INTRODUCTION

1.1 POLLUTION OF RIVER SYSTEMS

The industrial and urban waste water are released into nearby water resources from various industrial and urban activities which adversely affect the river ecosystem along with the natural environment. As a result, the river pollution has become a matter of great concern in respect of gradual increasing pollution from the industrial and urban activities. The people settle around the large scale industry for their livelihood, and consequently, it leads to formation of urban and suburban areas. Small scale and other subsidiary industries are grown in and around the urban areas which initiate severe air and water pollution in the neighbouring areas. The urban area occupies only about 0.30% of the world’s geographical area but 40% of the total population of world lives in this urban area.

The dynamics of industrialization and increase of population has led to growth of modern urban complexes. Industrialization and urbanization are growing hand in hand to form modern technological society. High density of population, high consumption of energy, large amount of solid wastes generation, discharge of domestic waste water and sewages, industrial effluent and other waste materials are the distinctive characters for both industrial and urban activities as well as industrialization and urbanization. The water bodies of the neighbouring area is being gradually affected in respect of morphological and ecological aspects.
1.2 STATEMENT OF THE PROBLEM

1.2.1 General Statement

This study on “The Impact of Industrial and Urban Activities on the Water Quality of Tunia River, Assam” was carried out with broad objectives to identify and list sources of pollution in the Tunia River and impact of pollution on its water quality and ground water and soils of the catchment area and suggest remedial measures for preventing deterioration of water quality.

1.2.2 Water of Tunia River

The water quality of the Tunia River, flowing through Bongaigaon, an industrial town in Lower Assam of India, is being gradually deteriorated due to receiving of effluent, domestic waste water, sewages and other waste materials from various sources. The river is receiving about $9312 \text{m}^3/\text{day}$ of effluent from industrial units and about $9112 \text{m}^3/\text{day}$ of domestic waste water from the urban area. The industrial units discharges about $915.96 \text{kg}$ of organic matters through the effluent and domestic sources $3337.17 \text{kg}$ of organic matters through the waste water as organic pollution load in a day into the Tunia River. Besides, the river also receives $196.28 \text{kg}/\text{day}$ of oil and grease and $75.31 \text{kg}/\text{day}$ of phenolic compounds from various sources. Therefore, the overall water quality is being gradually deteriorated in order to receiving of said organic content from various sources and initiated adverse impact to flora and fauna in the river system along with neighbouring ground water and soil in the catchment area.

The water quality in respect of physico-chemical and biological constituents are being gradually increased against the natural level in the river water. As a result,
the fish and other aquatic lives are being gradually disappearing in the river system, and consequently, it will lead to a biological desert.

The river is also facing environmental problem in respect of eutrophication due to receiving of municipal and industrial waste materials from various sources. This eutrophication hazards is very serious in winter and pre-monsoon season on account of low flow, low level of water and optimum temperature along with abundance of nutrients such as nitrogen, phosphorus and other exotic components which assist for the growth of eutrophication hazards. The eutrophication hazards along with effluent, waste water, sewage and other waste material initiated severe adverse impact on fish and other aquatic flora and fauna in the river system. The natural self-purification process and ecology of the river system are less efficacious to reduce their adverse impact in the water system of the Tunia River. Besides, the deteriorated water quality of the river has initiated adverse impact to ground water and soil in the neighbouring catchment area.

1.2.3 Study Area

Bongaigaon is an industrial town in the western side of Assam and Tunia River is flowing through the town. The industrial activities are growing after commissioning of Bongaigaon Refinery and Petrochemicals Ltd. (BRPL). This unit is now known as Bongaigaon Refinery Ltd. (BRL) under the Indian Oil Corporation Ltd. (IOCL), since 2009. Earlier, Birjhora Tea Estate (BTE) and C&W Workshop (C&WW) of the N.E.F. Railways (NEFR) had been setup at Bongaigaon Town which opened up industrial development in the area. The Bongaigaon Refinery and Petrochemicals Ltd. was established in 1974 on the bank of the Tunia River. Major subsidiary industrial units such as Brahmaputra Carbon
Ltd. (BCL), Assam Chemical Industries (ACI), North East Gases Pvt. Ltd. (NEGPL), Indane Botling Plant (IBP), Bongaigaon Roller Flour Mills (BRFM), Oil India Pumping Stations (OIPS), Anjil Plastic Industries (API), Sapphire Oil Industries Ltd. (SOIL), Viswakarma Plastic Works (VPW), New Bongaigaon Industrial Estate (NBIE) and other small industrial units had been setup under the private and public sectors. This has initiated massive industrial growth in the catchment area of the upstream of Tunia River. Besides, some tertiary industrial units such as laundry, hotel, restaurant, patholab and nursing home are growing in and around the Tunia River. The New Bongaigaon Railway Station was converted to Railway Junction after rapid development of Bongaigaon Town along with in the Lower Assam.

Earlier, the water of the Tunia River was being used by people for domestic purposes such as drinking, bathing, cleaning and other aesthetic purposes. But the water cannot be used any purposes due to heavy organic load. The river is now carrying effluent, domestic and municipal waste water, sewage and other waste materials from the aforesaid industrial units along with the Railway Junction, Railway Colony, New Bongaigaon and Bongaigaon Municipal Area.

1.2.4 Aim of the Study

The aims of the study are to:

- identify and list the sources of pollution in Tunia River and assess the present status of pollution of the river,
- assess the status of water quality of Tunia River and its seasonal variation,
- assess the impacts of pollution on the river water quality, and
- suggest remedial measures for preventing deterioration of water quality.
1.2.5 Scope of the Study

The study on impacts in river waters due to confluence of domestic waste water, municipal waste water, industrial effluents and other waste materials from various sources has been given due importance as such studies suggest remedial measures to reduce pollution load in the river. This study on “The Impact of Industrial and Urban Activities on the Water Quality of Tunia River, Assam” will suggest necessary conservation measures in favour of flora and fauna and steps to be taken for revival of its water to be used for domestic purposes indicating the progress of self-purification process of the river system with implementation of such measures. The study will also lead to impacts of the river water pollution on soil and ground waters of the neighbouring area and suggest remedial measures for prevention of deterioration of soil and ground water quality.