

Multi-Isoscape approach to realize environmental traceability

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Multiple elements and their stable isotope ratios constituting ecosystems, such as water, air, living organisms and soil, can act as fingerprints. By using the traceability function of the fingerprints, we can conduct research that contributes to solving global environmental problems covering various regions and time scales. Stable isotope ratios of elements, together with concentrations of elements, can trace the flow of matter and chemicals through the environment, better describe ecosystem structure and conditions, and appraise food products' chemical profile. Spatio-temporal variation of multiple isotope ratios can be used for studying earth systems, ranging from local to global scales. The information may serve as a key decision-making factor for local people consider water, food and environmental security, all of which are fundamental for the sustainability of human society.

We seek to establish a methodology for how to use the concept of environmental traceability in the project of “Proposal and verification of the validity of isotope environmental traceability methodology in environmental studies”, which is being done in the Research Institute for Humanity and Nature. A combination of quantitative and qualitative tools, including “Multi-Isoscapes” (use of multiple elements and multiple isotope ratios, together with GIS-based mapping technique), social surveys, and workshops, are deployed to investigate the role of environmental traceability in confronting environmental issues. We hypothesize that the role and perception of traceability methods in transdisciplinary processes will differ among stakeholders and that the co-production of “Multi-Isoscapes” can act as an effective “bridging tool” for understanding and explaining variation in local environments. The ultimate objective of this research is to demonstrate the effectiveness of multi-isotopic information in solving global environmental issues. Research is taking place at sites in Ono City, Fukui; Otsuchi Town, Iwate; Saijo City, Ehime; Oshino Village, Yamanashi; the Chikusa river watershed, Hyogo; Lake Biwa and surrounding watershed in Shiga; and Laguna de Bay and surrounding watershed in the Philippines.

Keywords: Stable isotopes, Environmental traceability