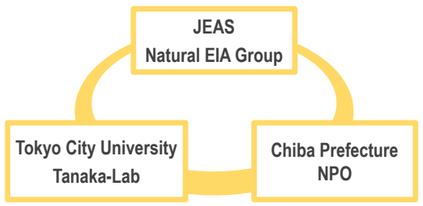
Study of the Introduction of Biodiversity Offsetting in Japan

Natural Environmental Impact Assessment Study Group
JEAS Japan Association of Environment Assessment

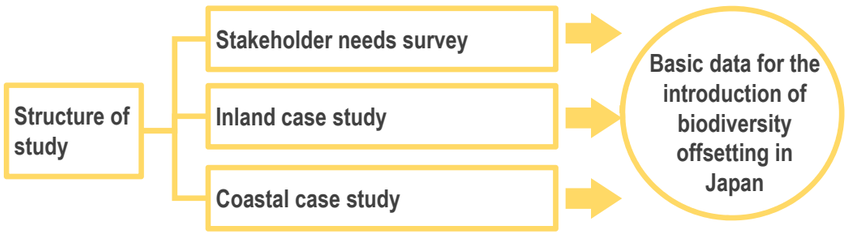
Study Background, Objectives, Framework

- Biodiversity offsetting is now commonly systematized in the countries of the West. In Japan, although it was not included in the 2012 revision of the Environmental Impact Assessment Act, its effectiveness has been the subject of lively debate at symposiums.
- This study, with the objective of gathering and summarizing basic data to facilitate introduction of biodiversity offsetting in Japan, involved identifying stakeholder needs and conducting its case studies in inland and coastal areas.



- This study was conducted jointly with Tokyo City University's Landscape Ecosystems Tanaka-Lab, which has conducted studies of biodiversity offsetting, and a Chiba Prefecture NPO conducting initiatives similar to biodiversity offsetting.

Overview



Research Topics	Details
Stakeholder needs survey	▪ Questionnaire-based survey of business operators, government bodies, and NPOs to identify needs ▪ Summary of biodiversity offsetting needs and challenges faced in its introduction
Inland case study	▪ Case study of a hypothetical area-wide development project in a satoyama area, covering everything from project launch to offsetting implementation ▪ Summary of quantitative ecosystem forecasting techniques and challenges faced in introducing biodiversity offsetting
Coastal case study	▪ Case study of a hypothetical nature restoration project in a coastal area (*Zostera marina* establishment), calculating the effect of the project ▪ Summary of project effect calculation techniques and challenges faced in introducing biodiversity offsetting

○ Inland case study
Location: Chiba City, Chiba Prefecture
Environment: Suburban mixed-use satoyama area used for agriculture, forestry, and housing, located on the outskirts of the Greater Tokyo area (approximately 10km from the city center)

○ Coastal case study
Location: Sanbanse, Ichikawa City, Chiba Prefecture
Environment: Tidal flat on the outskirts of the Greater Tokyo area

Stakeholder Needs Survey

What measures should be carried out to address impact of development project on natural environment?

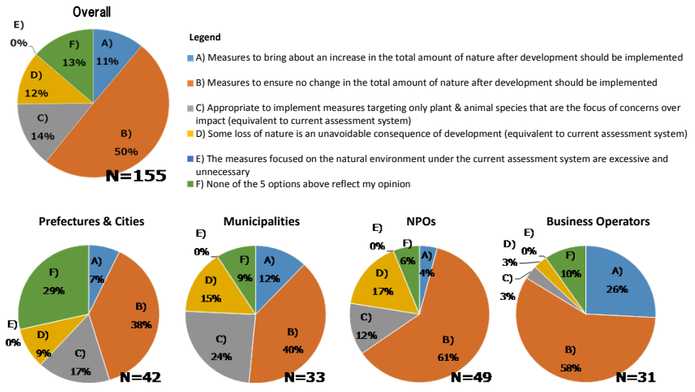


Figure: Questionnaire Results
Measures to address development impacts

What challenges can you think of with the introduction of biodiversity offsetting?

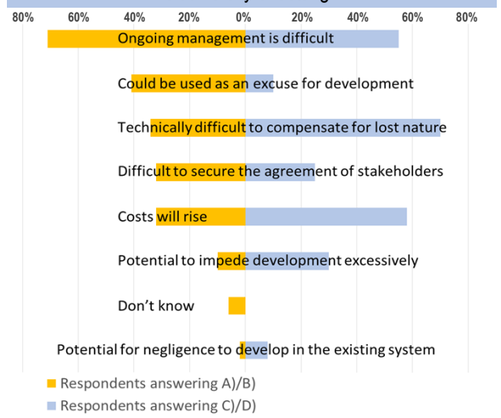


Figure: Questionnaire Results:
Challenges in Introducing Biodiversity Offsetting

[Findings from the questionnaire]

- When asked about the impact of projects on the natural environment, respondents stated that they **needed to achieve No Net Loss** of biodiversity
- In terms of the challenges faced in introducing biodiversity offsetting, **ongoing management, costs, and technology were particular concerns.**

Inland Case Study

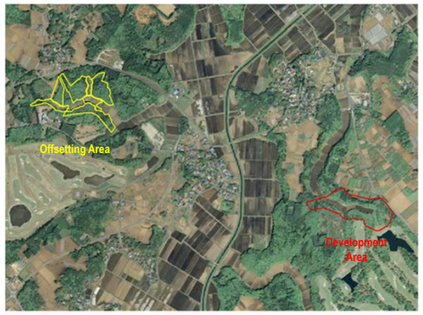


Figure: Development Area and Offsetting Area

Figure: Development Area Alteration Plan

Figure: Development Plan for Offsetting Area

Table: Changes in HU in the Developed Area and the Offsetting area

Indicator species	Developed Area			Case 1			Case 2		
	After development	Before development	Changes in HU from development	Managed	Not managed	Changes in HU from offsetting	Managed	Not managed	Changes in HU from offsetting
Sasakia charonda	0.00	2.18	−2.18	2.20	1.40	0.40	2.20	1.40	0.80
Turdus pallidus	0.51	3.81	−3.30	2.20	4.26	−1.03	2.20	4.26	−2.06
Dendrocopos kizuki	0.18	1.36	−1.18	1.23	1.64	−0.21	1.23	1.64	−0.41
Rana japonica	0.33	3.31	−2.98	2.70	2.01	0.35	2.70	2.01	0.69

Case 1: Offset area (1) Gradual management
Case 2: Offset area (2) Maintenance of initial management

Formula for Area Restored *in Compensation*

In case of homogeneous equivalent $= -A\frac{\sum_{i=1}^{4} Mili}{\sum_{i-1}^{4} Mi^2}$ In case of heterogeneous equivalent $= -A\frac{\sum_{i=1}^{4} li}{\sum_{i-1}^{4} Mi}$

Table: 4-species Assessment & Area Restored

Case 1: Offset area (1) Gradual management

Indicator species	AAHU: Loss due to project impact ①	AAHU: Benefit due to compensatory measures ②	Mi*2	Mi①
Sasakia charonda	−2.18	0.40	0.160	−0.872
Turdus pallidus	−3.3	−1.03	1.061	3.399
Dendrocopos kizuki	−1.18	−0.21	0.042	0.242
Rana japonica	−2.98	0.35	0.119	−1.028
Σ	−9.64	−0.49	1.382	1.741

In Kind −7.10
Out of Kind −110.96

Case 2: Offset area (2) Maintenance of initial management

Indicator species	AAHU: Loss due to project impact ①	AAHU: Benefit due to compensatory measures ②	Mi*2	Mi①
Sasakia charonda	−2.18	0.80	0.640	−1.744
Turdus pallidus	−3.3	−2.06	4.244	6.798
Dendrocopos kizuki	−1.18	−0.41	0.168	0.484
Rana japonica	−2.98	0.69	0.476	−2.056
Σ	−9.64	−0.98	5.528	3.482

In Kind −3.55
Out of Kind −55.48

Table: 2-species Assessment & Area Restored

Case 3: Offset area (1) Gradual management (2 indicator species)

Indicator species	AAHU: Loss due to project impact ①	AAHU: Benefit due to compensatory measures ②	Mi*2	Mi①
Sasakia charonda	−2.18	0.40	0.160	−0.872
Rana japonica	−2.98	0.35	0.119	−1.028
Σ	−5.16	0.75	0.279	−1.900

In Kind 38.41
Out of Kind 39.06

Case 4: Offset area (2) Maintenance of initial management (2 indicator species)

指標種	AAHU: Loss due to project impact ①	AAHU: Benefit due to compensatory measures ②	Mi*2	Mi①
Sasakia charonda	−2.18	0.80	0.640	−1.744
Rana japonica	−2.98	0.69	0.476	−2.056
Σ	−5.16	1.49	1.116	−3.800

In Kind 19.20
Out of Kind 19.53

[Findings from Case Study]

- Estimates of the effect size of conservation measures focused on multiple species showed that **caution is required in setting conservation targets**, as the effect size is smaller in some species.
- The study showed that **the offsetting area needs to be larger than the development area** in order to achieve No Net Loss.
- Consideration of the conservation period is required in the future.

Coastal Case Study

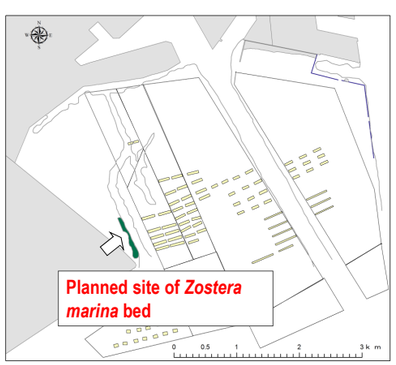


Figure: Area Suitable for Establishment of a *Zostera marina* Bed
(From Ishii & Morita (2010))

■ Habitat Unit (HU) calculation method

HU = 500 × 1 × 0.75 = 375

Area of *Zostera marina* bed created: 500㎡
Area suitable for establishment of a *Zostera marina* bed as shown in Ishii and Morita (2010) : HSI=1
Zostera marina growing season: 9 months/year = 0.75 year

Equivalent to the offsetting of a construction project covering **375m²**

[Findings from Case Study]

The study showed that the establishment of a *Zostera marina* bed would be highly valuable from the perspectives of fish and shellfish habitats, CO_2 absorption capacity, and cultural services

- Fish & shellfish
  ¥0.25 million/year
- CO_2 absorption
  ¥0.023 million/year
- Water purification capability (Removal of nitrogen)
  ¥0.094 million/year
- Cultural service value of a *Zostera marina*
  ¥65 million/year (neighboring cities of Ichikawa & Urayasu)