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Integrated Resource Management Policy of Wetland Between Threat, Conservation, and Wise Use

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ABSTRACT
There is a unique appreciation that wetlands, in all their classifications, provide exceptional services to humans (communities and recreation) and ecological systems; therefore, they need wise management procedures for the present and the future. The Convention on Wetlands is an intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. Wetland loss is the loss of wetland area due to human activities converting wetlands to non-wetland areas. Wetlands are essential to the global hydrological cycle because they provide water for human use, agricultural production, recreation, and the survival of biological diversity. In addition, wetlands provide food (particularly fish, rice, and other natural resources) and fiber (such as wood, peat, and reeds); they are also rich in rare plant and animal species and serve as sites for economic development based on industry, transportation, food production, and tourism. Wetlands are facing social, financial, and environmental challenges across the globe as a result of degradation and poor management, particularly disregard for their economic values. This study aims to highlight the importance and challenges of wetlands. Moreover, it presents an action plan for the conservation and wise use of one of the vital ecosystems, wetlands, for keeping ecosystem functions for human benefits, biodiversity, and the reduction of loss/degradation.

Keywords: *Action Plan; Ramsar Convention; Threats to wetlands; wetlands functions; wetlands in Egypt*.

1. Introduction

Wetlands are areas of land between terrestrial and aquatic ecosystems, typically with shallow water covering the ground or the groundwater level at or near the ground surface. Any place that is covered permanently or seasonally in water is referred to as a "wetland" [1]. Wetlands are the base for animal populations. They extend an offer. Swamps and ponds are home to specific plant species only. Fish, birds, and plants are just a few animal species that depend on wetlands for food and habitat. Wetlands rank among the world's most biologically productive natural ecosystems. A wetland is necessary for the reproduction of various species. Wetlands offer feeding places, resting, and nesting thus more migratory birds get there. As previously indicated, the variety of wildlife that wetlands attract and their attraction serve to either support or sustain a wide range of activities [2].

Examples of these locations include tidal flats and areas that are overflowed near lakes, rivers, rice fields, or swamps. In addition to recycling nutrients, purifying water, reducing the intensity of floods, replenishing groundwater, and providing drinking water, fish, fodder, fuel, and habitat for wildlife, wetlands also regulate the rate of runoff into urban areas, protect shorelines from erosion, and provide recreational opportunities for the general public. Despite having features from both habitats, they cannot be categorized as aquatic or terrestrial. The key factor is the existence of water for a significant duration of time, which affects the microbes, plants, and animal diversity, soil composition, and overall function of the land, making it distinct from both aquatic and arid environments. An attempt has been made by researchers to evaluate the economic benefit of wetland. Mitsch and Gosselink [3] assessed the economic value of the ecological services that different ecosystems offer in comparison to the cost of facilities to do the functions.

2. Research Significance

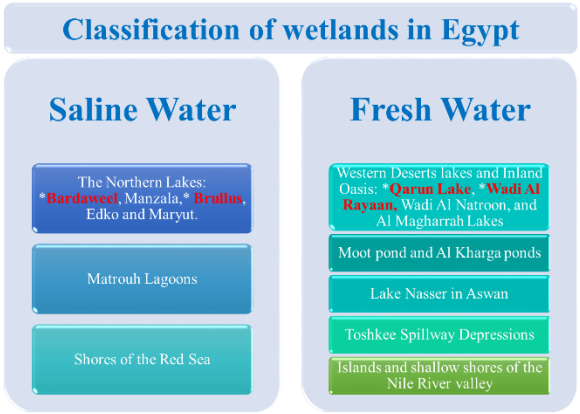
Wetlands provide a variety of vital functions for both people and wildlife. Therefore, the essential importance function of wetlands will be addressed.

Monitoring the growth of the economic value of wetlands over recent years. Wetlands, throughout the world, suffer several problems, therefore, this study summarizes the obvious and underlying reasons behind the loss, threats, and degradation of wetlands. Monitoring the total area of Egypt's wetland from 2000 to 2020 by analyzing the reports presented by the Organization for Economic Co-operation and Development. The proposed Action Plan for Egyptian Wetlands, Predicted Outcomes, and Performance Indicators will be presented as a guide for the promotion and implementation of conservation of wetlands procedures and strategies in Egypt. The general aim of this study is to conserve wetland potential to meet the needs and aspirations of future generations.

3. The main sites of wetlands in Egypt

The Northern Lakes, Matrouh Lagoons, Western Deserts lakes and Inland Oasis, Western Deserts lakes and Inland, Lake Nasser in Aswan, Toshkee Spillway Depressions, Islands and shallow shores of the Nile River. Figure (1) shows the location of wetlands in Egypt, and Figure (2) shows the classification of wetlands in Egypt.

Figure 1- The Location of Wetlands in Egypt.



* Ramsar Sites in Egypt.

Figure 2- The classification of wetlands in Egypt

4. The Convention on Wetlands of International Importance (Ramsar)

Ramsar Convention is a crucial intergovernmental Convention on Wetlands promoting the conservation and wise use of wetland through local, regional, and natural actions and international cooperation, as a contribution towards achieving sustainable development throughout the world. First implemented in 1971 in Iran, this is the oldest intergovernmental environmental agreement. Ramsar Convention can be used as an adjective to refer to any conservation site covered by this treaty. The Ramsar Convention adopts a broad approach in classifying the wetlands in the text of the Convention as Areas of marsh, peat water or land, fen, whether artificial or natural, temporary or permanent, with water that is flowing or static, fresh, salt or brackish, including areas of marine water, the depth of that at low tide less than 6 m. There are a total of 376 Ramsar sites in Africa, 4 sites in Egypt [4] (See Table (1)). Figure (3) shows the location of four Ramsar Sites in Egypt.

Figure 3- The Location of Ramsar Sites in Egypt.

Table 1- Ramsar Sites in Egypt.

1-Wadi El Rayan			
Designation date	Administrative region	Area (ha)	Location
4 Jun 2012	Fayoum	175,790	29°12'N 030°18'E
2-Lake Qarun Protected Area			
Designation date	Administrative region	Area (ha)	Location
4 Jun 2012	Fayoum	134,042	29°34'N 030°35'E
3-Lake Bardawil			
Designation date	Administrative region	Area (ha)	Location
9 Sep 1988	North Sinai	59,500	31°05'N 033°05'E
4-Lake Burullus			
Designation date	Administrative region	Area (ha)	Location
9 Sep 1988	Kafr El Sheikh	46,200	31°30'N 030°50'E

Source: https://www.ramsar.org/

5. The requirements of the Ramsar Convention

The requirements of the Ramsar Convention are summarized in the context of "three pillars", whereby the Contracting Parties undertake to:

- Inscribe appropriate wetlands on the List of Wetlands of International Importance ("the Ramsar List") and ensure their effective management.
- Work for the wise use of all their wetlands.
- Cooperate at the international level on transboundary wetlands, shared wetland systems, and shared species.
-

6. Importance of Wetlands

Wetlands are vital for human survival. They are among the world's most productive environments, cradles of biological diversity that provide the water and productivity upon which countless species of plants and animals depend for survival. The Convention on Wetlands is an intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. Human activities were attributed to development and land use caused drained and filled-in wetlands to be used for development projects for human benefits. Therefore, these activities have a negative effect on the wetlands area by causing a decline in its area partially or totally. This vision does not pay attention to the value and functions associated with them. Wetlands are an integrated ecosystem that includes the soil, water, and plants and animals are among the Earth's ecological systems' most productive ecosystems. Wetlands support rich biodiversity through its hydrogeological and hydrological cycle through the interaction between groundwater, surface water, and atmosphere.

7. Wetlands serve important functions

Wetlands assist both people and wildlife and provide a variety of vital functions. Millions of people are directly supported by wetland ecosystems. These ecosystems provide humans with products and services. Wetland soils are used for agriculture, wetland trees are cut down for fuel and lumber, wetland reeds are used to produce mats and thatch roofs, and people catch and consume wetland fish. Direct use can also mean scientific research or recreational activities like sailing. In addition to their direct use, individuals gain from the functions or services provided by wetlands. Floodwater is temporarily preserved as it flows over floodplain wetlands, which decreases the river's highest level and postpones its peak period, potentially helping riparian communities downstream.

In the following section, many of the wetland functions will be addressed.

Fish production: Wetlands in Egypt play a significant role in fish production. For example, the fish production from the Northern Lakes is about 197.973 $*10^3$ tons, and the total fish production is 2010.6 $*10^3$ tons in 2020 [5].

Restrict Erosion: During floods, wetlands' supporting vegetation serves as a buffer against flooding and decreases the erosion of stream banks.

Store floodwater: When flooding occurs, wetlands keep water, which is subsequently gradually released after the flooding moves on.

This can significantly decrease peak flood fluxes and the subsequent downstream flood damage. In times of rain, wetlands also act as a reservoir for runoff water.

Recharge of groundwater: Wetlands keep surface water, which escapes under the ground and recharge aquifers. In turn, this groundwater recharge gradually returns to nearby surface water basins, supplying them with water during times of low flow. Natural flood plains have the potential for recharging groundwater that is utilized for dry agricultural land.

Purification of Water: this process occurs by filtering contaminated runoff from agricultural regions and urban regions, they break down several aquatic pollutants, absorb excess nutrients from runoff, and trap sediments. Contaminated water from

mines, sewage systems, and urban runoff is treated by a wetland system that is filtered by these reservoirs. Wetlands can filter away silt, nutrients, and toxic substances before they reach the water table below. The wide variety of plants, each with unique physiological capacities, keeps nutrients and toxic substances from building up and upsetting the wetland's natural cycle. For these previous reasons, wetlands enhance the quality of water.

Storm protection: Preventing storms may have indirect use value by lowering property damage.

Shoreline stabilization: A wetland's ability to stabilize the shoreline has great value by reducing waterfront building damage.

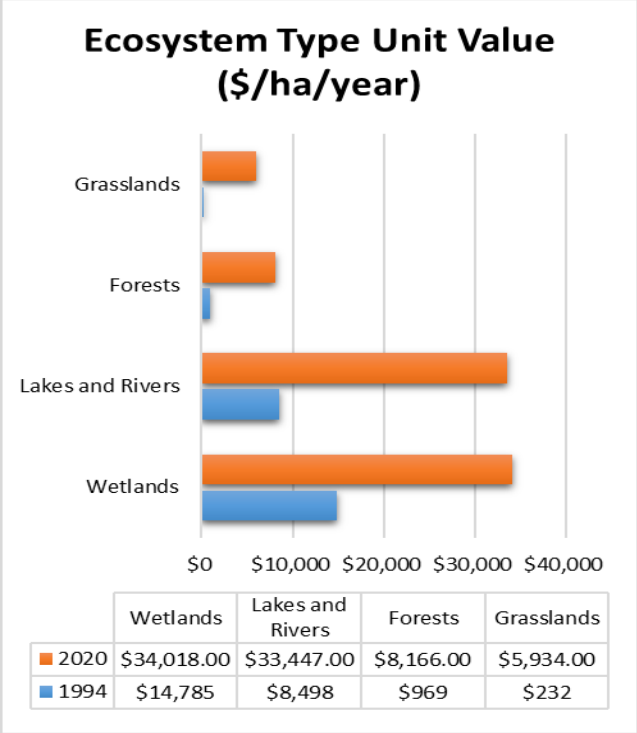
Wildlife habitat - Wetlands are one of the most vital environmental structures in neural entity. They are providing adequate habitat for invertebrates, amphibians, birds, fish, reptiles, and mammals. All these species depend on wetlands regions for their life cycle. Additionally, these grounds serve as a breeding land for migrating birds. They congregate in wetlands for water and escape from the sun's heat. For example, the mangrove systems serve as fish and shrimp nurseries and breeding grounds, which are vital to coastal and marine fisheries. Nevertheless, these vital habitats are currently being quickly transformed for aquaculture, especially shrimp ponds, in many places.

The economic value: Wetlands provide many economic benefits, from tourism and recreation to fishing, agriculture, and flood protection. Therefore, investing in their conservation and sustainable management represents long-term economic value. Each ecosystem category has a total value “dollar per hectare per year” ($/ha/year), based on evaluating a set of environmental services the ecosystem presents.

Mitsch and Gosselink (2000)[3] assessed the economic value of the ecological services that different ecosystems offer compared to the cost of having facilities designed by humans to carry out the services. Compared to other habitats, wetlands were valued much more.

The Ecosystem Services Valuation Database (ESVD) provides an international synthesis of the monetary value of the environmental services that 15 terrestrial and marine biomes supply. Data from more than 1,300 research projects have been gathered and arranged, resulting in more than 9,400 monetary value estimations. Estimates in the ESVD are standardized to a common set of units ($/ha/year) to facilitate value synthesis and comparison.

Figure.(4) shows a comparison of the ecosystem-type unit value of units ($/ha/year) between data, that has been collected and organized in units (($/ha/year) at year 1994 price levels) [6] and the Ecosystem Services Valuation Database (ESVD) in units ($/ha/year) at year 2020 price levels) [7].



	Wetlands	Lakes and Rivers	Forests	Grasslands
2020	$34,018.00	$33,447.00	$8,166.00	$5,934.00
1994	$14,785	$8,498	$969	$232

Figure 4- Comparison of the ecosystem-type unit value of units ($/ha/year) for 1994 and 2020.

From the previous chart, it can be noted that there is a growing wide appreciation for the economic value of wetlands as a result of their unique ecosystem services. On the other hand, some people want wetlands to be protected "in their own right" even when they do not actively use them. Existence value is another term for this kind of "intrinsic" value. This is one of the forms of non-use value. Figure. (5) shows the summary of the direct use and indirect use of wetlands [8].

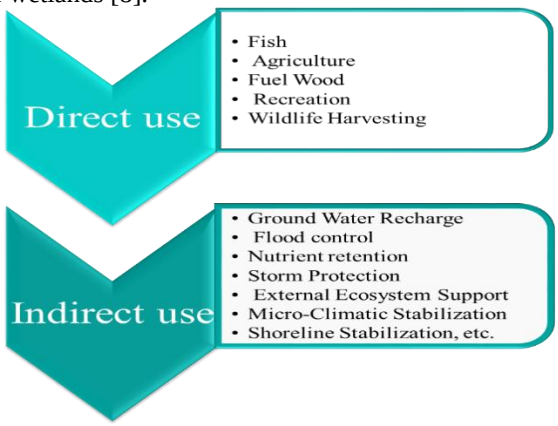


Figure 5- The summary of the direct use and indirect use of wetlands

8. Threats To Wetlands

Since 1970, we have lost 35 percent of the world's wetlands, and we are still losing them at a rate that is faster than that of forest loss [9]. Wetlands' loss and degradation set off a dynamic effect that exacerbates the hazard of floods, droughts, and wildfires while contributing to the decline of biodiversity and stressing food and water resources.

The ecological and environmental issues that took place by the disappearance of wetlands directly affect the socioeconomic advantages enjoyed by the local population. There could be severe repercussions, such as an increase in flooding, a decline in species, their deformity or extinction, and a degradation in water quality. Additionally, wetlands play a crucial role as a genetic storehouse for many different plant species, including rice, which is a staple meal for three-quarters of the world's population. Identifying the threats facing wetlands greatly helps in developing solutions when studying the restoration of water resources, especially lakes [10].

9. Wetlands loss and degradation

Wetland loss is the loss of wetland area due to human activities converting wetlands to non-wetland areas. Additionally, Hydrological alteration has an impact on the values, characteristics, functions, and external features of wetlands.

9.1. The obvious reasons behind the loss, threats, and degradation of wetlands

— **Anthropogenic activities**

- ***Urbanization:*** Wetland systems along rivers or coasts are drained to build more waterfront construction.
- ***Reclamation land projects :***Conversion of wetlands area to agricultural land for investment.
- ***Removal of biomass***: the removal of biomass from national wetlands for energy.
- ***A region's hydrology is dramatically changed :*** making it possible to use flowing water as a source of energy. Energy has many known advantages, but it also affects the ecological system.
- ***Deforestation:*** removing wetlands to make space for different human activities. It causes soil erosion.

— **Irrigation works:**

- ***Hydraulic structures:*** The hydrology of the wetlands was dramatically changed by the construction of irrigation works such as canals, dams, and reservoirs. The wet area is being threatened by dams and other barrages that divert water from these flood plains.
- ***Hydrological adjustments:*** include elevating the surface elevation to prevent flooding or draining water from wetlands.

— **Pollution:**

- ***Decrease in Biological Diversity:*** Many sources of pollution such as Sewage, industrial pollution, and agricultural runoff, may contain chemicals such as fertilizers, pesticides, and herbicides
- ***Degradation of water quality:*** The sewage, agricultural runoff, and industrial pollution, which contain pesticides and fertilizers could cause the degradation of water quality for wetland.

— **Salinization:**

Wetland water chemistry is significantly impacted by salinity, especially in coastal wetlands. Particularly, in areas with significant precipitation deficits that are arid or semiarid. The interactions between surface and groundwater control natural salinity. These interactions may be impacted by human activities.

— **Climate Change:**

Wetland biodiversity is predicted to be further lost and degraded as a result of global climate change, affecting both migratory and non-migratory species that depend on many wetlands at different phases of their life cycles.

9.2. Underlying reasons behind the loss, threats, and degradation of wetlands

A limited realization of the underlying causes of the loss and degradation of wetlands is often one of the actual reasons for the continuous loss. Understanding the major drivers of changes can guide to the ways to adequate management actions. It may be effective when it relates to wetland management. The three Underlying reasons behind the loss, threats, and degradation of wetlands are mentioned below.

— **Informational failure:** People are not aware of the benefits of preserved wetlands.

— **Market failure:** The inability of markets to fairly price the goods and services that preserved wetlands provide.

— **Intervention failure:** Wetland loss and degradation result from inconsistent inter-sectoral policies and an inadequate integrated resource management policy. Figure. (6) Shows the direct and indirect reasons behind the loss, threats, and degradation of wetlands.

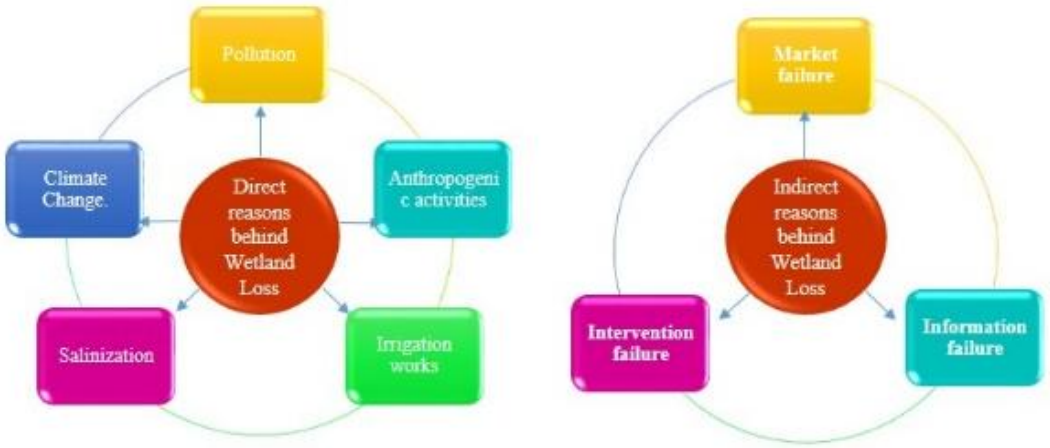


Figure 6- The direct and indirect reasons behind the loss, threats, and degradation of wetlands.

10. Egypt Land Cover: Wetland.

Egypt Land Cover: Wetland: In 2020, a total area of wetland of 10,689.000 km2 was reported. Compared to the previous record for 2015, which was 10,691.000 km2, this indicates a decrease. Egypt Wetland: Cover of Land Every year, the entire data set is updated with five observations, averaging 10,729.000 km2 from 2000 to 2020. The data set a record low of 10,689.000 km2 in 2020 and a record high of 10,738.000 km2 in 2005. (See Figure. (7)).source:-Egypt Land Cover: Wetland: Total data remains active status in CEIC and is reported by Organization for Economic Co-operation and Development. The data is categorized under Global Database's Egypt – Table EG.OECD.ESG: Environmental: Land Cover: Non OECD Member: Annual.

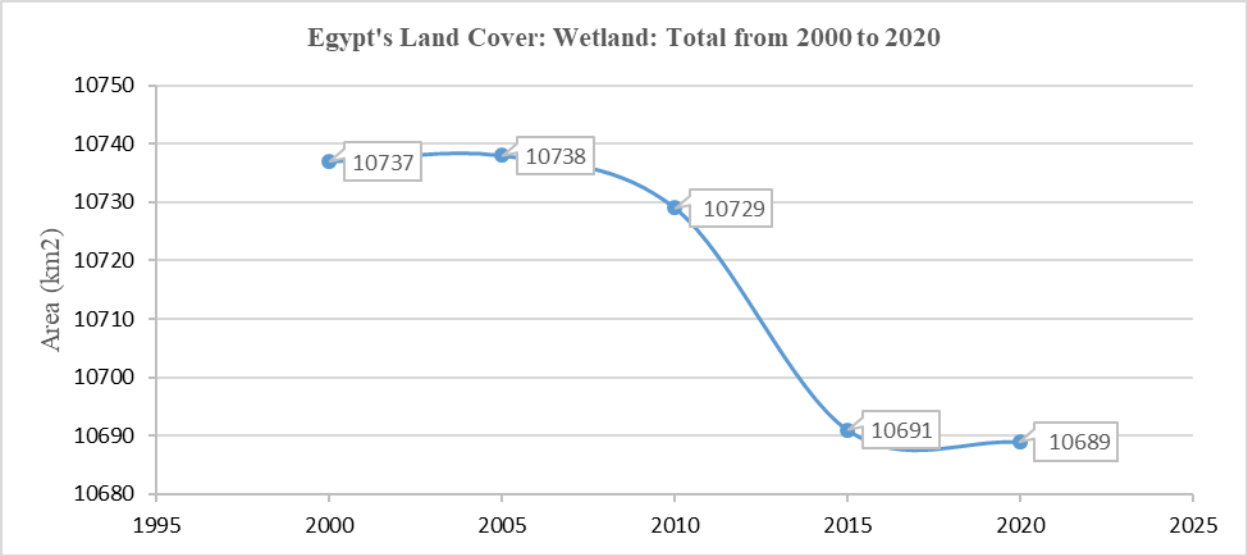


Figure 7- The total area of Egypt's wetland from 2000 to 2020.

11. The proposed Action Plan for Wetlands

The proposed Wetlands Action Plan serves as a guide for the promotion and implementation of conservation of wetlands procedures and strategies in Egypt. The proposed Action Plan provides a framework for all relevant sectors of society such as the business sector, government and non-government agencies, local organizations, business sector, and indigenous people, to keep ecosystem functions for human benefits, biodiversity, and reduction of loss/degradation, the management and wise use of wetlands for their benefit by the current and future generations, Table (2).

Table 2- The proposed Action Plan for Wetlands

Action Plan (General Strategies)		
Action (1)	Goal	Activity
Developing Wetlands Policies	Clear policy on wetland conservation considering its wise use according to threats	• The economic, cultural, and social values of wetlands have to be taken into account by organizations or agencies during the setup of development plans so as not to conflict with beneficiaries and stakeholders. • The necessity of adhering to international and regional agreements to ensure the sustainability of wetlands and their optimal exploitation • The integrated implementation of national plans that belong to wetlands will require effective and flexible communications between organizations, civil society, and the private sector. Additionally, the consistency between non-governmental and governmental organizations in applying and conducting these plans. • Commitment and follow-up of the Ramsar Convention applications of the wise use principle and guidelines.
Action (2)	Goal	Activity
Protecting Ecosystem of wetlands	Sustainable utilization of ecosystem and habitat of wetlands	• Allocate some of the existing wetlands to be a natural protectorate. • It is required to make affective Environmental Impact assessments for development projects that are built on wetlands. • Preparing annual reports on all wetlands and identifying improvement plans for restoration or rehabilitation and stopping wetlands loss any more.
Action (3)	Goal	Activity
Enabling strategies	Promoting the culture of the conservation of wetlands	• Wetlands conservation is a national priority. Therefore, they have to be a part of the effective national country development strategies. • Setting up and increasing the awareness program concerning the value of wetlands as natural resources that should be protected, managed, and developed in local communities. • Establishment special authorities with main targets of wetland conservation, rehabilitation, and management. • ensuring that all stakeholders participate in wetland • Establishment of a special database of the existing wetlands that provided all information belonging to wetlands such as maps, productions, products, stakeholders, etc. • Activating the role of scientific research by the academies of national science, educational institutions, and national technical and scientific agencies. • Encourage the students in local schools to get educational trips to see various animals and plants and to introduce the wildlife.
Predicted Outcomes		Wetlands in Egypt are ecologically valid, therefore they are able to present products and to serve their functions.
Performance Indicators		Applying obvious policies on wetlands conservation considering its wise use, strict enforcement of various laws influencing the wetlands. Databases established, Maps created, and policies revised/optimized periodically..

12. Conclusions

Wetlands and their importance as a natural resource should be protected and developed in the long run. Wetlands are the foundation of wildlife populations. They offer. Certain plant species are unique to swamps and ephemeral ponds Wetlands are essential for the shelter, habitat, food, and of a wide variety of animal species, including fish, birds, reptiles, amphibians, and plants. For several species, a wetland is a prerequisite for reproduction. Wetlands provide sites for resting, feeding, and nesting, which attracts more migratory waterfowl. The wetlands' attraction and the variety of flora and fauna they draw either sustain or contribute to support many different industries and activities.

1. This research is significant to value the threats and wetland-wise uses, therefore, the decision-makers should take these evaluations into their account when they make policies that relate to wetlands.
2. The government agencies should take substantial proceedings based on these evaluations when they make strategic plans that belong to the conservation or utilization of wetlands, especially in developing countries by optimum use for regional and domestic resources.
3. In most cases, it is necessary that take into account the value of option value when the decision-makers are uncertain about the future demand. Therefore, it is preferred to incorporate the option value into the strategic analysis by contrasting the results of the prior and current evaluations, identifying improvement procedures, and setting up development schedules.
4. This data offers a foundation for value to guide decision-making in the current policy contexts, context-specific value determinants must be appropriately taken into account and adjusted for.
5. Wise use of wetlands is achieved by the conservation of their ecological character by applying the ecosystem procedure via the sustainable development context.

Since Egypt is a signatory of the RAMSAR convention on wetlands and other regional and international agreements for the conservation of biodiversity, plans for the conservation of wetlands should take Egypt's role in the region and internationally into account. The Convention defines wise use of wetland to be "their sustainable utilization for the benefit of human kind in a way compatible with the maintenance of the natural properties of the ecosystem" as well as the sustainable "*human use of a wetland so that it may yield the greatest continuous benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations*".

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