

Climate change mitigation and adaptation of museums in Egypt

Mitigação das alterações climáticas e adaptação de museus no Egito

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Keywords:

Climate change

Museums

Sustainable Development

Abstract: What has climate change got to do with museums? Climate change will impact all aspects of life everywhere, which means that climate change is relevant to all museums, and they can all fulfill roles in addressing climate change. Museums can incorporate climate change into their exhibitions, events and educational programmes, whatever their subject matter. These activities help support the elements of Action for Climate Empowerment, namely education, training, public awareness and public access to information. Museums can support climate action in other ways beyond their programming. For example, research based on collections may contribute to a better understanding of the impacts of climate change; making the results of such research available to the public in programmes would contribute to the elements of Action for Climate Empowerment. Museums can also address climate change directly through their operations, as they often consume vast amounts of energy and resources that contribute to climate change: curtailing their own emissions is one of the most important ways they can play their part in addressing the climate crisis. Museums are further implicated since many are publically funded institutions, with a reasonable attendant expectation that they could use public funding for public good. The particular role of museums as players in sustainable development was recognized most clearly in the UNESCO 'Recommendation concerning the protection and promotion of museums and collections, their diversity and their role in society' (UNESCO 2016). It is surely no coincidence that this Recommendation was made in the same year that the Sustainable Development Goals and the Paris Agreement were agreed upon. While climate change is not specifically mentioned in the UNESCO Recommendation, the intent of the Recommendation is aimed at protecting and promoting cultural and natural heritage (which are of course threatened by climate change), advancing human rights, and fulfilling a positive social purpose. Nonetheless, while museums were heavily implicated in the original UNFCCC and the Paris Agreement, they have been rather slow to address climate change in meaningful and impactful ways. This situation has improved in the last 10 years or so, and activity is ramping up rapidly, but there is a long way to go and not much time to do it in. In this paper, we explore two questions: 1) how can museums help people develop their understanding of what climate change means to them? and 2) how can museums help facilitate a response to the climate challenge?

Palavras-chave:

Mudança climática

Museus

Desenvolvimento sustentável

Resumo: O que a mudança climática tem a ver com museus? A mudança climática impactará todos os aspectos da vida em todo lugar, o que significa que a mudança climática é relevante para todos os museus, e estes podem desempenhar papéis no enfrentamento da mudança climática. Os museus podem incorporar a mudança climática em suas exposições, eventos e programas educacionais, seja qual for o assunto. Tais atividades apoiam os elementos da Ação para o Empoderamento Climático, que são a educação, o treinamento, a conscientização pública e o acesso público à informação. Os museus podem apoiar a ação climática de outras maneiras além de sua programação. Por exemplo, pesquisas baseadas em coleções podem contribuir para uma melhor compreensão dos impactos da mudança climática; a disponibilização dos resultados dessas pesquisas ao público em programas contribuiria para os elementos da Ação para o Empoderamento Climático. Os museus

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também podem abordar a mudança climática diretamente por meio de suas operações, pois geralmente consomem grandes quantidades de energia e recursos que contribuem para a mudança climática: reduzir suas próprias emissões é uma das maneiras mais importantes de desempenhar seu papel no enfrentamento da crise climática. Os museus estão ainda mais envolvidos, pois muitos são instituições financiadas publicamente, com uma expectativa razoável de que poderiam usar o financiamento público para o bem público. O papel particular dos museus como participantes do desenvolvimento sustentável foi reconhecido mais claramente na "Recomendação da UNESCO sobre a proteção e promoção de museus e coleções, sua diversidade e seu papel na sociedade" (UNESCO 2016). Certamente não é coincidência que esta Recomendação tenha sido feita no mesmo ano em que os Objetivos de Desenvolvimento Sustentável e o Acordo de Paris foram acordados. Embora a mudança climática não seja mencionada especificamente na Recomendação da UNESCO, a intenção da Recomendação é proteger e promover o patrimônio cultural e natural (que são, naturalmente, ameaçados pela mudança climática), promover os direitos humanos e cumprir um propósito social positivo. No entanto, embora os museus tenham sido fortemente implicados na UNFCCC original e no Acordo de Paris, eles têm sido bastante lentos para abordar a mudança climática de maneiras significativas e impactantes. Esta situação melhorou nos últimos 10 anos ou mais, e a atividade está aumentando rapidamente, mas há um longo caminho a percorrer e não muito tempo para fazê-lo. Neste artigo, exploramos duas questões: 1) como os museus podem ajudar as pessoas a desenvolver sua compreensão do que a mudança climática significa para elas? e 2) como os museus podem ajudar a facilitar uma resposta ao desafio climático?

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Context

Global context: Climate change threats facing the planet

The world's climate is changing and the impacts are already being observed at both global and local levels. Climate change is a natural phenomenon that happens at very low rates affecting the ecosystem. Nevertheless, since the industrial revolution in the late 18th century, human activities greatly disrupted the natural balance of the ecosystem. Human beings did not only exploit and degrade the planet's natural resources, but also intervened significantly and contributed to the gradual change in climate. In consequence of the overuse of fossil fuels and deforestation, the normal percentage of GreenHouse Gasses (GHG) has increased significantly, leading to global warming. The direct result of this has been a rise in the average temperature of the planet, leading to a sequence of climate events. This includes extreme weather conditions, increasing temperatures, melting polar

icecaps, sea level rises (SLR), severe droughts, and flooding resulting from the redistribution of rainfall patterns. These new dynamics are key elements in changing the global water map. Such events may lead to significant socioeconomic and environmental losses. Climate change indeed is a challenging problem to any government as it poses a serious threat, among other things, to food security and national economy. Let us look in depth at the problem in the Egyptian context.

National context: Climate Change Risks in Egypt

Egypt is Africa's most populous country, with 97.5 million capita (CAPMAS, 2017), and also the 87th most vulnerable country facing the threat of climate change. Yet, it ranks at 73rd in the world when it comes to lack of preparedness to face climate change (Climate Change Profile, 2018). The high population growth and rapid urbanization, together

with the climate change arising impacts, put serious stress on water supplies. This leads further to threats towards food security, human health and biodiversity. Egypt's quickly increasing urban centres will be struggling to deliver fundamental services such as housing, health care, education, sanitation, and energy, particularly with the climate effects forecast. Productive lands will also be pressured to increase yields, aggravating water shortages as the country progressively senses the climate change effects. Moreover, Egypt is particularly susceptible to climate change and its negative effects, with 98% of the population and most of its facilities focused along the Nile River, its delta, and the northern and eastern coasts. This is expressed in the Nile flow variability, changing weather patterns, and increasing SLR and salt intrusion. Climate change will increase the interactive impact of political, economic, and demographic forces by acting as a risk multiplier. The Sea level rise and the heavy correlation between climate change and the Nile river flow are two of the most significant factors leading to the high vulnerability of Egypt to climate change. The country is surrounded by the Mediterranean Sea to the North, where it lies at a low altitude to sea level, putting the whole area under the threat of Sea Level Rise (SLR). This will consequently give rise to flooding, affecting the groundwater quality in the coastal aquifers (EEAA, 2016). Further implications will be the increase of soil salinity, degrading its fertile quality and leading to the erosion of coastal barriers. Additionally, an SLR of 0.3 meters will lead to the migration of at least half a million inhabitants and 70,000 subsequent job losses spanning various sectors (Green Climate Fund, 2017). Second, the Nile and its Delta were identified as one of the world's three most extremely vulnerable hotspots under climate change conditions (IPCC, 2007). Its flow is highly sensitive to rainfall and variations in temperature. Temperature change impacts rainfall, which is foreseen to decrease by 7% on the coastline by 2030 (Climate Change Profile, 2018). Predictions on evapotranspiration rates, defined as "the sum of evaporation and plant transpiration from the Earth's land and ocean surface to the atmosphere", claim that "climate change will take the form of fluctuations in levels of precipitation resulting in

changes in temperature". Thus, there will be a growing need for dams in upstream countries. Water scarcity, storms and heat waves will influence the crop yield production, thus imposing a great threat to national food security. Taking a closer lens, the role of the Nile River in Egypt's food and water security is pivotal. Hence, the imposition of climate change cannot be overlooked. The Nile is responsible for supplying Egypt with 95% of its water demand, in which 85% of it is used in agriculture (Climate Change Profile, 2018). The Nile Delta forms more than 50% of Egypt's agricultural land and supports 80% of Egypt's fish farming demands. The Nile itself supplies water for domestic activities, industry, power generation, cooling of machinery and power plants and transport between Nile Valley cities (Green Climate Fund, 2017). For such an interconnected role in diverse sectors, the Nile is of great concern when considering the effect of climate change on Egypt's water quota and food security. Rising temperatures, precipitation variability and increasing heat stress on crops are the potential results of climate change. These factors act as challenges of closing the rapidly growing gap between the limited water availability and the mounting demand for water in agriculture and in various economic sectors. Thus, management of practices and irrigation methods is a crucial intervention for climate change adaptation in Egypt to maintain or increase the productivity of irrigation water use (Crop output/ Unit of water consumed) (IPCC, 2007). Agriculture and welfare losses are foreseen and will be restricted by water availability. For the Egyptian economy, agriculture accounts for an estimated 14.5% of GDP and 28% of all jobs. It is also the main water-using sector in Egypt, consuming 80% of Egypt's water quota (Egypt-Country Profile, 2018). Agricultural production is projected to decrease by 8% to 47% by 2060, with agricultural employment cuts of up to 39%, according to a UNDP study. Agricultural welfare losses are projected to range from 40 to 234 billion EGP in 2060 due to the impacts of climate change (UNDP, 2013).

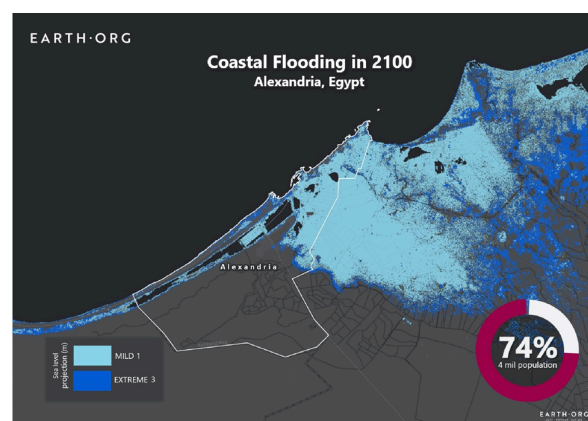
All these factors threaten 50% of Egypt's economic activities in agriculture, fisheries and industries in which water acts as a main component. Other impacts include issues regarding the sailing of

ferries on the Nile, effects on coral reef growth and integrity, saltwater intrusion and submersion of monuments on the north coast, and socioeconomic losses due to all-mentioned impacts, all of which will negatively impact tourism and biodiversity (EEAA, 2016).

Egypt Action towards Adaptation

On the national level, 1999 marked the first time that Egypt shed light on its required adaptation plans, climate impact actions and vulnerabilities in the 1stUNFCCC National Communication. This was subsequently modified in the second 2010 National Communication (Arab Republic of Egypt, 2010b). The first communication plan concentrated solely on emission reduction strategies. The second communication suggested intersectoral strategies and actions that would contribute to the adaptation efforts. A number of institutional agreements have been created over those 10 years to tackle climate change-related problems, with more focus on adaptation and mitigation (Abutaleb, Mohammed and Ahmed, 2018). In 2007, “The National Committee on Climate Change” was established by the Prime Minister Decree no. 272 and was led by the Minister of Environment. The committee included representatives from the technical ministries - besides the Ministry of Environment - like, the Ministry of Water Resources and Irrigation, and the Ministry of Agriculture and Land Reclamation. It also included representatives from functional Ministries like the Ministry of Foreign Affairs, Ministry of Electricity and Energy, Ministry of Petroleum, Ministry of Trade and Industry, Ministry of Local Development and Ministry of Defense. The committee was concerned with developing mitigation and adaptation strategies to address the phenomenon of climate change. Moreover, it was required to review and activate a National Strategy for Climate Change with the preparation of plans and programs in both long and short terms, in order to be integrated into national action plans for development in Egypt (EEAA, 2016). In 2011, the National Committee and its Information and Decision Support Center issued a National Strategy for Adaptation to Climate

Change and Disaster Risk Reduction that contains adaptation plans tailored to every geographic region of Egypt. The most affected regions would include Governorates of the North Coast including Alexandria, Marsa Matrouh, Damietta, Portsaid, and the entire Delta region. Farmers and people working in tourism are among the heavily impacted actors. Media and civil society are among the key players when it comes to dealing with the issue and communicating its severity to the public alongside the steps necessary to be taken to alleviate the consequences anticipated.



Sea Level Rise Projection Map – Alexandria, @ Earth.org

Museums and climate change

Climate change presents one of the most serious challenges to human society and the environment, where both reducing emissions and adapting to the impacts of climate change involve major systemic change to society and the economy. Given the scale, nature and speed of these systemic changes, greater public engagement has been considered to be essential for numerous reasons, including the building of democratic support for action (Carvalho and Peterson 2012), and to improve policy making (Pidgeon and Fischhoff 2011), notably through the incorporation of diverse perspectives.

Climate change engagement may be defined as ‘an ongoing personal state of connection’ with the issue of climate change (Lorenzoni et al. 2007: 446; Whitmarsh et al. 2011). As connection incorporates a broad range of aspects that constitute what we

think, feel and do about climate change – cognitive, socio-emotional and behavioral aspects – simply knowing more about climate change does not necessarily promote action and, where information provision does not provide people with an understanding of the actions that are needed or is demotivating, it can inadvertently disempower people (Moser and Dilling 2004; O'Neill and Nicholson-Cole 2009). The three elements of climate change engagement – cognitive, socio-emotional and behavioral – approximate to the three domains of the learning model used by UNESCO as a framework for Global Citizenship Education (GCED) and Education for Sustainable Development (ESD); GCED aims to educate people 'to know, to do, to be, and to live together', empowering learners of all ages to play an active role in overcoming global challenges (UNESCO 2015: 22; UNESCO 2017). Museums have the potential to be important venues to promote public education, empowerment and action around climate change, and were formally recognized at COP24 in Katowice (Poland) in December 2018 as key sites for supporting Action for Climate Empowerment.

In this paper, we explore two questions:

- 1) how can museums help people develop their understanding of what climate change means to them? and
- 2) how can museums help facilitate a response to the climate challenge?

The big task of the museum sector is not only to inform the public on the science of climate change but also to equip citizens with tactical knowledge that enables participation in actions and debates on climate change that affect their futures.

Museums and science centers can engage a future-oriented, forward thinking frame, as places to link the past to the far future through projections of what might happen as places to offer practical governance options and as places to present long-term temporal trajectories. They offer an antidote to short-term thinking and the failure of governments to act, by presenting the variable dispositions, ideologies, and governance options, thereby constructing a mediated view of the future as a series of creative pathways (Cameron et al. 2013: 11; see also Cameron and Neilson 2015).

Notwithstanding the wide potential of museums to contribute meaningfully to addressing the challenges of climate change, it has noted that, for the most part, museums have been slow to incorporate climate change into their work, risking their own long-term relevance (Janes 2009, 2016).

Rather than direct their attention to protecting material from the past, museums can direct their work (the full range of their work, including collecting and public-facing work) towards supporting and enabling better futures more actively. Natural history museums and science centres could readily engage around contemporary issues such as climate change and other environmental topics (as could many other kinds of museums) to become 'natural futures museums'; military museums could focus on topics around the causes and consequences of contemporary wars in order to reduce future conflicts; and ethnographic museums could emphasize issues around cultural diversity and identity in the face of globalization and social inequality (Basu and Modest 2015; Dorfman 2018). This approach recognizes the interconnectedness of different forms of heritage – material, natural, cultural and intangible – and connects with emerging ideas of heritage as a future-making practice. Heritage is not a passive process of simply preserving things from the past that we choose to hold up as a mirror to the present, associated with a particular set of values that we wish to take with us into the future. Thinking of heritage as a creative engagement with the past in the present focuses our attention on our ability to take an active and informed role in the production of our own 'tomorrow' (Harrison 2013: 4).

The history of people and landscapes, whether natural or cultural, is fundamentally connected. Answering key historical questions about this relation will allow us to approach our most important environmental issues in novel ways.

"Issues like climate change are not just ecological problems – they are social ones." No distinction between the history of people and landscapes, or natural and cultural, the two are fundamentally connected."

The focus on learning from the past is also critical as "worldwide and through time, humans

have adapted to environmental stresses and climatic shifts. Although it's easy to assume that people tend to disastrously impact environmental health", "through studying the archaeological record and working with local collaborators, we see many examples of ancient societies that have successfully responded to environmental instability by conscientiously managing their resources and behaving in ways that promote resilient and biodiversity habitats."

Another reason history matters is that to be able to predict the effects of contemporary human activity, to create accurate models for future climate change for example, we need to know how modern landscapes have been shaped by the actions of people in the past. "Humans have been modifying their environments for a long time. We need to take into account how the landscapes we live in today are the result of millennia of people doing things like burning vegetation, herding animals and farming when we make decisions about how to preserve, restore, or remodel environments. Historical ecology research in museums is all about generating that data so we can figure out how best to manage our world."



Historical ecology in museums @ Ossama



Historical ecology in museums @Ossama

Another clear concern for these researchers is how academics can better integrate science with traditional knowledge bases. "Local communities that have tended to be marginalized from environmental management decisions have much to offer," "issues like climate change need to be approached with diverse knowledge sets, and take into account multiple perspectives". Greater attempts at meaningful and respectful collaboration with local communities are seriously needed, revealing that "the questions submitted from researchers about how resource managers can best engage with local communities were consistently flagged as some of the most important."

Museums and Climate Change in Egypt

There is no doubt that climate change is one of the most important topics of the day, given that there is no evidence of the increase in temperature since the nineteenth century and the doubling of the rate of increase in the twentieth century. Warming leads to sea level rise, weather fluctuations and disasters as a result of floods, storms, droughts or torrential rains. Therefore, there should first be a national program to develop a risk map for the threatening effects in coastal areas and in the course of torrents to take the necessary measures to protect them. On the other hand, a plan should be drawn up. Because of the impact of climate change on tourism because it affects what the tourist intends to visit. Therefore, it is necessary to prepare the areas

that will be more attractive and diversify the tourist destinations and programs in the field of cultural tourism, including the interest in the intangible heritage. It is advisable to organize museum programmes to places that will indicate what climatic changes have occurred with accompanying explanations of the impact of climate change on society and the measures taken to mitigate and overcome it. Among these places is the Nilometer in Al-Rawda, from which it is inferred that the climate impacts the scarcity of floods that led to Al-Mustansiriyah severity and the Nilometers in Aswan, Edfu and Luxor, which monitored the change in flood levels as a result of climatic fluctuations in the upper Nile in ancient Egypt. There is also a “Jarawi Dam” in Helwan, it was designed in the age of the pyramids to block the waters of torrents and avoid their dangers. Lake Qarun in Fayoum also provides a unique record of the scarcity of floods that contributed to the collapse of the ancient state as a result of global climate change in 2200 BC, which requires the establishment of a heritage and climate center to provide visitors with explanations and evidence. Fayoum also has the Wadi El-Hitan Museum, which is the first museum that focused on the relationship of natural heritage to climate. We also look for another center in the Oases to provide evidence of climate change and its impact on the greening and drying of the desert in successive periods that contributed to the spread of the first human from North Africa through Egypt to the rest of the world and in Communication between Egypt and its neighbors during the rainy ages and the impact of drought 7000 years ago on the displacement from the deserts to the Nile Valley, and the concomitant transformation into agriculture, which paved the way for the emergence of Egyptian civilization. One of the tasks of these centers will be to organize visits for all, including students, in cooperation with the local communities, to the places where the climatic evidence is represented in: The deserts are the deposits of lakes and the rock drawings that show the elephants and giraffes that lived in the rainy periods and became extinct as a result of the drought that formed the features of the desert as we know it today.



Nilometer in Elephantine @ Amusing plant



The Rowda Nilometer in Cairo @ Cairo top



Jarawi Dam in Helwan @ Ossama

The Climate Change Museum in Wadi El Hitan: The Egyptian site is a Unesco Heritage Site since 2005



The Climate Change Museum in Wadi El Hitan @ global times

The Wadi Hitan Fossil and Climate Change Museum features the largest intact “Basilosaurus isis” whale fossil and a unique collection of fossils found nowhere else in the world. Wadi El Hitan was transformed through climate change from sea to a hyper-arid desert through millions of years. The museum aims to educate the public about climate change and raise awareness about preventing its negative effects on the environment and people.

The museum has been built by the United Nations Development Programme in partnership with the Government of Egypt and the financial support of the Government of Italy within a collective set of actions being implemented to support the conservation of protected areas, promote eco-tourism, and sustainable development links environment protection and sustainable use of natural resources.

The museum educates visitors about “the importance of natural heritage” and its message is “protect it: pay attention to climate change; if you don’t do so, you shall be extinguished” just like the prehistoric whales.

It makes sense to have this museum in Wadi El Hitan, rather than in Cairo, because you can have a firsthand impression of the tremendous modifications climate change has had locally by

seeing shells and fossils encrusted in the middle of the barren desert.”

Visible layers of sedimentation scarring the flanks of the surrounding limestone hills bear witness to the changing seawater levels across different geological eras. “Climate change should be witnessed in the field,” “this is when it becomes instrumental and can raise awareness.”

The museum is home to various fossils of plants such as mangroves, corals and watermelons, and animals such as whales, sharks, dolphins, crocodiles and the complete skeleton of a leopard. All of the samples originated from Wadi El Hitan, Siwa, the Qattara Depression, Sinai, Qusur El Arab and the nearby Wadi El Rayan.

In the central exhibition space lies the complete fossil of an 18-metre-long male Basilosaurus Isis discovered in May 2015, only seven kilometres away from its current resting place. The cast of the female Basilosaurus fossil sits beside the male skeleton - gigantic heads and massive jaws propped up on an elevated bed of sand.

What makes the Basilosaurus remarkable is its body, equipped with two tiny yet perfectly-shaped hind legs. “Basilosaurus was the first archaic whale found to have fully developed hind limbs with a knee, ankle, foot and toes,”

Grand Egyptian Museum to be Egypt’s first eco-friendly museum



Grand Egyptian Museum @ construction review

The Ministry of Tourism and Antiquities and the National Center for Housing and Building Research announced that the Grand Egyptian

Museum (GEM) and all its buildings will be green buildings. This will provide environmental, economic and cultural sustainability, and make GEM the first green museum in Egypt.

The GEM is currently in the process of obtaining the Egyptian Green Pyramid accreditation and in order to receive the accreditation, GEM has to meet certain requirements.

These requirements include visitor services, transportation to the museum, ease of access, the creation of bike paths, parking lots, the use of electric cars, efficiency of water and energy consumption, especially in the museum's green landscape, as well as use of renewable energy sources.

This accreditation comes within the framework of the Ministry of Tourism and Antiquities' strategy for sustainable development as part of Egypt's Vision 2030 to preserve the ecological balance and the sustainability of tourism and antiquities as well as encouraging the sector to develop in unison with the transition to a green economy and environmentally friendly practices.

Museum of Mummification and Luxor A Heritage Green City "Awareness Raising Actions toward Sustainable Energy & Climate Adaptation Plan"



Egypt- Benban solar power plant @ construction review

Awareness and communication are indispensable tools for the dissemination of good practices, to help reduce energy consumption on a

day-to-day basis. The Governorate of Luxor needs to develop robust campaigns all across the City of Luxor and the Governorate on this issue. One has to recognize that the Governorate of Luxor has other major priorities to address. On the contrary, Governorates concerned with energy management on their territory and benefiting from a direct connection with their constituencies are the right institutions to develop awareness activities.

Museum of Mummification hosted a series of lectures and workshops to ensure the coherence of the overall Governorate's policy and all energy related projects design and implementation.

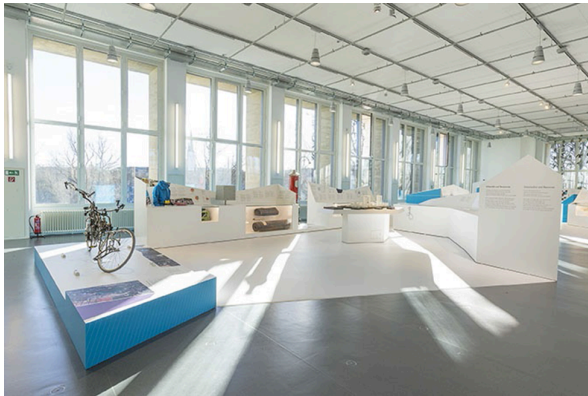
The missions include:

- Educating users about the implementation of the Governorate's policy on sustainable energy;
- Training the technical personnel in charge of the different services, including to ensuring adequate maintenance of renewable energy facilities; and
- Organising reporting on progress made and communicating the results of implemented actions to municipal personnel, city's inhabitants and stakeholders.

To ensure the success of project implementation within the framework of the sustainable energy strategy, certain awareness-raising actions for different sectors of the local population carried out. These include:

- Lectures: organizing and facilitating a series of conferences and lectures given by professionals and experts. These meetings are meant for a diverse audience: local authorities, enterprises and the general public. The main objective is to educate local actors and encourage them to take action.
- Workshops: holding thematic workshops on sustainable energy (energy consumption reduction, energy efficiency and renewable energies) that enrich Governorate (municipal) personnel's knowledge on the subject and, thus, facilitate the implementation.

Children's Museum, Cairo: The Earth in our Hands Exhibition



The Earth in our Hands Exhibition @ Ossama

The Children's Museum hosted a major special hands-on exhibition: "The Earth in Our Hands" in cooperation with the French Embassy in Cairo and the Academy of Scientific Research and Technology.

Climate change has a worldwide impact. This introduces the "World in our Hands exhibition" and examines the issues faced by the global community. Climate change is our greatest test, it is real and time is running out. For the good of all the communities across the planet we must act now. Already hundreds of thousands of people have been killed or had their homes destroyed. This talk examines the present and future challenges faced by all communities and re-enforces the need for us to act together against this imminent and deadly threat. The presentations examine the actions required to overcome this challenge for governments, businesses and each of us. This exhibition provides education on Climate Change, to help drive action for change. The world really is in our hands and we mustn't let it slip through our fingers.

The exhibition visualized the history, present, and (scientifically based) future of the Anthropocene as well as the deep interventions of humans into the geo- and biosphere over the last two centuries. It was not, however, conceptualized as a history of decline, but as a complex story of shaping. Here, scientific concepts of sustainable transformation and a society that overcomes the dualism between humans and nature are as

important as today's problematic phenomena and the ethical challenges connected with them. The topics of the exhibition included, among others: humankind as destroyer, but also as creator and designer; the anthropogenic planet that is shaped and changed by human beings; historically grown consumption patterns and lifestyles; time and space as important factors in the Anthropocene; and the future as challenge but also as chance for humankind and its political institutions, social networks, and dreams.

It looks at the complexity of human influence on the Earth and how this is reflected in urban development, mobility, energy, climate, food, nature, and global justice. In the essay section, contributions by distinguished scholars discuss the history of the concept of the Anthropocene, its characteristics and consequences, and life in the Anthropocene both today and in the future, as well as the importance of the idea for education, research, and museums. Artistic and literary contributions offer new ways of looking at the changing relationship between humans and nature. Finally, a "making of" activity section explains the design choices and guiding principles behind the exhibition.

Green Museum Initiative

Museums that integrate the concepts of sustainability into their design - where they depend on sustainable design, the use of environmentally friendly building materials, and the reliance on resources sustainable energy in the generation of electricity used in lighting, heating and cooling, Reducing waste and air pollution, and using reusable materials and recycling - and in managing its various groups and activities.

The first step: a training program for workers in the museum sector

Sustainable Development: Its Dimensions, Objectives, and Egypt's Vision 2030

Green museums and galleries

Towards implementing governance in museums

Digital transformation for sustainable development

Green building standards

Sustainable management of materials and waste Management of the museum collection, programs and activities of the museum to achieve SDGs

The second step: converting museum buildings into green buildings;

Energy Efficiency

Water efficiency

Sustainable management of materials and waste: the application of the 6 R of sustainability

Turning Gift Houses Green:

Cultivation of at least 10% of the museum area (in museums that do not have a museum garden) Cultivation of heritage native plants that require less irrigation.

Encouraging environmentally friendly transportation

Use environmentally friendly cleaning products

Implementation of digital transformation in museums.

The third step: Establishing a sustainable development unit in the museum sector and a Green Team in each museum to measure the museum's carbon footprint on the environment annually, to follow up on the museum's performance towards green, and to monitor the challenges and problems that may prevent the transition to green and work to solve them.

Challenges and lessons learned

Challenges hindering museums' contribution to climate action

1. Many museums, or at least senior staff of museums, are more concerned with internal outcomes or with the past rather than with current or future issues. They are averse to dealing with real-world issues for fear of appearing to be somehow 'political' or 'not neutral'. This comment came up a number of times in the consultation.

2. There is a lack of serious buy-in from museum leaders or trustees, although many other staff are

more willing to engage with climate education, awareness and action.

3. Many recognize a need for stronger leadership and coordination across the museum sector, as well as from national governments and government departments.

4. There is a lack of prioritization or support (direction, information or funding) from governments or agencies on national and international commitments regarding climate change. As a result, the museum sector is unaware of opportunities to contribute meaningfully, has no specified resource to support these, and isn't given a mandate or encouragement to direct its resources to do so.

5. Museums are hindered by a lack of budget, commitment, ambition, and staff dedicated to climate action.

6. Many people in museums lack knowledge, motivation, confidence or skills to contribute effectively to climate education and awareness. They need to be empowered and trained to contribute in meaningful ways to climate education, awareness and action.

7. Museums are slow to embrace climate change as a social, economic and environmental problem rather than a scientific or technological one.

8. Museum education programmes relating to climate change tend to focus on awareness-raising, which does not necessarily lead to concrete action to address climate change. A greater emphasis on practical actions and outcomes should help empower people to act on climate change.

9. The museum community lacks a platform to showcase lessons learnt and best practices regarding climate change, or to collate museums' collective action to address climate change.

10. There is a need for the faster, smoother flow of information, up wards, down wards and among museums, to enable museums and others to accelerate their activity for climate change and build momentum.

Key lessons learnt that can accelerate climate action across museums

1. The importance of acting now. There is great urgency and a lot of public interest in climate change and climate action.
2. The importance of confident and competent staff. Ongoing climate-change-related training for educators and other museum staff is needed to help them become confident and competent at climate change education and communication, be effective climate ambassadors, and learn from one another.
3. The great importance of information. Reliable, up-to-date information and science are critical for effective, meaningful climate-related programmes. Science alone is not enough: diverse values and activities should be incorporated into climate education to foster constructive concern and personal climate action.
4. The great importance of a focus on solutions, not problems. Museums should focus on providing and exploring viable options and providing encouragement. Museums don't have to have the answers, but should support people with their explorations of challenges and potential solutions.
5. The importance of making climate change and climate action personal and relevant in the context of the bigger picture. Museums should make climate change and solutions personal and relevant to people's own lives by speaking to their interests and concerns. At the same time, they should build an understanding of the big picture. Helping people explore systemic change and its relationship with their own lives is important.
6. The importance of acknowledging people's emotions and feelings. Museums should be sensitive to feelings and emotions among museum visitors and staff, and avoid frightening people through climate change education and awareness programmes. Effective programmes should be stretching for participants without being too comfortable or too frightening.
7. The importance of balancing discussion, dialogue and active participation among visitors and groups in museums, with top-down information provision. Bringing different stakeholders together, including experts, policy workers, activists, and providing opportunities for people to share their own

thoughts, ideas and solutions helps empower people to collaborate in climate education, awareness and action, and showcase their activities. This will encourage others to participate.

8. The importance of engaging everyone in climate education, awareness and action. Education and learning are lifelong. Engaging everyone creates many different opportunities and ensures that no-one is left behind (a principle that is central to Agenda 2030 and the Sustainable Development Goals). The purpose of engagement is not what takes place in the museum, but how the museum supports people to engage with climate change in their lives, in the world.

9. The importance of coordination and collaboration between museums and partners. On their own, museums can only do so much. By partnering, working with other sectors, amplifying their work through coordination and shared agendas/outcomes, and connecting with external/global agendas such as the Sustainable Development Goals, and International Observance Days, more can be achieved.

10. The need for support from governments, government agencies and funders. Top down support and guidance through climate change education policy and educational resources, and making climate change education and awareness-raising a priority are critical. Directives linking funding to energy use, sources and reduction will also help to drive action and ambition. Mechanisms that help museums submit their individual initiatives to be aggregated, whether as quantitative or qualitative statistics, will help build common and shared awareness of the overall contribution of museums to climate action. Dedicated resources, financial or otherwise, are necessary to foster climate education and awareness programmes, notably between museums and other sectors and partners.

Conclusions and Recommendations

Museums have tremendous potential for promoting public discourse and engagement around contemporary issues such as climate change. They provide (potentially) one of the few venue types

where people can express their feelings and values beyond their immediate social circle, something that schoolchildren and students enjoy but which is typically not available to adults. Museums offer adults the space and opportunity to continue to learn and engage with new ideas and concepts, and to interact with other people as a shared cultural and learning experience. Museums can help people find out what they think about environmental issues and what other people think; they can provide opportunities for people to express themselves to others. In this, museums have a civic-social function that they would do well to take very seriously. Museums could also connect people with the bigger picture and can provide people with a frame within which to reflect on, and debate upon, people's place in the world (individually and collectively) and to explore timeframes beyond the day-to-day or short-term. Given the obvious social dimensions of interventions and policies to mitigate climate change, once taken outside the museum, the learning that has taken place within a museum can also provide a context in which wider societal debates can take place.

Connecting museums with issues of social responsibility and social justice (including climate change and environmental sustainability) is not a new idea, but it has been adopted with variable levels of support by various museum types. However, if museums choose to sit on the fence, at best they impede the reduction of inequalities and, at worst, as trusted institutions, they give tacit approval for these systems and reinforce them, obstructing constructive change. Museums with natural heritage collections can, and surely should, do a lot in terms of connecting people with issues of environmental sustainability and nature conservation, just as those with collections of cultural artifacts can connect with contemporary issues of cultural diversity and social sustainability. Climate change, as a scientific-social issue, presents an opportunity for museums of many kinds to connect with a theme of wide-scale importance, and for widespread public benefit. Through doing so, museums can create real and impactful public value, delivering positive benefits for society and the environment, and concurrently building a stronger purpose for themselves.

Recommendation to Consider for Climate Change Engagement in Museums:

- Be clear on what you are trying to achieve: are you interested in what people do in the museum, or beyond the museum?
- Ask yourself seriously whether you are enabling or disabling climate action.
- How are you promoting critical thinking?
- Be clear on what assumptions you are making about your audience, who they are, what they know and what they want from their visit.
- If you are not confident in the topic, don't be tempted to play down the science or importance of climate change, or to present false 'balance'.
- Don't overinvest space and time in persuading people that climate change is 'real': focus on critical thinking skills, and imagining and exploring solutions instead.
- Disrupt general narratives of hopelessness and inevitability to encourage positive action: tell a different story.
- Symbols, images and ideas can be just as important as graphs and facts—or even more important.
- Use creative experiences to encourage people to find their own words, ideas and symbols that can promote positive actions around climate change.
- Balance challenge with support, and positive and negative information.
- Be both brave and empathetic.
- Give people some agency: allow them to imagine and create solutions that work for them.
- Give people plenty of chances to respond to exhibitions and events.
- Allow people to connect issues and solutions of similar scales.
- Create a platform for people to explore and express ideas around citizenship and the world they want, and to explore the impacts of that world both nearby and farther afield.

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