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Christian Ocean Stewardship on the Taiwan Marine Wind Farm Policy and Cetacean Conservation

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Abstract: This study aims to explore the practice of Christian ocean stewardship on Taiwan's marine wind farm policy, with a particular focus on the critically endangered Taiwanese humpback dolphins (*Sousa chinensis taiwanensis*). Marine wind farms, while integral to the shift toward renewable energy, present complex ethical challenges due to their adverse environmental impacts—particularly noise pollution, which poses a serious threat to vulnerable marine species. International laws have underscored the importance of preventing marine noise pollution. Although Taiwan has relevant laws and policies, their implementation and supervision in preventing marine noise pollution are inadequate. This study critically examines the anthropocentric frameworks that currently dominate Taiwan's marine development policies, arguing that they inadequately address the moral obligations humans have toward the broader ecosystem. Through a theological reflection grounded in Christian stewardship ethics, this research advocates for a shift away from human-centered environmental policies towards a more holistic ethic that acknowledges the intrinsic value of all creation. It emphasizes that ethical stewardship requires not merely reducing harm but actively participating in the restoration and protection of ecosystems, thus extending beyond utilitarian considerations of human benefit. The plight of the Taiwanese humpback dolphin serves as a case study for exploring these ethical tensions, highlighting how the energy transition can inadvertently contribute to biodiversity loss if not approached with caution and moral responsibility. Building on this, this study proposed four key principles to guide future marine development. These principles advocate for respecting nature, responsible management, continuous innovation, and social participation and transparency. This approach not only helps guide Taiwan's marine policies but also provides new perspectives and practical approaches for applying Christian ethics in the field of marine environmental protection.

Keywords: marine policy; offshore wind farm; noise pollution; dolphin conservation; stewardship; Christian ethics

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1. Introduction

The United Nations' "World Oceans Day" in 2021 had the theme "The Ocean: Life and Livelihoods", intended to showcase the wonders of the ocean and how it supports all other forms of life on Earth as a source of life. The UN Secretary-General emphasized in his speech on this day the importance of the ocean to the culture, life, and economic survival of all global communities. He highlighted the need to achieve the goals of the Paris Agreement to limit global warming to 1.5 degrees Celsius, to practice the "Sustainable Development Goals", and to ensure that the oceans remain healthy for present and future generations.

Three billion people rely on the ocean for their livelihoods, and it is a source of protein for over a billion people. Additionally, the ocean produces at least half of the Earth's oxygen and is home to most of its biodiversity. By 2030, it is estimated that over 40 million people will be directly employed in ocean-related industries, such as marine fishing, shipping, and ocean engineering [1]. Yet, what we leave to the ocean includes the impacts of excessive carbon emissions causing ocean warming and acidification, damage to marine ecosystems, overfishing, and a large amount of marine waste that cannot be processed. In my view, as modern humans increasingly gain confidence in their ability to exploit and utilize the ocean, they may feel lost about the value and meaning of such actions.

The 2011 Fukushima nuclear disaster renewed attention on renewable energy, with Taiwan seeing marine wind power as a promising solution due to its abundant wind energy resources. Taiwan is located in the monsoon climate zone and is surrounded by the sea with abundant wind energy, and it offers a promising renewable energy source despite its limited land area. The government's energy transition, particularly since 2016, prioritizes marine wind power as part of a non-nuclear homeland, though it is largely grounded in anthropocentric environmental ethics. For example, the announcement of marine wind power development was even before the announcement of the "Basic Law of the Sea". Accordingly, if we only think about how to rationally use the marine environment and do not consider the appropriate respect and obligations, there is no doubt that the environmental issue in marine wind farm development mentioned above has potential ethical concerns.

Some may argue that Taiwan's marine policy should incorporate naturalistic ethics, which extend moral obligations beyond humans to include other living beings and ecosystems. The uniqueness of naturalistic ethics lies in its consideration of not just human interests but also extending moral considerations to how we treat other groups of living beings, not just based on human collective interests. The question then arises: while humanism and naturalism offer valuable perspectives, should Taiwan's marine policy prioritize a humanist or naturalist approach? Could Christian stewardship provide a unique ethical framework to guide Taiwan's marine policy and address the complex challenges facing our oceans?

This study was designed to investigate the role of Christian ocean stewardship in shaping Taiwan's marine wind farm policies, with a particular focus on the conservation of the critically endangered Taiwanese humpback dolphin (Sousa chinensis taiwanensis). Taiwan has aggressively pursued the development of marine wind farms as part of its renewable energy transition, aiming to reduce reliance on fossil fuels and nuclear power. However, this rapid expansion has raised significant environmental concerns, particularly regarding noise pollution in coastal waters. These impacts are especially concerning for the critically endangered Taiwanese humpback dolphin population confined to the shallow estuarine waters along Taiwan's western coast. By examining these intertwined issues, this study explores how Christian environmental ethics can inform an approach where renewable energy development inherently reflects a commitment to creation care.

Grounded in the environmental ethics of Christian stewardship, the research begins by offering a theological reflection on modern human concepts and policies related to the ocean, specifically exploring how these ideas intersect with Taiwan's marine wind energy initiatives. This study examines the relationship between Christian environmental concern and the conservation of marine species, particularly cetaceans. A key aspect of this research involves reviewing Taiwan's current marine policies, highlighting the threats posed by marine wind farms to marine ecosystems during the energy transition process. Particular attention is given to the impact of noise pollution generated by wind power installations on marine mammals, especially the Taiwanese humpback dolphin. This

study also considers the international and domestic regulatory frameworks addressing marine noise pollution, pointing out the inadequacies in Taiwan's laws and enforcement in mitigating these environmental risks. Ultimately, the research advocates for a new ethical framework within Christian stewardship that calls for a deeper respect for all of creation and emphasizes active participation in environmental protection, with specific policy recommendations for Taiwan's marine wind power sector.

2. Reimagining Stewardship: God-Centered Ethics for an Interconnected World

God said, "Let us make man in our image, after our likeness, and let them have dominion over the fish of the sea, the birds of the air, the livestock, and all the earth, and every creeping thing that creeps on the earth" (Genesis 1:26). Christians are sometimes taught this way: The earth and its flora, fauna, and minerals are all created by God for human enjoyment. Genesis 1:29 records that God gave plants to people for food. After the flood of Noah, God added all living animals to the range of food (Genesis 9:3). The Psalms also say, "The heavens are the Lord's heavens, but the earth He has given to mankind" (Psalm 115:16). It seems that God has entrusted humans with the responsibility of stewardship. Traditional Protestantism is anthropocentric in its view of stewardship ethics, and human survival and prosperity seem to require the proper use of other organisms and ecosystems. Theologian Larry Rasmussen believes that the role of humans is defined as stewards, meaning that humans must be responsible to God for things that do not belong to them, serving other creatures [2]. Theology professor Richard Bauckhanm once quoted a report published in 1991 by the Board for Social Responsibility of the General Synod of the Church of England, pointing out that the main implication of this stewardship model is often used by humans as powerful evidence to prove that their role in the created world is management and development [3] as follows:

> *We all own and depend on the same world with limited resources and most of which cannot be regenerated. Christians believe that this world belongs to God, it is created, redeemed, and held by God, and He also entrusts this world to humans created in His image and responsible to Him. Whether humans recognize this responsibility or not, our status in this world is that of managers, residents, guards, trustees, protectors. Stewardship implies good management, not selfish exploitation; caring for oneself, paying attention to the present, preparing for the future, knowing that the world we manage, in addition to benefiting humans, also has the right to pursue survival and well-being. . . A good steward must be fair and just, honest and sincere, fraternal, and compassionate.*

Bauckham further criticizes the stewardship division, including (1) the biggest problem with the modern Christian concept of stewardship is that if humans consider themselves to be in complete control of the earth, whether intentionally or unintentionally, it is absolutely arrogant, because human knowledge and ability are not enough to play this role. (2) The concept of stewardship deliberately ignores God's participation, and those who strongly advocate stewardship imply that God has fully authorized humans to manage the world. (3) The definition of stewardship is not strict and fails to answer what is the relationship between humans and non-human creatures? Why do other creatures need us? Is it the responsibility of the steward to protect or seek the benefits of creatures? (4) In the concept of stewardship, humans are superior to other creatures, and the relationship between humans and other creatures is unidirectional; humans govern and care for the created world, and the created world passively accepts. (5) The concept of stewardship comes from a single scripture, namely, Genesis 1:26 and 28. It is generally believed that these two verses in the Bible are of extraordinary significance because they are closely related to human creation. But it is not impossible to separate these two verses from other scriptures. The

Bible describes a lot about human status in the created world, and "management" is just one of them [3].

The above-mentioned traditional Protestant stewardship division concept that has been criticized may cause people to ignore that nature has its intrinsic value, but when we value the intrinsic value of nature, there is a conflict between human needs and nature conservation. Therefore, establishing a "new ecological paradigm" has become an important issue in environmental ethics [4], and we are actually participants with other creatures, trustees of the earth in this paradigm [5]. The earth is not for anyone to exploit and use. Behind this trust, there is a real owner and ruler who cares for all that He has created. "Behold, I will establish my covenant with you and your descendants, including all living creatures with you, that is, birds, livestock, all the beasts of the earth, all the creatures that come out of the ark to the earth". (Genesis 9:9–10). In addition, as trustees, we actually have no real control over other creatures. Whether the land is fertile or barren is in God's hands, "The land you are going to inherit is a land of mountains and valleys, watered by rain. The Lord your God cares for it, from the beginning of the year to the end, the eyes of the Lord your God are always watching over it". (Deuteronomy 11:11–12).

Bauckham pointed out that if we understand the natural world as a network of interrelationships composed of various organisms, then every human action will undoubtedly have an impact on other members of this ecosystem [3]. Humans cannot exist independently of nature; they need the gift of the Creator and depend on the interaction with other organisms. We now understand that the destruction of the natural world is often caused by human behavior. The environmental ethics under the new ecological paradigm is holistic thinking, rebuilding the appropriate relationship between God, humans, and the environment, knowing how to respect the integrity and sustainability of all creatures [4]. Can we say that the environment has been more severely damaged after the start of humanism followed by anthropocentrism, and the root of the current environmental crisis is actually a human spiritual crisis? The new ecological paradigm challenges us to re-examine the relationship between humans and the natural environment and deepens our understanding of how to play a responsible steward, including the responsibilities and attitudes that this role should bear in maintaining ecological balance. This God-centered way of thinking not only confirms that humans have been given the mission to manage nature but also emphasizes that humans as stewards need to express God's love and justice and re-recognize the value of the created world. Humans are created in the image of God, in order to embody His divine characteristics of unconditional love and, at the same time, glorify God through the love of the entire created world. Therefore, the new ecological paradigm ethics transform the relationship between humans and nature from a hierarchical structure to an equal interaction based on love and respect.

3. Christian Stewardship in the Face of Environmental and Ethical Challenges in Cetacean Conservation

At the beginning of the 19th century, humanity developed more efficient methods of whaling, leading to the greedy devastation of large whales. Before the discovery of petroleum, whale oil was a precious lubricant for the Industrial Revolution and a source of light for European and American cities, while whale meat became a rare delicacy. Research has found that nearly 3 million large whales may have been hunted in the 20th century, bringing enormous industrial and commercial benefits to humanity [6]. What impact does the dramatic decline in whale numbers have on the planet? In 2010, several scientific teams discovered that the feces of large whales could help reduce the amount of carbon dioxide in the atmosphere, thereby reversing the trend of climate change [7–9]. This is because whale feces contain high concentrations of iron, which can promote the growth of phytoplankton

and thereby perform photosynthesis, significantly reducing the concentration of carbon dioxide in the atmosphere, potentially regulating current global environmental changes.

From this perspective, protecting whales indeed brings significant benefits to humanity. Should we, as Christians, also think this way? The theme for World Oceans Day in 2022 was "Revitalization: Collective Action for the Ocean", aimed at restoring vitality to the oceans and giving them new life. However, is this for the benefit of humanity or simply a moral action? In recent years, marine biologist Lavenia Ratnarajah from the University of Liverpool expressed her hope to prove that whales are engineers of the ecosystem [10]. She believes that conservation efforts often focus on the beauty of whales, which cannot convince everyone to protect them. If she can prove the importance of these animals to the oceans, then it would be easier to obtain protection. This marine biologist has presented a reality that cannot be denied: many people protect whales from a point of view that protects themselves, a human-centered starting point, i.e., anthropocentric environmental ethics. This ethic views the environment as part of human interests.

When viewing the conservation and utilization of cetaceans from a humanistic perspective, the values we cherish include survival, economy, recreation, science, beauty, genetic diversity, history, and cultural symbolism [11]. From a human-centered perspective, we rationally think about how to effectively use environmental resources. In the environmental ethics of modern humanism, the value of the environment depends on its functionality to society, followed by the preferences of the majority and then the benefits and personal preferences of individuals. Emphasis is placed on highlighting the contributions and benefits of cetaceans to human society and the economy, such as providing food, income, and job opportunities. Anthropocentric environmental ethics advocate finding a balance between protection and development, considering the negotiations and compensations among stakeholders (e.g., fishermen, tourism operators, and government). If whaling is a traditional culture and legitimate interest that does not affect the sustainability of whale populations, then the marine resources can be reasonably utilized. Thus, in Taiwan, cetaceans were once hunted for food but later listed as protected animals, maximizing their value in society, such as regulating global warming and as a purpose for whale watching. However, this ethic is still human-centered.

From a naturalistic environmental ethics perspective, the focus is on how to treat other creatures in the natural environment, not just humans. This ethical approach extends traditional moral concepts, expanding the scope of care from humans to animals, plants, endangered species, ecosystems, and the entire planet [11]. Proponents of naturalistic environmental ethics oppose whaling, emphasizing the value and beauty of whales and the marine life they support, advocating for their protection from human harm and exploitation. They call for reducing various threats to cetaceans, such as climate change, pollution, overfishing, and tourism development. They support measures to raise public awareness, strengthen scientific monitoring and restoration, prohibit commercial whaling, restrict scientific whaling, and establish marine protected areas. This ethic emphasizes the respect humans should have for other species, not just from a human benefit standpoint. Naturalism tends to view humans and other creatures as equal, believing that nature also has rights.

From the standpoint of a new ecological paradigm to which an ethic based on Christian faith may contribute, humans are distinct from other animals, endowed with value, the ability to evaluate the world, discover values, feel wonder, and stand above nature. Humans are residents of nature, given the role of stewards, and are the species that truly practices altruism in the biosphere. Compared to the human-centric environmental ethics, the purpose of human creation and their way of living on Earth as described in the Bible is more convincing. Through the redemption of Jesus Christ, we can return to the original

intent of creation, becoming a species that lives in this world as stewards. God in the Bible insists on justice, cares for all creations, and only by following God's laws can humans thrive on Earth. Those with a new ecological paradigm ethic can see the entire biosphere, ecosystems, and the Earth, and understand Jesus' command to love thy neighbor, which includes not only humans but all of God's creations. When suggestions or policies are proposed that sacrifice the natural environment to satisfy human needs, Christians should stand firm in their belief that humanity is entrusted with managing the created world and should do so with God's wisdom rather than economic value.

4. Intersecting Crises: Critically Endangered Species and the Expansion of Wind Power Development

In the past decade, under the rising awareness of clean and renewable energy worldwide, marine wind power has become one of the solutions for alternative energy sources. Marine wind power has a history of more than twenty years in countries such as the United Kingdom, Denmark, and Belgium [12]. The Taiwanese government has planned to increase the proportion of renewable energy generation to 20% by 2025 in order to achieve the policy goals of being nuclear-free, reducing coal usage, and increasing green energy [12]. Therefore, it is fully promoting the construction of marine wind farms, developing the wind power industry chain, and planning to form an Asian marine wind power technology and industry cluster. In recent years, Taiwan has been fully developing marine wind power, which has made the marine noise pollution caused by the development process of marine wind farms a matter of high concern to the government, fishermen, and civic groups. The first marine wind farm in Taiwan started commercial operation in November 2019, and many marine wind farms are gradually being planned and constructed. Since marine wind farms usually cover large sea areas, the piling of marine wind turbines and the entry and exit of operation ships will cause huge underwater noise.

Over the years, scientific evidence has increasingly demonstrated that marine noise pollution can cause harm to marine mammals, fish, and other marine life to varying degrees, with particularly severe effects on marine mammals [13]. According to Harris (2017), the proliferation of human activities such as shipping has significantly increased underwater noise levels, which interferes with the natural behaviors of marine mammals and can lead to physiological and behavioral harms [13]. Whales and dolphins exposed to intense noise may suffer adverse effects both in the short and long terms, such as temporary threshold shifts in hearing, which affect their ability to communicate, navigate, and detect predators and prey [14]. Kastelein et al. (2016) demonstrated that harbor porpoises exposed to pile-driving playback sounds experienced temporary hearing loss, with the degree of threshold shift being directly related to the duration of exposure [14]. Furthermore, anthropogenic noise can impact the immune function of marine mammals. Yang et al. (2021) found that captive dolphins exposed to artificial sound exhibited elevated stress levels, which can suppress immune responses and have broader implications for cetacean health [15]. Prolonged or intense exposure to underwater noise can lead to severe cases of permanent hearing loss or even death. Excessive noise can cause physical trauma, such as rupture or bleeding of the lungs, eardrums, or other body organs and tissues of marine mammals. In some cases, whales and dolphins may dive rapidly to escape from intense underwater noise, and when they resurface too quickly, they can suffer from decompression sickness, leading to physical injuries or death [16]. Markus and Sánchez (2017) emphasized the importance of managing and regulating underwater noise pollution to mitigate these harmful effects on marine life [16].

The Taiwanese humpback dolphin (*Sousa chinensis taiwanensis*) is a critically endangered subspecies of the Indo-Pacific humpback dolphin, confined to a small range of

estuarine waters along the western coast of Taiwan [17,18]. Juveniles are characterized by a dark gray coloration with a few light spots, while adults transition to a predominantly white or pinkish hue (Figure 1). With an estimated population of fewer than one hundred individuals, this species faces numerous anthropogenic threats, including accidental entanglement in fisheries, chemical and biological pollution, noise pollution from industrial activities, and habitat degradation [19,20]. These factors contribute to their classification as "Critically Endangered" on the IUCN Red List, highlighting the urgent need for intensified conservation efforts to ensure the survival of this vulnerable population.

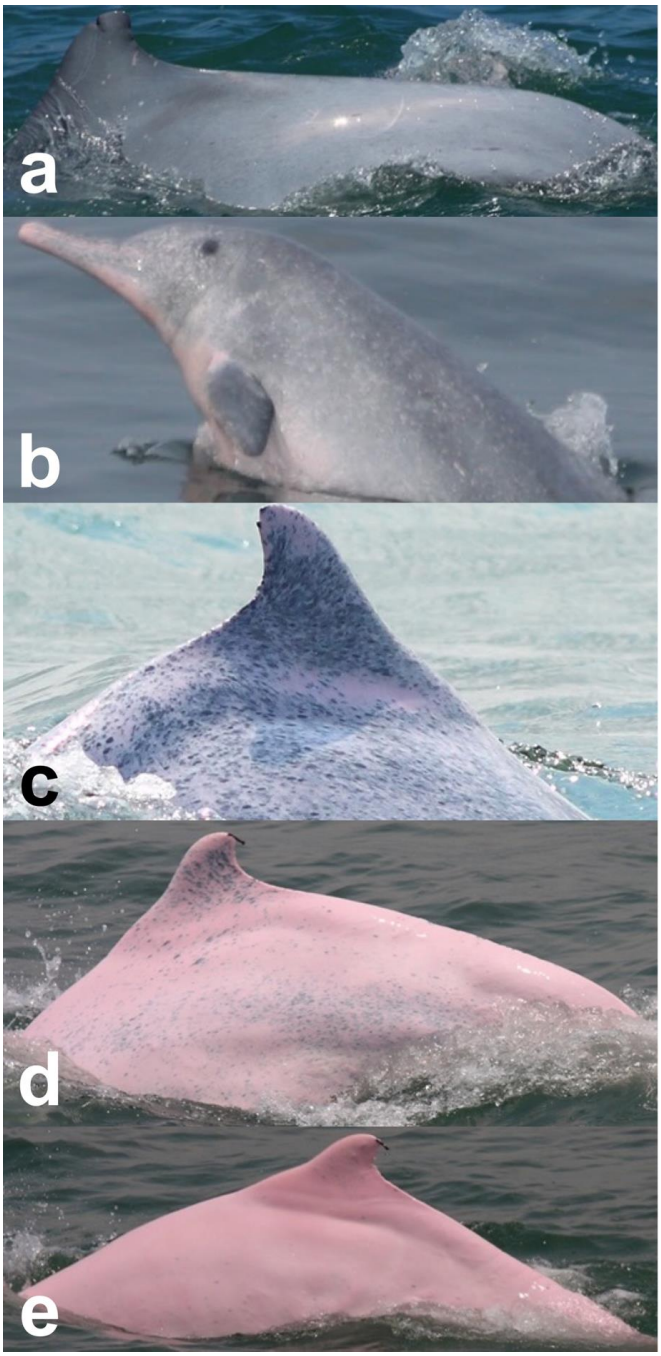

Figure 1. Images of Taiwanese humpback dolphins (*Sousa chinensis taiwanensis*) in different coloration stages: (**a**) calf, (**b**) mottled stage, (**c**) speckled stage, (**d**) spotted adult, and (**e**) unspotted adult. Photos from [20].

The distribution of pile-driving noise from marine wind farms in the western Taiwan marine area overlaps with the habitat of the Taiwanese humpback dolphins (*Sousa chinensis taiwanensis*). Pile driving produces intense, low-frequency impact sounds that travel long distances underwater with minimal attenuation, meaning that sound levels do not decrease significantly even several kilometers away from the source [14]. Given the proximity of some offshore wind farms—just several kilometers from the dolphins' habitat (Figure 2)—this noise exposure creates an unavoidable acoustic disturbance. Research suggests that wind farm developers should reduce noise levels to lessen the impact on the dolphins' range of activities [15]. However, for such a critically endangered population, merely reducing the impact may not be sufficient. This overlap between industrial noise and the dolphins' habitat further amplifies the risks to this already fragile population.

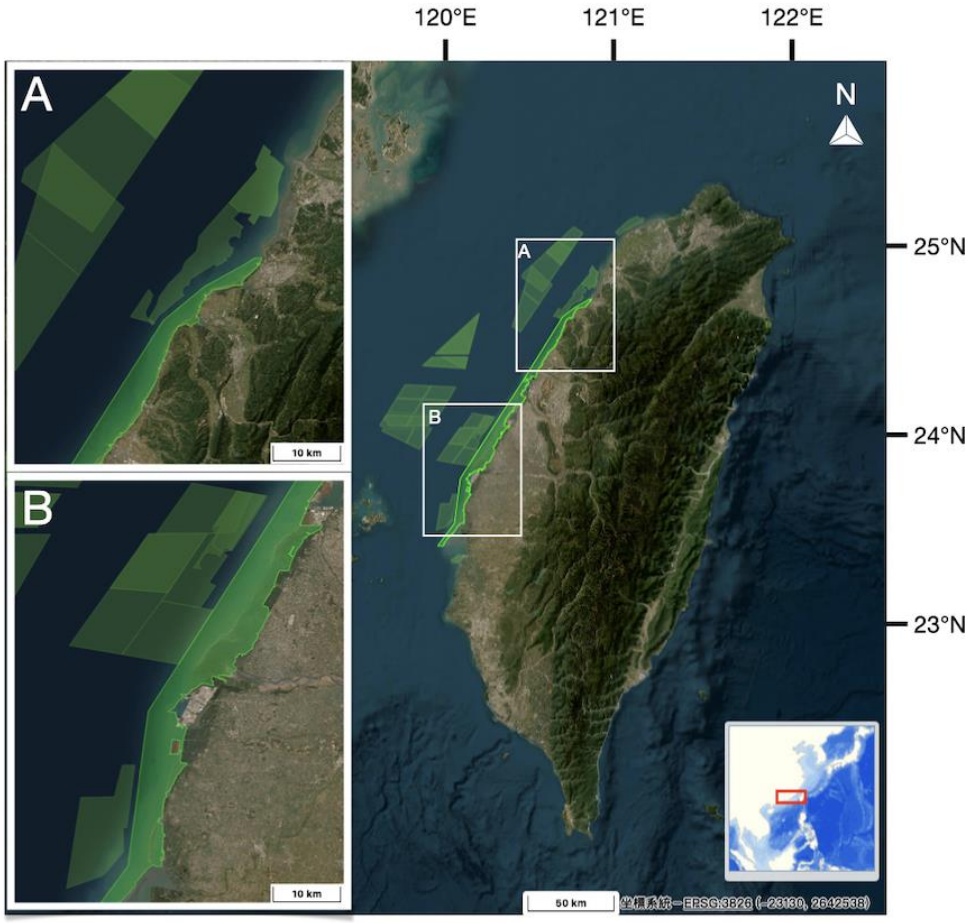

Figure 2. Map illustrating the spatial relationship between Taiwanese humpback dolphin (*Sousa chinensis taiwanensis*) habitat and marine wind farm developments along the western coast of Taiwan. The Major Wildlife Habitat of Taiwanese Humpback Dolphin announced by the Taiwan government is highlighted in bright green, representing the narrow estuarine zone where this critically endangered species resides. The darker green-shaded areas indicate the locations of operational and planned marine wind farms. Panels (**A**,**B**) provide close-up views of regions where wind farm installations are situated in close proximity to the dolphin's habitat. The Chinese texts indicate coordinate system. From: https://iocean.oca.gov.tw/iOceanMap/map.aspx (accessed on 15 September 2024).

According to the precautionary principle outlined in Article 15 of the 1992 Rio Declaration on Environment and Development [21], "In order to protect the environment, nations should widely adopt preventive measures according to their capabilities. Where there is a risk of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation".

This principle emphasizes the need for proactive and decisive actions when dealing with threats of serious or irreversible harm. Animal protection groups have indicated that the significant noise from marine wind turbines, the increased traffic of maintenance vessels, and the drilling during the laying of submarine cables all exert additional pressure on the survival of the Taiwanese humpback dolphins [15]. Therefore, it is imperative to implement more stringent measures beyond noise reduction. These could include establishing exclusion zones to prevent wind farm construction in critical habitats, enforcing stricter regulations on underwater noise pollution, and enhancing monitoring and conservation efforts to protect and restore the dolphins' environment [16].

In light of the precarious status of this population, has Taiwan adopted appropriate preventive measures in its regulations on noise pollution from marine wind power generation to protect the humpback dolphin? Have we worked towards safeguarding the future of the Taiwanese humpback dolphins and preventing their slide towards extinction? In the following paragraphs, I would argue that the current marine protection-related legislation in Taiwan is inadequate in regulating the impact of noise from marine wind power pile-driving on Taiwanese humpback dolphins.

5. Negligent Legislation to Safeguard Endangered Species and Preserve Ecological Balance

In 2018, the Taiwanese government established the Ocean Affairs Council to coordinate and promote various marine policies. In 2019, the Basic Ocean Act was announced, emphasizing Taiwan's goals of creating a healthy marine environment and promoting sustainable resources, serving as the foundational framework for national oceanic law and policy. Article 8 of the Basic Ocean Act stipulates: "The government should integrate and make good use of domestic resources, formulate strategies for marine pollution prevention and control, reduce pollution from the source, strengthen pollution prevention and control capabilities, effectively respond to climate change, prudently promote territorial planning, enhance marine disaster protection, accelerate marine restoration efforts, and actively promote regional and international cooperation to protect the marine environment". This article has become the basic direction for Taiwan's marine pollution prevention and control. However, Taiwan's Marine Pollution Control Act, as the main legal instrument for controlling marine pollution, includes provisions on preventing pollution from marine projects only limited to the discharge of "hazardous substances" and does not regulate underwater noise and various types of energy pollution caused by marine projects. Therefore, marine noise pollution caused by marine wind power development is not applicable under the aforementioned provisions. In 2023, the Ocean Affairs Council published recommended thresholds for anthropogenic underwater noise; however, these were in line with the standards for non-endangered species of whales and dolphins in Germany, rather than for critically endangered species like the Taiwanese humpback dolphin.

Taiwan's marine wildlife conservation-related laws include the Wildlife Conservation Act and the Marine Conservation Act (hereafter referred to as the Conservation Acts). The harm of marine noise generated by marine wind power development to marine wildlife has been proven; therefore, it could potentially constitute "harassment", causing disturbance to wildlife. However, both Acts do not prescribe penalties for negligent acts of harassing wildlife. Furthermore, some studies believe that wind turbine pile-driving and vessel operations are not intentionally disturbing marine wildlife, making it difficult to apply penalties under the Conservation Act [22]. In summary, the current marine protection-related legislations, including the Basic Ocean Act, Marine Pollution Control Act, Conservation Acts, and the latest recommended thresholds for anthropogenic underwater noise, are inadequate in regulating the impact of noise from marine wind power pile-

driving on Taiwanese humpback dolphins, and the laws directly related to wind power development are of a lower legal hierarchy, such as demonstration incentive measures and application operation guidelines [23].

Taiwan's ambitious expansion of marine wind energy has progressed rapidly, outpacing the development of appropriate environmental regulatory frameworks. The government's "Thousand Wind Turbines Project" (https://www.twtpo.org.tw/eng/offshore/directions.aspx, accessed on 15 May 2024), approved in 2012, marked a significant milestone in renewable energy policy, with the Bureau of Energy under the Ministry of Economic Affairs (MOEA) leading efforts to promote wind power [24]. As part of the "Four-Year Wind Power Promotion Plan", the MOEA set a target of generating 5.7 GW of marine wind energy by 2025, with numerous turbines slated for installation in the Taiwan Strait. However, this rapid pace of development has exposed a notable disparity between industrial progress and environmental governance. For instance, it is noteworthy that Formosa 1, Taiwan's first commercial marine wind farm, commenced operations in April 2017 off the coast of Miaoli County [25], well before the introduction of crucial legislative frameworks, such as the Basic Ocean Act in 2019 and the Marine Conservation Act in 2024. This highlights a significant regulatory lag in addressing environmental concerns amid the rapid development of marine wind energy projects.

The existing foundation of law, characterized by insufficient standardization and density, results in administrative actions that lack a solid legal basis. In contrast, Germany has accrued substantial experience and developed a significant scale in marine wind energy [23]. This success can largely be attributed to a robust legal framework, which has facilitated the smooth implementation of policies. Furthermore, Germany enacted the 'WindSeeG' specifically for marine wind energy, which has been effective since 2017. This legislation synergizes the development of marine wind farms with grid expansion, ensuring mutual benefits.

6. Stewardship and Responsibility

The current scenario with the Taiwanese humpback dolphins reveals not only the inadequacy of environmental legislation but also a deeper ethical and spiritual crisis pervading multiple levels of society. The urgency to complete marine wind farm construction without implementing adequate safeguards reflects a mindset shaped by anthropocentrism and short-term economic priorities. This urgency stems from a worldview that measures progress in terms of immediate human benefits, such as energy production and economic growth, while overlooking the intrinsic value of the natural world. Such a worldview is a manifestation of the spiritual crisis described earlier, where humanism and anthropocentrism have replaced God-centered stewardship with a self-centered exploitation of creation.

This crisis extends beyond policy gaps and technological decisions—it infiltrates every level of society. At the governmental level, it prioritizes political and economic expediency over ecological responsibility. Within industries, it fosters a profit-driven culture that disregards long-term environmental harm. Among communities, it perpetuates a disconnection from the natural world, diminishing public awareness and concern for vulnerable species like the Taiwanese humpback dolphin. This spiritual disconnection from the natural environment results in fragmented, utilitarian approaches that fail to recognize humanity's role on the earth.

From a Christian ethical standpoint, the inadequacy of Taiwan's marine protection-related legislation in regulating the impact of noise from marine wind power pile-driving on Taiwanese humpback dolphins raises significant concerns. Theologically, this situation challenges the Christian principle of stewardship as a sacred responsibility. Humanity's God-given role as stewards of creation emphasizes care, respect, and justice for all living

beings, not domination. In this light, our pursuit of renewable energy, while aimed at reducing dependence on fossil fuels and nuclear power, must also align with a deeper moral obligation to safeguard the integrity of ecosystems and the vulnerable species within them. The plight of the Taiwanese humpback dolphin is a poignant reminder that technological progress, when pursued without theological guidance, risks violating the role of humanity God gives.

Proverbs 31:8–9 calls us to "speak up for those who cannot speak for themselves, for the rights of all who are destitute", urging us to defend the vulnerable and uphold justice. This call resonates deeply with the principles of the new ecological paradigm, which recognizes that humanity is not an isolated entity but an integral part of an interconnected web of life. Rooted in theological reflection, this paradigm extends the biblical mandate to advocate for justice to include all of creation, emphasizing that stewardship involves speaking for and protecting those without a voice, including endangered species like the Taiwanese humpback dolphin. The new ecological paradigm transcends anthropocentric environmental ethics, reframing humanity's role as participants and co-workers within a broader ecological community, rather than dominators over it. This perspective recognizes that nature has intrinsic value as part of God's creation, independent of its utility to humans, and compels us to see the Taiwanese humpback dolphin not merely as a species to protect for biodiversity's sake but as a unique member of creation, imbued with its own God-given purpose and worth. Such a view calls for a profound reassessment of existing laws and a commitment to strengthening them to safeguard these vulnerable marine creatures. When legislation falls short of protecting these creatures, it reflects a failure to honor their intrinsic value and leads to a diminished understanding of the interconnectedness of all creation, ultimately devaluing not only non-human life but also humanity's own role and purpose.

Furthermore, the precautionary principle, while a cornerstone of science-based environmental ethics, finds a deeper and distinct dimension in Christian environmental ethics through its foundation in God's wisdom. Unlike secular approaches that rely solely on empirical evidence and scientific reasoning, Christian environmental ethics is guided by a theological understanding that all of creation reflects the Creator's divine purpose and order. As Psalm 119:66 reminds us, "Teach me knowledge and good judgment, for I trust your commands". This perspective is rooted in trusting God's wisdom to discern right actions, especially in the face of uncertainty. This unique character of Christian ethics moves beyond a utilitarian or purely precautionary approach, calling for proactive stewardship that aligns human actions with God's intent for the flourishing of creation. Applied to the conservation of the Taiwanese humpback dolphin, it calls for decisions guided by both theological reflection and practical judgment. Addressing these considerations involves not only revising existing policies to close gaps in protection but also fostering a culture of respect and responsibility towards the environment. This requires a collective ethical reflection on the part of policymakers, industry stakeholders, and the community at large, prompting a shift towards more sustainable and considerate practices in the pursuit of renewable energy.

The context of Taiwan's marine energy development and the plight of the Taiwanese humpback dolphins is not merely a local issue; it reflects broader global challenges that arise when technological progress is pursued at the expense of ecological and ethical considerations. According to the Global Wind Energy Council, wind energy must grow significantly—from its current contribution of approximately 6% of the global power mix to over 30% by 2050—in order to align with pathways aimed at limiting global temperature increases to well below 2 °C [12]. The Chinese government has also committed to ambitious climate goals, including reaching peak emissions by 2030 and achieving carbon neutrality by 2060. To support these objectives, China is actively working toward establishing a new

power system centered on renewable energy [26]. This scenario underscores the urgent need for more robust and ethically grounded policies that prioritize the well-being of all creation over short-term technological or economic gains. It compels both the public and policymakers worldwide to confront the long-term implications of their actions on biodiversity and to embrace a worldview that recognizes the intrinsic value of all species as part of a divinely interconnected creation, rather than reducing them to mere resources for human utility.

Ultimately, the ethical dialogue in theology about environmental issues invites a moral and spiritual awakening that transcends local or national boundaries. It calls for new ways of living that genuinely reflect the principles of stewardship, compassion, and respect for life. This awakening is about preserving ecosystems and renewing humanity's relationship with creation and God. It offers a vision of hope, where technological progress and ecological harmony are not in conflict but are reconciled through a commitment to God's wisdom and the flourishing of all creation.

7. Learned Lessons: New Ecological Paradigm Ethics for Taiwan's Marine Wind Policy

In contemporary society, humanity faces an urgent need for energy transition, where marine wind power, as a form of renewable energy, plays a pivotal role. However, this process inevitably involves disruptions to marine ecosystems, especially for critically endangered species such as the humpback dolphin. As E.O. Wilson [27] compellingly argues in The Creation, the preservation of biodiversity is not merely a scientific endeavor but also a profound moral obligation shared by all of humanity. He calls for a unified approach between religious and scientific communities, emphasizing that the sacredness of life on Earth should inspire both faith-driven and evidence-based efforts to protect endangered species. Faith-based initiatives like the Blue Theology Mission Station and Tikkun HaYam (Repair the Sea) [28] exemplify this union, pairing hands-on conservation activities with theological reflection to instill a sense of moral responsibility toward marine wildlife. From the perspective of new ecological paradigm ethics, any intervention in nature must be based on a reverence for the God's wisdom and a respect for life. Our stewardship, therefore, must ensure that technological progress, such as marine wind power development, does not come at the expense of the vulnerable species with whom we share the planet.

To reconcile the advancement of marine wind power with the protection of such vulnerable marine life, it is essential to integrate ethical principles with robust policy and regulatory frameworks. Thus, how to advance marine wind power development while practicing new ecological paradigm ethics, especially in protecting endangered species like the Taiwanese humpback dolphin, in light of Taiwan's legal context—including the Marine Pollution Control Act, the Wildlife Conservation Act, the Marine Conservation Act, and even the Environment Education Act—I propose four key principles as follows:

7.1. The Principle of Respecting Nature

a. Comprehensive Environmental Impact Assessment: Our understanding of nature is limited, and any intervention should be based on caution and respect. This lesson is particularly crucial for marine wind power development due to its profound impact on marine ecosystems, especially on endangered species like the Taiwanese humpback dolphin. A comprehensive Environmental Impact Assessment (EIA) is not just a technical procedure but an ethical practice. It requires developers to understand the potential consequences before acting and to take necessary measures to minimize negative impacts. This assessment should include a detailed analysis of biodiversity, ecosystem services, and the impact

on specific species, particularly endangered ones, as required by the Conservation Acts. Through this, we demonstrate respect for creation and assume responsibility for protecting and maintaining the integrity of nature.

b. Dynamic Monitoring System: The complexity of nature and the mystery of God's creation remind us of the need for continuous observation and learning when intervening in nature. Establishing a dynamic monitoring system aligning with the requirements of the Marine Conservation Act allows us to track in real time the impact of marine wind power development on the marine environment and specific species, such as the Taiwanese humpback dolphin. This is not only a technical challenge but a practice of our ethical commitment. Through continuous monitoring, we can more accurately understand our actions' impact on nature and adjust development strategies as necessary to reduce negative impacts. This approach embodies a humble attitude, acknowledging our limited knowledge and willingness to adjust our actions based on new information and understanding.

7.2. The Principle of Responsible Management

a. Phased Development Plan: A phased development plan is one of the key strategies for achieving responsible management. This strategy requires setting clear stages and evaluation points in the development process, allowing adjustments based on feedback from the EIAs and dynamic monitoring system. Through this, we can find a balance between protecting the environment and advancing renewable energy development, ensuring no irreversible harm to endangered species like the Taiwanese humpback dolphin.

b. Establishing Protected Areas: Establishing protected areas is another crucial strategy for practicing the principle of responsible management. Through scientific research and environmental monitoring, we can identify critical habitats and migration paths for the humpback dolphin and establish protected areas in these regions to prohibit or restrict wind power development activities. This direct protection of the humpback dolphin's life and the integrity of the marine ecosystem involves public participation and cross-sector collaboration to ensure transparency and fairness in the decision-making process, demonstrating profound respect for creation.

7.3. The Principle of Continuous Innovation

a. Development of Low-Impact Technologies: In designing and implementing marine wind power projects, developing low-impact technologies is key to achieving ecological harmony. This includes reducing noise pollution during construction and developing wind turbine layouts and operational strategies with minimal impact on marine life. From a theological perspective, this innovation is not only a demonstration of technical progress but also a respect for the created order and an affirmation of the value of life.

b. Ecological Recovery Plans: Recognizing that any development inevitably alters the environment, even if slightly, implementing ecological recovery plans is a responsible and proactive practice. By conducting comprehensive demographic studies, EIAs, and establishing dynamic monitoring systems, we gain a thorough understanding of the current health of marine populations and communities. This knowledge enables us to implement aggressive conservation strategies such as recovering damaged marine ecosystems, establishing new marine protected areas, and supporting conservation programs for endangered species like the Taiwanese humpback dolphin. This approach is not about compensation, which often relies on ineffective and unnatural restoration interventions. Instead, it focuses on a committed effort to actively recover and enhance the natural environment. From a theological viewpoint, these ecological recovery practices envision the redemption and renewal of creation, actively participating in God's healing work and showing profound respect for life and the created order.

7.4. The Principle of Social Participation and Transparency

a. Importance of Social Participation: Social participation plays a vital role in marine wind power development. It ensures that various stakeholders, including local communities, environmental organizations, scientists, developers, and policymakers, have the opportunity to participate in the decision-making process. This participation not only increases the social acceptance of construction projects but also facilitates the exchange of different viewpoints and knowledge, helping to identify potential environmental and social issues and their solutions.

b. Ethical Significance of Transparency: Transparency is fundamental to building public trust and ensuring responsible decision-making. In the process of marine wind power development, transparency requires developers to share information about construction design, environmental impact assessments, risk management plans, and monitoring data openly. This helps the public understand the potential impacts on the environment and the local community and provides a mechanism for public oversight to ensure timely resolution of issues in the development process.

In addition, to achieve effective social participation and transparency, the following measures can be taken: (1) Establishing a platform for the involvement of multiple stakeholders, allowing all stakeholders to participate in the discussions and decision-making process of marine wind power development, ensuring their voices are heard and considered. (2) Regularly publishing information and progress reports, through websites, social media, and public meetings, to keep the public informed about the project's progress, environmental monitoring results, and any significant decisions. (3) Promoting public education and awareness through educational activities and information dissemination to enhance public understanding of marine wind power technology, environmental impacts, and biodiversity conservation. It is evident that social participation and transparency are not only necessary means to achieve project success in marine wind power development but also represent an ethical practice respecting order creation and social justice. In the new ecological paradigm, ethics, dialogue, listening, and justice are keys in seeking solutions to complex challenges.

8. Conclusions

In conclusion, this study has explored how Christian stewardship ethics can serve as a guiding framework for addressing the challenges of renewable energy development and marine conservation, using Taiwan's marine wind farm policies and the plight of the Taiwanese humpback dolphin as a case study. By integrating theological reflection, ecological ethics, and practical policy considerations, the paper demonstrates that energy transition and biodiversity preservation are not competing goals but interconnected aspects of an approach to creation care. The call for a unified effort between religious and scientific communities highlights the potential for interdisciplinary collaboration to inspire more ethically grounded and sustainable policies. This contribution underscores the importance of embedding moral and spiritual values in environmental decision-making, offering a fresh perspective to the field of conservation ethics. Future research could build on this foundation by examining the application of faith-based stewardship ethics in other contexts, while policymakers could draw from this framework to develop robust strategies that reflect both ecological integrity and human responsibility.

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