ASSESSMENT OF THE WATER QUALITY
FROM SOME SELECTED REGIONS
OF THE AYEYARWADY RIVER

Ph.D. DISSERTATION

THAZIN LWIN, B.Sc.(Hons); M.Sc.

ABSTRACT

The water quality of the Ayeyarwady river near the locality of three different stations such as Kyunchaung Fertilizer Plant (between Pagan and Kyunchaung), Oil Refinery Plant (between Magway and Minbu), and Shwedaung Textile Plant (between Shwedaung and Padaung), i.e., a stretch of 328 km, was seasonally investigated during the period 1995-1997.

With a view to making use the water bodies as a possible source of quality water for the surrounding areas of the studied stations, the present work was thus undertaken; that is , to find out whether impairment of the water body has taken place or not due to the recent developments in industrialization, increased inhabitant population and intensive agricultural activities.

The impacts of human and natural events on the river bodies was assessed by the determinands such as hydrological profiles, physico-chemical parameters, inorganic constituents, metallic constituents (toxic and non-toxic), nutrients, organic constituents, organic contaminants, biological characteristics, and possible presence of radioactivity.

These determinands were measured by using recommended physico-chemical, biological, radiochemical and instrumental analytical methods. It includes titrimetry, gravimetry, uv-vis spectrophotometry, atomic absorption spectrometry, ion chromatography, gas chromatography-mass spectrometry, inductively coupled plasma-mass spectrometry, inductively coupled plasma-optical emission spectrometry, non-dispersive infrared spectrometry, fourier transform-infrared spectrometry, x–ray diffraction technique, microcoulometry, isotachophoresis, BET technique, Stokes' sedimentation technique, laser-beam

particle size analysis, multiple tube method based on the most probable number technique, gross and high purity (Ge) advanced gamma counting technique, and anti-compton low-level gamma spectrometry.

The systematic studies have revealed that apart from radioactivity, the water bodies along the stretch of 328 km are more or less in the threshold of pollution stress, contrary to previous preliminary reports which have assumed that the water quality of the Ayeyarwady river is "safe and clean".

The above findings are based on the results of the physico–chemical and biological parameters as well as on the presence of toxic contaminants which in most cases were found to be above the *EPA* guidelines. The data were evaluated statistically by computer using the standard *SPSS* (Statistical Package for the Social Science) software.

Pollution stress was more prevalent at the two sites where the fertilizer plant and the textile plant were located and less at Magway–Minbu . At Magway – Minbu, there was more concentration of polycyclic aromatic hydrocarbons which may be traced to the nearby oil refinery plant. Generally, pollution stress was high in summer and winter and low in the rainy season.

Based on the unique seasonal temporal trends of the determinands which are in concordance with the trends of the hydrological properties; statistical models such as time series Box–Jenkins ARIMA model and Linear Regression Model were generated to forecast the future aspects of the water quality of flowing water bodies.

The seasonal temporal trends of some of the determinands were effective indicator factors for the assessment of the water quality of the Ayeyarwady river.

A separate study of the river Rhine which is known to be more or less biochemically pollution free was also made to compare with those of the water bodies of the Ayeyarwady river.

A unique finding of this work is the presence of heavy toxic metals and also high concentrations of toxic carcinogenic polycyclic aromatic hydrocarbons, together with high levels of microbiological organisms.

On the whole, the bodies of water studied have reached the threshold of pollution stress. Hence, in order to make use of the water body as a possible water resource; it would be advisable to develop cost–effective and efficient water treatment and monitoring processes. Also for reducing the present pollution situation, it needs to establish wastewater treatment and monitoring stations near the point sources.

* * * * * * * * * * * * * * * * *