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A Review on Tannery Pollution in Vellore District, Tamil Nadu, India.

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ABSTRACT

This study attempts to know the nature and causes of environmental degradation on account of tannery activities in and around Vellore district. Vellore is a place known for extreme climatic condition and it is a major exporter of leather. Numbers of tanneries are situated here; Palar river is a major river which drains into the district. The effluent of the leather industries and other small scale industries are drained into the Palar river and the quality of the drinking water is affected. The tannery wastes are dumped in the Palar river for nearly a decade so it becomes necessary to know the impact of pollution due to leather tanneries in the Palar river basin. This review paper deals about the extent of pollution and its effect on the life of people in the district.

Keywords: leather tanneries, Vellore District

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Introduction about polluted areas in Vellore District:

Heavy metals are ubiquitous in nature. Heavy metals are commonly found as naturally occurring toxic elements and compounds. Some metals in trace amounts are essential for human biochemical processes (*Soghoian, 2009*)**.** The flow of heavy metals into urban environments is mainly due to municipal wastewater discharge, which includes both domestic and industrial sewage effluents. Vellore district has lot of tanning industries. Studies on heavy metals concentrations in the environmental components of Vellore urban environment would give an idea about the impact of tanneries in this area. Vellore district lies between 12^{o} and 13^{o} 15' of Northern latitude and 78^{o} 20' and 79^{o} 50' of Eastern longitude. Vaniyambadi, Ambur, Pernambattu, Melvisharam, Ranipet, are municipal towns of Vellore district. As per 2001 census population of each of these towns is 103,841; 99,855; 41,323; 36,675 respectively, with 138 tanneries in Vaniyambadi, 83 tanneries in Ambur, 18 tanneries in Pernambattu, and 228 tanneries in Ranipet (Directory of Tanneries, 1998). Besides tanneries, Vellore has industries like chrome chemicals manufacturing unit, refractory's, and ceramic contributing to a significant amount of heavy metals released into the environment (Gowd and Govil, 2008). The processing of raw skin and hides is done in Vellore district since 1914 (Thangarajan, 1999). Tanners use calcium carbonate, sodium chloride, sodium sulphide, sodium dichromate and sulphuric acid for processing the raw hides and skins. The main tanning processes available are chrome tanned, vegetable tanned and alum tanned. Chrome tanned leather is tanned using soluble heavy metals salts, primarily heavy metals sulfate.

The effluents are generally untreated and are discharged into the neighboring fields and irrigation tanks. The effluents overflow these tanks and stagnant pools and finally reach the Palar River course. Ganguli and Tripathi (2002) have reported that metals contamination is one of the major environmental problems in many countries and these contaminants generally come from various industries like leather, agricultural, textile industries. The most commonly occurring metals at these sites are lead, chromium, arsenic, zinc, cadmium, copper, and mercury. Presence of these metals in groundwater and soils may cause a significant threat to human health and ecological systems (Evanko and Dzombak, 1997). Incidences of skin and urine infections are very common among tannery workers in India (Das *et al.,* 1989). According to the study carried out by Stanley Associates, the Palar basin is one of the worst affected due to industrial pollution, where groundwater is quite heavily contaminated. To quote, "Judging by the amount and strength of the effluents, it is likely that the aggregate tannery effluent will have an adverse effect on the groundwater quality in the entire area and also on the Palar river, where the effluents are finally getting mixed" (Asian Development Bank, 1994).The extent of effluent produced by processing one kilogram of raw hides and skins to finished leather is around 34 liters. Therefore, the total weight of the raw hides and skins processed works out to 1.1 million kilograms per day. Moreover, for each 100 kg of raw hides and skins processed, solid waste generation works out to 38.5 to 62 kg; the 100 kg of raw hides and skins is reduced to 20 to 32 kg of finished leather after processing. On an average, 35 to 45 liters of wastewater is discharged per kilogram of raw skin / hide processed. Total quantity of water used by the tanneries in the basin works out to a minimum of 45 to 50 million liters per day. The quantity of effluent discharged from the tanneries (numbering 847), which are supposed to be connected to one of the 8 Common Effluent Treatment Plants (CETPs) installed in the Palar basin, works out to 37,458 kld or 13.5 mcm per year (Janakarajan, 2004).

According to a study conducted out by Stanley Associates sponsored by the Asian Development Bank and executed by the Tamil Nadu Pollution Control Board (Asian Development Bank, 1994) pollution loads in the Palar river is extremely threatening: (all parameters are in kilograms per day) TSS: 29,938, TDS: 400,302; Chloride: 101,434, Sulphide: 3818; BOD: 23,496; COD: 70,990: Total Chromium: 474; Cyanide: 22. The Tamilnadu Water Supply and Drainage Board have conducted a study collecting random samples of water along the Palar river to a distance of about 60 km. These results were compared with a study conducted by the Kings Institute in 1968. The latest study by the TWAD Board indicated that TDS has increased by 79% in the upstream tannery cluster. The study also denoted that in the downstream the value of TDS stood at 142%. This establishes the travel of pollutant, which is significant. The report also indicated that even if all the tannery effluent is stopped immediately, the extent of inorganic chemical constituents already dumped in the river could not be recovered even in the long run (TWAD Board, 1997).

The drinking water is sold at Rs.2 per pot in Ambur (one of the worst affected towns in the basin). An epidemic has spread in the town recently in which 8 people were killed. Consumption of Polluted drinking water alleged to be the reason for the outbreak of epidemic (The Indian Express, 8-4-1997). There has been a steep reduction in the area under paddy in the affected villages; since 1980, area under paddy has come down

by more than 50%. Many problems in crop production have been reported such as poor germination, stunted vegetative growth, poor grain formation, reduced grain weight and low quality output; coconut water has turned saline, size of the nuts is reduced and falling buttons are quite large in number (Tamilnadu Agricultural University research station); Incidence of crop failure is very high. Soil salinity is quite common in the affected villages. Net area irrigated by wells in the affected villages is extremely low compared to those of unaffected villages. Yield of paddy per wells in the affected villages is 628 kg, whereas, in the unaffected villages, the yield of paddy per well works out to 7118 kg. A detailed survey of 8 villages conducted in this basin as a part of the IDRC (International Development Research Center, Canada, 1997-99) research programmers indicates that the value of land has come down drastically due to degradation of groundwater and soil salinity. More than 60% of the wells in the affected villages are defunct due to water contamination; the investments that have gone into those contaminated wells are also lost permanently.

51 samples were collected from villages (located along the river) that were selected for the survey, 42 were very badly affected, 3 were moderately affected, 3 were marginally affected and 2 were unaffected. Of the 110 sample wells in the affected villages, 104 have reported water contamination and 38 of them have completely abandoned their wells. Groundwater quality data collected by various government and private agencies indicate very high level of contamination. Declining life expectancy of tannery workers was observed in the people of the basin area; Fear of impotency due to the consumption of contaminated water was also observed. Forced migration of people from villages is taking place which is permanent and semi-permanent in nature. Consumption of contaminated water is commonly seen; the common health problems reported are skin allergies, asthma and gastritis.

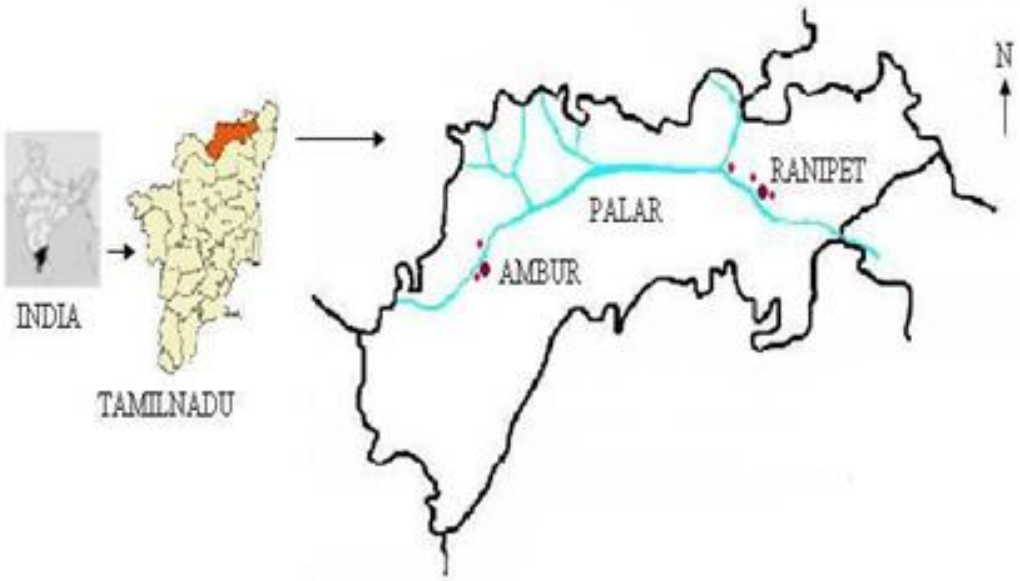
The Blacksmith Institute Report (2007) has identified Ranipet as the one of the World's Worst Polluted Places in the world. The potentially affected people have been estimated up to 3,500,000. The source of pollution was found to be azodyes and Tanneries. Ranipet was reported as the most top ten polluted places of world by Blacksmith Institute in 2006. According to the report, Ranipet is a medium sized town but its pollution problems pose a potential risk to a larger population due to its proximity to the city of Vellore. It is also reported that a factory in Ranipet manufactured sodium chromate, chromium salts and basic chromium sulfate tanning powder that is used locally in the leather tanning process. The Tamilnadu Pollution Control Board (TN PCB) estimates that about 1,500,000 tons of solid wastes accumulated over two decades of plant operation. These lie without check in an open yard (three to five meters high and on nearly five and a half acres of land) on the facility premises and easily leach into the groundwater (Blacksmith Institute Report, 2007).

Health Impacts: The contamination of the soil and groundwater, along with runoff from solid wastes has affected thousands of people in a residential colony about 1 km from the factory. Three open wells, a dozen bore wells and about 25 public hand pumps have been abandoned due to high chromium levels in the water. Agricultural land about a kilometer from the factory has also been affected. There is widespread fear that if this pollution is left unchecked, the Palar basin, the main drinking water source in the region, could also be contaminated. Local farmers claim that the waste from the nearby tanneries degrades the fertility of the land and that, invariably, "only one in five crops does well." Farmers also complain of the foul smells that emanate from the water they use to irrigate their fields and that they suffer from skin ulcerations from direct contact with the water (Blacksmith Institute Report, 2007). Declining agricultural activity, yield, farm income and employment are noticed. After processing, the quality of waste water generated is 17,000-20,000 cu.M/day (Blacksmith Institute, 2000).

Clean-up activity: In 1996, the government shut down Tamilnadu Chromates & Chemicals Limited (TCC), the factory responsible for the estimated 1.5 million tons of untreated chromate sludge. The Tamilnadu Pollution Control Board authorities have assigned the National Geophysical Research Institute (NGRI) and National Environmental Engineering Research Institute (NEERI) to design and implement remediation plans to clean up this site. One solution to tackle the issue of chromate leaching from the legacy site would be to encapsulate the waste dumpsite in order to prevent further leaching. Subsurface soils also need to be treated. However, it is understood that no real progress has been made on tackling the problems (Blacksmith Institute Report, 2007). All the big tanneries, which had discharged effluent in the past, and few small tanneries still letting their effluent water into the Palar River is a real concern, because of accumulation of heavy metals in different environmental components and its possible impact to human health. Most of the farmlands are located adjacent to Palar river basin. Sometime due to water scarcity the effluent water from tanneries are used for

irrigating crops, vegetables, and also feeder for cattle. Though common effluent treatment plants (CETP) have come into being, these can treat only organics and not very effective in treating inorganic pollutants.There are many methods for tannery effluent treatment, like precipitation, chemical oxidation or reduction, lime neutralization, ion exchange, filtration, electrochemical treatment, reverse osmosis, membrane technologies and evaporation recovery. All these methods are expensive and will produce solid sludge containing toxic compounds (Sharma and Goyal, 2010), besides inefficient removal of chromium from the effluent at low concentrations (Ahluwalia and Goyal, 2007). An alternate treatment strategy is required, which would be environment friendly for which the indigenous tree species namely *Casuarina equisetifolia* was selected for phytoremediation of heavy metals. At the same time, *Casuarina equisetifolia* root system encourages the colonization of rhizobacterial community which in turn helps in rhizoremediation of heavy metals.

Heavy metals have the potential to accumulate in the environment. This is true for Vellore environment since it is contaminated with tanneries and number of industries. So studies on heavy metals levels in the sediments would throw light on the body burden of Heavy metals in Vellore population which in turn will reflect upon the slow poisoning due to Heavy metals toxicity. It would help the environmental planners to go for remediation solutions. There is not enough scientific information about the load of heavy metals in the various environmental components of tannery polluted places in Vellore. There is also no information on the accumulation and passage of heavy metals through food chains in this urban ecosystem. Therefore, the present study was carried out to bring to light, the much needed information on the flow of heavy metals in the tannery belt of Vellore urban environment. Moreover, there is no environmental friendly remediation strategy to alleviate the problem of heavy metals in the soil ecosystem.



VELLORE DISTRICT WITH PALAR AND THE STUDY AREA

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