CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

A better understanding about the typical spatial and seasonal variations of the material transport of suspended sediment, phosphorus and silicate through the Chao Phraya River had been made. Trends of the daily and annual mean fluxes in this study can be used as an indicator of many processes occuring in the watershed, such as rainfall/runoff processes, geochemical processes together with anthropogenic activities.

The study showed that material transport in the river is affected by tide. During low discharge conditions the influence of flood is relatively greater than during high discharge conditions. This causes material loads to be back transported on some tidal cycles during Period 2. The daily net fluxes of each tidal cycles are changed both in magnitude and direction. Considering the daily net fluxes through the river of the Pak Kret and Bang Sai Transects, it can be concluded that they have spatial and seasonal variations. Amounts of material loads carried by the river depend on discharges corresponding to the content of materials at the time of sampling.

Trends of materials introduced by river in particulate/or particulate-associated form of suspended sediment, total phosphorus and particulate phosphorus mostly seem to be consistent with the flow patterns. In comparison to the dissolved species, trends of silicate flux may be varied and modified due to the influence of discharge and geochemical processes of the watershed. Silicon introduced in solution by the Chao Phraya River are dominantly derived from natural weathering processes and later transported through the estuary conservatively (i.e. no loss or gain). In the case of dissolved phosphorus the influence of anthropogenic inputs also affect their behaviors in river system, such as the use of watershed in agriculture, industry and an increasing of population in the Metropolis. In addition, the mixing experiments revealed that dissolved phosphorus behaved conservatively during estuarine mixing at salinities above 18 ‰. In the region of 0-18 ‰ it was removed by the influence of adsorption behaviors of the bottom river sediment and river-borne suspended sediment. Thus, the dissolved phosphorus load carried to the sea by the Chao Phraya River ought to be less than the actual loads introduced to the river system.

An estimate of the annual mean material fluxes through the lower basin of the Chao Phraya River also depend on the drainage area which will reflect the annual runoff of river systems. The amounts of long term net transport of material together with the annual runoff of about 155 x 10^8 m^3 yr^{-1} during December 1987 to December 1988 were:

- suspended sediment flux 1,566 x 10^8 tons yr^{-1} or 11.02 tons km^{-2} yr^{-1},
- phosphate phosphorus flux 0.63 x 10^3 tons yr^{-1} or 4.43 kg P km^{-2} yr^{-1},
- total phosphorus flux 3.13 x 10^3 tons yr^{-1} or 22.04 kg P km^{-2} yr^{-1},

- particulate phosphorus flux, 2.49 x 10^3 tons yr^{-1} or 17.53 kg P km^{-2} yr^{-1}, and
- silicate flux 69.48 x 10^3 tons yr^{-1} or 489.3 kg Si km^{-2} yr^{-1}.

These values may be useful in comparing trends and patterns of material transport in a tropical system to other systems. In addition, the suspended sediment flux can used as a basic data for estimating amount of transported sediment and for dredging in order to improve the navigation in the river. The river pollution control may be determined and carried out by considering trends of dissolved phosphorus flux of this study.

In studying the material transport through a river system, it is very difficult to determine the influence of man on river chemistry. In order to better understand, some recommendations for further researches are:

1. The field measurement of watershed in the region of more natural state should be made at the upper basin of the Chao Phraya River to compare with this study.

2. The direct measurement of various pollutant sources such as urban wastes, discharges and agricultural runoff should be made to compare with this study.

3. The deforestation and agriculture in the area of Bang Sai Station may cause the natural river system to have more erosion which will increase load of silicate into the waterways, thus, for further researches the amounts of silicate carried by the Chao Phraya River

should be estimated by consideration of the relative proportion of the use of land and the remaining area of the catchment.

In fact, the reactive phosphorus flux is more difficult to estimate because it includes not only dissolved reactive phosphorus but also dissolved organic phosphorus plus any potentially exchangeable forms, such as phosphate adsorbed to clays and iron oxides, iron and aluminium phosphates and any particulate organic phosphorus, some portion of which may be released in seawater and enters the biological cycles (Froelich and others, 1982). Thus,it may be varied and modified by adsorption/desorption behaviors between the aqueous phase and suspended sediment in the river. This includes the adsorption capacities of phosphorus on the bottom river sediment as has been observed in this study. However, an estimated value of dissolved phosphorus flux reaching coastal area will be more reliable if the field measurements are observed at salinities above 18 ‰.

Furthermore, an estimate of material flux from extrapolation method by regression techniques of the relationships between discharge and watershed chemistry of this study should be reliable for conservative elements. The direction of loops of hysteresis can identify the characteristics of the Chao Phraya River, that is, if the river is in normal condition the direction of loops should repeat from year to year.

However, the material flux estimation in rivers is complicated and often biased from the true value because the material flux have temporal and spatial variations. The reliability of material fluxes depend on several factors, such as frequency of sample collection, sampling scheme and calculation procedure used for combining chemical and flow imformation (Dickenson, 1981; Walling and Webb, 1981). In order to obtain the reliability results, it is essential to do intensive sampling.