CHAPTER 4

CONCLUSIONS AND SUGGESTIONS FOR FURTHER WORK

The present study investigated the impacts of the effluents and other wastes of Textile Mill on quality of soil and water in the surrounding areas. All the results have been discussed in relation to soil and water from a 'Control' site and also on the basis of available permissible values. Degradation of both soil and water quality was a general observation, and the following specific impacts have been identified from the work:

(i) There was an increase in the pH of the soil in the vicinity of the Mill, thus the normally acidic soil was turned into near neutral conditions.

(ii) The soil was getting enriched with both ionic matter and hydrophobic organic matter resulting in high electrical conductivity and lower bulk density. The accumulation of the organic matter nearer to the Mill has been shown to give rise to reduction in water holding capacity and increase in hydraulic conductivity of the soil. The considerable organic load of the soil was also confirmed by high values of 'loss on ignition' as measured by the XRF.

(iii) The soil texture was dominated by sand in conformity with high hydraulic conductivity and low water holding capacity. XRD patterns of the soil samples also supported the same.

(iv) The toxic organic contaminant, oil and grease, had a directional presence and the values were not much alarming.

(v) The soil was rich in nitrogen and phosphorus, the major crop nutrients, and therefore, the soil had not lost its nutritive character.

(vi) All the four major cations, Ca, Mg, Na and K, had considerable presence in the soil with the contents much more near the Mill. The soil was very rich in Al and Fe. The measurement of major oxides by XRF was in agreement with the presence of these metals in the soil in large amounts.

(vii) Trace metals, which were conspicuous by appreciable presence, are As, Cd, Cr, Cu, Hg, Mn, Ni, Pb, and Zn.

In general, it was observed that the earthen dam behind the Mill had divided the area into two zones viz., the affected zone between the Mill and the dam, and the less affected zone beyond

the dam. The dam had served as a physical barrier in preventing the contaminants from the Mill to areas far beyond. The experimental data showed important variations from one season to another, particularly with respect to pre-monsoon and post-monsoon seasons, but significant trends were very few. This may be due to irregular and intermittent inflow of the effluent and also due to absence of a particular pattern of discharge.

The quality of the drinking water in and around the textile mill did reflect the changes in the physico-chemical quality of the soil. In general, it was seen that

(i) The pH, EC, alkalinity and solids present in the water were within the permissible limits and therefore, the influence of the Textile Mill effluent has not yet reached the position of critical interference.

(ii) The water was characterized by considerable presence of the cations, Ca, Mg, Na and K, being compensated by comparative presence of Cl, NO_3 and SO_4. All the contents of the cations and anions were within the permissible limits. The only concern was the presence of fluoride in very high concentration in some of the drinking water sources, which might have impact on human health. However, the source of fluoride could not be definitely ascertained and no conclusion could be drawn whether the large amounts were due to the Mill effluent. The water was rich with PO_4 content which would be likely to stimulate growth of undesirable algae, weeds, herbs, microorganisms, etc. leading to deterioration of water quality.

(iii) The toxic organic contaminant, phenol, which usually was contributed by industrial effluents, was present in some of the drinking water sources.

(iv) Huge amount of iron was present in all the samples. The seasonal variation was distinct. The maximum value was obtained in the pre-monsoon season and the minimum in the post-monsoon season for all the samples.

(v) Among the toxic heavy metals, As and Hg were absent in most of the sources. Two other toxic metals, Cd and Cr, were however present in all the sources with concentration of more than the permissible limit. The presence of copper and zinc was low and not significant.

(vi) The water was also found to be contaminated with Mn, Ni, and Pb – the level of contamination being dependent on the source, the sampling season, etc.

The surface water was not much different from the drinking water with respect to quality. It contained large amounts of dissolved solids, and was having significantly high amounts of phenol, and oil and grease.

It was also seen that the rice crops grown in the study area had accumulated appreciable amounts of metals in them as seen from the analysis of rice grains and husks. Significantly, the husks were seen to be richer in the metals than the grains with one or two exceptions.

Suggestions for further work

The present work is exploratory in nature and it definitely established that an industry could have significant chemical impact on the soil and water in the vicinity. The study has clearly opened up the following areas for further research:

(i) Work needs to be carefully carried out to find out the patterns of distribution of various pollutants temporally and spatially. Of particular importance will be the investigation of downward spread of the pollutants, which depends on soil permeability and other factors. This will be helpful in establishing the groundwater infiltration potential.

(ii) The organic pollutants need to be identified in details with respect to the specific composition. The role of soil in their accumulation as well as degradation can be evaluated by identifying some of the components and then carefully studying their fate over time and distance.

(iii) The properties of the soil and those of the water need to be correlated by using careful sampling and analysis strategies as well as using statistical packages.

(iv) The intake of pollutants by the crops needs a detailed study under different conditions by simulation in the laboratory and then correlating the same with results from a field study.

(v) Another study is required to identify the exact sources of the pollutants and then, to design appropriate prevention/remediation techniques.