Environment is explained as the complex aggregate of external conditions which affect the life, development and survival of an organism. It includes water, air and land and the inter-relationship which extends among water, air, land and property. Any unfavourable alteration of this environment is called environmental pollution. In other words, the adverse change in physical, chemical and biological conditions in environment is called environmental pollution.

The rapid pace of urbanization and population pressure expose large number of people to health risks associated with lack of clean water and basic sanitation, industrial and agro-chemical pollution, crowded housing and a variety of other risks. The conflict between economic growth and environmental protection is on the rise, even while environmental standards are being developed, tried and their enforcement is being strengthened in various countries.

Water is an abundant natural resource as three fourth of the surface of the earth is covered with it. Total water resource on earth is estimated to be about 1,360 million cubic kilometres (mck) of which only 0.2 mck is fresh water consists of rivers, lakes, swamps and reservoirs and 23.4 mck is ground water which is mostly saline. It is only this limited quantity of water which is available to meet the water demands of both human and livestock world over. With rapid growth of population and avaricious attitude of industrial producers, fresh water and ground water are becoming scarce. As water is getting polluted uncontrollably, health care becomes a task to the government. The WHO has estimated that currently more than 800
million people are lacking access to safe water in rural areas alone. At the same time, the number of urban people who lack safe water supply in the developing countries due to rapid urbanization is also increasing, much of which is occurring in peri-urban and slum areas. Limited care taken by the government, industrialists and individuals are responsible for this pathetic situation.

Water pollution is a state where contamination of water or alteration of the physical, chemical and biological properties of water or the discharge of any liquid, gaseous or solid substance into the water either directly or indirectly which will render water harmful to public health and health of animals, plants and aquatic organisms. At the global level, over 1.2 billion people suffer from poor water supply and over 1.7 billion people are affected due to lack of sanitation and waste disposal. Water may cause diseases by drinking contaminated water or through contact with an aquatic invertebrate living in contaminated water, or even by the lack of pure water and sanitation. The infection can also spread through mosquitoes or insects that depend on water.

The southeast part of Brazil grapples with its worst drought in nearly a century, a problem worsened by polluted rivers, deforestation and population growth and the largest reservoir system serving Sao Paulo is near depletion. They are witnessing an unprecedented water crisis in one of the world’s great industrial cities. Due to environmental degradation apart from other factors, millions of people in Sao Paulo are wondering when the water will run out. Many residents are already enduring sporadic water cut-offs, some going days without it. Officials say that drastic rationing may be needed, with water service provided only two days a week. Some residents have begun drilling their own wells around homes and
apartment buildings, or hoarding water in buckets to wash clothes or flush toilets. Public schools are prohibiting students from using water to brush their teeth, and changing their lunch menus to serve sandwiches instead of meals on plates that need to be washed.

Rapid growth in industrialization to support the country’s growing population and economy has polluted the rivers like never before. Studies show that domestic and industrial sewage, agricultural wastes have polluted almost all of Indian rivers. Most of these rivers have turned into sewage carrying drains. This poses a serious health problem as millions of people continue to depend on this polluted water from the rivers. Water-borne diseases are a common cause of illness in India today. The bad effects of river pollution are not limited to human population only. Pollution of river has affected animals, fish, and bird’s population, sometimes threatening their very existence. Polluted water seriously affects the reproductive ability of animal and fish species in rivers thus making them extinct in future. The Ganges runs for some 2,500 kilometers (1,550 miles), with more than two dozen major urban centers located on its banks. With many factories and business dumping toxic chemicals into the river, human sewage compounds the situation. An estimated 3 billion liters (800,000 gallons) of sewage is released into the Ganges each day, of which only a third - according official figures - is processed by treatment plants. Agricultural businesses are also draining the river basin and adding toxic pesticides and fertilizers into the river system.

In Tamil Nadu, ground water contamination was reported in almost all the districts such as Coimbatore, Erode, Salem, Karur, Vellore, Kanchipuram and Chennai. Ravichandran, Bhavanishankar and Muthukrishnan studied the ground
water quality of Chennai. High level of contamination was recorded in Pudupet and Vallalar Nagar. The study revealed that the contamination of ground water was due to the seepage of river Cooum. Jacob investigated the influence of river Cooum on the ground water quality of Nungambakkam and Anna Nagar. The study revealed that the level of many chemical particles and cadmium exceeds the permissible level of drinking water standards.

The economic effects of unsafe drinking water include changes in expenditures and well-being of water-users in terms of medical costs, lost earnings, lost production in the home, lost leisure time and decline in expenditures. The studies which deal with the willingness to pay for reducing or averting the economic impacts assume that people make choices in order to maximise their level of well-being when faced with increased health hazards associated with exposure to unsafe drinking water.

Industries contribute to the economy in more than one way; investment, output, employment, income, linkage both backward and forward with other sectors, all directly contribute to the growth of the economy. Employment generated especially by the small and medium scale industries is quite crucial to the people who could not enter the high quality employment. However, industries like textile, leather and others also lead to negative externalities with their effluents, which affect the quality of drinking water. Also, Governments are under tremendous pressure to attract producers and investors to raise the rate of investment and employment generation.

Supply of pure and potable drinking water is the most crucial element of livelihood issue for any society. Many of the diseases are directly related to the
absence of such facility, which is particularly true in the case of developing countries, and within them, the most afflicted are the socially and marginally backward segment of the population. Lack of sustained Government effort in bringing all sections of society under its ambit of drinking water supply has led to many water borne diseases like diarrhoea, etc., since people are forced to drink unclean water. Kanchipuram is a renowned temples’ town and tourists’ spot. The main source of water in Kanchipuram is the Palar river.

Kanchipuram, which is quite popular for its silk industry, has been affected by the chemicals of the dyeing units along with other industrial units like tanneries. Studies made to analyse the environment of this district have scientifically proved and concluded that the quality of both surface water and ground water, especially in Kanchipuram town has been deteriorating over the years, mainly due to the dyeing units. But studies indicate that hardly any attempt has been made so far to study the health impact of ground and surface water pollution on those people who are living near the banks of the Vegavathi river. It is very pertinent to analyse and also to estimate how far water pollution in Kanchipuram town has affected the health conditions of the water users in this area, since it can also lead to associated economic impact like higher medical cost, lost earnings, lost production and also lost leisure time. Hence, this study focuses on the health impact of the surface and ground water pollution of the Vegavathi river in Kanchipuram town.

Kanchipuram is a popular town both for its silk industry and temples. The industrial development of this district has generated considerable amount of employment. In the total work-force of this district, around 60 per cent of the workers are engaged in sectors other than agricultural and household industry. The
same industrial development process has resulted in severe pollution of surface and
ground water in this district due to the discharge of untreated waste water,
particularly by the dyeing units along with the tanneries and rice mills. Hence, it is
imperative to study, especially the health status of the people living near the banks
of Vegavathi river due to the surface and ground water pollution in Kanchipuram
town, which is the consequence of the industrial development process that has taken
place in this district. This will also help in bringing out the severity of impact on
various segments of the society, since the degree of impact will differ among the
different segments, though all have been affected.

The review of the related studies shows that the process of industrial
development has led to environmental degradation by polluting the water bodies
such as lakes and rivers. This has resulted in the pollution of both ground and
surface water in many areas. Thus, water pollution and its effects are universal in
nature, spread across many countries including both developed and developing
countries. Moreover, the severity of pollution has also gone up along with the
industrialisation over the years. The review also reveals that in research area of
Kanchipuram town, studies have proved that water bodies like the Palar river and
its tributaries have also been polluted by the textile dyeing units and tannery units.
But, so far little effort is made to assess its impact on the health conditions of the
human beings living in this area. In this background, the objectives of the study are
to trace the level of water pollution in Kanchipuram town; to examine the socio-
economic characteristics of the sample households in the study area; to evaluate the
health hazards of water pollution by the dyeing units among the sample households
in the study area; to evaluate the health impact of water pollution on various
segments of the sample households in the east zone by comparing them with the sample households in west zone in Kanchipuram town; to measure the costs of water pollution in terms of time lost cost, medical cost and total cost among the sample households in the study area; and to estimate the households’ WTP for the improved quality of ground water in Kanchipuram town.

**FINDINGS OF THE STUDY**

The analysis of the primary data suggests that the female headed households form 15 per cent of the total sample households, which is 17.5 per cent in the East zone and thus, the share of the male headed households is higher in the West zone.

The level of education among the respondents who reside in the East zone is less than that of those who belong to West zone, since the proportion of illiterate is 14.6 per cent in the former and 9.9 per cent in the latter, while the percentage of those with a minimum of graduation is 29.8 per cent and 44.2 per cent in East and West zones respectively.

The area-wise age group of the sample respondents indicates that the share of those who come under the age group of upto 45 years is 54 per cent overall, which is 48 per cent in the East zone and 60 per cent in West zone, and thus, the proportion of older respondents is higher in the East zone than in the West zone.

The proportion of Hindus is the highest at 68.1 per cent overall, which is 66 per cent in East zone and 70.2 per cent in West zone, while the share of those who belong to Islam and Christianity is higher in the former than in the case of the latter.

The share of those who belong to the BC community is the highest overall, followed by those who belong to the MBC, SC and ST and FC communities; however, the share of FC and BC respondents is higher in the West zone than in
East zone, whereas the percentage of MBC and SC and ST respondents is higher in the latter than in the case of the former. Thus, a greater proportion of the vulnerable sections (MBC and SC and ST communities) reside near the river bank compared to others.

The proportion of respondents who live in nuclear families is the highest in both areas, with 56 per cent in the East zone and 59.2 per cent in West zone, and the proportion of respondents who live in joint families is 38.1 per cent in the former and 35.3 per cent in West zone. Thus, the practice of joint family living is higher in the East zone, while the nuclear family type of living is higher in the West zone.

The share of those who reside in thatched houses and tiled houses is higher in the East zone (11.9 per cent and 19.4 per cent respectively) than in the West zone (5.9 per cent and 16.5 per cent respectively), while the percentage of those who live in multi-storied houses is higher in the latter (24.6 per cent) than that of the former (17.5 per cent). Thus, the living conditions of those who reside in the West zone are better than that of those who reside in the East zone.

The area-wise family size of the sample respondents suggests that among those who belong to the East zone, 63.1 per cent have up to four member families, which is 70.6 per cent among the respondents who belong to West zone, and 36.9 per cent of the former have five or more members in their families, which is only 29.4 per cent in the case of the latter. Hence, the family size of the respondents who are located in East zone is higher than that of those who are located in the West zone.

The share of those who are engaged as agricultural labourers and unskilled workers is higher among those who are located in the East zone, while the
percentage of those who are employed as skilled workers, Government employees and private professionals is higher in the West zone than that of East zone. This suggests that the employment conditions of those who reside in East zone is worse with little diversification compared to that of those who are located in the West zone.

The area-wise monthly income of the sample respondents indicates that there is considerable difference in the income levels of the respondents in the study area. For instance, among those who reside in the East zone, 69.8 per cent come under the monthly income slab of upto Rs. 25000, which is 59.6 per cent in the case of West zone and thus, 30.2 per cent of the former earn more than Rs. 25000 per month, which is 40.4 per cent in the case of those who are located in West zone. This suggests that the earning capacity of those who are residing in East zone is less than that of those who are residing in the West zone, which is the manifestation of their differing levels of education and types of employment.

In the case of the respondents who are located in the East zone, 63.9 per cent spend upto Rs. 2500 per month, which is 52.6 per cent in the case of those who belong to West zone, while 36.1 per cent of the former spend more than Rs. 2500, which is 47.4 per cent in the latter. Thus, the spending capacity of the respondents who belong to West zone is considerably higher than that of those who belong to East zone, which is the outcome of the differences in their earning levels.

As in the case of food expenditure, the spending capacity of the respondents who belong to the West zone is higher in the case of non-food expenditure as well. For instance, 53.3 per cent of the respondents who belong to the East zone spend upto Rs. 3000 per month, which is 48.5 per cent among those who are located in
West zone, while 46.7 per cent of the former spend more than Rs. 3000, which is 51.5 per cent in the case of the latter, though overall the respondents spend more on their non-food requirements compared to their food expenditure.

The percentage of illiteracy is only 12.2 per cent, since the literacy level of Kanchipuram district is quite higher than that of Tamil Nadu, which is 10.3 per cent among the male respondents and 22.9 per cent in the case of the female respondents; while the share of those who have educated up to a minimum of graduation level is 37 per cent overall, which is 40.9 per cent among males and 15.7 per cent among females. Hence, the level of education is higher among the male respondents than that of the female respondents.

The gender-wise age levels of the sample respondents imply that among the male respondents, 51 per cent are under 45 years of age, while among the females, this proportion is 71.1 per cent. On the other hand, among the males, the percentage of respondents who belong to the above 45 years of age group is 49 per cent, while it is 28.9 per cent among the female respondents and thus, the male respondents are considerably older than their female counterparts.

The gender-wise religion of the sample respondents indicates that among males, 72 per cent are Hindus, which is 47 per cent among females, while the proportion of Muslims and Christians are higher among the female respondents than in the case of male respondents.

The gender-wise community of the sample respondents suggests that the proportion of those who belong to FC and BC communities is higher among the male respondents than in the case of the female respondents, while the share of MBC and SC and ST respondents is higher among the latter than that of the former.
Among the male respondents, only 22.3 per cent reside in thatched and tiled houses, which is 51.8 per cent in the case of the female respondents, while 6 per cent of the latter reside in multi-storied houses, which is 23.9 per cent in the case of the former. Thus, the male respondents have better living conditions than that of their female counterparts.

Among the male headed households, 71.1 per cent have upto 4 members in their families, which is 43.4 per cent in the case of the female headed households, while 28.9 per cent of the former have more than 4 members in their families, which is 56.6 per cent among the latter. Thus, the family size of the female headed households is higher than that of the male headed households, which is due to their joint family type of living.

The proportion of respondents who are engaged as agricultural labour is 4.4 per cent among the male respondents, which is 53 per cent among the female respondents, while the proportion of those who are employed in the Government and as private professionals is 34.3 percent among the former and 12 per cent in the case of the latter. This indicates the fact that employment is not much diversified among the female respondents, since more than three-fourths of them are wage labourers, which is the outcome of the differences in their levels of education.

Among the male respondents, 62.1 per cent earn upto Rs. 25000 per month, which is 78.3 per cent among the female respondents, while 37.9 per cent of the former come under the income category of more than Rs. 25000 per month, in which 21.7 per cent of the female respondents could be found. Moreover, none of the female respondents earn more than Rs. 50000. This brings out the discrepancies
in the earning capacity between the male and female respondents, which arise due to the differences in the educational levels and type of employment among them.

54.3 per cent of the male respondents spend upto Rs. 2500 on their food requirements, which is 79.5 per cent in the case of the female respondents, while 45.7 per cent of the former spend more than Rs. 2500, which is 20.5 per cent in the case of the female respondents. Hence, the spending capacity of the male respondents is higher than that of the female respondents.

48.6 per cent of the male respondents spend upto Rs. 3000 for their non-food requirements, which is 63.9 per cent in the case of the female respondents, whereas 51.4 per cent of the males and 36.1 per cent of the females spend more than Rs. 3000 per month. Thus, the spending capacity of the male respondents is clearly higher in both food and non-food items than that of their female counterparts.

The community-wise distribution of the educational levels of the sample respondents indicates that the proportion of illiteracy is the highest among the SC and ST respondents (32.4 per cent), which is 17.2 per cent among the MBC respondents and 3.2 per cent in the case of the BC respondents, while no one is illiterate among the FC respondents. On the other hand, the share of those who have completed a minimum of graduation is 18.1 per cent, 21.8 per cent, 36 per cent and 82.7 per cent among the SC and ST, MBC, BC and FC communities respectively, which indicates that the levels of education of the FC and BC respondents are considerably higher than that of their MBC and SC and ST counterparts.

Among the FC respondents, 80.6 per cent have upto 4 members in their families, which is 74.2 per cent, 62.2 per cent and 47.7 per cent among the BC,
MBC and SC and ST respondents respectively, and thus, the proportion of respondents who have more than 4 members in their families is 19.4 per cent, 25.8 per cent, 37.8 per cent and 52.3 per cent among the FC, BC, MBC and SC and ST respondents respectively. This underscores the fact that the family size is higher among the MBC and SC and ST respondents than in the case of the FC and BC respondents.

The income levels among the social groups differ quite considerably, since in the case of the respondents who belong to the FC community, 34.7 per cent earn upto Rs. 25000 per month, which is 60.2 per cent, 76.2 per cent and 83.8 per cent among the BC, MBC and SC and ST respondents respectively, and thus, the proportion of those who earn more than Rs. 25000 per month is 65.3 per cent, 39.8 per cent, 23.8 per cent and 16.2 per cent among the FC, BC, MBC and SC and ST respondents respectively. This is the outcome of the differences among the different social groups in their levels of education and type of employment.

The East zone households are more prone to water pollution as they are located on the banks of the highly polluted Vegavathi river, while in the case of West zone households, though they are located away, still considerable percentage of the households report water pollution, which underscores the degree of prevalence of the problem.

The proportion of respondents who report water pollution in their area increases from 35.7 per cent in the case of FC respondents to 55.4 per cent, 88.1 per cent and 91.4 per cent among the BC, MBC and SC and ST respondents respectively. Thus, the opinions of the respondents indicate that the degree of water
pollution is higher among the marginalised sections like MBC and SC and ST households compared to that of the FC and BC households.

The opinions of the respondents indicate that ground water is highly polluted, while some opine that even the water supplied by the municipality is also polluted, as it is also drawn from ground water sources, while the proportion of respondents who opine that their ground water is polluted is 68.5 per cent in East zone and 31.5 per cent in the West zone.

Majority of the respondents in both zones opine that the effluents discharged by the dyeing units in the river are the chief cause for water pollution. Hence, the households are not only clear about the existence of pollution, but also the reason behind it. This is not surprising, given the fact that most of the dyeing units which are unregistered, are functioning in the backyard of the houses of the owners. These units are functioning very much in their midst and the discharge of untreated effluents directly into the river.

The degree of health impact due to the polluted water among the households is quite severe in the East zone, since more than 89 per cent of them report some sort of health impact, which is only 19.5 per cent in the case of the households that reside in West zone.

As in the case of degree of water pollution among the different social groups, the extent of health impact too differs among them. The severity of health impact due to water pollution is most severely felt by those who are forced to dwell in the close proximity of the polluted river. Thus, among the FC households, only 15.3 per cent report health impact due water pollution, which is 30.1 per cent, 83.4 per cent and 90.5 per cent among the BC, MBC and SC and ST households. Thus,
health impact is quite severe among the MBC and SC and ST households compared to the FC and BC households, which is mostly determined by the area of residence and also their awareness and economic condition.

The monthly income-wise health impact due to water pollution among the sample respondents suggests that the proportion of health impact is around 70 per cent in the case of those who earn less than Rs. 25000, which comes down to 30.3 per cent and 20.8 per cent among those who earn Rs. 25001-50000 and more than Rs. 50000. This underscores the fact that those who earn less could not afford to spend more on pure and safe drinking water, which forces them to depend only or mostly on the polluted water sources and that results in higher degree of health impact. On the other hand, those who are economically better off, could afford to spend more on pure and safe drinking water through which they can avert any kind of health impact from the polluted water.

Apart from the 292 respondents who are affected in all, 108 households (37 per cent) report health impact to one more member, while 34 households (11.6 per cent) report health impact to two more members, which has taken place exclusively in the East zone. Thus, the extent of health impact is quite widespread and acute, especially in the East zone, since more number of members report health impact, which will have serious implications on health expenditure.

The age profile of the affected members in the sample households suggests that a total of 87 children under 5 years of age are affected, in which 77 belong to the East zone, while 55 persons come under the age group of 6-14, of which 51 persons are located in the East zone. Hence, including the respondents, a total of 367 persons are affected due to the polluted water in the East zone, while it is 67
persons in the case of West zone. This indicates that health impact is also quite sizeable in the case of the children.

There is widespread health impact among the households and they face more than one health issue due to the higher level of water pollution, especially in the East zone. But in the west zone, both the number of people affected and the number of diseases caused are less, since it is less-polluted. However, it is also to be noted that all the diseases or the health problems cannot entirely or directly be attributed to water pollution, it is the major reason, nonetheless.

The health impact of water pollution is quite severe on the sample households in the East zone, compared to that of the West zone. The average number of days lost and the number of persons affected are higher in the former than in the latter. This is quite worrying, given the fact that the health impact is more on the sample households in the East zone whose monthly income levels and the living standard are less than that of the West zone.

The number of days lost is markedly higher among the MBC and SC and ST respondents, since none of the BC respondents has lost more than two days, which is only one day in the case of the FC respondents and even among those who have lost two days in the 30-day period prior to the survey, 80 per cent belong to the MBC and SC and ST communities.

The monthly income-wise number of days lost by the respondents indicates that among those who earn upto Rs. 10000, 62 per cent have lost at least three days, which is 52.2 per cent among those who earn in the range of Rs. 10001-25000, while nil in the case of those who earn more than Rs. 25000 and as far as the respondents who earn more than Rs. 50000 are concerned, all of them have lost
only one day due to the polluted water’s health impact. This underscores the fact that those who earn more can afford to spend more on averting health impact from the polluted water through purchasing purified water or the mechanism of water purification and most of them reside in quite a distance from the polluted river.

The proportion of respondents who make use of the private sector services is the highest with 69.2 per cent overall, which is almost similar in both zones, while around one-fifth of the respondents also use both the services. This indicates the fact that the affected sample respondents will have to spend a lot on their medical expenses, as most of them depend on the private clinics for their treatment. Most of the respondents do not access the public healthcare services, mainly to the widespread absenteeism of the doctors and nurses and hence, are forced to wait for long hours. Moreover, though it is cost free, they have to access the public healthcare only during the day time, which will also force them to lose a working day. On the other hand, private clinics are quite nearby and easier to access at any time.

There is considerable amount of health impact which is captured by the cost incurred on medical treatment by the affected households, since around 40 per cent of them spend more than Rs. 1000 per month, which is quite considerable given their level of income. This is particularly true in the case of the households who belong to the East zone, since the share of those who spend more than Rs. 1000 is 42.8 per cent, while it is only 18.8 per cent in the case of those who reside in the West zone. Hence, the degree of water pollution due to the discharge of untreated effluents by the dyeing units in the Vegavathi river causes immense health hazard,
since those who cannot afford and those who live in the margins are forced to spend more towards medical expenditure.

The proportion of households who spend more than Rs. 1000 per month is nil among the FC and BC households, since as noted earlier, the extent of health impact is quite negligible among them, whereas all of those who spend more than Rs. 1000 belong to the MBC and SC and ST communities. This once again brings out the fact that the burden of social cost of water pollution, health impact and medical expenditure falls disproportionately on the marginalised sections compared to others.

Among those who earn up to Rs. 10000, 47.9 per cent spend more than Rs. 1000 per month as their medical expenditure, which is 42.1 per cent in the case of those who earn Rs. 10001-25000, but nil among those who earn more than Rs. 25000 per month.

There is considerable amount of time lost cost incurred by the affected households, since around 81.3 per cent of them have lost around Rs. 501-2000 per month due to their ailments which have forced them to lost working days, which is 83.1 per cent in the East zone and 68.8 per cent in West zone, which again reiterates the fact that those who reside in the East zone lost more number of working days and thus incur greater amount of time lost cost vis-a-vis their counterparts in the West zone. Even some of those who reside in the West zone lose around Rs. 1001-2000 per month which is due to their better employment and higher average earnings.

The proportion of households who lose more than Rs. 1000 per month is nil among the FC and BC households, since as noted earlier, the extent of time lost is
quite negligible among them, whereas all of those who have lost more than Rs. 1000 belong to the MBC and SC and ST communities. This is notwithstanding the fact that the MBC and SC and ST respondents’ earning capacity is less than that of the FC and BC respondents, which again brings the fore the extent to which the former are affected due to the polluted water.

Among those who earn upto Rs. 10000 per month, 57.9 per cent have lost more than Rs. 1000 per month due to loss of working days, which is 38.6 per cent among those who earn in the range of Rs. 10001-25000 and nil among those who earn more than Rs. 25000. Thus, there is a disproportionate burden on those households who earn less as they face severe ailments compared to those who earn more.

In the case of those who spend upto Rs. 250 in order to ensure pure and safe drinking water, 64.6 per cent report no health impact, which goes upto 72.6 per cent and 100 per cent in the successive higher spending slabs; while in the case of those who report health impact, 75.7 per cent do not spend anything, which declines to 15.4 per cent, 8.9 per cent and nil in the successive higher spending classes. This suggests that there is a direct and proportionate relationship between averting expenditure and health impact, since as the amount of expenditure goes up, the share of households reporting health impact declines and *vice versa*.

As far as the households in the East zone are concerned, 66 per cent do not spend anything on averting cost, which is only 25 per cent in the case of West zone, while 15.6 per cent of the former spend more than Rs. 250, which is 46.3 per cent in the latter. This underscores the fact that those who reside in the West zone spend
considerably more on averting cost compared to that of those who reside in the East zone.

Averting cost incurred by the FC and BC households is markedly higher than that of MBC and SC and ST households. For instance, among those who do not spend, 36.4 per cent belong to the former, while 63.6 per cent belong to the latter; on the other hand, among those who spend more than Rs. 500 per month, 74 per cent belong to the former, while only 26 per cent belong to the latter.

The proportion of those who do not spend anything on averting expenditure declines consistently as the monthly income level increases. For instance, among those who earn upto Rs. 10000, 95.4 per cent do not spend anything, which declines to 35.1 per cent, 4.2 per cent and nil in the successive higher income levels, whereas the share of those who spend more than Rs. 500 per month goes up from nil among those who less than Rs. 10000 to 3.9 per cent, 11.8 per cent and 73.6 per cent in the successive higher income classes. This suggests that better earning capacity enables the households to spend more on averting expenditure.

There is considerable amount of cost involved in the study area due to water pollution, since the households are forced to spend on various aspects. A total of 68.5 per cent of the households spend in the range of upto Rs. 2000 per month as their total cost of water pollution, which is 48.9 per cent in the East zone, but 87.8 per cent in the West zone and thus, 31.5 per cent of the total households spend more than Rs. 2000 per month, which is 51.1 per cent and 12.2 per cent in the East zone and West zone respectively. This indicates that the households particularly who reside in the East zone spend a huge part of their income due to water pollution.
Among the FC households none of the spends more than Rs. 3000 per month as total cost, which is 18.3 per cent, 44.3 per cent and 65.7 per cent among the BC, MBC and SC and ST households respectively. Hence, the burden of water pollution is quite regressive in nature, since the marginalised sections of the society are forced to bear a greater burden vis-a-vis the FC and BC communities.

In the case of those who earn upto Rs. 10000, 44.1 per cent spend more than Rs. 2000 due to water pollution, which is 39 per cent, 20.2 per cent and nil among those who come under the successive higher income categories. This unequivocally brings out the fact that there is a disproportionate burden on those who earn less and compared to those who earn more.

The proportion-wise total cost incurred by the households presents a true picture, since it is clear that more than one-third of the sample households spend at least 15 per cent of their total monthly income as the total cost on water pollution, which is 60.8 per cent in the East zone and only 11.8 per cent in the West zone and moreover, none among the latter spends more than 20 per cent of their income as total cost. This needs to be viewed against the backdrop of the relatively poor living conditions of the households in the East zone vis-a-vis the households in the West zone.

Even in terms of proportion of their income, the marginalised sections like the MBC and SC and ST households spend more than that of BC and FC households, since the earning capacity of the former is quite less than that of the latter. For instance, among the FC households, none of them spends more than 15 per cent, which is 8.1 per cent, 66.9 per cent and 75.3 per cent among the BC, MBC and SC and ST households respectively.
The burden of water pollution is regressive in nature, since among those who earn less than Rs. 10000 per month, 61.5 per cent spend more than 15 per cent, which is 40.9 per cent, 10.1 per cent and nil among the successive higher income slabs. Thus, among those who earn more than Rs. 50000 per month, no one spends more than 15 per cent of their income as total cost.

A greater proportion of the respondents in the East zone understand the significance of water pollution compared to that of West zone, though some of them do not view so, which is mainly due to their lack of awareness about the same.

The share of those who agree with the efficacy of pollution control measures is totally outstripped by that of those who disagree and the degree of disagreement is quite higher in the East zone compared to that of the West zone, as they are the most affected lot by the problem.

The opinions provided by the respondents again suggest that the East zone respondents are quite categorical in stating that the measures taken by the Government are not efficient in tackling the problem of discharge of untreated effluents in the river or in controlling water pollution.

There is greater willingness among those who reside in the East zone compared to that of those who belong to the West zone, since they are the most affected and also due to the fact that the respondents who belong to the West zone opine that their own purifications mechanisms will do better than that will be provided by the Government. Hence, more than 65 per cent of the respondents are willing to pay for a pure and safe drinking water.

Overall, 37 per cent are willing to pay upto Rs. 100 per month, which is 31.8 per cent in the case of East zone and 49.5 per cent in the West zone, while 63
per cent of the total respondents are willing to pay more than Rs. 100, which is 68.2 per cent in the East zone and 50.5 per cent in the West zone. This clearly shows the greater WTP by the East zone respondents to access safe drinking water, which also underscores the level of pollution in that area.

Those who earn less are willing to pay more and *vice versa*, since those who earn more already have their own purification mechanism or access purified drinking water from the market. For instance, in the case of those who want to pay less than Rs. 50 per month, 61.9 per cent earn more than Rs. 25000, while 38.1 per cent earn less than Rs. 25000; on the other hand, in the case of those who are willing to pay more than Rs. 200 per month, all of them earn less than Rs. 25000.

The mean, minimum and the maximum values of variables like monthly income, averting cost, food expenditure and non-food expenditure are higher among the West zone respondents than that of their counterparts in the East zone, while the mean, minimum and maximum values of other variables like number of days lost, time lost cost, medical expenses, total cost and WTP are higher among the latter than in the case of the former. Hence, the East zone respondents, though earn less are forced to bear a greater burden of water pollution in the form of number of days lost, time lost cost and medical expenses, which also pushes up their total cost. The respondents in the West zone with better income spend more on averting the health impact of the polluted water and thus, their WTP too is less, since they are already spending on the same.

Regression estimate for the East zone indicates that among the variables, age of the respondents has an inverse relationship, which suggests that the younger respondents would be willing to pay more than their older counterparts, but not in a
significant manner. COM with a negative sign as hypothesised indicates that the mean WTP of the Non-SC respondents is less than that of the SC respondents. The respondents with no/less education would be willing to pay more than the higher educated, due to the ‘impact’ factor. Income of the respondent does influence his/her WTP mainly through the ‘impact’ factor, since both are inversely related. Moreover, as the level of income goes up, the level of WTP declines. The ‘impact’ factor is directly tested with the help of two variables viz., MED and TIME. Both these are positively linked with the dependent variable. Hence, higher the health impact due to water pollution, respondents would also be willing to pay more to avert the same. Averting expenditure too is negative and statistically significant and this indicates that those who spend more for pure and safe drinking water are willing to pay less and the difference of Rs. 3.96 is statistically significant.

In the case of West zone, COM, GENDER and DLIT-1 are not statistically significant. Moreover, unlike in the East zone model, the first two variables have attained positive signs. This implies that the mean WTP level of the Non-SC respondents is higher than that of the SC respondents, but it is not statistically significant. Similarly, male respondents in this zone are willing to pay more than the female respondents; but the difference is again quite insignificant. This arises mainly due to the fact that the number of SC respondents and female respondents in this zone is quite less compared to the East zone.

In this zone also, the mean WTP scores of the respondents who are illiterates and literates upto primary level are quite larger than that of the higher educated. The value of the co-efficient of averting expenditure is higher in this zone than in the case of the East zone, which suggests that West zone respondents spend
more on averting expenditure which influences their mean WTP in a greater manner.

Testing of hypotheses suggests that there is statistically significant variation in the extent of ailments among the sample households, which is particularly higher in the East zone than in the case of the West zone.

There is significant association between monthly income levels of the households and the extent of averting expenditure incurred by them, since those who can afford can spend more on accessing safe drinking water and *vice versa*.

There is significant difference in the amount of WTP among the sample respondents, which is mainly influenced by the degree of health impact due to the polluted water in the study area.

There is no significant variation in the opinions of the respondents who view that the Government’s measures are not adequate in mitigating the evils of the discharge of untreated effluents by the dyeing units in the study area, though it is quite clear that it is directly responsible for the pollution of the water resources in the study area.

**SUGGESTIONS**

The following suggestions are made on the basis of the opinions expressed by the sample respondents during the field survey and by the researcher too:

- Stringent action should be taken against the dyers who let out their untreated effluents into the Vegavathi river and open water bodies.
- Heavy penal tax should be levied on those who extract ground water for dyeing and bleaching purposes.
In the study area, especially in the East zone, the number of PHCs can be increased in order to meet the demands of the affected households.

More over-head tanks should be constructed to ensure regular supply of drinking water to the households in the east zone, so that their dependence on ground water can be reduced/avoided.

The municipality should purify the water completely before it is supplied to the households. Moreover, the over-head tanks need to be cleaned more often.

A comprehensive survey of all the existing dyeing units should be made, since most of them are functioning without proper licensing. This is important to make them more accountable.

All the existing dyeing units should be made to install effluent treatment plants either individually or jointly and this must be enforced very strictly.

The government or the non-governmental organisations can come forward to conduct free medical camps once in every three months to identify people who are vulnerable and affected by the polluted water.

Protection of environment can be done effectively only by the concerted efforts of all the people concerned, viz., the public, the non-governmental organisations, bureaucracy, politicians and the polluters.

For further research, the impact of water pollution on agricultural production, productivity, cropping pattern and farmers’ income can be probed and studied in the future.

**CONCLUSION**

Industrialisation is always necessary for the benefits it brings in: higher investment, output, employment generation, new technology, exports and so on. However, it also involves lot of social cost in the form of environmental and health impact. But, the degree of social cost, sadly is not paid its due attention particularly in the developing countries which are always in the pursuit of higher economic growth. This study brings out the extent of health impact due to the pollution of
water sources, both ground water and surface water from the unmindful discharge of the untreated effluents by the textile dyeing units in Kanchipuram Town. The impact of such water pollution is quite enormous particularly on the marginalised sections of the society like MBC, SC and ST and also the female headed households who always lack educational and other endowments. They literally live on the margins of the society, which accentuates the burden of water pollution in a disproportionate manner. The extent of ailments from the polluted water, number of working days, time lost cost and medical cost are all higher among these sections of the population compared to others like the FC, BC and the male headed households. The affected households, though earn less, are willing to pay more for a clean and safe drinking water from the municipality, while the better off have their own purification system in place.

The Government’s measures in forcing the dyeing units to set up effluent treatment plants are not implemented with all its vigour and vitality, even after the intervention of the highest court of the land, which shows the scant respect being paid to the law of the land. The poor people lack adequate lung power to prove their plight and might, as they are being deprived of one of the basic right, safe drinking water. Hence, the Government along with the non-governmental organisations should come forward to reduce and abolish the menace of water pollution and also to ensure safe drinking water to all the people, since the Government cannot shirk its duty and thereby compelling people to purchase water from the market.