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# Setting the Utilization of Marine Space Tariff Based on Sustainability Principles. The Case of Indonesia

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**Abstract**

Managing marine space in a developing country like Indonesia poses significant challenges. The urbanization of the sea has turned marine areas into contested spaces among various user groups. The rise in population and economic activities along the coast has strained coastal ecosystems, leading to unsustainable exploitation of marine resources. Therefore, sustainable management of these ecosystems is crucial. This paper aims to tackle this issue by proposing a market-based instrument to sustainably control and manage marine space. The objective is to establish a fair tariff system for the sustainable allocation of marine space among different user groups. The study utilized the ranking method to determine appropriate tariff rates for various marine activities, calibrated with stakeholders in eight locations. The study's results offer different tariff sets based on economic, social, and environmental criteria, which can inform policy decisions on tariff systems for marine spatial planning in Indonesia. Valuable lessons can be gleaned from this study to enhance marine space management practices.

**Keywords:** marine spatial planning, tariff system, market-based instrument, sustainability
**Jel codes:** Q57, Q01

## 1. Introduction

One of the challenging problems in marine space management elsewhere is the “urbanization of the sea” (Couling and Hen, 2020). The urbanization of the sea is partly driven by a marine space utilization paradigm that leans towards the "Anthropocene," prioritizing human interests. According to Stel (2013), there is a need to shift this paradigm from the Anthropocene to the Geocene and sustainable ocean, focusing on the characteristics and sustainability of the marine ecosystem itself. While still acknowledging human interests in welfare improvement, the health of marine ecosystems is also a key factor in marine space utilization. This shift in paradigm necessitates transition or transformational management of marine space utilization, including potential changes in tariffs for marine space usage.

The shift towards sustainable marine space management involves a gradual transition in user behavior. However, this transformation comes with associated costs, as sustainable management necessitates investments. The principle of cost-conscious transformation is rooted in the idea of user fees, where resource users bear the responsibility for the costs linked to resource utilization. Implementing user fees is a key step in advancing towards a sustainable transition toward more equitable and sustainable use of marine spaces.

Revising the marine space management paradigm is crucial and time-sensitive, especially in light of the recent World Bank report on Changing Wealth of Nations (2021). The report highlights that one of the reasons for suboptimal management of natural resource assets, including those from the sea, is the presence of "mispricing" or inadequate evaluation methods. This inaccurate assessment results in undervaluing marine resource assets, leading to their degradation and unsustainable management practices. The current non taxation revenue mechanism as stipulated in government regulation 85/2021 as a basis for marine space tariff, falls short in capturing the true value of these marine resources.

In addition to the factors mentioned, the changing economic, social, and environmental landscape are also factoring the need to be considered for adjustments in setting tariff for marine space utilization rates. These changes will significantly impact fairness, justice, and sustainability for businesses, the government, and the marine ecosystem. Therefore, modifications to the marine space utilization tariff should also consider the dynamic nature of the natural and socio-economic systems, while factoring in economic and ecological risks supported by strong scientific evidence. Taking these factors into account, the marine space utilization tariff needs to be revised.

## 2. Literature Review

Sound management of marine space has been implemented through various mechanism. One of these mechanisms is through Marine Spatial Planning also known as MSP. Marine spatial planning is a comprehensive planning process that aims to manage interactions between various uses of ocean space and their environmental impact. It involves multiple objectives and uses integrated principles and processes to achieve this goal (Flannery and Cinneide 2012; Ehler 2021).

Marine spatial planning (MSP) is a method of sustainably and equitably managing human activities in ocean environments. It shares similarities with terrestrial zoning systems but is more intricate and tailored to the unique marine ecosystem. MSP involves analyzing and designating areas for diverse user groups, determining suitable locations for activities such as fishing, shipping, renewable energy, conservation, and recreation. It also involves balancing conflicting interests among stakeholders, including industries and conservation groups, to meet various oceanic needs while safeguarding the environment. MSP prioritizes ecological, economic, and social goals, aiming for overall well-being rather than solely profit-driven outcomes. By considering the broader context, MSP promotes healthy ecosystems, economic prosperity, and social welfare in coastal communities (von Thunen et al, 2021, Sue et al, 2020).

Looking at it through an economic lens, ocean space is a key for food, materials, energy, transportation and leisure. Nevertheless, in the context of ocean spaces, the single-use paradigm, i.e allocation space to single use is not practical, especially in nearshore area since it might create competition of space. To overcome this issue, marine spaces are allocated based on multi use paradigm where combination of different activities might use the ocean space as joint use of resources in the same area ( Ramos et al, 2022; Schultz-Zehden et al, 2018). Therefore, from economic perspective, marine spatial planning involves the specific allocation of limited marine resources and services to different uses over space and time, along with the governance structure responsible for planning, executing, and overseeing this allocation (World Bank, 2022). Hence, just like allocation of scare resource in market-based economy, benefit and cost of utilizing this resource should be made visible to the user to avoid overuse or overconsumption of the resources.

One effective market-based method for enhancing resource allocation efficiency is the implementation of user fees. These fees, also referred to as resource charges or access fees, involve payments made by individuals or businesses for the privilege of utilizing natural resources. They play a crucial role in promoting sustainable and

fair resource management. Similar to other economic systems, responsible management of marine space should involve the use of user fees. This is essential because the simultaneous use of ocean space can result in costs to both the ecosystem and society (Ciravegna et al., 2024). By implementing user fees, users are not only encouraged to utilize the space efficiently but also contribute to the government's cost recovery efforts, considering the significant taxpayer funds invested in managing and overseeing ocean spaces.

User fees for utilizing goods and services from the ocean are commonly implemented through methods like entry fees or fees for protected areas (Thur, 2010, Florence & Green, 2006). These fees are determined based on the user's willingness to pay for enjoying services provided by the ecosystem, such as scuba diving or snorkeling. The revenue generated from these fees is used for managing protected areas and contributes to government revenue. In fishing, various types of user fees like taxes, auctions, and fishing permits are imposed. This is because fisheries management comes at a cost, and it is fair for the fishing industry, as the primary beneficiaries, to share in the cost of management. Fishing activities can also have negative impacts on the environment, so user fees can help mitigate these externalities (Carpenter & Milar, 2018, Gunnlaugsson et al, 2018, Mathiasson, 2001). Similar arguments apply to the implementation of user fees for utilizing marine space.

## 3. Data & Methodology

This study used both primary and secondary data to develop the level of tariff for different use of marine spaces. The secondary data were derived from regulatory framework regarding the non-revenue taxation for utilization of marine space as stipulated in Government regulation number 85/2021. Under this regulation the tariff for utilization of marine space was determined using constant coefficient. This coefficient is then used as baseline to determine the tariff rate for marine space. The primary data were gathered from stakeholder dialogue to determine the coefficient of multiplier for different utilization of marine spaces.

The proposed level of tariff rate for utilization of marine spaces, was calculated by considering six variables namely:

- Degree of economic activities
- Social inclusivity (inclusiveness)
- Degree of co-existence among different user groups
- Economic risk
- Ecological sensitivity
- Technological risk

The first three variables, namely degree of economic activities, inclusiveness, and degree of coexistence, are variables that provide benefits in utilizing marine space. Economic degrees such as business income obtained from economic sectors that are granted marine space permits have a positive impact not only on the economic sector itself but also on the wider community. Likewise, the degree of inclusivity. If the business activity that applies for a marine space utilization permit considers other sectors or coastal communities, then the activity is inclusive and is seen as providing positive benefits. The degree of co-existence provides an overview of business activities that allow co-existence with other businesses such as fisheries and tourism or seaweed cultivation.

Economic risk, ecological sensitivity and technological risk variables are variables that are considered to make a negative contribution to the use of marine space. This variable will be a deduction in the assessment of tariff permits and as a balancing factor in looking at business activities and their relationship to marine space utilization permits. Business activities that apply for space permits in coral reef areas that are sensitive to damage, for example, will be given a reduced weight in determining their rates. Likewise with the risks of the technology used. If the business activity, such as mining in the sea, uses technology that is not environmentally friendly, it will be a deduction in the assessment score for marine space utilization permits.

By considering the various criteria discussed, the determination of the rate of permit for utilization marine space is then built through a mathematical model by first building a decision matrix.

$$X_{ij} = \begin{pmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{n1} & \cdots & x_{nn} \end{pmatrix}$$

where $x_{ij}$ describes type of utilization of bisnis *i* with criteria *j*. The decision matrix was than normalized using vector normalization i.e.

$$x_{ij}^{*} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{n} x_{ij}^{2}}}$$

Once the normalization has been carried out, the next step is to determine the location coefficient ($\theta^{*}$) related to marine space allocated for marine related business. Using modified MOORA (Multi Objective Optimization by Ratio Analysis) model of Brauer dan Zavadskas (2006), the location coefficient known also as Sustainable Wealth Tariff (SWT) coefficient is determined by the following formula:

$$\theta^{*} = \sum_{j=1}^{g} x_{ij}^{*} - \sum_{j=g+1}^{n} x_{ij}^{*}$$

Where $g$ denotes indicators or variables with positive polarity (the more the better ) and $(n-g)$ m denotes indicators with negative polarity ( the less the better).

The level of tariff was the calculated based on the following formula:

$$MST = BS \times (1 + \theta^{*}) = BS \times (1 + SWT)$$

Where MST is marine space tariff, BS is baseline tariff as stipulated in Government Regulation 85/2021.

It is also worth noting that some economic activities such as seaweed farming might take times from initial investment to harvest seasons. In this case time component of the tariff should be taken into account. Based on this consideration the second type of tariff calculated based on the following formula:

$$MSP2 = \sum_{t=1}^{n} \left(\frac{1}{(1+\delta)^{t}}\right) TD \times (1 + \theta^{*})$$

Where $\delta$ is discount factor.

**4. Results and Discussion**

In order to determine the sustainable tariff for the multiple use of marine spaces by various user groups, we initially categorized economic activities utilizing marine spaces into two groups. The first group pertains to the reclamation of marine space for constructing infrastructures like ports, offices, real estate, roads, or other developments requiring additional land from coastal areas. The second group comprises economic activities that utilize marine space without the need for reclamation, such as mariculture, pearl farming, seaweed cultivation, fishing, laying cables on the seabed, and obtaining permits for oil and gas extraction. Each group was designated as either for business or non-business purposes. Business spaces are allocated for the primary activities of the business. For instance, in seaweed or pearl farming, the main business area is the marine space designated for installing cages or longlines, while non-business areas serve as buffer zones not directly utilized for business operations. The following diagram illustrates the classification and delineation of marine spaces.

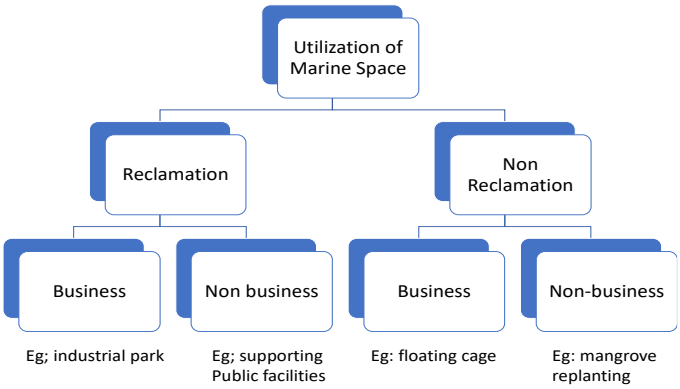


**Figure 1.** Classification of utilization of marine space

The subsequent stage in determining the tariff involves arranging a matrix with activities listed in rows and criteria in columns. The row matrix comprises components outlined in Figure 1, while the column matrix consists of six criteria detailed in the methodology section. This matrix is commonly referred to as a decision matrix, as previously mentioned.

**Table 1**. Decision matrix for sustainable tariff of marine space

| **Type of activities** | **DE** | **SI** | **Co-exist** | **EconRisk** | **ES** | **Tech Risk** |
|---|---|---|---|---|---|---|
| Reclamation for business | | | | | | |
| Non Reclamation for Business | | | | | | |
| Reclamation Non business | | | | | | |
| Non Reclamation Non Business | | | | | | |

Note; DE = Degree of economic activities, SI = Social inclusiveness, Co-Exist= Co-existence

EconRisk =Economic Risk, ES= Ecological Sensitivity, TechRisk+ Technoligcal Risk

The decision matrix, which includes six evaluation components for determining tariff coefficients, was assessed with stakeholders in six coastal and marine-related locations. These locations are Lombok in West Nusa Tenggara, Kupang in East Nusa Tenggara, Balikpapan in East Kalimantan, Makassar in South Sulawesi, Manado in North Sulawesi, and Surabaya in East Java. The selection of these locations was based on their characteristics in relation to marine space usage. For instance, Lombok in West Nusa Tenggara is primarily known for tourism, seaweed farming, and pearl farming. Kupang was chosen due to its proximity to the Savu Sea, one of the largest marine protected areas in Indonesia. Balikpapan serves as a representation of the central part of Indonesia and is considered a potential location for the new national capital. The coastal area surrounding Balikpapan is expected to face increased pressure in the future once the national capital relocates from Jakarta to East Kalimantan. Manado and Makassar, located in the eastern part of Indonesia, are known for being hubs for fishing activities (such as Bitung Port in Manado) and seaport operations in Makassar. Surabaya is recognized for its industrial establishments along the northern coastal areas, with a recent rise in requests for marine space permits in this region.

Stakeholder dialogues were initiated between March and December 2023 to identify the most crucial variables for establishing a fair and sustainable tariff. Multiple Focus Group Discussions took place in the selected locations. Through various rounds of dialogues, three out of the six criteria emerged as top priorities for determining the multiplier coefficient or sustainable tariff. These criteria include the degree of economic activities (DE), Social Inclusiveness (SI), and Ecological Sensitivity (SE). Stakeholders were then requested to

assess the relevance of these criteria in tariff setting, using a scoring system ranging from 1 (not important) to 4 (strongly important). The outcomes of these multiplier coefficients for each typology are detailed in Table 2

**Table 2**. Multiplier coefficient for sustainable tariff marine space.

| Typology of location | DE | SI | ES |
|---|---|---|---|
| Lombok | 4.0 | 4.0 | 2.8 |
| Kupang | 3 | 3.1 | 2.4 |
| Balikpapan | 3.1 | 3.2 | 2.8 |
| Makasar-Manado | 3.1 | 3.3. | 2.6 |
| East Java Timur (Surabaya) | 3.2 | 3.4 | 3.1 |

As depicted in Table 2, the multiplier coefficient for the degree of economic activities ranges from 3.0 in Kupang to 4.0 in Lombok. Kupang exhibits relatively low density of economic activities related to marine space, whereas Lombok, being in proximity to Bali, has seen the development of numerous tourism spots in the area. Following closely in terms of economic significance is Surabaya, with a multiplier coefficient of 3.2. Despite the presence of many industries in Surabaya, several areas are grappling with heavy sedimentation, posing a challenge to sustainable business practices. This is further underscored by the highest multiplier score for ecological sensitivity in Surabaya, standing at 3.1, which is the highest score among all areas in terms of ecological sensitivity.

When considering the socially inclusive coefficient, stakeholders in Lombok placed the highest value on inclusivity compared to other regions. This preference could be linked to the predominance of small-scale businesses, such as seaweed farming and ecotourism, in the utilization of marine space in Lombok. In these small-scale operations, local community involvement is crucial for ensuring the sustainability of the businesses. Additionally, Lombok, along with East Java (which follows closely behind), is home to many small-scale fisheries

Determining the multiplier coefficient is a critical step in establishing sustainable tariffs for the utilization of marine space. At this initial phase, this coefficient indicates the relative importance of criteria in setting sustainable tariffs for marine space. Subsequently, this coefficient will be utilized for more intricate calculations for each business sector in every location across the country. The selected locations serve as benchmarks for other locations scattered along the coastal areas of Indonesia. At this juncture, a rough estimate of the tariff offers a qualitative assessment that the proposed tariff for small-scale businesses will be lower than the current rate paid by users, which is approximately Rp 18.6 million per hectare (equivalent to around US$ 12,000 per hectare). Conversely, larger business activities like reclamation would be subject to higher rates than the existing tariff. It is projected that businesses engaging in reclamation activities would pay four to five times more than the current rate. This aligns with the concerns of policymakers and conservationists who believe that the current tariff is insufficient for irreversible uses of marine space, such as reclamation, where the ocean's resources and services would be permanently lost once the marine space is converted into land.

## 5. Conclusion

This study is a preliminary study to assess the fair and sustainable level of tariff for marine space in Indonesia. In general, adjusting the marine space tariff with this updated formula results in tariffs that are not considered "average." Business activities with unrecoverable environmental impacts, like reclamation, may have higher tariffs compared to activities like aquaculture, despite their significant economic impact. Under this new system, tariffs for reclamation activities can vary 4-5 times from current tariffs, which some may view as unfair since it applies the same amount per hectare for all activities. This tariff also considers the environmental impact, meaning activities that harm the environment will face higher tariffs, while those that benefit the marine environment will face relatively lower tariffs.

The next phase in the tariff analysis involves conducting a sensitivity test for the six components across different business sectors, from small-scale fisheries to the oil and gas industry. This aims to achieve detailed and consistent results. A generic formula has been created at this point to determine tariffs based on sustainability

factors. When applied to a specific scenario, this formula only needs adjustments in calculating location coefficients and activity scores for the six components under review.

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