W.K. FLETCHER: Applied Geochemistry and Renewable Resources

On 12 January 1983, Dr. W.K. Fletcher gave the above technical talk at the Dept. of Geology, University of Malaya, which was attended by 15 members. Dr. Fletcher is presently serving as the UN Expert at SEATRAD Centre, Ipoh, while on leave from the University of British Columbia, where he is Associate Professor, Dept. of Geological Sciences. What follows is an outline of the talk specially prepared by Dr. Fletcher for the benefit of GSM members.

Application of geochemical methods to mineral exploration is widely known and routinely used. Less well known is the application of similar techniques to environmental problems and increased production of renewable resources.

In addition to the major elements necessary to sustain healthy plant and animal life, micronutrients are required at trace (ppm) levels. The list of these essential trace elements continues to grow but at present is believed to include V, Cr, Mn, Co, Ni, Cu, Zn, As, Se, Cl, F, I, Mo and possibly Sn. If concentrations of these elements are below those required deficiency disorders result. Similarly, in some cases concentrations greater than those required can result in toxicity. In addition certain non-essential elements, for example Cd, Hg and Pb, can cause toxicity at abnormally high concentrations.

Biogeochemical cycling and availability of the micronutrients is complex, nevertheless for most of the elements their ultimate source is the soil parent material. It is therefore not surprising that on a regional scale trace element disorders can often be related to geology and that regional geochemical maps might be useful in delineating potential problem areas.

The technique most widely used for preparation of regional geochemical maps is the collection and analysis of drainage sediments, the basic premise being that the sediment is a natural composite sample of the products of weathering upstream of the sample site. The method is rapid and inexpensive permitting large regions to be surveyed

and areas of interest, with abnormally high or low trace element concentrations, delineated. Case studies inthe U.K. and Canada have demonstrated that resulting maps can successfully outline hitherto unrecognised areas wherein abnormally high concentrations of Mo (derived from black shales) cause Mo-induced Cu deficiency in cattle. In a region of some 1,000 km^2 in Canada the resulting loss to the agricultural economy is some $(C)3x10^6$ annually. Regional geochemical patterns of Cu, Zn, Mn, Co and Se have also been related to agricultural disorders and at the same time the extent of base metal pollution, resulting from mining and related activities, defined.

It is concluded that although the principal role of geochemical surveys will continue to be mineral exploration, resulting data are also relevant to study of trace element related agricultural and environmental problems.

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