

## 【Grant-in-Aid for Scientific Research(S)】

### Integrated Disciplines (Complex systems)



Title of Project : Integrating dryland disaster science

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Research Area : Geography

Keyword : Natural disaster, Drought, Desertification, Dust, Dryland

#### 【Purpose and Background of the Research】

Drylands occupy 41% of Earth's land area and are home to more than 2 billion people—a third of the human population in the year 2000. The large proportion is the poor, forming the Bottom of the Pyramid. The nature-society system is among the most vulnerable to projected increasing frequency of various extreme weathers. Especially, drylands in middle-high latitudes have a severe environment coupled with an arid and cold climate and the livelihood has been jeopardized repeatedly by natural disasters that occur in such a climate. The disasters are characterized by so-called 4D (i.e., drought, dzud, dust storm, and desertification; Fig. 1) that occur interactively. However, previous approaches towards elucidating disaster mechanisms and implementing the management have not fully been integrated, as they only dealt with each disaster separately.

Given this background, the present project aims (1) to relate the 4D disasters in the dry inland area of Eurasia to each other in terms of causal mechanisms (especially, drought memory) and the time scales of their occurrence and (2) to develop comprehensive proactive countermeasures and make a policy recommendation for mitigating multi-disaster impacts.



Figure 1 4D disasters in arid Eurasia (dust storm, S. Otani; drought, T. Ito; desertification, N. Yamanaka)

#### 【Research Methods】

Objective 1 can be achieved by correlating

impacts of 4D-producing extreme weathers in terms of the concept of drought memory and by evaluating risks for each disaster as the product of impact (hazard or forcing) and vulnerability (expressed by three elements of exposure, sensitivity, and resilience) of the nature-society system (Fig. 2). Objective 2 can be achieved by implementing approaches integrating countermeasure opinions to reduce the vulnerability.

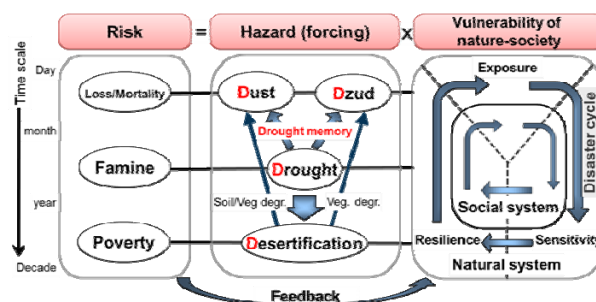


Figure 2 How are 4D interrelated?

#### 【Expected Research Achievements and Scientific Significance】

Expected achievements are (1) prediction of 4D disasters based on integrated risk assessment and (2) policy recommendation of proactive disaster management with countermeasure options.

#### 【Publications Relevant to the Project】

Shinoda, M.: Land: Proactive Management of Drought and Its Derived Disasters. In R. Shaw and T. Phong eds.: *Environment Disaster Linkages*. Community, Environment and Disaster Risk Management, Vol. 9, Emerald Publishers, Bingley UK, 61-78, January 2012.

【Term of Project】 FY2013-2017

【Budget Allocation】 168,400 Thousand Yen

#### 【Homepage Address and Other Contact Information】

<http://www.alrc.tottori-u.ac.jp/japanese/organization/shinoda.pdf>