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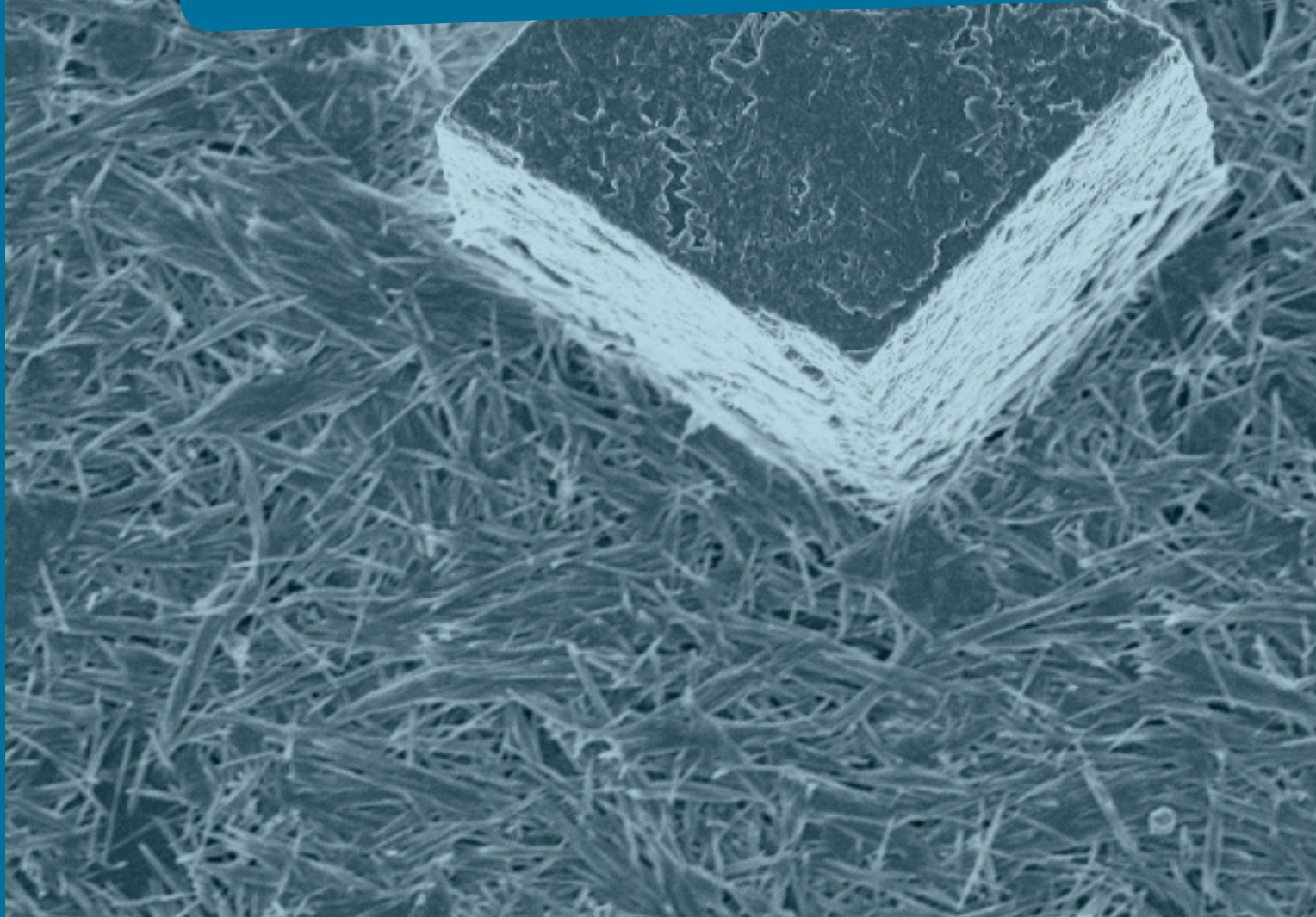

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ORIGIN, DISTRIBUTION AND FATE OF PHOSPHORUS AND POTENTIALLY TOXIC ELEMENTS IN THE SEDIMENTS OF INLE LAKE (SOUTHERN SHAN STATE, MYANMAR)

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Inle Lake is the second largest lake in Myanmar and the most important, for its economic, touristic, agricultural and environmental value. Previous studies report that Inle lake is seriously threatened by anthropic activities on the lake sides and in its drainage basin. One of the main problems is related to the decrease in the open water surface, attributed to an increase in sedimentation caused by accelerated soil erosion, as a consequence of deforestation in the watershed, and to the expansion of agriculture in the form of floating gardens [1].

A detailed sediment sample collection including 10 sediment cores ranging from 40 to 85 cm in length, and 16 dredged samples, was carried out in March 2014 (hot dry season). Dredged sediments and cores, cut in 5 cm slices, were wrapped in polythene foil to prevent oxidation, and were transported to the Department of Earth and Environment Sciences, University of Pavia (Italy). In the laboratory, sediment samples were dried at room temperature for 2-3 days in order to maintain the crystal structures, weighted and described for their colour using the colour chart. Major shells were eliminated by manual picking and dried sediment was ground to fine powder in agate mortar. Total P and trace metal concentrations in sediment samples were analysed by Total Digestion ICP/MS. In addition the acid soluble-P content and P fractions were investigated using a sequential extraction procedure according to the SMT protocol [2].

Results indicate a good correlation of P with U, Cd, Mo and Sb concentrations, but no correlation with the mineralogical composition of the samples. This correlation can be considered as the “P pollution factor”, due to the association of this element and to other trace elements commonly found in P fertilizers. The more enriched Tot-P content was found in the floating gardens area, due to the use of chemical fertilizers and to other anthropogenic sources such as domestic and sewage effluents. High amounts were also detected at the inflow stream, and at the centre of the lake, where the P content derives from to soil erosion and detrital inputs by the streams. The highest Tot-P concentrations were detected in the top layers of the sediment cores, which are affected by anthropogenic activities, whereas low values were observed in the deep sediment, which can be attributed to the natural level of phosphorus. Ca-bound P, accounting for an average of 35%, was the main inorganic-P pool. This is a relatively stable and non-bioavailable P form. Another important form was organic-P, accounting for about 30% of the total. This P pool is considered the more bioavailable since, during organic matter degradation, it can be released to the water column, thus contributing to the lake eutrophication. The rank order of P fractions allowed classifying Inle lake as mesotrophic, potentially shifting to eutrophic. In conclusion, the study provides useful information of anthropogenic impact on the lake ecosystem as a premise for the correct management of this valuable water body.

[1] Sidle R.C., Ziegler A.D., Vogler J.B. (2007). Contemporary changes in open water surface area of Lake Inle, Myanmar. Sustainability Science, 2, 55-65.

[2] Ruban V., López-Sánchez J.F., Pardo P., Rauret G., Muntau H., Quevauviller Ph. (2001). Development of a harmonised phosphorus extraction procedure and certification of a sediment reference material. Journal of Environmental Monitoring, 3, 121-125.