

Decision making criteria between conservation and development



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Environmental & Natural Resource Economics

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Suk-Jae Kwon currently a Principal Research Scientist at the Korea Institute of Ocean Science and Technology(KIOST). He also plays a role in PEMSEA as a Co-Chair of Technical Session. He is also an adjunct professor in Pukyung National University.

Previously, he held the role of Director of the International Cooperation Department of the same institution, vice president of the Marine Biodiversity Institute of Korea(MABIK), and president of Korean Society of Marine Environment and Safety.

He has more than 20 years of experience in economic evaluation of marine environmental and natural resources, marine disaster assessment, and integrated coastal zone management.

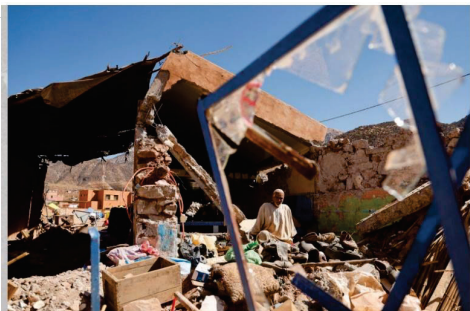
He received my Ph.D in Environmental and Natural Resource Economics at the University of Rhode Island in the United States, and completed his Bachelor's and Master's degrees in Economics at the Sungyunkwan University in the Republic of Korea.



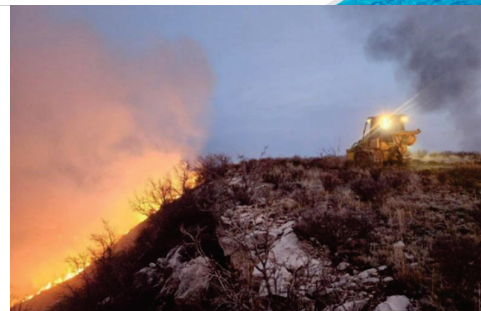
Ocean Regime and issues

3

Climate Change and Natural Disaster



Morocco earthquake kills more than 2,000



Fire in Texas



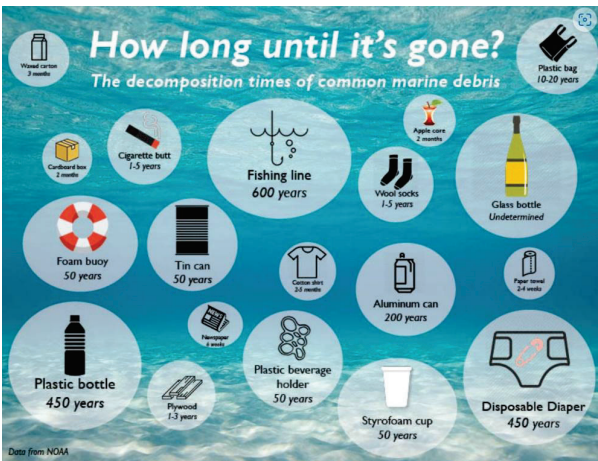
Hurricane in Florida



California Floods

4

Ocean waste problem



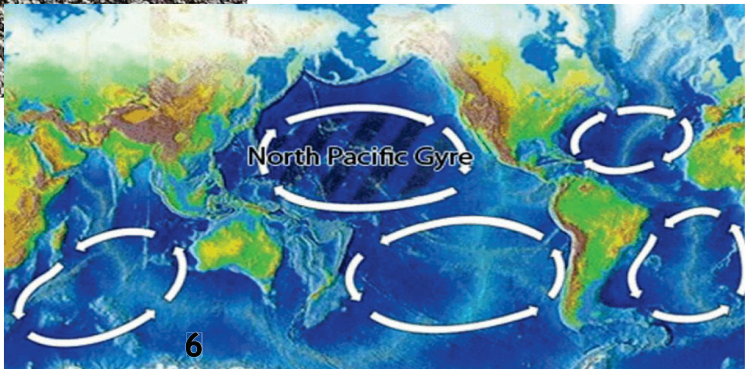
World Clean-up day
(Ghana)

Great Pacific Garbage Patch



Garbage Island – Great
Pacific Garbage Patch

The currents in these Gyres
are circular in nature





Wetland loss and degradation



Over a third of the world's wetlands have disappeared since 1970.



83% of freshwater species are in decline worldwide.



86% of rivers in the UK don't meet good ecological status.



Global risks ranked by severity over the short and long term



Source
World Economic Forum Global Risks
Perception Survey 2023-2024.



Key issues(terminology) of Ocean:

- Natural disasters due to climate change
- Ocean waste (debris)
- **Wetland** loss and degradation due to development
- Blue Economy, Green Technology, **Blue Carbon**



Ocean governance and treatment

Millennium Development Goals(MDGs)

The eight Millennium Development Goals (MDGs) – which range from halving extreme poverty rates to halting the spread of HIV/AIDS and providing universal primary education, all by the target date of 2015



The United Nations Millennium Development

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KIOST
한국해양과학기술원

Sustainable Development Goals(SDGs)



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UN Ocean Decade

LEAD OR PARTICIPATE IN A DECADE ACTION

Decade Actions will be implemented by a wide range of proponents throughout the Ocean Decade. Regular Calls for Action will be issued and Actions that are submitted for endorsement will need to demonstrate how they meet the criteria described in the Implementation Plan.

ESTABLISH OR JOIN A VOLUNTARY STAKEHOLDER NETWORK

Decade stakeholder engagement networks convene ocean actors with common interests to facilitate connections and collaboration. All registered networks are members of the Global Stakeholder Forum.

BECOME A MEMBER OF THE OCEAN DECADE ALLIANCE

The Ocean Decade Alliance is a key mechanism for resource mobilization during the Decade and will act as a matchmaker between resource providers and proponents of Decade Actions - in line with the priorities of the Decade.

HOW TO ENGAGE?

JOIN GENERATION OCEAN

It is everyone's Decade! 'GenO' convenes all living and future generations to build a new kind of society by 2030, one in which all of humanity will use the best available science and knowledge to deliver the ocean we need for the future we want.



Accelerate ocean science and knowledge sharing for sustainable development



Foster innovative partnerships for transformative science-based actions to inform policies and solution delivery



Support a well-functioning, productive, resilient, and sustainable ocean.

II. KIOST의 해양과학기술 공유 플랫폼

Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat



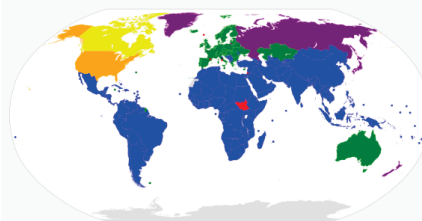
Kunming-Montreal

GLOBAL BIODIVERSITY FRAMEWORK

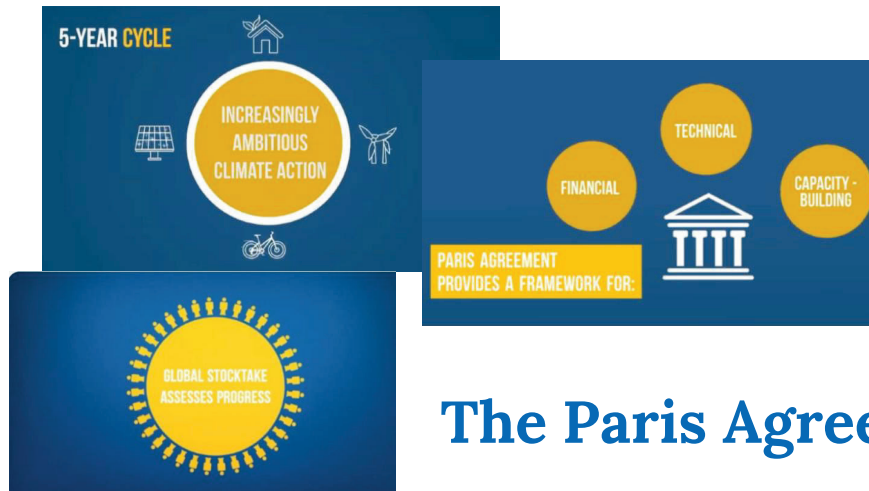
Target 3

Conserve 30% of Land, Waters and Seas

Kyoto Protocol to the UNFCCC



- Annex B parties with binding targets in the second period
- Annex B parties with binding targets in the first period but not the second
- Non-Annex B parties without binding targets
- Annex B parties with binding targets in the first period but which withdrew from the Protocol
- Signatories to the Protocol that have not ratified
- Other UN member states and observers that are not party to the Protocol



The Paris Agreement



Criteria for decision making b/w conservation and development: B/C Analysis



Decision Criteria

Compare Benefits and Costs of an Action.

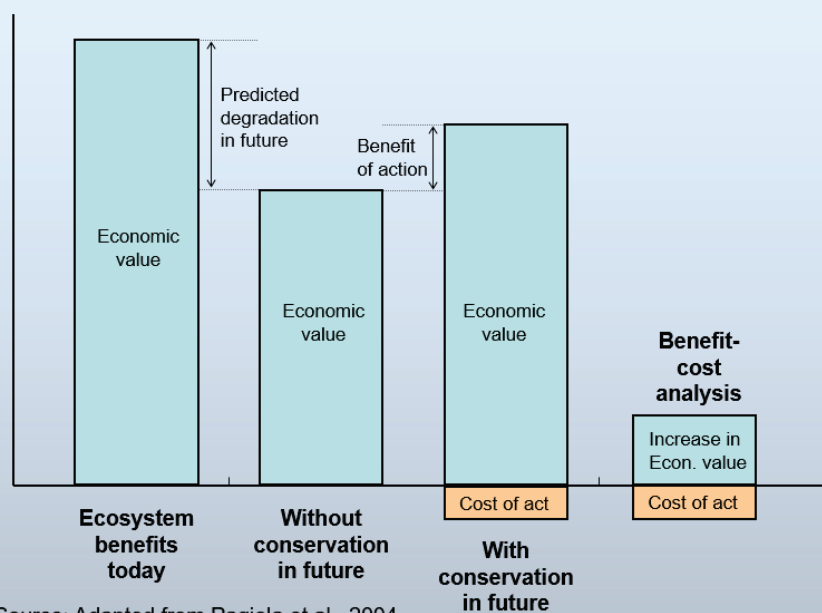
- If **Benefits > Costs**, take the action.
- If Costs > Benefits, think other alternatives.



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Cost-benefit Analyses for Decision-making



Source: Adapted from Pagiola et al., 2004

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Cost and benefit analysis(CBA)

- Net Present Value (NPV): 순현재가(純現價)
- BC Ratio: 편익비용비(比)
- Internal Rate of Return(IRR): 내부수익률



Net Present Value (NPV):

$$NPV = \sum_{t=0}^n \frac{B_t - C_t}{(1+r)^t} \quad (t=0, 1, 2, \dots, n)$$

BC Ratio:

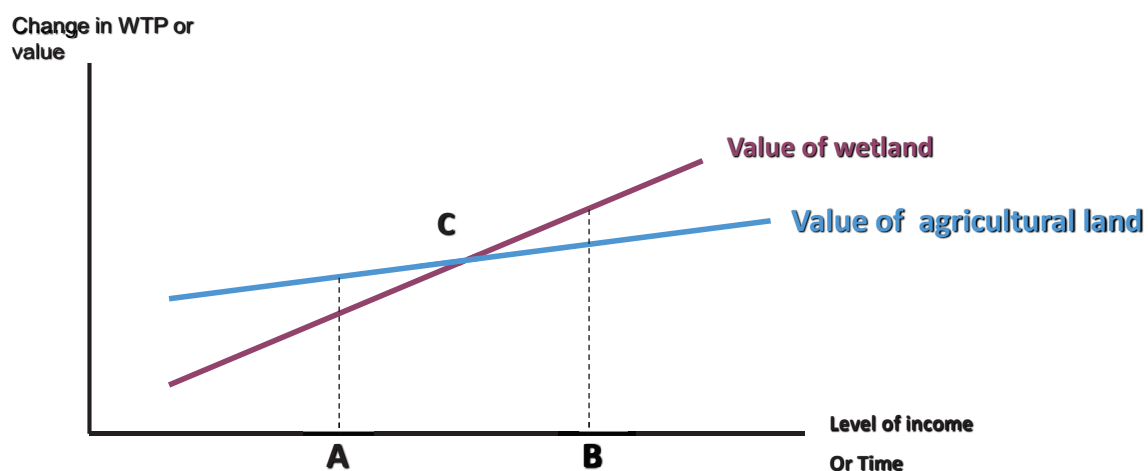
$$\frac{B}{C} = \sum_{t=0}^n \frac{B_t}{(1+r)^t} / \sum_{t=0}^n \frac{C_t}{(1+r)^t}$$

Internal Rate of Return(IRR):

$$B_0 - C_0 = \sum_{t=1}^n \frac{(B_t - C_t)}{(1+r)^t} = 0$$



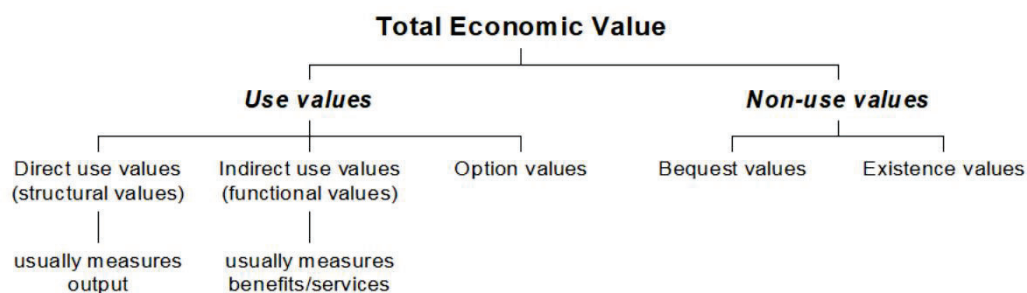
- Financial Cost and Benefit
- Environmental Cost and Benefit
- ✓ Cost = financial cost + environmental cost
- ✓ Benefit = financial Benefit + environmental benefit



- ✓ At A reclamation projects are carried out to make agricultural land (destruction of wetlands)
- ✓ At B restoration (or conservation) projects are carried out.
- ✓ This results are due to change in value(or WTP) by level of income or awareness of value for public services (development of nonmarket valuation techniques).



Techniques for Non-market valuation





Classification and Examples of Total Economic Values for Aquatic Ecosystem Services

Use Values		Nonuse Values
Direct	Indirect	Existence and Bequest Values
Commercial and recreational fishing	Nutrient retention and cycling	Cultural heritage
Aquaculture	Flood control	Resources for future generations
Transportation	Storm protection	Existence of charismatic species
Wild resources	Habitat function	Existence of wild places
Potable water	Shoreline and river bank stabilization	
Recreation		
Genetic material		
Scientific and educational opportunities		

SOURCE: Adapted from Barbier (1994) and Barbier et al. (1997). National Academies of Sciences, Engineering, and Medicine. 2005. Valuing Ecosystem Services: Toward Better Environmental Decision-Making. Washington, DC: The National Academies Press. <https://doi.org/10.17226/11139>.



Typical techniques for non-market valuation (use value and/or nonuse value)

- Contingent Valuation Method(CVM)
- Travel Cost Method(TCM)
- Hedonic Property Method & Hedonic Wage Method (HPM, HWM)



Exxon Valdes Oil Spill Accident and CVM

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The **Exxon Valdez oil spill** was a major [environmental disaster](#) that occurred in [Alaska's Prince William Sound](#) on March 24, 1989. The spill occurred when [Exxon Valdez](#), an oil [supertanker](#) owned by [Exxon Shipping Company](#), bound for [Long Beach](#), California, struck [Prince William Sound's Bligh Reef](#), 6 mi (9.7 km) west of [Tatitlek, Alaska](#) at 12:04 a.m. The tanker [spilled](#) more than 10 million US gallons (240,000 bbl) (or 37,000 [tonnes](#))^[1] of [crude oil](#) over the next few days.

It killed an estimated **250,000 sea birds, 3,000 otters, 300 seals, 250 bald eagles and 22 killer whales(nonuse value).**

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Two things are induced by Exxon Valdez Oil Spill Accident:

1. It is first time to compensate nonuse value in oil spill accident by using CVM
2. In the wake of the Exxon Valdez oil spill, the U.S. Congress passed the Oil Pollution Act of 1990, which President [George H.W. Bush](#) signed into law that year.



Published articles relating to economic valuation of wetlands by using CVM, TCM, and HPM

Ecosystem Services
Volume 66, April 2024, 101696

Full Length Article

Economic values for ecosystem services: A global synthesis and way forward

L.M. Brander ^{a,b}, J. de Groot ^c, J.P. Scholze ^d, V. Guisado-Gutiérrez ^e, V. van 't Hoff ^f, S. Solomonson ^g, A. McVittie ^h, T. Eppink ⁱ, M. Sponzo ^j, L. Du ^k, A. Ghermandi ^l, M. Sinclair ^m, B. Thomas ⁿ

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<https://doi.org/10.1016/j.ecoser.2024.101696>

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Highlights

- The Ecosystem Services Valuation Database (ESVD) now contains information from over 1,300 studies, yielding over 9,400 value estimates in monetary units.
- The coverage of these data is global and drawn from over 2,000 study sites in over 140 countries.
- Value estimates are standardised to a common set of units (Int\$/ha/year at 2020 price levels) to enable the comparison and synthesis of values.
- This paper provides summary values for 23 ecosystem services from 15 biomes to represent the magnitude, variation and gaps in economic values.

Ecological Economics
Volume 37, Issue 2, May 2001, Pages 257-270

ANALYSIS

The economic value of wetland services: a meta-analysis

Richard T. Woodward ^a, Yong-Suk Wul

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[https://doi.org/10.1016/S0924-6460\(01\)00276-7](https://doi.org/10.1016/S0924-6460(01)00276-7)

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Abstract

The number of studies quantify the value of wetlands and the services provided by these ecosystems is rapidly expanding. The time is ripe for an assessment of what has been learned from this literature. Using results from 39 studies, we evaluate the relative value of different wetland services, the sources of bias in wetland valuation and the returns to scale exhibited in wetland values. While some general trends are beginning to emerge, the prediction of a wetland's value based on previous studies remains highly uncertain and the need for site-specific valuation efforts remains large.

Ecological Economics
Volume 124, April 2016, Pages 164-174

The economic value of wetlands in developing countries: A meta-regression analysis

Mayala Chaikumbung ^a, Hristos Doucouliagos ^b, Helen Scarborough ^c

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<https://doi.org/10.1016/j.ecolecon.2016.01.022>

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Abstract

This paper presents the first comprehensive synthesis of economic valuations of wetlands in developing countries. Meta-regression analysis (MRA) is applied to 1432 estimates of the economic value of 379 distinct wetlands from 50 countries. We find that wetlands are a normal good, wetland size has a negative effect on wetland values, and urban wetlands and marine wetlands are more valuable than other wetlands. Wetland values estimated by stated preferences are lower than those estimated by market price methods. The MRA benefit transfer function has a median transfer error of 17%. Overall, MRA appears to be useful for deriving the economic value of wetlands at policy sites in developing nations.

Ecological Economics
Volume 2, Issue 2, June 1990, Pages 129-147

Economic value of wetlands-based recreation

John C. Bergstrom ¹, John R. Stoll ², John P. Titre ³, Vernon L. Wright ⁴

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[https://doi.org/10.1016/0921-8009\(90\)90004-E](https://doi.org/10.1016/0921-8009(90)90004-E)

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Abstract

The loss of wetlands is an issue of growing concern. Previous studies have focused primarily on quantifying the commercial, storm protection, and energy-output values of wetlands. Relatively little research has been devoted to quantifying the outdoor recreational value of wetlands. In this paper, the recreational value of wetlands is discussed conceptually within a total economic value framework. Total economic value contains many value components which are broadly divided into non-use, current use, and future use values. Each of these value categories can be further subdivided into expenditures and consumer's surplus.

An empirical study was conducted to measure expenditures and consumer's surplus associated with on-site, current recreational uses of a coastal wetlands area. Aggregate expenditures were estimated at approximately \$118 million and aggregate consumer's surplus was estimated at approximately \$27 million. These results suggest that the economic impacts and net economic benefits associated with wetlands-based recreation may be substantial. Hence, recreational functions provided by wetlands may be important considerations for wetlands policy and management.

Environmental Challenges
Volume 5, December 2021, 100303

A proposed framework for economic valuation and assessment of damages cost to national wetlands ecosystem services using the benefit-transfer approach

Jalil Badamfrooz ^a, Roya Mousazadeh ^b, Hamid Sarkheil ^c

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<https://doi.org/10.1016/j.envc.2021.100303>

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Highlights

- Estimating the cost of damage to ecosystem services can be effective in preventing further damage.
- The benefit transfer method was used to estimate the values of ecosystem goods and services provided by wetlands.
- The study aims to propose a framework for estimating the environmental costs of development activities.
- Using the ecosystem services valuation database, the values of ecosystem services over one year were adjusted for this studied area.



Total economic value of wetland conservation in Sri Lanka identifying use and non-use values

Original Paper | Published: 28 December 2007

Volume 16, pages 359–369, (2008) [Cite this article](#)

Abstract

In tropical regions, mangroves, clean (unpolluted) water-bodies and fish are important aspects of wetland areas, which are considered as the basic requirement for livelihood improvement in local communities. Particularly, their conservation is very important to both inland as well as inshore fisheries. However, conservation of such areas is dependent on the perceptions of key stakeholders in the area. A novel approach of a one and one-half bound based contingent valuation method (CVM) was implemented to measure the stakeholder willingness to pay (WTP) towards the conservation of fish, mangroves and water in a Sri Lankan wetland area. Estimated median WTP is Rs. 264.26, which is thought reliable when considering average income in the community. The analytic hierarchy process (AHP) was used to separate use and non-use values from the total value. Results show that non-use values are a significant component in the elicited WTP value, of between 45–55%. In the past such commodities have been assigned zero or low values due to difficulties involved in assigning economic values.



Journal of Environmental Management
Volume 34, Issue 1, January 1992, Pages 59-76



Valuing goods' characteristics: An application of the hedonic price method to environmental attributes

G.D. Garrod, K.G. Willis

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[https://doi.org/10.1016/S0301-4797\(05\)80110-0](https://doi.org/10.1016/S0301-4797(05)80110-0)


Landscape and Urban Planning
Volume 37, Issues 3–4, July 1997, Pages 211-222



The amenity value of the urban forest: an application of the hedonic pricing method

Liisa Tyrväinen

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[https://doi.org/10.1016/S0169-2046\(97\)80005-9](https://doi.org/10.1016/S0169-2046(97)80005-9)
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Journal of Environmental Management

Volume 127, 30 September 2013, Pages 289-299



The land value impacts of wetland restoration

We test the impacts of aquatic restoration sites on nearby property values.

- We find that un-restored wetlands consistently increase nearby property values.
- This finding may be due to restoration's poor public awareness and aesthetic problems.
- Within 0.5 mi, restoration sites decrease surrounding property values.
- However, over 0.5 mi, restoration sites increase property values significantly.



Title

NOISE EXTERNALITIES: A HYBRID MODEL TO ASSESS EFFECTS AND MANAGEMENT WITH APPLICATION TO TRANSPORTATION ISSUES IN RHODE ISLAND

BY
SUK-JAE KWON
January 26, 2004



Potential Environmental Issues from Port Development

- Dredging and Dredge Disposal
- Loss of shoreline and bottom wetlands habitat
- Loss of open space amenities
- **Noise** and congestion on roads near the port
- Air pollution from mobile sources



Open Access Article

Economic Valuation of Lake Tana: A Recreational Use Value Estimation through the Travel Cost Method

by Atalel Wubalem ^{1,*} , Teshale Woldeamanuel ² and Zerihun Nigussie ¹ 

¹ Department of Agricultural Economics, Bahir Dar University, Bahir Dar, P.O. Box 70, Ethiopia

² Department of Natural Resource Economics, Addis Ababa University, Addis Ababa, Ethiopia

* Author to whom correspondence should be addressed



Ecological Economics
Volume 190, December 2021, 107192



Scopus

Analysis

Travel-cost method for assessing the monetary value of recreational services in the Ömerli Catchment

Nuket Ipek Cetin ^{a,b} , Gulhan Bourget ^c , Azime Tezer ^d 



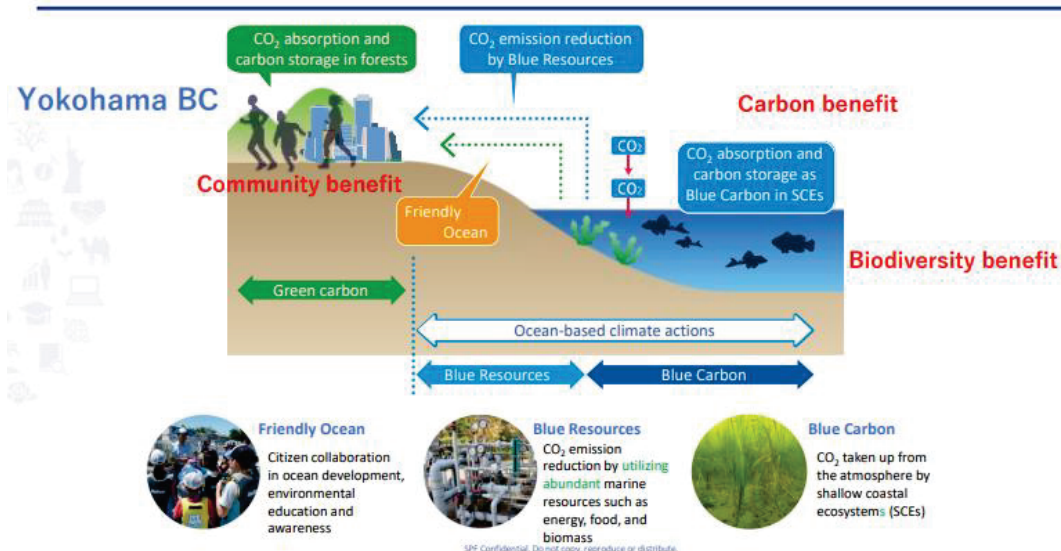
Wetland restoration and creation link to blue carbon: Case of Japan

Citation from the presentation material by Dr. Atsushi Watanabe (OPRI)

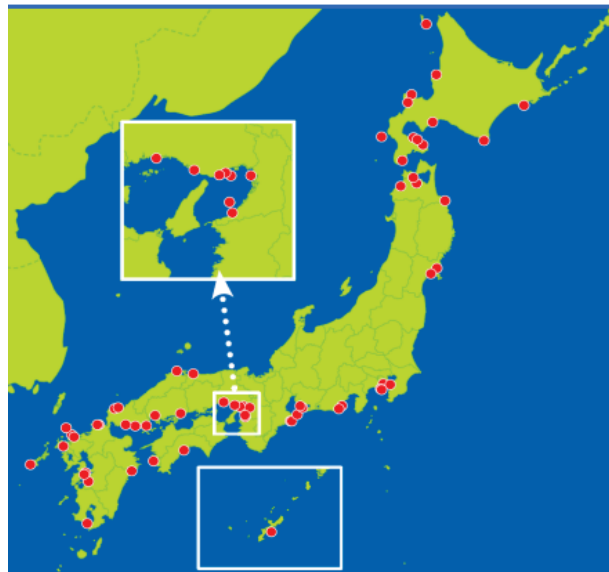
Reasons for introducing Japan BC

- BC Credit market by JBC Association
- Scientific researches for seagrass, mangrove etc.
- J-Blue Credit guideline
- Possibility to make income to local communities
- Incentives for conservation including restoration and creation of wetlands

Benefits from BC ecosystems



J-Blue Credit® projects in Japan 22



【Credit Creator】

Fishers	85% (52/61)
Local government	69% (42/61)
Private firm	52% (32/61)
Local entity	30% (18/61)
Universities	10% (6/61)

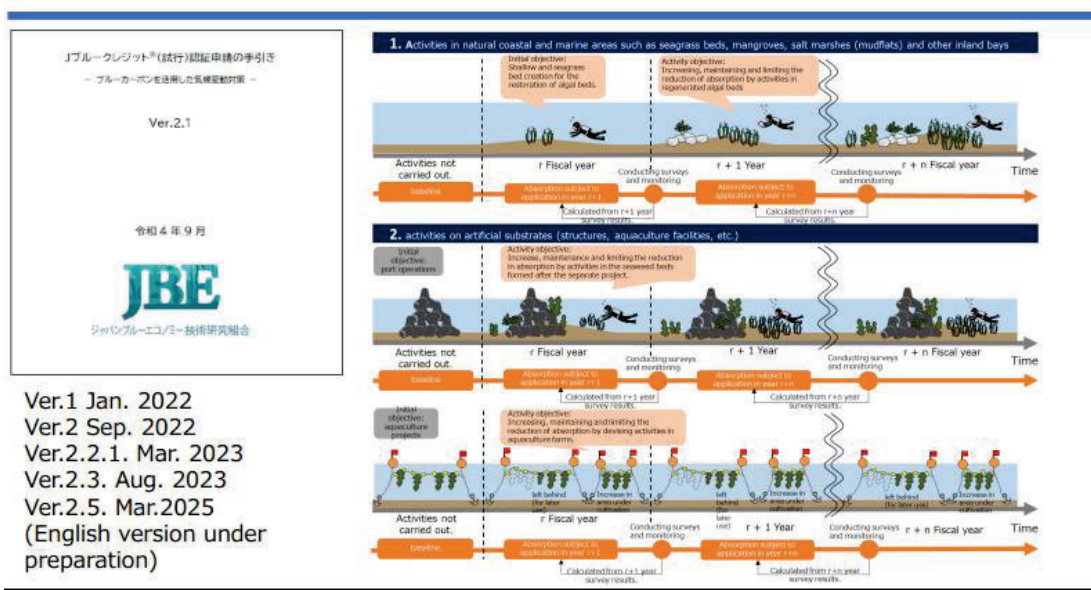
【Ecosystem】

Macroalgae	74% (45/61)
Seagrass	33% (20/61)
Tidal flat	8% (5/61)

【Project classification】

Restoration	66% (40/61)
Creation	62% (38/61)
Seaweed farming	20% (12/61)

J-Blue Credit Guideline





Summary and conclusion:



- ✓ Internalizing economic value of nonmarket goods into framework of B/C Analysis
- ✓ Interdisciplinary collaboration: all field experts
- ✓ Training and institutional capacity building for changeover thought: importance of public goods (or service)
- ✓ Development business model like Blue Carbon
- ✓ Networks network: sharing data, experience, best practice, green technology and governance

감 사 합 니 다

Thank you

