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# Developing a co-management financing mechanism to enhance the financial sustainability of marine protected areas in Taiwan

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ABSTRACT

Marine Protected Areas (MPAs) are a cost-efficient and management-effective tool. Fishery Resource Conservation Zones (FRCZs) are one type of MPA in Taiwan, and they were designated to ensure the sustainability of fishery resources since 1976; however, government appropriations are the only financing source for FRCZs, leading to manpower and equipment shortages for FRCZ management. This study selected the Touching and Suao FRCZs in Yilan County of Taiwan as cases studies. To assess the feasibility of establishing a sustainable financing mechanism for MPAs, the Contingent Valuation Method (CVM) was applied to examine respondents' willingness to pay (WTP) to setup a fund for FRCZ management. The empirical results indicated that approximately 90% of respondents would be willing to donate funding for MPAs, and the WTP per respondent is NT$586.51 (US$19.6). Thus, establishing an MPA fund is a feasible way to operate Taiwanese MPAs through a co-management framework involving the central government, local government, local communities and stakeholders. However, based on our empirical results, a co-management financing mechanism for MPAs should be established to ensure stable and diverse financing sources.



## 1. Introduction

The United Nations Conference on Environment and Development (UNCED), also called the Earth Summit, was held in Rio de Janeiro, Brazil, in 1992 and adopted Agenda 21 as an action plan for sustainable development. Agenda 21 urged coastal states to maintain the biological diversity and productivity of marine species and habitats under national jurisdiction [1]. In addition, the Convention on Biological Diversity (CBD) was developed at the Earth Summit in 1992 and entered into force on 29 December 1993 to encourage the use of protected areas to promote biodiversity. In 2002, the World Summit on Sustainable Development (WSSD) in Johannesburg, South Africa, stated the following in the convention about Marine Protected Areas (MPAs): "Developing and facilitating the use of diverse approaches and tools, including the establishment of MPAs consistent with international law and based on scientific information, including representative networks by 2012" [2].

In 2010, the 10th meeting of the Conference of the Parties (COP 10) to the CBD announced the "Aichi Targets", which called for conserving 10% of coastal and marine areas by 2020—especially areas of particular importance for biodiversity and ecosystem services—through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures [3]. Moreover, previous studies indicated that MPAs are an effective management tool for enhancing fish stock and biodiversity [4–6]. Another previous study indicated that the MPA designation is an effective tool for reducing the impacts of over-exploitation on marine ecosystem [7]. In fact, in addition to the effects of marine resource conservation and restoration, MPAs can improve local community development and economic sustainability [8]. For those reasons, most coastal countries began to develop and designate MPAs as a marine environment management activity. Based on the international trend, the Taiwanese government planned and designed several types of MPAs.

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**Table 1**
Summary of Taiwanese MPAs.

| Type | Classification | Competent authority | Legal basis | Financing source |
|---|---|---|---|---|
| National park | II | Ministry of the Interior | National Park Law | 1. Government appropriations<br>2. National Park Fund (user fees and entrance fees)<br>3. Donations |
| Fishery resource c onservation zone | IV | Council of Agriculture | Fishery Act | Government appropriations |
| Wild life protected area | IV | Council of Agriculture | Wildlife Conservation Law | 1. Government appropriations<br>2. User fees<br>3. Donations<br>4. Nature and Ecological Conservation Fund |
| Nature preservation area | I | Council of Agriculture | Cultural Heritage Preservation Act | Government appropriations |
| National scenic area | V or VI | Ministry of Transportation and Communications | Act for the Development of Tourism | 1. Government appropriations<br>2. User fees |

*Note*: according to IUCN Classification as follows: I is strict nature reserve and wilderness area; II is national park; III is natural monuments or features; IV is habitat/species management area; V is protected seascape; VI is sustainable use of natural resources.

The Fourth World Park Congress was held in 1999, which mentioned major issues for protected areas management, including bioregional planning, co-management, the structure of management, and financial sustainability [9]. Management problems of MPAs were also mentioned in several studies, which recommended sustainable and diverse financing sources to be established to improve management effectiveness and ensure stable financing sources [10], such as government appropriations, environmental trust, conservation funding, international funding, donations, environmental taxes, and user fees. In Taiwan, weak legislative support for securing diverse financing sources for Taiwanese protected areas management; thus, MPAs' management is inefficient, caused by insufficient funding, manpower, equipment, and support from local residents [11].

Meanwhile, public–private partnership enhancement is also an important topic to improve the performance of protected areas [12]; thus, stakeholders and local people need to be involved in the co-management mechanism for MPAs to link this mechanism with other stakeholders. Alternatively, The Economics of Ecosystems and Biodiversity (TEEB) indicated that investment in natural capital can create and safeguard jobs; therefore, local people, and stakeholders investing in marine resource protection and conservation would promote economic benefits and development opportunities for themselves and their communities [13].

The Fishery Resource Conservation Zone (FRCZ) is one type of MPA in Taiwan, designated to enhance fish stocks and protect habitats since 1976. Currently, 26 FRCZs have been established in the coastal area of Taiwan. Some studies have indicated that the management mechanism weakness of FRCZs leads to poor performance in enhancing the fishery resources and protecting habitats [14]. Therefore, due to the importance of marine resources and fisheries in Yilan County of Taiwan, two FRCZs of Yilan were chosen for case studies and used a questionnaire survey and non-market techniques to conduct a feasibility assessment of MPA sustainable financing mechanisms. Based on our investigation, this study discusses how to prompt local people, communities, and stakeholders in an MPA sustainable financing mechanism and offer suggestions for policy decision makers to plan and manage Taiwanese MPAs.

## 2. MPAs in Taiwan

The Taiwanese Government approved the Biodiversity Promotion Plan (BBP) in 2001, which requested that 5% of coastal waters be designated as MPAs. According to the "Aichi Targets" in 2010, the Taiwanese Government revised the BBP and increased the ratio of MPAs to 10% of the area of total territorial sea. In 1998, The World Conservation Union (IUCN) specifically defined MPA as "any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical, and cultural features, which has been reserved by law or other effective means to protect part or the entire enclosed environment." According to the definitions, there are five types of Taiwanese MPA described in the following section.

### 2.1. Types of Taiwanese MPAs

As previously mentioned, there are five types of MPAs in Taiwan shown in Table 1, including National Park (NP), Fishery Resource Conservation Zone (FRCZ), Wild Life Protected Area (WLPA), Nature Preservation Area (NPA), and National Scenic Area (NSA). Those types of MPAs were setup by different authorities according to different laws, established in accordance with such regulations as the Fisheries Act, National Park Law, Wildlife Conservation Act, Cultural Heritage Preservation Act, and Act for the Development of Tourism [15]. The details of each type of MPA are as follows:

(1) National Park (NP): There are three NPs located in coastal and ocean areas as MPAs. The first one is Kenting National Park, established in 1984 by the Ministry of Interior according to the National Park Law and contains with 152 $km^2$ of sea. The second is Donsha Atoll National Park, located in the South China Sea, with 3535 $km^2$ of sea designated as protected area in 2007. The third is Taijiang National Park in western Taiwan, with 3344 $km^2$ of sea designated as protected area in 2009.
(2) Fishery Resource Conservation Zone (FRCZ): To ensure sustainable use of fisheries resources, the Council of Agriculture (COA) started to designate 26 FRCZs according to the Fishery Act, with 4795 ha protected since 1976.
(3) Wild Life Protected Area (WLPA): To protect sea birds and sea turtles, according to the Wild Animal Conservation Law, COA announced three sites as WLPAs, with a total area of 6.5 $km^2$.
(4) Nature Preservation Area (NPA): Since 1985, COA designated seven sites for mangroves and coastal nature reservations as NPAs according to the Cultural Asset Preservation Law, with a total area of approximately 2 $km^2$.
(5) National Scenic Area (NSA): Since 1984, the Ministry of Transportation designated a total of 15 NSAs, with 197 $km^2$