

One Reef, Many Values: Understanding Cross-National Drivers of Coral Conservation in the Gulf of Aqaba

Extended Abstract

Background and Motivation

Coral reefs are among the most valuable yet vulnerable ecosystems on Earth, providing biodiversity support, cultural meaning, and a wide range of ecosystem services. Despite their importance, they are increasingly threatened by climate change and human activities, even in regions historically considered resilient. The Gulf of Aqaba (GoA), located at the northern tip of the Red Sea, hosts one of the world's most thermally tolerant coral reef systems. These reefs have demonstrated an exceptional capacity to withstand elevated sea temperatures, positioning them as a potential global refuge under climate change. However, recent evidence of extreme thermal stress and coral bleaching events suggests that this resilience may be approaching ecological limits.

At the same time, the GoA is a transboundary ecosystem shared by countries with distinct socio-economic, cultural, and ideological contexts. While the reef system is ecologically continuous, public perceptions, moral frameworks, and motivations for conservation may differ substantially across national borders. Understanding how different societies value the same ecological resource is therefore critical for designing legitimate and effective conservation policies, particularly in regions where environmental governance requires cross-border cooperation.

Economic valuation provides a systematic framework for quantifying the benefits individuals derive from environmental protection, including values that are not reflected in market transactions. Importantly, many of the benefits associated with coral reefs are non-use values: individuals may care about the existence of reefs, their preservation for future generations, or the option to enjoy them in the future, even if they do not currently visit them. While such values are increasingly recognized in environmental economics, relatively few studies have examined how non-use values and their underlying motivations vary across cultural and national contexts, especially within a shared ecological system.

This study addresses this gap by estimating and comparing the non-use values of coral reef conservation in Israel and Jordan using a unified methodological framework. In addition, it examines whether direct exposure to the reef system reinforces or alters conservation motivations through a case study of Israeli visitors to the Coral Beach Nature Reserve (CBNR) in Eilat. Beyond estimating willingness to pay (WTP), the study places particular emphasis on identifying the moral, cultural, and ideological drivers that shape support for reef conservation.

The study pursues four main objectives:

1. To estimate the non-use economic value of coral reef conservation in the Gulf of Aqaba among the general public in Israel and Jordan.
2. To identify and compare the motivations underlying willingness to pay for reef conservation across these two national contexts.

3. To address methodological challenges associated with zero and protest bids by applying a Heckman two-step selection model, thereby producing more robust and inclusive WTP estimates.
4. To examine the role of direct experience with the reef ecosystem by comparing stated preferences among Israeli non-users and on-site visitors (users), and by benchmarking stated values against revealed preferences derived from travel behavior.

Conceptual Framework

The study is grounded in the Total Economic Value (TEV) framework, which distinguishes between use values (derived from direct or indirect utilization of an ecosystem) and non-use values. The latter include:

- Existence value: the value of knowing that the reef exists, independent of any use.
- Bequest value: the value associated with preserving the reef for future generations.
- Option value: the value of retaining the possibility of future use.

While non-use values often constitute a large share of total ecosystem value, they are inherently linked to ethical considerations, cultural norms, and ideological worldviews. The study therefore integrates insights from environmental psychology and political economy, recognizing that conservation preferences may be rooted in different moral foundations across societies. In more liberal contexts, environmental concern is often framed around intergenerational responsibility and altruism, whereas in more traditional or collectivist societies it may stem from spiritual reverence for nature or moral obligations embedded in cultural and religious norms.

Research Design and Data Collection

The core empirical component of the study is a Contingent Valuation Method (CVM) survey conducted among non-users of the coral reef in Israel and Jordan. Non-users are defined as individuals who do not currently engage in direct recreational use of the reef but may nevertheless hold values related to its conservation.

Representative samples were collected in both countries using harmonized survey instruments. Respondents were presented with hypothetical conservation scenarios and asked to state their willingness to pay an annual voluntary donation to a dedicated national coral reef conservation fund. Payment cards were used to elicit WTP, with bid levels calibrated separately for Israel and Jordan based on purchasing power parity to ensure comparability.

The valuation scenario was structured sequentially. Respondents first evaluated their WTP for maintaining the reef in its current condition under growing environmental stress (a conservation scenario), and then their WTP for actively improving reef health through enhanced management and protection. Average WTP across these stages was used as the main outcome measure.

Following the WTP question, respondents were asked to indicate their primary motivation for supporting conservation. These motivations were explicitly categorized as direct use, option value, bequest value, or existence value. This design enabled the study not only to quantify economic values but also to analyze the moral and cultural reasoning behind them.

A significant challenge in stated preference studies is the interpretation of zero WTP responses. Zero bids may reflect true indifference, but they may also arise from protest behavior, distrust in institutions, objections to the payment vehicle, or financial constraints. Excluding such responses can bias estimates downward and obscure meaningful patterns of support.

To address this issue, the study employed a Heckman two-step selection model. In the first stage, a selection equation modeled the likelihood that a respondent reveals a valid WTP, distinguishing true zero values from protest or constrained responses. In the second stage, the WTP amount was estimated conditional on selection, with correction for potential selection bias. This approach allowed the inclusion of a broader range of respondents and improved the statistical validity of the results.

To complement the non-user analysis, an on-site survey was conducted among Israeli visitors to the Coral Beach Nature Reserve in Eilat. These respondents represent direct users of the reef ecosystem. The survey instrument mirrored the non-user CVM design, allowing direct comparison of WTP levels and motivations.

In addition, data on travel behavior and expenditures were collected to support a Travel Cost Method (TCM) analysis. This revealed-preference approach provided an external benchmark for validating the stated WTP estimates derived from the CVM.

Findings

Both Israeli and Jordanian respondents expressed positive willingness to pay for coral reef conservation, indicating broad public support despite differences in income levels and national context. Average WTP was higher in Israel than in Jordan in absolute terms. However, when considered relative to national income levels, Jordanian respondents demonstrated comparatively strong support for conservation.

When extrapolated to the national level, the estimated annual non-use value of coral reef conservation amounted to approximately \$87.2 million in Israel and \$36.6 million in Jordan. These figures highlight the substantial societal value attributed to the reef system by the general public in both countries.

Across both samples, WTP increased when respondents moved from a basic conservation scenario to an active improvement scenario. The proportional increase was similar in both countries, suggesting a shared perception of the marginal benefits of enhanced conservation efforts.

While non-use values dominated in both countries, their composition differed markedly:

- Jordan: Existence value emerged as the most frequently cited and economically significant motivation. Respondents emphasized the intrinsic importance of the reef's continued

existence, independent of use. This motivation was also a significant predictor of higher WTP in the econometric analysis.

- Israel: Bequest value was the dominant motivation. Israeli respondents placed strong emphasis on preserving the reef for future generations, and this motivation was associated with substantially higher WTP than other value types.

These differences point to distinct cultural and ideological foundations of environmental concern. In Israel, conservation support appears closely tied to intergenerational ethics and future-oriented responsibility. In Jordan, it is more strongly linked to moral or spiritual appreciation of nature as an entity worthy of protection in its own right.

The Heckman selection models revealed that both economic and ideological factors influence conservation support, but their roles differ across contexts.

In Jordan, income and parenthood increased the likelihood of expressing a positive WTP, while existence value was the primary driver of higher donation amounts. Ideological orientation and pro-environmental behavior also played a role in shaping participation.

In Israel, bequest value was the strongest determinant of WTP, overshadowing existence and option values. Pro-environmental behavior, liberal ideological orientation, and engagement with reef-related activities increased the likelihood of donation.

The statistical significance of the selection correction terms in both models confirms the importance of accounting for protest and zero responses rather than excluding them.

Israeli visitors to the Coral Beach Nature Reserve reported the highest WTP levels among all groups studied. Despite their direct use of the reef, non-use values, particularly bequest value, remained the dominant motivation. This suggests that direct interaction with the ecosystem does not crowd out moral or ethical considerations; instead, it may reinforce them.

The close alignment between stated WTP and travel cost estimates provides external validation for the CVM results and suggests consistency between revealed and stated preferences among users.

This study makes three main contributions.

First, it provides robust estimates of the non-use economic value of coral reef conservation in a globally significant and politically sensitive region. These values underscore the importance of incorporating public preferences into marine conservation policy.

Second, it demonstrates that conservation support is not monolithic. Even within a shared ecosystem, motivations differ systematically across societies. Effective policy design and communication must therefore be culturally informed. Messaging that emphasizes intergenerational stewardship may resonate more strongly in Israel, while appeals to intrinsic and moral value may be more effective in Jordan.

Third, the study advances valuation methodology by applying a Heckman selection framework in a cross-country CVM context. This approach enhances the credibility and inclusiveness of WTP estimates and is particularly valuable in settings where protest responses are common.

Conclusion

The findings reveal strong public support for coral reef conservation in the Gulf of Aqaba, grounded primarily in non-use values. While Israelis and Jordanians value the same ecological system, they do so through different moral and cultural lenses. Recognizing and respecting these differences is essential for designing legitimate, effective, and cooperative conservation strategies in transboundary marine ecosystems.