

## Interface between material cyclings and human dimensions

Eitaro Wada

Research Institute for Humanity and Nature (RIHN)

Interactive cycles between humans and nature are investigated with emphasis on material cycles concerning a watershed management. Along this line, possible indicators and carrying capacities for assessing the interactive material cycles are examined and developed.

Final goal of our project is to establish a methodology to diagnose the ecosystem health. In our project, following subjects have been studied with emphasis on the diagnosis in question.

**Category I** Relating to the environmental capacity of a watershed.

- i) Total available dissolved oxygen in Lake Biwa
- ii) Evaluation of adequate human population density by the  $\delta^{15}\text{N}(\text{POM})$  measurement in a stream

**Category II** Relating to the possible indicators or important human activities.

- i) Discharge of POM from paddy fields
- ii) Small streams and rivers as a  $\text{N}_2\text{O}$  producing system
- iii) A stable isotope structure of a watershed
- iv)  $\delta^{15}\text{N}(\text{PON})$  or  $\delta^{15}\text{N}(\text{sediment})$  as an indicator of eutrophication
- v) Contribution of C4 food to the total food demand in several regions in the monsoon Asia

In this report, I will focus on the following subjects with emphasis on stable isotope techniques.

- i) Use of  $\delta^{15}\text{N}$  (POM or sediment) for assessing human impacts = pollution
- ii)  $\delta^{15}\text{N}$ – $\delta^{13}\text{C}$  map of river sediments for assessing the human disturbance of a watershed
- iii) The lower reach of Hebisuna River as significant  $\text{N}_2\text{O}$  source

A linear relation was obtained between  $\ln[\text{NO}_3^-]$  and  $\delta^{15}\text{N}(\text{N}_2\text{O})$ , strongly supporting the production of  $\text{N}_2\text{O}$  via denitrification. A  $\delta^{18}\text{O}$  -  $\delta^{15}\text{N}$  map for  $\text{N}_2\text{O}$  was examined to clarify the possible  $\text{N}_2\text{O}$  production mechanisms.

- iv)  $\delta^{13}\text{C}$  as a possible indice for assessing C4 food chain in the monsoon Asia.  
The  $\delta^{13}\text{C}$  of human hair was measured in the following nations: Japan, Nepal, Thailand, Russia and Mongolia in Asian regions. The monitoring has been also carried out for peoples living in the Lake Biwa-Yodo River watershed.
- v) Use of the down-core samples and biological specimen for evaluating the ecosystem change during recent past ( $\delta^{15}\text{N}$ – $\delta^{13}\text{C}$  map).