WETLAND DEGRADATION AND LOSS DUE TO THE EXPANSION OF ANTHROPOGENIC ACTIVITIES

Vishwa Kuchara¹, Charan Ronak R.², Dr. Archana Mankad³, Dr. Hitesh Solanki⁴

Department of Botany, Bioinformatics and Climate Change Impacts Management, School of Science, Gujarat University, Ahmedabad-380009, India.

ABSTRACT
A wetland ecosystem covers about 5-10% of the earth's land. Wetlands play a significant role in the world's economy but they suffer from several threats from various influencing factors. Wetlands are destroyed due to the expansion of human activities and their effect on living and non-living organisms. Some of India's and Gujarat's wetlands case studies highlight the worst conditions of wetlands from past decades. These case studies highlight the reasons for wetland degradation, and also which types of issues need to be addressed. Wetlands are the most important ecosystem on earth, and to control wetland degradation, it is essential to improve special laws and regulations and be aware of people to conserve ecosystems.

Keywords: Wetlands, Degradation and loss, Ecosystem, Service, Habitat, Urbanization, Economy, destruction.

INTRODUCTION
A wetland is an ecosystem that is constant or recurrent shallow inundation at or near the surface of the ground and the presence of physical, chemical and biological features. The most common characteristics of wetland ecosystems are hydric soil and hydrophytic vegetation. Some specific physiochemical, biotic and anthropogenic factors have harmed those wetlands' features for purpose of development. (Council, 1995)

Wetland ecosystem has unique and high levels of biodiversity, not only obligate organisms but also many terrestrial and marine organisms are indirectly connected with wetland productivity, fresh water and nursery habitats. The Wetland ecosystem has boosted nutrient cycling, improved water quality and carbon sequestration and maintained environment composition also provides food, fiber and controlled flooding. (R. T. Kingsford et al., 2016)

Wetland ecosystem services are uniquely related to hydrological processes that’s why wetlands are important for humankind. Wetlands are natural assets but their services are nearly always non-remarkable. Because wetlands generate services that play a major role in human welfare, they are considered a form of wealth. (Daily, 1997; Daily et al., 2000; Development & Institute, 2001; Pagiola et al., 2004; MEa, 2005; Barbier, 2007).

As Freeman states that “The economic value of resources, and ecosystems resides in the contributes that the wetland ecosystem functions and services make to humans well-being.” (Freeman III, 2003). Similarly, Boyd and Banzhof state that “wetland ecosystem services are components of nature directly enjoyed, benefits or used for human well-being.” (Boyd & Banzhaf, 2007).

Wetland ecosystems are given more benefits to humans which are classified into 3 categories: (1) “Goods”- products provided by ecosystems, such as resource harvest, water and other fuel material; (2) “Services”- recreational, tourism, some ecological regulations and habitat functions like water purification, climate regulations, erosion control and habitat provision; (3) “Cultural benefits”- such as heritage values, spiritual and religious benefits. (Wetlands as Natural Assets, n.d.)
The wetland ecosystem occurs in almost every landscape. Wetlands are the earth’s most productive ecosystem and are also important for many plants and animal species. Especially migratory birds. Wetlands also provide a habitat for fresh water and marine organisms and they are essential for many bird species as breeding sites and staging areas for nesting during migration. (Naiman & Décamps, 1990).

Wetlands help to decrease the concentration of atmospheric particles and increase the air standard. Environment particular matter (PM) is defined as a mixture of solid and liquid organic and inorganic materials in the air. Wetlands block dust and filter harmful particles in urban areas. They improve the relative humidity and reduce the air temperature, thereby, increasing the mass of the PM. At that time the plants of wetlands absorb environmental particles and decrease the amount of atmospheric PM. Wetlands decrease the amount of PM$_{2.5}$ by 6% (from 50 to 47 μg/m$^3$) when air quality is good and reduces strongly polluted air by 44% (from 155 to 89 μg/m$^3$). (Cong et al., 2018).

WETLAND DEGRADATION

Wetlands are the most important ecosystems on the earth, but the rapid growth in human population worldwide caused major wetland destruction. Wetland degradation or loss is due to pollution, wetland reclamation, land use change and civilization and that’s why they affect directly human health, biodiversity, regional climate and ecological security. (Bai et al., 2013)

About 5-10% of the earth is covered by wetlands but >70% is already destroyed. Wetlands degradation has some major threats like habitat loss and degradation, invasive species, overharvesting and disease. The serious impact of habitat loss and degradation caused by upstream water resource developments on agriculture, industry and urban development. (R. T. Kingsford et al., 2016)

Globally more people live in urban areas than in rural areas, about 54% of the world's population lived in urban areas. Erratic and unplanned development of the urban area has damaged the environment. Unplanned structures reduce the green cover and emissions of industries and vehicles have caused many climatic issues. (Gupta et al., 2019)

Wetland degradation has created some problems including the extinction of wild flora and fauna, loss of water reservoirs, and loss of natural soil, nutrients and their important benefits. Wetland loss also has effect traditional occupations, cultural activities, food storages, increased drainage and cultivation, and collection of sedges and reeds for roofing and housing. (Bezabih & Mosissa, 2017)

The total water area of the earth and the land integrity showed reducing threats and the wetland has degraded, which directly affects water supply and climate change. The main reason for wetland degradation is becoming transformation of natural wetlands into agricultural land and constructed wetlands. About 49% of flooded wetlands are converted into manmade surfaces or bare land. (Xu et al., 2019)

- **Issues of wetland conservation:**
  1. **Poor management system and mechanism:** The classification of land is based on its components and its management by the government (Y. Chen & Zhou, 2007; Aqsiq, 2007), but the wetland ecosystem is not considered as any type of land. Wetlands are unused land and wild land, there for several wetlands are destructed also the lack of coordination in the mechanism of management agencies has resulted in difficulties in the protection of wetlands.
  2. **Not specific laws and regulations for wetland conservation:** There is no special law for wetland conservation and management due to the lack of a legal framework. Wetlands are not protected as specific land. Wetlands are classified as wild land and this land is used for urban construction which resulted in the rapid degradation of wetlands.
  3. **The negative impact of water conservation projects:** The construction of water reservoir projects directly affects the regional climate, hydrology, sediment deposition, river morphology, biological diversity and water quality. These projects impact the degradation of the wetland ecosystem and destruct the structure and function of the wetland. (Goodchild, 2013)
Inadequate public awareness, education and funding: Sometimes developed regions people are not aware of the importance of wetlands and also people don’t have knowledge about wetlands. So the local government have to pay more attention to educating people about wetland conservation. Some industries are discharging their wastewater, and in some areas, residents discharge their rubbish and domestic sewage randomly into wetlands which leads to damage wetland ecosystem. For that, some reasons spreading awareness among people is most important and this work is done when sufficient funds are available.
(Meng et al., 2017)

- Reasons for wetland degradation:
The major factors that affect the wetland and destruct them are two types: Anthropogenic factors- (pollution, excessive utilization of biological resources, peat exploration, reclamation, aquaculture, urbanization); and Natural factors- (climate change and biological resources).

1. Climate change: Climate strongly impacts wetland degradation, mainly change temperature and precipitation. Precipitates increase the water content in soil and enlarge the air of wetlands. (Melly et al., 2017) when the climate will change and the temperature is rise evaporation level is high which results in wetland reduction.

2. Pollution: The main pollution of wetlands is wastewater discharges from industry, agriculture, animal dung and aquaculture. A large amount of industrial wastewater and domestic sewage is discharged into wetlands, rivers, lakes and swamps. Also, pollution from pesticides and fertilizers caused threats om wetlands which results in degradation. (Act, 2016)

3. Excessive utilization of biological resources: Wetland ecosystem can provide food, water and shelter for living beings, but excessive utilization of resources has damaged wetlands, and urbanizations and construction are the main threats that caused biodiversity losses. Long-term overgrazing damage soil structure and that damaged soil structure turns into wetland degradation. (Fu et al., 2006)

4. Urbanization: Many wetlands are changed into artificial aquaculture ponds. Wetlands are occupied by farmlands and infrastructure. Excessive urbanization become very common which leads to the reduction of wetlands and habitat loss of wildlife. The improvement of human activities has turned into a serious lack of wetlands land fragmentation, and a lack of ecological resources is affected by a decrease in the capacity of flood storage and also fish spawning, bird habitat and feeding area destruction. (M. Chen et al., 2016)

5. Wetland destruction and habitat degradation: Wetland destruction usually turns in the degradation of its ecological functions, and damage the energy flow and nutrient cycling. Human activities caused wetland degradation and wild animals and plants lose their natural habitat. (Yang et al., 2016)
(Meng et al., 2017)

Case study

- Case study in India: In India, the total area of the wetland is considered about 11.69 m.ha. This is about 3.66% of the geographic area of the country.

(1) Keoladeo National Park: This national park covers an area of about 29 sq. km on the extreme western edge of the Gangetic basin, a confluence of Gambhir and Banganga rivers in Bharatpur district, Rajasthan. (Perennou & Ramesh, 1987) KNP has a variety of habitats. In the last two decades, major threats are water scarcity and drought conditions, other problems are restricted flow of water in the catchment area, exposure of pollutants and differential inflow of agrochemicals to wetlands in the catchment. (Mathur et al., 2009) One of the major problems in KNP is an uncontrolled growth rate of grass in the wetland area and this may turn into a loss of natural habitat. Wetland management is very important, for a regular survey and collecting information about diversity that helps to identify the condition of wetlands. (“Assessment of Environmental Factors Causing Wetland Degradation, Using Fuzzy Analytic Network Process,” 2015)
Chatra Wetland: This wetland is located in eastern India, West Bengal. Also, this wetland is known as the peri-urban wetland of English Bazar city because it is located in the southwest corner of the city. Wetland covered an area of about 8.47 sq. km. this wetland provides several ecological benefits to the urban residents. (Pal & Ziaul, 2017). Due to the rapid expansion and urbanization of English Bazar city, it started to convert the wetland of Chatra into other land use. (Kar & Pal, 2012; Pal & Ziaul, 2017; Kar, 2018; Dutta & Sengupta, 2015). In this wetland, rainfall is the main source of water and the area is divided into two parts, one is marshy and the other belongs to the visible surface water area. (Pal & Ziaul, 2017) And the total area of this wetland is shrinking day by day due to urbanization and the demand for cheap land. English Bazar city is unplanned and does not have any proper land use planning, so it will grow in an uncontrolled manner using the land of wetland. It is important to take action against excessive urbanization. (Das & Basu, 2020)

Varthur Wetland: Varthur wetland is one of the largest wetlands located south of Bengaluru. The area covered by wetland is about 220 sq. km. The wetlands water is used in agriculture fields to grow crops like rice, ragee, coconut, flowers and varieties of fruits and vegetables. It provides habitat to wild flora and fauna, including resident and migratory birds. But due to sewage and industrial wastewater wetland is damaged and this wastewater, not contaminant only the wetland but also pollutes the Pinakini river downstream and which decreases water quality. And directly influenced the economic significance of wetlands. (Ramachandra et al., 2011)

East Kolkata Wetland: Wetland is located in the eastern region of India. In the year 2002, EKW recognizes as a wetland ecosystem, it covered an area of about 127.41 km². This wetland faces the pressure of urban expansion. EKW cover the surrounding areas namely Rajarhat-Gopalpur, Bindhannagar and Sonarpur. EKW wetlands face an aerial shrinkage of 26% due to human activities, mainly urban encroachment. (Mondal et al., 2017)

Case study in Gujarat:

Chhaya Rann Wetland: Chhaya rann wetland is a complex, narrow strip of brackish wetland habitat, spread about 2.25 km² and comprises Porbandar rann, Chhaya 1, Chhaya 2 and Chhaya 3 wetlands. Early it is also known as Birla rann where sea salt was produced. In recent years most of the wetland area covered the construction of housing societies, roads, shops and other infrastructure as part of the urban exploration of Porbandar. Due to the development of reads, wetlands are fragmented into small parts known as Porbandar bird sanctuary, Porbandar rann, Chhaya 1, Chhaya 2 and Chhaya 3. The Porbandar bird sanctuary is separated from the Chhaya wetlands, and water can flow between Chhaya 1,2 and 3 and none of these are connected to the sea. Chhaya 3 is not available in summer and is managed as salt pans and it provides standing sites for waterbirds. (Vargiya & Chakraborty, 2019)

Gosabara Wetland: Gosabara wetland located in the Porbandar district of Gujarat, is spread over 129 km². Gosabara wetland is a group of wetlands in the Porbandar district. Wetland is formed with Karli tidal regulators. It is the combination of the estuary and freshwater habitat. The main reason for to destruction of the wetland is evaporation due to climate change. The water spread area decreased without reducing the capacity. (Publication15-12-2017-1513309472.Pdf, n.d.)

Impact of Wetland Loss:

Wetland loss is a global phenomenon (Zedler & Kercher, 2005; Dudgeon et al., 2006; Vörösmarty et al., 2010) with major causes. The primary threats of wetland destruction are habitat loss, climate change, pollution, invasive species, overharvesting and disease. (R. T. Kingsford et al., 2016)

Wetland provides goods and services that affect the economic importance of wetlands for residents who depend on this wetland. (Schuyt, 2005). When building dams to store water for agricultural purposes and diverse the flow of water, it sometimes turns wetland drees and that directly affects irrigation. (Lemly et al., 2000; R. Kingsford, 2006).
Wetland loss does not only affect humans but as well as they affect animals and plant species. Due to urbanization living beings lose their habitat, and wetland pollution damage their growth of population, also urban expansion destructs the natural wetland and damages their wild floral and faunal diversity. wetland degradation also affects the atmosphere of the earth, pollution, damaging natural ecosystem and climate change.

In the 21st century development is most important for any economy and these uncontrolled and unplanned development break the chain of healthy ecosystems. These cause serious impacts on living and nonliving organisms.

The concrete infrastructure reduces green cover and these problems turn into increasing greenhouse gases in the atmosphere. As well as sewage and industrial wastewater polluted the pure water of wetlands and these impact human health, cause several diseases and also affect aquatic organisms. (R. T. Kingsford et al., 2016)

CONCLUSION
This paper focuses on the importance of wetland ecosystems and how wetlands play a major role in the world's economy. But several human activities, harm these natural ecosystems. If we don’t value the importance of natural resources, wetlands are further degraded. Evolution in any field gives more facilities and opportunities for humans. In past, some decades people were ignorant about protecting the earth's environment and which resulted in losing the natural ecosystem. Wetland degradation and loss is a major issue in the current situation. The case studies show the reality of resources, not only small water bodies but largest wetlands are fragmented or degraded due to exploration of human activities. Wetland degradation prevents several issues like pollution, climate change, loss of natural habitat, etc. and these problems directly affect the environment. To control the loss of wetlands, strict rules and regulations are needed and also Government should spread awareness. Government can also make special laws, organize management agencies, and built strong research and monitoring teams to conserve wetlands.

REFERENCES


