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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :9.014(2025); IC VALUE:5.16; ISI VALUE:2.286
PEER REVIEWED AND REFEREED INTERNATIONAL JOURNAL
( Fulfilled Suggests Parametres of UGC by IJMER)
Volume:14, Issue:9(1), September, 2025
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed : Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available : www.ijmer.in

# A STUDY ON THE ECOSYSTEM OF SUNDARBANS IN WEST BENGAL

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**Abstract:**

The Sundarbans are known for having the largest delta in the world. This is mainly because the three rivers, Ganga, Brahmaputra and Meghna rivers meet in the coastal region of this forest. The delta region is known for having mangrove trees along with the Sundari tree which is found here in abundance. The delta region is 40,0000 square kilometres long and is an area filled with trees that grow on the waterbody formed by the mixing of the three rivers mentioned above (The Commonwealth, 2024). The delta region is not considered fit for human settlement since most of the places here are filled with water with insects infesting trees. However, several forms of animals like Irawadi Dolphins and fish are found in this location (Saha and Sarkar, 2022). This makes the place one of the ideal spots for fishermen to catch fish. However, this place is also inhabited by tigers who roam in the location close to the delta. This makes the place very unsafe for human settlements. However, human settlements were still made in the northern part of the delta which was not filled with too many mangrove trees. The delta's northern part is filled with fertile soil that is considered to be fit for agriculture.

**Keywords:** Sundarban, Ecosystem, Animal, Mangrove, River

## Introduction:

There are three forms of soil found in the delta region of this forest. These are namely saline alluvial and clayey soil as well as sandy soil. The alluvial soil found in this region is fit for producing different forms of rice. The delta region is known for being submerged in water during the rainy seasons which often leads to flooding of nearby areas. This flooding causes the production of deepwater rice which is grown in abundance in this region (Sievers *et al.,* 2020). The delta region is also known for being formed of sediments carried by all three rivers straight from the Himalayas. The huge number of mangrove trees in this region makes this place a barrier against all forms of cyclonic storms that are formed in the Bay of Bengal. The abundance of mangrove trees in this region makes the environment of the Sundarbans stable since these trees do not allow flooding to happen here and absorb large amounts of water and greenhouse gases (Bomer *et al.,* 2020). The presence of so many mangrove trees is also a feature that makes the delta region of this forest responsible for controlling pollution and making air quality better as well.

The delta also experiences tides when water levels rise. The tidal waves that occur here are also responsible for enriching the soil of this place with essential nutrients to an extent. The mangrove forests in the delta region also ensure that the tidal waves are not damaging enough and control the increasing water levels by absorbing the excess water (Rajakumari *et al.,* 2024). Because of this feature, one can say that the delta region's features are responsible for protecting the human settlements from flooding and destruction. It can also be said that the delta region is responsible for making the soil fertile enough for agriculture and also providing fish thus acting as a major support for the survival of the people living near the forests while also providing food supplies for the people of eastern India and Bangladesh (Roy *et al.,* 2024). Lastly, the delta region is also responsible for supporting large amounts of vegetation as well. Apart from the mangrove and Sundari trees, the delta region also has several small islands which are filled with trees like coconut trees for example. This again makes the delta region a provider of food for common people living in this region while also conserving vegetation in large numbers.

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**Overabundance of methane**

Apart from having the largest delta in the world, the ecosystem of the Sundarbans is also characterised by an abundance of methane in the jungle's atmosphere. The formation of methane gas can be attributed to the presence of the mangrove trees present in this forest. This is because organic matter present on the surfaces or even the roots of such trees can lead to an increase in organic carbon present in the soil of this forest (Das *et al.,* 2023). This in turn leads to the creation of methane gas which causes problems when it comes to carbon absorption by the mangrove trees. However, the methane gas abundance in this region also leads to the creation of the Aleya ghost lights which are often seen in the forests or even on the river banks as well. The concentration of methane gas in this region also varies with changing seasons as well. This is shown as follows.

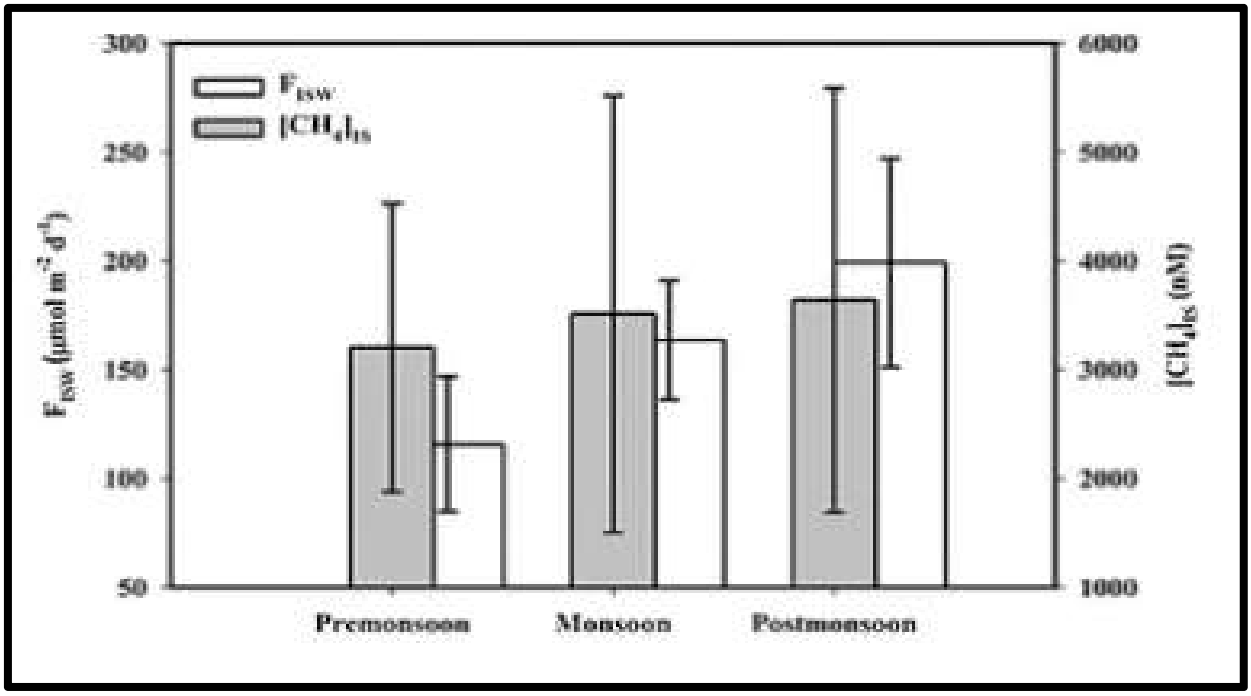


**Figure 1: Concentration of methane in the Sundarbans in different seasons**

(Source: Dutta *et al.,* 2017)

The figure given above shows that the concentration of methane in the Sundarbans Forest increases by 4000 nM as the monsoon approaches and ends. The reason for this lies in the fact that an excessive amount of organic matter gets deposited on the soil and near the roots of the mangrove trees during floods or high tides. The decomposition of this matter near the roots of mangrove trees causes the formation of methane which makes the environment of this forest warm. It also led to the creation of the ghost lights phenomenon which makes Sundarbans one of the major tourist attractions in India (Mondal and Mandal, 2022). However, the methane formation leads to the production of more carbon-based gases in this region as well. Despite the presence of many mangrove trees absorbing carbon dioxide, the presence of methane only makes the carbon dioxide levels increase in this region (Arai *et al.,* 2021). Although methane does not directly affect the ability of mangrove trees to absorb carbon gases, the deforestation happening in this region will only lead to methane and carbon gases increase in concentration which will lead to more warming of this place and will also cause poor air quality. The increasing methane concentration can also cause plants to die out as well due to an increase in ozone levels in the air which can lead to plants having yellow lives or dying slowly. Additional methane in the Sundarbans is also produced by the agricultural activities of farmers as well due to the presence of cow dung on the fields and river banks which get washed

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away during floods or tides (Department of Jobs, 2021). This causes methane levels to rise in this region which causes the air to get warmer in the Sundarbans.

**Fish Nursery in Sundarbans**

The ecosystem of Sundarbans is associated with a unique ecosystem for which it was declared a World Heritage site in 1989. This can be observed in India which is considered to be a significant biosphere. The first world heritage site is considered to be Nilgiris which is also situated in India. It is mostly due to the ecosystem that has been contained within such an area consisting of an area of around 10,200 square kilometres which is spread throughout and consists of 4200 square kilometres of reserved forest (SSDC, 2017). The rest of the 6000 square kilometres of the area belongs to Bangladesh.

As for the ecosystem the Sundarbans area is considered to be highly productive as it consists of a natural nursery. It is due to that this forest due to its thick mangrove cover prevents issues like cyclones which are responsible for protecting a natural fish nursery. Therefore, it plays a major role in preventing soil erosion which could damage soil quality. It is necessary as it can protect fish nurseries from various tidal storms. In addition to this, such a fish nursery provides local population with a reliable source of food which affects the lifestyle of individuals who are living in that area.

**Mangrove ecosystem**

In the context of the ecosystem of Sundarbans, it can be observed that it has maintained a significant ecosystem within its area. It has been named after the mangrove species which has its local names that are in Bengali Language. This can be reflected in the name of Sundarbans which itself means beautiful in Bengali. A major aspect behind this can be observed as it is one of the World's Natural Wonders which has been depicted from UNESCO World Heritage Site (Wikramanayake, 2024).

The ecosystem of such Sundarbans area can be depicted by its wildlife which has created a food chain. At the top of this food chain, is the Bengal tiger which is considered to be the largest predator and is known worldwide. This food chain also consists of chital deer and wild pig both of which have contributed much to the development of a food chain. Due to this reason, this region has created an ecosystem which has created a dangerous atmosphere for humans. It can be reflected in humans who have gone into the forest to collect honey and have been hunted by the famed Royal Bengal Tigers.

**Creation of Flora and Fauna**

The ecosystem of Sundarbans can be depicted from the existence of various flora and fauna both of which have created a healthy coastal ecosystem. This ecosystem is responsible for containing carbon in that area which makes the area liveable for its natural elements. It is crucial as such an area helped by providing shields against floods and storms both of which contributed much in maintaining a healthy area around coastal regions of both India and Bangladesh.

In the context of an ecosystem, it can be considered that it consists of 18 mangrove species which indicates its diverseness (Sahana *et al.,* 2022). However, in its current condition, this mangrove area has degraded much due to a recent cyclone which damaged its cover.

It has been further augmented by the help of several bird species which have contributed much to this ecosystem. In this regard, it can be observed that the Sundarbans area provides shelter for many types of bird species. Therefore, contributed much to the flora and fauna which in the end has helped in the development of an ecosystem. It describes that in such areas the help of flora and fauna along with birds helped in the process of developing a healthy ecosystem.

**Carbon sequestration**

The ecosystem of Sundarbans is associated with the process of carbon sequestration which is the process of storing carbon. It is due to that this area is covered with a thick mangrove process that plays a significant role in storing carbon. This is due

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to that excessive carbon plays a significant role in deteriorating environmental quality. This is why the importance of trees plays a significant role which can help in the process of absorbing carbon from the atmosphere.

In this context, it can be stated that due to the importance of such an atmosphere, it helps in the process of carbon sequestration (Bera *et al.,* 2022). Therefore, it has contributed much to maintaining the temperature in the Sundarbans area. It is crucial as it helps in maintaining a cooler temperature around the surrounding area. Due to this reason, the ecosystem of the Sundarbans area contributed to maintaining a significant surface temperature which is crucial for other living organisms in that area.

Despite all this, it has changed significantly in recent years which have contributed much to the increasing temperature of surrounding areas. This is due to recent storms and cyclones which destroyed most of the mangrove cover and affected its living organisms. Due to this reason, it has affected its flora and fauna significantly. Therefore, negatively affects the surrounding areas which leads to increasing surface temperature.

**Ecosystem in providing natural resources**

The ecosystem of the Sundarbans is associated with the provision of various resources which are available naturally. Therefore, it has contributed much to the local populace which has led to its sustainability. One such product that can be acquired from the ecosystem is fish as this area consists of a large fish nursery. Therefore, contributing fish to the local populace helped in providing them with basic needs (Iqbal, 2020). In addition to the fish, such a diverse ecosystem provides shrimp larvae which like fish provide local individuals with a means to earn.

Contrary to this, such an ecosystem is also responsible for providing many plant-based products to the local individuals. This contributed much to their earning and a basic requirement for needs that contributed much to their overall lifestyle. One common example of this can be observed from providing various types of leaves and grasses which helped in creating new products. In addition to this, it also played a crucial role in providing fruits and honey collection. Therefore contributes much to the living standards of local populace in which such an ecosystem plays a major role.

**Existence of Fish fauna**

The ecosystem of the Sundarbans consists of a natural nursery, which is why the Sundarbans area is thought to be very productive. This forest's thick mangrove cover prevents cyclones, which are responsible for protecting a natural fish nursery, from occurring. As a result, it plays a significant role in preventing soil erosion, which has the potential to harm soil quality. Because it can shield fish nurseries from a variety of tidal storms, it is necessary (Habib *et al.,* 2020). Additionally, such a fish nursery provides a dependable source of food for the local population, which has an impact on the way of life of those who live there.

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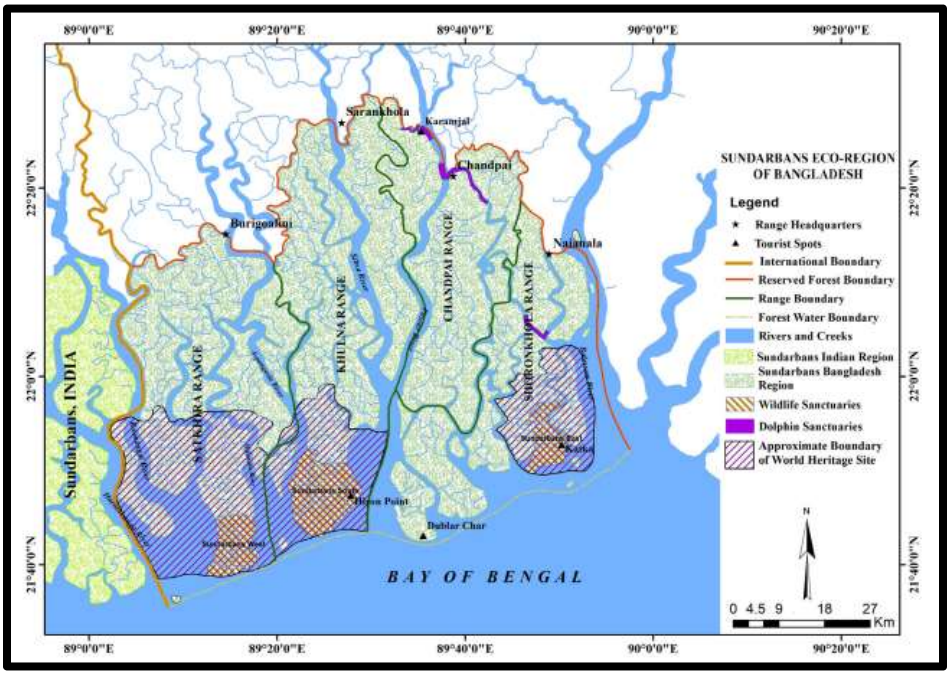


**Figure 2: Areas for fish fauna**

(Source: Habib *et al.,* 2020)

A main consideration of the Sundarbans is regarding fish fauna which lead to the development of fish fauna. It is crucial and necessary to provide an aquatic habitat that contributes much to the local communities. The above diagram helped in the depiction of such areas which consist of fish fauna areas. Therefore, it led to the development of more than 322 species of fish fauna which has contributed much to this fauna. In addition to this, it has also contributed to fish fauna which contributed much to an increasing fauna.

**Species in Ecosystem**

The ecosystem of the Sundarbans is considered to be one of the largest mangroves in the world which consists of an area of around 10,277 square kilometres. This is situated between the Ganges and Brahmaputra rivers. In the case of the ecosystem, it can be observed that it is associated with a diverse set of flora and fauna (Das, 2022). It includes various types of plants and trees which are spread out all across the area.

In the case of species, it can be observed that it consists of a diverse set of animals one of which is the famed Royal Bengal Tiger. It is considered to be a threatening animal as its number is on a constant decline. In addition to this, this ecosystem also consists of other globally threatened animals. These animals include fishing cats, Gangetic dolphins, estuarine crocodiles, horseshoe crabs, water monitor lizards and river terrapins all of which are species that are becoming endangered over the years.

This ecosystem of the Sundarbans is responsible for providing local inhabitants with sources of funding. It incorporates the measure of prawn and fish farms both of which are responsible for providing such population groups with a steady source of income.

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**Wetland Ecosystem**

The ecosystem of Sundarbans is associated with the feature of a wetland for which it hosts a diverse nature of flora and fauna. These consist of various elements all of which are living and non-living species. Due to this reason, the ecosystem of the Sundarbans is mostly diverse and is of international importance. It can be reflected in its diverse set of plants and birds both of which contributed much in providing ecological services.

A common example of this can be observed from the presence of more than 300 species of birds which belong to all the bird species that are mostly endangered. In the case of fish, it can be observed that it belongs to more than 250 species all of which contributed much to the ecosystem of the Sundarbans (ES, 2020). The uniqueness of such an area can be depicted from a variety of reptile species which numbers around 58 to 60. In case of mammal species, it consists of around 42 species.

In addition to this, this ecosystem also includes several insect species, crustaceans, invertebrates, and mollusks all of which contributed much to such a diverse ecosystem. It also includes diverse phytoplankton, fungi, bacteria, and zooplankton all of which are also crucial elements of this ecosystem. In the context of services of such wetland ecosystems, it provides services like carbon sequestration which helps in storing carbon dioxide. Adding to this, such an ecosystem also consists of producing oxygen that helps provide with breeding ground for various types of fish.

**Salinity Value in Ecosystem**

The salinity value of the ecosystem is considered to be a significant measure that has contributed much in this area. It is due to that salinity is responsible for depicting the presence of salt in the ground which can determine the presence of species in those areas (Sarker *et al.,* 2024). Therefore it can be considered to be one of the significant methods that is responsible for making the place liveable for such individuals.

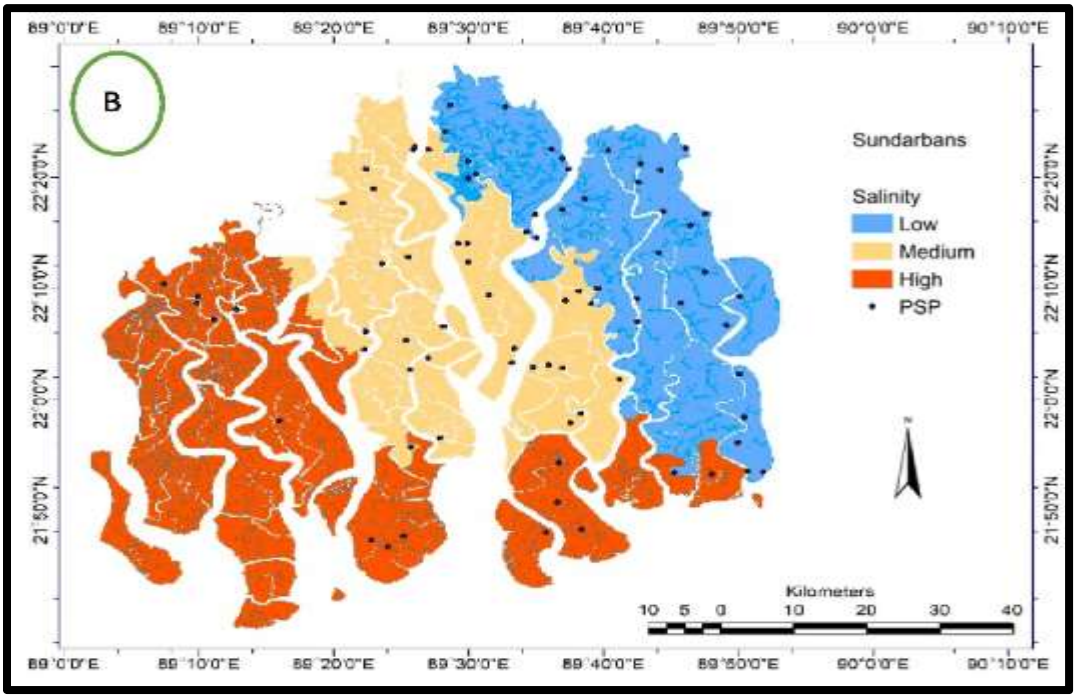


**Figure 3: Salinity in the Sundarbans**

(Source: Sarker *et al.,* 2024)

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The above-mentioned diagram has helped in the process of salinity which is present in the Sundarbans area. From this, it can be interpreted that in all of Sundarbans, the presence of salt in the areas is more or less the same. Therefore, it played a significant role in affecting the productivity of Sundarbans effectively. To be more precise, due to versatile salinity the Sundarbans area consists of many types of flora and fauna. In addition to this, it also contributed much to the presence of a significant number of animals.

**Conclusion:**

The Sundarbans region is thought to be very productive due to the presence of a natural nursery in its ecosystem (Sarker *et al.,* 2024). This timberland's thick mangrove cover forestalls twisters, which are liable for safeguarding a characteristic fish nursery, from happening. As a result, it significantly contributes to the prevention of soil erosion, which has the potential to compromise the quality of the soil. It is necessary because it can protect fish nurseries from a variety of tidal storms. Additionally, such a fish nursery provides the local population with a steady supply of food, which affects the way of life there.

On account of species, it tends to be seen that it comprises a different arrangement of creatures one of which is the popular Regal Bengal Tiger. Due to the constant decline in its population, it is regarded as a threat. This ecosystem also contains other animals that are in danger around the world. Fishing cats, Gangetic dolphins, estuarine crocodiles, horseshoe crabs, water monitor lizards, and river terrapins are among these species, all of which are in danger of extinction in recent decades.

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