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Spatial Prioritization of Biodiversity and Ecosystem Services to Environmental Changes: a Case of Adaptive Management of Land Use for Japan

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Japan is receiving worldwide attention as a biodiversity hotspot harboring a number of endemic and threatened species. This project clarifies adaptive land-use management methods in relation to environmental changes. We firstly focus on natural history and biodiversity information in Japan and create a dataset of species distribution, functional traits and phylogeny of multiple taxa including vascular plants, mammals, birds, amphibians, reptiles and freshwater fishes across terrestrial ecosystems. Using this biodiversity big data, we visualize biodiversity patterns and the related ecosystem functions associated with the impacts of global warming in the future. Moreover, we combine biodiversity information with socio-economic data, e.g. human population and structure of local industries, in space and time, which facilitates cost-benefit analysis of biodiversity conservation by zonation algorithms and optimization. Then we explore sustainable land-use strategies in the framework of systematic conservation planning. Specifically, we tackle the following six conservation issues that directly link to administrative needs: 1) development of an adaptive protected area network that enables future shifts of biodiversity patterns in response to global warming to be captured, 2) spatial conservation prioritization of potential biodiversity and ecosystem services in primeval forests, 3) nation-scale spatial prioritization ranking of *satoyama* and artificial forests based on a trade-off relationship between biodiversity conservation and management costs, 4) planning for national-scale management of the sika deer population: identifying important management areas based on the relationships between biodiversity values, deer population density, deer grazing impacts and management costs, 5) conservation planning for Red-List threatened species based on estimates of macro-scale metapopulation structure, and 6) spatial prioritization of alien species management for biodiversity conservation: ranking important areas for management of invasive species. Based on the results of these six projects, we propose feasible land-use plan scenarios that balance biodiversity conservation, the provision of ecosystem services and economic activities, and finally contribute to decision making for implementing adaptive management methods in response to environmental changes in the future. Additionally, from a global conservation target viewpoint (e.g., 30 by 30), we identify priority areas for biodiversity conservation and restoration and propose a spatial plan for expanding the protected area network (involving OECM) in Japan. The results of this project are published by Think Nature, Inc. (<https://think-nature.jp>) on the J-BMP Biodiversity Visualization website (<https://biodiversity-map.thinknature-japan.com/en/>), and are used in environmental administration and by private companies to promote nature-positive projects.

<Figure legend>

Japan Biodiversity Mapping Project J-BMP (<https://biodiversity-map.thinknature-japan.com/en/>): an example of social implementation using the results of this project.

