CHAPTER -1
INTRODUCTION

1.1 General:
Water is a vital natural resource, since it is an essential element for life on earth and plays a major role in climate regulation and bio-geological cycles. Although 72% of earth’s surface is covered by water \( 1.36 \times 10^7 \text{ m}^3 \) only 0.62 percent \( 8441.25 \text{ T m}^3 \) is available in rivers and surface or under ground water as fresh water- which is suitable for human consumption (Bourmgartner, 1975). This quantity of water, which is in circulation, remains more or less constant although the demand for it is increasing day by day with the growth of population, development of industries and extensive agricultural activities. The lotic and lentic waters may acquire in space and time, certain quality characteristic due to natural or man made interaction respectively. These acquired quality characteristics may render water unfit for the particular use. It is not possible to keep the water bodies in pristine or even at uniform quality throughout the entire stretch of lotic water body. However, it is necessary that the water quality in various stretches of water bodies is maintained at prescribed standards as per its designated best use. It is possible to accomplish the above objective by controlling the pollution caused by human activities by applying the scientific innovation and monitoring.

In addition to agriculture practices, the increasing urban settlements and growing industrial production are causing problems for water quality management. The demand for water is increasing rapidly. Disposal of effluents is also increasing day by day. Agricultural sector is responsible for degrading the water quality by generating runoff from animal husbandry units, which contains high organic matter, and residual chemicals from intensive use of fertilizers and pesticides to increase the crop yield. The industrialization is also taking place at an accelerated rate since the 18th century all over the world and especially in Europe after the French revolution in 1789. By the late 18th century, the water of Rhine and the Thames had become so polluted that it was unfit to support the fish and aquatic life. The water quality in the rivers is deteriorating due to the disposal of large volumes of industrial and domestic effluents and large quantity of solid wastes in quantities much above the self-purification
capacity of the rivers. These effluents contain high organic matters causing the deficiency of Dissolved Oxygen (DO) in river water and increase in Biological Oxygen Demand (BOD). These effluents also contain toxic metals, pesticides, insecticides and other chemicals harmful to the aquatic life.

The situation as regards to river water quality in India is also not different from the rest of the world. In India 80% of the surface water is exposed to the pollution. More than 90% of the sewage in the country is not treated (Chaudhry, 1981). The amount of raw sewage entering the rivers is increasing; the increase is caused by urbanization and population growth. In the post independence era, the fast industrial development begun in mid sixties to boost up economy of the country, without considering the environmental consequences and assimilating capacity of water bodies, thereby affecting the quality of water in rivers. Also the tremendous efforts have been made in agricultural sector to meet the food requirement of ever increasing population. The use of chemical fertilizers, pesticides and insecticides have increased manifolds; and the residual part of these chemicals are entering as distributed pollution loads into water bodies and affecting the water quality of these bodies. The large volume of unabated polluted industrial effluents being discharged into the rivers due to the fast industrial development much above the self-purification capacity of rivers and these effluents are not compatible with or readily assimilated by the environment and rivers. The rivers converted into wastewater drains/sewers in the down stream of industrial estates and cities; the impact can be seen number of kilometers downstream. The holy Indian River Ganga has been polluted in the downstream of industrial towns (Rishikesh, Haridwar, Kanpur, Allahabad, Calcutta, etc.) to such an extent, that to improve the water quality of the river, the Government of India started the special Ganga Action Plan. Also under National River Conservation Plan, Yamuna, Gomti and Damodar Action Plans and National Lake Conservation Plan have also been initiated for the improvement of water quality in these rivers and lakes (MOE F, 2002).

Himachal Pardesh is one of the States in Northern India with abundance of water resources, since the major rivers such as Satluj, Beas, and Ravi originate in middle/upper Great Himalayan Ranges of this State. These rivers are lifeline for Punjab, Haryana, Rajasthan and Delhi states of Northern India as the water for power
The water quality of these rivers and their tributaries in the upper areas of Himachal Pradesh has not deteriorated, since no industrial development has taken place on the banks of these rivers and the flow in these rivers is very high throughout the year being snow fed rivers. The water quality of tributaries of these rivers has not deteriorated in the upper parts of the State. There are only small towns located on the banks of these rivers/streams upstream. The water of these rivers is used for the drinking purposes with conventional treatment and without any treatment for irrigation purposes. These rivers are the lifeline for the public of this hilly state as the under ground water is not available in hills. However the industrial development in state that has taken place in the catchment of these rivers is mainly in the lower Shivalik ranges (Kandi Areas) due to proximity to Chandigarh and major towns of Haryana and Punjab. The tributaries of major rivers flowing in the Kandi Areas are having low water discharge, dense population and receiving large volume of industrial and domestic effluents affecting the water quality. The situation is aggravated due to the disposal of treated/partially treated industrial effluents and the domestic sewage. There is strong need to enforce an effective management plan for pollution control, since the unabated disposal of effluents into these rivers is likely to lead severe water quality problems in the downstream sections and pose health hazard to the community living along the banks of river in the lower catchment.

1.2 Statement of the Problem:

The industrial development in the lower Shivalik Ranges in Himachal Pradesh has taken place in Paonta Sahib, Kala Amb, Parwanoo, Baddi-Barotiwala, Mehatpur and Damtal. The proximity of the twin industrial complex of Baddi-Barotiwala to Chandigarh, Ludhiana and other nearby markets in Punjab and Haryana attracted the major industrial houses to establish their units in this area. This area therefore has more pollution problems in comparison to other industrial complexes of the state. The river Sirsa that flows downstream of the Baddi-Barotiwala complex is used for effluents and garbage disposal. There are about 50 large & medium scale units, more than 300 small and tiny units and two Export Parks in this industrial complex.