
Session 1: Ecosystem Services and the Value of Biodiversity

Environmental Valuation of Biodiversity in Japan

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This paper addresses the environmental and economic values of biodiversity in Japan. The environmental value can be classified into two types: use value and non-use value. While tourism is one example of the use value, examples of non-use value include the wildlife habitat, ecosystem and biological diversity. Because there is no market price for the non-use value, the non-use value is often slighted. Therefore, it is important for the policy manager to evaluate a total value which includes both the use value and non-use value. In the literature of environmental economics, some valuation methods have been developed, including replacement cost, hedonic pricing, travel cost and contingent valuation. The contingent valuation (CV), a survey-based method which uses the data of stated willingness to pay for the environmental resources, can estimate the total value. In this paper, we used CV approach to estimate a total value of biodiversity in the Yakushima World Heritage Site.

Yakushima Island is located approximately 60 km south of the Sata Misaki promontory on the southern tip of Kyushu, Japan. The island is roughly circular in shape, with a circumference of about 100 km. Many of the island's mountain peaks are more than 1,000 meters high. Yakushima has more than 1,900 species of animal and plant life, including some that are unique to Yakushima. The island is also famous for its thousand-year-old Japanese cedar, known as "Yakusugi." Jomon-sugi is a particularly well-known Yakusugi cedar that is 25 meters high, and is said to be the tallest cedar in the world. This area was added to the United Nation's World Heritage List in December 1993 because of its unique ecosystem and natural beauty.

One of the primary problems in Yakushima is the negative impact of mass tourism. The "high season" in Yakushima includes the Golden-Week holidays in May and the summer holidays. Many tourists use a trail from Arakawa Mountain Trail Entrance to Jomon-sugi, the oldest and most famous Yakusugi cedar, which causes soil erosion along the trail. To prevent this soil erosion around Jomon-sugi, an observation deck was constructed there in 1996. Tourists can enjoy the view of Jomon-sugi from this deck, but because they cannot directly access the Jomon-sugi, the negative impacts to Jomon-sugi are mitigated. However, this is obviously a stopgap measure unless the number of visitors can be limited to below the environmental carrying capacity. Additionally, constructing an observation deck at the World Heritage Site can have a negative impact on the value of natural beauty at this site.

To estimate the use value and non-use value of Yakushima World Heritage Site, we conducted the CV survey. We developed two CV scenarios for the resource management of Yakushima: a "strong scenario" that considers is a management plan for total value (use value plus non-use value), and a "weak scenario" that considers only the use value.

After four pilot surveys, the final CV survey was administered to 821 respondents throughout Japan in July 1997. This was an in-person interview and the response rate was

68.4 percent. The willingness-to-pay (WTP) was estimated by the survival analysis of the Weibull model. Table 3 provides estimation results of two scenarios for the Yakushima World Heritage Site. While the mean willingness-to-pay (WTP) for the strong scenario of the total value is 5,655 yen or \$47.1 USD per household, the mean WTP for the weak scenario of the use value is 3,441 yen or \$28.7 USD per household. Therefore, the difference between the two scenarios is 2,214 yen or \$18.5 USD per household. If one applies the mean WTP per household to Japan's 44 million households, the aggregate WTP for the total value is 248 billion yen or \$2.1 billion USD and for the use value is 151 billion yen or \$1.3 billion USD. The aggregated non-use value difference between these two is 97 billion yen or \$810 million USD. The total value is significantly higher than the use value, which includes tourism, and therefore the non-use value, including the wildlife habitats, ecosystem and biodiversity, should be considered for inclusion in the management plan of the world heritage sites.

TABLE 1. Estimated Value of Yakushima World Heritage Site

	mean WTP	Aggregated Value	Ratio
	(yen / household)	(billion yen)	(%)
(a) Strong Scenario (Total Value)	5,655	248	100%
(b) Weak Scenario (Use Value)	3,441	151	61%
(c) = (a) - (b) (Non-use Value)	2,214	97	39%

Source : Kuriyama K., Y. Kitabatake and Y. Oshima eds.(2000) Economics of World Heritage : Environmental Valuation of Yakushima. Keiso-shobo (in Japanese).

Note : US\$1 = 120 yen in 1997



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