

Increase of Non-Green Motorised Boats in Sone Beel, Assam

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Abstract: Only about 0.036% of the planet's total water supply is accessible in lakes and rivers. Maintaining the ambient quality of aquatic resources is of great importance. The impact of motorised boats on the aquatic environment has been the subject of much discussion over the years but there has been relatively little scientific research conducted on the subject. Gasoline and diesel engines are among the greatest contributors of hydrocarbons (HC) and oxides of nitrogen (NOx) pollution. Fuel from boat motors is the primary cause of impaired water body in many parts of the world. There is an urgent need to enumerate the ecological impact of the increase use of motorised boats on Sone Beel in order to specifically ascertain the long term implication of slow but gradually increasing Hydrocarbon pollution in the waters of Sone Beel.

Keywords: Sone Beel, Motorised boat, Diesel, Pollution, Green-technology.

1. Introduction

Water is a source of life and regarded as the most essential of natural resources. Approximately 98% of this water is seawater and is unusable for drinking because of the high concentration of salt. About 2% of the planet's water is fresh, but 1.6 % is locked up in polar ice caps and glaciers. Another 0.36 % is found underground in aquifers and wells. Therefore, only about 0.036% of the planet's total water supply is accessible in lakes and rivers.

To maintain the ambient quality of aquatic resources is of great importance. In this study an attempt is made to report the increasing use of motorised boats on Sone Beel over the years. The impact of motorised boats on the aquatic environment has been the subject of much discussion over the years but there has been relatively little scientific research conducted on the subject; particularly concerning the potential impacts of emissions on specific habitats. There are studies which examine the implications of engine emissions on non-designated aquatic species and plants.

In Indian, capture fisheries and enhanced fishing effort has resulted in substantial increase in motorised boats being used. As a result there has been considerable increase in diesel consumption. For every tonne of fish caught, the CO₂ emission has increased. Gasoline and diesel engines are among the greatest contributors of hydrocarbons (HC) and oxides of nitrogen (NO_x) pollution. Fuel from boat motors is the primary cause of impaired water body designations in USA.

Petroleum in or on the water is harmful and, in some cases, fatal to aquatic life. Benzene, a carcinogen, is in gasoline. Oil contains zinc, sulphur, and phosphorous.

Once petroleum is introduced into the water, it may float at the surface, evaporate into the air, become suspended in the water column or settle to the floor of the water body. Floating petroleum is particularly noxious because it reduces light penetration and the exchange of oxygen at the water's surface. Floating oil also contaminates the micro layer. The micro layer refers to the uppermost portion of the water

column. It is home to thousands of species of plants, animals, and microbes. The abundance of life in the microlayer attracts predators: birds from above and fish from below. Pollution in the microlayer, thus, has the potential to poison much of the aquatic food web. Also worth noting, a single pint of oil released onto the water can cover one acre of water surface area. Diesel may be spilled during the act of fuelling, as backsplash out the fuel intake or as overflow out the vent fitting. Spills of this sort harm aquatic life, waste money, and can result in stains on the hull and damage to the gel coat.

Capture fisheries contribute to nutritional security and income generation for the people depended upon Sone Beel. The sector currently faces several sustainability issues such as overexploitation, pollution and habitat degradation. In recent years, concerns have been extended to environmental issues, and climate change in particular, has been recognized as one of the critical issues in fisheries. One of the characteristics of fishing is its dependence on fossil fuels and the resultant emission of greenhouse gases (GHGs). With regard to GHG emissions, insufficient attention has been paid to the fisheries sector as a whole and to fishing operations in particular. While the use of fossil fuels has increased the availability of fish to fisheries, the dependence of the fishing sector on fossil fuels raises concerns related to climate change, freshwater acidification and economic vulnerability. Due to high PCO₂ in the atmosphere, its miscibility in water increases.

2. Study Area

Lake Sone, which is locally known as the 'Sone Beel' is the largest fresh water tectonic lake in the northeastern Indian State of Assam (Table 1). This widespread lake when full runs a length of 13.2 km and a width of 4.2 km, along with a vast shoreline covering 35.4 km. Enclosing a 3458.12 hectare area at full storage level, it almost shrinks to a mere 409.37 hectare area at the dead storage level (Kar *et al.* 2008).

The lake-bed is mostly alluvium along with fine grain sandstones in the catchment areas which also has tropical

evergreen forests. Lake Sone is continuously fed by a major inlet called Singla, which originates as Thing Tlawng Lui within the Mizo Hills; from an altitude of 365 meters above sea level, this inlet traverses a torturous course of 62 km to finally empty itself in the Lake Sone.

Moreover, a major outlet called River Kachua traversing a distance of 19 km from the northernmost end of the lake, eventually drains this lake water into a bigger river called 'Kushiara'. Situated between 92°24'50'' - 92°28' 25''E and 24°36' 40'' - 24° 44' 30'' N within Karimganj district of Assam.

3. Material and Method

Two categories of fishing boats operate in Sone Beel, the motorized boats and the traditional boats. The first category is gaining predominance over the years, not only for fishing but more so as a means of transport during the elongated monsoon of the north eastern India. Motorboats use a wide variety of different engines and transmission systems. This makes an assessment of the generic impact of emissions from such craft particularly difficult. The emissions themselves also vary in their importance. Hydrocarbons, may impact upon the water column and sediment. To compound the difficulty in assessing emissions, there has been little research carried out specifically into the impacts of motorised boats on the aquatic environment of Sone Beel.

There has been a steady increase in the number of motorised boats in the last 5 years in Sone Beel (Table 1). Average Diesel consumption per boat on daily basis is about 10 liters. This data source provided information on diesel consumption per trip basis, i.e. from the time the boat departed and arrived at the different points of traffic and commodity pick up and landing.

Table 1:

Year	Nos. Mot. boat	Fuel type	Fuel used/boat/day (in lits.)
1990	2	HC(diesel)	4-5
2000	5	HC(diesel)	4-6
2010	11	HC(diesel)	6-8
2011	17	HC(diesel)	8-10
2012	20	HC(diesel)	8-10
2013	24	HC(diesel)	8-10
2014	31	HC(diesel)	8-10

As the number of motorized boats and size of motors on Sone Beel continues to increase, questions arise about the potential effects these boats have on the lake environment. In the last 20 years, there has been a 600% increase in the number of motorised boats in Sone Beel. There has been an increase in the Effective Mixing Depth (Table 2) of the aquatic system and also its frequency. Effective Mixing Depth is the maximum depth at which the engine stirs up the water and, in turn, the lake bottom sediment. Motorised boating in shallow lakes is likely to stir up the bottom sediments, decreasing water clarity and thereby decreasing the euphotic zone and consequently decreasing the D.O of the system as well as its primary productivity. There is an estimated consumption of nearly 300 liters of diesel daily by the motorised boats on Sone Beel. On a monthly basis

this amounts to about 9000 liters. This is really a figure to be concerned about.

Table 2: Effective Mixing Depth as per Engine Size.

Horse Power	Mixing Depth
10	6 feet
28	10 feet
50	15 feet
100	18 feet

Source: Lakeline.

The Wisconsin Department Natural Resources, USA did a study on the effects of motorized watercraft on aquatic ecosystems. Boats can affect water quality in a few different aspects. First, they can add metals and chemicals to the water column. A certain amount of the fuel that enters into a motor is discharged unburned and ends up in the water. Two stroke motors can emit 25-30% of their unburned gas and oil mixture into the water. This pollution can affect the pH and dissolved oxygen in the lake, which can influence the type and abundance of fish and wildlife.

Another main impact by motors is churning up the lake bottom in shallow areas. This action stirs up the lake sediment, re-suspending nutrients (phosphorus) that are at the lake's bottom. When these nutrients reach the surface of the water where the algae are, they can feed algae and cause and algal bloom. This stirring can also decrease the water clarity because of additional particles suspended in the water column. Two stroke engines use a method of combustion which results in some unburned residual oil and partially burnt oil entering the marine environment through the exhaust. This leads to the familiar sight of small patches of oil forming on the water where 2 stroke marine engines are being run.

Outboard engines exhaust below the water surface and, as a result, all hydrocarbon emissions pass through the water they become suspended in the water column or form surface film until they degrade or are released into the atmosphere. Hydrocarbons reach the sediment slowly due to the efficiency of the degradation process.

Motorboat engines also pollute the water with their exhaust and by spilling oil and gasoline. Every year in the U.S., the total amount of water pollution from motorboats may equal 10 to 15 Exxon Valdez oil spill disasters. The chemicals in this pollution can kill fish eggs and other forms of water life.

Lead - Butcher (1982) found that lead concentrations were increasing, but that at that time it did not create quality problems in the water column. However, long term build-up of lead in the sediment was considered to be of potential environmental concern. He concluded that sublethal and long term biological effects of leaded fuel cannot be entirely ruled out. Recent research carried out by the State of California Air Resources Board (1998) found that two-stroke engines can discharge as much as one-third of the oil/petrol mixture unburned into the water. It concluded that there is potential for considerable impact from such emission.

4. Conclusion

There is an urgent need to enumerate the ecological impact of the increase use of motorised boats on Sone Beel in order to specifically ascertain the long term implication of slow but gradually increasing Hydrocarbon pollution in the waters of Sone Beel. It being the largest of the fresh water lakes of North-east India, immediate assessment of the physico-chemical parameters along with biological indicators is required. To protect one of the primary fish bowl of south Assam and to make the system a sustainable one, considering the huge number of families directly and indirectly dependent on Sone Beel, it is time to introduce boats with green technology.

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