International Journal of Accounting and Economics Studies, 12 (SI-1) (2025) 210-216

International Journal of Accounting and Economics Studies

Website: www.sciencepubco.com/index.php/IJAES
https://doi.org/10.14419/hwp3xm76
Research paper

A Case Study Approach for Economic Valuation of Marine Ecosystem Services

Majendiran Gopinath *, M. Muthazhagu

Department of Marine Engineering, AMET University, Kanathur, Tamilnadu, India.
**Corresponding author E-mail: mahandran@ametuniv.ac.in*

Received: May 28, 2025, Accepted: June 4, 2025, Published: August 28, 2025

Abstract

Coastal ecosystems are defined by interactions between the land and oceanic systems. All over the world, there exists diversity in coastal ecosystems, ecosystem services, and the related human activities in coastal regions. As a result, coastal regions are often characterized by higher population density, dependence on ecosystem services, population pressure, ecosystem degradation, and alteration. Coastal regions face the threats of extreme climatic events, changes in temperature and rainfall patterns, sea level rise, tidal water surge, cyclones, and coastal flooding, among several other processes. Additional sources of threats include coastal erosion and accretion, shoreline change, and anthropogenic threats. High degree of ecosystem dependence in coastal regions, alteration and degradation of coastal ecosystem services, and several human, social, economic, institutional, and other factors and their interactions result in vulnerability and welfare loss in the human and economic system. The study discusses applicable economic valuation techniques—including market-based methods, travel cost, and choice experiments—for assessing the full value of marine ecosystem services. It is evident from the findings that the role of the community in carrying out occupational practices differed across occupation categories. Based on their role in the community, the occupations under study could be divided into four categories. These include activities that are entirely individual, entirely group, entirely individual with organizational support, and entirely individual with community support.

Keywords: *Coastal Ecosystems; Economic Valuation; Marine Ecosystem.*

1. Introduction

Coastal zones are characterized by richness and diversity of resources and natural systems, high concentration of human activities and settlements, hazard proneness, inter-regional variations in ecosystem processes, and economic systems. Coastal zones have been conceptualized in a broad range of ways across literatures(Li, 2024). Definition varies according to the scope of study, issues addressed, and objectives(Vassilopoulos &Koundouri, 2017). It is usually the area on Earth's surface where the purely terrestrial and purely marine elements meet. From an administrative perspective, the Indian government designates as the Coastal Regulation Zone (CRZ) the area between the low tide line (LTL) in the seawaters and the point where the seawater reaches during high tides, as well as the coastal stretch that is impacted by tidal action up to 500 meters from the high tide line(Xu & Lu, 2024). This includes the land surrounding tidal-action-affected rivers, creeks, lagoons, estuaries, coral reefs, mangroves, swamps, and backwaters. However, landward area up to 100 kilometers away from the interface between land and sea(Sagebiel et al., 2016; Ferreira et al., 2017).

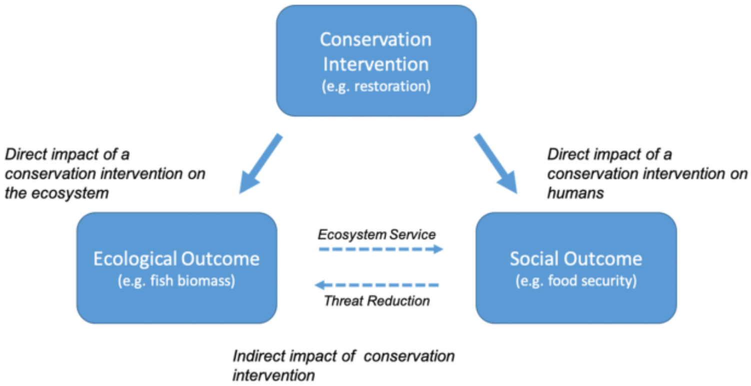

Fig. 1: Coastal Marine Ecosystem

Globally, coastal population densities are nearly three times higher than those of inland regions, and they have been growing exponentially over time(Villegas-Palacio et al., 2016; Ghosh, 2021). In addition to their ecological and ecosystem service values, coasts have historically had significant socioeconomic significance. They sustain livelihood, sub-national and national product through the development of several industries dependent on provisioning and recreational ecosystem services(Marre et al., 2016). In addition to these benefits, coastal ecosystems also control the composition of the atmosphere, recycle water and nutrients, and remove waste(Maghsoodi, 2014). To make well-informed decisions regarding the management of coastal systems for economic, recreational, aesthetic, research, and conservation purposes with a variety of priorities attached, one of the biggest challenges during the pursuit of sustainable development strategies for coastal areas is comprehending the dynamics of this complex system with multiple service delivery potential(Hanley et al., 2015). Coastal regions are extremely vulnerable to anticipated intensification and frequent climate variability due to their large and expanding populations. The resilience of human and coastal ecosystems is threatened by any alteration of coastal ecosystems, whether due to natural forces or human interventions(Zamanpoore et al., 2024). Recent research also emphasizes the role of economic trade-offs in marine policy decision-making. Ferreira et al. (2023) highlight the challenges of integrating ecological and economic priorities, underscoring the value of multi-criteria valuation frameworks for improved governance of marine protected areas and coastal development zones. A pertinent metric for managing the coastal ecosystem in this context is the idea of the "sustainability transition," which can be defined as a long-term, multifaceted, and fundamental transformation process through which systems change to a more sustainable state. A deeper comprehension of the interconnectedness and vulnerability of the coastal community is necessary due to the ongoing alteration, fragmentation, and erosion of the coastal ecosystem. Understanding the risks and opportunities to maintain coastal communities' well-being, the possibility of boosting resilience, and the extra risk brought on by climate change is also crucial (Mishra &Haval, 2024; Awadzi, 2018; Habeeb &Kazaz, 2023).

2. Background of Study

The phrase "ecosystem services" refers to the internal operations of the ecosystem, such as energy flux maintenance, nutrient (re)cycling, and food-web interactions. It can also refer to the advantages that humans derive from the characteristics and functions of ecosystems, such as waste treatment and food production(Remoundou et al., 2019). Ecosystem services, however, are those contributions of the natural world that produce goods that people value from an economic standpoint. "Goods" are any objects or structures that improve human welfare. This covers both tangible and intangible commodities, such as detoxification services and the function of ecosystem services in food production. Additionally, it comprises non-use products that are valued only for their continuing existence as well as items that produce use values (Bateman, Mace, Fezzi, Atkinson, & Turner, 2011; Luisetti et al., 2011). Similar to this, "value" refers to the contributions ecosystem services bring to wellbeing, where each person's evaluation of their financial well-being is used to gauge human welfare (Lange &Jiddawi, 2009).

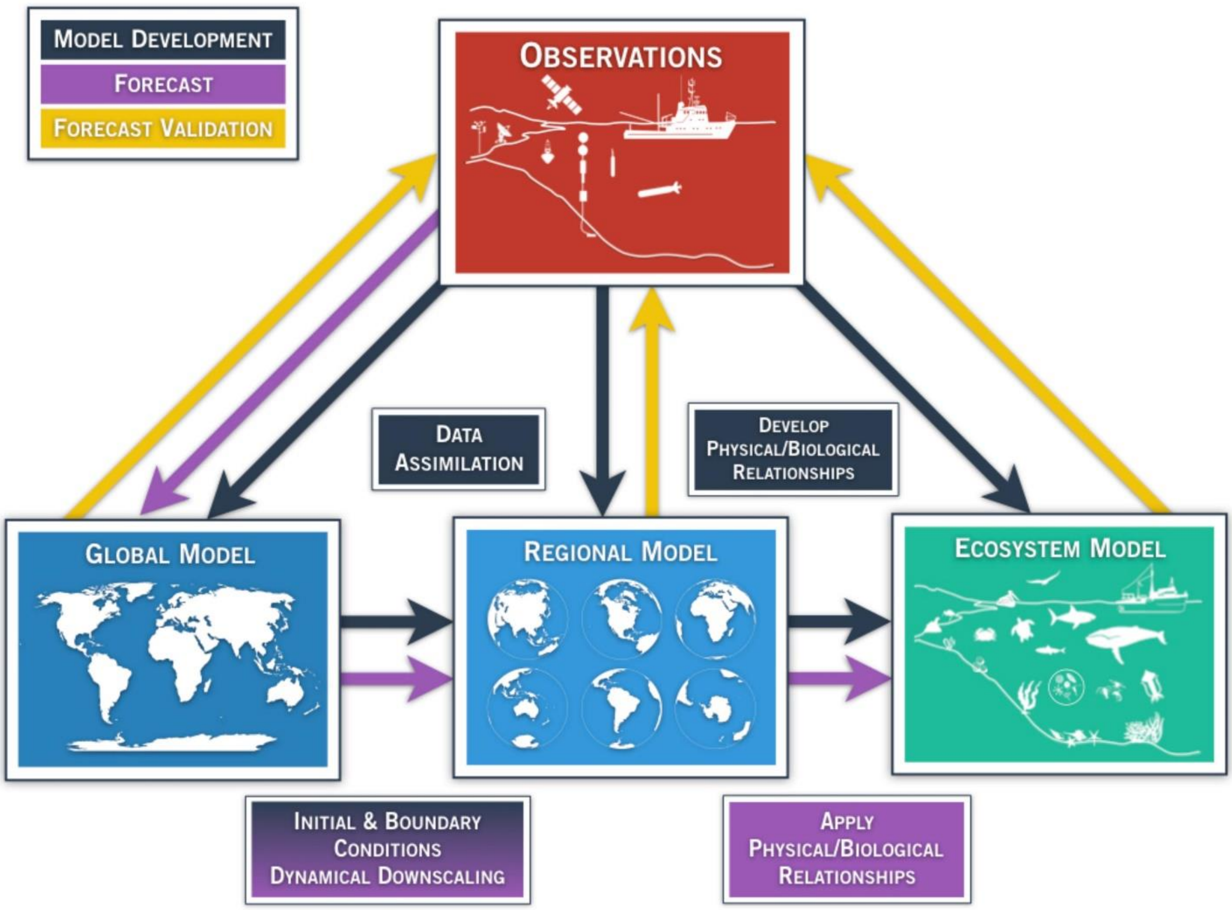

Fig. 2: Influence of GHRM (Source: Prepared by author)

Coastal ecosystems encompass any regions that are significantly impacted by proximity to the ocean and extend seaward to roughly the middle of the continental shelf and inland. They are defined as the direct contact between the ocean, land, and atmosphere. There are coastal ecosystems in over 123 nations worldwide. Different regions have different coastal zone ecosystems(Luisetti et al., 2014). Reefs, salt marshes, wetlands, seaweed and seagrass beds, beaches, dunes, estuaries, coastal lagoons, woods, grasslands, and more are all included.

Large-scale diversity can also be found in the South Asian coastal ecosystem, which is a subset of the global coastal ecosystem.to comprehend the effects of man-made and natural hazards, risk reduction techniques through shock-resistant adaptation, how the coastal community explains different social and ecological resilience drivers, and how the community perceives changes and their impact on their livelihood. The following are the broad research objectives of this study in the context of a coastal ecosystem:

- To determine and examine how the coastal economy and ecological services are interrelated.
- To determine the risk preferences of the coastal community, which can explain the importance the community places on different forms of social and ecological resilience.
- To comprehend the effects of anthropogenic and natural threats.
- To comprehend risk reduction techniques through adaptation drivers.

3. Methodology

As was previously indicated, the percentage of people who live close to the coast has grown over time. According to statistics, about 41% of the world's population lives along the coast. Over 80 percent of the population of most coastal nations lives within 100 kilometers of the shore. Additionally, it has been predicted that coastal populations will grow faster than the general population. Numerous stresses resulting from local to global scale factors lead coastal habitats to deteriorate. This sizable population is quite susceptible to weather-related risks, some of which have the potential to impact the entire landmass. Coastal ecosystems experience unpredictable seasonal and annual variations in their environmental conditions. These include shifting current and wave patterns, climate processes, land-based chemical and nutrient flows, and more.Sea level rise, altered temperature and precipitation patterns, and extreme weather events are some of the expected large-scale effects of climate change that will disrupt life and cause economic damage. Increased levels of inundation and storm flooding, accelerated coastal erosion, seawater intrusion into fresh groundwater, tidal water encroachment into river systems, and increased rainfall during monsoons are all likely to occur in many coastal systems as a result of sea level rise. Areas that are already vulnerable to flooding are likely to be more affected. In addition to many natural shocks that affect the coastal ecosystem, human-induced factors such as urbanization and population pressure also have a significant impact. Humans modify coastal habitats to extract cultural, amenity, and provisioning services. There is fierce competition among these services and other service flows, such as supporting and regulatory services, for the growing demand for their flow. The trade-off between ecosystem services varies according to context and time. In this scenario, the coastal human-environmental system's resilience is crucial. Ecosystem service-dependent communities' social resilience, or their capacity to withstand external stresses and disturbances brought on by social, political, and environmental change, is linked to the ecosystem's resilience to natural shocks and other events. As a result, changes in ecosystem resilience will undoubtedly have an immediate effect on the sustainability of the community's well-being.

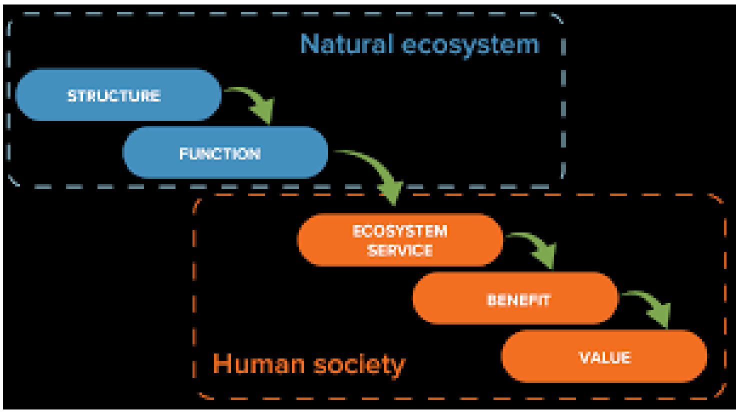

Fig. 3: Conceptual Framework of the Study

4. Performance Analysis

Reducing ecosystems to a single bottom-line figure is not always the aim of ecological valuation.The main goal is to create a better and more thorough understanding and information base of the dynamics of wetlands as ecosystems and the interactions of resource users who rely on them for their livelihood, which may eventually be reflected in the decision-making and policy-making process, rather than to "price tag" the environment or its constituent parts. A key component of the sustainable use of natural resources is the availability of such data about the local resource base and its fundamental ecological connections. Although valuing wetland benefits may not always be appropriate, environmental valuation should be viewed as competent wetland management's greatest ally rather than as a hindrance or enemy. To better align with economic valuation frameworks suitable for journal readers in the accounting and economics domain, we now compare multiple valuation techniques. While this study uses market-based valuation for provisioning services, additional approaches such as the Travel Cost Method (TCM), Contingent Valuation Method (CVM), and Choice Experiments (CE) offer robust tools for estimating recreational and non-use values of coastal and marine ecosystem services. TCM estimates use values based on the costs incurred by visitors. CVM elicits willingness to pay for conservation under hypothetical scenarios, while CE allows estimation of marginal willingness to pay for individual ecosystem attributes. Incorporating these tools in future research can help improve economic rigor and decision-making relevance in coastal management policies.

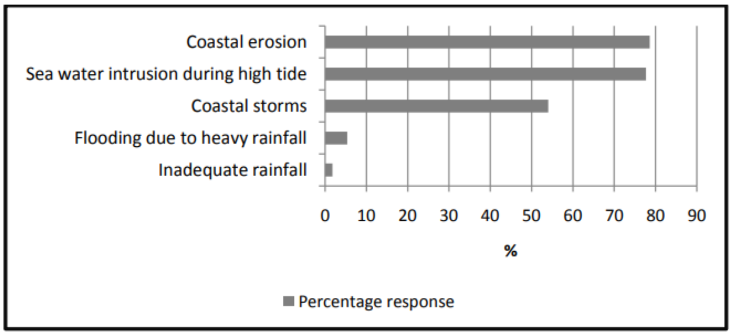

Fig. 4: Percentage of Respondents Reporting Natural Threats

Table 1: Comparative Overview of Economic Valuation Methods for Marine Ecosystem Services

Method	Use Case	Value Type
Market Valuation	Fish catch, aquaculture	Direct-use value
Travel Cost Method (TCM)	Beach visits, ecotourism	Recreational value
Contingent Valuation (CVM)	Willingness to pay for conservation	Non-use value
Choice Experiments (CE)	Trade-offs between habitat features	Attribute-level WTP

Source: Prepared by the author

Table 1 summarizes commonly used economic valuation methods applicable to marine and coastal ecosystems. Each method varies in scope, from direct market assessments to stated preference techniques, enabling researchers and policymakers to capture a wide range of ecosystem service values, including both use and non-use benefits.

One of the most important and rapidly developing fields of study in environmental and ecological economics during the past three decades is the valuation of environmental goods and services. During the past few decades, people's views and opinions toward wetlands have drastically changed. These studies promote preference-based techniques (customer and/or citizen preferences), can advise decision makers on alternative and efficient ways to allocate limited resources, and are consistent with a single monetary meter used across competing uses.

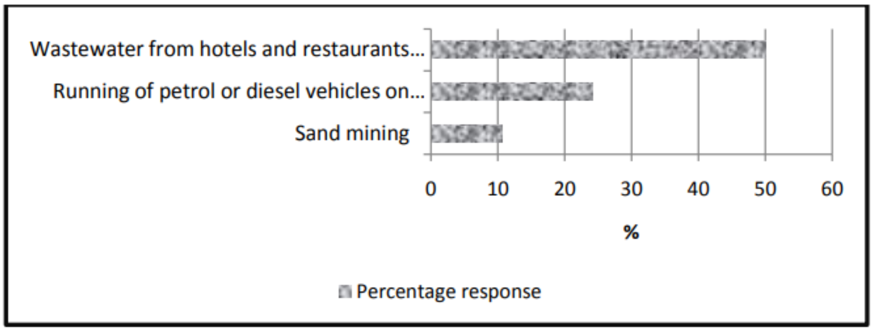

Fig. 5: Percentage of Respondents Reporting Anthropogenic Threats

Source: Prepared by the author

Even though this technique is adequate, it is incomplete because it doesn't specifically address or consider the opinions of different users that underlie the entire "economic values" generation process. According to valuation theorists, the process of creating value is based on the personal preferences of each individual and is influenced by how these resource users view their surroundings. Put differently, preferences are determined by perceptions. In order to organize different economic activities, institutions (formal state laws and informal norms, customs, non-state laws, code of conduct, etc.) must be created. These human perceptions differ among different resource users and result in numerous preferences on resource usage. Individual tastes are shaped by these institutions, which serve as limitations. As complex commons, wetlands support a variety of property systems, and their coexistence creates nuanced sets of preferences that influence values. Given this, identifying these institutional structures and calculating the monitoring magnitudes of diverse economic activity must be the first steps in any genuine attempt at value elicitation.

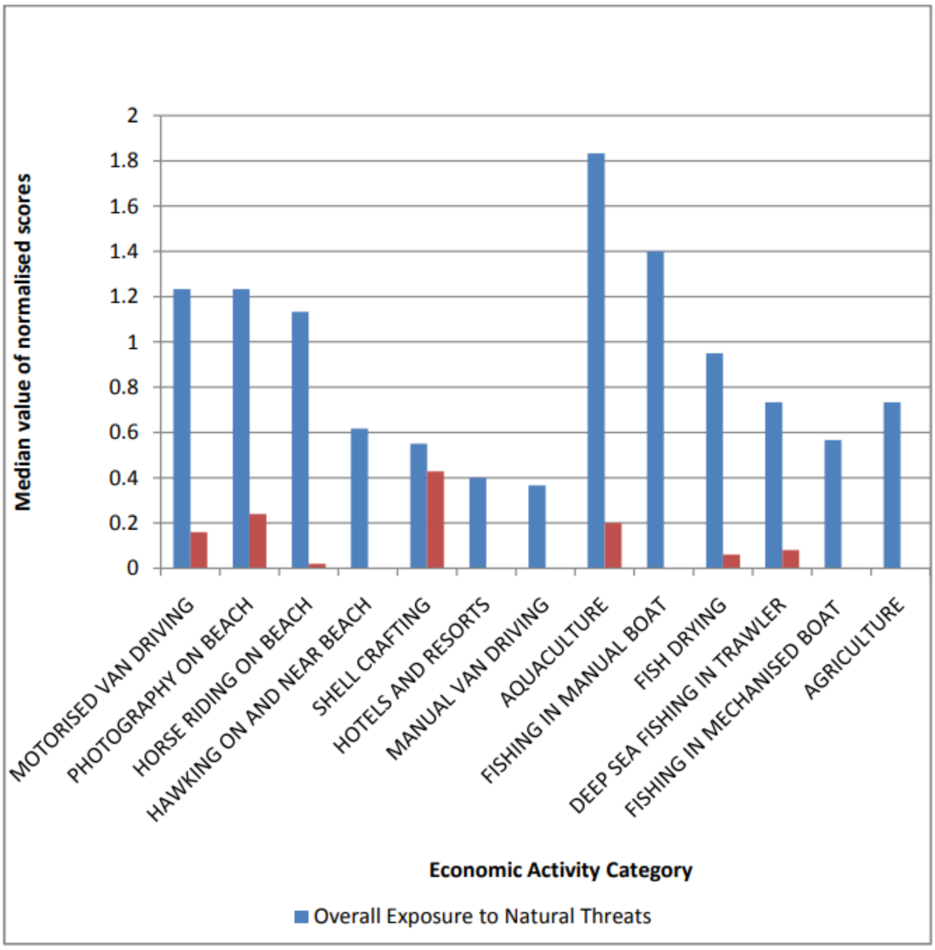

Fig. 6: Overall Exposure to Natural and Anthropogenic Threats

Source: Prepared by the author

Identifying diverse resource users and analyzing the framework of property rights that control their access to various wetland services and uses is the first step in the examination of the economic valuation of Cochin wetlands. Among other things, property rights systems have a significant role in determining the varying economic values that different communities create and appropriate in the case of wetlands. The framework of different fishing rights, property rights over agricultural lands, aquaculture fields and ponds, navigation routes, and tourist territories is extensively examined. Following up immediately, the different direct, indirect, and non-users of the Cochin wetland ecosystem are listed along with a description of how their economic activities are organized.

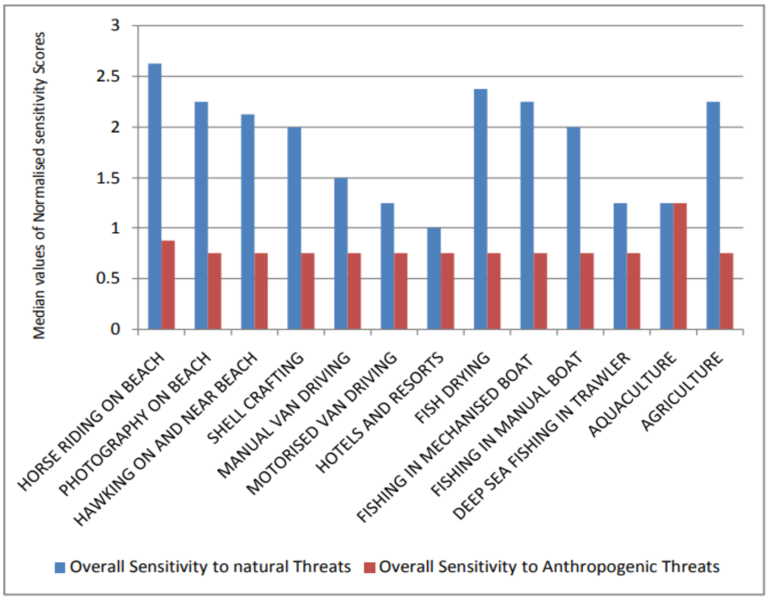

Fig. 7: Overall Sensitivity to Natural and Anthropogenic Threats

Source: Prepared by the author

The complex issue of who qualifies as a resource user is at the center of the discussion surrounding ecosystem usage and management, when it comes to intricate, multi-stakeholder settings like wetlands. The choice of the right tools is essential to the computation of economic values. Therefore, the gross and net values of commodities and services with direct markets are estimated in this study using market valuation techniques. The marginal value for each product or sensor was determined using monetary units per unit of area.

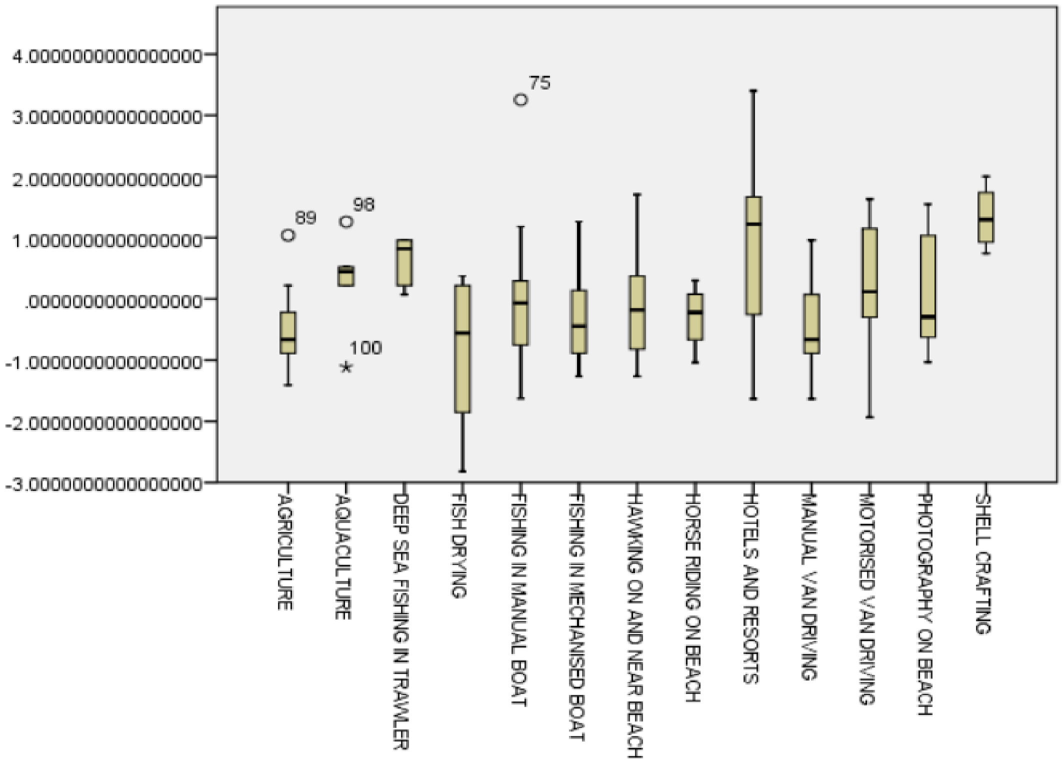

Fig. 8: Box Plot of Adaptive Capacity Scores

5. Conclusion

Using costs or market prices as stand-ins for willingness to pay or accept has the benefit of being readily observable. If the markets for the commodities and services in question are competitive, market equilibrium prices can be used as a foundation for these strategies. However, several strict assumptions are made to estimate these values. First, there is a full range of markets with clearly defined property rights to facilitate easy business dealings between buyers and sellers. Second, economic agents maximize their prospects and act competitively. Third, all agents are aware of market prices, and lastly, there are no transaction fees. For each of the ten economically significant gears in each zone, the total production and productivity per gear per day were computed using the data from the landing centers. The entire cost expended for each of the ten gears was determined using the earnings and cost survey.Net values were estimated using the cost computation, which considered both fixed and variable costs. A separate tabulation of the socioeconomic survey was made.
The insights from this valuation study can inform Environmental, Social, and Governance (ESG) reporting frameworks by translating marine ecosystem service values into decision-useful indicators. For example, companies operating in coastal areas can incorporate natural capital assessments and ecological risk metrics into their ESG disclosures. Additionally, these economic valuations can guide cost-benefit analyses (CBAs) for public and private coastal infrastructure projects, helping decision-makers evaluate the trade-offs between development goals and ecosystem protection. This approach supports more transparent, accountable, and sustainability-aligned coastal governance.

References

[1] Awadzi, C. (2018). Gamification and the Future Workplace. International Academic Journal of Organizational Behavior and Human Resource Management, 5(1), 104–108. https://doi.org/10.9756/IAJOBHRM/V5I1/1810007
[2] Ferreira, A. M., Marques, J. C., &Seixas, S. (2017). Integrating marine ecosystem conservation and ecosystem services economic valuation: Implications for coastal zones governance. Ecological Indicators, 77, 114–122.
[3] Barhoumia, E. M., & Khan, Z. (2025). Predictive analysis of climate change impact using multiphysics simulation models. Bridge: Journal of Multidisciplinary Explorations, 1(1), 23–30.
[4] Ghosh, T. K. (2021). Bibliometric investigation on research productivity in physics, chemistry, and mathematics in the Indian Institute of Technology (IIT) Kharagpur during 2001–2020. Indian Journal of Information Sources and Services, 11(1), 47–57. https://doi.org/10.51983/ijiss-2021.11.1.2654
[5] Habeeb, A. A., &Kazaz, Q. N. N. (2023). Bayesian and Classical Semi-parametric Estimation of the Balanced Longitudinal Data Model. International Academic Journal of Social Sciences, 10(2), 25–38. https://doi.org/10.9756/IAJSS/V10I2/IAJSS1010
[6] Hanley, N., Hynes, S., Patterson, D., &Jobstvogt, N. (2015). Economic valuation of marine and coastal ecosystems: Is it currently fit for purpose? Journal of Ocean and Coastal Economics.
[7] Anh, D. L. (2025). Literature Review of Management Accounting Practice in Vietnam from 2010 TO 2024. Calitatea, 26(204), 42-56.
[8] Lange, G.-M., &Jiddawi, N. (2009). Economic value of marine ecosystem services in Zanzibar: Implications for marine conservation and sustainable development. Ocean & Coastal Management, 52(10), 521–532.
[9] Li, W. (2024). Design of an intelligent protection and promotion system for non-heritage music inheritance based on the Internet of Things. Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications, 15(4), 25–37. https://doi.org/10.58346/JOWUA.2024.I4.003

[10] Luisetti, T., Turner, R. K., Bateman, I. J., Morse Jones, S., Adams, C., & Fonseca, L. (2011). Coastal and marine ecosystem services valuation for policy and management: Managed realignment case studies in England. Ocean & Coastal Management, 54(3), 212–224.

[11] Luisetti, T., Turner, R. K., Jickells, T., Andrews, J., Elliott, M., Schaafsma, M., Beaumont, N. (2014). Coastal zone ecosystem services: From science to values and decision making; A case study. Science of the Total Environment, 493, 682–693.

[12] Maghsoodi, M. (2014). A new method to build gene regulation network based on fuzzy hierarchical clustering methods. International Academic Journal of Science and Engineering, 1(1), 96–103.

[13] Rahman, F., & Prabhakar, C. P. (2025). From synapses to systems: A comprehensive review of neuroplasticity across the human lifespan. Advances in Cognitive and Neural Studies, 1(1), 28–38.

[14] Marre, J. B., Thebaud, O., Pascoe, S., Jennings, S., Boncoeur, J., &Coglan, L. (2016). Is economic valuation of ecosystem services useful to decision-makers? Lessons learned from Australian coastal and marine management. Journal of Environmental Management, 178, 52–62.

[15] Mishra, N., &Haval, A. M. (2024). Sustainable soil and crop management practices to boost the crop productivity and soil properties. Natural and Engineering Sciences, 9(3), 40–51. https://doi.org/10.28978/nesciences.1606546

[16] Remoundou, K., Koundouri, P., Kontogianni, A., Nunes, P. A. L. D., &Skourtos, M. (2009). Valuation of natural marine ecosystems: An economic perspective. Environmental Science & Policy, 12(7), 1040–1051.

[17] Sindhu, S. (2024). A blockchain-enabled framework for secure data exchange in smart urban infrastructure. Journal of Smart Infrastructure and Environmental Sustainability, 1(1), 31–43.

[18] Sagebiel, J., Schwartz, C., Rhozyel, M., Rajmis, S., & Hirschfeld, J. (2016). Economic valuation of Baltic marine ecosystem services: Blind spots and limited consistency. ICES Journal of Marine Science, 73(4), 991–1003.

[19] Vassilopoulos, A., &Koundouri, P. (2017). Valuation of marine ecosystems. In Oxford Research Encyclopedia of Environmental Science. Oxford University Press.

[20] Villegas Palacio, C., Berrouet, L., López, C., Ruiz, A., &Upegui, A. (2016). Lessons from the integrated valuation of ecosystem services in a developing country: Three case studies on ecological, socio cultural and economic valuation. Ecosystem Services, 22, 297–308.

[21] Xu, X., & Lu, W. (2024). Digital preservation and network security protection: A case study of landscape painting in Ming dynasty. Journal of Internet Services and Information Security, 14(4), 249–262. https://doi.org/10.58346/JISIS.2024.I4.015

[22] Sadulla, S. (2025). Effect of Pranayama on lung function in post-COVID rehabilitation among middle-aged adults: A clinical study. Journal of Yoga, Sports, and Health Sciences, 1(1), 24–30.

[23] Zamanpoore, M., Sedaghat, F., Sorbie, M. R., &Ashjar, N. (2024). Evaluation of the primary production and maximum fish production in Salman Farsi Reservoir, Fars Province, Iran. International Journal of Aquatic Research and Environmental Studies, 4(2), 19–36. https://doi.org/10.70102/IJARES/V4I2/2

[24] Ferreira, A. M., Marques, J. C., &Seixas, S. (2023). Reconciling ecological integrity and economic priorities in marine ecosystem valuation: Policy trade-offs and management strategies. Marine Policy, 152, 105942. https://doi.org/10.1016/j.marpol.2023.105942

[25] Veerappan, S. (2025). Integration of Hydrogen Storage with PV Systems for Off-Grid Power Supply. Transactions on Energy Storage Systems and Innovation, 1(1), 41-49.

[26] Prasath, C. A. (2025). Transformerless Inverter Technologies for Compact And High-Efficiency PV Applications. Transactions on Power Electronics and Renewable Energy Systems, 36-43.

[27] Rahim, R. (2025). AI-Driven Fault Diagnosis in Three-Phase Induction Motors Using Vibration and Thermal Data. National Journal of Electrical Machines & Power Conversion, 21-28.

[28] Vishnupriya, T. (2025). Real-time infrared thermographic characterization of functionally graded materials under thermomechanical loads in high-temperature combustion chambers. Advances in Mechanical Engineering and Applications, 1(1), 32–40.

[29] Kumar, T. S. (2025). A Comparative Study of DTC and FOC Techniques in Multiphase Synchronous Reluctance Drives. National Journal of Electric Drives and Control Systems, 1(1), 12-22.

[30] Prasath, C. A. (2025). Green Hydrogen Production via Offshore Wind Electrolysis: Techno-Economic Perspectives. National Journal of Renewable Energy Systems and Innovation, 8-17.

[31] Reginald, P. J. (2025). Design of an Intelligent V2G Energy Management System with Battery-Aware Bidirectional Converter Control. National Journal of Intelligent Power Systems and Technology, 1(1), 12-20.