



# Ecosystem-based approaches to disaster risk reduction in Japan: transdisciplinary research and actions



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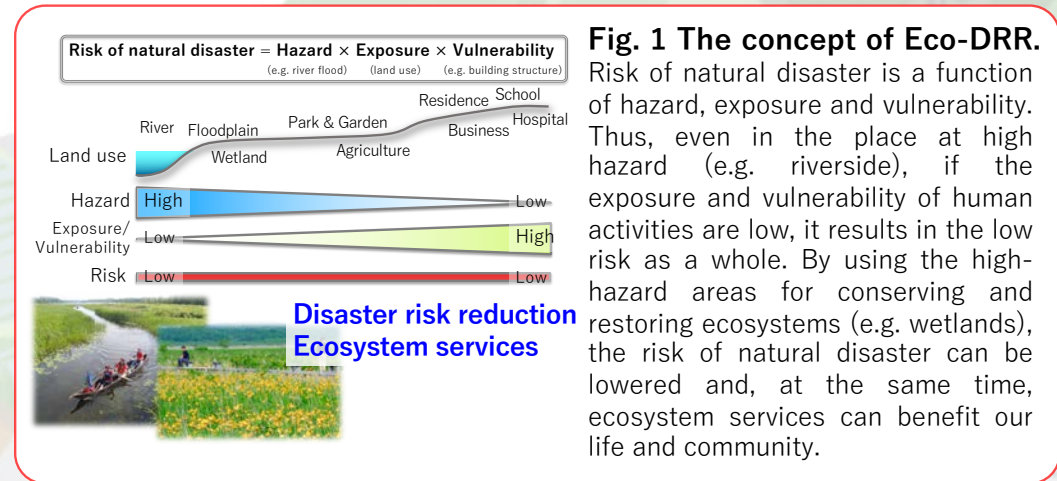
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[https://www.chikyu.ac.jp/rihn\\_e/project/2018-01.html](https://www.chikyu.ac.jp/rihn_e/project/2018-01.html)

Transdisciplinary research project on ecosystem-based approaches to disaster risk reduction (Eco-DRR, Fig. 1) is ongoing at the Research Institute for Humanity and Nature in Kyoto, Japan. This project aims at developing practical solutions for implementation of Eco-DRR by visualizing natural disaster risks, evaluating multi-functionality of Eco-DRR solutions, conducting transdisciplinary approaches in collaboration with various stakeholders, and advocating traditional and local knowledge of disaster risk reduction. Main research topics and some outcomes are introduced here, although many research activities are in progress.

Natural disasters occur at an increasing rate and adaptation to natural disaster risks is a key to the sustainability of local communities in Japan. At the same time, Japan is experiencing a rapid decline of human population and aging. Eco-DRR takes advantage of the multi-functionality of ecosystems and biodiversity, including their capacity to mitigate natural disasters while providing multiple ecosystem services, and population decline provides ample opportunity for implementing Eco-DRR.

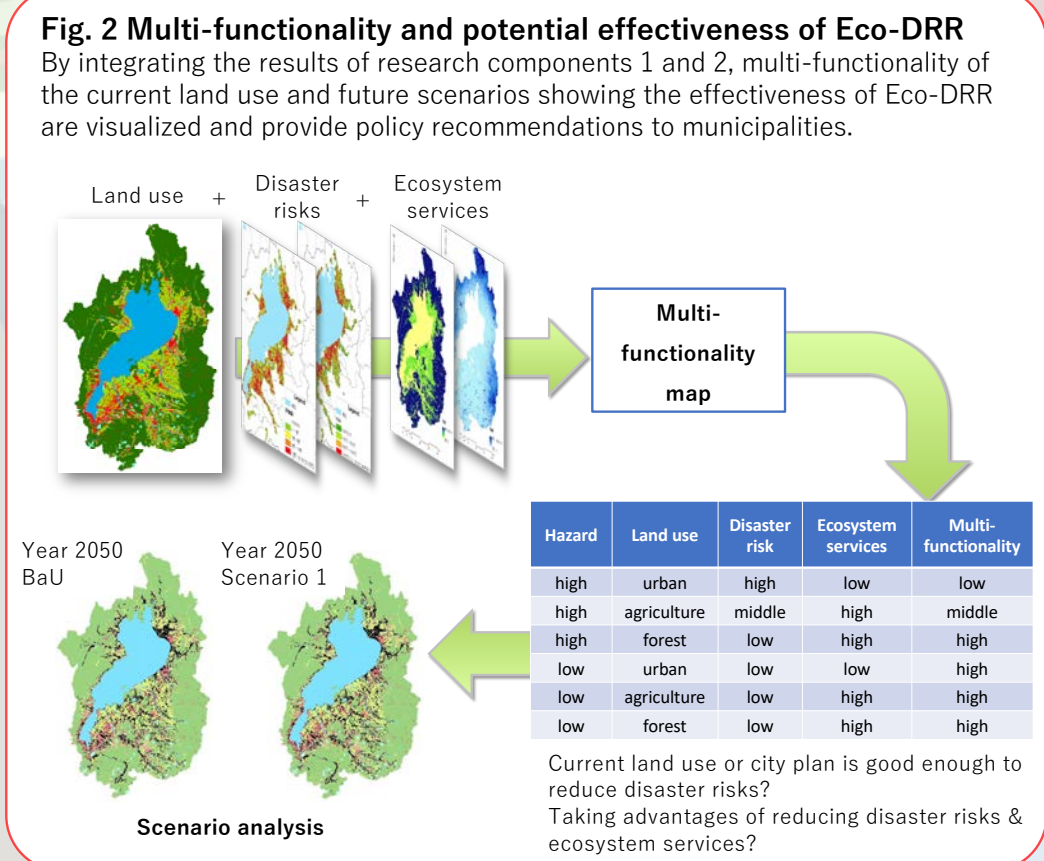


## Research 1: Visualizing natural disaster risks

The risk components of hazard, exposure and vulnerability of different types of natural disasters are analyzed on the GIS, and then the risks of natural disasters in terms of monetary loss and the number of victims are visualized as a map (Fig. 2). Historical changes of the risks are also examined in some local sites. Scenario analysis considering the population shrinking and the land use change is applied to model the future risks of natural disasters.

## Research 2: Evaluating multi-functionality of Eco-DRR

Various ecosystem services are evaluated on the GIS and integrated with the spatial distribution of the risks of natural disasters into a single map showing multi-functionality (Fig. 2). The scenario analysis is conducted to examine the potential effectiveness of Eco-DRR for different land use scenarios in the future.



## Research 3: Transdisciplinary approaches for implementing Eco-DRR.

In collaboration with various stakeholders at study sites in Fukui, Shiga and Chiba, we evaluate the multi-functionality of Eco-DRR and work together to implement the Eco-DRR solutions in the local policies and communities. Relevant economic incentives and institutions are also examined together with industrial, government and public sectors. Furthermore, we advocate the traditional and local knowledge of disaster risk reduction that is highly relevant to Eco-DRR.

### Transdisciplinary approaches at local sites

- ✓ Fukui site: ecosystem restoration + DRR → Eco-DRR
- ✓ Shiga site: flood and sediment control + Eco → Eco-DRR
- ✓ Chiba site: watershed management → Eco-DRR



### Examining economic incentives and institutions

- ✓ Comparing flood insurance schemes among different countries (Table 1)
- ✓ Examining financial schemes for implementing Eco-DRR
- ✓ Reviewing existing engineering techniques for Eco-DRR

**Table 1 Flood insurance schemes in Japan and other countries**

Nation	Insurance system	Premium	Obligate/optional subscription	Subscription rate
Japan	Optional coverage of fire insurance (private)	Uniform	Optional	66%
France	Catastrophe Naturelles (public)	Uniform	Obligate	95~98%
USA	National Flood Insurance Program (public)	Depending on the flood risk	Optional	~49%

Conclusion: Current Japanese insurance system has no incentive effect in flood risk avoidance, but it can compensate well for the loss of private properties, although the premium is relatively low.

### Advocating the traditional and local knowledge (TLK)

- ✓ Inventory and analysis of TLK related to disaster risk reduction and natural resources use
- ✓ Publishing a series of booklets for learning the TLK of Eco-DRR (Fig. 3)

**Fig. 3 Booklet series "Learning from the local history of disaster risk reduction"**

The first booklet was published in 2019 for the case in Hira mountains in Shiga and available for free at the RIHN web site. English version and other booklets are in progress.

