

ASSESSMENT OF TEMPORAL VARIATION IN WATER QUALITY FOR ADYAR RIVER IN THE LOWER COURSE OF URBAN LIMIT, CHENNAI, INDIA

Sumathi S.N.,* Shail Mahamad**

*Research Scholar, Department of Geography, Presidency College, Chennai.

**Assistant Professor, Department of Geography, Presidency College, Chennai.

Abstract

The Adyar river originates near the Chembarabakkam Lake in Kanchipuram district, is one of the two rivers which winds through Chennai, Tamil Nadu, India, and joins the Bay of Bengal at the Adyar Estuary. The 42.5-kilometre long river contributes to the estuarine ecosystem of Chennai and has been subjected to immense degradation and pollution due to the huge amount of domestic wastewater entering the river. Despite the persistent efforts in the form of the Adyar Eco Park - phase I and II, the river quality has not improved. The aim of the present study was carried out to assess the status of water quality of Adyar river in Chennai city using physicochemical parameters, the secondary samples were collected from Manapakkam bridge, Thiru Vi Ka bridge, Slaughter house, Manapakkam STP outlet, Nesapakkam STP outlet extension for the year 2008-2009 & 2015-2016. The selected Parameters such as BOD, COD, pH, TSS, TDS, and EC were analysed with the Drinking water quality standards of BIS (2012) and WHO. Encroachment is also another major problem in the River Adyar which blocks the storm water drain and doesn't allow the river to recharge in monsoon period. The industrial Sector and the slaughter house source point has found to be more polluted compared to the other sample locations, these points are found to highly polluted in the pre – Monsoon Period, when the river is not recharged.

Keywords: Water Quality, Encroachments, Pollution and Urbanisation.

Introduction

Global concern for the quality of river water in addition to quantity has been on the increase, in recent years. Adyar Estuary and Creek and the Theosophical Society on the Estuary's southern side has been a haven for migratory and resident birds for years. The environmental conditions in the estuary with low salinity, good shelters and high plankton availability in the Adyar creek serves as a good nursery for fish. The flow of tidal water in and out of the creek allowed for easy travel of boats. It therefore encouraged fishing and there was a thriving economy of fish trade here. However, with the city's sewage and effluence from its various industries, for some time, emptying into the river, the biological activities in the region was affected. Although the number has been in decline due to pollution and anthropogenic activities, they still attract hundreds of birds. Even before few years the Theosophical Society has come out with a CD on 'Birds of Adyar', compiled by Trust for Environment Monitoring and Action Initiating. The proposed Adyar Poonga may be a first towards restoring this fragile but vibrant eco-system.

The river receives a sizeable quantity of sewage from Chennai after reaching Nandambakkam near Chennai. The river is almost stagnant except during the rainy season. Rapid industrialisation and urbanisation has led to severe contamination of this river. However, the river gets just 10 per cent of the untreated sewage being let into the three principle waterways of Chennai daily, with the other two, namely, the Buckingham Canal and the Cooum River, taking the major share (60 per cent and 30 per cent, respectively).

The problem of sedimentation was not severe as the Adyar's width near Thiru.Vi.Ka. Bridge is nearly 480 metres (1,570 ft) that enabled tidal effect into the waterway for about 4

kilometres (2.5 mi). However, it was essential to provide groynes to keep the river mouth open for adequate width and prevent inundation during monsoon. In 2011, the Water Resources Department (WRD) proposed to construct groynes to reduce formation of sand bars near the mouth the river.

The river water quality has been greatly influenced by the discharge of domestic, industrial waste waters besides agricultural runoff. Introduction of different wastewaters into the river in large quantities not only alters the environment but also influence the aquatic Communities. The title deals with water quality of the Adyar River and the changes taken place near the Adyar River. Rivers in States face the problem of pollution caused by municipal wastes which include liquid, solid, industrial effluents and agricultural runoffs. Studies have identified, inter alia the following.

The serious impacts of pollution in the Adyar river

Pollution of surface water with organic load, causing anaerobic conditions and foul smell, bacteriological contaminants and trace metal contamination. Adverse impacts on river ecology, aquaculture and other biological life. Rise in the bed level of rivers leading to change in the course of the Rivers.

Aims & Objectives

The aim of the study is to produce a water quality condition in the River Adyar and to find the changes taken place along the Adyar River due to urbanisation. This helps to better understand the condition in which the river is passing. To analyse the water quality of the Adyar river during 2008-2009 and 2015-2016. To analyse the comparison of the water quality from various sampling Location. To examine the encroachments and the changes taken place along the Adyar River.

Methodology

Water sample were collected during all the seasons from 2008-2009 (Apr – Mar) and 2015 – 2016 (Apr – Mar) to test for physical qualities and chemical contents in Adyar river. Five numbers of sampling location were selected and on every month. Thus, for this study, in total five samples water quality were collected in each season (secondary Data). Thus, for this study total 5 parameters were used Biological Oxygen Demand(BOD), Chemical Oxygen Demand(COD), Potential of Hydrogen(pH), Total Dissolved Solids(TDS), Total Suspended Solids(TSS).

Study Area

Adyar, originating near the Chembarambakkam Lake in Chengalpattu district, is one of the two rivers which winds through Chennai (Madras), South India, and joins the Bay of Bengal at the Adyar Estuary. The 42-km long river contributes to the estuarine ecosystem of Chennai. Despite the high pollution levels, boating and fishing take place in this river. The river takes in surplus water from about 50 tanks and lakes, small streams and the rainwater drains in the city. Most of the waste from the city is drained into this river and the Cooum.

Adyar River starts from Malaipattu tank (80.00° latitude and 12.93° longitude) near Manimangalam village in Sriperumbudur Taluk at about 15 KM west of Tambaram near Chennai. It starts to appear as a stream only from the point where water from Chembarambakkam Lake joins the river. It flows through Kancheepuram, Tiruvallur and Chennai district for about 42 km before joining Bay of Bengal in Adyar, Chennai.

The Adyar River enters in the Chennai zone approximately in the Manapakkam Bridge, which is covered with 12 wards from the both the side. The river is passing from residential part to the industrial as well as commercial. At last it joins in to the Bay of Bengal. The annual average during the North-East monsoon season between Septembers to December. The study is analyzed only from the Chennai zone with 5 sampling location. The samples have been collected in the pre-monsoon, monsoon and the post monsoon periods.

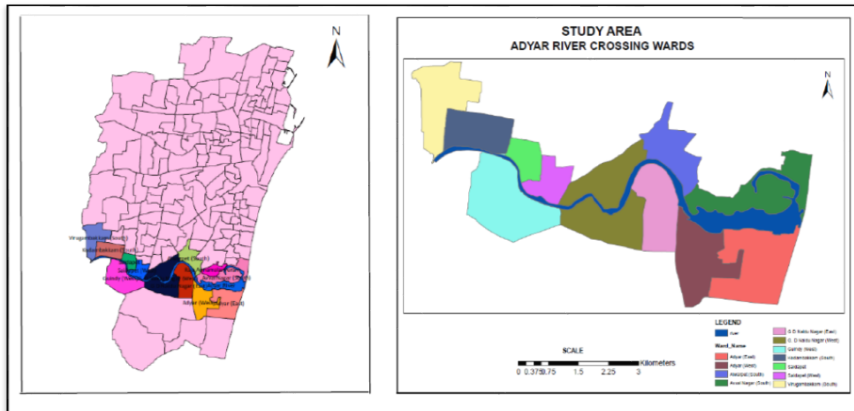


Figure 1.1. Location Map of Adyar River

Urban storm water drainage and solid waste management form part of an integrated water resource management approach and have a direct impact on the quality of river waters. This makes a river, which unable to recharge from it and also leads to the flooding of the river.

The water quality of the river has been collected from the Tamil Nadu pollution control board

They collected the water sample from the various sampling points, which are. Manapakkam bridge in the upper stream. Thiru. VI. KA. bridge in the mouth of the river. Slaughter house. Nesapakkam STP outlet. Nesapakkam STP Outlet Extension.

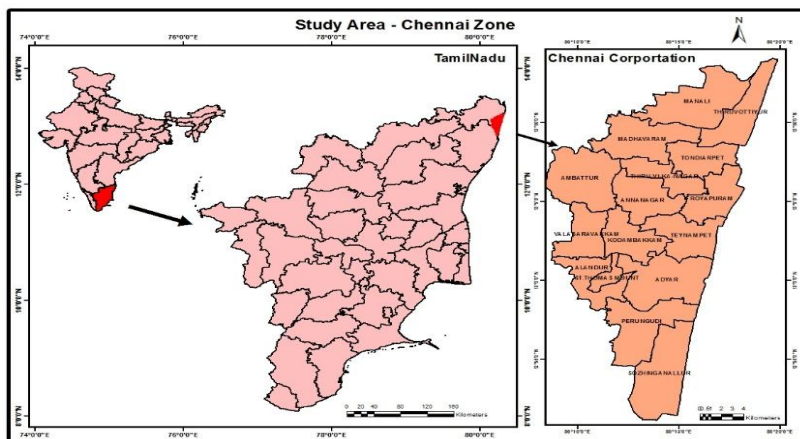


Figure 1.2. Shows the Study Area – Chennai Zone

This study analysed the decadal changes of the river and river water quality pattern and the encroachments; through this study we can come to an end, that what are the major reason of the river pollution and the steps has been taken from the government sectors to improve the environment.

The water quality is being analyzed by the following parameters. Biological oxygen Demand (BOD). Chemical Oxygen Demand (COD). Total Suspended Solids (TSS). Total Dissolved Solids (TDS). Potential of Hydrogen (pH).

The river is surrounded by the 12 wards from the both side which has the high population from the upper stream. Water quality of the river is being polluted from the industrial waste, house hold, slaughter house and the Nasapakkam Sewage Retreatment plant. Introduction of different wastewaters into the river in large quantities not only alters the environment but also influence the aquatic communities.

Table 1.1. Shows BOD value of Adyar River water quality in Chennai

Sample Avg. Months	Manapakkam Bridge	THIRU. VI. KA. Bridge	Slaughter House	Nesapakkam STP Outlet	Nesapakkam STP O/L Extn
APR-JUN 2008	19	30	8625	25	21
JUL-SEP 2008	55	42	4789	33	17
OCT-DEC 2008	18	17	16133	19	9
JAN-MAR 2009	14	23	6400	12	18

Note: BOD level in mg/l

Table 1.2. Shows BOD value of Adyar River water quality in Chennai

Sample Avg. Months	Manapakkam Bridge	THIRU. VI. KA. Bridge	Slaughter House	Nesapakkam STP Outlet	Nesapakkam STP O/L Extn
APR-JUN 2015	22	33	4633	19	17
JUL-SEP 2015	33	67	6050	23	22
OCT-DEC 2015	18	16	4500	8	12
JAN-MAR 2016	18	30	3750	7	9

Note: BOD level in mg/l

Table 1.3. Shows COD value of Adyar River water quality in Chennai

Sample Avg. Months	Manapakkam Bridge	THIRU. VI. KA. Bridge	Slaughter House	Nesapakkam STP Outlet	Nesapakkam STP O/L Extn
APR-JUN 2008	125	123	24600	91	123
JUL-SEP 2008	216	363	15867	104	75
OCT-DEC 2008	40	64	33400	52	32
JAN-MAR 2009	53	283	26187	40	61

Note: COD level in mg/l

Table 1.4. Shows COD value of Adyar River water quality in Chennai

Sample Avg. Months	Manapakkam Bridge	THIRU. VI. KA. Bridge	Slaughter House	Nesapakkam STP Outlet	Nesapakkam STP O/L Extn
APR-JUN 2015	96	163	13200	75	75
JUL-SEP 2015	107	181	22667	93	80
OCT-DEC 2015	64	88	13627	40	56
JAN-MAR 2016	59	112	13333	48	69

Note: COD level in mg/l

Table 1.5. Shows TSS value of Adyar River water quality in Chennai

Sample Avg. Months	Manapakkam Bridge	THIRU. VI. KA. Bridge	Slaughter House	Nesapakkam STP Outlet	Nesapakkam STP O/L Extn
APR-JUN 2008	27	28	2662	29	27
JUL-SEP 2008	38	47	2813	28	23
OCT-DEC 2008	41	29	12170	24	10
JAN-MAR 2009	33	15	3988	21	20

Table 1.6. Shows TSS value of Adyar River water quality in Chennai

Sample Avg. Months	MANAPAKKAM BRIDGE	THIRU. VI. KA. BRIDGE	SLAUGHTER HOUSE	NESAPAKKAM STP OUTLET	NESAPAKKAM STP O/L EXTN
APR-JUN 2015	26	45	4310	35	21
JUL-SEP 2015	54	141	4923	30	39
OCT-DEC 2015	35	39	4513	15	19
JAN-MAR 2016	35	48	4300	18	22

Table 1.7. Shows TDS value of Adyar River water quality in Chennai

Sample Avg. Months	Manapakkam Bridge	THIRU. VI. KA. Bridge	Slaughter House	Nesapakkam STP Outlet	Nesapakkam STP O/L Extn
APR-JUN 2008	1615	17911	3867	1032	1140
JUL-SEP 2008	1301	8823	6001	848	989
OCT-DEC 2008	906	4242	1975	868	869
JAN-MAR 2009	703	15155	750	939	910

Table 1.8. Shows TDS value of Adyar River water quality in Chennai

Sample Avg. Months	Manapakkam Bridge	THIRU. VI. KA. Bridge	Slaughter House	Nesapakkam STP Outlet	Nesapakkam STP O/L Extn
APR-JUN 2015	1039	1706	1580	943	975
JUL-SEP 2015	1013	2961	2010	862	1619
OCT-DEC 2015	485	817	921	827	1341
JAN-MAR 2016	725	1787	1610	773	831.3

Note: TDS level in mg/l

Table 1.9. Shows pH value of Adyar River water quality in Chennai

Sample Avg. Months	MANAPAKKAM BRIDGE	THIRU. VI. KA. BRIDGE	SLAUGHTER HOUSE	NESAPAKKAM STP OUTLET	NESAPAKKAM STP O/L EXTN
APR-JUN 2008	7.36	7.72	6.89	7.37	7.5
JUL-SEP 2008	6.89	7.63	6.93	7.35	7.58
OCT-DEC 2008	7.67	7.6	6.58	7.57	7.98
JAN-MAR 2009	7.63	7.44	6.67	7.16	7.78

Table 1.10. Shows pH value of Adyar River water quality in Chennai

Sample Avg. Months	Manapakkam Bridge	THIRU. VI. KA. Bridge	Slaughter House	Nesapakkam STP Outlet	Nesapakkam STP O/L Extn
APR-JUN 2015	7.49	7.6	6.67	7.48	7.63
JUL-SEP 2015	7.54	7.54	6.7	7.54	8.49
OCT-DEC 2015	7.33	7.3	6.77	7.5	8.37
JAN-MAR 2016	7.61	7.33	6.81	7.35	7.53

Results and Discussion

During Jul-Sep2015 PH level (8.49) in the NESAPAKKAM STP OUTLET EXTENSION was very high. It shows the basic nature of the Adyar river during July to September 2015. (The pH scale ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic. A pH greater than 7 is basic).

During Jul-Sep2015 TSS level (4923) in the SLAUGHTERHOUSE area was very high. (acceptable limit 500mg/l).

During Jul-Sep2008 TDS level (2961) in the sampling point THIRU.VI.KA BRIDGE was very high comparatively other sampling points.

During Jul-Sep 2015 BOD level (6050) in the SLAUGHTERHOUSE sampling point was very high.

During Jul-Sep 2015 COD level (22667) in the SLAUGHTERHOUSE area was very high.

Conclusion

Due to leather tannery effluents, sewage from domestic waste, municipal waste, industrial waste, factories are the major polluters in the Adyar River. Sewage and industrial waste mainly from leather tanneries and Slaughter Houses encouraged the growth of a variety of phytoplankton and benthos. During July to Sep 2015 pH, TSS, BOD, COD level was very high in Nesapakkam OTP EX., Thiru. Vi. Ka. bridge, Slaughterhouse. July-Sep 2008 TDS level in Thiru-vi-ka bridge was high. Due to these undesirable physical and chemical characteristics (BOD, COD, pH, TSS, TDS) of Adyar river quality was adversely affected. The beautification of the river would not work until letting of sewage water and dumping of garbage are stopped.

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