PROGRAM IN KUWAIT

Jinan Bahzad

The Kuwait Environmental Protection Society (KEPS) launched the Green Schools program in 2011. Since then, the program annually serves over 80 schools in Kuwait at all levels. KEPS has developed this program as part of its environmental awareness strategy, in view of building the capacity of students and teachers and to spread positive thinking towards the environment.

The program aims at raising the level of environmental awareness among students and promoting good behavior towards the environment at community level, and in schools in particular. It encourages students and teachers to participate in voluntary work in the environmental field, based on the understanding and appreciation of environmental values and principles. It builds capacity in auditing, monitoring and managing environmental impacts, and teaches students through demonstration activities and field trips. The program provides teachers with the opportunity to learn new methods and techniques for better delivery of environmental education in the classroom. Moreover, the program supports the establishment of environmental clubs for students, and organizes workshops for teachers catering to various levels and courses.

The themes of the Green Schools program include: climate change, with a focus on sea level rise and coastal threat, and the impacts of high temperature; wildlife in Kuwait, covering plant diversity, nature reserves and wildlife management; Kuwait's marine environment, particularly coral reefs and the impact of sea level rise, based on the first national communication report; solid waste management, including optimization, disposal and recycling, alongside school security and safety measures. Other themes covered by the program are biodiversity, local and migratory birds, freshwater and rationalization of consumption, renewable energy – particularly applications of solar energy – and environmental health.

During the 2018-2019 academic year, 86 primary and secondary schools, both public and private, participated in the Green Schools program. In cooperation with the General Authority for the Environment, a campaign



was launched to raise awareness on climate change and its effects, as well as a campaign on environmental protection law, in cooperation with the Environmental Defense Committee of the Kuwaiti Lawyers Association and the Environment Police Division of the Ministry of Interior.

During its eighth edition the program rolled out many activities, which were characterized by the dynamic participation of the competent authorities and researchers. They included actions to support the conservation of coastal biodiversity, rationalization of water consumption, climate change, environmental protection law, and the establishment of environmental clubs in schools. The program seeks to develop legal awareness and to encourage the implementation of environmental laws, mainly through such environmental clubs. By starting with students and teachers, the program hopes to spread environmental awareness to parents and the larger community.

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sea, air and soil are covered, alongside chemical, biological and bacterial pollution. Major local sources of pollution are discussed, such as solid and liquid waste, power generation and cars. The inclusion of thermal water pollution and radioactive pollution is unique in the Lebanese curricula.

In Bahrain, the concept of pollution is addressed in grade 12 in social subjects, commercial and social sciences, grades 1 and 7 in religion, and in grades 2 to 6 in English. While the stress is on waste, cleanliness and proliferation of insects, noise pollution is also included. There are several texts on pollution in the English language textbooks, but the presentation of the topic is imbalanced among different grades and courses.

In Syria, pollution is addressed in grades 3 to 11 within social studies, geography and science. Special attention is placed on soil contamination. Light pollution is unique to Syrian curricula, which are characterized by a balanced distribution of pollution topics among science, social studies and civics in various grades. However, air pollution and water pollution, which are common challenges, are not adequately covered. In the UAE, the concept of pollution is addressed

in grades 1 to 3 in social studies. Main topics include the individual's responsibility for cleanliness, traffic congestion and the UAE's efforts to reduce pollution. The UAE curriculum emphasizes individual responsibility to reduce pollution and the country's efforts to solve pollution problems. However, this concept is generally limited to the social studies courses.

Pollution in Jordan is addressed in grades 1 to 8 in science, grade 9 in chemistry and life sciences, grade 10 in chemistry, and in grade 11 in earth and life sciences. The main topics are noise pollution, protecting water from pollution, the impact of fertilizers and pesticides on the environment, biological weapons and wastewater treatment, and the impact of pollution on the spread of cancer. The Jordanian curriculum highlights water pollution and modern technological methods of purification, biological pollution and the use of biological weapons. While the concept of pollution is well integrated into scientific subjects, it is almost absent from others.

In Tunisia, pollution is addressed in grade 1 in life and earth sciences. The main topics are the dangers of water pollution, ways of protecting water resources, industrial pollutants, maintaining

the safety of water sources, diseases resulting from water pollution and ways of prevention, and the impact of oil extraction on the environment. While the Tunisian curriculum discusses water pollution in detail, it is weak in other aspects.

In Saudi Arabia, pollution is included in grades 1 to 4 in family education, grade 8 in science, and in grades 11 and 12 in geography. The Saudi curriculum focuses on the efforts of the individual and the state to address the problem of pollution, but it is deficient in dealing with pollution in science courses.

In Iraq, pollution is addressed in grades 4 to 7 in social sciences, grades 9 to 12 in chemistry, grade 10 in life sciences, grade 8 in science, grades 2, 3 and 8 in English, grades 2 and 3 in religion, grade 7 in Arabic, and in grades 10 to 12 in arts. The curriculum includes: the right to a clean environment, the role of citizens in preventing pollution, and the carbon footprint. Iraq's pollution-related curricula focus on the role of individuals, the carbon footprint, environmental rights and duties, and social environmental responsibility.

Moroccan curricula are characterized by addressing pollution in Arabic language courses using prose and poetry that promotes a cleaner environment.

3. NATURAL RESOURCES

Arab schools' curricula tackled natural resources by defining them and listing their types and classification, distinguishing between renewable and non-renewable ones. The role of man in preserving natural resources was highlighted, while the concept of resource management was not adequately covered in most instances.

The Egyptian curricula address natural resources in grades 6 to 9 in social studies, grades 4 to 7 in science, grades 3 to 5 in Arabic, grades 1 to 3 in religion, grades 8 to 10 in English, grade 10 in geology and environmental sciences, and grade 11 in geography. Main areas of interest are renewable and non-renewable resources, food, rationalization of consumption, degradation of rangelands and forests, decline of fresh water, fossil fuels and minerals, and management practices. The topic of natural resources in

the various grades and courses in the Egyptian curricula is diverse, where theoretical and applied aspects are linked.

In Lebanon, natural resources are taught in grades 1 to 9 in science, grades 3 to 11 in geography, grades 3 and 7 in Arabic, grades 2, 4, 8, 9, 11 and 12 in English, grades 1, 3, 7, 10 and 12 in civics, grades 9 and 10 in mathematics, grades 1, 7 and 8 in French, and grade 11 in social sciences and economics. The most prominent topics on natural resources in Lebanese curricula are soil, water, food production, plants, forests, animals and various energy sources. Topics are diverse, with balanced integration in various grades and courses.

Natural resources are covered in Bahrain's curricula in grade 11 in social studies, grades 1, 2, 3 and 7 in religion, grades 2, 3, 4 and 8 in English and grade 10 in civics. The main topics are the preservation of water, marine life, and the role of man in preserving resources. The theme of resource management is often mixed-up with biodiversity and pollution.

In Syria, natural resources topics are included in most grades in social studies and geography, in grades 2, 3 and 5 in sciences, grades 1, 2 and 4 in Arabic, and in grades 4 to 6 in agricultural courses. Soil, water, regeneration of resources, marine and ocean assets and forests are among the most prominent topics, while energy sources are not adequately covered.

The concept of natural resources in the UAE is addressed in most grades between 2 and 11 in social studies, and in grade 3 in Arabic. The most prominent topics on natural resources are plants, their types and uses, water in the UAE, seas and oceans, conservation of non-renewable natural resources, energy sources, future energy trends, and water and food security in the Gulf countries. The UAE curriculum emphasizes individual responsibility in conserving natural resources and the UAE's resource management efforts. The natural resources topics in the UAE curricula are rich and diverse, but mostly covered in social studies.

In Jordan, natural resources are introduced in grades 1 to 8 in science, grades 10 and 11 in physics and life sciences, grade 10 in chemistry, and in



grades 9 and 11 in earth and life sciences. The main topics are water conservation, innovative clean water sources, deforestation, renewable energy, pressure of population increase on resources, and the leading wind and solar projects in Jordan. The Jordanian curriculum includes an extensive presentation of energy sources, with a focus on renewable energy projects in the country.

Natural resources are addressed in Tunisia in grade 11 in earth and life sciences and in grade 10 in geography. The main topics are: means to protect water resources, extraction of phosphates and the relationship between man and nature. Tunisian curricula focus on the economic return of natural resources, including minerals.

In Saudi Arabia, the concept of natural resources is tackled in grades 1 to 6 in family education, grades 1 to 8 in science, grades 11 and 12 in geography, grade 1 in Arabic, and grades 4 to 7 in social studies and civics. The main topics are rationalization of water and energy consumption and preserving marine and terrestrial environment. The focus

of the Saudi curricula on rationalization of consumption reflects a new approach to resource management, particularly water and energy.

Iraq integrated natural resources in social sciences in grades 4 to 7, in grades 11 and 12 in chemistry, in grade 8 in science and life sciences, in grades 9 to 12 in English, and in grades 10 to 12 in art. The main topics are energy sources, with a focus on renewables, preservation of the resources through rationalization, and utilizing art to preserve natural resources. The Iraqi curriculum is unique in linking art to natural resources.

As in other topics related to nature and environment, the Moroccan curricula heavily include natural resources in Arabic and French courses, stressing respect of nature and environmental protection.

4. CLIMATE CHANGE

Climate change is part of Arab school curricula in four main subtopics: the concept, the causes, the manifestations, and facing its impacts. The

role of human activity in increasing greenhouse gases is discussed, especially as a result of intense industrialization and the high demand for fossil fuels. It also covers the consequences of climate change, such as diminishing potable water, declining agricultural yields, loss of soil fertility, spread of pests and diseases, rising seas and increased droughts, extreme floods and storms. It proposes solutions to reduce the impact of climate change, including reducing the reliance on fossil fuels as a primary source of energy, and using renewable energy. Energy efficiency is not well discussed as a way to reduce emissions. Climate change is not adequately incorporated in the curricula of Tunisia, Saudi Arabia, Morocco and the UAE.

The Egyptian curricula tackles climate change in grade 7 in social studies, grade 8 in science and English, and grade 12 in geology and environmental sciences. Highlights include global warming and the causes and consequences of climate change. Acid rain and the erosion of the ozone layer are often mixed up with climate change, which causes confusion. While the Egyptian approach to climate change addresses concept, causes and results, it does not address

the role of individuals in mitigating the causes.

In Lebanon, climate change is addressed in grades 1, 2 and 3 in science, grade 1 in civics, grades 9 and 10 in mathematics, and grade 11 in chemistry. The Lebanese curricula contain a comprehensive presentation of the subject, integrating the concept of climate change in all grades, starting with the first elementary classes. However, the inclusion of the topic in geography, Arabic and English curricula is weaker than in other subjects.

In Bahrain, the coverage of climate change is confined to grade 11 in social studies. In Syria, climate change is discussed in grade 11 in social studies and geography, but is marginal in science, Arabic and agriculture courses.

In Jordan, climate change is addressed in grade 7 in science, grade 9 in physics, grades 9 and 11 in chemistry and life sciences, and grade 10 in earth and life sciences. In addition to basic information, emphasis is placed on the importance of the atmosphere for sustaining life on earth, soil acidity, ocean acidification, reducing air pollution



from acid rain, and the effect of rising river water temperatures on river organisms. It is noted that climate change is absent from social studies in the Jordanian curricula. In Iraq, the concept of climate change is addressed in grade 8 in English and science.

5. SOLID WASTE

Arab school curricula addressed solid waste by reviewing its sources, methods of management, collection, transport, processing, and responsible recycling. It also offered a classification of different types of waste, and transforming parts of it to compost, or applying waste-to-energy technology, which is an advanced type of incineration. It has been noted that reduction from the source and re-use of solid waste are largely neglected.

The Egyptian curricula address solid waste in grades 1 and 2 in religious education, grade 7 in English, and grade 12 in geology and environmental sciences. Recycling, environmental conservation, protection and hygiene are among the highlighted topics.

In Lebanon, solid waste is discussed in grade 6 in science, grades 4 and 5 in geography, and grades 4 to 8 in civics. The main topics include the definition of waste and disposing of it in designated areas, disposal methods, refraining from throwing waste in forests, and solid waste treatment and recycling.

In Bahrain, solid waste is addressed in grades 2 and 4 in English courses. In Syria, waste is included in grade 10 in social studies and geography, grades 2, 4 and 11 in science, and grade 4 in agricultural courses. The main topics were the safe disposal of waste through the construction of a sanitary landfill, waste sorting, recycling and composting to produce organic fertilizer. The UAE curriculum addresses the subject in grade 1 in social studies, and in Jordan solid waste is addressed in grades 4 and 5 in science. Main topics are composting and paper recycling.

In Saudi Arabia, the concept of solid waste is introduced in grades 3 and 6 in family education and grade 8 in science. The main topics are street cleaning, waste recycling and solid waste disposal. In Iraq, solid waste is included in grade 8 in social science, grade 10 in chemistry, and in

grades 8 and 12 in English. In addition to the common general topics, the Iraqi curriculum includes topics on the waste remnants of war and landmines, in addition to chemical waste.

6. BIODIVERSITY

Biodiversity has been addressed in Arab school curricula starting with definition, significance and major problems – mainly the dangers of extinction. The curriculum in each country includes sections on the national natural reserves and discusses their role in supporting life on earth. National legislations and international treaties on the conservation of biological diversity are not adequately discussed, and in some cases entirely absent.

In Egypt, biodiversity is included in grades 6 to 8 in social studies, grade 8 in science, grades 1, 2 and 4 in religion, grades 1 and 2 in Arabic, grade 9 in English and grade 12 in geology and environmental science. The most prominent topics are natural reserves, animal welfare, classification of living organisms, adaptation and continuity of life, and the risk of extinction. The Egyptian curriculum focuses on the threats to local biodiversity and reviews the status of a number of local nature reserves.

The Lebanese curriculum covers most aspects of biodiversity in several grades and courses. The concept of biodiversity is included in the science curricula in grades 4 and 7, in geography in grade 9, in English in grade 4, in social sciences and economics in grades 10 and 11, and in English in grade 8. The main topics are natural reserves, protection of fauna and flora, forest fires, forest biodiversity and ecological balance. The Lebanese curriculum intricately links the subject of biodiversity to the local environment.

In Bahrain, biodiversity is introduced in grades 3 to 7 in English courses. In addition to the general titles, the Bahraini curriculum includes a presentation on the local Al-Areen sanctuary, and focuses on marine organisms. It also highlights the role of the World Wildlife Fund (WWF). The Syrian curriculum covers biodiversity in grade 7 in social studies and geography, grades 9 and 10 in science, grade 4 in Arabic and grade 5 in agricultural courses. Topics include the conservation of natural resources,

ENVIRONMENTAL EDUCATION IN ABU DHABI

Ahmed Baharoon

Despite its harsh desert environment, Abu Dhabi, and in fact the entire United Arab Emirates, is home to a surprisingly rich variety of wildlife, flora and fauna. However, the recent boom in Abu Dhabi's economy and population has placed a tremendous strain on this delicate ecosystem.

The Environment Agency – Abu Dhabi (EAD) strives to minimize this strain of development on the environment, by ensuring a sustainable natural environment for human well-being. Part of our success comes from raising awareness that leads to a change in behavior. The principles of the United Nations Decade of Education for Sustainable Development (DESD) inform and inspire much of our work in this regard.

Over the years, we have launched many groundbreaking initiatives and participated as an enthusiastic partner in programs developed by other agencies and private individuals, examples of which are included in this overview.

Promoting Eco-Literacy

The Enviro Spellathon program ran for over 15 years, educating a whole generation of young people in basic eco-literacy. Over 92 percent of schools participated in this program, with a total reach of 1.8 million children. Between 2001 and 2016, participating students increased from 45,000 to 180,000. The program has since been integrated into the curriculum of schools under the Ministry of Education. (<https://sustainableschools.ead.ae/SSI/partners>)

Forum for Voicing Students' Environmental Concern

Launched in 2001, the Annual Environment Competition aligns with the United Nations theme for World Environmental Day (observed annually every 5th of June). The Competition, created exclusively for all United Arab Emirates (UAE) schools, targets students from kindergarten to universities. Over 3,000 schools have participated in the competition since 2001. (<https://sustainableschools.ead.ae/SSI>)

Awareness to Action

The Sustainable Schools Initiative (SSI), launched in 2009

and sponsored by BP, builds schools' capacity to help them: assess and address their environmental impact through eco-audits; empower students to turn environmental awareness into action through eco-clubs; build educators' capacity by training the trainers; and expose students to 'hands on' experience about the environment through field trips. Furthermore, the initiative encourages schools to reduce their ecological footprint and increase their 'ecological handprint'.

The initiative has led to many concrete achievements, including:

- 67 percent of registered schools compost their organic waste
- Over 92 percent of registered schools recycle their paper, plastic and metal waste
- 88 percent of registered schools undertake partial recycling of electronic waste
- 65 percent of registered schools reuse or recycle their white and grey wastewater
- 60 percent of registered schools use energy efficient equipment and technologies
- 19 percent of registered schools have initiated the use of renewable energy
- 78 percent of students in registered schools use shared transport
- 85 percent of registered schools have started growing native plants
- 97 percent of registered schools have reduced their water use
- 93 percent of registered schools have reduced their bottled water usage (<https://sustainableschools.ead.ae>)

Empowering the Youth for a Better Environment

The Sustainable Campus initiative (SCI), a program sponsored by Borouge, targets UAE youth aged 19 to 25. Outcomes include:

- 21 colleges and universities participating in the initiative
- 201 liters as average water consumption per day per capita
- 706,868 Kg CO₂ generated by routine energy per day
- 134 Kwh as average energy consumption per day per capita

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- 754 Kg as average waste generated per day
- 98,833 m² as average green area in campus. (<http://www.sustainablecampus.ae>)

Addressing Regional Water Woes

EAD is UNESCO's international coordinator for water education in the Arab world. It has developed the Arab Water Education Program, from which 12 Arab countries are benefitting. In the UAE, the program is supervised by EAD and the UAE UNESCO Office.

Fishermen's Program

EAD conducts awareness campaigns with fishermen on many issues, communicating with them in Arabic, English, Hindi, Bengali, Urdu, Tamil, Malayalam and Gujarati. EAD also offers trainings in sustainable, traditional fishing methods.

Additionally, we supported Emirates Nature (formerly Emirates Wildlife Society – WWF) in a widespread consumer, restaurant and retailer awareness campaign. The campaign included the introduction of sustainable species and retail labeling to reduce demand for at-risk species.

Divers

EAD works with recreational and professional divers, helping them to maintain the environment as well as the livelihood of marine animals. Working with UNEP, Save Our Seas and the Emirates Marine Environmental Group, we developed educational lectures and participatory programs for coral monitoring and underwater clean-ups.

We raise awareness and encourage divers to report marine creatures in distress, saving the lives of many endangered species such as the whale shark, dugong and hawksbill turtle. Additionally, we work with organizations such as Emirates Wildlife Society WWF and UNEP to collate and disseminate data on endangered species and distribute this information among the diving community.

Farmers and Landscapers

EAD regularly disseminates information in Arabic, English, Urdu, Bangali and other languages, to farmers and landscapers. This is complemented by hands-on workshops illustrating problems and offering solutions, such as a newly introduced drip feed sprinkler system that reduces water consumption by as much as 46 percent.

With government and private sector partners, we have



trained 6,000 farms to adopt an irrigation system that can reduce consumption from 1,500 liters to 300 liters per palm tree per day: a saving of over 80 percent. In conjunction with the Department of Planning and Municipalities, we have also developed guidelines for villa owners for environmentally sensitive gardens that minimize irrigation water use.

Falconers

We work with the falconry community to encourage sustainable practices for falconers. Also, our falcon hospital conducts tours for students and tourists, bringing them into contact with the cultural significance of falconry and the threats to its sustainability. The tours annually attract over 12,000 visitors.

Religious Preachers

Islam is the prevalent religion of the UAE and many of its teachings speak directly to environmental issues. Islamic preachers – Imams – are highly trusted, respected members of society, and as such are valued partners in ensuring holistic approaches to sustainability. EAD therefore works with the General Authority of Islamic Affairs and Endowments (AWQAF) to incorporate sustainability messages inspired by the Quran into Friday sermons. Many mosque ablution areas also have messages educating worshippers on preventing water wastage.

Development of Resource Materials

To aid its various environment education and awareness programs, EAD has produced a plethora of resource materials. They include over 140 separate resource materials just for teachers.

AFDC: SUPPORTING ENVIRONMENTAL EDUCATION AND AWARENESS IN LEBANON

Sawsan Bou Fakher Eddin

The Association for Forests, Development and Conservation (AFDC) is a Lebanese non-profit, non-governmental organization that aims to achieve sustainable development and conservation of natural resources, with a focus on forests. It works with an integrated management approach, by building technical and scientific capacities and raising awareness with the help of local communities and the public and private sectors.

Through its Environmental Education Program, AFDC aims to create a positive attitude towards the environment among young generations and within local communities. More specifically, AFDC works on:

- Building the capacity of schools' approach to environmental challenges and constraints, and the integration of the concept of nature conservation and sustainable development within school programs.
- Establishing effective partnerships with the Ministry of Education and the Center for Educational Research and Development (CERD) to update the National Strategy for Environmental Education.
- Integrating the Environmental Education Curriculum in new schools' curricula to reflect the main environmental threats and challenges such as climate change, resiliency and sustainable development.
- Creating long-term partnerships with schools to monitor attained results and draw lessons to ensure sustainability.

Since its establishment, AFDC has been one of the leading NGOs tackling environmental education, with different partners including NGOs, academic institutions and public authorities. In 2011, AFDC entered a partnership with the Ministry of Education to develop the National Strategy for Environmental Education, which was subsequently adopted in 2012. Consequently, AFDC has worked in close cooperation with CERD – the national center responsible for the development of national curricula – to evaluate the integration of environmental education concepts within

the existing educational curriculum, dating from 1997, and to propose a new curriculum accordingly. As a result, a new Environmental Education Curriculum for Cycle I (Grades 1, 2 and 3) and Cycle II (Grades 4, 5 and 6) was developed, that will be integrated into the updated national curriculum by 2020.

In addition to the work being done at the level of schools with the Ministry of Education and Higher Education, AFDC works on developing effective tools to promote environmental education and raise awareness about different environmental challenges, such as solid waste management. In this regard, it implements the "Awareness on Wheels" project, in which a mobile unit conducts educational tours at schools and communities to raise awareness about the importance of adopting an integrated solid waste management approach and to highlight good practices. Finally, the AFDC developed "Sanjoub", a forest-fires awareness mascot to make awareness on forest fires in schools and communities more fun and accessible.



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the environmental variety of seas and oceans, extinction, and natural reserves.

The UAE curriculum addresses the concept of biodiversity in grades 2, 6, 8 and 9 in Arabic, and in grades 1 and 5 in social studies and civics. Biodiversity-related titles in UAE curricula focus on natural plants, different species and benefits of natural diversity. The curriculum also highlights UAE natural reserves, with a presentation on the “UAE Tree Planting” initiative. In Jordan, biodiversity is included in grades 2, 7 and 8 in the science curriculum and in grades 10 and 11 in life sciences. The Jordanian approach focuses on the role of nature reserves in safeguarding biodiversity, with ample examples of protected areas in Jordan.

Biodiversity in Tunisian curricula is part of grade 8 in earth and life sciences, and grades 5 and 6 in the general sciences. In Saudi Arabia, biodiversity is addressed in family education courses at various levels, in grade 5 in Arabic, and in grades 5 and 7

in social sciences and civics.

7. SUSTAINABLE DEVELOPMENT

The school curricula in the surveyed Arab countries examine the concept of sustainable development through the sustainability of resources, problems that threaten development and the role of the state in achieving sustainable development. It also addresses the prospects of development in Arab countries. The topic is characterized by general information, while the sustainable development goals (SDGs), adopted in 2016, remain absent from the curricula, as well as ambitious national development plans announced in several countries over recent years, which embrace the principles of sustainability. The notion of sustainable development is still absent from the curricula in some countries.

The Egyptian curricula deal with sustainable development in grade 5 in social studies, grade 12 in geology and environmental sciences, and grade

ENVIRONMENTAL EDUCATION WITHIN THE SAUDI GREEN INITIATIVE

Saiyed Al-Khouli

As part of the Green Initiative to spread environmental knowledge in Saudi Arabia, the General Authority of Meteorology and Environmental Protection (GAMEP) launched a program to promote environmental education in pre-university educational institutions in 2008. They did this in cooperation with the Ministry of Education, the Center for Environment and Development for the Arab Region and Europe (CEDARE) and the Saudi Environmental Society (SENS). The program outputs included setting models for environmental education materials.

The Environmental Education Program is one of the important mechanisms for promoting environmental work in Saudi Arabia. The program merges the environmental dimension into the educational process and promotes the practical skills necessary for positive participation in sustainable development activities and projects, together with civil society and the public sector. The Green Initiative aims to mainstream sound environmental concepts and interlinked elements as essential impetus in different areas, for stimulating positive environmental practices. This contributes to building youth leadership skills that can be applied towards responsible environmental practices through understanding and utilizing modern technologies, while keeping up with the global changes.

Some of the main objectives of the executive program for environmental education include: raising awareness among members of the education sector, their families and communities; developing the spirit of cooperation and team work to carry out environmental projects at the local level; enhancing appreciation of the environmental components; and acquiring skills that help achieve sustainable development goals at the local level.

The program's activities and components – represented in the educational kits and their contents such as books, publications and other related training tools – were designed based on Saudi Arabia's solemn commitment to international decisions and recommendations in the field of environmental education. The aim was to distribute these kits to teachers and students in secondary schools throughout the country. The program includes training

teachers and environmental education supervisors on the practical implementation of the initiative's activities through continuous coordination and cooperation with the Ministry of Education, the Saudi Environmental Society and concerned partners – especially international organizations, civil society organizations and non-governmental organizations – in the various stages of implementation.

The program's slogan was My Environment is My Life, considering that a healthy and clean environment results in a good and safe life, and also signifies purity, loveliness and beauty, goodness and tranquility. We learn from the environment about the environment and for the environment, to build up environment supporters. The program emphasized its conformity with international decisions on the environment, sustainable development and the principles of environmental education. It based its contents on six main characteristics: justice and accuracy, depth, skills building, a pragmatic approach to action, learning process integrity and ease of use.

The Education Kit

The materials of My Environment is My Life were designed to suit the training processes and methods, in accordance with Saudi Arabia's commitment to international decisions and recommendations in the field of environmental education. The materials adopted positive and active learning, and learning by doing, which leads to positive interaction with knowledge and the available data. The main components of the program resulted in producing two kits for teachers and students. The first kit includes the Environmental Education for Sustainable Development textbook, guidelines for evaluating environmental education materials and a collection of books that support the initiative's activities. The second, which is the environmental education kit for students, includes seven environmental activity books, wall panels, demonstration posters, and supplementary tools for the implementation of activities.

The other components of the program include a set of posters with pictures of various fauna and their habitats in Saudi Arabia, as well as the most serious risks that endanger them, a map of natural reserves' sites and guidelines on energy conservation at home and in school. Other products include postcards with pictures

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of the most important endangered flora and fauna, landscapes of the most important natural reserves, geological formations, water springs and valleys, with an invitation encouraging people to visit these sites and to preserve them.

The program also includes a component of establishing school environmental libraries that contain books for adults and for young students. Books are selected to correspond with current topics to encourage reading,

researching and acquiring more knowledge and information.

Coping with the developments and changes in institutional work regarding the environment, there is continuous action to integrate the initiative with the Saudi Vision 2030 and the programs concerned with the realization of the Sustainable Development Goals and to translate the Green Initiative into electronic programs, while retaining its practical aspects.



11 in geography. Among the most prominent topics covered are modern technologies for development, the future of development in the Arab world, the economics of growth and development, population and socio-economic challenges, and sustainable tourism. The Egyptian approach focuses on the difference between traditional economic development and sustainable development, and the proper management of natural resources to achieve sustainability.

Sustainable development in Lebanon is addressed in several grades in geography, grade 5 in English, grade 3 in Arabic, grades 1, 2, 6, 7, 9 and 10 in civics, and grade 12 in life sciences and earth, social sciences and economics. The main topics are: development concepts, relation between development and environment, and techniques of environmental assessment of projects. The topics are characterized by a rich variety and a balanced distribution among several school levels. Green economy is part of the curricula at the high school level. In Bahrain, sustainable development is part of commercial science in grade 11 and in grades 9 and 10 in civics.

The Syrian curriculum focuses on the sustainability of resources, by presenting the

concept of sustainable development in grades 5 to 8 in social studies and geography, grade 5 in science, and in grades 5 and 6 in agricultural courses. The topics include sound investment in nature's assets, harnessing and conserving natural forest resources, soil sustainability, water sustainability and rationalization of water and energy use, with a focus on renewable energy.

The UAE curriculum addresses sustainable development in grades 5, 8 and 10 in social studies and civics. It focuses on green economy and human development, with a presentation of national initiatives in this area. The curriculum also includes examples of UAE efforts to achieve sustainable development.

In Jordan, the concept of sustainable development is introduced in grade 11 in earth and life sciences. The concept is taught in the Tunisian curricula in grade 11 in earth and life sciences, grade 10 in geography, and grade 3 in general sciences, with a focus on rationalization of consumption. In Saudi Arabia, sustainable development is addressed in grades 9 and 12 in social education and geography. The Moroccan curricula include sustainable development in grade 12 in history and geography, and grade 11 in English.

8. NATURAL DISASTERS

The presentation of natural disasters in Arab curricula includes some common elements, revolving around the definition of natural disasters, their causes and consequences, and the role of man and society in reducing their impact. Some topics lack sufficient treatment, such as the frequency of natural disasters and human factors that may contribute to their aggravation. Natural disasters are entirely excluded in the curricula of some countries, such as Lebanon, UAE, Tunisia and Morocco. Even in countries that deal with natural disasters in their curricula, the treatment remains inadequate.

The Egyptian curricula tackle natural disasters in grades 7 and 8 in social studies, grade 12 in geology and environmental sciences, and grade 11 in geography. Highlights include the concept of natural hazards, water and wind hazards, environmental hazards, earthquakes and volcanoes.

In Bahrain, natural disasters are introduced in grade 8 in English. The Syrian curriculum addresses the concept in grade 10 in social studies and geography. The topics related to natural disasters within the Syrian curriculum include the recession of Dead Sea water levels and soil erosion.

In Jordan, the concept of natural disasters is addressed in the upper classes in physics and life and earth sciences. The Jordanian curriculum highlights the role of technology in monitoring natural disasters, introducing the environmental applications of remote sensing.

Natural disasters are addressed in Saudi Arabia in grades 7 and 9 in social studies and civics, and grade 11 in geography. Topics include disaster imaging from space, population migration from their natural habitat due to natural disasters, and early warning technology to detect natural disasters. It also highlights Saudi aid to countries affected by natural disasters.

The Iraqi curriculum addresses the concept of natural disasters in grade 9 in physics, grade 10 in chemistry, and grade 7 in Arabic. One of the topics is the relationship between disasters, diseases and epidemics.

9. OTHER ENVIRONMENTAL CONCEPTS

Arab schools' curricula deal with some other environmental concepts as well. In Egypt, environmental tourism is highlighted in the fifth grade in social studies. In Syria, the environmental impact of wars is included in grade 8 and genetic engineering is part of the grade 10 social studies and geography curriculum. The environmental footprint is introduced in grade 6 in social studies, the welfare tax and organic agriculture in grade 10 in science.

The curriculum of social studies and civics in the UAE includes a variety of environmental concepts, such as environmental responsibility in grades 1, 2 and 4, environmental security in grade 3, hydroponics and green economy in grade 8, resource management in grade 9 and water and food security in grade 11. Arabic language curricula in the UAE also include environmental responsibility in grade 6, recycling of paper in grade 7, and the disposal of plastic in grade 11.

In Jordan, science curricula include sections on fires, overfishing and overgrazing in grade 4, gray water and environmental awareness in grade 6 in science, and remote sensing in grade 10 in physics. Saudi curricula include healthy home in grade 5 in family education, and consumer habits in grade 8, while social studies and civics cover health damage caused by fast food and sugars.

III. CONCLUSION AND RECOMMENDATIONS

Environmental concepts have been gaining ground in the school curricula in the Arab region, although big differences exist among countries regarding topics included, the depth of contents and methods of delivery. Pollution, natural resources and biological diversity still represent the common elements in school curricula, but other issues have been included in the last 20 years, such as climate change and resource management. With the global adoption of the sustainable development approach, green economy, green jobs and green buildings are topics that have been recently included in Lebanese curricula, while

ecological footprint became part of the curricula in Syria, the UAE and Jordan.

Among topics included in the curricula in various Arab countries are food security, plastic pollution, energy and water efficiency and waste management. The UAE introduced the topic of water security alongside food security. Renewable energy became part of the curricula in most Arab countries. Across the region, environment topics are no longer restricted to science, geography and civics books, but have started to become part of other subjects including languages, literature, history and economics.

In most cases, curricula covered aspects of personal action to protect the environment and to preserve and enhance natural resources, such as instructions to consume water and electricity in a sensible manner, recycling and tree-planting. Environment is widely becoming part of art education in Arab schools, mainly demonstrated in painting, and to a lesser extent music and theater competitions with environment themes. While fieldwork and nature expeditions are organized at a smaller scale, they started to be part of environmental education in some Arab countries. In few countries, students are encouraged to engage in community work to champion environmental causes.

The environmental content of the curricula needs to be strengthened in depth and breadth. Environmental aspects in school curricula should be discussed in the context of the Sustainable Development Goals (SDGs), in such a way to relate environment to the social and economic aspects. Sound management of natural resources, to achieve sustainability, should be given priority. This can be achieved through the introduction of the concept of ecological footprint, alongside options for green growth, with a focus on Arab countries. Big challenges facing the region such as water scarcity, desertification, drought, marine pollution and dangers of sea-level rise due to climate change, have to become a central part of the curricula. Extracurricular activities and community work should also be enhanced. Ultimately, environmental content in school curricula should be designed to adequately prepare students to be responsible citizens, to provide them with sufficient knowledge to place them on the right path for higher education.

NOTE:

Data has been collected from school text books and ministries of education, as well as from material provided to AFED by the concerned ministries. Results have been compiled in tables 1 -17.

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ANNEX TABLES

Concepts	Environmental Concepts								
	1	2	3	4	5	6	7	8	9
Countries	Ecosystem	Pollution	Natural resources	Climate change	Waste	Biodiversity	Sustainable development	Natural disasters	Others
Egypt	×	×	×	×	×	×	×	×	×
Lebanon	×	×	×	×	×	×	×	×	
Bahrain	×	×	×	×	×	×	×	×	×
Syria	×	×	×	×	×	×	×	×	×
United Arab Emirates	×	×	×		×	×	×		
Jordan	×	×	×	×	×	×	×	×	×
Tunisia	×	×	×			×	×		
Saudi	×	×	×		×	×	×	×	
Iraq	×	×	×	×	×	×		×	×
Morocco	×	×	×			×	×		×

















Concepts	Environmental Concepts										
	Grade	1-Ecosystem	2-Pollution	3-Natural resources	4-Climate change	5-Waste	6-Biodiversity	7-Sustainable development	8-Natural disasters		
Grade 1											
Note:		 Morocco	 Iraq	 Saudi Arabia	 Tunisia	 Jordan	 United Arab Emirates	 Syria	 Bahrain	 Lebanon	 Egypt

TABLE 2 MAIN ENVIRONMENTAL CONCEPTS IN THE CLASSROOMS IN SOME ARAB COUNTRIES (CNTD.)




























	1-Ecosystem	2-Pollution	3-Natural resources	4-Climate change	5-Waste	6-Biodiversity	7-Sustainable development	8-Natural disasters
Grade 2								
Grade 3								
Grade 4								
Grade 5								

TABLE 2 MAIN ENVIRONMENTAL CONCEPTS IN THE CLASSROOMS IN SOME ARAB COUNTRIES (CNTD.)



























	1-Ecosystem	2-Pollution	3-Natural resources	4-Climate change	5-Waste	6-Biodiversity	7-Sustainable development	8-Natural disasters
Grade 6								
Grade 7								
Grade 8								
Grade 9								

TABLE 2		MAIN ENVIRONMENTAL CONCEPTS IN THE CLASSROOMS IN SOME ARAB COUNTRIES (CNTD.)							
	1-Ecosystem	2-Pollution	3-Natural resources	4-Climate change	5-Waste	6-Biodiversity	7-Sustainable development	8-Natural disasters	
Grade 10									
Grade 11									
Grade 12									
Note:									
Morocco	Iraq	Saudi Arabia	Tunisia	Jordan	United Arab Emirates	Syria	Bahrain	Lebanon	Egypt

TABLE 3 DISTRIBUTION OF ENVIRONMENTAL EDUCATION ELEMENTS IN TEXTBOOKS IN EGYPT BASIC EDUCATION (PRIMARY EDUCATION & PREPARATORY EDUCATION)

Subject	Social Studies									Science									Arabic language									Religious Education									English language																				
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9												
Grade 1																																																									
Grade 2																																																									
Grade 3																																																									
Grade 4	x																																																								
Grade 5																																																									
Grade 6	x	x																																																							
Grade 7	x																																																								
Grade 8																																																									
Grade 9																																																									
Grade 10																																																									
Grade 11																																																									
Grade 12																																																									

1- Ecosystem 2. Pollution 3. Natural resources 4. Climate change 5. Waste 6. Biodiversity 7. Sustainable development 8. Natural disasters 9. Others

TABLE 4 ENVIRONMENTAL CONCEPTS IN SECONDARY SCHOOL IN EGYPT

Subject	Geology and Environmental Sciences									Statistics and Economics									Geography																		
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9										
Grade 10																																					
Grade 11																																					
Grade 12	x	x	x	x	x	x	x	x	x																												

1- Ecosystem 2. Pollution 3. Natural resources 4. Climate change 5. Waste 6. Biodiversity 7. Sustainable development 8. Natural disasters 9. Others

TABLE 11 ENVIRONMENTAL CONCEPTS IN THE CURRICULA OF UAE

Subject	Social Studies & National Education									Arabic language								
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
Grade 1	×	×			×	×			×									
Grade 2	×		×						×						×			
Grade 3	×	×	×						×			×						
Grade 4		×							×									
Grade 5			×			×	×		×									
Grade 6									×						×			×
Grade 7			×															×
Grade 8								×	×						×			
Grade 9			×						×						×			
Grade 10								×										
Grade 11			×						×									×
Grade 12																		
1- Ecosystem	2. Pollution		3. Natural resources		4. Climate change		5. Waste		6. Biodiversity		7. Sustainable development		8. Natural disasters		9. Others			

TABLE 12 ENVIRONMENTAL CONCEPTS IN THE CURRICULA OF TUNISIA

Subject	Life and Earth Sciences									Geography									Scientific awakening								
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
Grade 1																											
Grade 2																											
Grade 3																					×					×	
Grade 4																					×						
Grade 5																				×	×				×		
Grade 6																									×		
Grade 7					×																						
Grade 8	×																										
Grade 9																											
Grade 10																	×										
Grade 11	×	×	×					×																			
Grade 12																											
1- Ecosystem	2. Pollution		3. Natural resources			4. Climate change			5. Waste		6. Biodiversity		7. Sustainable development		8. Natural disasters		9. Others										

TABLE 17 ENVIRONMENTAL CONCEPTS IN THE CURRICULA OF MOROCCO

Subject	Life and Earth Sciences									History and Geography									Arabic language									English language									French language																																											
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9																																			
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1- Ecosystem									2. Pollution									3. Natural resources									4. Climate change									5. Waste									6. Biodiversity									7. Sustainable development									8. Natural disasters									9. Others								



ENVIRONMENTAL EDUCATION IN THE NATIONAL JORDANIAN CURRICULUM

Mayyada Abu Jaber

Formal education systems supported by suitable resources, teaching material and trained educators can play a great role in influencing the youth's knowledge about and attitudes towards environmental issues. Within Jordan's national education system, environmental education is still considered a relatively new subject that has been addressed only modestly.

Environmental education concepts were first introduced in Jordan's national curriculum in 1996 by the UNDP. At this time a conceptual framework was prepared for all environmental concepts that needed to be tackled in the textbooks. In 2003, the Water Efficiency and Public Information for Action (WEPIA) program surveyed the national curriculum specifically for learning material related to water. Based on the mapping of textbooks in five subjects, a total of 524 water concepts were found in the curriculum and about 100 concepts were inserted or revised in the textbooks, of which 13 were put online.

In 2015, the World of Letters team conducted a study to evaluate the concepts of water, energy and solid waste that exist in the curriculum and the manner in which they are tackled. This mapping was a follow up to the mapping conducted in 2010 by the Public Action Project (PAP), and revealed negligible differences, as the textbooks were not changed during that period. The mapping was based on the three themes of the study: water, energy and solid waste. In order to develop a holistic approach, the three themes were categorized under six main environmental education principles. These principles form the conceptual framework, based on which the mapping was conducted. Each mapped concept was classified under the environmental education objectives of knowledge, attitude, skills, participation and ethics.

A comprehensive survey of 104 school textbooks from grades 1-10 in 14 subjects was conducted in the subjects of Arabic, English, mathematics, social studies, history, geography, Islamic religion, vocational education, civic education, art, science, physics, chemistry, biology, and geology. The mapping of concepts required a specific methodology to ensure useful and accurate results. Environmental education (EE) goals were formulated

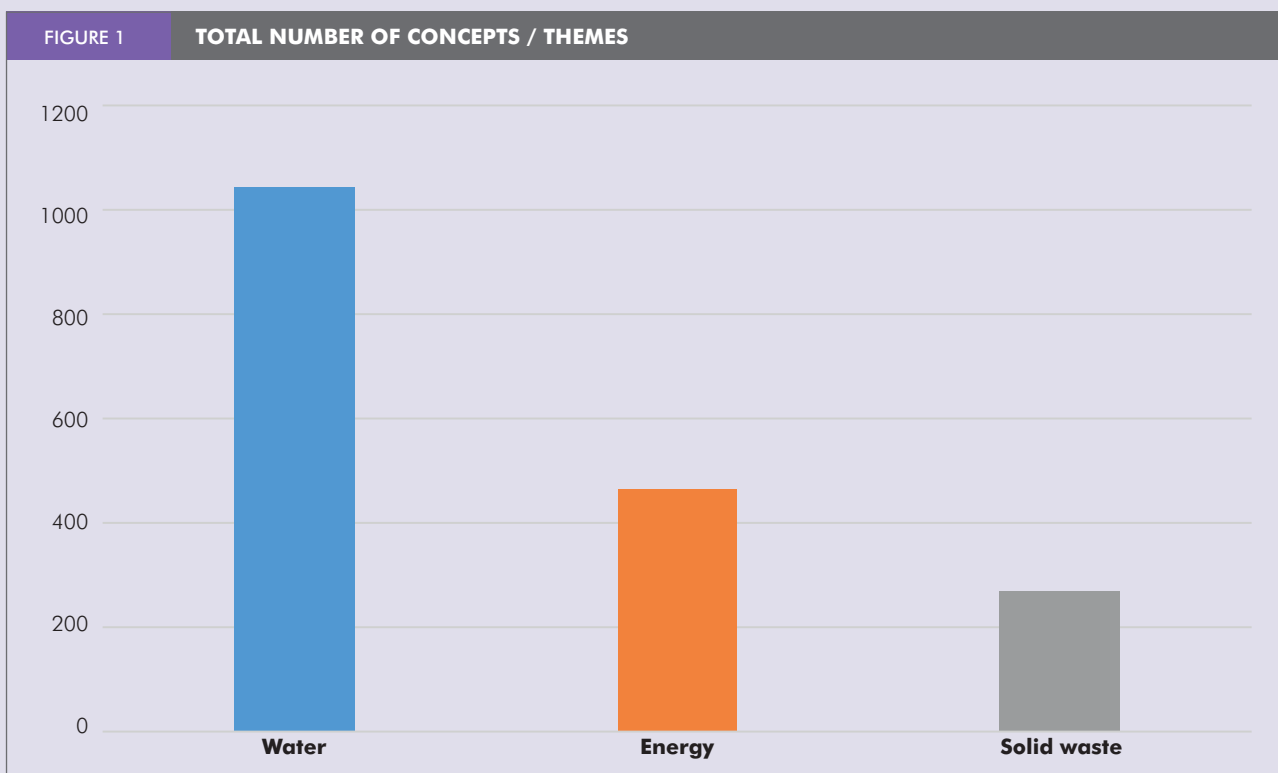


initially. Based on the formulated goals all other educational concepts were organized in reference to the outlined goals.

The established goal of environmental education is to make students knowledgeable and environmentally aware citizens willing to act locally and collectively from an intrinsic motivation to defend and sustain the environment for future generations. The main analytical framework for mapping EE, classifies concepts into five main categories: perceptual awareness, knowledge, environmental skills, environmental participation, and environmental ethics.

- Perceptual awareness occurs when students appreciate and acquire sensitivity to the natural and human-made environment.
- Knowledge helps students acquire the foundation to understand and comprehend environmental systems. This is essential for taking environmental action.
- Environmental skills help students develop proficiency in identifying, investigating, communicating, and being prepared to take action for the prevention and resolution of environmental issues.
- Environmental participation helps students apply the acquired perceptual awareness, knowledge, and

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environmental skills and ethics to take action for the prevention and resolution of environmental issues at various levels of society.

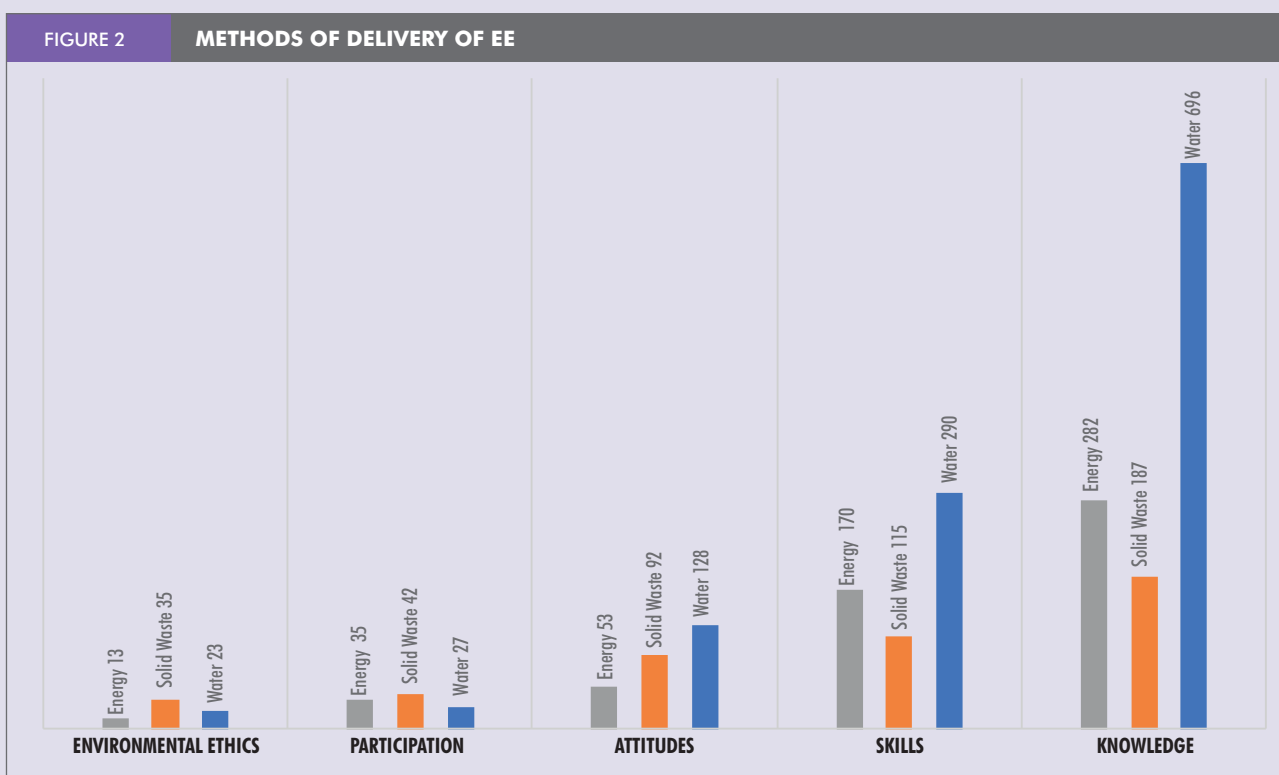
- Environmental ethics are used to develop universal ethics that students can act upon regardless of their culture and religion. Thus, students are motivated by their ethical values to practice positive environmental behavior¹.

Results of the survey showed that environmental education concepts were vastly covered in all subjects of the study with a total of 1777 concepts. While there were more water (1045) than energy (463) and solid waste concepts (269) in the curriculum, most focused on scientific facts and information and were often repeated. Solid waste concepts were few, and lacked the depth required to promote real understanding. These concepts were often delivered as add-ons to topics. The sequential development of the water concepts was more adequately developed compared to that of energy and solid waste. While energy concepts were repetitive and did not follow a sequential flow, those of solid waste were few and scattered. Important concepts that tackle issues of the social, political and economic implications of environmental issues, as well as sustainable development, were vastly missing.

The greater, more sequential presence of water concepts was mainly due to an earlier WEPIA project that was carried out at the Ministry of Education in 2004. Despite the fact that the curriculum underwent several reforms and reviews following this project, the curriculum division kept these concepts in the textbooks, recognizing their significance.

Even so, while conducting a survey of youth, it was clear that behaviors and attitudes of youth were not dependent on the amount of knowledge they acquired. Thus, any gap in information regarding solid waste and energy, even if integrated in the curriculum, would have little influence on children's behavior. It is thus recommended that instruction sessions be conducted with curriculum division members in order to influence the curriculum while carrying out more substantial projects that have real influence on attitudes and behaviors of youth.

Finally, Jordanian textbooks put great emphasis on information and knowledge while less attention is dedicated to the synthesis and application of this information. Concepts therefore remain only superficially tackled. In addition, the ethical dimension is virtually absent from the current curriculum. Students need to seek better understanding of the ethical imperatives needed to



keep nature alive, and to translate those imperatives into real action.

Figure 2 shows that three themes covered in the textbook, namely water, energy and solid waste, appear mostly as knowledge. Skills were present but to a lesser degree. Most of the skills covered were in the form of asking a critical question at the end of the unit/lesson, conducting research, writing about visits to institutions, and comparing and reading graphs and figures. These were stated as activities, but a thorough explanation of the methodology needed to implement such activities was not described, nor did any evaluations follow. In sciences, most of the skills were in the form of experiments, researching, and drawing graphs and charts. In lower grades, the emphasis was on drawing pictures, comparing photos of behaviors, as well as some sorting exercise. In vocational education, some higher skills were introduced such as making electrical circuits or applying water quality testing techniques, but these skills remained minimal. In the subject of geography, most skills focused on drawing maps, researching, suggestions for field visits, and some critical thinking questions that need researching. Solid waste concepts had the highest skills compared to the number of concepts, mainly because these concepts were introduced as add-ons to subjects and often were in the form of “to do and not to do” situations.

Attitudes were tackled in the form of situations and selecting positive behavior. While students may select positive behavior to receive a high grade, this does not mean that they actually believe in it, let alone practice it. Furthermore, most of these situational questions came as add-ons and did not follow a progressive thought. To change attitudes, authors of textbooks need to align the environmental values with the values already shared by students and with the collective values of society. By making environmental ethics relevant to youth by relating it to their personal ethics and culture, students will genuinely assume the environmental values, making them an intrinsic, ingrained part of youth and thus future leaders. This progression and method of making the environment pertinent is missing from textbooks.

It is thus recommended to explore the inclusion of an ethical, value-based program to complement the knowledge-based environmental education program that is currently found in the textbooks.

The environmental ethics guiding principles as defined by the Center for Environmental Ethics and Law² (CEEL) are as follows:

1. Promote ecological solidarity between humans

Key findings from the mapping of environment in the curriculum in Jordan

- Environmental Education concepts are adequately, if not vastly, covered in the national textbooks. However, some concepts have greater emphasis than others. For example, water concepts are covered more extensively than energy concepts and solid waste concepts. This reflects the effects of the WEPIA project, and the concepts introduced to the curriculum as a result of it.
- Water concepts are covered in abundance despite the curriculum reform that occurred after the WEPIA project. This indicates a change in the attitude and approach of the curriculum division members after the completion of the earlier project.
- Based on the mapping survey, knowledge remains the dominant form in which environmental concepts are tackled, with skills as the second most common form of presentation. Participatory and ethical approaches are virtually absent from the current curriculum.
- The textbook mapping reflected the source of much of students' vast knowledge, but the lack of hands-on activities prevented a genuine, meaningful connection to environment. Furthermore, the methodology of the current textbook does not allow for the integration of these concepts in an interactive manner that promotes higher thinking skills and greater participation.
- When evaluating the scope and sequence chart, it was found that water themes followed a systematically developed sequence of concepts through grade levels and subjects. However, while energy concepts are vastly covered, the concepts appear scattered and un-sequenced. At times energy concepts are loaded disproportionately into one grade (e.g., grade 10). Finally, the solid waste concepts were fewer and scattered without much consideration of development over grade levels.
- In all concepts surveyed there has been greater emphasis on demand management techniques and the role of individuals in conservation. However, these concepts are presented in a stand-alone, superficial fashion, delivered in the form of brute facts that often lack the requisite knowledge base or the depth of exploration and practical application needed to change values and attitudes.
- Concepts that are scientific in nature are more extensively covered with greater depth and understanding. Other concepts that emphasize a social, political or cultural dimension of the theme under study are minimally covered, typically in the form of pure knowledge, lacking the inquiry-based learning that shapes attitudes and values. For example, natural ecosystems are covered most frequently in all textbooks, followed by demand management concepts. Concepts related to sustainability are covered least frequently.

and nature, with the obligation to respect and the compassion of love as the basis for genuine care of living beings, places and people: love for the beauty and gift of the natural world with all of its living diversity; love for our places and our homes; and love for the people of today and tomorrow.

2. Support universal human rights and efforts for social, economic and environmental justice.
3. Recognize the danger in the commodification of life, the appropriation of life processes and the synthetic creation of new life forms being introduced into the biosphere.
4. Maintain, promote and nurture bio-cultural diversity.
5. Foster local and regional alliances that recognize the knowledge and understanding that each has to contribute.

6. Recognize that the application of scientific knowledge is not value-neutral.

Finally, teachers are considered role models and represent the real agent of change to any attitude or behavior, and can shape ethical behaviors themselves. In order to make the environmental ethics program effective, comprehensive and intensive training programs need to be developed for educators.

NOTES

1. <https://sites.duke.edu/eelandscape/round-i/tbilisi-goals-and-objectives/>
2. <https://www.environmentalethicsand-law.org/>

ANNEX1

INTRODUCTION TO ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

Proposed Course Syllabus

COORDINATED BY IBRAHIM ABDELGELIL

✓ **Course Description:**

This course is designed to introduce the essential concepts of environment and sustainable development to junior-level university students from all faculties and specializations. It examines the complex environmental issues in a multidisciplinary approach. The course will focus on the environment through its many diverse interrelationships with the social and economic aspects of sustainable development, through various modes of delivery, including case studies from the Arab region. The course might be split over 2 semesters, with basics in semester 1 and advanced topics in semester 2.

✓ **Course Objectives & Learning Outcomes:**

Upon completion of this course, the student is expected to:

- Better understand the basic concepts of ecology and environment.
- Better understand challenges facing the environment and means to achieve sustainable development, including financial aspects and the transition to green growth.
- Better understand the services provided by ecosystems to human life.
- Analyze the complex relationships between the socioeconomic systems and the environment.
- Identify the human impacts on the ecosystems.
- Appreciate environmental ethics.
- Understand the concept and importance of sustainability and its historical evolution.

- Gain basic skills to conduct academic research, technical writing and presentations in environment-related subjects.

✓ **Required Readings & References**

The required readings for the course will be selected from international and local sources. Ultimately, one textbook or more would be produced, specifically developed to teach the course in Arab universities. Additional readings will be given to students as handouts.

✓ **Course topics**

I. Basic Definitions (environment, ecology, natural resources)

II. Ecosystems and their Function

1. Definition and origin
2. Types, components and structure

III. Environment and Development

1. Background and definition
2. Interactions between socio-economic systems and ecosystems
3. Concepts of carrying capacity and pollution
4. Ecological Footprint
5. Sustainable Development (definition, evolution and concepts)
6. Sustainable Development Goals (SDGs)
7. Green Growth

IV. Biodiversity

1. Definitions
2. Values of biodiversity (economic, social, ethical, etc.)
3. Threats to biodiversity

- V. Land-use and Urbanization**
1. Environmental impacts of urbanization
 2. Transportation and its impacts on land and air
 3. Urban services: waste, water, sanitation (details in VII, X and XI)
- VI. Agriculture, and Food Security**
1. Agriculture productivity
 2. Agrochemicals and their environmental impacts
 3. Land degradation
 4. Organic food
 5. Genetically modified crops
 6. Food security
- VII. Water Sources and Management**
1. Hydrological cycle
 2. Water pollution
 3. Marine pollution
 4. Integrated water resources management
 5. Usage and efficiency
- VIII. Energy Sources**
1. Fossil energy (Coal, oil, and gas)
 2. Renewable energy (biomass, solar, wind, hydro, geothermal)
 3. Nuclear
 4. Sustainable energy options
- IX. Energy-Water-Food Nexus**
1. Definition of the nexus
 2. Synergies and trade-offs
 3. Management issues
- X. Air Quality Issues**
1. Sources and types of air pollutions
 2. Air quality standards and monitoring
 3. Strategies/technologies for air quality management
- XI. Waste Management**
1. Solid wastes types, sources and management
 2. Wastewater types, sources and management
 3. Hazardous materials definition, types, sources and management
- XII. Global environmental issues**
1. Climate change and its impacts
 2. Ozone depletion
 3. Desertification
 4. Biodiversity
 5. Oceans and international waters
- XIII. Environmental Policy and Governance**
1. Environmental laws and regulations
 2. Global environmental institutions and governance
 3. International conventions and treaties on environment and climate change
 4. Environmental Management System-ISO 14001
 5. Capacity building, training, and public awareness
- ✓Proposed references and reading materials:**
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 2. Eldon D. Enger (2016) "Environmental Science: A study of interrelationships"
 3. Richard T. Wright, Dorothy F. Boorse (2017) Environmental Science: Toward A Sustainable Future, Pearson, 13th Edition
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 5. <https://www.undp.org/content/undp/en/home/sustainable-development-goals.html>, Accessed May 2019.
 6. www.myfootprint.org Accessed May 2019.
 7. <http://www.globalchange.umich.edu/globalchange1/current/lectures/klings/ecosystem/ecosystem.html>, Accessed May 2019.
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ANNEX 2 GLOBAL ENVIRONMENTAL CHALLENGES

IBRAHIM ABDEL GELIL



I. INTRODUCTION

Geographically, environmental challenges can be classified into two major groups: 1) Global challenges that can affect our planet as a whole such as ozone depletion and climate change; and 2) challenges specific to the local environment such as air quality, industrial pollution and waste management. Some challenges, including waste management, air quality and water scarcity have been prominent in the Arab region for decades. Others have emerged in recent years, such as chemical pollution, transition to green economy, climate change and the adoption of a water-energy-food nexus approach. Further, UNEP's Global Environment Outlook (GEO-6), released in 2019, has identified a set of emerging issues that – although are recognized as very important by the scientific community – are not yet generally recognized by the policy community while they could have a major impact on human wellbeing and the environment. These include microplastics, illegal trade in wildlife, loss and damage of ecosystem services, dust and sandstorms and circular economy, (UN Environment, 2019).

Chemical management has become a major public health concern. It is estimated that there are more than 100,000 chemicals on the market, and chemical pollution is now considered a global threat. Common categories of chemicals include pharmaceutical and veterinary chemicals, pesticides, antibiotics, flame-retardants, plasticizers and nanomaterials. Some chemicals that are persistent, toxic and bioaccumulating, and may travel long distances, are listed under international conventions, such as the Stockholm Convention (persistent organic pollutants) and Minamata Convention (mercury), but scientific evidence shows that more chemicals regularly made available for commercial use display the same properties as the regulated persistent organic pollutants. Promoting safer and sustainable alternatives to chemicals, especially biodegradable replacements for plastics, and sound cradle-to-cradle chemicals management is essential (UN Environment, 2019).

Sustainable resource use is another major environmental challenge that requires sound management of renewable resources and aims to recycle non-renewable resources, leading

to the concept of a circular economy in which waste, the by-product of a process, becomes a raw material for another process. In a circular economy, efficient use of resources across their entire life cycle is critical: from extraction to manufacturing, through consumption and use, to recycling and reuse. The transition to a circular economy will provide many opportunities for technology innovation and deployment that also present many new business prospects.

II. MAJOR ENVIRONMENTAL CHALLENGES

Environmental Education (EE) is crucial to build the critical mass of human capital needed to attain a sustainable future. It should not be seen as a complement to the existing curriculum. Mainstreaming EE requires integrating environmental topics into the curricula and the intended learning outcomes at all levels. In addition to the formal education curricula, EE should also be promoted by non-formal and informal education. Community engagement and local learning can also play an important role, especially for involving traditional and indigenous knowledge into the learning process. However, upscaling of EE is still needed in order to include it as a core element in the structures of educational systems in the Arab countries. To contribute to that mainstreaming process, this overview briefly covers some of the major global environmental challenges that are of priority to the Arab region. It draws heavily on the previous thematic AFED reports with updates when needed.

1. Peace, security, and the environment

According to AFED, “scientific assessment of the environmental effects of conflict are generally categorized as direct and indirect impacts. Direct impacts relate to those whose occurrence may be physically linked to military action and which typically arise within the immediate short-term (up to six months), whereas indirect impacts are those that can be attributed to the conflict but which usually interact with a web of factors and only become fully manifest in the medium to longer run” (AFED, 2008). Some examples of direct impacts of conflict include environmental contamination from bombing of industrial

sites, and military debris and demolition wastes. Indirect impacts include the environmental footprint of displaced populations, collapse of environmental governance and data vacuum, and lack of funding for environmental protection.

The accumulation of long-standing environmental problems over the years, the harsh environment and fragile ecosystems, along with population growth, have augmented the effects of the Arab region's armed conflicts and political instability on the environment. It is very difficult to scientifically assess the impact of conflicts on environment in the region due to the lack of solid pre-conflict baseline data and the scarcity of available scientific assessments. However, some impacts were well documented such as those of the 1991 Gulf War on the natural environment in Kuwait and Saudi Arabia (IIASA, 2004).

The main response to the environmental consequences of conflict has come from UNEP. The Gulf War of 1991 was the first time that UNEP examined the environmental risks of a conflict, producing a series of desk studies. Of UNEP's twelve post-conflict assessments,

slightly under half have been done in the Arab world including Iraq, Lebanon, the Occupied Palestinian Territories, Somalia and Sudan (AFED, 2008).

For decades, the Arab region has dealt with armed conflicts, terrorism, and a state of political instability. The region has witnessed the Arab Israeli conflict (1948-present), the Lebanese civil war (1975-1990), the Iran-Iraq war (1980-1988), the 1991 Gulf War, the two-month civil war in Yemen in mid-1994, and the ongoing war since 2014, the war on Iraq in 2003, and the waves of political uprisings and terrorism in Tunisia, Egypt, Syria, Libya, Algeria, Somalia, and Sudan during the last two decades. As a result, the region suffered great human and economic losses and substantial damages to the environment. The escalating levels of unrest in the last few years has also put more socio-economic pressures on affected countries, hindering their path towards achieving sustainable development.

Military activities have increased pressures on the region's fragile habitats and environment. In the Gulf War of 1991, nearly 31 percent of





Kuwait's land area was disturbed by military activities such as movement of off-road military vehicles, dug trenches and pits, erected sand walls, and the emergence of oil lakes and mine fields. Spilled oil was the main pollutant of the region's marine ecosystem. About 6-8 million barrels of crude oil were discharged into the Gulf marine ecosystem from damaged oil terminals, sunken vessels and oil tankers, affecting fishing industries, marine species and severely polluting coastlines. Hazardous sites also pose threats to local populations. Radioactive contamination due to the use of depleted uranium in the wars of 1991 and 2003 became a concern for its potential effects on human health.

Refugees and internally displaced people are an issue that cannot be overemphasized in the Arab region. Arab-Israeli wars, Gulf wars and wars on Iraq, the current instability and terrorism attacks in Syria, Libya, and Egypt as well as current armed conflicts in the Palestinian territories over the last few decades have increased the number of internally and cross-border displaced people. Thirty percent of Palestinian refugees live in 59 refugee camps in Jordan, Lebanon, Syria, and the West Bank and Gaza Strip (UNRWA, 2019). Furthermore, the mass displacement of people across the region due to the war in Syria is having severe environmental impacts,

endangering the health of millions of people (AFED, 2017).

Additionally, those Arab countries that underwent political transition and encountered uprisings in recent years witnessed economic downturn and experienced a severe setback to progress on the MDGs and consequently also the SDGs.

2. Water resources

The Arab countries are among the world's most water scarce. The prevailing arid conditions in the region play a key role in reducing freshwater availability. Arab countries cover 10 percent of the world's area but receive only 2.1 percent of its average annual precipitation. Most of the region is classified as arid or semi-arid, receiving less than 250 millimeters of rainfall annually.

Many water resources basins, both surface and groundwater, are also shared among a number of countries. Overall, the Arab region's renewable freshwater availability is estimated at about 338 Km³/year, more than 55 percent of which originates from outside the region. This presents major challenges for the sustainable management of water resources and leaves Arab countries vulnerable to conflicts, particularly as pressure mounts for meeting increasing



demands for domestic, agricultural, industrial, and environmental uses. An additional stress anticipated to exacerbate these strains is climate change.

Rapid population growth, since the mid-1970s, has caused a dramatic reduction in per capita renewable freshwater resources, from an average of 1,230 m³/capita/year in 1992 to an alarming 750 in 2014, below the water scarcity line of 1,000 m³/capita/year. Eighteen of the 22 Arab countries have fallen below the water scarcity line, and 13 are among the world's 19 most water-scarce nations (AFED, 2015). Per capita water availability in nine countries is already below 200 m³, much less than the 500 m³/capita/year designated as absolute water scarcity. This means that about 40 percent of the Arab population lived in conditions of absolute water scarcity in 2014 (ESCWA, 2015). These trends in the reduction of per capita water availability are expected to continue as population growth continues. It is projected that by 2025, Iraq and possibly Sudan could be the only Arab countries

with an average above 1,000 m³/capita/year. Moreover, it is estimated that by 2030, the effects of climate change will have reduced renewable water resources by another 20 percent (UNDP, 2013).

Groundwater resources in the Arab region in general, and in the Arabian Peninsula in particular, are under critical conditions. In Bahrain, Jordan, Lebanon, Oman, Tunisia, the United Arab Emirates and Yemen, groundwater contributes more than 50 percent of total water withdrawals. In the Arabian Peninsula it accounts for 84 percent. The current rate of groundwater extraction far exceeds the natural recharge, resulting in a continuous decline in groundwater levels and quality deterioration in most of the countries due to seawater and the encroachment of connate water.

Due to the scarcity of water resources in the region, non-conventional water supplies have been widely adopted in the form of desalination plants, wastewater reuse programs, and irrigation

schemes utilizing mixed agricultural drainage water.

With more than half the world's desalination capacity, the Arab region leads the world in desalination. Although desalinated water contributes only a very small share of Arab countries' total water supply (1.8 percent), it contributes nearly all the water supply for many cities, especially in the GCC region.

While desalination plants produce freshwater that augments supply and reduces pressure on conventional water resources, they have harmful environmental effects, including air emissions, seawater and marine life pollution from discharged brine, increased salt concentration from effluents and emission of trace elements and residual treatment chemicals such as anti-scaling agents. Another major environmental concern is the greenhouse gasses emitted while burning fossil fuels to produce electricity and steam to power desalination plants (UNDP, 2013).

Some Arab countries are using more treated municipal wastewater to meet escalating demand in urban areas. GCC countries use about 40 percent of treated wastewater for fodder, landscaping and the irrigation of non-edible crops.

The water demand in the region is increasing at alarming rates, thus placing exceeding pressure on the amount of water available. On average, irrigation consumes about 88 percent of the total sectoral abstractions, and with efficiency of less than 50 percent.

3. Urbanization and its effects on the environment¹

Intense urbanization has been a key characteristic of many Arab countries for the past four to five decades, with significant impact on environmental and natural resources and an already overstretched urban infrastructure. Currently, eight countries have an urban population of more than 80 percent and four countries have an urban population of less than 40 percent. As of 2010, the Arab countries were home to 357 million residents, 56 percent of whom live in cities. By 2050, these countries will expectedly be home to 646 million people, 68 percent of whom will live in cities (UN-HABITAT, 2012).

Rapid urbanization and rising quality of living standards are leading to a greater demand for water. Scarce water resources are also being further depleted by current practices of unsustainable water consumption. Access to improved water and sanitation in the cities of the Arab Mashreq





countries continues to be almost universal, with most households having direct access to piped water and water-based sanitation. While the share of urban residents in Syria and the occupied Palestinian territories with access to improved water has decreased slightly, the absolute number of people with access is growing. However, inequitable allocation of water resources – access that favors Israelis and water quality that does not meet WHO standards – continue to be major challenges for Palestinian communities (UN-HABITAT, 2012). Water tariffs are low compared to other countries, but many Arab countries such as Egypt, Saudi Arabia, UAE, and others have already raised tariffs in order to promote voluntary improvements in water efficiency and conservation.

Along with inadequate management of municipal waste, which is mostly organic and disposed of in open dumps, accelerated urbanization there has also been a substantive increase in carbon dioxide (CO₂) emissions in the region, mainly as a result of burning fossil fuels to produce electricity and fuel urban transportation, especially the GCC

countries which are implementing ambitious urban transportation master plans to reduce congestion and improve public transit and pedestrian networks and the general quality of urban life.

There had been an expansion in slum areas² and refugee camps especially around the major cities. In Mauritania, Somalia and Sudan, 67 to 94 percent of urban residents live in slums. It is noticeable that Tunisia was the first Arab country to eliminate slums, restore historic areas, legalize land tenure and ensure basic services to the urban poor (UN-HABITAT, 2012).

4. Solid waste management

The management dilemma of municipal solid waste (MSW) has been recognized and tackled seriously worldwide. However, the majority of Arab countries are still striving towards establishing suitable and practical mechanisms for addressing the MSW issue at local and national levels. It is predicted that the amount

of municipal solid waste generated in Arab countries in 2020 will exceed 200 million tons per year, with higher waste generation correlated to a higher gross domestic product (GDP). On average, organic matter accounts for over half of municipal solid waste, while paper, plastic, glass, metals, and textiles account for about 30 to 40 percent. However, the recycling rate is lower than 5 percent. Judging by the size of the recycling industry in other nations, the inability of Arab countries to recycle municipal solid waste is a lost economic opportunity. In addition, the mismanagement of municipal solid waste causes significant negative environmental impacts (AFED, 2011).

In many Arab countries up to 50 percent of waste generated may be left uncollected. Primitive methods of disposal are still practiced in most parts of the region, including open dumping and burning, as well as the mixing of municipal with industrial and medical wastes. Problems related to old landfill site contamination, residential areas intrusions, and sequential remediation and rehabilitation efforts are rising in several countries.

The most prevalent method of waste disposal is in sanitary landfills, which have become overwhelmed by the increasing volumes of waste. Waste-to-energy incineration started to be introduced in some countries. Initiatives to reduce waste generation, including a phasing out of plastic shopping bags, were launched in some countries, including the UAE and Morocco. The high content of organic matters in municipal waste triggered the interest in composting, thus several composting plants have been established and are already in operation producing compost-fertilizing materials and soil conditioners.

Improper waste disposal and widespread littering cause environmental degradation and foregone economic opportunities in the region, with direct negative consequences for human health and standards of living.

The transition to the circular economy, moving from “waste management” to “resource management,” needs a new paradigm of regulations in the region. Appropriate rules are necessary to apply the 3-R principle (Reduce-Reuse-Recycle), ensuring that the root of the

problem is tackled. Fiscal deterrents and incentives are also required to ensure that business as usual for industries becomes the most expensive option as external costs is well factored into the price of primary raw materials. This would create a level-ground for recycling industry to compete and penetrate the market

5. Biodiversity resources, conservation and management

The Arab world houses a unique biological diversity in terms of species and ecosystems represented by arid, semi-arid, and Mediterranean biomes.

Many species in the Arab world currently face major threats, which will be augmented in the future due climate change. The dual effect of continued anthropogenic activities and climate change will further undermine biodiversity, in addition to further biodiversity degradation caused by current conflicts and instability in some Arab countries of the region.

Conservation of biodiversity in the Arab region has critical regional and worldwide significance. Most of the Arab states have developed and enforced laws to protect biodiversity and established and are continuing to establish and maintain protected areas on land and in the sea.

Reducing the direct pressures on biodiversity and promoting sustainable use require that conservation policies be integrated into national and regional planning, implementation and regulatory frameworks. In this regard, capacity building in biodiversity planning, information management, and enforcing laws and regulations are key tools for the conservation and sustainable use of biodiversity in the region (UNEP, 2016).

6. Marine and integrated coastal zone management (ICZM)

The three major marine systems in the Arab region are the Mediterranean, the Red Sea Gulf of Aden (RSGA) and the ROPME (Gulf) regions. The marine and coastal environments are threatened by pollution, over-fishing, loss of biodiversity, climate change, and other problems. The RSGA, one of the world's most unique coastal and marine environments, is threatened

by a variety of human activities, such as dredging and filling operations, the disposal of domestic and industrial effluents, and the expansion of the tourism industry. The Gulf area is considered a high-risk pollution area, due in particular to the large number of offshore oil and gas installations, transportation and leakages.

Industrial and power sectors such as refineries, petrochemical complexes, power plants, desalination plants grew rapidly in the last few decades and most of those facilities are associated to coastal area. Jubail and Yanbu industrial cities in Saudi Arabia are good examples. The heavy reliance on desalination plants is clear in the region and particularly among the GCC countries. Desalination plants discharge brine water directly to the marine environment. The discharged water contributes brine, chlorine, thermal pollution as well as microorganism and possibly viruses to the marine environment.

Oil spills and chemical contamination is a major threat for marine environment in the region. Marine waters and rivers—mainly the Nile, the Tigris, and the Euphrates—and the natural and man-made lakes constituting inland water resources afford the Arab countries very important potential for fisheries. Proper management of available resources is required by the fisheries authorities in the Arab states. It cannot be over-emphasized that, for the Arab states, fisheries are vital for the food security and economic livelihood of a major portion of the population. Fisheries productivity and sustainability are dependent on both high-quality management and a high-quality natural environment.

In the last decade, many countries in the region have developed Integrated Coastal Zone Management Plans as part of a network of marine protected Areas. Recently, more than 30 Marine Protected Areas are reported in the region, and around 18 regional and international agreements related to coastal and marine environment are signed or ratified by governments in the region.

7. Land degradation

Desertification or land degradation is caused by variation in climate and natural disasters include drought, soil erosion (wind & water), dust storms, disease and insect pest epidemics while human

activities include overgrazing in rangelands; deforestation; non-sustainable intensification of agricultural production; salinization due to faulty irrigation, over pumping of ground water and sea water intrusion; urbanization; pollution and conflict (AFED, 2014). This trend has had an estimated economic cost of USD 9 billion a year, with salinity alone estimated to have caused some USD1 billion in lost crop yields across the region. In some Arab countries the reduction in soil productivity has been estimated in the range of 30-35 percent of potential productivity (ESCWA, 2018).

Degradation affects some 70 percent of dryland in the Arab region and is primarily caused by rapid population growth and the failure of resource management policies, coupled with overgrazing.

Although human activities related to land management, and conflicts, that flared up in some Arab countries in 2011, have been identified as direct drivers of desertification, climate change is expected to alter the underlying natural conditions under which desertification may occur, with further intensification of food insecurity in the region.

Measures to mitigate the impacts of drivers of land degradation and to protect the threatened areas are well defined in the national plans of action to combat desertification (NAP) in the region. Countries that complete their NAP such as Lebanon, Oman, and Jordan should accelerate the implementation of such plans. In addition, Arab countries are requested to achieve target 15.3 of the SDGs which stipulates that “By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world”.

8. Sustainable energy options

The Arab region accounts for some thirty percent of the world's oil and around 16 percent of global natural gas production. Some three-quarters of the region's oil production is exported and traded on international markets (ESCWA, 2019). The region is still dominated by fossil fuels, which constitute around 98 percent of total primary energy consumption, of which oil accounts for 53.8 percent of the total. The use of natural



gas as a primary energy source has increased by 8.7 percent since 2000, totaling 43.5 percent of regional primary energy consumption in 2014 (RCREEE, 2017).

Given the region's projected continued economic and population growth, further industrialization and rising living standards, energy demand is expected to continue to increase over the coming decades. Decoupling growth from energy consumption will hence be one of the fundamental challenges for Arab economies, along with ensuring that future growth is inclusive through access to secure, clean and affordable energy for all.

Many Arab countries have made noticeable progress towards creating better conditions for the uptake of renewable energy investments. By mid-2016, the total installed capacity in the Arab countries of new renewables (excluding hydro) surpassed for the first time 3000 MW. Wind generation is currently dominated by utility scale installations in Egypt and Morocco,

while solar PV and CSP have been most developed in Algeria, Morocco, Egypt and the UAE. It is important to note that by mid 2016, Algeria, Egypt, Jordan, Morocco, Palestine and UAE (Abu Dhabi) were the only countries in which private actors practically owned and operated utility scale renewable energy power plants (RCREEE, 2016).

As energy plays a pivotal role in the socioeconomic development of nations, the seventh Sustainable Development Goal (SDG7) of the 2030 Agenda for Sustainable Development seeks affordable, reliable, sustainable and modern energy services for all, and aims to reach three targets by 2030: (a) universal access to affordable, reliable and modern energy services; (b) substantially increasing the share of renewable energy in the global energy mix; and (c) doubling the global rate of improvement in energy efficiency.

9. Air pollution³

Air pollution is a major environmental health

problem, affecting all countries around the world. Increasing amounts of potentially harmful gases and particles are being emitted into the atmosphere on a global scale, resulting in damage to human health and the environment. In 2013 air pollution was associated with 5.5 million deaths—that is, 1 in 10 deaths globally, an increase from 4.8 million in 1990 (World Bank and IHME, 2016).

Ozone is also an important pollutant affecting health and is formed under the action of sunlight, and is often high in polluted areas with a lot of sunshine, such as in polluted part of the Arab region. Ozone pollution is also a significant cause of crop yield losses in the region, in countries which have significant agricultural production, dominated by Egypt, Morocco, Algeria, Syria, Sudan and Tunisia. These represent large crop losses in relation to the overall annual yield and will have serious economic consequences (Climte Clean Air Coalition and UN Environment, 2017).

Mainstreaming awareness of the highly negative social and economic costs of rising air pollution will be one area of major policy challenges in the Arab region, as general environmental conservation and protection still occupy only a small space in public policy beyond declarations of good intent. The long-term consequences of this

situation include the potentially vast costs related to deteriorating public health, the treatment of respiratory disease and severe impacts on quality of life.

In addition to air pollution, Arab economies' high reliance on fossil fuels has also contributed to the Arab region's growing carbon footprint. While the Arab region's total emissions are small compared to large industrialized economies, the region accounts for around 5 percent of global greenhouse gasses (GHG) emissions and its domestic carbon footprint is increasing rapidly. The three largest energy consumers – Egypt, Saudi Arabia and the United Arab Emirates – account for more than half the total emissions from the Arab region. On a per capita basis, the GCC country economies are among the highest CO₂ emitters in the world, having overtaken by far highly industrialized nations such as the United States and Japan, reflecting the high energy and fossil fuel content of their national industries relative to their small populations. Saudi Arabia is also in absolute terms one of the top 10 global emitting countries of CO₂, with a share of 1.4 percent of global emissions in 2014 (ESCWA, 2019).

Climate change⁴

The Arab region is particularly vulnerable to climate change. It is one of the world's most water-scarce and dry regions; with a high dependency on climate-sensitive agriculture and a large share of its population and economic activity and situated in flood-prone urban coastal zones. An increasing level of awareness is building among all stakeholders in the region on the significance of climate change, reflecting both the global increase in awareness of the phenomenon, as well as mounting concerns in the region about increasingly frequent droughts and a looming water supply shortage.

Much of the progress so far achieved by countries in the region to tackle challenges of high unemployment and integration with the global economy can be jeopardized by climate change. Changes in temperature and precipitation patterns may result in damage to strategic economic sectors such as tourism or others with growth potential such as high-value-added agriculture. The combination of such impacts





is likely to slow down the reform process and adversely affects efforts to achieve the SDGs.

Climate change also poses many challenges to the region's cities which represent hubs for economic, social, cultural and political activities. Rising sea level could affect coastal cities, in the case of Alexandria, Egypt, a 0.5-meter rise would leave more than 2 million people displaced, with USD35 billion in losses in land, property, and infrastructure, as well as incalculable losses of historic and cultural assets.

Contributions of the region to global GHGs emissions are minimal. However, per capita carbon emissions (5.3 metric tons) are higher than the world average (4.9 metric tons). The involvement of the Arab countries in the climate change negotiations started from the beginning of the process and evolved in parallel with the evolution of the international climate regime. All Arab countries ratified the UNFCCC and the

majority had ratified the Kyoto protocol. All Arab countries, except Syria and Libya, had submitted their "Nationally Determined Contributions" (NDCs). Arab countries need to continue working on building national capacities to deal with different aspects of the climate change threats and the evolution of the international climate regime. They need to foster regional cooperation to adapt to the potential climate risks and work closely with the international community to make use of the opportunities offered for climate finance and climate friendly technology transfer (AFED, 2016).

Water-energy-food-climate nexus⁵

The Arab region is energy intensive, water scarce, and highly vulnerable to potential impacts of climate change. The water scarcity challenge in the region is being compounded by its multiple nexuses with various development sectors, such as water and environment, water

and food, water and energy, which carry within them many cross-cutting issues of social, economic, legal, technical, political, and security nature. It is therefore important to address much more explicitly the various linkages of the food sector with other sectors like energy, water, and economic development as a whole and for professionals in all sectors to think and act beyond the boundaries of their own sector, to achieve effective and integrated resources planning and management.

In addition, climate change is mostly driven by energy use and land use changes. Worldwide, the food sector alone contributes to about a third of the global greenhouse gas emissions through energy use, land use change, methane emissions from livestock and rice cultivation, and nitrous oxide emissions from fertilized soils.

At the same time climate change mitigation places new demands on water and land resources, such as production of biofuels, carbon sequestration and carbon capture and storage (CCS). Climate adaptation measures, such as intensified irrigation or additional water desalination, are often energy intensive. Further, increased groundwater use and water storage may require additional pumping. Thus, climate policies can have impact on water, energy and food security, and adaptation action can in fact be maladaptive if not well aligned in a nexus approach and implemented by appropriately interlinked institutions. Climate change, hence, underpins the triple context of water security, food security and energy security, so there is an urgent need to understand better why this nexus requires urgent attention, especially in the Arab region, which is energy rich, water scarce, and food deficient.

The nexus approach can boost resource efficiency and productivity by addressing externalities across sectors. For example, nexus thinking would address the energy intensity of desalination, or water and land demands in renewable energy production (e.g. solar energy and some hydropower schemes). The nexus approach integrates management and governance across sectors. It can also support the transition to a Green Economy, which aims, among other things, at resource use efficiency and greater policy coherence. The strong interdependency between energy, water and climate change

makes it imperative that policy formulation becomes coordinated, particularly with respect to mitigation of and adaptation to climate change effects. Traditionally, energy and water policies are developed within each sector with little coordination. Change from fossil fuel with large emissions and considerable water use towards renewable sources, with minimal emissions and water use, should be pursued. Conventional policy- and decision-making in 'silos' therefore needs to give way to an approach that reduces trade-offs and builds synergies across sectors. This new development has created unprecedented opportunities for fundamental policy changes in various economic, institutional, technological, social and political systems.

III. CONCLUSION

For decades, human development has caused daunting environmental problems leading to deterioration of air, soil, and water quality, in addition to some adverse impacts that threatened the planet earth such as ozone depletion and global climate change.

Furthermore, inefficient environmental management practices, the accumulation of long-standing environmental problems over the years, as well as the harsh environment and fragile ecosystems, along with population growth, industrialization and unsustainable consumption patterns, have been augmented by the effects of armed conflicts and political instability on the environment. Some of those environmental problems, such as poor air quality, deteriorated water quality, land degradation, and loss of biodiversity have been prominent for decades in the Arab region, while others such as climate change and chemical management, have recently emerged. Moreover, the evolution of environmental management concepts and practices such as the transition to the green economy, the circular economy and the emergence of water-energy-food nexus approach pose new challenges to Arab policymakers. To address these challenges, a new and capable cadre of environmental human capital is urgently needed. Thus, it is crucial to foster environmental education, both formal and informal, at all levels, throughout the Arab countries.

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NOTES

1. This section draws mainly from UN-HABITAT, 2012

2. Slum areas include both formally and informally constructed areas of the city and point to areas where physical and living conditions are significantly deteriorated.

3. This section is mainly drawn from ESCWA, 2019

4. This section is mainly drawn from World Bank, 2019

5. This section was drawn mainly from AFED, 2014.

ANNEX 3

UNEP'S GEO-6 KEY MESSAGES

The 6th edition of UNEP's flagship report, Global Environment Outlook (GEO6), was released in March 2019. Here are the key messages presented to policy makers:

Healthy planet, healthy people: Time to act!

1. The United Nations Environment Programme's sixth Global Environment Outlook (GEO-6) is the most comprehensive report on the global environment since 2012. It shows that the overall environmental situation is deteriorating globally and the window for action is closing.

2. GEO-6 shows that a healthy environment is a prerequisite and foundation for economic prosperity, human health and well-being. It addresses the main challenge of the 2030 Agenda for Sustainable Development, , that no one should be left behind, and that all should live healthy, fulfilling lives for the full benefit of all, for present and future generations.

3. Unsustainable production and consumption patterns and trends as well as inequality, combined with population growth-driven increase in resource use, put at risk the healthy planet needed to attain sustainable development. These trends are deteriorating planetary health at unprecedented rates with increasingly serious consequences especially for poorer people and regions.

4. Furthermore, the world is not on track to achieve the environmental dimension of the Sustainable Development Goals, and other internationally agreed environmental goals, by 2030 and is not on track to deliver long-term sustainability by 2050. Urgent action and strengthened international cooperation are now needed to reverse those negative trends and restore the planet and human health

5. Past and present greenhouse gas emissions have already committed the world to an extended period of climate change with multiple and increasing environmental and society-wide risks.



6. Air pollution, currently the cause of 6 to 7 million premature deaths per year, is projected to continue to have significant negative effects on health, and still cause between 4.5 million and 7 million premature deaths annually by mid-century.

7. Biodiversity loss from land-use change, and habitat fragmentation, overexploitation and illegal wildlife trade, invasive species, pollution and climate change is driving a mass extinction of species, including critical ecosystem service providers such as pollinators. This mass extinction compromises Earth's ecological integrity and capacity to meet human needs.

8. Marine plastic litter, including microplastics, occurs in all levels of the marine ecosystem and also shows up in fisheries and shellfish at alarming levels and frequency. The adverse impact of marine microplastic on the marine system is unknown with potential health impacts through the consumption of fish and marine products. More research on the magnitude of the problem is still needed.



9. Land degradation is an increasing threat for human well-being and ecosystems, especially for those in rural areas who are most dependent on land productivity. Land degradation hotspots cover approximately 29 per cent of global land, where 3.2 billion people reside.

10. Natural resources, including freshwater and oceans, are too often over-exploited, poorly managed and polluted. Approximately 1.4 million people die annually from preventable diseases, such as diarrhoea and intestinal parasites, that are associated with pathogen-polluted drinking water and inadequate sanitation

11. Antibiotic-resistant infections are projected to become a main cause of death worldwide by 2050. Affordable, widely available wastewater treatment technologies, to remove antibiotic residues could have huge benefits for all countries. Even greater efforts should be made to control mismanagement of antibacterial drugs at source, in human and agricultural use.

12. The harmful impacts of inappropriate use of pesticides, heavy metals, plastics and other substances are of significant concern as such compounds appear in alarmingly high levels in our food supply. They primarily affect vulnerable members of society, such as infants exposed to elevated levels of chemicals. The impacts of neurotoxins and endocrine-disrupting chemicals are potentially multi-generational.

Transformative change: a call for systemic and integrated policy action

13. The social and economic costs of inaction often exceed the costs of action and are inequitably distributed, often being borne by the poorest and most vulnerable in society, including indigenous and local communities, particularly in developing countries.

14. Current environmental policy alone is not enough to address these challenges. Urgent cross-sectoral policy actions, through a whole-of-society approach, are needed to address the challenges of sustainable development.

15. Achieving internationally agreed environmental goals on pollution control, clean-up and efficiency improvements is crucial, yet insufficient to achieve the Sustainable Development Goals. Transformative change is needed to enable and combine long-term strategic and integrated policymaking while building bottom-up social, cultural, institutional and technological innovation.

16. Some of the key features of effective environmental policies for sustainable development are integrated objectives, science-based targets, economic instruments, regulations and robust international cooperation.

17. Transformative change that achieves the Sustainable Development Goals and other internationally agreed targets includes a tripling of today's decarbonization rate as we head towards 2050, a 50 per cent increase in food production and the adoption of healthy and sustainable diets across all regions.

18. The transformative changes needed to achieve sustainable development will be most successful when they are just, respect gender equality, recognize different impacts for men, women, children and the elderly and take into account inherent societal risks.

19. The health co-benefits of reducing greenhouse gas emissions and air pollutants, including short-lived climate pollutants, together can outweigh the costs of mitigation, while achieving climate and air quality targets, increasing agricultural production and reducing biodiversity loss. Access to safe drinking water and sanitation can also provide environmental and health co-benefits.

20. Sustainable outcomes can best be achieved by combining objectives for resource use efficiency, with ecosystem-based management and better human health, drawing on scientific, indigenous and local knowledge.

Governance of innovations: innovations in governance

21. Food, energy and transport systems as well as urban planning and chemical production, are primary examples of systems of production and consumption needing innovative, effective and integrated policies.

22. Innovations are part of the solution but can also create new risks and have negative environmental impacts. Precautionary approaches can reduce threats of serious or irreversible damage where relevant scientific evidence is insufficient to inform decision making.

23. Innovation in and deployment of technologies to reduce greenhouse gas emissions and increase resource efficiency can strengthen the economic performance of countries, municipalities, enterprises and other stakeholders.

24. Agreement on desired pathways for transformative change under conditions of uncertainty can be fostered by coalitions between governments, businesses, researchers and civil society.

25. Sustainable development will be more likely to be achieved through new modes of

governance and adaptive management that give greater priority to the environmental dimension of the Sustainable Development Goals, while promoting gender equality and education for sustainable production and consumption.

Harvest time: knowledge for sustainability

26. These new sustainability governance models should also ensure adequate investments in knowledge systems such as data, indicators, assessments, policy evaluation and sharing platforms, and act on internationally agreed early signals from science and society to avoid unnecessary harm and costs.

27. Data from satellites, combined with monitoring on the ground, can enable quicker actions across the world, for example in response to extreme weather events. Widening possible access to data, information and knowledge and improving the infrastructure and capacities to harness that knowledge, will enable this data to be put to most effective use.

28. More investment in indicators that integrate different data sources and delineate clearly gender and inequality aspects, will enable better designed policy interventions and their evaluation.

29. Further developments are needed in environmental and natural resource accounting to ensure that environmental costs are internalised into economic decision making for sustainability.

30. Harnessing the ongoing data and knowledge revolution, as well as ensuring the authenticity and validity of these data to support sustainable development, combined with international cooperation, could transform capacities to address challenges and accelerate progress towards sustainable development.

31. Most important is the need to take bold, urgent, sustained, inclusive and transformative action that integrates environmental, economic and social activity to put society on pathways to achieve the Sustainable Development Goals, multilateral environmental agreements, internationally agreed environmental goals and other science-based targets.

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ACRONYMS AND ABBREVIATIONS

10YFP	Ten Year Framework of Programmes on Sustainable Consumption and Production	AOAD	Arab Organization for Agricultural Development
AAAD	Arab Authority for Agricultural Investment and Development	AP	Advanced Passive reactor
ABSP	Agricultural Biotechnology Support Programme	AP	Additional Protocol
AC	Air-Conditioning	API	Arab Planning Institute
AC	Alternating Current	APR	Advanced Power Reactor
ACG	Arab Coordination Group	APRUE	National Agency for the Promotion and Rationalization of Use of Energy
ACSAD	Arabic Centre for the Studies of Arid Zones and Drylands	AREE	Aqaba Residence Energy Efficiency
ACU	Arab Custom Union	ARWR	Actual Renewable Water Resources
ADA	Arriyadh Development Authority (Riyadh)	ASABE	American Society of Agricultural and Biological Engineers
ADCO	Abu Dhabi Company for Onshore Oil Operations	ASDRR	Arab Strategy for Disaster Risk Reduction
ADEREE	The National Agency for Energy Efficiency and the Development of Renewable Energy	ASFSD	Arab Strategic Framework for Sustainable Development
ADFD	Abu Dhabi Fund for Development	ASPnet	Associated Schools Project Network
ADR	Alternative Disputes Resolution	ASR	Aquifer Storage and Recovery
ADSG	Abu Dhabi Sustainability Group	AU	African Union
ADWEA	Abu Dhabi Water & Electricity Authority	AUB	American University of Beirut
AED	United Arab Emirates Dirham	AUM	American University of Madaba (Jordan)
AEPC	African Environmental Protection Commission	AVL	Automatic Vehicle Location
AEPS	Arctic Environmental Protection Strategy	AWA	Arab Water Academy
AEWA	African-Eurasian Waterbird Agreement	AWC	Arab Water Council
AFED	Arab Forum for Environment and Development	AWCUA	Arab Water Countries Utilities Association
AFESD	Arab Fund for Economic and Social Development	b/d	Barrels per Day
AG	Associated Gas	BADEA	Arab Bank for Economic Development in Africa
AGDP	Agricultural Gross Domestic Product	BAU	Business as Usual
AGERI	Agricultural Genetic Engineering Institute	Bbl	Oil Barrel
AGP	Arab Gas Pipeline	BCH	Biosafety Clearing House
AGU	Arabian Gulf University	Bcm	Billion cubic meters
AHD	Aswan High Dam	BCWUA	Branch Canal Water User Association
AHDR	Arab Human Development Report	BDB	Beyond Design Basis
AIA	Advance Informed Agreement	BDL	Central Bank of Lebanon
AIDS	Acquired Immunodeficiency Syndrome	BEPS	Base Erosion And Profit Shifting
AIECGC	Arab Investment and Export Credit Guarantee Corporation	BGR	German Geological Survey
AKTC	Aga Khan Trust for Culture	BMP	Best Management Practices
AI	Aluminum	BMZ	German Federal Ministry of Economic Cooperation and Development
ALBA	Aluminium Bahrain	BNEF	Bloomberg New Energy Finance
ALECSO	Arab League Educational, Cultural, and Scientific Organization	BOD	Biological Oxygen Demand
ALMEE	Lebanese Association for Energy Saving & Environment	boe	Barrels of Oil Equivalent
ALOA	Association for Lebanese Organic Agriculture	BOO	Build-Own-Operate
AMCEN	African Ministerial Conference on the Environment	BOOT	Build Own Operate Transfer
AMF	Arab Monetary Fund	BOT	Build Operate Transfer
AMU	Arab Maghreb Union	BP	British Petroleum
ANME	National Agency for Energy Management	BREEAM	Building Research Establishment Environmental Assessment Method
AoA	Agreement on Agriculture (WTO Uruguay Round)	BRO	Brackish Water Reverse Osmosis
		BRS	ARZ Building Rating System
		BSI	Biome Solar Industry

BU	Boston University	CMS	Convention on the Conservation of Migratory Species of Wild Animals
C&D	Construction and Demolition	CNA	Competent National Authority
C&I	Commercial and Industrial	CNCA	Public Agricultural Bank
CA	Conservation Agriculture	CNG (CNS)	Compressed Natural Gas
CAB	Centre for Agriculture and Biosciences	CO	Carbon Monoxide
CAGR	Compound Annual Growth Rate	CO ₂	Carbon Dioxide
CAIP	Cairo Air Improvement Project	CO _{2e/eq}	CO ₂ equivalent
CAMP	Coastal Area Management Project	COD	Chemical Oxygen Demand
CAMRE	Council of Arab Ministers Responsible for the Environment	COP	Conference of the Parties
CAN	Competent National Authority	CoP	Community of Practice
CAP	Compliance Assistance Programme	CPB	Cartagena Protocol on Biosafety
CAPEX	Capital Expenditures	CPC	Calcined Petroleum Coke
CBC	Community-Based Conservation	CRS	Center for Remote Sensing
CBD	Convention on Biological Diversity	CSA	City Strategic Agenda
CBO	Community-Based Organization	CSD	UN Commission on Sustainable Development
CBSE	Center for the Study of the Built Environment (Jordan)	CSEM	Centre Suisse d'Electronique et de Microtechnique
CCA	Climate Change Adaptation	CSO	Civil society organizations
CCE	Climate Change Education	CSP	Concentrated Solar Power
CCAP	Climate Change Action Plan	CSR	Corporate Social Responsibility
CCESD	Climate Change Education for Sustainable Development	CTAB	Technical Center of Organic Agriculture
CCGT	Combined Cycle Gas Turbine	cum	Cubic meters
CCS	Carbon Capture and Sequestration	CZIMP	Coastal Zone Integrated Management Plan
CCS CO ₂	Carbon Capture and Storage	DAC	Development Assistance Committee
CCUS	Carbon Capture, Usage and Storage	DALYs	Disability-Adjusted Life Years
CD	Compact Disk	DBFO	Design Build Finance Operate
CDM	Clean Development Mechanism	DBO	Design-Build-Operate
CDRs	Certified Emissions Reductions	DC	Direct current
CEDARE	Centre for Environment and Development for the Arab Region and Europe	DAC	Development Assistance Committee
CEDRO	Country Energy Efficiency and Renewable Energy Demonstration Project for the Recovery of Lebanon	DED	Dubai Economic Department
CEIT	Countries with Economies in Transition	DASI	Deloitte Accelerator for Social Innovation in the Middle East
CEO	Chief Executive Officer	DCFs	Directed Credit Funds
CEP	Coefficient of Performance	DEFRA	Department for Environment, Food and Rural Affairs (UK)
CERES	Coalition for Environmentally Responsible Economics	DEM	Digital Elevation Model
CERs	Credits	DESA	Department of Economic and Social Affairs
CFA	Cooperative Framework Agreement	DESD	Decade of Education for Sustainable Development
CFC	Chloro-Fluoro-Carbon	DEWA	Dubai Electricity and Water Authority
CFL	Compact Fluorescent Light	DFID	UK Department for International Development
CFL	Compact Fluorescent Lamp	DHW	Domestic Hot Water
CG	Coordination Groups	DII	DESERTEC Industrial Initiative
CGE	Computable General Equilibrium	DMN	Moroccan National Meteorological Office
CGIAR	Consultative Group on International Agricultural Research	DNE	Daily News Egypt
CH ₄	Methane	DOE	United States Department of Energy
CHN	Centre Hospitalier du Nord -Lebanon	DRM	Disaster Risk Management
CHP	Combined Heat and Power	DRR	Disaster Risk Reduction
CILSS	Permanent Interstate Committee for Drought Control in the Sahel	DSIRE	Database of State Incentives for Renewables & Efficiency
CIRAD	Agricultural Research for Development	DTC	Dubai Transport Corporation
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora	DTCM	Dubai Department for Tourism and Commerce Marketing
CIWM	Chartered Institution of Wastes Management	DTIE	UNEP Division of Technology, Industry, and Economics
CIHEAM	International Centre for Advanced Mediterranean Agronomic Studies	DTO	Dublin Transportation Office
CLO	Compost-Like-Output	DUBAL	Dubai Aluminum Company Limited
CLRTAP	Convention on Long-Range Transboundary Air Pollution	E3G	Third Generation Environmentalism
CM	Carbon Management	EAD	Environment Agency Abu Dhabi
CMI	Community Marketing, Inc.	EBRD	European Bank for Reconstruction and Development
		ECA	Economic Commission for Africa
		ECAs	Energy Conversion Agreements
		ECE	Economic Commission for Europe
		ED	Electrodialysis
		EDCO	Electricity Distribution Company

EDF	Environmental Defense Fund	FEMIP	Facility for Euro-Mediterranean Investment and Partnership
EDL	Electricité du Liban	FFEM	French Fund for Global Environment
EDM	Al- BiaWal-Tanmia - Environment & Development magazine	FiBL	Research Institute of Organic Agriculture
EE	Energy Efficiency	FIFA	Fédération Internationale de Football Association
EE	Environmental Education	FIT	Feed-in-Tariff
EFA	Education for All	FL&W	Food Lost and Wasted
EEAA	Egyptian Environmental Affairs Agency	FOEME	Friends of the Earth Middle East
EEHC	Egyptian Electricity Holding Company	FPEC	Future Pioneers for Empowering Communities
EEPP	Egyptian Environmental Policy Program	FSP	Food Security Program
EF	Ecological Footprint	FSU	Former Soviet Union
EGBC	Egyptian Green Building Council	F-T	Fischer-Tropsch process
EGPC	Egyptian General Petroleum Corporation	FTE	Full Time Equivalent
EGS	Environmental Goods and Services	FTIAB	Packaging and Newspaper Collection Service (Sweden)
EIA	Energy Information Administration	G7	Group of Seven: Canada, France, Germany, Italy, Japan, United Kingdom, United States
EIA	Environmental Impact Assessment	G8	Group of Eight: Canada, France, Germany, Italy, Japan, Russian Federation, United Kingdom, United States
EITI	Extractive Industries Transparency Initiative	GAM	Greater Amman Municipality
EIU	Economist Intelligence Unit	GAP	Good Agricultural Practices
EJ	Electro Joules	GAP	Global Action Plan
EMA	Europe, the Middle East, and Africa	GAPs	Good Agricultural Practices
EMAL	Emirates Aluminium Company Limited	GAS	Guarani Aquifer System
EMAS	Eco-Management and Audit Scheme	GATT	General Agreement on Tariffs and Trade
EMR	Eastern Mediterranean Region	GAVI	Global Alliance for Vaccine and Immunization
EMRO	WHO Regional Office for the Eastern Mediterranean	GBC	Green Building Council
EMS	Environmental Management System	GBIF	Global Biodiversity Information Facility
ENEC	Emirates Nuclear Energy Corporation	GCC	Gulf Cooperation Council
ENPI	European Neighborhood and Partnership Instrument	GCED	Global Citizenship Education
ENSO	El Niño-Southern Oscillation	GCF	Green Climate Fund
EOR	Enhanced Oil Recovery	GCM	General Circulation Model
EPA	US Environmental Protection Agency	GCOS	Global Climate Observing System
EPC	Engineering Procurement and Construction	GDP	Gross Domestic Product
EPD	European Patent Office	GE	General Electric
EPDRB	Environmental Program for the Danube River Basin	GECF	Gas Exporting Countries Forum
EPI	Environment Performance Index	GEF	Global Environment Facility
EPSA	Exploration and Production Sharing Agreement	GEMR	Global Education Monitoring Report
ESAUN	Department of Economic and Social Affairs	GEMS	Global Environment Monitoring System
ESBM	Ecosystem-Based Management	GEO	Global Environment Outlook
ESCO	Energy Service Companies	GERD	Gross Domestic Expenditure on Research and Development
ESCOs	Energy Service Companies	GFEI	Global Fuel Economy Initiative
ESCWA	United Nations Economic and Social Commission for Western Asia	GFs	Green Funds
ESD	Education for Sustainable Development	GFU	Global Facilitation Unit for Underutilized Species
ESG	Environmental, Social and Governance	GGGI	Global Green Growth Institute
ESDU	Environment and Sustainable Development Unit	Gha	Global hectare
ESI	Environment Sustainability Index	GHGs	Greenhouse Gases
ESMAP	World Bank Energy Sector Management Assistance Program	GIPB	Global Partnership Initiative for Plant Breeding Capacity Building
ETFs	Earmarked Tax Funds	GIS	Geographical Information Systems
ETM	Enhanced Thematic Mapper	GIWA	Global International Waters Assessment
EU	European Union	GJ	GigaJoule
EU ETS	European Union Emission Trading System	GLASOD	Global Assessment of Soil Degradation
EVI	Environmental Vulnerability Index	GLCA	Global Leadership for Climate Action
EWRA	Egyptian Water Regulatory Agency	GM	Genetically Modified
EWS	Emirates Wildlife Society	GME	Gazoduc Maghreb Europe
FACE	Free Air Carbon Enrichment	GMEF	Global Ministerial Environment Forum
FANR	The Federal Authority for Nuclear Regulation (UAE)	GMO	Genetically Modified Organism
FAO	Food and Agriculture Organization of the United Nations	GMP	Green Moroccan Plan
FDI	Foreign Direct Investment	GNI	Gross National Income
FEBEA	European Federation of Ethical and Alternative Banks		

GNP	Gross National Product	IDSC	Information and Decision Support Center
GPC	Green petroleum Coke	IEA	International Energy Agency
GPEDC	Global Partnership for Effective Development Cooperation	IEADSM	International Energy Agency Demand-side Management
GPS	Global Positioning System	IEEE	Institute of Electrical and Electronic Engineers
GPRS	Green Pyramid Rating System	IEEF	Inclusive Economic Empowerment Finance Facility
GRI	Global Reporting Initiative	IFA	International Fertilizer Industry Association
GRID	Global Resource Information Database	IFAD	International Fund for Agricultural Development
GSDP	General Secretariat for Development planning-Qatar	IFC	International Finance Corporation
GSI IISD	Global Subsidies Initiative	IFOAM	International Federation of Organic Agriculture Movements
GSLAS	General Secretariat of League of Arab States	IFPRI	International Food Policy Research Institute
GSR	Global Status Report	IGCC	Integrated Gasifier Combined Cycle
Gt	Gigaton	IHP	International Hydrology Program
GTZ	German Technical Cooperation (Gesellschaft für Technische Zusamm)	IIED	International Institute for Environment and Development
GVC	Civil Volunteers' Group (Italy)	IIIEE	Lund University International Institute for Industrial Environmental Economics
GW	Gigawatt	IIIP	Integrated Irrigation Improvement Project
GW	Greywater	IIP	Irrigation Improvement Project
GW _e	Gigawatt electrical	IISD	International Institute for Sustainable Development
GW _i	Global Water Intelligence	ILO	International Labour Organization
GWP	Global Warming Potential	ILW	Intermediate Level waste
GWP	Global Water Partnership	IMC	Istituto Mediterraneo Di Certificazione
GW _{th}	Gigawatt-thermal	IMF	International Monetary Fund
ha	Hectares	IMO	International Maritime Organization
HACCP	Hazardous Analysis and Critical Control Points	INDC	Intended Nationally Determined Contributions
HCFC	hydrochlorofluorocarbons	InWEnt	Capacity Building International-Germany
HDI	Human Development Index	IO	Input-Output
HFA	Hyogo Framework for Action	IOC	International Oil Companies
HFCs	Hydrofluorocarbons	IPCC	Intergovernmental Panel on Climate Change
HFO	Heavy Fuel Oil	IPF	Intergovernmental Panel on Forests
HICs	High-Income Countries	IPM	Integrated Pest Management
HIV	Human Immunodeficiency Virus	IPNS	Integrated Plant Nutrient System
HLW	High Level Waste	IPP	Independent Power Producer
HNWI	High Net Worth Individuals	IPR	Intellectual Property Rights
HPMPs	HCFC phase-out management plans	IPTRID	International Program for Technology and Research in Irrigation and Drainage
HVAC	Heating, Ventilation, and Air-Conditioning	IRENA	International Renewable Energy Agency
I/M	Inspection and Maintenance	IRESEN	Institut de Recherche en Energie Solaire et en Energies Nouvelles
IAASTD	International Assessment of Agricultural Knowledge Science and Technology for Development	IRR	Internal Rate Of Return
IAEA	International Atomic Energy Agency	ISCC	Integrated Solar Combined Cycle
IAS	Irrigation Advisory Service	IsDB	Islamic Development Bank
IC	Irrigation Council	ISESCO	Islamic Educational, Scientific, and Cultural Organization
ICAM	Integrated Coastal Area Management	ISIC	UN International Standard Industrial Classification
ICARDA	International Center for Agricultural Research in Dry Areas	ISO	International Organization for Standardization
ICBA	International Center for Biosaline Agriculture	ISWM	Integrated Solid Waste Management
ICC	International Chamber of Commerce	ITC	Integrated Tourism Centers
ICEE	International Conference on Environmental Education	ITC	International Trade Center
ICGEB	International Center for Genetic Engineering and Biotechnology	ITSAM	Integrated Transport System in the Arab Mashreq
ICLDC	Imperial College London Diabetes Centre	IUCN	International Union for Conservation of Nature
ICM	Integrated Coastal Management	IUCN	World Conservation Union (International Union for the Conservation of Nature and Natural Resources)
ICPDR	International Commission for the Protection of the Danube River	IWMI	International Water Management Institute
ICT	Information and Communication Technology	IWPP	Independent Water And Power Producer
ICZM	Integrated Coastal Zone Management	IWRB	International Waterfowl and Wetlands Research Bureau
IDA	International Desalination Association	IWRM	Integrated Water Resources Management
IDB	Islamic Development Bank	JAEC	Jordan Atomic Energy Commission
IDECO	Irbid District Electricity Company	JBAW	Jordan Business Alliance on Water
IDP	Internally Displaced Persons	JCEDARE	Joint Committee on Environment and Development in the Arab Region
IDRC	International Development Research Center		

JD	Jordanian Dinar	MD	Membrane Distillation
JEPCO	Jordan Electric Power Company	MDGs	Millennium Development Goals
JI	Joint Implementation	MEA	Multilateral Environmental Agreement
JMWI	Jordan Ministry for Water and Irrigation	MECTAT	Middle East Centre for the Transfer of Appropriate Technology
JNRC	Jordan Nuclear Regulatory Commission	MED	Multiple-Effect Distillation
JREEEF	Jordan Renewable Energy and Energy Efficiency Fund	MEdIES	Mediterranean Education Initiative for Environment and Sustainability
JVA	Jordan Valley Authority	MED WWR WG	Mediterranean Wastewater Reuse Working Group
KA-CARE	King Abdullah City for Atomic and Renewable Energy	MED-ENECS	Energy Efficiency in the Construction Sector in the Mediterranean
KACST	King Abdulaziz City for Science and Technology	MEES	Middle East Economic Survey
KAHRAMAA	Qatar General Electricity and Water Corporation	MEMAC	Marine Emergency Mutual Aid Centre
KAUST	King Abdullah University of Science and Technology	MENA	Middle East and North Africa
KEPCO	Korea Electric Power Corporation	MEPS	Minimum Energy Performance Standards
KFAED	Kuwait Fund for Arab Economic Development	METAP	UNEP Mediterranean Environmental Technical Assistance Program
KFUPM	King Fahd University of Petroleum and Minerals	MEW	Lebanese Ministry of Energy and Water
KfW	German Development Bank	MGD	Million Gallon per Day
KISR	Kuwait Institute for Scientific Research	MHT	Mechanical Heat Treatment
KSA	Kingdom of Saudi Arabia	MICE	Meetings, Incentives, Conferences, And Events
KW	Kilowatt	MICs	Middle-Income Countries
kWh	Kilowatt-hour	MIGA	Multilateral Investment Guarantee Agency
LADA	Land Degradation Assessment of Drylands	MIO-ECSDE	Mediterranean Information Office for Environment, Culture and Sustainable Development
LAS	League of Arab States	MJ	Mega Joule
LATA	Lebanese Appropriate Technology Association	MIST	Masdar Institute of Science and Technology
LAU	Lebanese American University	MMBTU	One Million British Thermal Units
LBNL	Lawrence Berkeley National Laboratory	MMCP	Making the Most of Commodities Programme
LCC	Life Cycle Costing	MNA	Multinational Approaches
LCEC	Lebanese Center for Energy Conservation	MoCCE	Ministry of Climate Change and Environment
LCOE	Levelized Costs of Electricity	MOQ	Maersk Oil Qatar
LDCs	Least Developed Countries	MOU	Memorandum of Understanding
LDN	Land degradation neutrality	MOX	Mixed-Oxide
LED	Light-Emitted Diode	MPA	Marine Protected Area
LEED	Leadership in Environmental Design	MPAP	Multi-Stakeholder Policy Formulation and Action Planning
LEMA	Suez Lyonnaise des Eaux, Montgomery Watson and Arabtech Jardaneh	MPAR	Ministry of Planning and Administrative Reform
LEU	Low-enriched Uranium	MSF	Multi-Stage Flash
LGBC	Lebanon Green Building Council	MSF	Multi-Stakeholder Forum
LLF	Lives & Livelihoods Fund	MSP	Mediterranean Solar Plan
LICs	Low-Income Countries	MSW	Municipal Solid Waste
LLW	Low Level Waste	Mt	Metric tons
LMBAs	Land and Marine Based Activities	MT	Million ton
LMEs	Large Marine Ecosystems	Mt	Megatons
LMG	Like Minded Group	MtCO ₂	Million tons of CO ₂
LMICs	Low Middle-Income Countries	Mtoe	Million tons of oil equivalent
LMO	Living Modified Organism	MTPY	Metric Tons Per Year
LNG	Liquefied Natural Gas	MV	Medium Voltage
LowCVP	Low Carbon Vehicle Partnership	MW	Megawatt
LPG	Liquefied Petroleum Gas	MW _h	Megawatt-hour
LRA	Litani River Authority	MW _p	Megawatt-peak
LV	Low Voltage	MWRI	Ministry of Water Resources and Irrigation
MAAR	Syrian Ministry of Agriculture and Agrarian Reform	MW _{th}	Megawatt-thermal
MAD	Moroccan Dirham	MVR	Measurement, Reporting and Verification
MALR	Ministry of Agriculture and Land Reclamation	N ₂ O	Nitrous Oxide
MAP	UNEP Mediterranean Action Plan	NAMA	Nationally Appropriate Mitigation Actions
MARPOL	International Convention for the Prevention of Pollution from Ships	NARI	National Agricultural Research Institutes
MASEN	Moroccan Agency for Solar Electricity	NARES	National Agricultural Research and Extension Systems
mb/d	million barrels per day	NASA	National Aeronautics and Space Administration
MBT	Mechanical-biological treatment		
MCM	Million Cubic Meters		

NBC	National Biosafety Committee	OFID	OPEC Fund for International Development
NBDF	Nile Basin Discourse Forum	OIC MCs	Organization of Islamic Conference Member Countries
NBF	National Biosafety Framework	OIES	Oxford Institute for Energy Studies
NBI	Nile Basin Initiative	OME	Observatoire Méditerranéen de l'Energie
NBM	Nile Basin Management	OMW	Olive Mills Wastewater
NC	National Communication	ONA	Omnium Nord-Africain
NDC	Nationally Determined Contributions	ONE	National Electricity Office
NEPCO	National Electric Power Company	ONEP	National Office of Potable Water
NCSR	Lebanese National Council of Scientific Research	OPEC	Organization of Petroleum Exporting Countries
ND	Neighborhood Development	OPEX	Operational Expenditures
NDW	Moroccan National Drought Watch	OSS	Sahara and Sahel Observatory (Observatoire du Sahara et du Sahel)
NEA	Nuclear Energy Agency	OWG	Open Working Group
NEAP	National Environmental Action Plan	PACD	Plan of Action to Combat Desertification
NEEAP	National Energy Efficiency Action Plan	PARC	Pan Arab Research Centre
NEEP	National Energy Efficiency Program	PBCs	Performance-Based Contracts
NEEREA	National Energy Efficiency and Renewable Energy Action (Lebanon)	PC	Personal Computer
NERC	National Energy Research Centre	PCB	Polychlorinated Biphenyls
NF	Nano-Filtration	PCFPI	Per Capita Food Production Index
NFC	Nile Forecast Center	PCFV	Partnership for Clean Fuels and Vehicles
NFP	National Focal Point	PEA	Palestinian Energy and Natural Resources Authority
NGCCs	Natural-Gas-Fired Combined Cycles	PERG	Global Rural Electrification Program
NGGP	National Green Growth Plan	PERSGA	Protection of the Environment of the Red Sea and Gulf of Aden
NGO	Non-Governmental Organization	PFCs	Perfluorocarbons
NGV	Natural Gas Vehicles	PICs	Pacific Island Countries
NGWA	Northern Governorates Water Authority (Jordan)	PIF	Public Investment Fund
NIF	Neighborhood Investment Facility	PIM	Participatory Irrigation Management
NMC	Northern Mediterranean countries	PJ	Peta Joule
NMVC	Non-Methane Volatile Compounds	PM	Particulate Matter
NOAA	National Oceanic and Atmospheric Administration	PMU	Program Management Unit
NOC	National Oil Company	PNA	Palestinian National Authority
NOEC	Net Oil Exporting Countries	PNEEI	Tunisian National Program of Irrigation Water Conservation
NOGA	National Oil and Gas Authority (Bahrain)	POPs	Persistent Organic Pollutants
NOIC	Net Oil Importing Countries	PPA	Power Purchase Agreement
NORDEN	Nordic Council of Ministers	PPIAF	Public-Private Infrastructure Advisory Facility
NOx	Nitrogen Oxides	PPM	Parts Per Million
NPK	Nitrogen, Phosphates and Potash	PPM	Process and Production Methods
NPP	Nuclear Power Plant	PPP	Public-Private Partnership
NPP	Net Primary Productivity	PPP	Purchasing Power Parity
NPPA	Nuclear Power Plant Authority	PPP	Public-Private Partnership
NPT	Non-Proliferation treaty of nuclear weapons	PRM	Persons with Reduced Mobility
NRC	National Research Council	PSPER	Promotion of Sustainability in Postgraduate Education and Research Network
NREL	National Renewable Energy Laboratory	PRY	Potential Researcher Year
NREAP	National Renewable Energy Action Plans	PTSs	Persistent Toxic Substances
NRW	Non-Revenue Water	PV	Photovoltaic
NSAS	Nubian Sandstone Aquifer System	PWA	Palestinian Water Authority
NSR	North-South Railway project	QNFSP	Qatar National Food Security Programme
NUS	Neglected and underutilized species	QP	Qatar Petroleum
NWRC	National Water Research Center (Egypt)	QSAS	Qatar Sustainable Assessment System
NWSAS	North Western Sahara Aquifer System	R&D	Research and Development
OA	Organic Agriculture	RA	Risk Assessment
O&M	Operation and Maintenance	RADEEMA	Régie autonome de distribution de l'eau et de l'électricité de Marrakech
OAPEC	Organization of Arab Petroleum Exporting Countries	RB	Raised Bed
OAU	Organization for African Unity	RBA	Results-Based Approach
ODA	Official Development Assistance	RBF	Results-based financing
ODP	Ozone Depletion Potential	RBO	River Basin Organization
ODS	Ozone-Depleting Substance		
ODDD	Organisation de Développement Durable		
OECD	Organization for Economic Co-operation and Development		

RBP	Restrictive Business Practices	SPM	Suspended Particulate Matter
RCE	Regional Centre of Expertise on Education for Sustainable Development	SRES	Special Report on Emission Scenarios
RCM	Regional Circulation Model	SRTM	Shuttle Radar Topography Mission
RCREEE	Regional Center for Renewable Energy and Energy Efficiency	SSA	Sub-Saharan Africa
RDF	Refuse Derived Fuel	SSR	Self-Sufficiency Ratio
RE	Renewable Energy	SRI	Socially Responsible Investments
REC	Renewable Energy Credits	STI	Science, Technology and Innovation
REMPEC	Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea	SWCC	Saline Water Conversion Corporation
REN21	Renewable Energy Policy Network for the 21st Century	SWH	Solar Water Heating
Rep	Republic	SWRO	Seawater Reverse Osmosis
RET	Renewable Energy Technologies	SWIM	Sustainable Water Integrated Management
RISE	Regulatory Indicators for Sustainable Energy	SWIM SM	Sustainable Water Integrated Management Support Mechanism
RM	Risk Management	T&D	Transmission and Distribution
RO	Reverse Osmosis	TAC	Technical Advisory Committee
ROPME	Regional Organization for the Protection of the Marine Environment of the sea area surrounded by Bahrain, I.R. Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates	TAR	Third Assessment Report
RPS	Renewable Portfolio Standard	Tcm	Trillion cubic meters
RSA	ROPME Sea Area	TDM	Transportation Demand Management
RSC	Royal Society of Chemistry (UK)	TDS	Total Dissolved Solids
RSCN	Royal Society for the Conservation of Nature	TES	Thermal Energy Storage
RSGA	Red Sea and Gulf of Aden	TFP	Total Factor Productivity
RUAF	Resource Centers Network on Urban Agriculture and Food Security	TFEC	Total Final Energy Consumption
S&T	Science and Technology	TIES	The International Ecotourism Society
SAIC	Science Applications International Corporation	TII	Thermal Insulation Implementation
SAP	Strategic Action Program	Toe	Tons of Oil Equivalent
SASO	Saudi Standards, Quality and Metrology Organization	TOSSD	Total official support for sustainable development
SCP	Sustainable Consumption and Production	TPES	Total Primary Energy Supply
SCPI	Sustainable Crop Production Intensification	TRAFFIC	Trade Records Analysis for Flora and Fauna in International Commerce
SCP/RAC	Regional Activity Centre for Sustainable Consumption and Production	TRI	Toxics Release Inventory
SD	Sustainable Development	TRIPs	Trade-Related Aspects of International Property Rights
SDGs	Sustainable Development Goals	TRMM	Tropical Rainfall Measuring Mission
SDIAR	Sustainable Development Initiative in the Arab region	tU	tones of Uranium
SEA	Strategic Environmental Assessment	TVET	Technical and Vocational Education and Training
SEEA	System of Environmental and Economic Accounting	TWh	Terawatt-hour
SEEC	Saudi Energy Efficiency Cen	UA	Urban Agriculture
SEGC	Chinese Shanghai Electric Generation Group	UAB	Union of Arab Banks
SEMC	Southern and Eastern Mediterranean Countries	UAE	United Arab Emirates
SFD	Saudi Fund for Development	UCLA	University of California at Los Angeles
SHS	Solar Home System	UCS	Union of Concerned Scientists
SIR	Shuttle Imaging Radar	UF	Ultrafiltration
SIWI	Stockholm International Water Institute	UFM	Union for the Mediterranean
SL	Syrian Pound	UHCPV	Ultra-High Concentration Photovoltaic
SLM	Sustainable Land Management	UHI	Urban Heat Island
SLR	Sea Level Rise	UIS	UNESCO Institute for Statistics
SME	Small and Medium-Size Enterprises	UK	United Kingdom
SMS	Short Messaging Service	UMA	Union du Maghreb Arabe (Arab Maghreb Union)
SNA	System Of National Accounts	UMICs	Upper Middle-Income Countries
SoE	State of the Environment	UN	United Nations
SONEDE	Société Nationale d'Exploitation et de Distribution des Eaux	UNCBD	United Nations Convention on Biological Diversity
SOx	Sulfur Oxides	UNCCD	United Nations Convention to Combat Desertification
SPD	Sozialdemokratische Partei Deutschlands	UNCED	United Nations Conference on Environment and Development
		UNCHS	United Nations Centre for Human Settlements (now UN-Habitat)
		UNCLOS	United Nations Convention on the Law of the Sea
		UNCOD	United Nations Conference on Desertification
		UNCTAD	United Nations Conference on Trade and Development

UNDAF	United Nations Development Assistance Framework	WGEO	World Green Economy Organization
UNDP	United Nations Development Programme	WHC	World Heritage Convention
UNEP	United Nations Environment Programme	WHO	World Health Organization
UNESCO	United Nations Educational, Scientific and Cultural Organization	WIPP	Waste Isolation Pilot Plant
UNESCO-ROSTAS	UNESCO Regional Office for Science and Technology for the Arab States	WMO	World Meteorological Organization
UNFCCC	United Nations Framework Convention on Climate Change	WNA	World Nuclear Association
UNFPA	United Nations Population Fund	Wp	Watt-peak
UNHCR	United Nations High Commission for Refugees	WRI	World Resources Institute
UNICE	United Nations Children's Fund	WSSCC	Water Supply and Sanitation Collaborative Council
UNIDO	United Nations Industrial Development Organization	WSSD	World Summit on Sustainable Development
UNISDR	United Nations International Strategy for Disaster Reduction	WTO	World Trade Organization
UNLD	United Nations Literacy Decade	WTTTC	World Travel and Tourism Council
UNWTO	United Nations World Tourism Organization	WUA	Water User Association
UPC	Abu Dhabi Urban Planning Council	WUE	WUE Water Use Efficiency
UPI	United Press International	WWAP	World Water Assessment Program
USA	United States of America	WWC	World Water Council
USAID	United States Agency for International Development	WWF	World Wide Fund for Nature
USCCSP	United States Climate Change Science Program	WWF	World Water Forum
USEK	Université Saint-Esprit De Kaslik	WWI	First World War
USEPA	United States Environmental Protection Agency	WWII	Second World War
USJ	Saint Joseph University	YASAD	Yemenite Association for Sustainable Agriculture and Development
USPTO	United States Patent and Trademark Office	YR	Year
UV	Ultraviolet (A and B)	ZT/CA	Conservation Agriculture/Zero Tillage
VAT	Value-Added Tax		
VC	Vapor Compression		
VCM	Volatile Combustible Matter		
VMT	Vehicle Miles Traveled		
VOC	Volatile Organic Compound		
VRS	Vapor Recovery System		
WACC	Weighted Average Cost of Capital		
WaDImena	Water Demand Initiative for the Middle East and North Africa		
WAJ	Water Authority of Jordan		
WALIR	Water Law and Indigenous Rights		
WANA	West Asia and North Africa Region		
WB	West Bank		
WBCSD	World Business Council for Sustainable Development		
WBG	World Bank Group		
WBGU	German Advisory Council on Global Change		
WCD	World Commission on Dams		
WCED	World Commission on Environment and Development		
WCMC	UNEP World Conservation Monitoring Center		
WCP	World Climate Programme		
WCS	World Conservation Strategy		
WDM	Water Demand Management		
WDPA	World Database on Protected Areas		
WEEE	Waste of Electronic and Electrical Equipment		
WEF	World Economic Forum		
WEF	Water-Energy-Food		
WEF	World Education Forum		
WEI	Water Exploitation Index		
WETC	Wind Energy Technology Centre		
WF	Water Footprint		
WFN	Water Footprint Network		
WFP	World Food Programme		
WGP-AS	Water Governance Program in the Arab States		

State of Arab Environment Series

AFED Annual Reports

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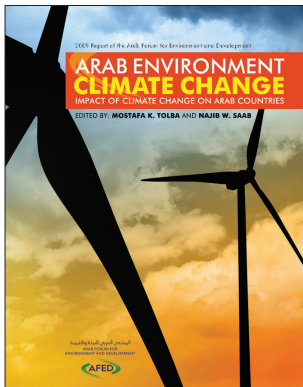


Arab Environment: Future Challenges

2008 Report of the Arab Forum for Environment and Development

For the first time, a comprehensive independent expert report on Arab environment is released for public debate. Entitled *Arab Environment: Future Challenges*, this ground-breaking report has been commissioned by Arab Forum for Environment and Development (AFED), and written by some of the most prominent Arab experts, including authors, researchers and reviewers. Beyond appraising the state

of the environment, based on the most recent data, the policy-oriented report also evaluates the progress towards the realization of sustainable development targets, assesses current policies and examines Arab contribution to global environmental endeavors. Ultimately, the report proposes alternative policies and remedial action.

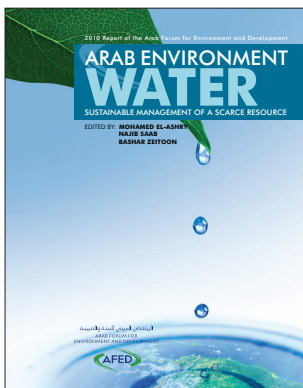


Arab Environment: Climate Change

2009 Report of the Arab Forum for Environment and Development

Impact of Climate Change on the Arab Countries is the second of a series of annual reports produced by the Arab Forum for Environment and Development (AFED). The report has been designed to provide information to governments, business, academia and the public about the impact of climate change on the Arab countries, and encourage concrete action to face the challenge. The report analyzes the Arab

response to the urgent need for adaptation measures, and uses the latest research findings to describe the vulnerabilities of natural and human systems in the Arab world to climate change and the impacts on different sectors. In an attempt to help shape adequate policies, the report discusses options for a post-Kyoto regime and outlines the state of international negotiations in this regard.

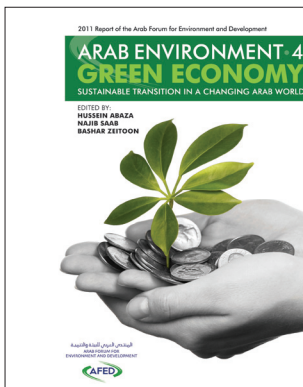


Arab Environment: Water

2010 Report of the Arab Forum for Environment and Development

Water: Sustainable Management of a Scarce Resource is the third of a series of annual reports produced by the Arab Forum for Environment and Development (AFED). It follows the publication of two reports, Arab Environment: Future Challenges in 2008 and Impact of Climate Change on Arab countries in 2009. The 2010 report is designed to contribute to the discourse on the sustainable management of water resources in the Arab world and provides critical understanding of

water in the region without being overly technical or academic in nature. The unifying theme is presenting reforms in policies and management to develop a sustainable water sector in Arab countries. Case studies, with stories of successes and failures, are highlighted to disseminate learning. This report contributes to the ongoing dialogue on the future of water and catalyzes institutional reforms, leading to determined action for sustainable water policies in Arab countries.

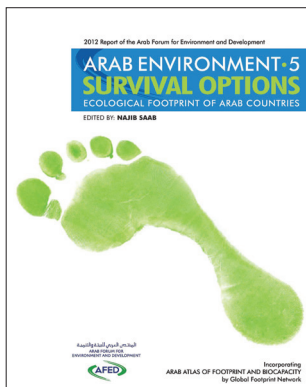


Arab Environment: Green Economy

2011 Report of the Arab Forum for Environment and Development

Green Economy: Sustainable Transition in a Changing Arab World is the fourth of a series of annual reports on the state of Arab environment, produced by the Arab Forum for Environment and Development (AFED). This report on options of green economy in Arab countries represents the first phase of the AFED green economy initiative. Over one hundred experts have contributed to the report, and discussed its drafts in a

series of consultation meetings. The report is intended to motivate and assist governments and businesses in making a transition to the green economy. It articulates enabling public policies, business models, green investment opportunities, innovative approaches, and case studies, and addresses eight sectors: agriculture, water, energy, industry, cities and buildings, transportation, tourism, and waste management.

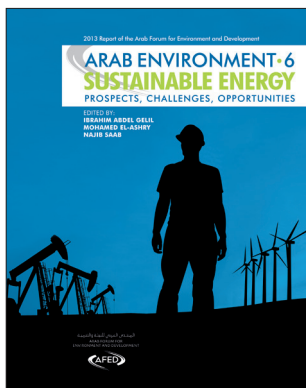


Arab Environment: Survival Options

2012 Report of the Arab Forum for Environment and Development

Survival Options - Ecological Footprint of Arab Countries is the fifth in the series of annual reports produced by the Arab Forum for Environment and Development (AFED) on the state of the Arab environment. It examines sustainability choices in Arab countries, based on a survey of people's demand of natural capital and available supply. The report discusses potential paths to sustainability based on ecological constraints. As a basis for the analysis, AFED has commissioned the Global Footprint Network, the world leader in this field, to produce an Arab Ecological Footprint and Biocapacity

Atlas using the most recent data available. The Atlas covers the 22 members of the League of Arab States, as region, sub-regions and individual countries. The analysis focuses on the challenges posed by the state of food security, water and energy, while considering main drivers such as population and patterns of production and consumption. Ultimately, it prescribes regional cooperation and sound management of resources as the main options for survival in a region characterized by stark variations in ecological footprint, natural resources and income.



Arab Environment: Sustainable Energy

2013 Report of the Arab Forum for Environment and Development

Sustainable Energy is the sixth in the series of annual reports produced by the Arab Forum for Environment and Development (AFED) on the state of Arab environment. The report highlights the need for more efficient management of the energy sector, in view of enhancing its contribution to sustainable development in the Arab region. The AFED 2013 report aims at: presenting a situational analysis of the current state of energy in the Arab region, shedding light on major challenges, discussing different

policy options and, ultimately, recommending alternative courses of action to help facilitate the transition to a sustainable energy future. To achieve its goals, the AFED 2013 report addresses the following issues: oil and beyond, natural gas as a transition fuel to cleaner energy, renewable energy prospects, the nuclear option, energy efficiency, the energy-water-food nexus, mitigation options of climate change, resilience of the energy sector to climate risk, and the role of the private sector in financing sustainable energy.

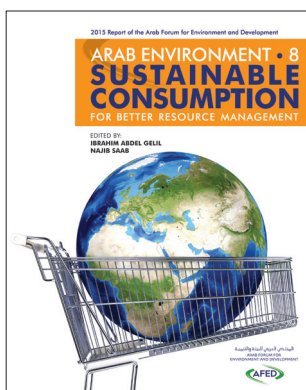


Arab Environment: Food Security

2014 Report of the Arab Forum for Environment and Development

Food Security is the seventh in the series of annual reports on the state of Arab environment, produced by the Arab Forum for Environment and Development (AFED). The report highlights the need for more efficient management of the agriculture and water sectors, in view of enhancing the prospects of food security. *Food security* is of great concern to Arab countries. They have been pursuing a target of higher food self-sufficiency rate, but achieving this goal remained beyond reach. While they have limited cultivable land and

scarce water resources, they did not use their agricultural endowments in an effective and efficient manner. Lack of appropriate agricultural policies and practices led to diminishing the bio-capacity of the resources to regenerate their services and threatened agricultural sustainability. AFED hopes that its report on Food Security will help Arab countries adopt the right policies and commit to long-term investments, allowing them to secure a sustainable supply of food to meet ever-growing needs.

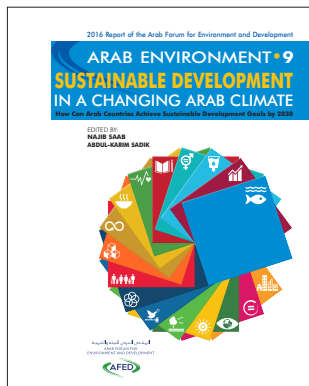


Arab Environment: Sustainable Consumption

2015 Report of the Arab Forum for Environment and Development

Increasing production alone cannot solve the need of food for hungry people and water for thirsty people, nor will it provide power to dark villages. Equally, solely building more waste dumps and incinerators cannot solve the trash crisis. Inadequate consumption patterns are at the core of the problem, and any feasible solution requires a fundamental change in the way we consume resources and produce waste. Thus, the 2015 AFED Annual Report, *Sustainable Consumption for Better Resource Management*, discusses how changing

consumption patterns can help preserve resources and protect the environment, ultimately leading to sustainable development. While it is true that changing consumption patterns requires adequate policies based on expert studies, the support of consumers is a prerequisite for successful implementation. AFED carried out a wide-ranging public opinion survey, which found that the Arab public is ready to pay more for energy and water and to change their consumption patterns if this will help preserve resources and protect the environment.

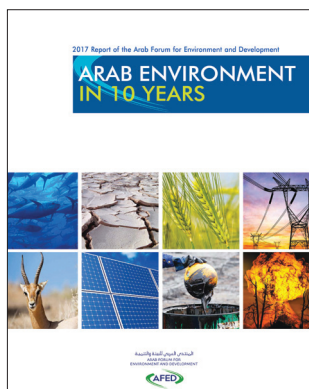


Arab Environment: Sustainable Development in a Changing Arab Climate

2016 Report of the Arab Forum for Environment and Development

This AFED report on “*Sustainable Development in a Changing Arab Climate*” highlights the policy options available for the Arab countries to realize the Sustainable Development Goals by the 2030 target set by the United Nations, in light of the new political, economic, and social developments. The report recommends an alternative approach, based

on integrating sustainable development principles within the anticipated rebuilding efforts. It calls upon local, regional, and international aid organizations not to limit their efforts to providing safety and basic necessities to those affected, but rather to use the relief plans as a launch pad for promoting new approaches to development, rooted in a transition to green economy.



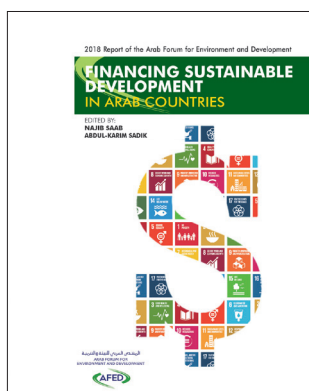
Arab Environment in 10 Years

2017 Report of the Arab Forum for Environment and Development

Arab Environment in 10 Years crowns a decade of the series of annual reports produced by the Arab Forum for Environment and Development (AFED) on the state of Arab environment. It tracks and analyzes changes focusing on policies and governance, including level of response and engagement in international environmental treaties. It also highlights developments in six selected priority areas, namely water, energy, air, food, green

economy and environmental scientific research.

This report found that the state of environment in the Arab countries over the past ten years has been characterized by disparities. While progress was slow and the situation deteriorated in many aspects, there were advances in others, especially regarding matters related to governance and commitment to international treaties, particularly regarding climate change.



Financing Sustainable Development in Arab Countries

2018 Report of the Arab Forum for Environment and Development

Financing Sustainable Development in Arab Countries identifies financing needs, gaps, options and mechanisms, while focusing on potential financing sources and addressing enhancement of their roles. The report found that Arab countries would need a minimum of USD 230 billion annually to support the achievement of the SDGs. The financing gap in Arab countries with deficit has been estimated at over

USD 100 billion, comprising a cumulative total of over USD 1.5 trillion through 2030. This does not only call for new funding requirements but also the greening of budgets and the redirecting of existing budgetary allocations from conventional investments to sustainable ones, including addressing climate change concerns.

الأخضر والبصمة البيئية في كليات الاقتصاد. ومن المهم مساهمة الجامعات في دراسات حول كيفية إدخال حسابات الموارد الطبيعية في الموازنات والحسابات القومية، وجعل هذا الموضوع جزءاً في مناهج الإدارة العامة. كما يجب ربط البحث العلمي حول البيئة والاستدامة بقطاعات الصناعة والأعمال والمال. ومن الأهمية بمكان أن يتم تصميم المناهج بحيث تحفّز النقاش بين الطلاب حول القضايا البيئية وأثار السلوك البشري على البيئة الطبيعية والتنمية المستدامة.

ينبغي تصميم المحتوى البيئي في المناهج لإعداد الطلاب بشكل مناسب كي يكونوا مواطنين مسؤولين، وتزويدهم بالمعرفة الكافية لوضعهم على الطريق الصحيح نحو التعليم العالي وظروف العمل المهني المحترف، إذ لم يعد مقبولاً أن يبقى محتوى المناهج البيئية المدرسية محصوراً في الطبيعة والتلوث والأمور ذات العلاقة بالصحة، بل يجب توسيع نطاقها لتعالج إدارة الموارد وقضايا مستجدة ملحة مثل تغير المناخ والاستهلاك المستدام والاقتصاد الأخضر. ولا يمكن تحقيق هذا إلا بإدماج التربية البيئية في جميع الصفوف والمواضيع، أكانت علمية أو اجتماعية أو أدبية، ابتداءً من سن الطفولة المبكرة.

ولكي يصبح تحقيق هذه الأهداف ممكناً، على المنطقة العربية تشجيع التربية البيئية من خلال وضع سياسات تربوية ملائمة واستقطاب التمويل الإضافي للأبحاث. كما ينبغي أن تسرّع البرامج الأكاديمية وتيرة البحث العلمي الذي يوفر حلولاً للتحديات البيئية الإقليمية، وإجراء تقييمات للمبادرات البيئية من أجل معالجة أوجه القصور وتحسين جودة برامج التربية البيئية. وفي نهاية المطاف، يجب أن تصبح المواضيع البيئية جزءاً أساسياً ومتأصلاً في جميع المناهج العربية، بدلاً من أن تكون هامشية أو اختيارية.

بالتغيرات في الظروف البيئية، وتؤثر في الوقت نفسه بشكل بالغ الأهمية على البيئة، فقد كانت غائبة تقريباً عن المناهج في نصف البلدان، وضعيفة في النصف الآخر. أما الصفوف التي تمت فيها تغطية المفاهيم البيئية أكثر من غيرها فكانت الصف الخامس، وهو الأخير في المستوى الابتدائي، والصف الحادي عشر، أي الصف قبل الأخير على المستوى الثانوي. وكان الصف السادس، أو السنة الأولى في المرحلة المتوسطة، الأضعف في تغطية المفاهيم البيئية.

ومن المثير للاهتمام أن المواضيع البيئية لم تعد تقتصر على كتب العلوم والجغرافيا والتربية المدنية، بل بدأت تصبح جزءاً من مواضيع أخرى، مثل اللغات والأدب والتاريخ والاقتصاد. وفي معظم الحالات، شملت المناهج جوانب من العمل الشخصي لحماية البيئة والحفاظ على الموارد الطبيعية وتعزيزها، مثل إرشادات الكفاءة في استهلاك المياه والكهرباء، وإعادة التدوير وزراعة الأشجار. كما أن العمل الميداني ورحلات الطبيعة بدأت تصبح جزءاً من التعليم البيئي في بعض الدول العربية، إلى جانب تشجيع الطلاب على المشاركة في العمل المجتمعي من أجل الدفاع عن القضايا البيئية.

وقد حلل الاستطلاع حول مناهج المدارس العربية وكتبها المدرسية مجالات القوة والضعف، وذلك لسد الفجوات. وغطى التحليل ثمانية مواضيع بيئية رئيسية في مناهج المدارس العربية هي: النظم الإيكولوجية والتلوث والموارد الطبيعية وتغير المناخ والنفايات الصلبة والتنوع البيولوجي والتنمية المستدامة والموارد الطبيعية. ويمكن القول إن إدخال المفاهيم البيئية أخذ في الازدياد، على الرغم من وجود اختلافات كبيرة بين البلدان في ما يتعلق بالمواضيع المدرجة، وعمق المحتوى المشمول، وطرق إيصال المعلومات.

من الضروري تعزيز المحتوى البيئي للمناهج المدرسية في المفاهيم التي تغطيها كما في دقة المعلومات. ولا بد من مناقشة الجوانب البيئية في المناهج الدراسية في سياق أهداف التنمية المستدامة، بطريقة تربط البيئة بالجوانب الاجتماعية والاقتصادية، وإعطاء الأولوية للإدارة السليمة للموارد الطبيعية لتحقيق الاستدامة. ويمكن تحقيق ذلك من خلال إدخال مفهوم البصمة البيئية، إلى جانب خيارات النمو الأخضر، مع التركيز على أوضاع الدول العربية. كما ينبغي تعزيز الأنشطة اللامنهجية والعمل المجتمعي.

V. خلاصة وتوصيات

تواجه المنطقة العربية العديد من التحديات البيئية، بما في ذلك إدارة الموارد الطبيعية المحدودة والمتناقصة، وأثار استخراج وإنتاج النفط والغاز، ونقص المياه، والجفاف والأراضي القاحلة، وأنواع مختلفة من التلوث، بالإضافة إلى تغير المناخ. وتعتبر التربية أداة رئيسية في معالجة هذه القضايا البيئية، من خلال تعزيز المعرفة بالبيئة والتنمية المستدامة، التي يمكن أن تقود إلى أفعال. صحيح أنه من الضروري التصدي للتحديات البيئية في الإطار العام للتنمية المستدامة، لكن يجب الحفاظ في الوقت نفسه على المكونات الخاصة للتربية البيئية. ومن المفيد أن نتذكر أن هدف رعاية البيئة وإدارة الموارد كان الدافع الرئيسي لنشوء مفهوم التنمية المستدامة.

من المهم إعداد مقرّر (موضوع) جامعي حول البيئة والاستدامة، يكون متاحاً لطلاب السنة الأولى من جميع الاختصاصات. ويجب تطوير برامج أكاديمية تجمع الكليات الجامعية المختلفة، لمعالجة الترابط بين التحديات البيئية والاجتماعية والاقتصادية. ولا بد من إدخال القضايا المستجدة في صلب الدراسات الجامعية، مثل القانون البيئي في كليات الحقوق، والاقتصاد

النتائج البحثي العام. وقد تبين أن السعودية ومصر هما الأكثر نشاطاً، حيث تشهد كلتاهما زيادة في مخرجات البحث. ففي السعودية، زادت الدراسات المنشورة في العلوم البيئية من 3,8 في المئة للفترة 1999-2008 إلى 6 في المئة للفترة 2009-2018. أما في مصر، فقد لوحظت زيادة من 5,4 إلى 6,4 في المئة في الفترة الزمنية نفسها.

ولما كانت الأبعاد البيئية والاجتماعية والاقتصادية للتنمية المستدامة مترابطة، فمن المهم دمج هذه الركائز الثلاث في البرامج الجامعية. كما أن هناك حاجة إلى تعزيز مواضيع مثل القانون البيئي في كليات الحقوق، والاقتصاد الأخضر في كليات الاقتصاد. بالإضافة إلى ذلك، يجب إدراج البصمة البيئية وحساب رأس المال الطبيعي ضمن الدراسات الاقتصادية. فمثل هذه المواضيع ستمكّن الخريجين من زيادة فهمهم للإدارة والسياسات البيئية.

على الرغم من الزيادة في البرامج المتعلقة بالبيئة والتنمية المستدامة في الجامعات العربية، إلا أن المزيد من التعاون بين كليات ذات تخصصات متعددة في الجامعة نفسها، وبين الجامعات المختلفة، يمكن أن يعزز دورها في مواجهة التحديات البيئية. فعلى سبيل المثال، يمكن تبادل الطلاب وإطلاق برامج التعاون العلمي البيئي بين الجامعات ومؤسسات البحث. كما أن هناك حاجة إلى التعاون بين الجامعات والقطاعات الأخرى، مثل الصناعة والأعمال، من أجل المساهمة بفعالية في أهداف التنمية المستدامة.

ويقترح تقرير «أفد» إدخال مقرّر (Course) جامعي تمهيدي حول البيئة والاستدامة، يكون متاحاً لطلاب السنة الأولى من جميع الاختصاصات. وقد تم تطوير محتويات الموضوع المقترح، بعنوان «مقدمة في البيئة والاستدامة»، بالتعاون بين «أفد» وعدد من الجامعات الرائدة في العالم العربي.

IV. التربية البيئية في المدارس العربية

بدأت البيئة تحتل موقعاً ثابتاً في مناهج المدارس في جميع أنحاء المنطقة العربية، مع نجاح متفاوت بين بلد وآخر. وأدى ظهور تحديات بيئية جديدة بمعدل غير مسبوق في السنوات الأخيرة إلى إدراج مفاهيم ومقاربات لم تكن موجودة قبلاً في المناهج. ووفق استطلاع أجراه «أفد» على الكتب المدرسية والمناهج الدراسية، يمكن القول إن دور التربية في حماية البيئة والحفاظ على الموارد الطبيعية أصبح معترفاً به أكثر فأكثر. وفي حين استمر التركيز على التلوث والنفايات والمسائل ذات الأثر الصحي المباشر على الناس، أدى التخوف من نضوب الموارد الطبيعية إلى إدخال مفاهيم جديدة مثل البصمة البيئية، ولكن على نطاق محدود.

رغم أن التنمية المستدامة دخلت إلى الكتب المدرسية في معظم البلدان العربية، إلا أن هناك مواضيع مثل الاقتصاد الأخضر والنمو الأخضر وإدارة الموارد غير متوفرة بشكل عام. ومع ذلك، فقد تم رصد هذه المفاهيم في بعض البلدان، مثل «البصمة البيئية» كجزء من منهج الجغرافيا في سورية، و«الاقتصاد الأخضر» كجزء من البرامج الجديدة للمدارس الثانوية في لبنان.

وقد وجد استطلاع «أفد» أن المواضيع البيئية الأكثر شيوعاً في المدارس العربية هي النظم الإيكولوجية والتلوث والموارد الطبيعية والتنمية المستدامة. وفي حين تم إدراج موضوع التنمية المستدامة، الذي يُعتبر جديداً إلى حد ما، وجد الاستطلاع أن تغيير المناخ كان غائباً، أو لم تتم مناقشته بشكل كافٍ، في 40 في المئة من البلدان المشمولة. أما الكوارث الطبيعية، التي تتأثر

السنوات الأخيرة ضمن أفضل 500 جامعة على مستوى العالم لمساهماتها في تحقيق أهداف التنمية المستدامة. وقد شهدت الجامعات العربية خلال العقد الماضي زيادة سريعة في البرامج المتعلقة بالبيئة والتنمية المستدامة. ومع ذلك، يمكن للجامعات تسريع مساهمتها من خلال دمج جميع أهداف التنمية المستدامة في أنشطة التعلم والتدريس والبحث والمبادرات المجتمعية، وذلك في برامج مختلطة بين الاختصاصات المختلفة.

سعيًا إلى تحديد مواطن القوة والضعف في التعليم الأكاديمي حول المواضيع المتعلقة بالبيئة والتنمية المستدامة، أجرى المنتدى العربي للبيئة والتنمية (أفد) استطلاعاً في النصف الأول من سنة 2019 لتتبع البرامج الجامعية المعنية بالبيئة في المنطقة العربية. شمل الاستطلاع الجامعات الأعلى مرتبة على المستوى الوطني في كل من الدول العربية الـ22، كما شمل برامج البكالوريوس والدراسات العليا وغيرها من البرامج المتخصصة. وكشفت النتائج أن معظم الجامعات العربية تقدم برامج بيئية للطلاب الجامعيين وطلاب الدراسات العليا، وبشكل إجمالي، تقدم الجامعات التي شملها الاستطلاع، وعددها 57 جامعة، 221 برنامجاً للشهادات العلمية حول المواضيع البيئية.

ولتحديد كيفية توزيع البرامج الأكاديمية إقليمياً، تم تجميع النتائج ضمن المناطق الفرعية العربية الخمس. وكشف ذلك عن وجود أكبر عدد من البرامج المتعلقة بالبيئة (55) في بلاد الشام (العراق، الأردن، لبنان، فلسطين، سورية)، يليها 42 برنامجاً في دول مجلس التعاون الخليجي (البحرين، الكويت، عُمان، قطر، السعودية، الإمارات) واليمن، و39 برنامجاً في شمال إفريقيا (الجزائر، ليبيا، موريتانيا، المغرب، تونس)، و26 برنامجاً في وادي النيل (مصر، السودان)، و3 برامج في القرن الإفريقي (جزر القمر، جيبوتي، الصومال).

تتوزع البرامج الأكاديمية المتعلقة بالبيئة في الجامعات العربية على مختلف التخصصات، بدءاً من الهندسة البيئية والصحة البيئية وإدارة موارد المياه، وصولاً إلى التخصصات ذات الصلة بالسياسات مثل التربية البيئية والقانون البيئي والسياسة البيئية. لكن عدد الشهادات العلمية والتقنية أكثر من تلك المتعلقة بالاقتصاد والتربية والسياسات. وجاءت معظم الشهادات ضمن العلوم البيئية (34 شهادة)، تليها الهندسة البيئية (30 شهادة)، والموارد المائية (29 شهادة)، والطاقات المتجددة (19 شهادة).

على مستوى شهادة البكالوريوس، أظهر الاستطلاع تحولاً عاماً من العلوم البيئية الكلاسيكية، التي تركز على الفيزياء والكيمياء وعلوم الأحياء والرياضيات، إلى نهج متعدد التخصصات يدمج العلوم الهندسية والصحية. 23 في المئة فقط من برامج البكالوريوس تندرج تحت العلوم البيئية العامة. ويتم إدراج المواد الأخرى مع التخصصات مثل الهندسة البيئية والمياه والطاقة والزراعة والجيولوجيا.

تتوجه برامج الدراسات العليا عادةً نحو الأبحاث. ففي المستويات العليا من التعليم، يصبح البحث أداة لاكتساب المهارات والمعرفة المتخصصة اللازمة للتربية البيئية والتنمية المستدامة. ولا بد في هذا الإطار من تعزيز البحث العلمي لحل المشاكل البيئية الوطنية والإقليمية. وتشارك الجامعات العربية في دعم تحقيق أهداف التنمية المستدامة من خلال مجموعة متنوعة من برامج الدراسات العليا المتعلقة بالبيئة والتنمية، تقدم معظمها جامعات في مصر ولبنان والأردن وسورية والإمارات.

يمثل الناتج البحثي للجامعات ومراكز البحوث العربية في العلوم البيئية نحو 7 في المئة من إجمالي

والقانون البيئي والسياسات البيئية. وهذه التخصصات يمكن أن تسمح للأجيال القادمة بتطوير طرائق بديلة للحياة المستدامة.

على الرغم من بدء الاستجابة العالمية للتربية البيئية منذ ستينات القرن الماضي، فإن اهتمام الدول العربية بها لم يبدأ حتى أوائل الثمانينات، وبدأ إدخالها في المناهج ببطء خلال السنوات العشرين الماضية. وفي العديد من الدول العربية، وقُر ظهور التربية من أجل التنمية المستدامة حافظاً لإجراء إصلاحات في التربية البيئية. وفي بعض البلدان التي لم يكن فيها تربية بيئية بعد، أو حيث كانت حاضرة بشكل هامشي، أتاحت حركة التربية من أجل التنمية المستدامة فرصة لتحقيق دفعة قوية.

وفي حين تحقق تقدم كبير على صعيد إدخال التربية من أجل التنمية المستدامة في المنطقة العربية، إلا أن نطاق أنشطة التنفيذ يختلف بشكل كبير بين الدول. فعلى سبيل المثال، تم دمج التربية من أجل التنمية المستدامة في الرعاية والتعليم المبكر في الكويت وسلطنة عُمان، كما بدأت الكويت بدمج كامل للتربية من أجل التنمية المستدامة في برامج التعليم الحكومي. وأظهر كل من الأردن ولبنان ومصر وسلطنة عُمان تقدماً واعداء في هذا المجال، بما في ذلك التدريب على دمج مواضيع التربية من أجل التنمية المستدامة في المناهج الدراسية والمواد الجامعية، وتمويل المنح الدراسية والبرامج المتعلقة بها. ولا تزال الاستجابة العملية ضعيفة في دول أخرى، مثل إدخال التربية من أجل التنمية المستدامة في دورات محدودة في قطر، وشبه غيابها عن مناهج التعليم في المغرب.

وعلى الرغم من الإنجازات الواعدة في أنشطة التربية من أجل التنمية المستدامة في الدول العربية على الصعيدين الوطني والإقليمي، يبدو أن المنطقة متأخرة عن بقية أنحاء العالم عندما يتعلق الأمر بالتنفيذ العملي للبرامج. ويعود ذلك جزئياً إلى الاعتماد على المانحين الدوليين في الغالبية العظمى من المبادرات والمشاريع الوطنية والإقليمية للتربية، مما يجعلها غير مستدامة، مع نقص في التعاون الإقليمي ودون الإقليمي. والمطلوب أن تكون معالجة هذه التحديات من أولويات الدول العربية التي تهدف إلى المضي قدماً في مجال التربية البيئية من أجل التنمية المستدامة، مع دمج التعليم البيئي كمكوّن أساسي في المناهج.

في تقرير عن القضايا والاتجاهات المتعلقة بالتربية من أجل التنمية المستدامة، نشرته اليونسكو عام 2018، تم اختيار ستة مواضيع رئيسية لمناقشتها بالتفصيل هي: تغيير المناخ والتنوع البيولوجي والحد من مخاطر الكوارث والحد من الفقر والإنتاج والاستهلاك المستدام والعدالة العالمية. وفي حين أن تغيير المناخ والتنوع البيولوجي يمثلان قضيتين بيئيتين هامتين، فمن المؤكد أن هناك الكثير من القضايا الأخرى التي لا يمكن حذفها، مثل المياه والطاقة واستخدام الأراضي ونوعية الهواء، مما يعكس إهمالاً لقضايا بيئية أساسية. ومن أجل تجنب دفن البيئة تحت قضايا أخرى، من الضروري التعامل مع المحتويات البيئية للتربية من أجل التنمية المستدامة في حد ذاتها، من خلال الحفاظ على خصوصية «التربية البيئية» كعنصر قائم بذاته ضمن مفهوم التربية من أجل التنمية المستدامة، وليس ملحقاً بها.

III. البيئة والاستدامة في الجامعات العربية

تلعب الجامعات في البلدان العربية دوراً متزايد الأهمية في تحقيق أهداف التنمية المستدامة، من خلال برامجها الأكاديمية وأنشطتها البحثية. وقد تم تصنيف بعض الجامعات العربية في

المرتبطة بها، وهي تُسهم في تطوير المهارات والخبرات اللازمة لمواجهة التحديات وتعزيز المواقف والدوافع والالتزامات لاتخاذ قرارات مستنيرة وإجراءات مسؤولة». إنه مجال متعدد التخصصات التعليمية، يشمل علم الأحياء والكيمياء والفيزياء، وعلوم الأرض والغلاف الجوي والرياضيات والجغرافيا، ويتداخل مع القانون والعلوم السياسية والاجتماعية. والأكد أنه في ظل التحديات البيئية العالمية الحالية، ومع إقرار أهداف التنمية المستدامة (SDGs) عام 2015، ووضع خطة لتنفيذها مع حلول سنة 2030، تعاضمت مكانة التربية البيئية. وهي تؤدي حالياً دوراً بارزاً يتمثل في إيصال المعرفة والمهارات والقيم والسلوكيات اللازمة من أجل التكيف مع التغيرات البيئية أو الحد منها. وتبدأ أسس التربية البيئية بالوعي والمعرفة والسلوكيات والمهارات، وتنتهي بالمشاركة.

سبقت التربية البيئية مفهوم «التربية من أجل التنمية المستدامة»، الذي بدأ يكتسب أهمية بعد مؤتمر الأمم المتحدة حول البيئة والتنمية في ريو دي جانيرو عام 1992. وقد كان الهدف من إطلاق مفهوم «التربية من أجل التنمية المستدامة» خلق فهم أفضل للأبعاد الاقتصادية والاجتماعية والبيئية المعقدة والمتراصة للتنمية وأثرها البيئي على القدرة البيولوجية للأرض لتجديد خدماتها من أجل رفاهية الإنسان، من خلال تشجيع التغيير الإيجابي في المعرفة والمهارات والقيم والسلوكيات. وفي حين لا يوجد تعريف واحد للتربية من أجل تنمية مستدامة، فإن معظم التعريفات اليوم تشمل دمج التنمية المستدامة في منهجيات التعليم المتعددة التخصصات، والتي تغطي الجوانب الاجتماعية والاقتصادية والبيئية للمناهج، من أجل حماية رفاهية الأجيال الحالية والمقبلة.

ظهرت الفكرة الأولية للتربية البيئية في القرن الثامن عشر، عندما كتب فلاسفة ومعلمون أمثال جان جاك روسو ولويس أغاسيز على التوالي عن الطبيعة وأهمية التعلم عن الطبيعة والبيئة. ولكن لم يتم استخدام مصطلح «التربية البيئية» لأول مرة علناً حتى عام 1948. وابتداءً من ستينات القرن الماضي وحتى عام 1989، اكتسب مفهوم التربية البيئية رواجاً من خلال المبادرات والمؤتمرات التي أطلقتها الأمم المتحدة، والاستجابات الوطنية للمسارات المقترحة. والحدث الكبير الأول في هذا الإطار كان المؤتمر الدولي للأمم المتحدة بشأن «البيئة البشرية» عام 1972، الذي أسفر عن إعلان استوكهولم وشهد ولادة برنامج الأمم المتحدة للبيئة.

وفي جدول أعمال القرن 21، الذي انبثق عن قمة الأرض في ريو عام 1992، تم اقتراح خارطة طريق للمساعدة في تحقيق التنمية المستدامة من خلال التربية، بالتزامن مع بداية النظر إلى البيئة على أنها جزء من التنمية المستدامة. واليوم، يُنظر إلى التربية كعامل مساعد رئيسي في تحقيق أهداف التنمية المستدامة وعنصر أساسي في التعليم الجيد. وبحسب اليونسكو، فإن الغرض من التربية من أجل التنمية المستدامة على المدى الطويل هو التحول النهائي للأنظمة التربوية بطريقة تعيد توجيه المجتمعات نحو تحقيق التنمية المستدامة. وتماشياً مع هذا الهدف، أعلنت الأمم المتحدة عن «عقد التربية من أجل التنمية المستدامة» بين عامي 2005 و2014. وبحلول نهاية العقد، برز بوضوح قبول أكبر وفهم أعمق للتربية من أجل التنمية المستدامة، وأصبح دمج التنمية المستدامة في جميع جوانب التربية الهدف الجديد، بدلاً من التعامل معها كموضوع مستقل.

وقد أدت التشعبات المتعددة للاستدامة البيئية وارتباطها القوي بالمجتمع والاقتصاد إلى تطوّر التربية البيئية لتصبح جزءاً لا يتجزأ من التربية من أجل التنمية المستدامة. وقد بدأ التعليم العالي في تقديم برامج أكاديمية لا تتعلق فقط بالبيئة كوظيفة ونهج، ولكن أيضاً ضمن برامج تتعامل مع تعقيدات الاستدامة البيئية مثل الطاقة المتجددة والصحة البيئية والاقتصاد البيئي

ملخص تنفيذي

التربية البيئية من أجل تنمية مستدامة في البلدان العربية

التقرير السنوي للمنتدى العربي للبيئة والتنمية 2019

I. نظرة عامة

عند مناقشة التغيرات والتحديات البيئية وعلاقتها بالتنمية المستدامة، لا يمكن التقليل من أهمية دور التربية، التي هي موضوع التقرير السنوي الثاني عشر للمنتدى العربي للبيئة والتنمية (أفد). يتناول التقرير التربية البيئية ضمن السياق الأوسع للتنمية المستدامة في الدول العربية، مع التركيز على الترابط بين البيئة والعوامل الاجتماعية والاقتصادية. فبالإضافة إلى تعزيز مستوى المعرفة العلمية، تعمل التربية البيئية كمحفز للمشاركة والعمل الإيجابي. وقد بات من الواضح أن العالم العربي بدأ يدرك الدور الرئيسي الذي يجب أن تحظى به البيئة في أنظمتها التعليمية. لكن الخطوة التالية تتمثل في تجسيد هذه القناعة بشكل فعال في المناهج المدرسية والجامعية على نطاق المنطقة كلها.

فعلى الرغم من وجود اتجاه قوي إلى إدراج المواضيع البيئية ضمن المناهج الدراسية، إلا أن التقدم لا يزال غير متساو بين البلدان والمؤسسات التعليمية العربية. وإلى جانب ذلك، من الواضح أن هناك فجوة بين المنطقة العربية ومناطق أخرى من العالم عندما يتعلق الأمر بالتربية البيئية، كما أن هناك فجوة بين الخطط والتطبيق. فلقد لاحظ هذا التقرير أن الخطط والبرامج التي تعلن عنها بعض الدول لإدخال التربية البيئية في المناهج غالباً لا تُنفذ. ويعود ذلك جزئياً إلى استمرار الاضطرابات والصراعات في بعض البلدان، إلى جانب عدم إعتبار البيئة ضمن الأولويات. أما المشكلة الأخرى فهي نقص التمويل للمبادرات الوطنية والإقليمية لتعزيز مواضيع التنمية المستدامة في المدارس والجامعات. وبما أن معظم المبادرات تعتمد على المانحين الدوليين، فهي غالباً ما تكون مؤقتة وغير مستدامة.

حصلت خلال السنوات العشر الماضية زيادة سريعة في البرامج والخطط المتعلقة بالبيئة والتنمية المستدامة في المنطقة العربية. المطلوب الآن استخدام هذا الزخم لإثارة نقاش ملح حول مواصلة إصلاح أنظمة التعليم، من أجل تعميم القضايا البيئية في المناهج العربية، وتحويل الخطط إلى واقع. وعلاوة على ذلك، ينبغي تأمين التمويل بشكل مستقل عن المانحين الدوليين، من أجل تعزيز جودة التربية البيئية وضمان استمرارية البرامج.

II. من التربية البيئية إلى التربية من أجل التنمية المستدامة

للتربية البيئية تعريفات متعددة، قد يكون أكثرها شمولاً ذلك الذي اعتمدته منظمة اليونسكو: «التربية البيئية هي عملية تعلم تهدف إلى زيادة معرفة الناس ووعيهم حول البيئة والتحديات

في مواضيع مثل تغيّر المناخ والكوارث وأنماط الاستهلاك وعلاقة الأمن الغذائي بالبيئة. واللافت أن بعض الدول التي طوّرت أفضل الخطط لإدخال البيئة على نحو متكامل في المناهج المدرسية، مثل لبنان ومصر، تأخّرت كثيراً في الانتقال إلى التطبيق الفعلي.

كما لاحظ تقرير «أفد» ضعف التعاون بين وزارات التربية والتعليم والبيئة، مما أدى، في كثير من الحالات، إلى تكرار وتضارب في برامج التربية البيئية. ويوصي التقرير بأن تصبح التحدّيات الكبرى التي تواجه البلدان العربية، مثل ندرة المياه والتصحر والجفاف والتلوث البحري ومخاطر ارتفاع سطح البحر بسبب التغيّر المناخي، جزءاً أساسياً من المناهج المدرسية. كما يدعو إلى زيادة النشاطات التطبيقية والرحلات التعليمية، وتشجيع إنشاء الأندية البيئية.

لا يمكن حصول التغيير الإيجابي بمعزل عن إصلاح الأنظمة التعليمية. فالتربية محرك رئيسي للتحوّل إلى نمط حياة أكثر استدامة، يضمن الانسجام مع الطبيعة والاستخدام المتوازن للموارد. كما أنها تزوّد المتعلمين بالأدوات العلمية اللازمة للمساهمة في التغيير الفعلي، أكان في المختبر أو المكتب أو الحقل.

يوّد «أفد» أن يشكر جميع الشركاء الذين جعلوا إصدار هذا التقرير ممكناً، من خلال تبادل خبراتهم وعملهم في مجال التربية البيئية. يضم شركاؤنا الأكاديميون جامعة البحرين ومعهد الدراسات والبحوث البيئية في جامعة عين شمس والجامعة الأميركية في بيروت وجامعة الخليج العربي وجامعة البتراء. كذلك انضمت إلينا «كيمونيكس مصر» كشريك بحثي رئيسي. وساهمت هيئات أخرى في تقديم دراسات وأوراق عمل، بما فيها برنامج الأمم المتحدة للبيئة، ومنظمة التعاون الاقتصادي والتنمية، والاتحاد من أجل المتوسط، وخطة عمل البحر المتوسط والمركز التربوي اللبناني للبحوث والإنماء.

كذلك نتوجه بشكر خاص للجهات الراعية التي دعمت إنتاج التقرير والمؤتمر السنوي، وخاصة البنك الإسلامي للتنمية، ومؤسسة الكويت للتقدم العلمي، ومنظمة الأغذية والزراعة للأمم المتحدة، والصندوق الكويتي للتنمية، إلى جانب شركائنا الإعلاميين.

يستخدم هذا التقرير الأدلة المستندة إلى العلم لإثارة نقاش ضروري حول الحاجة الملحة إلى إصلاح أنظمة التعليم العربية من أجل تعميم القضايا البيئية في المناهج. ونأمل أن يساعد ذلك في تعزيز دور التربية كمحرك لإدارة بيئية أفضل، وكذلك للنهوض بالتنمية المستدامة في المنطقة العربية. فمن يربح معركة العلم يربح معركة المستقبل.

بيروت، 14 تشرين الثاني (نوفمبر) 2019

نجيب صعب

الأمين العام

المنتدى العربي للبيئة والتنمية (أفد)

تمهيد من يربح معركة العلم يربح معركة المستقبل تقرير «أشد» السنوي الثاني عشر، 2019

«التربية البيئية من أجل تنمية مستدامة في البلدان العربية» هو موضوع التقرير السنوي للمنتدى العربي للبيئة والتنمية (أشد) لسنة 2019. وهو يتضمن أول مسح شامل للمحتويات البيئية في المناهج المدرسية والجامعية في المنطقة العربية، بهدف تحديد الفجوات وتقديم توصيات لتعزيز دور التعليم في النهوض بقضية حماية البيئة وتنفيذ أهداف التنمية المستدامة.

هذا التقرير هو الثاني عشر في سلسلة التقارير السنوية عن وضع البيئة العربية التي يصدرها المنتدى العربي للبيئة والتنمية منذ عام 2008. وهو يسلط الضوء على دور التربية في بناء أجيال جديدة تتمتع بالمعرفة الكافية، التي ستمكنهم من مواجهة التحديات التي طرحتها التقارير السابقة. لقد أصبح التقرير السنوي الأول للمنتدى العربي للبيئة والتنمية، الصادر عام 2008 تحت عنوان «البيئة العربية: تحديات المستقبل»، مرجعاً رئيسياً في هذا المجال، وكان نقطة انطلاقاً للتقارير التي تلتها، والتي شملت عشرة مواضيع، هي: تغيير المناخ (2009)، المياه (2010)، الاقتصاد الأخضر (2011)، البصمة البيئية (2012)، الطاقة المستدامة (2013)، الأمن الغذائي (2014)، الاستهلاك المستدام (2015)، التنمية المستدامة في مناخ عربي متغير (2016)، البيئة العربية في 10 سنين (2017) وتمويل التنمية المستدامة (2018). إن تنفيذ الحلول للتحديات التي تم التطرق إليها في التقارير يتطلب زيادة الوعي وامتلاك المعرفة العلمية الكافية، وهنا يأتي دور التربية والتعليم.

وجد التقرير أن الجامعات العربية، خلال العقد الماضي، شهدت زيادة سريعة في البرامج المتعلقة بالبيئة والتنمية المستدامة. ففي 57 جامعة تمت دراسة مناهجها، تبين أن هناك 221 شهادة في المواضيع البيئية، معظمها تغطي العلوم الطبيعية والصحة. وفي الدراسات العليا، ظهر أن السعودية ومصر هما الأكثر نشاطاً في مخرجات البحوث البيئية. لكن التقرير أظهر قصوراً في بعض المواضيع المستجدة، مثل تغيير المناخ والاقتصاد الأخضر والقانون البيئي والسياسات البيئية واقتصاد التنمية. ودعا الجامعات العربية إلى دمج أهداف التنمية المستدامة في نشاطاتها التعليمية والتدريبية والبحثية وتعزيز المبادرات المجتمعية، وإدخال برامج دراسات عليا تضم اختصاصات مختلفة، كما فعلت الجامعة الأميركية في بيروت، التي تقدم برنامج ماجستير مشتركاً بين كليات الزراعة والصحة والهندسة، بالتعاون مع مركز أبحاث السياسات العامة في الجامعة. كما أوصى التقرير بإحداث مقر جديد يكون متاحاً لطلاب السنة الجامعية الأولى من جميع الاختصاصات، تحت عنوان «مقدمة في البيئة والتنمية المستدامة». ولا بد من ربط الجامعات ومؤسسات البحث العلمي بالإدارات الحكومية والقطاع الخاص، من صناعة ومؤسسات تجارية وخدماتية ومالية، والمجتمع عامةً، لتتفاعل إيجاباً مع حاجات التنمية الفعلية وسوق العمل.

وفي حين أخذت البيئة مكانة أكبر في المناهج المدرسية العربية خلال السنوات العشر الأخيرة، فلا يزال التركيز محصوراً في مواضيع تقليدية مثل جمال الطبيعة والتلوث والنظافة، مع قصور



التربية البيئية

من أجل تنمية مستدامة في البلدان العربية

حقائق وأرقام من تقرير «أفد»

النشأة والتطور

- تعود أصول التربية البيئية إلى منتصف القرن الثامن عشر، مع الفلاسفة والمربين الذين آمنوا بأن الطلاب يجب أن «يدرسوا في الطبيعة وليس في الكتب» .
- اكتسبت التربية البيئية زخماً مع ولادة برنامج الأمم المتحدة للبيئة في ختام مؤتمر الأمم المتحدة الخاص بالبيئة البشرية عام 1972 . وأصبح التعبير متداولاً على نحو أوسع عقب المؤتمر الدولي الأول حول التربية البيئية في تيبيلسي عام 1977 .
- اكتسب الارتباط القوي بين البيئة والتنمية في التعليم زخماً بعد قمة ريو حول البيئة والتنمية عام 1992، التي تمخضت عن جدول أعمال القرن 21 . وهو اعتبر التربية أداة رئيسية لتنفيذ التنمية المستدامة، بما في ذلك الحفاظ على البيئة .
- تم تسريع عملية دمج البيئة في التنمية المستدامة بعد مؤتمر الأمم المتحدة للتنمية المستدامة في جوهانسبورغ عام 2002 . وقد انعكس ذلك بسرعة في التربية، وبلغ ذروته مع الإعلان عن «عقد التعليم من أجل التنمية المستدامة» عام 2005 . وفي ختام العقد عام 2014، كانت 10 بلدان عربية من أصل 22 قد شاركت في برامجه، وهي الجزائر ومصر والأردن ولبنان وليبيا والمغرب وعمان وفلسطين وتونس والإمارات .

الجامعات العربية

- أظهر استطلاع المنتدى العربي للبيئة والتنمية (أفد) الذي شمل 57 جامعة رفيعة المستوى في المنطقة العربية وجود 221 برنامجاً تفضي إلى شهادات أكاديمية في المواضيع البيئية، تتضمن 71 درجة بكالوريوس و102 درجة ماجستير و36 درجة دكتوراه و12 شهادة تقنية .
- 55 من البرامج ذات الصلة بالبيئة تقدمها الجامعات في بلاد الشام (العراق، الأردن، لبنان، فلسطين، سورية)، يليها 42 برنامجاً في دول مجلس التعاون الخليجي (البحرين، الكويت، عمان، قطر، السعودية، الإمارات)، 39 برنامجاً في شمال إفريقيا (الجزائر، ليبيا، موريتانيا، المغرب، تونس) و26 برنامجاً في وادي النيل (مصر، السودان) و3 برامج في القرن الإفريقي (جزر القمر، جيبوتي، الصومال) .
- أظهر الاستطلاع أن عدد الشهادات العلمية والتقنية أكثر من تلك المتعلقة بالاقتصاد والتربية والسياسات . وجاءت معظم الشهادات ضمن العلوم البيئية (34 شهادة)، تليها الهندسة البيئية (30 شهادة)، والموارد المائية (29 شهادة)، والطاقات المتجددة (19 شهادة) .
- شكلت الأبحاث في العلوم البيئية 7 في المئة من مجمل ما نشره الباحثون العرب . وسُجّلت أعلى زيادة في البحوث البيئية في كل من مصر والسعودية .

المدارس العربية

- التلوث والصحة البيئية والطبيعة والتنوع البيولوجي تمثل العناصر المشتركة في المناهج الدراسية في جميع أنحاء البلدان العربية . القضايا الأخرى، مثل تغير المناخ والاقتصاد الأخضر والوظائف الخضراء والمباني الخضراء للطاقة المتجددة والبصمة البيئية، بدأ دمجها بدرجة أقل خلال السنوات العشرين الأخيرة .
- غالباً ما يبحث في موضوع النفايات ضمن التلوث والصحة، وليس في سياق إدارة النفايات، بما في ذلك خفض الاستهلاك وإعادة الاستخدام وإعادة التدوير .
- يغيب الأمن الغذائي والمائي والتلوث البلاستيكي وكفاءة الموارد عن المناهج المدرسية في قرابة 70 في المئة من البلدان العربية .
- يكتسب اتجاه دمج العناوين البيئية في جميع المواضيع، بما في ذلك اللغات والأدب والتاريخ، وليس فقط في العلوم والجغرافيا والتربية المدنية، أرضية في المنطقة العربية .

المنتدى العربي للبيئة والتنمية (أفد) هو منظمة دولية غير حكومية لا تتوخى الربح، يلتقي فيها قطاع الأعمال مع الخبراء وهيئات المجتمع المدني والإعلام، لتشجيع سياسات وبرامج بيئية فاعلة عبر المنطقة العربية . بعد تأسيس المنتدى في بيروت عام 2006، حصل على الإمتيازات والحصانات كمنظمة دولية غير حكومية، وتمت دعوته كعضو مراقب في برنامج الأمم المتحدة للبيئة وجامعة الدول العربية . المنتج الرئيسي للمنتدى هو تقرير سنوي مختص عن البيئة العربية، يتابع التطورات ويحللها كما يقترح سياسات بديلة وتدابير عملية للمعالجة . ومن مبادرات المنتدى الأخرى برنامج المسؤولية البيئية لقطاع الأعمال، وبناء قدرات هيئات المجتمع الأهلي، والتوعية والتربية البيئية .

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تقرير المنتدى العربي للبيئة والتنمية 2019

التربية البيئية

من أجل تنمية مستدامة في البلدان العربية

تحرير: نجيب صعب
عدنان بدران
عبد الكريم صادق

المنتدى العربي للبيئة والتنمية
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