A national geochemical baseline survey of New Zealand soils

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Decades of excellent soil-related research in New Zealand have been aimed primarily at the agricultural industry, with a focus on soil distribution, development, and physical and chemical properties. Chemical element and compound concentrations are well known in relatively small areas around the country but until recently, no systematic grid-based multivariate national, regional or urban survey of New Zealand soil geochemistry had been attempted. These surveys have been undertaken at continental-, national-, and urban-scales in Europe, northern America and Australia, and have provided important datasets for diverse end-uses including for the human and animal health sectors, environmental studies, the agricultural and forestry industries, forensic studies, and the mineral exploration and mining sectors.
The 2015 geochemical baseline survey of southern New Zealand soils by GNS Science is the first of its kind to be completed in New Zealand, where standardised and systematic sampling, sample preparation and QA/QC protocols were tested. Results from this survey revealed that meaningful element concentration and variation in the soil landscape can be measured, and differences relate primarily to underlying geology, local topography and climate, and anthropogenic input. With minor modification, we demonstrate that the sampling and analytical methodologies trialled in the 2015 southern New Zealand survey are applicable to a national geochemical baseline survey of New Zealand. Crucial to the success of a national scale geochemical baseline is the requirement for such a survey to be standardised with respect to sample collection (sample density, depth-collected), preparation (drying, sieving) and analytical protocols (grain-size analysed, strength of digestion, analytical technique). Data collected will enable construction of geochemical maps, refine the natural variation for chemical elements across New Zealand, and importantly, provide context and foundation for a wide variety of studies. A national geochemical survey will also provide an environmental baseline against which future change can be measured.