

UE-Net®

Urban Ecological Network Simulation system

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Our Environmental Vision



Future we want to fully realize

SHIMZ
Beyond Zero
2050

SHIMZ Beyond Zero 2050



- Zero negative impact from Shimizu's business on nature
- Implementation of green infrastructure to promote biodiversity and sustainable co-existence with nature.



Shimizu Group's
Green Infrastructure ^{Plus} 
Plus : Philosophy of Livable Universe for Sustainability



~Today's Seeds, Tomorrow's Landscape~

UE-Net®
Urban
Ecological
Network
Evaluation
system

Opportunity, issues, and UE-Net®

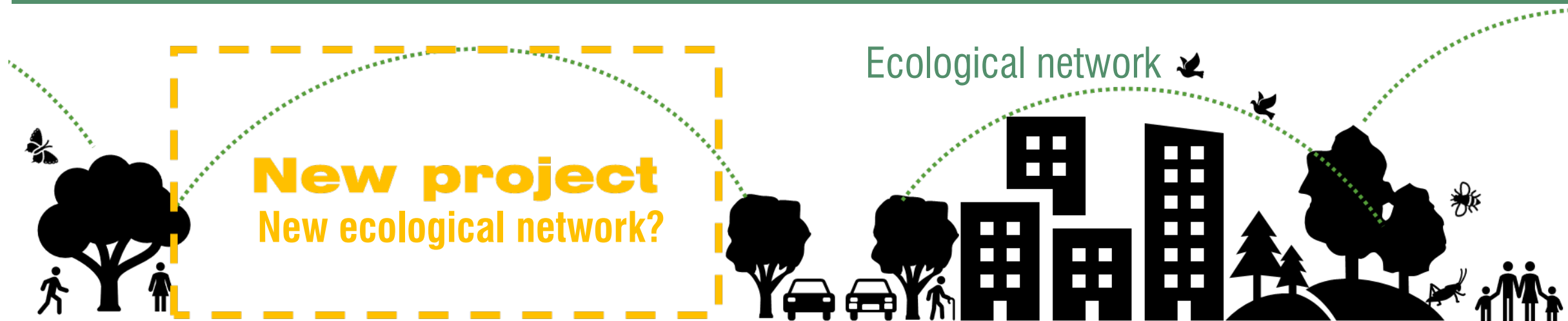
Opportunity when planning new landscape:

Landscape connectivity is important to maintain/recover habitable environment

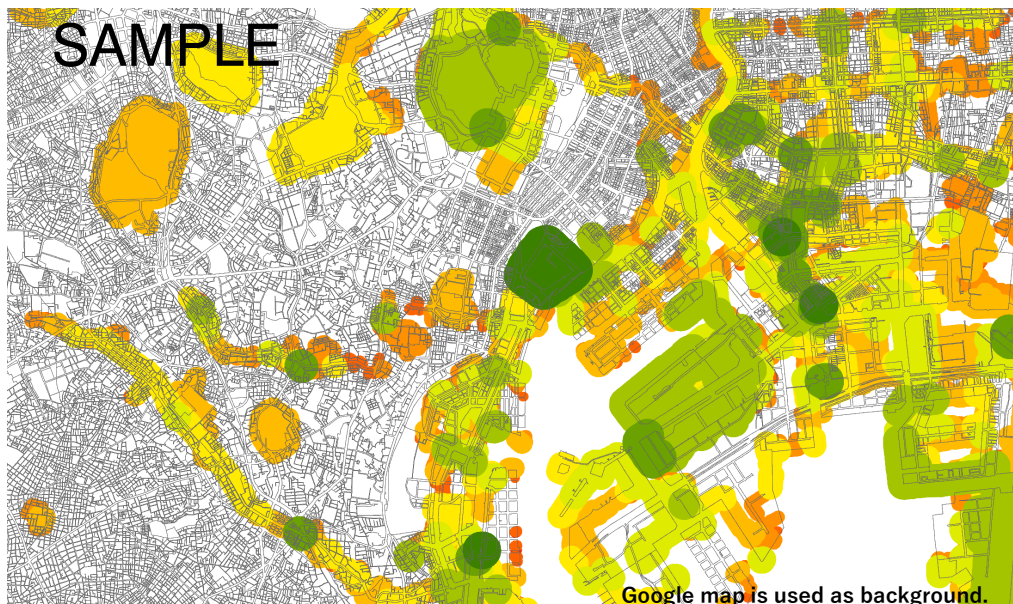
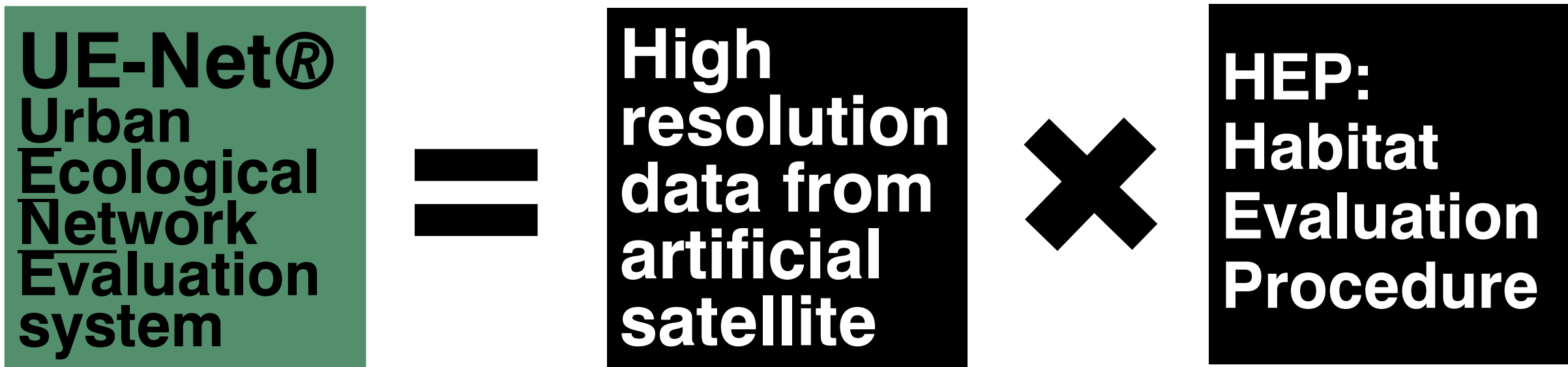
Issues: Biological distribution information is scarce at the planning phase.

: No quantitative indicators to assess newly planned ecological network.

UE-Net® can evaluate new ecological networks, which is a new connectivity created by planning new landscape as a continuous green with existing landscapes.



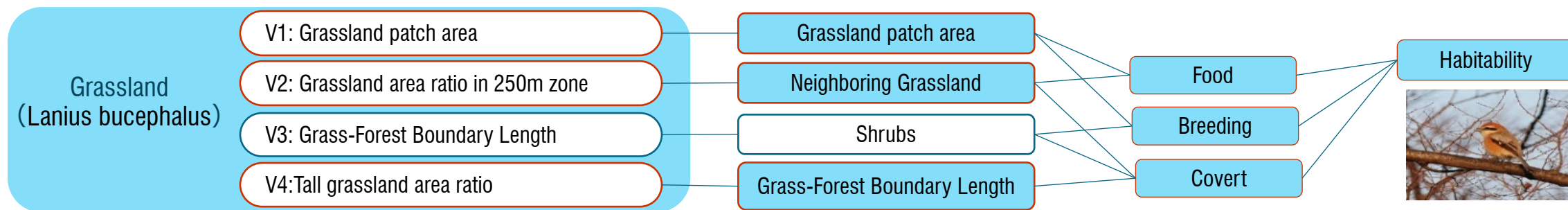
UE-Net®



Quantitative
evaluation of
ecological network
is available for
landscape planning

UE-Net[®] can solve the issues!

1) Create a model of habitability of index species (birds/ butterflies) .



2) Evaluation of existing ecological network using high-resolution satellite data.



Lanius Bucephalus
(Bull-headed shrike)

Grassland(G)



Parus major
(Great Tit)

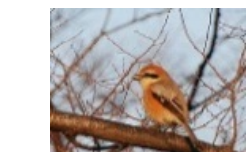
Forest(F)



Alcedo atthis
(Common Kingfisher)

Waterside(W)

3) Quantitative evaluation of ripple effect evaluation of new landscape.



Lanius Bucephalus
(G)



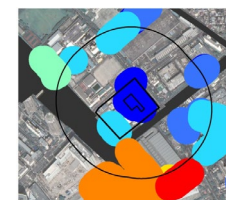
Existing



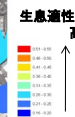
Plan A (G)



Plan B (G+F)

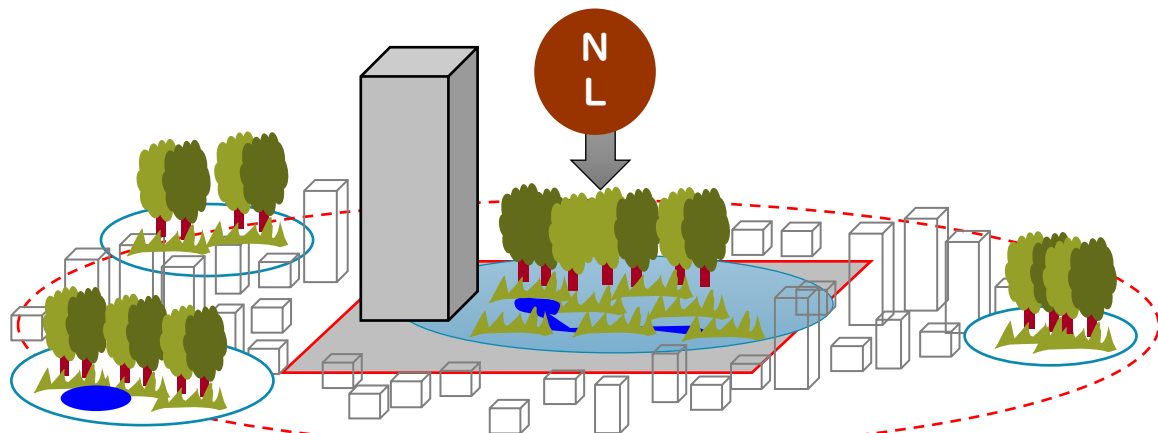


Plan C (G+F+W)



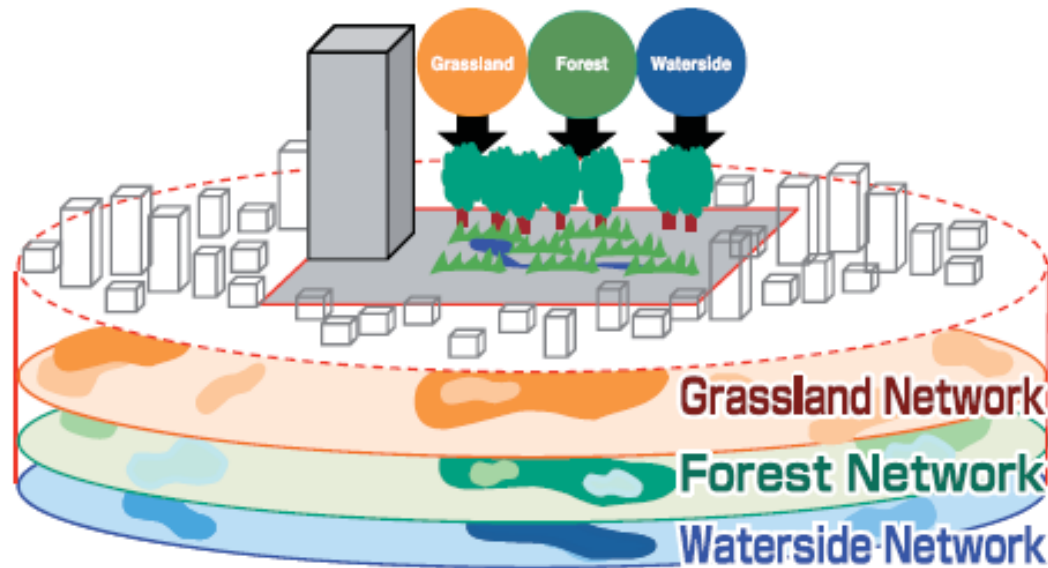
Uniqueness of UE-Net®

Conventional evaluation



- **New landscape's** placement and size
- New landscape's **effects within**

UE-Net®



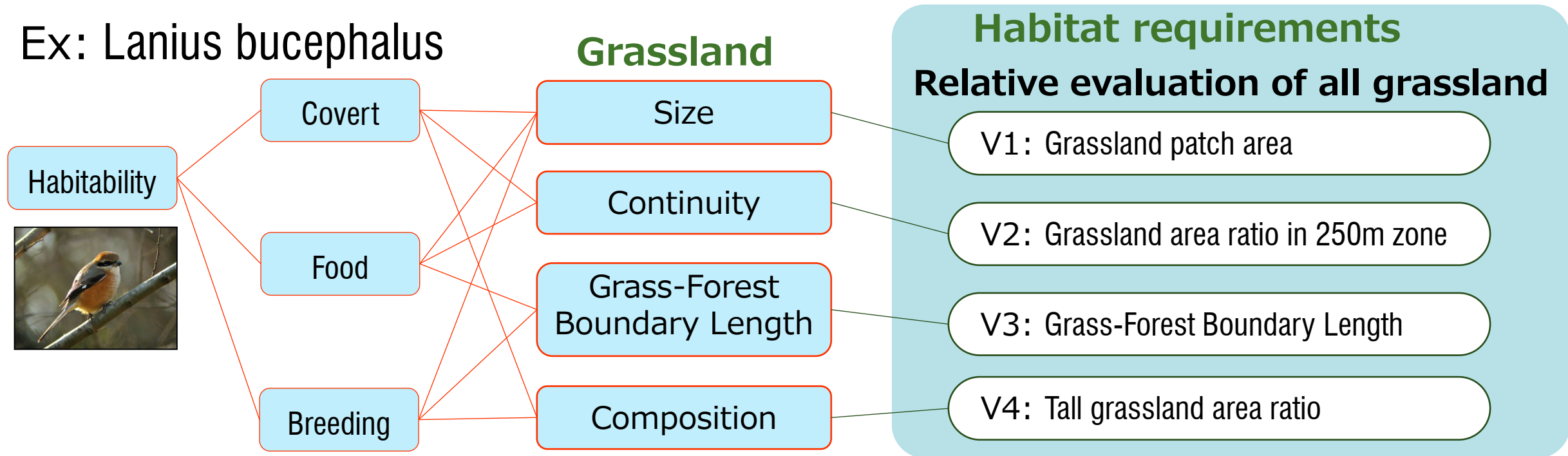
- Grasp **quality** of each environment (Grass, Forest, Waterside)
- **Ripple effects** to neighboring areas

Evaluation of effects per environmental qualities

UE-Net® Procedure 1)

- Select index species use different landscapes per survey
- Modeling habitability of index species

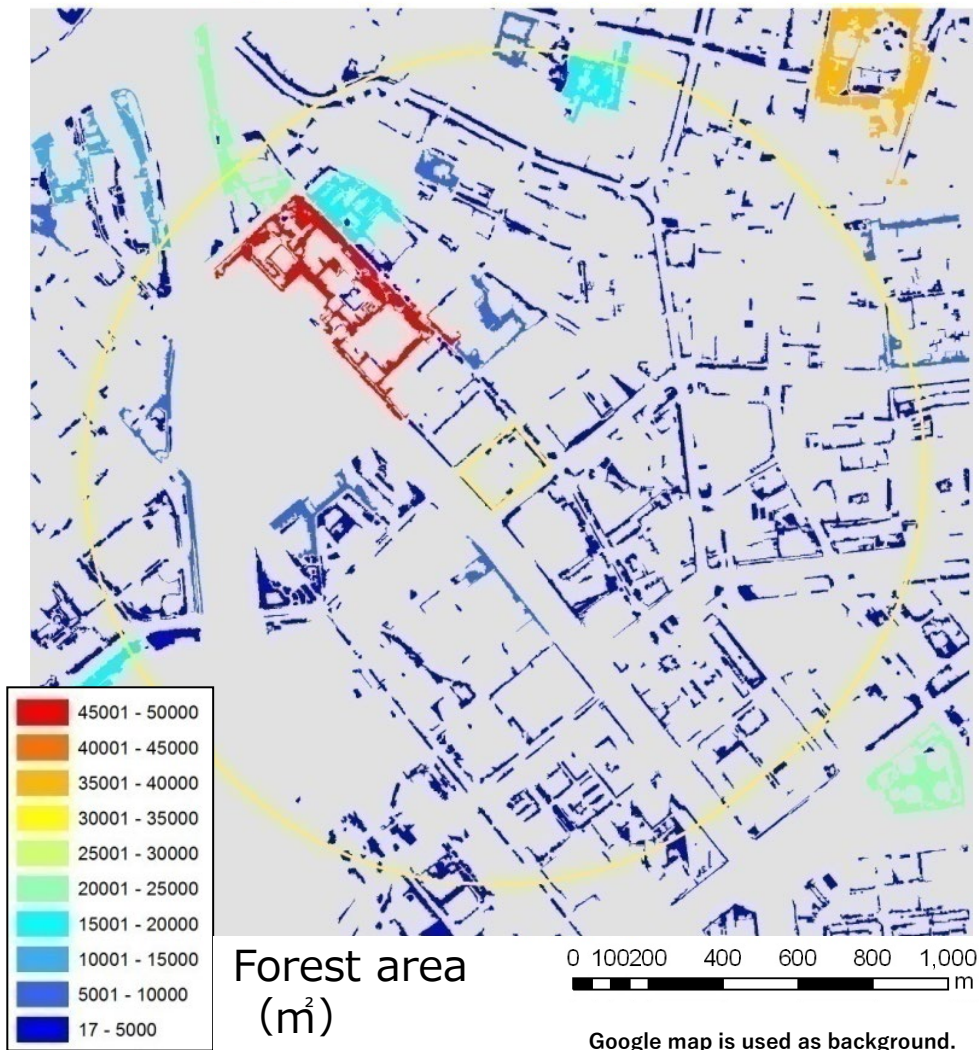
Ex: *Lanius bucephalus*



$$\text{Habitability} = \frac{V1 + V2 + V3 + V4}{4}$$

UE-Net[®] Procedure 2)

➤ Visualization of ecological network with high-res. satellite data(50cm)



a) **Segmentation** of data



2) **Extraction** of greens

- per vegetation index NDVI



3) **Classification** of greens



4) **Analysis of Environmental requirement**

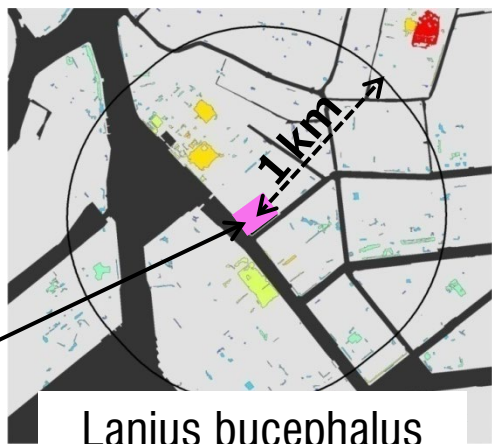
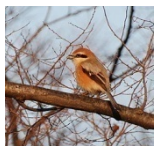
Per all grassland/forest/waterside

- area
- area ratio of neighbors
- Boundary Length (water, Grass-Forest) etc.

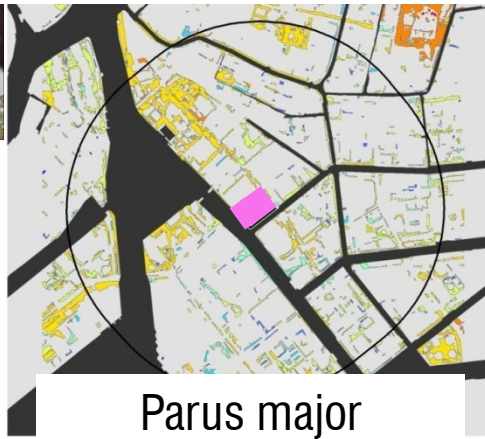
UE-Net[®] Procedure 2) network visualization

Habitability of
Each species

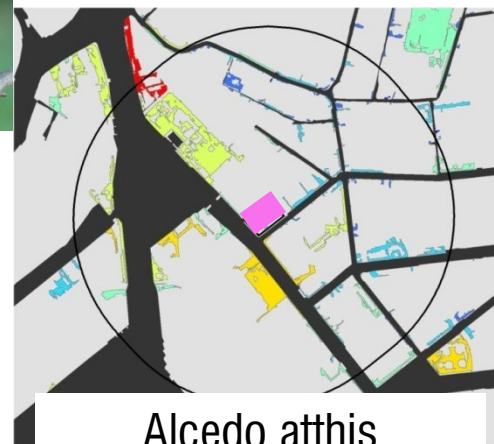
Project site



Lanius bucephalus
(Bull-headed shrike)



Parus major
(Great Tit)



Alcedo atthis
(Common Kingfisher)

Habitability network (connectivity of habitat suitability)



Lanius bucephalus = Grassland



Parus major = Forest



Alcedo atthis = Waterside

UE-Net[®] Procedure 3) Ripple effect simulation



Lanius bucephalus
(Lb)



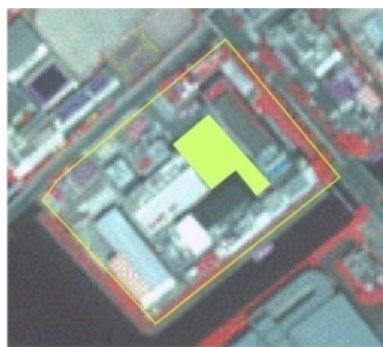
Parus major
(Pm)



Alcedo atthis
(Aa)

Plan A

Grassland (2,200m²)



GL

Plan B

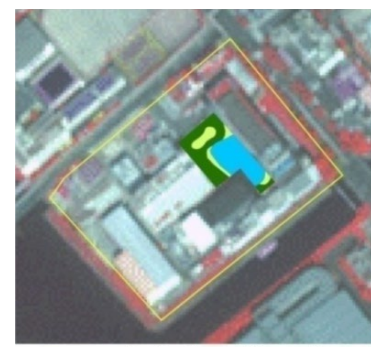
Grassland (1,100m²)
+ Deciduous (1,100m²)



GL
Deci.

Plan C

Grassland (340m²)
+ Deciduous (960m²)
+ Water (900m²)



GL
Deci.
Water

Google map is used as background.

grassland

Forest

Waterside

V1: Grassland patch area

V2: GL area ratio in 250m

V3: Grass-Forest Boundary Length

Habitability(Lb)

V1: Forest patch area

V2: F area ratio in 250m

V3: Deci. ratio

Habitability(Pm)

V1: Water patch area

V2: W area ratio in 250m

V3: Water-green Boundary Length

Habitability(Aa)

Change only inside project site

Changes in neighboring sites

Calculate for each plan

UE-Net[®] Procedure 3) Ripple effect simulation

Plan A

Grassland (2,200m²)

Plan B

Grassland (1,100m²)
+ Deciduous (1,100m²)

Plan C

Grassland (340m²)
+ Deciduous (960m²)
+ Water (900m²)



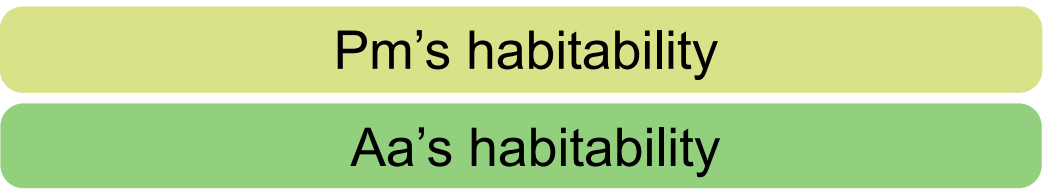
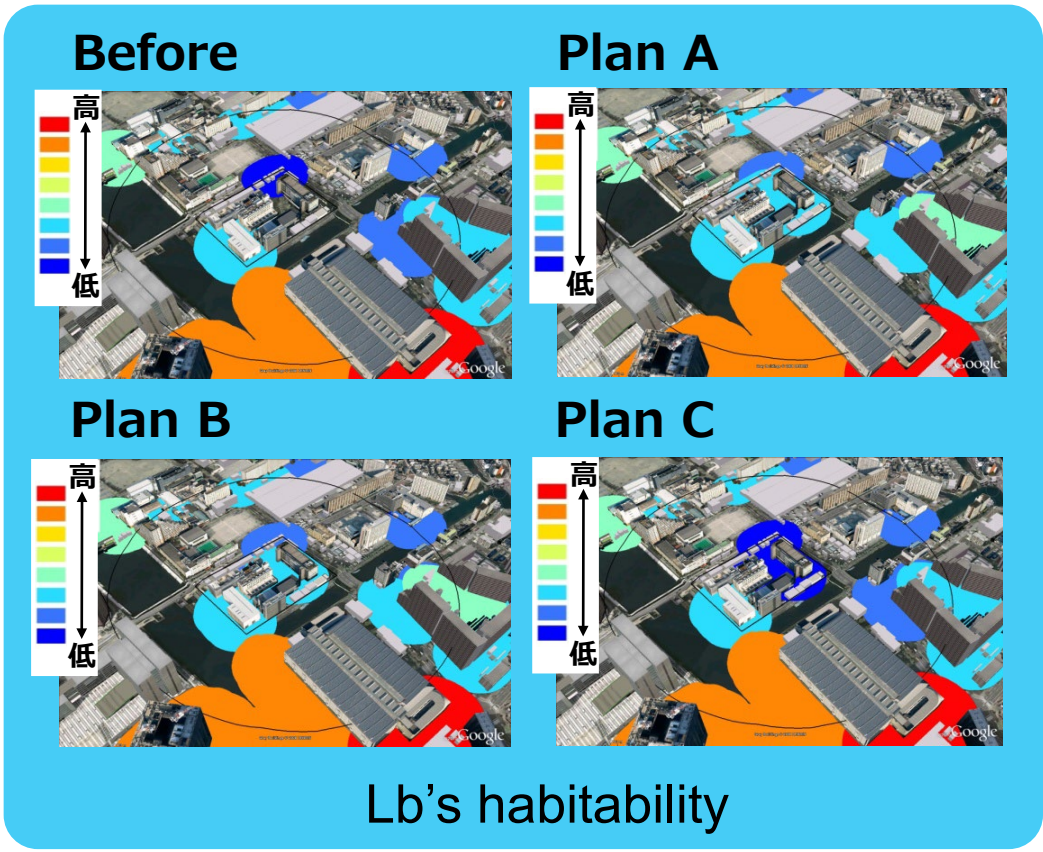
Lanius bucephalus
(Lb)



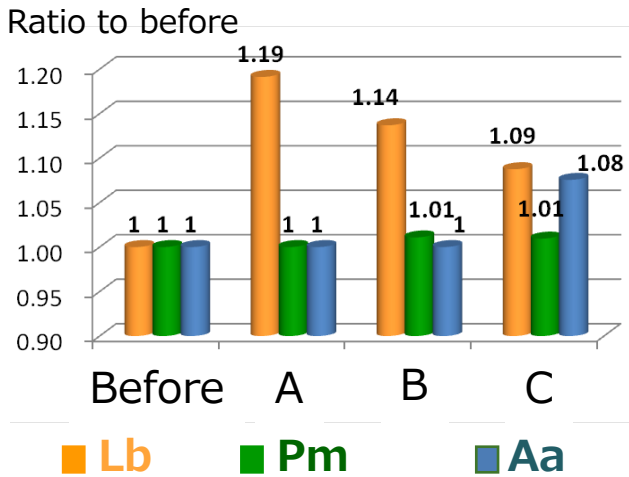
Parus major
(Pm)



Alcedo atthis
(Aa)



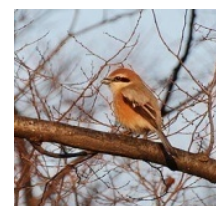
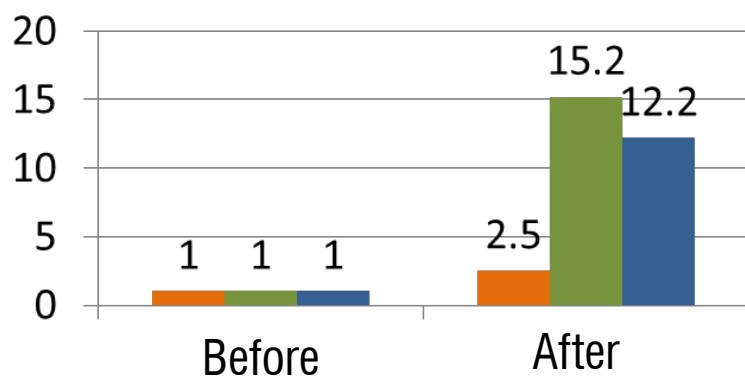
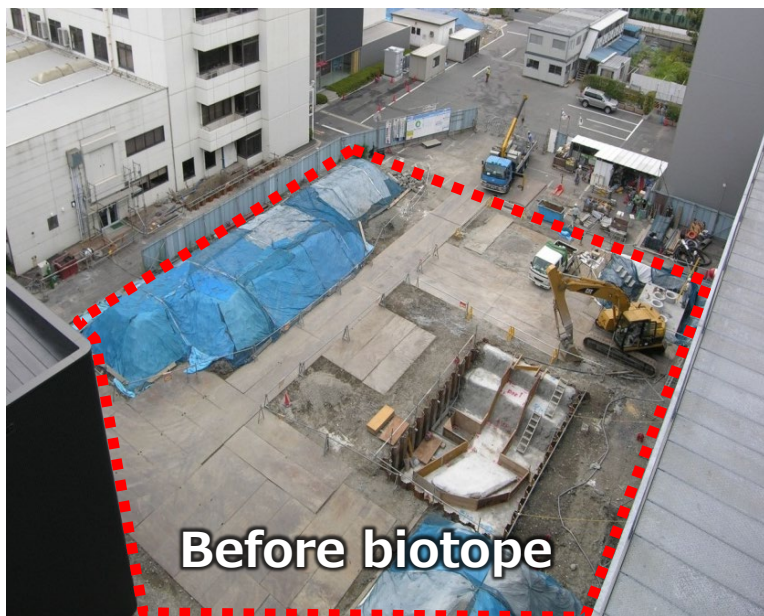
Plan C can host more diverse species



Rate of change in 250m
(Before = 1)

Ripple effect of plan

UE-Net® result



Lanius bucephalus
(Lb)



Parus major
(Pm)



Arrived in 1st yr

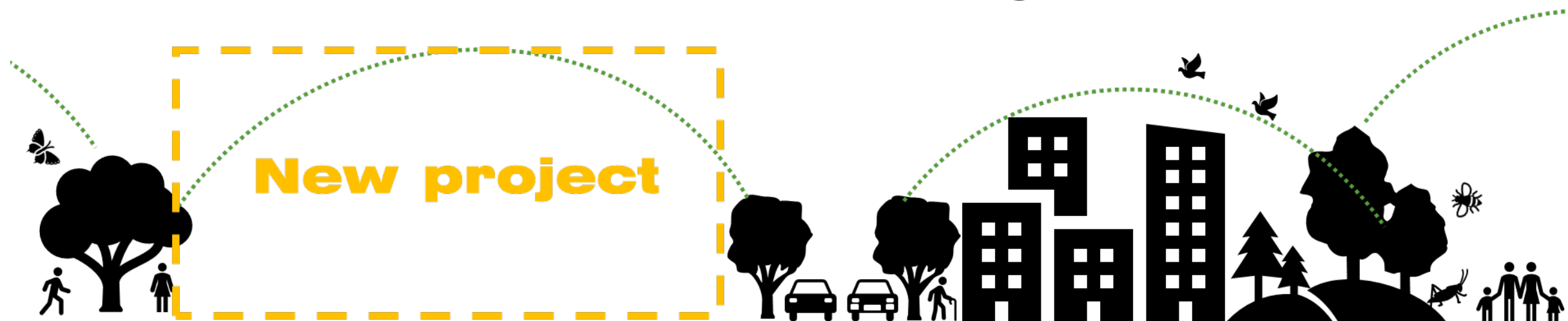


Alcedo atthis
(Aa)

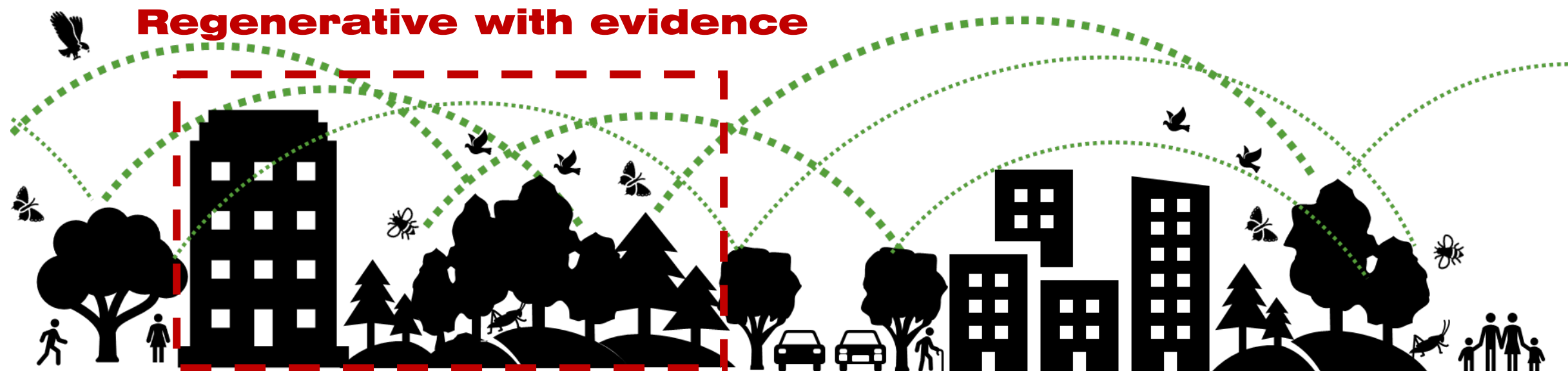


Arrived in 4th yr

UE-Net® can help to connect greens!



UE-Net® can provide evidences of targeted landscape at planning phase



Thank you very much!

UE-Net®

Urban Ecological Network Simulation system

Shimizu Corporation