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Biodiversity Resources: A Case Study of Egyptian Natural Reserves and Botanical Gardens



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MANY human activities have led to biodiversity loss including the degradation of habitats, the overuse of natural resources, invasive species outbreaks, deforestation, and climate changes. Egypt is located in a distinguished area in the North of Africa, which depends on the existence of the Nile River and its Delta beside both Mediterranean and Red Sea. This location gave Egypt several features as a suitable place for many migrant birds from Europe beside its habitation for several and rare plant species. So, the Egyptian government established several protected areas (about 30 beside 14 will be established in the near future), however, these places still need more concerns especially from the point of view of biodiversity. In this study, it highlighted only on three famous protectorates (i.e., Siwa Oasis, Burullus Lake and Shalateen region) and three botanical gardens (Al-Azhar park, Orman and Aswan botanical garden) in Egypt. This work is a call by EBSS to receive more different articles (original papers, reviews or short communications) about the biodiversity from different places all over the world. The main five habitats and ecosystems in Egypt include desert, marine, wetlands, artificial, and fresh water habitat system. This call will be a great support for different types of biodiversity including soil, water and plant biodiversity. Several open questions concerning this theme are still need to be answered such as what are the expected results on the global biodiversity in soil and water after the COVID-19 spreading?

Keywords: Biodiversity loss, Biodiversity conservation, Biodiversity dimensions, National parks, Protected areas

Introduction

Biodiversity could be defined as “*the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.*” It is the variety of life, which includes the variation among species, genes, and functional traits (Yang et al. 2021). The main key indicators of biodiversity may include 3 indicators, i.e., (1) evenness (the equitability among life forms), (2) richness (the number of unique life forms), and (3) the heterogeneity as

the dissimilarity among life forms (Cardinale et al. 2012). The biodiversity has 3 dimensions (i) biodiversity potential and its correlation to renewable resources, (ii) the biodiversity and its contribution to human well-being, and (iii) the global biodiversity conservation and local focal charismatic species (Yang et al. 2021). There is a weak link between the global biodiversity and its conservation programs, despite the availability of several data and assessments about biodiversity (Pollock et al. 2020; Norris et al. 2020).

It is well known that, protected areas (i.e., game refuge, wildlife sanctuary, indigenous

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reserve, or voluntary conservation area) and national gardens (i.e., parks represent) one of the best ways to safeguard nature and curb biodiversity loss because they are rich in biodiversity and their ecological value, especially endangered and endemic species (McCarthy et al. 2021). Therefore, several studies focused on the global biodiversity loss or its conservation (e.g., Jaishanker et al. 2021; Shiono et al. 2021; Vimal et al. 2021). Egypt has great biodiversity resources including soil, botanical, and marine biodiversity as distinguished and unique habitats especially mangrove swamps, sea grasses, coral reefs, and many types of shores as well as threatened species (Mohamed et al. 2019). Recently, many studies on different hot spots of biodiversity in many regions in Egypt such as South Sinai (Mohamed et al. 2019), North Sinai (Abdelhady et al. 2019a), Great Bitter Lakes, Suez Canal (Belal and Dar 2020), Manzala lagoon (Abdelhady et al. 2019b), and Lake Burullus (Hany et al. 2021).

Therefore, this is a call for articles on the biodiversity and its potential especially concerning the biodiversity loss and its conservation. This call also for publishing articles not only on the Egyptian natural reserves and botanical gardens but also on the global scale.

Biodiversity loss and its conservation

The debate of biodiversity loss and its conservation is considered one of the most important environmental issues on the global level. Several studies discussed this debate from different points of view as presented in **Table 1**. No doubt that, a rapid degradation in global biodiversity and its ecosystems has created tremendous pressure on natural systems over the last 50 years, which represent the main source for providing humanity with water, food, and other natural resources (Rodrigo-Comino et al. 2020). The COVID-19 pandemic and its associated lockdown has been impacted on biodiversity conservation (Bates et al. 2020). A lot of national parks and protected areas in many places e.g., Canada (Bates et al. 2021), Colombia (Sanchez-Clavijo et al. 2021) are still being guarded and vulnerable wildlife is still being protected in this hard time due to COVID-19 (Corlett et al. 2020).

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Some Egyptian natural reserves

The *Convention on Biological Diversity* (CBD), as an international convention on biodiversity was conceived at a *United Nations Environment Programme* (UNEP) entered into force on 29 December 1993. CBD and its Parties have engaged in increasing the global network of protected areas coverage to at least 17% of the world terrestrial land by 2020 (CBD 2011, 2020). The efforts of CBD are very likely to be potentially intensified, and maintained in the post-2020 global biodiversity framework as well (Vimal et al. 2021). According to CBD (2021), Egypt is composed of agricultural land (8%) and desert (92%). Egypt also has 22 main habitat groups, which could be classified into the following areas:

- 1- Red Sea region (littoral habitats, islands, marine habitats),
- 2- Sinai region (mountains and wadies of South Sinai, central and North Sinai),
- 3- Nile Valley and Delta,
- 4- Eastern Desert region (mountains and wadies of the Eastern Desert),
- 5- Western Desert region (depressions and oases, sand and dunes),
- 6- Mediterranean wetlands, and Mediterranean coast,
- 7- Gebel Elba region, Gebel Uweinat and Gilf Kebir (CBD 2021).

Based on the unique geographical location of Egypt and its distinguished biodiversity, the government of Egypt declared some areas as a national parks or protectorates since 1999 to avoid the living creatures from being endangered. These nature protectorates recently represent more than 15% of Egypt's land. Egypt has 30 protectorates or nature reserves including Nabq protectorate, Ras Mohamed national park, Saint Catherine protectorate, Siwa oasis, Burullus Lake, and white desert national park. The establishment of protected areas is considered one of the most common positive interference for biodiversity conservation. These protected areas are protected places from human activities' threats to avoid the adverse impacts through maintaining the ecosystem services or creating new options of livelihood (Mohamed et al. 2019). Few studies have been published regarding the biodiversity in natural protectorates in Egypt like Nabq Protected Area (Mohamed et al. 2019), Gabal Lagama in North

TABLE 1. The most important published studies on global biodiversity loss or its conservation

| Biodiversity item and study level | Main findings or the main aim of the study | References |
|--|--|--|
| Biodiversity loss studies | | |
| Europe | There is a need to support Europe's new "Farm to Fork" strategy through fighting both biodiversity loss and climate change | de Boer and Aiking (2021) |
| Global level | COVID-19 pandemic added new threat to freshwater fish biodiversity beside climate change, invasive species, pollution, flow alteration, fragmentation, and habitat loss | Cooke et al. (2021) |
| Japan | The role of increasing nitrogen deposition and their contributes to plant biodiversity loss in Japan | Lin et al. (2021) |
| Global level | The biodiversity loss in different ecosystems during COVID-19 pandemic depended on factors deforestation, land-use, habitat fragmentation, agricultural development, and uncontrolled urbanization | Platto et al. (2021) |
| Australia | The biodiversity offsetting and its relation to vegetation integrity metric as a biodiversity value | Oliver et al. (2021) |
| China | The loss of invertebrate biodiversity due to eutrophication through examining the diversity of zoobenthos and zooplankton across 261 lakes in the Lake Taihu in China | Wang et al. (2021b) |
| Biodiversity conservation studies | | |
| The USA | The targets of biodiversity conservation and the near-term allocation of protected areas on an ecoregion basis | Lovejoy (2020) |
| Global level | The biodiversity on university campuses should be investigated and monitored for more biodiversity-friendly designs and promoted based on science popularization | Liu et al. (2021) |
| North Korea | National parks and protected areas important items for biodiversity conservation in North Korea to achieve the Sustainable Development Goals | McCarthy et al. (2021) |
| India | The biodiversity conservation could be achieved through biodiversity clock and the conservation triangle, which are considered invaluable in strategizing the conservation of biodiversity | Jaishanker et al. (2021) |
| China | The small remaining grassland patches are considered hotspots in conservation the regional biodiversity in the fragmented landscape of agro-pastoral ecotone of northern China | Yan et al. (2021) |
| China | The restoration of degraded ecosystems for biodiversity conservation to enhance habitat availability in order to promote biological flows | Wang et al. (2021a) |
| Canada | A strong relation between global biodiversity crisis and different approaches of conservation like scientific, socioeconomic, and other approaches, which could be solved in Canada | Buxton et al. (2021) |
| Italy | The relation between biodiversity conservation and land use pressure or urban expansion in Central Italy | Di Pirro et al. (2021) |
| Ireland | Studying the relation between the costs of conserving biodiversity and the protection of ecosystem services and the effective biodiversity conservation | Rachel et al. (2021) |
| Europe | The study of biodiversity conservation with focus on the grassland ecosystems through the prescribed burning in Europe | Valkó and Deák (2021) |
| Brazil | The potential of land use and its using in modelling framework to improve predictions on biodiversity and its conservation | Sobral-Souza et al. (2021) |
| Global level | Losing biodiversity due to development, which need a management of human-modified landscapes to protect biodiversity | Soley and Perfecto (2021) |
| Global level | The relationship between COVID-19 pandemic and biodiversity and its crisis as well as the biodiversity during COVID-19 | El-Ramady et al. (2021); Gregg et al. (2021) |

Sinai (Abdelhady et al. 2019a), Great Bitter Lakes, Suez Canal (Belal and Dar 2020), and Lake Burullus (Hany et al. 2021).

Siwa Oasis

Siwa is one of the most important Egyptian oases, which located in the Western Desert and its land covers with sand dunes. Its climate is classified as desertic climate with extreme aridity and the main primary income sources is the agriculture of olive and date palm production (Fig. 1). According to Kipfer (2021), “*Siwa oasis is an oasis in the Libyan desert, west of the Nile, the seat of the oracle temple of Amon, which was already famous in the time of Herodotus and was consulted by Alexander the Great. The fragmentary remains of the temple, with inscriptions dating from the fourth century BC, lie in the ruins of Aghurmi. The oracle fell into disrepute during the Roman occupation of Egypt. Nearby is the ruined temple of Umm Beda (Um Ebeida), and there are also many Roman remains in the vicinity. The earliest remains date to the Twenty-Sixth Dynasty (664–525 BC). Two rock outcrops provide the sites of the old walled*

settlements of Siwa and Aghurmi, which are veritable fortresses.” It was declared as a nature reserve in 2002 and located between Qattara depression and the white sand desert.

Based on FAO (2016), Siwa is a globally significant *in situ* repository of plant genetic resources, especially because its unique adapted varieties of date palm, olive and secondary crops, which are highly esteemed for their quality and its significant role in rural livelihoods, both for nutrition and income. The Siwan list of crops comprises 46 crop species and Siwa has also variety of livestock, goat, sheep, and chickens. Siwa supports a distinct and wide-ranging collection of animal species, including 92 soil fauna, 52 insects, 32 reptiles, 28 mammals, at least 2 species of amphibians, and a variety of birds. Among these, several species appear to be unique at the Siwa region. Very few studies published on the biodiversity in Siwa oasis like the floristic diversity and vegetation analysis (El-Saied et al. 2015), uncultured bacteria biodiversity in hypersaline lakes (Elsaied et al. 2017), and date palm agrobiodiversity (Battesti et al. 2018), whereas many other studies can be



Fig. 1. Siwa Oasis is located in Matrouh Governorate between the Qattara depression and the Great Sand Sea in the Western Desert. It is about 50 km east of the Libyan border, and 560 km from Cairo. Its length is about 80 km and 20 km wide. It is one of Egypt’s most isolated settlements with about 33,000 people, mostly Berbers, who developed a unique and isolated desert culture (Wikipedia 2021).

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noticed on the main problems in Siwa particularly the drainage crisis and land degradation (Hussein 2021), evaluation the salts of salt pans (Khalil et al. 2021), and the potentiality of groundwater in Siwa (Ezz El-Deen 2021).

Burullus Lake

According to KBA (2021), “*Burullus as protectorate was declared by Prime Ministerial Decree no. 1444 of 1998 and is a Ramsar Site. Burullus covered 588 km² in 1913. An estimated 37% of the open-water area and 85% of the marsh area have been lost during the past 40 years, largely as a result of ongoing drainage and reclamation of the lake’s eastern, western and southern margins, and also due to the proliferation of emergent and submerged vegetation. Despite being the least polluted of the northern delta lakes, increasing quantities of agricultural drainage-water with heavy metals and pesticide loads are being released into Burullus, contributing significantly to the eutrophication and pollution of the lake. Quail nets, shotguns and lime are used along the sandbar to catch thousands of migrants in the autumn. A coastal highway running along the entire northern coast of the delta, designed to link the Egyptian Mediterranean coastal regions west and east of the delta, is near completion. The highway, which runs through the sandbar north of Lake Burullus, has dramatically increased accessibility and hence, coastal development*

pressures on this, the last wilderness of the delta.”

Burullus Lake is considered one of the four Egyptian Ramsar sites including Manzala, Burullus, Edku and Maruitt (**Fig. 2**), which consists of internationally important wetlands because they contain a rich biodiversity and have a large number of water bird species (Eid et al. 2020). Lake Burullus is a brackish water lake of area 410 km², linked to the Mediterranean Sea via a channel known as “Al-Bughaz” or Burullus outlet, and situated within the Nile Delta in northern Egyptian coast on the Mediterranean Sea. The water depth extends from 20 cm along the shoreline to up to 2 m in proximity to Al-Bughaz. The principal flora is reed swamps as main plant species in the lake. This lake contributes to the fishing industry about 52,000 tons of fish, which are produced annually. Around 4 billion m³ per year of water drain into the lake from different agricultural areas within various main drains in the Nile Delta, which collects the effluent (Eid et al. 2021a). Several investigations on different problems facing this lake especially the pollution have published such as monitoring of pollution risks in water and sediments (Ghoraba et al. 2019; Melegy et al. 2019; El-Metwally et al. 2021; Eid et al. 2021b), pollution of tilapia fish (El-Batrawy et al. 2018; Abdel-Kader and Mourad 2020), pollution and phytoplankton dynamic (Masoud



Fig. 2: Burullus Lake is located in Kafr El-Sheikh Governorate. It is a brackish water lake in the Nile Delta in Egypt. It is located in east of Rosetta, bordered by the Mediterranean Sea in the north and agricultural land to the south. According to a Biodiversity Report of the Egyptian Environmental Affairs Agency 33 species of fish, 23 species of reptiles, 112 species of birds, and 18 species of mammals live in and around the lake. Fish species declined from 52 recorded at the beginning of the 20th century, mostly due to the inflow of agricultural drainage into the lake resulting in lower salinity (Wikipedia 2021).

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et al. 2021), pollution of water (Mohsen et al. 2021), and climate change (Shalby et al. 2020a, b), whereas very few studies on biodiversity like the environmental impacts on biodiversity (Younis 2019) and change detection in coastal wetland vegetation lake (Eid et al. 2020).

Red Sea (Shalateen region)

According to the *Egyptian Environmental Affairs Agency* (EEAA 2021), Egypt is surrounded by two largely enclosed seas (i.e., in the north the Mediterranean Sea and Red Sea in the east). The Red Sea is very rich in its species and nurtures reef systems, which are considered among the richest ones in the world. The mangroves and the reefs of the red sea are arguably among the most important biodiversity vehicles all over the world. However, the flora and fauna of the Red Sea region is essentially a modified version of threat of the Indo-Pacific and it also has relatively few endemic species. Ecosystems and habitats must be maintained to safeguard species. Species must be protected in order to conserve different habitats and ecosystems. In Egypt, the lack of the relatively large number of eco-zones and habitats and species abundance makes the preservation of both especially important. Marine environment of both Mediterranean and Red seas is distinguished by many endangered species and habitats particularly all marine mammals (17 *species*), sharks (more than 20 *species*), marine turtles (4 *species*), many birds (ospreys, sooty falcons, white eyed gulls) and mangrove trees. Egypt has more than 5000 species as a great marine biodiversity, which represented by 800 species of seaweeds, more than 800 species of molluscs, 600 species of crustacean, 350 species of *Echinodermata*, and 209 species of coral reefs as well as hundreds of species that have never been revealed until now as reported by Egyptian State Information Service (SIS 2021a).

The biodiversity of Red Sea regions is a common topic, which many researchers reported about it such as water quality of mangrove ecosystem (Masoud et al. 2019), and biodiversity of a new species of fish (Fricke and Abu El-Regal 2019). An increasing concern on Shalateen region and its potential for the Egyptian ecosystem (Alwany 2009), which focused on many recent sides including groundwater exploration (Mohamaden and Ehab 2017), distribution of natural radionuclides and their hazards (Arafat et al. 2017), the pollution of this region (Nour et

al. 2019), but the biodiversity in Shalateen region still needs more studies (Fig. 3).

Some Egyptian botanical gardens

The prevailing views of nature, its relationship with humans and their activities, and the resulting approaches to conservation have changed from a focus on species and wilderness over the last decades, which excludes humans to a focus on ecosystem services and functions to integrate both nature and people. The dominant view of pristine, central state-controlled global network of protected areas began to change into what researchers referred to a paradigm shift (Vimal et al. 2021). Changings in natural ecosystems are mostly irreversible causing alternations to the species diversity on the Earth, and finally lead to biodiversity loss. These changes were more rapid and obvious during the past 50 years. Therefore, plans and proactive actions to maintain sustainable ecosystems are urgently required in order to prevent further degradation of the ecosystems and their services or reaching a state of collapse (Ghoraba et al. 2021). According to CBD (2021), in Egypt 51 species of mammals beside 26 bird species and 26 reptile species are already endangered. The coastal ecosystems, which represent one of the most threatened natural habitats, suffer from endangered species (17 mammals, 20 shark species, 300 bird species, 150 fish species, 80 algae species, 20 coral species, 80 molluse species, 60 crustacean species), with many seaweed species also currently at great risk.

Al-Azhar botanic garden

Due to devastating human activities, an increased loss in plant diversity, which decreased the ecosystem services. These human activities may include the change in land use, urbanization, forest over-exploitation, exotic invasive species, and environmental pollution, which have endangered the existence of about a third of the world's 300,000–450,000 vascular plant species (BGCI 2021; Panahi et al. 2021). Recently, the number of botanic gardens in the world has been increased, which focused mainly on living conservation collections (Cavender et al. 2015). There are more than 3600 arboreta and botanic gardens in the world with more than 150,000 plants, 6 million accessions, and about 80,000 taxa, thousands of which are threatened with extinction in the wild (Chen and Sun 2018; Panahi et al. 2021). Thus, these gardens have a crucial role in the *ex-situ* conservation and



Fig. 3: Shalateen region is located in Red Sea Governorate. Shalateen (also spelled Shalatin or Shalatayn) is the biggest town in the Halaib Triangle (region), a disputed territory claimed by both Egypt and the Sudan. It is located 520 km south of Hurghada and is controlled as the administrative center of all Egyptian territory up to the border between Egypt and Sudan (Wikipedia 2021).

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exploration of both regional and global plant biodiversity (Mounce et al. 2017). Therefore, the Global Strategy for Plant Conservation aimed globally to the *ex-situ* conservation of 70 % of the world's threatened plant species, where at least 20 % could be considered for the restoration and recovery purposes (Silveira et al. 2018; Panahi et al. 2021).

On the other hand, due to pathogens and invasive plant pests, there are increasing globally loss in biodiversity. Although, botanical gardens could provide a unique opportunity for biosecurity because they accommodate diverse collections of native and exotic plant species, but sometimes these gardens can pose substantial biosecurity risks to the environment through acting as bridgeheads for pathogen and pest invasions (Wondafrash et al. 2021). Another dimension for botanic gardens as protected areas recently appeared regarding the spreading of pandemic diseases especially COVID-19 as reported by several studies (e.g., Liu and Wang 2021; Mandić 2021; Miller-Rushing et al. 2021; Smith et al. 2021; Souza et al. 2021; Terry et al. 2021). These studies confirmed that, the global spread of COVID-19 caused loss of economic prosperity, and lives, as well as reduced people's behavior and their habits during their daily activities. Based on the social distancing regulations and lockdowns during the COVID-19 spreading, more urban green space and more pocket park are needed for a better future after the COVID-19 (Liu and Wang 2021).

According to SIS (2021b), "*Al-Azhar Park is a public park located in Cairo, Egypt. Among*

several honors, this park is listed as one of the world's sixty great public spaces by the Project for Public Spaces. The creation of the 30 ha and located on Al-Darassa region, by the Aga Khan Trust for Culture, came when his highness the Aga Khan decided to donate a park to the citizens of Cairo in 1984, out of the Islamic belief that we are all trustees of God's creation and therefore must seek to leave the world a better place than it was before us. This Park has several functions as a green lung because of its enormous potential, being located at the center of a historic location. This Park is the largest green space created in Cairo in over a century and was indeed in great need of an open green space. The hilly topography of the site, formed by debris accumulated over centuries, now provides elevated viewpoints dominating the city and offers a spectacular 360 panorama over the townscape of historic Cairo" (Fig. 4). There is urgent need for investigation about the potential and great role of this park in Cairo from the removing pollutants from air and its plant biodiversity.

Orman botanic garden

The Orman Garden is one of the oldest and most famous Botanical gardens in Egypt, located at Giza and established Khedive Ismail Pasha in 1875. It occupies an area of 58 in the past but now 28 feddans and became a public botanical garden in 1910/1917 and put under the Ministry of Agriculture (Fig. 5). There is a pond with water and marsh-plants among, which are found the two most famous plants on ancient Egypt Papyrus and Lotus. There is also a rose garden 2 feddans and rarely species of Ficus, Palm, Bamboo and



Fig. 4: Al Azhar Park is located in Cairo Governorate. It was established in 2005. Among several honors, this park is listed as one of the world's sixty great public spaces by the Project for Public Spaces. The Park was created by the Historic Cities Support Programme of the Aga Khan Trust for Culture, an entity of the Aga Khan Development Network. This Park was developed at a cost in excess of USD \$30 million, its funding a gift to Cairo from Aga Khan IV, a descendant of the Fatimid Caliphs of Cairo (Wikipedia 2021).

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Fig. 5: Orman Garden is located in Giza Governorate. The Orman Garden is one of the most famous Botanical gardens in Egypt. It dates back to 1875 and the reign of Khedive Ismail Pasha who established the garden on a larger site than it presently occupies as part of the Palace of the Khedive. The garden covers about 28 fed. Today, the garden contains a rock garden, a rose garden, cactus gardens, and probably the most notable feature, the lotus pond. Orman Garden is located west of the River Nile and east of Cairo University in the Giza Governorate. "Orman" is a Turkish word, which means "the forest". A small botanical museum attached to the garden shelters herbaria dating from the Ismail khedive and furniture from the king Farouk (Wikipedia 2021).

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Conifers. Orman Garden is located west of the River Nile and east of Cairo University in the Giza Governorate. “Orman” is a Turkish word, which means “the forest” (Abdel-Rahman 2016; BGCi 2021; SIS 2021c). There is urgent need for studies about the potential and great role of this park in Giza from the removing pollutants from air and its plant biodiversity.

Aswan botanic garden

Aswan botanic garden is considered one of the best features in Aswan, where the visitors can sail on a local boat (felucca or a motor boat) to the eastern bank of the Nile. This garden is located completely on an island, which called the island of plants (in Arabic Geziret El Nabatat). This island is also called “Kitchener Island”, because Lord Kitchener established this island as the headquarters for his army in 1899 during



Fig. 6. Aswan botanical garden was established in 1882 at Aswan Governorate. The Aswan Botanic Garden is located on the island of plants (El Nabatat). The island, as a whole, constitutes the Aswan Botanic Garden. One can view the many types of subtropical, exotic, and rare plantings and trees such as the Royal Palm tree and the Sabal Palm tree. The collection was begun by Lord Kitchener and cared for since. The island and gardens can be reached by felucca that reaches the Southeastern side of the small island (Wikipedia 2021).

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his military campaigns in Sudan. Since 1928, the ministry of irrigation has transformed the island to feature trees from the 5 continents. There are a huge variety of plants at Aswan botanical garden including many types of exotic, subtropical, and rare plantings and trees such as the Sabal Palm tree and the Royal Palm tree. There is urgent need for studies about the potential and great role of this park in Aswan from different point of view especially the plant biodiversity.

Conclusions

Egypt has many great and wonderful nature reserves or protected areas (i.e., protectorates), which represent more than 15% from the total area of Egyptian land. These protectorates established according to Law 102 of year 1983, which declared by the Egyptian government. These nature reserves or protectorates may include 30 protectorates beside 14 will be listed as nature reserves in the future in different regions in Egypt. Over the last decades, massive Egyptian efforts have been made to both increase and assess the amounts of land, which could be dedicated to biodiversity conservation, however,

different strategies for biodiversity management should be implemented across the network of protected areas to protect the biodiversity. This global network of protected areas should be considered the cornerstone of conservation policies, which are essential for the reduction of biodiversity loss. These protected areas could be contributed to different alternative goals, which include climate change mitigation, tourism and community development, poverty alleviation, the sustainable use of resources, and the preservation of indigenous cultures. Therefore, this is a call for submission articles to be published by EBSS, including all published materials by the journal.

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This article does not contain any studies with human participants or animals performed by any of the authors.

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