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The Effects of Wetland Degradation on Ecological Species

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Abstract:- Wetlands are vital ecosystems that provide numerous ecological services, including flood control, water filtration, carbon sequestration, and habitat for diverse flora and fauna. However, human activities such as urbanization, agriculture, and infrastructure development have led to widespread wetland degradation worldwide. Wetland ecosystems diminished by 21-35% between 1700 and 2020 as a result of human interference, with at least 1.3 million square miles of wetlands lost globally—an area about the size of Alaska, Texas, California, Montana, New Mexico, and Arizona combined. This research used a documented methodology for extracting information from different books, conversations, conferences, and international organizations to understand the effects of wetland degradation on the decline of species and strategies for wetland conservation and restoration.

This paper aims to elucidate the multifaceted effects of wetland degradation on ecological species. The results indicate that wetland degradation declines water quality, leading to alterations in water flow patterns, decreased groundwater recharge, and increased flooding downstream. This can result in the loss of biodiversity, as many species depend on specific water levels and habitats within wetlands. Moreover, the loss of wetlands diminishes their volume to store carbon, contributing to greenhouse gas emissions and exacerbating climate change. Furthermore, wetland degradation compromises water quality by reducing the natural filtration and purification functions of wetlands. Contaminants from agricultural runoff, industrial discharge, and urban pollution accumulate in degraded wetlands, posing risks to human health and aquatic ecosystems. Additionally, the loss of wetlands exacerbates erosion and sedimentation, leading to habitat destruction and loss of coastal resilience against storms and sealevel rise.

Addressing wetland degradation requires a multifaceted approach, including policy interventions, restoration efforts, and public awareness campaigns. Effective wetland conservation strategies involve the preservation of existing wetlands, restoration of degraded ones, and sustainable management practices to mitigate further degradation. Collaborative efforts between governments, NGOs, local communities, and stakeholders are essential to safeguarding these critical ecosystems and the invaluable services they provide to the environment and society.

Keywords:- *Wetland Degradation, Species, Biodiversity, and Ecosystem.*

I. INTRODUCTION

A wetland is an area of land that experiences seasonal or permanent saturation with water to the point where it develops its unique ecology. The main functions that wetlands do for the environment are water filtration, flood control, carbon sequestration, and coastal stability. Additionally, wetlands are thought to have the greatest ecological diversity of any type of environment, supporting a broad array of flora and fauna (Ramsar, 2017). The survival of humans depends on wetlands. They include some of the most productive ecosystems on the planet and offer ecosystem services that have innumerable positive effects (Kamble et al., 2012) (McInnes & Everard, 2017). Wetlands are essential ecosystems that consist of permanently or periodically flooded freshwater areas, including lakes, rivers, and swamps, as well as coastal and marine environments like estuaries, lagoons, mangroves, and reefs. The global water cycle plays a crucial role in sustaining these ecosystems by supporting primary production, nutrient recycling, and providing freshwater and food resources for people (Ramsar, 2018b). Wetlands are used for hydropower and transportation. They supply medicines as well as inherited assets and raw materials. They also provide support in safeguarding coastlines, reducing floods, and storing and sequestering carbon. Many are essential for inspiration, leisure, culture, and transcendent values (Russi et al., 2013).

Worldwide inland and coastal wetlands cover over 12.1 million km2, a region bigger than Canada, with 54% permanently inundated and 46% seasonally immersed. Figure 1 shows the territorial dispersion % of wetland regions with different continents. Yet, characteristic wetlands are permanently depleting all over the world; where data is available, between 1970 and 2015, both inland and marine/coastal wetlands decreased by about 35%, which is three times the rate of loss of woodland vegetation (Ramsar, 2018a).

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Wetland loss/degradation results in an associated reduction in ecosystem services delivered by wetlands, such as provisioning services, including food and fresh water; regulating services, such as flood control, storm protection, drought buffering, groundwater recharge and discharge, and carbon sequestration; cultural services, such as recreation; and supporting services, such as water supply purification, shoreline stabilization, and erosion control; retention of nutrients. The ecosystem services associated with human health largely involve the supply of water, food, nutrition, and medication, as well as waste purification and buffering against detrimental floods and climatic effects (Ramsar, 2018a). However, the causes of wetland degradation are direct and indirect. Anthropogenic activities such as land use change, agriculture activities, industrial development, expansions of different cities, and high population growth are threats to wetland degradation worldwide (Kuchara et al., 2023). Climate change and natural factors include heavy rainfall, earthquakes, drought, flooding, and landslides prevailing wetlands which led to degradation (Thomas, 2017). Wetlands across the world are under threat from both direct and indirect human activity. Direct human activity encompasses several sorts of land use change (Alavaisha, 2020), causing wetland degradation and loss by changing water quality and quantity; increasing pollution, and changing the species composition. Indirect (non-ecological) activities include natural hazards and a lack of coordination in the management of wetlands (REMA, 2020).

Wetland degradation has significant impacts of economic loss, Loss of Biodiversity, Impact on Wildlife, Water Quality Degradation, Increased Flooding, and Erosion, Carbon Emission, and Climate Impact (Nimusima, 2019). For instance, addressing the environmental impacts of wetland degradation is crucial for safeguarding these ecosystem ecological services, protecting biodiversity, ensuring water quality, mitigating climate change, and preserving cultural and economic values. Conservation efforts, restoration projects, sustainable land-use practices, and policy interventions are essential to prevent further degradation and restore the health of degraded wetlands. In addition, the overall objectives of the paper are to address the negative environmental impacts of wetland degradation or wetland loss can help to mitigate these issues to achieve the Ramsar Convention goals, sustainable development goals, and Millennium development goals of maintaining environment protection and sustainable wetland management with ecofriendly environment.

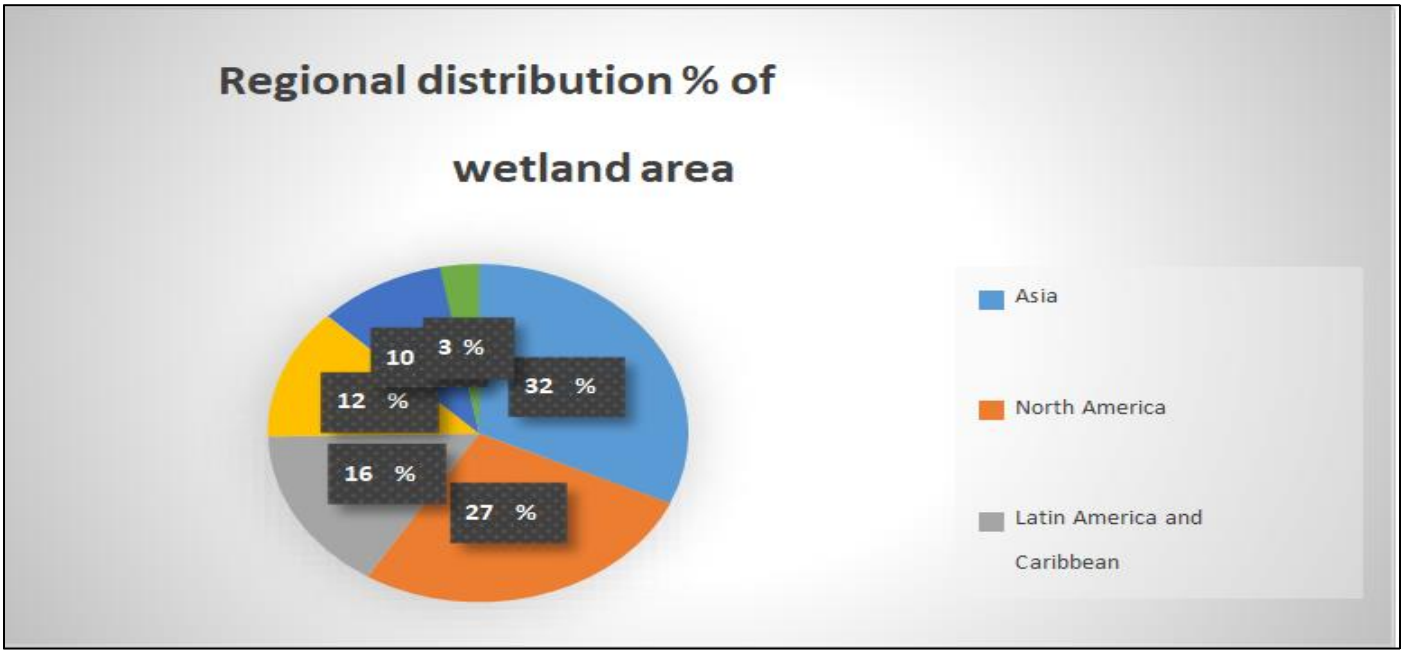

Fig 1 Regional Distribution of Wetland (Ramsar, 2018a)

II. APPROACH AND METHODOLOGY

Methodology is essential to ensure a comprehensive and well-supported analysis of this research. This paper used a literature review by extracting information on wetland degradation including factors, causes, and impacts. By conducting a systematic and thorough search across various academic databases. Retrieve scholarly articles, books, reports, and other reputable sources that became the introduction and results of this research, for instance, to discuss wetland degradation and mitigation strategies to reduce those impacts. However, Data Extraction, pertinent information from different books, conversations or Conferences, and international Organisations related to wetland management and biodiversity conservation were useful information used in this paper including key findings, and statistics. Employing a systematic approach encompassing a thorough literature review, critical analysis, synthesis of findings, and constructing a comprehensive framework of paper on the impacts of wetlands degradation or loss can offer valuable insights and contribute significantly to the existing body of knowledge on this crucial environmental issue and help communities to mitigate or to reduce the impacts caused by wetland loss in sustainable.

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III. RESULTS

➢ *Important of Wetland*

- *Wetlands Wetlands Support the Global Water Cycle (Hydrological Processes).*

Wetland dynamics and ecological function are influenced by physical, chemical, and biological interactions, which are known as ecosystem processes. Additionally, a lot of ecosystem services rely on them. Hydrology, biogeochemistry, carbon sequestration and storage, primary productivity, and energy flows are the main processes that fall under this category (Sun et al., 2017).

Wetlands are vital to the water cycle because they collect, hold, and release water over time, control water flows, and supply the water needed for life. A wetland's size, volume, timing, and frequency of water inflow and outflow are all measured by hydrology. It influences biodiversity and primary production, aids in the structure and function of wetlands, and produces ecosystem services like reduced flooding and enhanced water quality (Acreman & Bullock, 2003).

- *Complex Biogeochemical Processes Sustain Wetland Ecosystems.*

Because of the characteristics of their soil and hydrology, wetlands are home to a diverse array of biogeochemical processes. Wetlands store, break down and export nutrients and other compounds when they are saturated. Plant uptake and storage in tissues, microbial processing (especially of carbon, nitrogen, and sulfur), and physical sedimentation processes are ecosystem processes that result in nutrient uptake and storage (Reddy et al., 2010).

Many biogeochemical processes support ecosystem services such as improved water quality, particularly removing nutrients from agricultural and urban runoff. Nitrogen is an important nutrient needed for growth (P. Smith et al., 2015), but in excess, it can leach from agricultural and urban sources and contaminate soil, surface and groundwater (Howarth et al., 2002)

Through the process of denitrification, bacteria in wetlands transform nitrate nitrogen into nitrogen gas, which is then released back into the atmosphere (Yousaf et al., 2021), which is capable of eliminating up to 90% of incoming nitrate (de Groot et al., 2018). Wetlands are considered denitrification "hotspots" due to the high concentrations of nitrate and soil organic matter that are strongly correlated with denitrification rates (Hansen et al., 2016). Higher rates of denitrification are caused by increased nitrate runoff connected to agricultural runoff (Poe et al. (2003)). Wetlands also receive nitrogen deposition from atmospheric processes.

- *Wetlands are Among the Most Ecologically Productive Ecosystems.*

Plant growth is measured by primary production (i.e. the quantity of carbon fixed by plants and algae during photosynthesis) and serves as a source of energy for all living things. It is also the basis for a multitude of ecosystem services provided by wetlands, where high productivity sustains numerous human communities (Bullock & Acreman 2003).

Primary productivity depends on wetland type, plant species, climate, soil, nutrient availability, and hydrology (Lant, 2011). great rates of primary production tend to sustain great animal diversity (Bailey, 2006), For instance, the very productive

Pantanal area (in Brazil, Bolivia, and Paraguay) boasts 260 fish species, 650 bird species, and several megafauna (Reddy et al., 2010).

Water quality trends, particularly nutrient loading, have a substantial effect on primary production patterns. With nutrient enrichment, wetlands are prone to invasion by aggressive species with rapid growth rates, such as Typha spp. or, depending on location, Phragmites spp (Bansal et al., 2019).

The dominance of highly productive plant species may constitute a trade-off for other wetland activities. For example, total biodiversity is diminished, but organic matter buildup and wetlands carbon rise again (Ramsar, 2018b). The continued supply of phosphorus to the Florida Everglades enhanced primary output as

Typha infiltrated native plant communities (Wu et al., 2012). Higher atmospheric carbon dioxide concentrations can boost plant growth, however, this impact varies depending on the species and wetland type (Wu et al., 2012).

Finally, wetlands are major providers of organic carbon. They exported leaf litter and dissolved organic carbon, which supports downstream food webs (SCHIFF, 1998)

Organic carbon is also significant since it reduces light and absorbs dangerous UV-B rays (Williamson et al. 1999), therefore preventing amphibians and fish eggs from impacts such as injury (Häder et al., 2003).

➢ *Types of Ecology Services Provided by Wetlands*

- *Water*

Wetlands have an important role in providing fresh water for home consumption, agriculture, and industry. Global renewable water resources from rivers and aquifers amount to over 42,000 km3/year, with 3,900 km3/year removed for human consumption (Ramsar, 2018b). Agriculture consumes 70% of all water withdrawals, followed by industry at 19% and municipalities at 11%. In the last 50 years, the global irrigated agriculture area has doubled. Europe withdraws 6% of water resources (29% for agriculture), Asia 20% (80% for irrigation), while the Middle East, Central Asia, and North Africa extract 80-90 percent for irrigation (FOA, 2022).

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Groundwater demand has quickly expanded, notably in South Asia, where 40% of irrigated agriculture depends on groundwater alone or in combination with surface water (FAO, 2021). An estimated 60% of human water withdrawals are thought to return to nearby hydrological systems; the remaining 40% are thought to be used for consumptive purposes (FOA, 2022). Effects on water services are similar across highly wealthy and less wealthy nations (Dodds et al. 2013).

- *Food*

Wetlands provide a diverse range of foods. Inland fisheries range from large-scale industrial operations to subsistence fishing, with global annual harvests growing from 2 million tonnes in 1950 to over 11.6 million tonnes in 2012, and perhaps considerably greater if small-scale subsistence fisheries are considered (FAO, 2014). According to Bartley et al. (2015), 95% of inland fisheries harvest occurs in underdeveloped nations, where it often serves an important nutritional role, but accounts for just 6% of world fish output. Since industrialization, estuarine and coastal fisheries have plummeted by 33%, while fishery nursery environments (e.g., oyster reefs, seagrass beds, and other wetlands) have decreased by 69% (Holsman et al., 2018). Aquaculture grew from less than a million tonnes in 1950 to 52,5 million tonnes in 2008, accounting for 45,7 percent of the world's production of food fish (FAO, 2010). Aquaculture is being used on more and more rice fields (Edwards 2014). Aquaculture is most prevalent in Asia, particularly China, and is also quite important in Europe and Africa. In the Americas, however, it is still quite small, Wetlands also provide other hunting opportunities, wildfowling, and grown and harvested wet crops (UN, 2020).

- *Water Regulation*

Wetlands have an impact on laws like Natural Flood Management because they store, release, and exchange water (Prescott, 2017). Catchment hydrology is significantly influenced by river channels, floodplains, and broadly connected wetlands. Nevertheless, the ability of numerous wetlands that are "geographically isolated" to hold water can be crucial for hydrology (Lane & Leibowitz, 2021), having an impact on stream flows (Golden et al. 2016). Wetlands that operate properly can help to lessen catastrophe risk. Practical examples include the Charles River in Massachusetts, USA, where the conservation of 3,800 hectares of wetlands minimizes flood damage by an estimated $17 million annually (Herrera & Norris, 2022). In contrast, wetland degradation can increase floods and storm damage (Barbier et al. 2011). There is a growing recognition that sustaining wetland functions is typically more inexpensive than transferring them to alternate uses (Gardner et al., 2015).

- *Climate Regulation*

Wetlands play a significant role in regulating the climate due to their carbon storage and sequestration capabilities. Peatlands and vegetated coastal wetlands contain significant carbon sinks and store roughly as much carbon as world forests, but freshwater wetlands are also the greatest natural producers of methane (Harenda et al., 2018). Salt marshes store millions of tons of carbon yearly (Barbier et al., 2011), Deep tropical dams can be a significant producer of methane, negating or exceeding the purported low-carbon benefits of hydropower generation (Moran et al., 2018).

Natural processes in wetlands contribute to 25-30% of methane emissions, while wetlands play a substantial role in 90% of nitrous oxide emissions from ecosystems (Tian et al., 2015). Wetlands may also provide microclimate management, such as breaking down "heat islands" in metropolitan areas (Ramsar, 2018a).

- *Cultural Heritage*

Natural characteristics of wetlands and other ecosystems can represent cultural and spiritual significance, as well as regional identity. These may include both natural features, such as the holy lakes of the Himalayas (Ramsar, 2018b), and humanconstructed characteristics, such as the rice paddy, which provides the primary source of income for over 100 million households in Asia and Africa (Opata, 2020). Cultural heritage comprises traditional knowledge about the qualities, social importance, and care of wetland resources, such as for Australia's First People (Ramsar, 2018a).

- *Tourism and Recreation*

Both natural and manmade wetlands provide leisure opportunities and tourist benefits. Scuba diving on coral reefs provides a rationale for their protection, but it also adds potential stresses to ecosystems (Barker & Roberts 2004). In 2002, the income of around 100 diving operators in Hawaii was estimated at US$50-60 million per year (Alliance, 2006). Coral reef diving earns gross revenue of US$10,500–45,540/year in the Bohol Marine Triangle, the Philippines (Gulayan et al., 2015). The value of tourism in the Great Barrier Reef in Australia is more than AU$ 5.2 billion annually (Goldberg et al. 2016). Between 1950 and 2008, the world's aquaculture production rose from less than a million tonnes to 52.5 million tonnes, accounting for 45.7% of the world's food-fish production (Gulayan et al., 2015).

- ➢ *The Effects of Wetland Degradation on Ecological Species*

- *Water Quality Degradation*

The findings show that wetlands are rich reservoirs of biodiversity, with over 100,000 freshwater species identified to date. Coastal wetlands are among the most biologically diverse places (Ramsar, 2020). Wetland loss and pollution exacerbate the water issue, endangering all life. Nearly 90% of the world's wetlands have vanished since the 1700s, and 35% since the 1970s, and those that remain are vanishing three times faster than forests as a result of wetland degradation. Freshwater wetland destruction costs around US$2.7 trillion per year in lost services.

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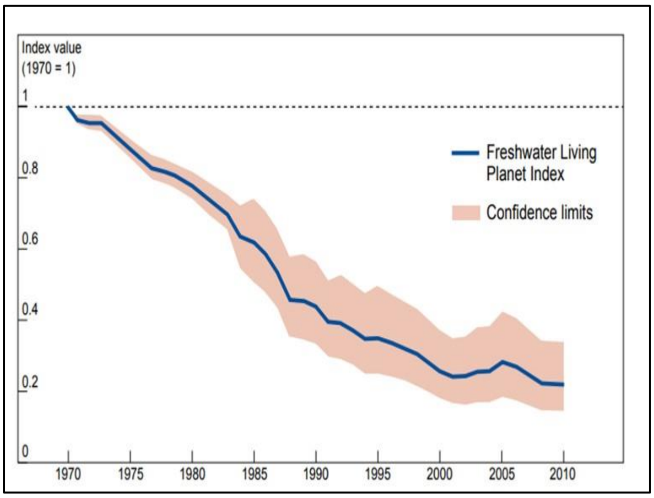

Fig 2 Water Quality Degradation

The Freshwater Living Planet Index reveals that worldwide freshwater declined by 76% from 1970 to 2010 **(Ramsar, 2018a)**

- *Biodiversity Loss and Species*

Wetland degradation hurts biodiversity and species. Wetland species are losing the greatest. Between 1970 and 2014, fish, bird, mammal, amphibian, and reptile populations fell by 60%. Since 1970, 81% of inland wetland species and 36% of coastal and marine species have decreased. 25% of wetland species are susceptible to extinction, including water birds, freshwater-dependent animals, marine turtles, and coral reefbuilding species (Ramsar, 2020). Wetland degradation is a crucial factor influencing the worldwide status of wetland species such as seagrasses, corals, amphibians, marine turtles, waterbirds, and mammals. According to the study, marine turtles (100% globally vulnerable), wetlanddependent megafauna (62%), freshwater reptiles (40%), non-marine mollusks (37%), amphibians (35%), corals (33%), and crabs and crayfish (32%) face the greatest threat of extinction.

The effects of wetlands on environmental destruction of the ecosystem and habitat loss including different species, marine plants, and marine organisms such as;

Freshwater vascular plants; The threat level is relatively low (17% worldwide threatened), but it varies greatly, from 2% (Indo-Burma) to 24% in Africa and 33% in the tropical Andes.

Seagrasses, 72 species, are falling by 31% and expanding by just 7%. Ten (16%) are at high risk of extinction, with three being Endangered (Short et al. 2011). Mangroves Eleven (17%) of the 66 species evaluated are internationally threatened (Polidoro et al. 2010). The Atlantic and Pacific coasts of Central America are particularly concerning since up to 40% of species there are endangered with extinction.

Corals, 33% of the 704 species investigated are internationally threatened (Carpenter et al. 2008). Regionally, the Caribbean and the Coral Triangle (western Pacific) contain the greatest percentage of corals under high extinction danger. Between 1996 and 2008, global threat status worsened by -17.8%. (BirdLife International 2015).

The global danger level is high (37%), rising to 59% in Europe, 45% in the Eastern Mediterranean, 41% in Africa, and 38% in the tropical Andes (Cuttelod et al. 2011).

Crabs are 32% worldwide vulnerable, and 5% are critically endangered (Collen et al. 2014). The continents of Africa and IndoBurma are quite dangerous. 10% of freshwater crayfish are classified as critically endangered, while 32% are threatened worldwide (Richman et al. 2015). Shrimps from freshwater 479 species are threatened worldwide, of which 28% are classified as critically endangered. The Nearctic (46% globally threatened by only a few species), Palearctic (32%), and IndoMalayan (30%) have the greatest threat ratings (De Grave et al. 2015). Shrimps from North America (40%) and Europe (41%) are considered to be highly threatened in the region.

The only insect group whose status has been evaluated globally is dragonflies (Clausnitzer et al. 2009). Only 8% are endangered, which is low when compared to other wetland-dependent species. For 1,968 species analyzed regionally, the average threat level is low (8%), with 1.5% Critically Endangered. Freshwater fish are 8,389 species evaluated, with 29% globally vulnerable and 5% critically endangered.

The threat level is highest in the Arabian Peninsula (50%), New Zealand (49%), Madagascar (43%), the Eastern Mediterranean (41%), and Europe (40%).

Parrotfish and surgeonfish make up the majority of the 160 species of coral reef fish that are widespread and of the Least Concern category, with only three (2%) globally threatened (Comeros-Raynal et al. 2012).

Amphibians are among the most globally vulnerable of the freshwater species studied, due primarily to the consequences of the chytrid fungus, with 35% globally threatened and 9% Critically Endangered (Stuart et al. 2004; Red List database 2017).

Threat levels are particularly high in New Zealand (75%), Madagascar (49%), India (41%), and the Eastern Mediterranean (33%). Amphibians that live in rivers and streams face more worldwide threats than those that live in static bodies of water (Stuart et al. 2004). The worldwide standing has worsened by -4.3% between 1980 and 2004 (BirdLife International 2015).

Reptiles are one of the most vulnerable taxa, with 40% of species worldwide threatened and 11% critically endangered (Collen et al. 2014), Six of the seven marine turtle species studied are globally threatened: two Vulnerable (Leatherback and Olive Ridley), two Endangered (Loggerhead and Green), and two Critically Endangered (Hawksbill and Kemp's Ridley) (IUCN-SSC Marine Turtle Specialist Group). Recent evaluations suggest

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population gains in certain populations of six of the seven species but with ongoing diminishing tendencies throughout the western Pacific (Mazaris et al. 2017)

Water birds have a relatively low worldwide threat rating at the species level, yet they are nonetheless 18% globally threatened and 3% Critically Endangered (IUCN Red List database). From 1988 to 2016, the global danger status declined by 1.5% (Bird Life International 2018). Water bird biogeographic populations were in a poor and deteriorating state globally in the 1970s; although the general situation improved marginally between 1976 and 2005, 47% of populations were still declining or extinct (Wetlands International 2010).

Mammals 23% of inland wetland-dependent animals are globally threatened, with 3% critically endangered (Collen et al. 2014). Between 1996 and 2006, global status fell by -1.9% (Bird Life International 2015).

Fresh water megafauna is particularly vulnerable to extinction: of 107 such species studied, 62% are globally endangered, and 27% are Critically Endangered (Carrizo et al. 2017). South and Southeast Asia have a higher number of vulnerable freshwater megafauna species.

IV. DISCUSSION

Wetlands are one of the most vulnerable ecosystems around the world, increasingly facing several anthropogenic pressures and referring to physical loss in spatial extent or loss of wetland functions. As a result, the rapidly expanding human population, land use change, burgeoning development ventures, and improper utilization of watersheds have all affected a significant decline in wetland resources (Zedler and Kercher 2005)

Wetlands are degraded, either directly or indirectly, due to changes in soil chemistry, nutrient status, and microbial composition (Hartman et al. 2008). Microbial assemblages of known and undiscovered organisms play an important role in wetland ecology. Fundamentally, wetlands are impacted by two factors: human and environmental. Nutrient enrichment conditions promote microbial biodiversity in wetlands, which influences wetland behavior. Anthropogenic influences include land use change, eutrophication, and the integration of harmful organic and inorganic wastes, whereas environmental elements such as floods, heavy rain, natural changes, etc. impact wetland systems as well (Gupta et al., 2020).

The loss of biodiversity due to environmental wetland degradation is a substantial consequence that affects ecosystems. For instance, Habitat Destruction of Wetlands provides a unique and diverse habitat for numerous plant and animal species. When wetlands are degraded or lost, the habitat for these species is destroyed or altered, leading to a reduction in the available living space and resources, which can directly impact their survival (Russi et al., 2013). Thus, Species extinctions and Population Declines Many species, including rare and specialized ones, depend on wetland ecosystems for breeding, feeding, nesting, and shelter. Wetland degradation directly affects these species, leading to population declines and, in severe cases, extinctions. Moreover, disruption of Food Chains and Ecosystem Balance, Wetland ecosystems rely on complex food webs where various species interact and depend on each other for survival. The loss of ecology due to degradation disrupts these intricate relationships, leading to imbalances in the ecosystem and potentially cascading effects on other species within and beyond the wetland. The Reduced Genetic Diversity, and loss of biodiversity in wetlands can lead to reduced genetic diversity within populations. This reduction in genetic This loss in genetic variety can render animals more susceptible to illnesses, environmental changes, and other stresses, further limiting their capacity to adapt and survive (Orsholm & Elenius, 2022). The Ecological Services Decline, Biodiversity loss in wetlands affects their ability to provide essential ecosystem services. For instance, certain species within wetlands might be crucial for water filtration, nutrient cycling, pest control, and other functions. Diminished biodiversity can compromise these services, affecting the overall health and functionality of the ecosystem (Orsholm & Elenius, 2022).

Land-use change is the most strongly related cause of biodiversity loss, and losses are expected to rise further. Wetlands are changing as a result of both land-use changes and pollution, with the consequences of climate change becoming increasingly obvious. Wetland species such as fish, waterfowl, and turtles are in significant decline, with one-quarter facing extinction, particularly in the tropics. Since 1970, 81% of inland wetland species populations and 36% of coastal and marine species have decreased (Ramsar, 2021).

Almost all inland and coastal wetland-dependent taxa studied have high global danger levels (more than 10% of species are threatened). Marine turtles, wetland-dependent megafauna, freshwater reptiles, amphibians, non-marine mollusks, corals, crabs, and crayfish face the greatest risk of extinction (more than 30% of species worldwide). The chance of extinction looks to be growing. Although waterbird species have a low global danger level, the majority of populations are declining over time. Only coral reef-dependent parrotfish, surgeonfish, and dragonflies have a minimal threat (Ramsar, 2018b).

Wetland degradation affected several taxonomic groupings of species, including seagrasses, corals, amphibians, marine turtles, waterbirds and mammals. The results suggest that more than a quarter of species are globally threatened, reaching to all species studied in the case of sea turtles (Ramsar, 2018b). Marine turtles (100%) are the most vulnerable species, followed by wetland-dependent megafauna (62%), freshwater reptiles (40%), non-marine mollusks (37%), amphibians (35%), corals (33%), and crabs and crayfish (32%). Only coral reefdependent parrotfish and surgeonfish (2% globally threatened) and dragonflies (8%) are classified as low concern owing to wetland degradation. Wetlands conservation and restoration are essential measures for

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reducing biodiversity loss. Conservation efforts, habitat restoration, protecting endangered species, and implementing sustainable land-use practices can help safeguard the rich biodiversity present in wetland ecosystems, ensuring the continued existence of diverse plant and animal species that rely on these habitats for survival (Orsholm & Elenius, 2022).

World fresh water and clean water currently declining. Water quality continues to deteriorate as a result of contamination from many sources. Nearly half of the world's population still uses sanitation that does not treat wastewater (UNICEF, 2016), Agriculture contributes significantly to nutrient loading, particularly nitrogen and phosphorus (Xie & Ringler, 2017). Wetlands in many regions of the world continue to suffer water quality concerns, with major human health consequences from waterassociated illnesses (UNESCO, 2020). Eutrophication harms numerous freshwater and coastal wetlands, with dead zones affecting over 700 coastal locations. Climate change, together with increases in sea surface temperature, acidity, and rainfall, will exacerbate these consequences (Glegg, 2016). Between 1960 and 2010, the global ocean oxygen density declined by around 2%, influencing the ocean nutrition cycle (Laffoley & Baxter, 2020). Pesticide runoff is destroying wetlands all around the world, including renowned areas like the Great Barrier Reef in Australia (Ramsar, 2021)

Water quality trends are predominantly unfavorable. Since the 1990s, practically all rivers in Latin America, Africa, and Asia have become more polluted. The deterioration is expected to accelerate. Major concerns include untreated wastewater, industrial waste, agricultural runoff, erosion, and changes in sediment (Chen et al., 2022). By 2050, one-third of the world's population will most certainly be exposed to water with high nitrogen and phosphorus levels, resulting in fast algae growth and breakdown that can kill fish and other animals. Severe pathogen contamination affects one-third of rivers in Latin America, Africa, and Asia, and fecal coliform bacteria have increased over the previous two decades. Salinity has accumulated in many wetlands, including groundwater, harming agriculture. Acid deposition is caused by nitrogen oxides from fossil fuel combustion and ammonia from agriculture. Acid mine drainage is a significant contaminant. Thermal pollution from power plants and industry depletes oxygen, changes food chains, and diminishes biodiversity (OECD, 2012). At least 5.25 trillion persistent plastic particles are floating in the world's oceans, which have a significant influence on coastal waterways. Pesticides exceed national approved limits in nearly half of OECD nations' agricultural water supplies. These consequences impair our health, degrade ecological services, and exacerbate biodiversity loss (M. Smith et al., 2018).

Wetland degradation or loss may have a substantial influence on cultural traditions and economic advantages linked with these ecosystems in a variety of ways. Cultural significance: Many indigenous people and civilizations have significant ties to wetlands. These sites frequently possess spiritual, cultural, and historical significance for these communities. Wetlands may serve as places for rituals, ceremonies, traditional customs, and storytelling, all of which help to preserve cultural heritage. Wetland degradation or loss can cause erosion of cultural practices, altering traditions and links to ancestral lands (Verschuuren, 2016).

Wetlands also offer services like water provisioning and flood control, supporting industries and communities downstream. Degradation or loss of wetlands diminishes these economic opportunities, impacting livelihoods and local economies. Wetlands attract tourists and outdoor enthusiasts interested in birdwatching, wildlife observation, boating, hiking, and other recreational activities. Degraded wetlands with reduced biodiversity and ecosystem health can deter tourists and impact revenue generated from tourism-related activities. Indigenous and local communities often possess valuable traditional ecological knowledge about wetlands, including sustainable resource management practices and medicinal uses of wetland flora and fauna. As wetlands degrade or vanish, the transfer of knowledge and traditions to future generations is in danger (Baker, 1968). Wetlands play an important role in water resource management, supplying clean water for drinking and agricultural purposes. Degradation influences water availability and quality, particularly in populations who rely on wetlands for water.

➢ *Strategies for Wetland Conservation and Restoration*

Wetlands must be conserved and restored to sustain their ecological integrity, biodiversity, and the benefits they give to humans and the environment. Here are some techniques for wetland protection and restoration:

Identification and Mapping such as conducting comprehensive inventories to identify and map existing wetlands is the first step in their conservation and restoration. This helps prioritize areas for protection, restoration, and management interventions. Legal Protection and Regulation, Establishing and enforcing legal frameworks, such as designating wetlands as protected areas or Ramsar Sites, provides essential safeguards against degradation and destruction. Regulation of activities such as drainage, dredging, and land conversion helps prevent further loss of wetland habitats.

Habitat Restoration and Creation: Restoring degraded wetlands through habitat restoration and creation projects can help reverse ecosystem degradation and promote biodiversity recovery. This may involve reestablishing hydrological connectivity, reintroducing native vegetation, and creating nesting sites for wildlife. Water Management, implementing sustainable water management practices is critical for maintaining wetland hydrology and ecological functions. This includes regulating water levels, controlling invasive species, and reducing nutrient inputs from agricultural runoff and urban pollution.

Community Engagement and Stakeholder Collaboration, engaging local communities, indigenous peoples, NGOs, and other stakeholders in wetland conservation and restoration efforts fosters a sense of ownership and promotes long-term sustainability. Collaborative approaches ensure that management strategies are socially inclusive, culturally appropriate, and supported by those directly affected by wetland resources, Ecosystem-based approaches such as Adopting ecosystem-based management approaches recognize the interconnectedness of wetland ecosystems with surrounding landscapes and watersheds. This involves considering land-use planning, buffer zone protection, and integrated watershed management to address upstream impacts on wetland health.

Climate Change Adaptation, integrating climate change adaptation strategies into wetland conservation and restoration efforts is essential for building resilience to changing environmental conditions. This may include enhancing wetland connectivity, promoting natural carbon sequestration, and restoring coastal wetlands to mitigate the impacts of sealevel rise and extreme weather events. Monitoring and Research, implementing monitoring programs to assess wetland health, track changes over time, and evaluate the effectiveness of conservation and restoration interventions is critical. Research initiatives help improve our understanding of wetland ecosystems and inform evidence-based management decisions.

V. CONCLUSION

The degradation and loss of wetlands pose significant challenges, encompassing ecological, social, and economic spheres. The cumulative impacts of these losses have far-reaching consequences, affecting biodiversity, exacerbating climate change, and jeopardizing human well-being.

Ecologically, the degradation of wetlands disrupts intricate ecosystems, leading to a decline in biodiversity and the loss of critical habitats for various species. This disruption reverberates through food webs, affecting ecosystem functions and resilience to environmental changes. Additionally, wetland loss contributes to the release of stored carbon, intensifying climate change.

From a social perspective, the repercussions of wetland degradation are profound. These ecosystems provide critical services, such as flood control, water purification, and storm protection, to adjacent towns. Their degradation heightens the vulnerability of these populations to natural disasters, impacting livelihoods, and posing risks to human safety.

Economically, wetlands contribute significantly to various industries such as fisheries, agriculture, and tourism. The loss of these ecosystems results in reduced productivity, income loss for communities dependent on these resources, and diminished opportunities for recreational and economic activities.

To address the impacts of wetland degradation and loss, concerted efforts are crucial. Comprehensive strategies involving conservation, restoration, and sustainable management practices are imperative. Effective policies, supported by community engagement and awareness programs, are essential for safeguarding these ecosystems and their invaluable services.

In conclusion, the effects of degradation and loss are multifaceted and interlinked, affecting both nature and humanity. Urgent action is necessary to halt further degradation, preserve these vital ecosystems, and ensure a sustainable future for generations to come. Prioritizing wetlands conservation is not just an environmental necessity, but also a critical step toward preserving biodiversity, protecting livelihoods, and minimizing the effects of climate change at the global level.

REFERENCES

[1]. &NA; (1999). Wetlands and Climate Change. Plastic & Reconstructive Surgery, 104(7), 2351. https://doi.org/10.1097/00006534-199912000-00109
[2]. Acreman, M., & Bullock, a. (2003). The role of wetlands in the hydrological cycle. Hydrology and Earth System Sciences, 7(3), 358–389.
[3]. Alavaisha, E. (2020). Agricultural expansion impacts on wetland ecosystem services from Kilombero Valleynia, Tanza (Issue 7).
[4]. Alliance, T. C. R. (2006). Coral reefs & sustainable marine recreation. 347 pp.
[5]. Bailey, D. E. (2006). Wetland Vegetation Dynamics and Ecosystem Gas Exchange in Response to Organic Matter Loading Rates. Biomass, 132. https://doi.org/10.25773/v5-4nf9-ks10
[6]. Baker, D. J. (1968). Patient oxygen monitoring during radiotherapy under high-pressure oxygen. British Journal of Radiology, 41(487), 556.
[7]. Bansal, S., Lishawa, S. C., Newman, S., Tangen, B. A., Wilcox, D., Albert, D., Anteau, M. J., Chimney, M. J., Cressey, R. L., DeKeyser, E., Elgersma, K. J., Finkelstein, S. A., Freeland, J., Grosshans, R., Klug, P. E., Larkin, D. J., Lawrence, B. A., Linz, G., Marburger, J., … Windham-Myers, L. (2019). Typha (Cattail) Invasion in North American Wetlands: Biology, Regional Problems, Impacts, Ecosystem Services, and Management. In Wetlands (Vol. 39, Issue 4). Wetlands. https://doi.org/10.1007/s13157-019-01174-7
[8]. Barbier, E. B., Hacker, S. D., Kennedy, C., Koch, E. W., Stier, A. C., & Silliman, B. R. (2011). The value of estuarine and coastal ecosystem services. Ecological Monographs, 81(2), 169–193. https://doi.org/10.1890/10-1510.1
[9]. Bergkamp, G., & Orlando, B. (1999). Wetlands and Climate Change Exploring. Article, January, 23.

[10]. Chen, S. S., Kimirei, I. A., Yu, C., Shen, Q., & Gao, Q. (2022). Assessment of urban river water pollution with urbanization in East Africa. Environmental Science and Pollution Research, 29(27), 40812–40825. https://doi.org/10.1007/s11356-021-180821 de Groot, D., Brander, L., & Max Finlayson, C.
[11]. (2018). Wetland ecosystem services. The Wetland Book: I: Structure and Function, Management, and Methods, January 2017, 323–333. https://doi.org/10.1007/978-90-481-9659-3_66
[12]. FAO. (2010). The state of world fisheries and aquaculture. disponível em http://www.fao.org/ docrep/013/i1820e/i18 20e.pdf, 218.
[13]. FAO. (2014). What future of inland fisheries ?
[14]. FAO, F. A. Agriculture organization of T. U. N. (2021). Systems at breaking point.
[15]. FOA. (2022). Agriculture, food and water.Prosperity in the Fossil-Free Economy, 184–234. https://doi.org/10.12987/9780300262919-012
[16]. Gardner, R. C., Barchiesi, S., Beltrame, C., Finlayson, C. M., Galewski, T., Harrison, I., Paganini, M., Perennou, C., Prichard, D., & Walpole, M. (2015). 12 th Meeting of the Conference of the Parties to Ramsar Briefing Note 7 State of the World's Wetlands and their Services to People : A compilation of recent analyses. State of the World’s Wetlands and Their Services to People: A Compilation of Recent Analyses, 1–19.
[17]. Glegg, G. (2016). Managing coastal eutrophication (Issue 17).
[18]. Gulayan, S., Aaron, J., Belleza, D. F., Buscato, W., & Sotto, F. (2015). Bohol, Philippines: Building Partners for Coral Reef Restoration in Panglao Island. BIMPEAGA Journal for Sustainable Tourism Development, 4(2), 35–41. https://doi.org/10.51200/bimpeagajtsd.v4i2.3184
[19]. Gupta, G., Upadhyay, A., & Singh, N. K. (2020). Restoration of Wetland Ecosystem: A Trajectory Towards a Sustainable Environment. Restoration of Wetland Ecosystem: A Trajectory Towards a Sustainable Environment, August. https://doi.org/10.1007/978-981-13-7665-8
[20]. Häder, D. P., Kumar, H. D., Smith, R. C., & Worrest, R. C. (2003). Aquatic ecosystems: Effects of solar ultraviolet radiation and interactions with other climatic change factors. Photochemical and Photobiological Sciences, 2(1), 39–50. https://doi.org/10.1039/b211160h
[21]. Hansen, A. T., Dolph, C. L., & Finlay, J. C. (2016). Do wetlands enhance downstream denitrification in agricultural landscapes? Ecosphere, 7(10). https://doi.org/10.1002/ecs2.1516
[22]. Harenda, K. M., Lamentowicz, M., Samson, M., & Chojnicki, B. H. (2018). The role of peatlands and their carbon storage function in the context of climate change. GeoPlanet: Earth and Planetary Sciences, 9783319717876, 169–187. https://doi.org/10.1007/ 978-3-319-71788-3_12
[23]. Herrera, M., & Norris, R. (2022). Catching Carbon: A Blue Carbon Assessment of San Diego Wetlands for Equitable Climate Action Planning. June.
[24]. Holsman, K., Hollowed, A., Ito, S., Bograd, S., Hazen, E., King, J., Mueller, F., & Perry, R. I. (2018). Climate change impacts, vulnerabilities, and adaptations: North Pacific and Pacific Arctic marine fisheries. In Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation, and mitigation options (Vol. 627).
[25]. Howarth, R. W., Sharpley, A., & Walker, D. (2002). Sources of nutrient pollution to coastal waters in the United States: Implications for achieving coastal water quality goals. Estuaries, 25(4), 656–676. https://doi.org/10.1007/BF02804898
[26]. Kamble, S., Rashinkar, G., Kumbhar, A., & Salunkhe, R. (2012). Ecosystems WETLANDS WELL-BEING: AND HUMAN AND WATER. In Green Chemistry Letters and Reviews (Vol. 5, Issue 1). https://doi.org/10.1080/17518253.2011.584217
[27]. Kuchara, V., Charan, R., Mankad, A., & Solanki, H. (2023). Wetland Degradation and Loss Due To the Expansion of Anthropogenic Activities. International Association of Biologicals and Computational Digest, 2(2), 41–47. https://doi.org/10.56588/iabcd.v2i2.191
[28]. Lane, C. R., & Leibowitz, S. G. (2021). AND CONNECTIVITY OF NON-FLOODPLAIN WETLANDS TOO. https://doi.org/10.1111/1752-1688.12633.HYDROLOGICAL
[29]. Lant, C. (2011). Natural Resource Sustainability: An introductory synthesis.
[30]. McInnes, R. J., & Everard, M. (2017). Rapid Assessment of Wetland Ecosystem
[31]. Services (RAWES): An example from Colombo, Sri Lanka. Ecosystem Services, 25(June), 89–105. https://doi.org/10.1016/j.ecoser.2017.03.024
[32]. Moran, E. F., Lopez, M. C., Moore, N., Müller, N., & Hyndman, D. W. (2018). Sustainable hydropower in the 21st century. Proceedings of the National Academy of Sciences of the United States of America, 115(47), 11891–11898. https://doi.org/10.1073/pnas.1809426115
[33]. Nimusima. (2019). Rwanda Environment and Climate Change Analysis. 1–26.
[34]. OECD. (2012). Agriculture's Impact on Aquaculture : Hypoxia and Eutrophication in. 1–46.
[35]. Opata, J. (2020). Innovative propagation techniques in banana and plantain Dissertation. Corporate Governance (Bingley), 10(1), 54–75.
[36]. Orsholm, J., & Elenius, M. (2022). Effects of hydrology on wetland biodiversity A literature study and development of hydrological indicators. 22, 53.
[37]. Pescott, O. L. (2017). Natural flood management. Wiley Interdisciplinary Reviews: Water, 4(3). https://doi.org/10.1002/WAT2.1211
[38]. Poe, A. C., Piehler, M. F., Thompson, S. P., & Paerl, H. W. (2003). Denitrification in a constructed wetland receiving agricultural runoff. Wetlands, 23(4), 817–826. https://doi.org/10.1672/0277-5212(2003)023[0817:DIACWR]2.0.CO;2

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24APR1244

[39]. Ramsar. (2017). Ramsar Management Plan Status Report. https://www.gov.je/SiteCollectionDocuments /Government and administration/R Ramsar management plan status report 2017 20190805 DM.pdf

[40]. Ramsar. (2018a). Global Wetland Outlook: State of the World's Wetlands and their Services to People. Global Wetland Outlook.Gland Switzerland : Ramsar Conventionsecretariat., 84. https://www.globalwetlandoutlook.ramsar.org/outlook

[41]. Ramsar. (2018b). GLOBAL WETLAND OUTLOOK.

[42]. Ramsar. (2021). GLOBAL WETLAND OUTLOOK.

[43]. Reddy, K. R., DeLaune, R., & Craft, C. B. (2010). Nutrients in wetlands: Implications to water quality under changing climatic conditions. Final Report submitted to U. S. Environmental Protection Agency. EPA Contract No. EP-C-09-001, 52.

[44]. REMA. (2020). National Wetlands Management Guidelines.pdf. December. https://www.rema.gov.rw/fileadmin/user_upload/National_Wetland_Management_Framework_Final_V2.pdf

[45]. Russi, D., ten Brink, P., Farmer, A., Bandura, T., Coates, D., Forster, J., Kumar, R., & Davidson, N. (2013). The Economics of Ecosystems and Biodiversity for Water and Wetlands: A final Consultation Draft. IEEP, London and Brussels; Ramsar Secretaria, 119.

[46]. SCHIFF, S. (1998). PRECAMBRIAN WETLAND: HYDROLOGIC CONTROL OF THE SOURCES AND EXPORT OF DISSOLVED ORGANIC MATTER.

[47]. Smith, M., Love, D. C., Rochman, C. M., & Neff, R. A. (2018). Microplastics in Seafood and the Implications for Human Health. Current Environmental Health Reports, 5(3), 375–386. https://doi.org/10.1007/s40572-018-0206-z

[48]. Smith, P., Cotrufo, M. F., Rumpel, C., Paustian, K., Kuikman, P. J., Elliott, J. A., McDowell, R., Griffiths, R. I., Asakawa, S., Bustamante, M., House, J. I., Sobocká, J., Harper, R., Pan, G., West, P. C., Gerber, J. S., Clark, J. M., Adhya, T., Scholes, R. J., & Scholes, M. C. (2015). Biogeochemical cycles and biodiversity as key drivers of ecosystem services provided by soils. Soil, 1(2), 665–685. https://doi.org/10.5194/soil-1-665-2015

[49]. Sun, G., Hallema, D., & Asbjornsen, H. (2017). Ecohydrological processes and ecosystem services in the Anthropocene: a review. Ecological Processes, 6(1). https://doi.org/10.1186/s13717-017-0104-6

[50]. Thomas, V. (2017). Climate Change and Natural Disasters: Transforming Economies and Policies for a Sustainable Future. In Climate Change and Natural Disasters: Transforming Economies and Policies for a Sustainable Future. https://doi.org/10.4324/9781315081045

[51]. Tian, H., Chen, G., Lu, C., Xu, X., Ren, W., Zhang, B., Banger, K., Tao, B., Pan, S., Liu, M., Zhang, C., Bruhwiler, L., & Wofsy, S. (2015). Global methane and nitrous oxide emissions from terrestrial ecosystems are due to multiple environmental changes. Ecosystem Health and Sustainability, 1(1), 1–20. https://doi.org/10.1890/EHS14-0015.1 UN. (2020). CBD - Global Biodiversity Outlook 5 -FULL REPORT. www.emdashdesign.ca

[52]. UNESCO. (2020). The United Nations world water development report 2020: water and climate change.

[53]. UNICEF. (2016). Triple threat. Fire Rescue Magazine, 34(6).

[54]. Verschuuren, B. (2016). Religious and Spiritual Aspects of Wetland Management. The Wetland Book, October. https://doi.org/10.1007/978-94-007-6172-8

[55]. Wu, Y., Ritchey, K., Newman, S., Miao, S., Wang, N., Sklar, F. H., & Orem, W. H. (2012). Impacts of fire and phosphorus on sawgrass and cattails in an altered landscape of the Florida Everglades. Ecological Processes, 1(1), 1–11. https://doi.org/10.1186/2192-1709-1-8

[56]. Xie, H., & Ringler, C. (2017). Agricultural nutrient loadings to the freshwater environment: The role of climate change and socioeconomic change. Environmental Research Letters, 12(10). https://doi.org/10.1088/1748-9326/aa8148

[57]. Yousaf, A., Khalid, N., Aqeel, M., Noman, A., Naeem, N., Sarfraz, W., Ejaz, U., Qaiser, Z., & Khalid, A. (2021). Nitrogen Dynamics in Wetland Systems and Its Impact on Biodiversity. Nitrogen, 2(2), 196–217. https://doi.org/10.3390/nitrogen2020013