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Editorial

**Climate Change Impact on the Ecosystem of Nasser Lake, Egypt**

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Global warming and climate change are the most prominent issues of the current environmental scenario. These problems arise due to higher concentration of greenhouse gases in the atmosphere which exert a warming effect. Although much attention has been given to anthropogenic sources and impacts of these gases, the significance and implications of microorganisms have remained neglected. The aquatic ecosystems are no less relevant to the issue of climate change.

There is now overwhelming scientific consensus that climate change is happening. The main indicators of the climate change are rapid changes in global temperature, small average global temperature, extreme weather patterns, super-storms, rising sea levels, increasing ocean acidification, increase in pests and disease, failing agricultural output; increase in world hunger. With global warming on the increase the living species and their habitats are on the decrease and chances for ecosystems to adapt naturally are diminishing. Global warming impacts on natural resource uses and management are threatened by extreme weather events that reduce ecosystem services and species abundance and distribution. Ecosystem approaches to mitigate global warming impacts on ecosystem services requires continuous monitoring of ecosystem components using case studies.

Microbial abundance is inversely related to abundance temperature in aquatic ecosystems. Temperature affects growth rates in both marine and freshwater microalgae (Butterwick et al. 2005). These organisms exhibit quick responses to changes in climate. Due to increased temperatures, metabolism and growth are likely to increase in some microalgal species. Among other intolerant species, competitions could be altered at the species and community levels. The resulting consequence would be the composite effect of complex interactions between climate change and other environmental factors (Beardall and Raven 2004).

The High Dam Lake, commonly known as Nasser Lake, is a man-made basin formed due to the construction of the Aswan High Dam in the 1960s. The Lake extends south to the Sudan and represents the national freshwater bank of Egypt. The only source of for the Lake water is the River Nile inflow from the Nile Basin countries, particularly Ethiopia in south. Lake Nasser is situated in a very hot and dry region, and lose up to 10% of its water volume to evaporation annually. The lake provides good habitat for establishing the community structures for many plants, algae,

animal, and microbial species that play an important role in providing habitat complexity, including food to aquatic animals, nutrient recycling, and nesting for both fish and birds.

The impacts of the climate changes were not sufficiently considered in previous studies dealing with the causes of biodiversity degradation in Lake Nasser. These changes may result in long periods of drought and increased temperature and wind speed. The climate changes will also most likely affect the Lake ecosystem structure and stability through changing community species types, distribution and richness of most of the aquatic flora and fauna, as well as the microorganisms, due to habitat changes or degradation.

Since the first filling of the Lake Nasser, regular studies have been done on the various aspects of the lake species biodiversity and social and economic functions, by research workers, experts. However, several environmental issues of ecosystem and threats to biodiversity in the Nile Basin countries provide a partial illustration of threats to the diversity of the ecosystem and the habitat types, examples include, inefficient water use, water pollution, population pressure, land degradation, deforestation, over hunting. In addition, Lake Nasser suffers threats to its ecosystem diversity and sustainability, such as development of agricultural land, diminishing natural habitats, excessive grazing, fishing, and sedimentation (Abdel-Meguid, 2016). However, the impacts of the climate changes were not sufficiently considered. These changes may change the amounts of rainfall on the Nile Basin with the presence of periods of drought increase temperature and increase wind unit. The climate changes will most likely affect the ecosystem structure and stability through changing community structures and the species richness of most of the aquatic flora and fauna, due to habitat loss or degradation

Few studies have been done on the flora and fauna components of the Lake and its shores. A few plant records of the shoreline vegetation of the Hgh Dame Lake were published by means of morphological characteristics and functional traits of plants established phase as published in literature reviews. The strategy analysis of submerged lake macrophyte communities and morphology was studied (Ali 2003)

Lake Nasser's fauna is considered one of the main components of the food web in the lake ecosystem. More recent studies were done by Iskaros et al. (2011) on the influence of the substrate quality on the benthic fauna in Aswan reservoir. Mola and Abdel-Gawad (2014) addressed the spatial and the temporal variations of macrobenthic fauna and observed that spring highest population density was reported in the Spring. Abdel-Gawad and Mola (2014) found 24 macrobenthic invertebrate species in Lake Nasser's mainstream in 2013. Recently, biodiversity and distribution of microbenthic invertebrate communities in Lake Nasser revisited was studied by Nassif (2021). This investigation was dedicated to monitoring the macrobenthic invertebrate groups inhabiting the mainstream of Lake Nasser (distribution, abundance, and diversity of macrobenthic invertebrates in relation to different physico-chemical parameters and seasonal variation).

Amany and Radwan (2021), studied the variability response of aquatic macrophytes in inland lakes: A case study of Lake Nasser, and found that only three submerged macrophyte species (*Myriophyllum spicatum*, *Potamogeton schweinfurthii* and *Najas marina*) were detected at Lake Nasser. The composition and structure of the submerged macrophytes community had a pronounced impact on fish production and diversity in the Lake. As the Lake is located in the subtropical region, where warm water fosters plant growth, the dangers of some macrophytes may be high. Therefore, additional studies are needed to avoid the negative effects of climate

change and the impact of the Renaissance Dam on Lake Nasser and to optimize the most benefit of its aquatic macrophytes.

Few projects were conducted on the impact of climatic change in Nasser Lake. The applied action research project titled "New Land, New Life" Adaptation to Climate Change (Near East Foundation, 2010) was run in Nasser Lake and aimed to studying the possible human and environmental effects of climate change on the new resettlement area west of the High Dam Lake in Aswan and the linkages between climate change and factors such as water and vector-borne diseases, land degradation and management methods, temperature fluctuations, agriculture, and socio-economic aspects of the settlers' community. Another project was run by the Institute for Technologies in the Tropics University of Applied Sciences, Cologne (Cologne 2008) titled "Semester project. Sustainable Rural Infrastructure Management in the Lake Nasser Region- Upper Egypt". It ended to achieve profitable cultivation of the land related to the Potential Evapotranspiration in the lake water

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