urban greening

to create

biodiversity net gain

through wildlife habitat restoration

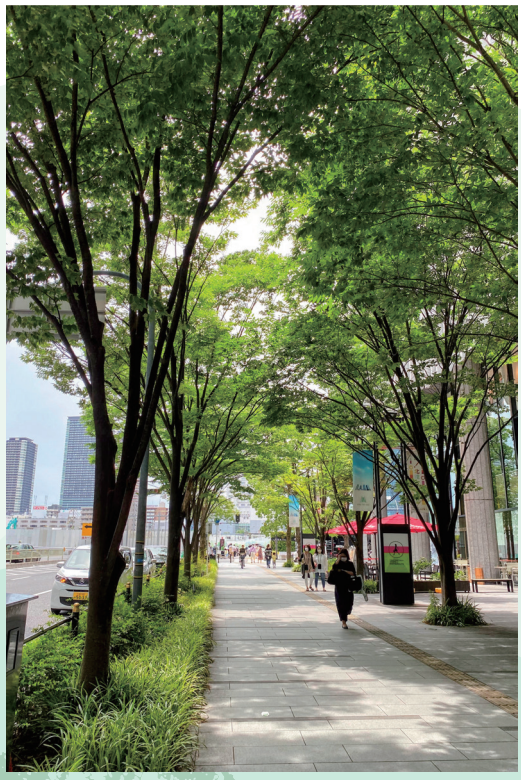
TN GAIN

evaluating the Nature-Positive Impacts

ThinkNature

Evaluating Biodiversity Net Gain in gardening at home or in a network of green spaces

Why Urban Biodiversity?



Urban areas provide a potential green space for compensating biodiversity loss that damage natural capital relevant to various services(Cameron et al. 2012) .
Therefore, urban biodiversity restoration is an important factor in mitigating the effects of climate change and ecosystem degradation.

Green infrastructure including a myriad of gardens functions as safeguard of biodiversity (Gaston et al. 2005; Owen 2010; Chamberlain et al. 2009); offsetting and net gain actions can reframe systematic conservation planning in response to the continued expansion of urbanization within social and economic development (Apostolopoulou & Adams 2017; Moilanen et al. 2020).

Biodiversity practices in urban areas, should be a key component in multiple international agendas such as Convention on Biological Diversity (CBD) underpinned by strategic goals promoting protection, restoration and sustainable use (Milner-Gulland et al. 2021).

Urban biodiversity restoration should be promoted by the concerted collective actions involving various stake-holders.

Think Nature's service focuses on the restoration effectiveness of company/citizen-driven wildlife-friendly gardening and evaluates the impact of Urban Nature Positive actions, contributing to a practical solution, i.e. spatial biodiversity offset and/or net gain in urban areas.

BIODIVERSITY IN BUSINESS

In recent years, the movement to conserve and restore biodiversity has accelerated around the world: the 15th Conference of the Parties (COP15) to the Convention on Biological Diversity was held in December 2022, and 23 targets to be achieved by 2030 were adopted as the Kunming-Montreal Biodiversity Framework (KM-GBF). For example, 30by30, which aims to establish at least 30% of land and sea as nature reserves, and the promotion of biodiversity impact assessment and information disclosure in business activities (e.g. TNFD). KM-GBF also set Target 12: "Enhance Green Spaces and Urban Planning for Human Well-Being and Biodiversity".

Urban Nature's Contributions to People

Tree planting restores biological connectivity, i.e. food webs, by providing habitat for the wildlife that uses plant species.And urban biodiversity and the related ecosystem services bring a sense of well-being to those of us who live there.

Green network of small-scale gardens harboring biodiversity

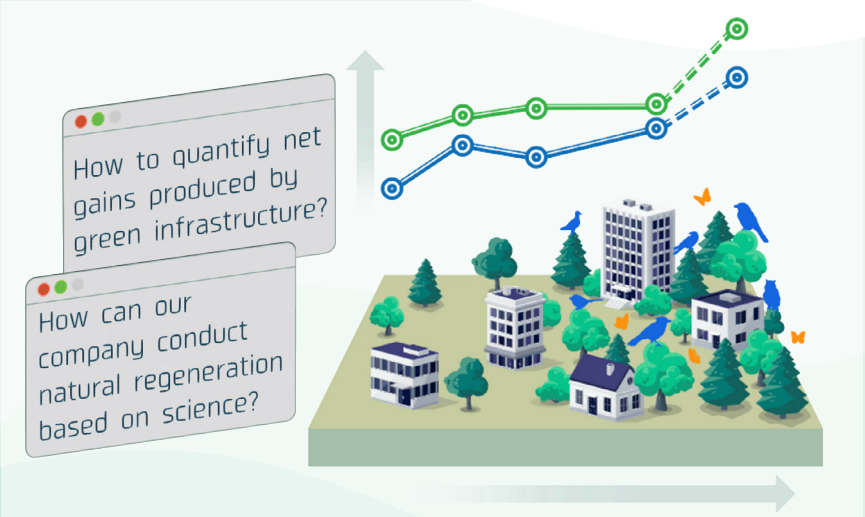
Urban wildlife-friendly gardening/greening recovers native biodiversity under the current intensive land use (Goddard et al. 2009). In housing/building constructions, the collective, small-scale gardening effectively reduces ecological risk of biodiversity loss through connecting habitat patches for wildlife species.

The aggregated green space captures macro-scale biodiversity patterns with substantial part of species richness including trees, butterflies and birds in the regions. A concept of ecological cityscape rewilding native species diversity in urban green space functions as a bottom-up measure of area-based conservation by the private sector: a network of green space collectively enlarges the size of habitats across the urban landscape.

Methodology visualizing Nature Positive impacts based on the concept/theory of macroecology

TN GAIN

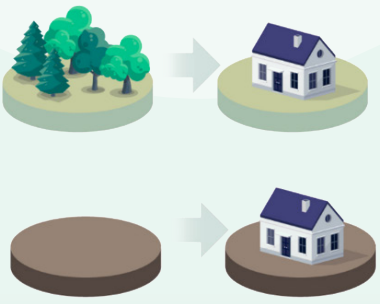
TN GAIN is a service of science-based, ecological softscape planning, which visualizes the impact of urban biodiversity restoration for revitalizing the city.



Needs biodiversity net gain in housing construction and urban redevelopment

Calculate restoration potential using species distribution data

Analise land use history in the focus locations



Data on animals using planted trees as habitat

Propose the planting species composition that maximizes the recovery of biodiversity

Quantify the restoration effects by the tree plantation with wildlife recovery

TN GAIN is implemented based on macro-ecological AI models that integrate satellite remote sensing and species/vegetation distribution data.

Think Nature's key technology

Building BigData with Diverse Data

Collecting scientifically credible data and aggregating extensive species distribution data

Papers

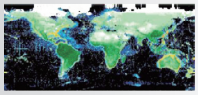
Open data base

Sampling data

Biologging data

Data collecting by specialists

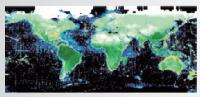
Environmental DNA



Building big data of species distributions

Species Distribution Map Creation using AI

Linking environmental information to species distribution data and using AI learning to simulate species distribution



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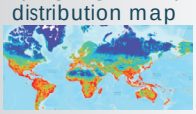
Linking various environmental data & AI learning

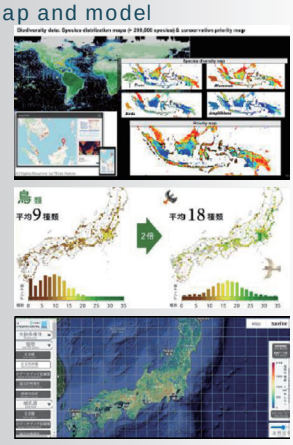
temperature | precipitation | ocean current | Land use | elevation

Developing a global species distribution map



Providing Various Nature Services

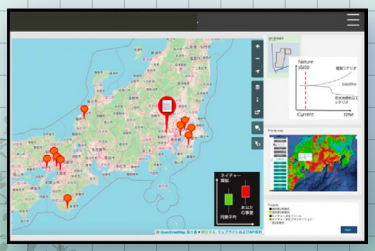
Various assessment analyses based on the species distribution map and model



We offer the world's largest biodiversity big data using scientifically reliable data and approaches and develop a variety of analyses (e.g. AI model).

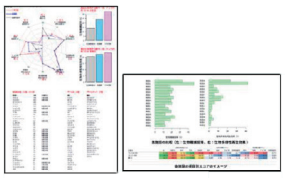
TN GAIN evaluates biodiversity net gain (BNG) by calculating the amount of wildlife habitat restoration from before- and after- comparisons of residential and building developments including private gardens, greening of property in urban redevelopment, reforestation of corporate green spaces and company forests and biotope planning.

Quantifying the nature-positive effects of gardening/greening actions



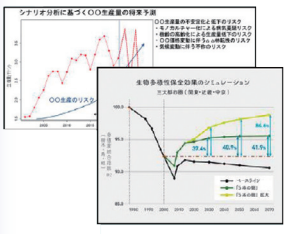
01 Visualization of Nature-positive Effects

- Quantifying and visualizing nature-positive effect of forest conservation and utilizing the native species
- Project before/after, comparative analysis, Industry Peer Comparison, baselines comparison



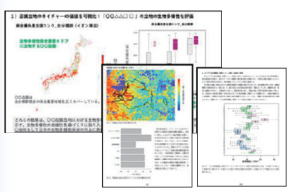
02 Identification of Conservation Effects with Scenario-based Analysis

- Conducting future forecasts based on various scenarios
- Utilizing scenario effects for goal setting

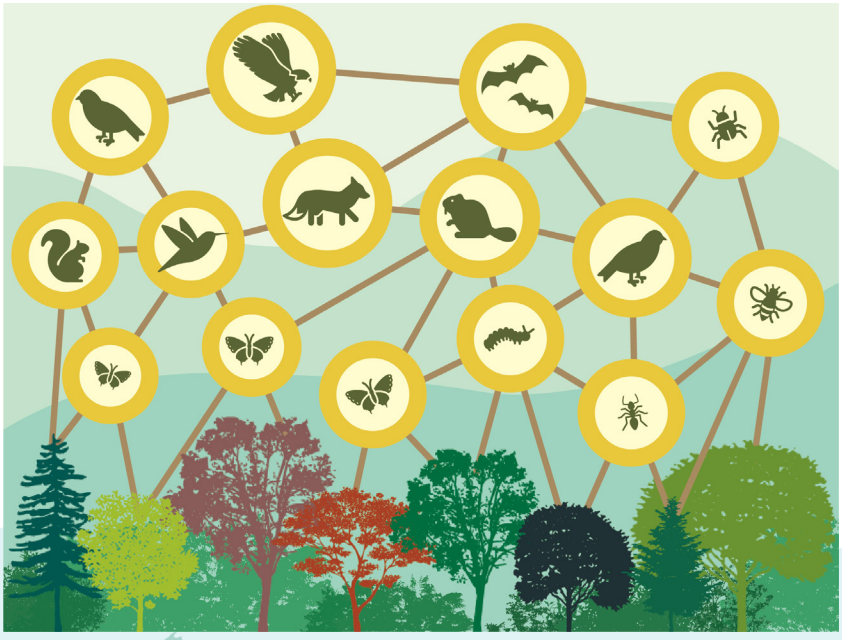


03 Utilization of PR for Nature Conservation Activities

- Quantification using multiple indicators such as area, species count, and conservation priority
- Enhancing appeal with visualization and quantification of effects



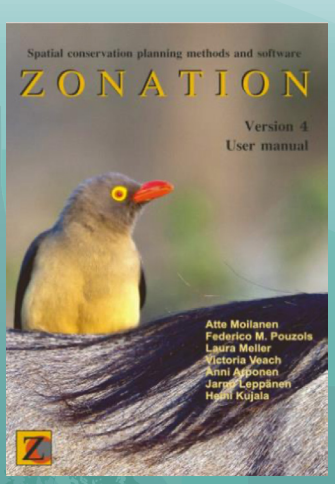
Notably, TN GAIN performs data-driven scenario analysis to calculate the cost-effectiveness of BNG and also proposes the optimal planting species composition that maximizes biodiversity recovery (surrogated by butterfly, dragonfly, and bird species etc.), based on an optimisation algorithm.



According to the location of housing construction and property development, we calculate the optimum combination of tree species and number of trees to be planted in order to substantially restore wildlife habitats, based on the food web data between tree and animal species. We can scientifically design best-practice nature-positive projects by conducting various simulations and comparing conventional projects (business-as-usual scenarios) and differentiated projects (in-house scenarios).

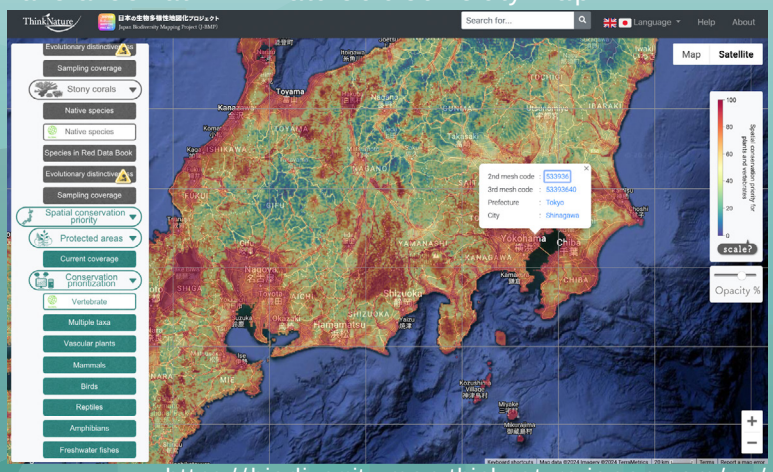
TN GAIN's outputs can be utilized as KPIs for biodiversity restoration (nature positive actions in businesses) in relation to corporate's PR and IR activities.

In the context of Systematic Conservation Planning with BIODIVERSITY MAP



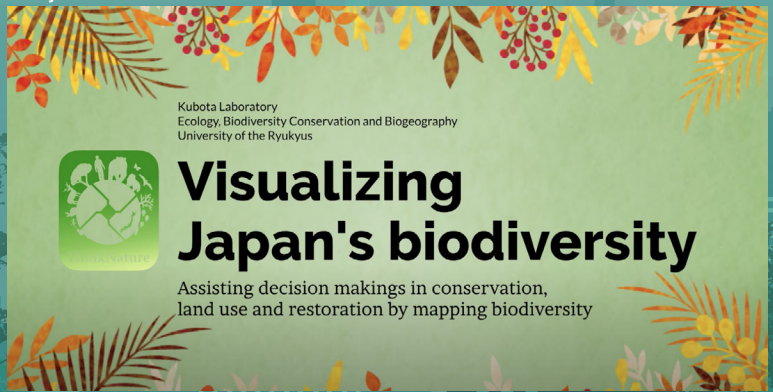
Spatial conservation prioritization (SCP) provides a transparent and quantitative framework for designing biodiversity restoration and evaluating its offsets/net gain effect (Moilanen et al. 2020): SCP analysis identifies priority areas in relation to land use and conservation planning, by integrating data of biodiversity features such as distributions of species, habitats, ecosystem services, costs and threats (Kukkala & Moilanen 2013). Therefore, SCP outputs strength the measurability of restoration effectiveness by informing the impact of habitat loss/increment on the persistence of biodiversity and the related ecosystem services.

Take a look at Think Nature's biodiversity map.



https://biodiversity-map.thinknature-japan.com/en/

See also this video! Japan Biodiversity Mapping Project: How to use the J-BMP



https://youtu.be/SGJH8NwAxf4?si=2lXjl6LTF9g6V2NU)

Business-driven Urban Gardening

Example: nature positive impacts of gardening promoted by Sekisui House company

This company-driven nation-wide green project embeds biodiversity considerations into the business operations. Planting native woody plant species in individual domestic gardens for harboring multi-taxon species diversity aims to emulate ***Satoyama biodiversity*** that has been historically maintained in Japanese rural areas.

Mapping of tree plantations in gardens. Tree planting was conducted mainly in urban areas along the lowland areas across Honshu island. The number of garden trees planted since 2001 has reached 16.11 million in total: for example, ca.0.4 million trees including 100-150 species was planted in individual 10 km grid cells, and in Tokyo and Osaka City, 10 thousands tree (more than 20 species) were planted in domestic gardens distributed in 1 km grid cells. These plantations were comparable to 8.566 km2 forested areas.

The principle of “three trees for birds and two for butterflies” , i.e. wildlife-friendly gardening, is based on the ecological cityscape concept of ***“Gohon no ki”*** that means “five trees” .

Think Nature's service TN GAIN measured the quantitative elements of restoration performance of the plantation action by Sekisui House company business operation.

Visualization of nature-positive effect by “Gohon no ki” Project

SEKISUI HOUSE

2022 ESG FINANCE AWARDS JAPAN GOLD

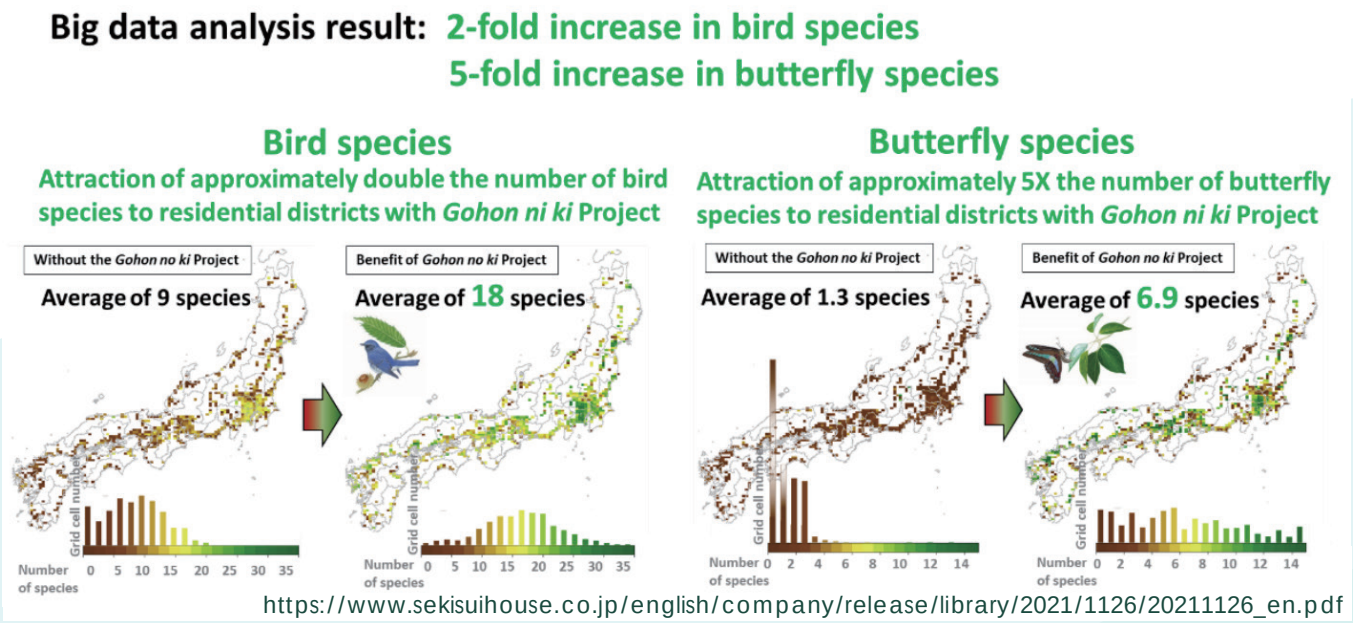
- the 30th Grand Prize for the Global Environment Award
- “EcoPro Awards” Minister’ s Award

Received several awards related to the environment

TN GAIN's assessment of urban biodiversity restoration provides a model to formulate effective restoration/conservation actions in human-modified environments across cities and improves biodiversity performance in businesses that assists corporate decision - making in relation to sustainability.

Creating the biodiversity of Satoyama, where people and nature live together, in urban green spaces.

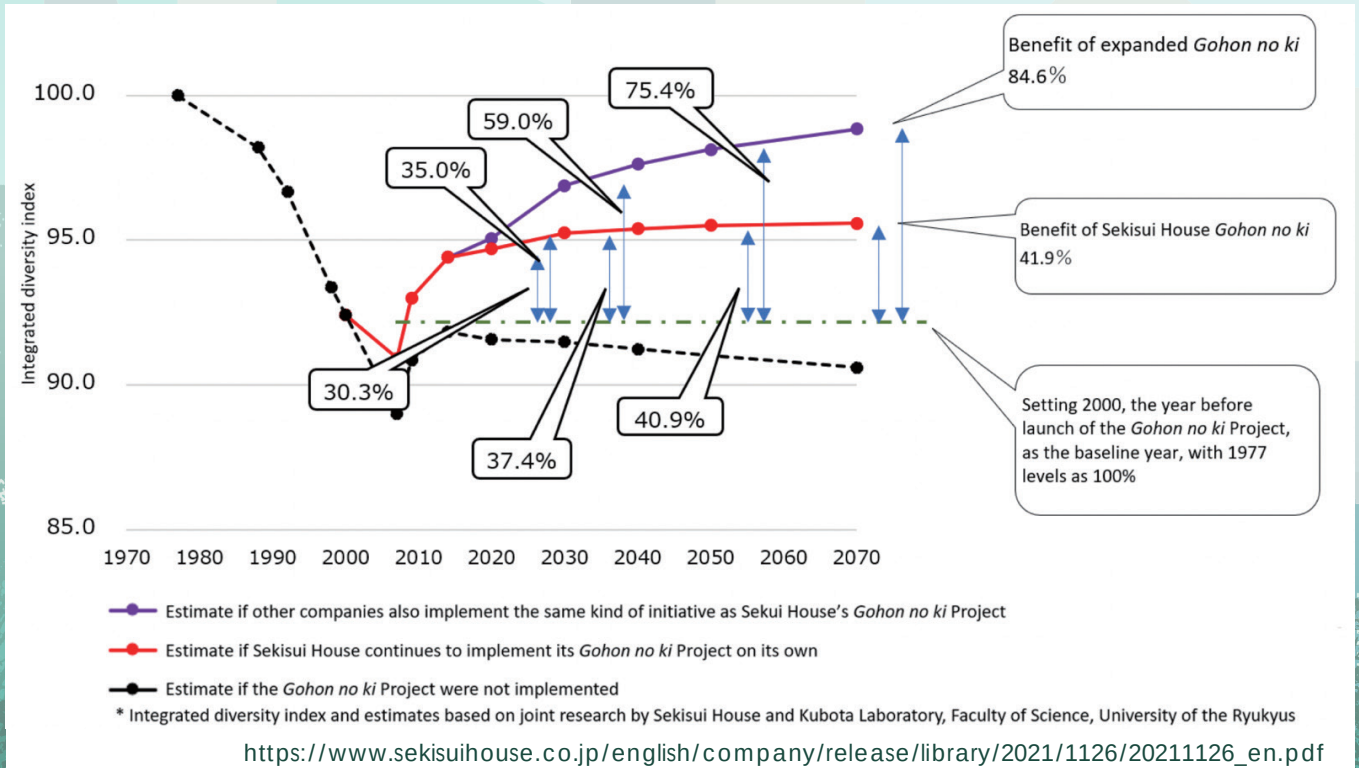
Specifically, we revealed the contribution of the gardening to nation-level conservation progress with the strategic targets, using a novel system to visualize spatial biodiversity features at 1 km resolution involving all vascular plants and vertebrate animals in Japan (Lehtomäki et al. 2019; Fukaya et al. 2020): how the past decade gardening recovered potential habitats for wildlife (butterflies and birds).



https://www.sekisuihouse.co.jp/english/company/release/library/2021/1126/20211126_en.pdf

Notably, these urban gardening substantially captured potential biodiversity in individual regions. Moreover, planted trees in the domestic gardens potentially functioned as host plants for a number of bird and butterfly species that accounted for 25-40% of bird and 50-70% of butterfly species in given regions.

If such an ecological planting project was applied to 30% of all newly constructed properties in Japan, urban biodiversity is predicted to rise to 84.6% of 1977 levels. This prediction indicates a promising way of collective actions: if the private sector works with the general public, the decline in biodiversity is reversible in line with the goal of KM-GBF.



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TN GAIN's assessment of urban biodiversity restoration provides a model to formulate effective restoration/conservation actions in human-modified environments across cities and improve biodiversity performance in businesses that assists corporate decision - making in conservation planning.

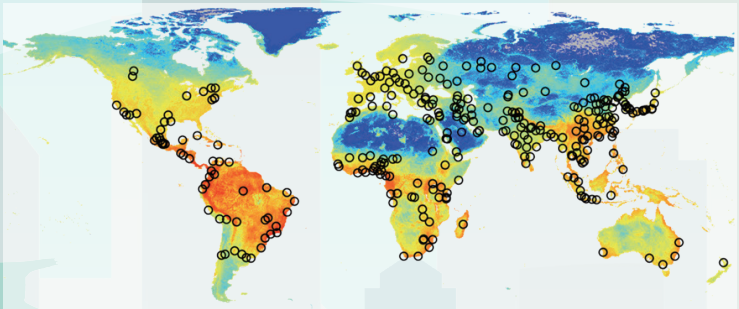
Think Nature's approach broadcast on the NHK SCIENCE ZERO TV programme

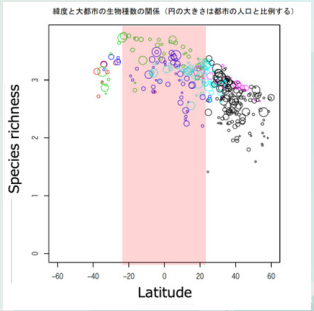
Measuring the effectiveness of restoration actions is fundamental (Oldfield et al. 2015): how private-driven practical actions, e.g. tree plantation or vegetation restoration, can contribute to halting biodiversity loss via the increment of potential habitats for wildlife. Therefore, **high-resolution visualization techniques for the spatio-temporal pattern of biodiversity strengthen the effectiveness of conservation and restoration actions**.

OECM AS A TOOL OF URBAN NATURE POSITIVE

KM-GBF tries to mobilize private sector' s actions, e.g. "other effective area-based conservation measures" (OECM): business/citizen-driven OECM is another solution to enhance feasibility of the conservation target through multi-objective landscape management sharing with private land use (Palfrey et al. 2020). Urban green space including domestic gardens owned/managed by private sectors potentially functions as an OECM that harbors wildlife in cities.

Cities are key for biodiversity





The biogeographical distribution of large cities is interesting. Overlay the location of major cities on a biodiversity map. Black circles represent large cities, red areas represent places with hotspots of wildlife species richness including vertebrate species.Latitudinal gradient of wildlife species numbers in large cities. The size of the circle symbol represents the population of individual cities.

Surprisingly, big cities are distributed in areas rich in species diversity (as shown by red areas on the map). This indicates that potential conditions for urban development require a rich natural environment for wildlife, such as rivers, lakes and other water bodies. Cities with potentially rich biodiversity are the ones with the best conditions for net gain action.

Wildlife habitat restoration through urban greening and tree planting is key to achieving a "Living in Harmony with Nature".

Scientifically Honest Way for implementing Nature Positive in the context of Business

The disconnection between business sector and biodiversity conservation remains a predominant issue (Smith et al. 2020); thus, incorporating biodiversity knowledge into private sectors is a key to implement conservation and restoration in business operations.

Although a number of CSR or SDGs actions has been conducted, the conservation effectiveness (or credibility) of biodiversity practices in businesses has rarely been evaluated scientifically (Boiral et al. 2018; Maier et al. 2018; Timothy A. C. et al. 2023), because of methodological difficulties in measuring biodiversity performance.

Therefore, business actions are prone to focus on consumers' brand perception or advertisements in the marketplace but not substantially address the target of biodiversity conservation framework (e.g. Marquis et al. 2016; Arouri et al. 2021), consequently providing limited force toward Nature Positive.

Indeed, companies' environmental actions often be criticized as greenwashing related to false communication or the selective disclosure of positive information on a company's environmental performance (Gatti et al. 2019). Importantly, a better understanding of the value of biodiversity also helps to reduce the material risk including stewardship and legitimacy in business operations (Addison et al. 2020).

Biodiversity loss and ecosystem degradation increase business costs in the future. In this view, the evaluation of conservation effectiveness of business actions, as shown in Think Nature's service, allows implementation of certifiable standards on biodiversity and promotes more effective efforts for broader business sustainability.

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