Harmonizing Welfare State Principles and Pentahelix Collaboration: Pathways to Equitable Water Governance in Indonesia

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Abstract: This study investigates the interplay between welfare state principles and pentahelix collaboration in achieving equitable governance of water resources in Indonesia. The study employs a descriptive-comparative qualitative approach to delineate the roles and interactions among five elements: government, private sector, academia, civil society, and media. It further examines the existing environmental legal framework and redistributive policies. Comparisons were conducted with the reclamation cases in Manila Bay (Philippines), the "Day Zero" crisis in Cape Town (South Africa), and the Ruimte voor de Rivier programme (Netherlands) to discern best practices and pinpoint implementation weaknesses. The findings indicate that in Indonesia, the disparity in the roles of various actors, insufficient law enforcement, and the failure to acknowledge local wisdom have contributed to the marginalisation of vulnerable communities and the degradation of ecosystems. In contrast, the three comparator countries effectively diminished conflicts and enhanced social-ecological justice by implementing the public trust doctrine, adopting green constitutions, and utilising participatory mechanisms grounded in multilevel frameworks. Research recommendations highlight the necessity of reinforcing transparent and stringent regulations, including implementing the polluter pays principle. Additionally, there is a call to enhance local communities' technical capabilities and acknowledge traditional systems like Subak in Bali. Therefore, pentahelix collaboration serves as a tangible mechanism for guaranteeing water access, conserving ecosystems, and ensuring the equitable distribution of benefits, aligning with the principles of the welfare state.

Keywords: Pentahelix Collaboration, Welfare State Principles, Water Governance, Social-Ecological Justice, Participatory Frameworks.

Introduction

World leaders established 17 objectives aimed at eradicating poverty, diminishing inequalities, and safeguarding the environment, referred to as the Sustainable Development Goals (SDGs), with a target for completion by 2030. The Government of Indonesia demonstrated its commitment by issuing Presidential Regulation No. 59/2017, which outlines the implementation strategies for achieving sustainable development goals. One of the Sustainable Development Goals to be completed is Goal 6, which focuses on Clean Water and Sanitation, specifically providing access to safe drinking water and sanitation facilities. The Indonesian government employs the principle of universality in its implementation, indicating that the targets encompass all population segments, including households, schools, health facilities, and workplaces. Equity involves systematically reducing disparities among various groups, particularly vulnerable ones. The government underscores the critical need to ensure safe and affordable sanitation and drinking water are accessible to everyone. This initiative seeks to guarantee the availability of these services to all individuals, irrespective of their constraints.

The situation in Bali, specifically in the Nusa Dua region, exemplifies the implementation of collaborative efforts regarding energy security and the management of water resources. The government of Bali is actively endorsing the "*Bali Mandiri Energi*" and "*Bali Energi Bersih*" initiatives as objectives aimed at achieving sustainable energy solutions. The project involves the establishment of a floating Solar Power Plant (PLTS) with a capacity of 100 kW

at the Nusa Dua Muara Reservoir. This project represents a concrete manifestation of the collaboration between PLN and the Bali Provincial Government aimed at enhancing the use of new renewable energy to achieve energy independence for the Island of the Gods. Bali's Subak cultural heritage, embodying the philosophy of Tri Hita Karana—representing the harmony among humans, nature, and spirituality—has been presented as a sustainable water resource management model. During the 10th World Water Forum in Nusa Dua (May 2024), Indonesia presented the Subak system as a national highlight, emphasising "Water for Prosperity." This theme underscores the importance of engaging citizens and multiple stakeholders in managing water resources. This approach is centred on Balinese ecological principles and *gotong-royong*, effectively aligning sustainable development goals with integrating social welfare and environmental balance.

Various other regions have effectively executed comparable strategies. The government of Indonesia, via the Coordinating Ministry for Human Development and Culture, promotes the pentahelix model for the development of village potential. This approach integrates the efforts of government, academics, entrepreneurs, communities, and media to achieve food, energy, and local economic security. The Mandalika Special Economic Zone in Lombok employs a Penta helix collaboration model to enhance tourism potential sustainably (Suryani, 2024). The international landscape reflects a comparable pattern: PentaHelix initiatives in Europe, for instance, incorporate public institutions, industry, academia, NGOs, and citizens in cross-regional sustainable energy and climate planning. Through a comparative analysis of these experiences, it becomes evident that the promotion of a philosophy centred on social justice and multi-stakeholder collaboration, alongside a focus on ecological balance, is essential for enhancing the security of energy and water resources in Nusa Dua, Bali (Coordinating Ministry for Human Development and Culture of the Republic of Indonesia, 2021).

The proposed N2S Hotel, constructed at Lot 5, Sawangan, Nusa Dua, Bali, is a pertinent case study for analysing the implementation of welfare state principles and pentahelix collaboration within sustainable development. The Nusa Dua region, recognised as a domestic and international tourism hub, encounters significant environmental issues resulting from substantial infrastructure development. Critical factors such as the clean water crisis, spatial violations, and disaster risks significantly impact the area's growth. A report from Wahana Lingkungan Hidup Indonesia (WALHI) Bali highlights that the proposed construction of the N2S Hotel has generated significant debate, primarily due to its possible adverse effects on the environment and the surrounding community. WALHI Bali, in collaboration with other organisations such as Front Demokrasi Perjuangan Rakyat (FRONTIER) Bali, is calling for a cessation of the project. The primary concern centres on the significant water consumption associated with the hotel, which is estimated to be 433,686 litres daily throughout its operational phase. PDAM Badung will supply the water, although it faces challenges in fulfilling the demand for drinking water in the South Bali region. The water discharge in numerous springs is experiencing a persistent decline, and the rates of pipe leakage have escalated to significant levels (WALHI Bali, 2025).

The project site is in a region with notable water challenges and an elevated disaster risk index. Significant issues include threats like large waves, tsunamis, and abrasion. The lack of disaster risk mitigation in the project design suggests an insufficient implementation of Penta helix collaboration, which should prioritise social responsibility and community safety (Tunjungsari et al., 2017). The concept of a welfare state requires that the government ensures fair distribution of developmental benefits to the community, encompassing access to sustainable natural resources. The high-water consumption by N2S Hotel may lead to diminished availability of clean water for nearby residents, potentially infringing upon their fundamental rights. The government ought to operate as both a monitor and an enabler to guarantee that hotel development aligns with the principles of social justice. The hotel occupancy rate in the Nusa Dua area of Badung Regency, Bali, has been documented by PT Indonesian Tourism Development (ITDC). The average hotel occupancy in the region for 2024 was 76.56 per cent. This significantly elevated figure will undoubtedly pose a challenge unless paired with developing policies promoting environmental equilibrium.

Research Methods

This study employs a descriptive-comparative qualitative approach, grounded in a non-doctrinal legal research framework and informed by the socio-legal studies tradition. The objective is to delineate and critically analyze the roles and interactions among five key societal elements—government, private sector, academia, civil society, and media—within the broader context of sustainable development governance. The descriptive aspect aims to portray the dynamics of these actors in relation to environmental regulatory frameworks and redistributive policies, while the comparative dimension facilitates the identification of similarities and divergences in institutional roles, responses, and interdependencies.

Adopting a socio-legal lens allows for the interpretation of law not merely as a set of normative rules but as a social institution shaped by political, economic, and cultural forces. Accordingly, the study integrates both primary and secondary data sources. Data collection is conducted through library research and fieldwork. The library research involves a comprehensive review of relevant literature, including statutory regulations, scholarly articles, research reports, books, and other legal and policy documents pertinent to environmental governance and actor-based analysis. The field research is conducted through direct observation and in-depth interviews with stakeholders involved in the development of the N2S Hotel project in Nusa Dua, Bali. Observational data serve to contextualize the empirical practices and interactions on the ground, while interviews aim to capture the nuanced perspectives, motivations, and experiences of the actors engaged in the development process. All collected data are subject to qualitative analysis to uncover patterns, tensions, and intersections between formal legal norms and their practical enactment, particularly in relation to ecological justice and inclusive policy implementation.

Results and Discussion

Challenges in the Management Of Water Resources

In 1948, physicist George Gamow introduced the Big Bang Theory, which posits that the universe originated from a cataclysmic explosion that instantaneously generated all mass and energy. This explosion transpired in an almost negligible timeframe—mere fractions of a second—and within the subsequent minute, the universe expanded to a width of approximately a trillion miles at an astonishing velocity, forming all known matter. Gamow argues that light elements, including hydrogen and helium, originated within the initial minutes following the Big Bang, a period characterised by extremely high temperatures that facilitated the combination of subatomic particles into simple atoms. In contrast, the formation of heavier elements occurred subsequently within the cores of stars. With the Universe's expansion and cooling, hydrogen and helium gas clouds aggregated to create stars and galaxies. These structures, composed of hundreds of millions of gravitationally interacting stars, include the Milky Way galaxy, which houses our solar system and is one of approximately 20 members of the Local Group alongside Andromeda. This process elucidates the fundamental physics underlying the formation of Earth and our galaxy. It is posited that water on Earth originated from the impact of comets during the planet's formative years, delivering the crucial liquid necessary for life. Water must exist in liquid rather than merely as vapour or ice for organisms to flourish. Throughout history, civilisations that prioritised the study and management of water, such as the Indus Valley civilisation with its advanced sanitation program around 3000 BCE, which included underground aqueducts and public baths, along with a focus on personal hygiene, health education, diet, and environmental sanitation, experienced prosperity and longevity. In contrast, those who overlooked these essential elements faced decline (Theodore & Dupont, 2019).

Water can be categorised into three primary types: surface water, groundwater, and rainwater. Surface water, encompassing streams, lakes, and reservoirs, is integral to managing water resources. Groundwater is crucial in providing raw water supply and irrigation in regions where accessing surface water is challenging. However, it is essential to ensure its sustainability through regulated withdrawals that adhere to safe discharge limits. Rainwater serves a dual purpose: it fertilises crops as adequate rainfall and can be systematically collected for household use. The longer this collection process is maintained, the more it contributes to decreasing reliance on irrigation and traditional water sources.

In this context, it is evident that water serves as an irreplaceable resource. Natural water resources serve various purposes, including domestic, agricultural, industrial, recreational, and environmental activities. All living organisms require water for survival, leading to the assertion that “water means life and life means water.” The composition of the Earth’s surface reveals that 25% is land while 75% is water, underscoring the necessity of water for all forms of life. Of the total surface water, a significant 97% is comprised of saltwater, leaving a mere 3% as freshwater. Additionally, over two-thirds of the planet's freshwater is found in glaciers or ice sheets. Nevertheless, most unfrozen freshwater is primarily found as groundwater, with the remaining portion existing above ground or in the atmosphere. Freshwater is a renewable resource; however, the global decline of groundwater supplies is a significant concern, with depletion occurring in various regions, threatening our survival shortly (Hossain, 2019).

The reduction in the availability of potable water on Earth can be attributed not only to the surge in population but also to a range of additional factors. Water resource issues encompass natural disasters like floods that result in fatalities, the phenomenon of global warming leading to seawater intrusion, heightened food and energy production activities necessitating substantial water usage, infrastructure development that diminishes water catchment areas, and, critically, pollution that degrades water quality, rendering it unfit for consumption. UN Environment reports that rivers in Latin America, Asia, and Africa are experiencing significant contamination from various types of pollution. Approximately one-third of the global river systems face threats from bacterial or pathogenic pollution, while one-

seventh are at risk from organic pollution. Additionally, one-tenth of these rivers are contaminated with substances that elevate salt concentrations, resulting in moderate salinity levels. Approximately 2.5% of the total water available on Earth is suitable for human consumption. According to data from the UN Environment, approximately 80% of wastewater is released directly into water bodies without treatment to mitigate pollution levels. This encompasses waste generated from industrial, agricultural, and household sources. Open defecation behaviour persists as a result of insufficient access to sanitation facilities. Approximately 2.4 billion individuals, representing around 30% of the global population, remain without adequate sanitation facilities. Additionally, an estimated 1.8 billion people are believed to be using water contaminated with faecal matter. Consequently, illnesses stemming from inadequate water quality, such as diarrhoea, continue to be a primary cause of mortality, particularly among children, with approximately 1,000 children succumbing to this condition daily.

The ongoing challenges regarding the availability and quality of water resources are poised to significantly affect various dimensions of human existence. Examining aspects such as food security, productivity, and human livelihoods. Without intervention, projections indicate that by 2050, a minimum of 25% of the global human population may experience insufficient access to healthy water sources. The United Nations, via the Sustainable Development Goals, has established multiple targets to enhance life on Earth through water and sanitation initiatives by 2030. These targets include ensuring universal and equitable access to safe and affordable drinking water for all; providing equitable and adequate sanitation and hygiene facilities to eliminate open defecation; improving water quality by reducing pollution levels; implementing integrated water resource management, including fostering transboundary cooperation; protecting and restoring water-related ecosystems, such as forests, wetlands, mountains, rivers, aquifers, and lakes; and increasing local community involvement in the management of water and sanitation resources. The UN is urging all nations globally to participate in realising these goals through the SDGs.

The water sector encounters challenges from various processes influencing water supply and demand. The lack of interconnection among these processes presents significant challenges for effective water management. Climate change influences water supply quantity and distribution patterns, complicating the planning and allocation of water for various uses. Conversely, climate change modifies the water needs of plants, animals, and humans as they react to rising temperatures and increased evapotranspiration, resulting in heightened and more challenging water demands from these sectors. Furthermore, the interplay between natural population growth and rural-to-urban migration alters demand dynamics and the focal points of demand, presenting challenges in the planning of water supply projects (Dinar, 2024).

Future water shortages will necessitate the development of more advanced solutions for treating polluted water to secure usable secondary and tertiary water. This principle is equally relevant to the remediation processes for groundwater originating from contaminated areas. Soil and groundwater contamination represents a persistent issue stemming from contemporary societal practices. Globally, contaminated areas present significant environmental challenges. Degraded fields, landfills, and historical and current industrial and military sites play a role in disseminating pollutants into the surrounding environment (Burlakovs et al., 2020). The concepts presented by Rachel Carson (1962) in ‘Silent Spring’ represented a significant shift in ecological thought, emphasising the necessity for a harmonious relationship between the environment and industrial practices. The influence of human activities on the environment has undergone a significant transformation. The degradation of the natural environment is occurring due to the exploitation of natural resources tainted by a range of chemicals. The growing population in coastal regions globally, particularly in Indonesia, is encountering emerging challenges. Agricultural, residential, industrial, and transport activities influence the quality of water resources.

Indonesian territories encounter issues related to the contamination of nitrates, phosphates, oil products, and heavy metals. These pollutants originate from point and diffuse sources, transferring through soil and groundwater into the sea. Legal instruments, including directives and laws, establish enduring solutions to mitigate groundwater quality degradation from intensive contamination and encourage the advancement and application of environmental technologies. The presence of organic and inorganic substances in the environment represents a significant issue, as the bioaccumulation of these substances can lead to both direct and indirect risks to environmental integrity and human health. Toxic heavy metal ions are characterised by their non-biodegradable nature, leading to their accumulation in living organisms, which can result in significant disorders and diseases.

Indonesia, characterised by its tropical climate and distinct rainy and dry seasons, presents significant opportunities for developing and managing water resources. Nonetheless, certain regions experience a deficiency in access to clean water necessary for their daily requirements. This article examines the complexities of clean water management in Indonesia, focusing on its potential, challenges, health implications, and relevant government policies

in place. This article provides a comprehensive overview of the country's current state of water management, derived from a thorough literature review. Indonesia experiences annual rainfall that contributes approximately 308 billion m^3 of water to its groundwater basins. The country possesses 10.8 million hectares of potential swampland that could serve as reservoirs alongside 21.28% of its current dams. By 2020, water availability per capita decreased to 1,200 m^3 annually. The primary challenges include the gradual progress of water management infrastructure, insufficient rainfall runoff storage facilities, and ineffective execution of eco-efficiency measures. The varied effects encompass a yearly rise in diarrhoea cases averaging 11% and an annual increase in dengue fever cases of 6.5%. The government initiated the Community-Based Drinking Water and Sanitation Programme to tackle this issue, reaching 15.4 million individuals (Umami et al., 2022).

The issue of water pollution caused by pesticides is interconnected with a larger environmental pollution challenge, where radioactive waste, nuclear waste, household garbage, and industrial chemical discharges contribute to the contamination of rivers and lakes. Pesticide contamination raises significant concerns as these chemicals penetrate soil and groundwater, with infiltration rates determined by the soil's properties and the active ingredients' molecular composition. Overusing pesticides, in conjunction with climate change, can undermine the soil's capacity to retain water, which may lead to contamination of the deeper soil layers. Hydrological systems, significantly shaped by climatic conditions, are crucial in regulating the water cycle. Additionally, water vapour and carbon dioxide released from the combustion of fossil fuels enhance the greenhouse effect, contributing to global climate change. Climate change and global warming stimulate interdisciplinary research due to their extensive impact on human life, primarily through the deterioration of drinking water sources. This degradation can pose health risks, influenced by chemical quality, exposure duration, toxin concentration, and toxicity levels (Navidi & Joodaki, 2025).

At the start of the 20th century in the United States, nearly all municipal wastewater was discharged directly into rivers and lakes, with over 95 per cent in 1905, decreasing marginally to 88 per cent by 1924 after implementing more effective activated sludge processes. However, the industrial and economic expansion after World War II introduced new challenges, characterised by the emergence of toxic chemical wastes and intricate organic compounds that had not previously been managed. The publication of significant studies on the hazards of DDT and the Love Canal incident heightened public awareness regarding pollution, prompting the government to contemplate environmental regulation more seriously. The evolution of the Water Pollution Control Act, beginning with its initial passage in 1948 and subsequent amendment to permanent law in 1952, reflects a progressive strengthening of regulatory frameworks. The significant enhancements in 1965 and the transformative changes in 1972 aimed at the ambitious goal of eradicating water pollution by 1985, alongside substantial financial investments for treatment plant construction, indicate a systematic approach to wastewater management efforts. The 1977 amendment actively promoted the development of alternatives to traditional integrated systems. As the late 1990s approached, policies became more stringent, integrating centralised management with water reclamation and reuse and focusing on managing rainfall runoff. During this period, decentralised systems began to cater to approximately 25 per cent of the population, while new suburban plans indicated a 37 per cent interest in their adoption. Despite the significant recession temporarily hindering advancement, an extended drought in the southwest ultimately resulted in a broad acceptance of wastewater reuse (McNabb, 2017).

Zeitoun and Mirumachi (2008) review the qualitative literature that seeks to theorise water conflict and cooperation. They highlight that although water conflicts frequently encompass social barriers related to access and allocation, the theoretical framework surrounding water cooperation remains inadequately developed. The literature often presents conflict and collaboration in a linear framework, operating under the normative assumption that cooperation serves as a means to avoid conflict. Acknowledging that conflict and cooperation are interconnected, as they frequently overlook the intricate political landscape surrounding water resources management and governance, is crucial. Designating an area as “conflictive” or “cooperative” can obscure the underlying dynamics of the actors involved and the shifting balance of power among them (Mirumachi & Chan, 2014).

Recognising that water serves as an essential and irreplaceable source of life for all living beings is crucial. Water-related issues can be systematically classified into three distinct categories. Initially, an excess of water can result in adverse events, including floods and the formation of unwanted puddles. Secondly, when water is excessively contaminated, it presents a significant issue regarding quality and pollution, rendering it unsuitable for fulfilling specific requirements. Thirdly, a minimal quantity of water typically arises from drought conditions, leading to water scarcity that fails to satisfy fundamental needs, potentially resulting in catastrophic events that endanger lives. Consequently, water management should be conducted in a manner that is equitable, efficient, and sustainable across generations (Hatmoko & Indrawati ., 2022)

Examining the legal framework and practices surrounding water management at the municipal level reveals that municipalities lack specific authority or dedicated management bodies within the national or state systems. Consequently, their role is primarily indirect, relying on watershed committees, municipal associations, or water resources boards for engagement. The absence of a municipal water policy, official indicators, and management instruments, including specific plans and information systems, indicates a lack of a structured approach. Furthermore, water-related budgeting primarily focuses on the sanitation, environment, or general infrastructure sectors. The absence of defined roles has resulted in disjointed governance, insufficient transparency and technical expertise, and a lack of systematic monitoring of river water quality—all funded and determined by state agencies that emphasise large-scale water supply capacity and anti-flood infrastructure. The push for regionalising sanitation has led to heightened complexity and isolation among cities, primarily due to the misalignment of administrative boundaries with river basin boundaries, coupled with a reluctance from local authorities to engage in the process. This intensifies the existing gaps in both vertical and horizontal integration among sanitation policy, urban planning, and water resource management, as the achievement of long-term water security relies on effective cross-sector synergies, active community participation, and well-defined governance at the local level (Nicollier et al., 2022).

Huffman (1955) posits that the fundamental objective of resource management is to enhance the capacity of the resource base to bolster private enterprise, which is essential in a capitalist economy. To achieve this goal, three key components must be addressed: (1) enhancing both the physical and economic accessibility of resources, (2) leveraging technology for resource development, and (3) modifying the institutional framework as needed. This idea has been previously established. Over an extended period, the federal government has allocated funding to a range of programmes and policies aimed at enhancing the feasibility of private utilisation of natural resources. The ongoing construction of hydroelectric power plants and irrigation and drainage facilities today reflects a continuation of governmental support that has historically included canals, railways, and the provision of free land for businesses. In establishing criteria for government action, it is crucial to differentiate between motivations driven by private profit and those aligned with the public interest. When a project demonstrates the potential to yield the necessary returns to draw private investment, it is suitable for the private sector to engage in it. There are instances when the associated risks are excessive, the project's scale is extensive, or public interest necessitates development before market demand—circumstances that pose challenges for private entities to navigate.

Additionally, it is essential to evaluate the potential compatibility of the two objectives: achieving the highest return per dollar of public funds and optimising resource utilisation. The most significant return is typically achieved when a resource is utilised singularly. However, evaluating the duration for which we can permit other opportunities to remain untapped is essential. In the context of irrigation, the allocation of public funds may achieve optimal efficiency when land is consolidated into larger units; however, this approach conflicts with the established practice of preserving family farms. Ultimately, despite the movement to diminish the federal government's influence, there is a concern that it is overlooking its significant obligation regarding resource management, which parallels the importance of national defence. Countries that deplete or harm their resource base are at risk of extinction or enduring poverty. Resolving numerous water issues necessitates intervention from the central government to safeguard the long-term public interest, even considering the contributions of regional governments and local agencies.

Huffman (1956) analyses the Eisenhower-era “partnership” policy that promoted water resources development via government and private sector collaboration. He outlines five critical observations: first, the “partnership” mindset has been overly concentrated on hydropower generation, often overlooking other significant benefits such as flood control, irrigation, and recreation; second, the private sector is inclined to cover costs that yield profits, while the government assumes costs for public benefits that do not directly generate profit; third, quantifying the value of non-market benefits (e.g., recreation or conservation) presents considerable challenges, despite the necessity for equitable calculation of all benefits; fourth, the inconsistency in cost-sharing arrangements among government agencies allows private partners to navigate towards the most advantageous regulations; and fifth, the growth of partnerships should extend not only between the central government and the private sector but also include local governments and institutions to ensure comprehensive water resource management. The effectiveness of this partnership policy, as noted by Huffman, is significantly influenced by the willingness of all involved parties to explore various resource utilisations, maintain transparency in cost-sharing, and establish coherent regulations aimed at public welfare.

Welfare State and Penta Helix: Equity in Water Resources Management

The Penta helix collaboration, which includes government, private sector, academia, community, and media, represents a governance model that aligns with sustainable development principles in environmental law, effectively balancing environmental, social, and economic dimensions. This method aligns with the principles advocated by T.H.

Marshall's (1950) welfare state. It ensures that citizens' fundamental rights are upheld, including access to clean water and a healthy environment, thereby promoting social justice and collective well-being. The government assumes a central position in the Penta helix by establishing policies and regulations grounded in the precautionary principle and the polluter pays framework, which serves as foundational elements of environmental law to prevent harm and ensure accountability. Academia is crucial in establishing the scientific basis for evidence-based policy and facilitating adaptive regulation through research on climate, water conservation, and environmental technology. This is exemplified by the collaboration between universities and government in the Netherlands, which led to the development of nature-based flood management solutions. The theory of environmental law underscores the importance of public participation, as articulated in Principle 10 of the 1992 Rio Declaration on Environment and Development. Community initiatives like river patrols in Jakarta and the subak system in Bali exemplify this principle. Nonetheless, this involvement frequently encounters obstacles due to deficiencies in information, particularly within marginalised communities. The media serves as a crucial intermediary between policy and the public, facilitating educational campaigns and conducting investigations that enhance awareness and accountability, aligning with the principles of environmental democracy.

Access to clean water is recognised as a fundamental human right, as stipulated by the constitution and various international legal frameworks, particularly when viewed through the lens of a welfare state. Article 33 of the 1945 Constitution indicates that the state governs the earth, water, and natural resources to maximise the welfare of the populace. In 2010, the United Nations adopted a resolution acknowledging clean water as a fundamental human right (The Human Right to Water and Sanitation, United Nations General Assembly Resolution A/RES/64/292, 2010). The Penta helix collaboration enhances this assurance by employing a comprehensive approach. The PAMSIMAS programme in Indonesia involves village communities constructing water supply systems, with backing from government funding and technological contributions from the private sector. Challenges emerge when policies fail to address the specific needs of vulnerable groups. In India, the construction of large dams frequently overlooks the rights of indigenous communities, which contradicts the principle of free, prior, and informed consent (FPIC) established in international environmental law. This indicates that pentahelix collaboration should be supported by a legal framework designed to safeguard the rights of minorities, as supported by environmental justice theory (Maturbongs, 2017).

The theory of the welfare state highlights the significance of ensuring equal access to resources as a means to mitigate inequality. Effectively managed clean water has the potential to serve as a mechanism for socio-economic redistribution. In South Africa, the water crisis in Cape Town prompted a collaborative effort across multiple sectors to avert "Day Zero" - the point at which the city's water supply would be depleted. The government implemented limitations on water consumption, the private sector contributed desalination technology, and the media initiated the #SaveWater campaign. This initiative effectively preserved the water supply while simultaneously mitigating the potential for social conflict between affluent and disadvantaged communities. This example demonstrates the role of pentahelix collaboration as both a mechanism for conflict resolution and a means of promoting equity, aligning with the principle of social equity within a welfare state (Enqvist, 2019).

Integrating environmental law theory and the welfare state in pentahelix practice presents several challenges that must be critically examined. Conflicts of interest among actors frequently obstruct the potential for synergy. The private sector prioritises economic returns, whereas communities emphasise the importance of ecological sustainability. The expansion of agribusiness in Brazil has posed significant risks to water availability for local communities, leading to protests that frequently went unacknowledged by the government. Secondly, disparities in technical and financial capabilities, particularly in developing nations, hinder the efficacy of collaborative efforts. In Indonesia, numerous areas are deficient in hydrologists and water quality monitoring tools, resulting in policies frequently being formulated without reliable data. Third, inadequate enforcement of environmental laws contributes to the corporate exploitation of water resources, exemplified by the pollution of the Citarum River due to industrial waste (Amelia, 2024). To address these challenges, environmental law theory advocates for enhancing the regulatory framework and the involvement of the public, exemplified by the adoption of pentahelix collaboration that integrates community input in project evaluation. Welfare states highlight the significance of education and empowerment in enhancing environmental literacy, as demonstrated by the effective "Ruimte voor de Rivier" programme in the Netherlands, which integrates engineering with citizen involvement in spatial planning (Rijkswaterstaat, 2025).

The pentahelix collaboration, encompassing the interplay among government, private sector, academia, community, and media, has emerged as a vital framework for managing Indonesia's water resources. This is particularly relevant when considering integrating environmental law theory with principles of the welfare state. Indonesia, characterised by its significant water resources yet susceptible to ecological challenges, encounters intricate

issues, including river pollution, drought, and conflicts over water access. The theory of environmental law, as outlined in Law No. 32 of 2009 concerning Environmental Protection and Management and Law No. 17 of 2019 regarding Water Resources, establishes the principle of the public trust doctrine. This principle asserts that the state is responsible for managing water resources in a manner that serves the public interest. Nonetheless, executing these regulations frequently conflicts with immediate economic priorities, including unsustainable industrial growth. Conversely, the notion of a welfare state is articulated in Article 33 of the Indonesian Constitution, highlighting the importance of state oversight of natural resources to ensure the populace's well-being. The Penta helix collaboration connects these two frameworks, with environmental law offering regulatory instruments and the welfare state guaranteeing social justice in the distribution of resources.

The revitalisation of the Citarum River via the Citarum Harum Program exemplifies the application of the polluter pays principle in environmental law alongside welfare redistribution (Fulazzaky, 2010). The central and local governments launched ecosystem restoration programs, including the Citarum Harum Task Force and implementing industrial waste restrictions as outlined in Presidential Regulation No. 15/2018 and Governor Regulation No. 26/2018. The private sector, exemplified by PT L'Oréal Indonesia, has contributed through Corporate Social Responsibility initiatives, including installing water quality monitoring devices. Concurrently, academic institutions like ITB have been engaged in developing biofilter technology to address domestic waste issues (Institut Teknologi Bandung, 2020). The involvement of the Citarum Care community in river patrols and tree planting exemplifies the principles of environmental democracy. However, the challenges of settlement relocation without sufficient compensation highlight underlying structural inequalities. The investigation conducted by Tempo into bribery cases was pivotal, resulting in the revocation of licenses for 12 factories identified as polluters. Despite a regulatory framework, only 5% of the 1,200 industries in Citarum faced sanctions, highlighting a significant gap in enforcing environmental laws (Tempo.co, 2019).

The Subak system in Bali, recognised as a UNESCO heritage site, embodies the principles of Tri Hita Karana and illustrates a collaborative framework rooted in local wisdom. Despite the safeguards established by Regional Regulation, the conversion of land for tourism poses a significant risk to sustainability, evidenced by the loss of 30% of land in Badung over the past decade. The private sector and academia play a role in advancing irrigation technology and revitalising springs, whereas the media highlights concerns regarding water privatisation and community resistance. The regeneration crisis faced by subak managers highlights the conflict between modernisation and the preservation of traditional practices (Cultural Landscape of Bali Province: The Subak System as a Manifestation of the Tri Hita Karana Philosophy, 2012).

In East Nusa Tenggara, the collaboration among various stakeholders is encountering significant obstacles in tackling the clean water crisis, as evidenced by the fact that 40% of Deep Well projects are currently stalled due to inadequate planning. The private sector is constructing water kiosks and embungs, while academics are advancing AWG (atmospheric water generator) technology. However, research from LIPI indicates that traditional embungs demonstrate greater effectiveness, yet they suffer from insufficient budget support (LIPI, 2021). The Manggarai indigenous community upholds the mamar tradition to safeguard springs, whereas media coverage emphasises the activities of water mafias. Dependence on large projects overlooks the principle of gradual realisation within the welfare state, highlighting the importance of steady and inclusive enhancement of water access.

The construction of the N25 Hotel in Nusa Dua, Bali, exemplifies the complex interplay among economic development, environmental protection, and social justice. The luxury hotel project has faced significant scrutiny from civil society, academics, and ecological activists due to claims of breaching environmental justice principles and disregarding local knowledge. The primary concern involves the filling and reclamation of coastal regions, which significantly affects alterations in coastal ecosystems and diminishes public access to beaches that local fishermen and nearby communities formerly utilised for economic and cultural purposes. This action represents a form of ecological space exclusion that carries significant implications for environmental and social marginalisation, particularly affecting vulnerable groups lacking bargaining power in the decision-making process.

The construction of Hotel N25 reveals deficiencies in the EIA process, particularly regarding transparency and community engagement during the public consultation phase. This situation contrasts Principle 10 of the Rio Declaration and the stipulations outlined in Law No. 32 of 2009 on Environmental Protection and Management. The lack of free, prior, and informed consent (FPIC) from impacted communities indicates a deficiency in the effective execution of substantial participation in environmental governance. The Penta helix collaboration framework reveals that the lack of involvement of local communities and academics in decision-making signifies an imbalance among stakeholders. This situation highlights the predominance of the private sector and the alignment of local governments

with investment interests, which tend to overlook critical aspects of social justice and ecological sustainability. An approach grounded in the welfare state principle necessitates that development prioritises not only economic growth but also the equitable distribution of benefits while mitigating adverse effects on the most vulnerable populations (Baloch et al., 2023).

A comparative analysis of the case of Hotel N25 and the Manila Bay reclamation project in the Philippines can provide deeper insights into these dynamics. The 190-hectare reclamation project in Manila has sparked significant protests due to its potential impact on coastal habitats and the marginalisation of urban fishing communities that historically resided in the region. Nevertheless, a notable distinction lies in the institutional response: The Philippine Supreme Court has mandated the restoration of Manila Bay via the public trust doctrine, which underscores the state's obligation to uphold environmental integrity as a public right. This illustrates the clear articulation of the welfare state principles and environmental law in balancing economic and ecological interests.

The Philippines has experienced increased participation from NGOs, academics, and local communities in strategic litigation and advocacy campaigns within the framework of pentahelix collaboration. This presents an opportunity for Indonesia to enhance participatory mechanisms and improve public oversight. The execution of reclamation and tourism infrastructure development, when conducted without consideration for the sustainability of water resources—such as the disruption of shallow aquifers and natural drainage systems—results in environmental damage and undermines citizens' constitutional rights to a good and healthy environment, as outlined in Article 28H paragraph (1) of the 1945 Constitution.

This case illustrates the local media's passive role, as it predominantly emphasises the economic facets of the project while downplaying its environmental consequences. This suggests a deficiency in the media's ability to uphold transparency and accountability effectively. In the optimal framework of pentahelix collaboration, the press ought to function as a conduit for education and advocacy, effectively uniting community voices with policymakers rather than merely serving as a promoter of development initiatives. The disparity in information intensifies existing knowledge gaps within the community, obstructing the effectiveness of inclusive deliberative processes. The opposition from indigenous communities and environmental organisations to the N25 Hotel project highlights the necessity of reinforcing the legal framework to safeguard the right to living space.

Research has highlighted the significance of maintaining local values like Tri Hita Karana, emphasising the balance between humans, nature, and spirituality (Adityanandana & Gerber, 2019). This insight aligns with the integrative ecological approach that forms the foundation of modern environmental legal justice theory. Nevertheless, the perspectives of academics frequently find themselves sidelined in local legislative processes, which tend to prioritise immediate investment interests. Examining the Hotel N25 case reveals a critical lesson regarding establishing justice-oriented collaborative governance in the context of governance reform. The strengthening of independent environmental audits, multi-stakeholder forums, and community-based complaint mechanisms is essential within the framework of the ecological democracy ecosystem. The polluter pays principle must be consistent, necessitating that developers undertake environmental restoration and provide social compensation for communities impacted by their activities.

The successful integration of welfare state principles and environmental law in tourism development, exemplified by Hotel N25, hinges on the presence of political will to reconcile economic interests with ecological protection and social justice (Brisbois & de Loë, 2016). Pentahelix collaboration transcends mere rhetoric; it necessitates the implementation of policy frameworks that are equitable, transparent, and grounded in environmental rights.

The Philippines is a notable case study illustrating how progressive environmental law safeguards the public interest. The Manila Bay Reclamation Project case that sparked protests in 2023-2024 bore similarities to the N2S Hotel conflict in Bali, yet it exhibited distinct differences in its legal response. The Philippine Supreme Court delivered a significant ruling grounded in the public trust doctrine (Minayo et al., 2023), which posits that the state is the trustee of natural resources, ensuring their preservation for the benefit of current and future generations. The decision annulled a permit for a 190-hectare reclamation project due to its disregard for citizens' constitutional right to a healthy environment and its potential threat to coastal ecosystems (Bernas et al., 2023). The legal framework of the Philippines incorporates Principle 10 of the Rio Declaration via the Philippine Environmental Impact Statement System (PD 1586), mandating community involvement in the Environmental Impact Assessment process. Nonetheless, research conducted by Magno et al. (2024) in the Journal of Environmental Management indicates that participation frequently serves a symbolic purpose attributable to the disparities in technical capacity among fishing communities.

A complex interplay between corporate interests and civil society dynamics characterises the political landscape in the Philippines. The Manila Bay reclamation project received backing from a partnership between developers and local government, which emphasised arguments for economic growth. However, it faced opposition from a diverse coalition that included NGOs such as Oceana Philippines, academics from the University of the Philippines, and investigative media outlets like Rappler. This collaboration effectively mobilised strategic litigation and national campaigns, generating political pressure that compelled the Supreme Court to intervene (Fabinyi et al., 2024). Research conducted by Cruz et al. (2023) in Ocean & Coastal Management indicates that 40% of reclamation projects in the Philippines are advancing through political "backdoors", highlighting the deficiencies in law enforcement in addressing oligarchic networks.

South Africa is a significant example of how welfare state principles can be incorporated into environmental law. The constitution establishes the right to clean water (Article 27) and a healthy environment (Article 24), providing a foundation for citizens to make claims against the state in instances of water scarcity (Mubangizi et al., 2021). The "Day Zero" crisis in Cape Town in 2018, characterised by the near depletion of water supplies due to severe drought, prompted a coordinated response that engaged the government, private sector, academia, communities, and the media. The government implemented stringent limitations on water consumption, capping it at 50 litres per person per day. In response, the private sector, exemplified by Coca-Cola Africa, contributed emergency desalination technology. The university, UCT, also created a real-time monitoring system utilising citizen science (Enqvist et al., 2024). The media significantly influenced the #SaveWater campaign by effectively engaging public participation.

Nonetheless, the political landscape in South Africa is significantly influenced by the enduring legacy of inequality stemming from apartheid. The research conducted by Loftus et al. (2023) in Geoforum indicates that 60% of impoverished communities in Cape Town are excluded from crisis mitigation planning, even though they are the most impacted by such issues. Water allocation exhibits a significant disparity: affluent regions like Constantia receive 300 litres per person per day, whereas the informal settlement of Khayelitsha is limited to just 25 litres (Rodina et al., 2024). The National Water Act (No. 36/1998), which aims to redistribute water resources for social justice, has not been effectively implemented, primarily due to corruption and inadequate state capacity (Mehta et al., 2024). South Africa demonstrates that multisector collaboration achieves effectiveness when supported by a framework emphasising inclusivity and redistribution.

The Netherlands has been at the forefront of combining environmental law, participatory policy, and ecological engineering within the water governance framework. Following the floods of 1993 and 1995, the country transitioned its approach from relying on "defensive dykes" to adopting a strategy of "living with water," exemplified by the Ruimte voor de Rivier (Room for the River/RvR) programme. The Water Act (2009) governs this policy, linking spatial planning with principles of climate adaptation (van Buuren et al., 2024). The co-creation approach in RvR stands out as it involves collaboration among various stakeholders: the central government (Rijkswaterstaat), local governments, NGOs (such as Wetlands International), universities (like TU Delft), and local communities, all of whom contributed to the design of 34 river restoration projects. In Nijmegen, the community actively participated in removing levees and establishing a flood park, which additionally functions as a public space (Edelenbos et al., 2023).

The Netherlands employs a deliberative democracy model in its political framework, utilising autonomous water boards that manage water resources by incorporating stakeholder representation, including farmers, industry, and citizens. The research conducted by van Popering-Verkerk et al. (2024) in Environmental Policy and Governance indicates that this model effectively mitigates conflict by integrating diverse interests. Nonetheless, the Netherlands encountered difficulties: the Marker Wadden project (lake restoration) received criticism for overlooking the perspectives of traditional fishermen (van Staveren et al., 2023). The success of the Dutch approach is founded on three key components: (1) a flexible legal framework that incorporates the most recent climate science, (2) sustainable financing mechanisms such as water taxes and green bonds, and (3) a system of multilevel accountability that ensures collaboration between central and local governments.

Indonesia falls short compared to these three countries in all significant areas. As Law 32 of 2009 outlines, Indonesia's environmental legal framework normatively incorporates the precautionary principle and the polluter pays principle; however, implementing these provisions is notably inadequate. The Philippines features a forward-thinking Supreme Court, and South Africa is characterised by its environmentally-focused constitution; in contrast, law enforcement in Indonesia faces significant challenges due to political influences. Amelia's (2024) study on the pollution of the Citarum River revealed that merely 5% of the industries responsible for the pollution faced penalties due to the manipulation of the legal process by a coalition of business people and officials. Secondly, the collaboration across multiple sectors in Indonesia often appears to be more symbolic than substantive. The AMDAL for Bali's N2S

Hotel was developed without substantial engagement with indigenous communities, which starkly contrasts the models employed by Dutch water boards or the civil society lawsuit in the Philippines. However, Law 6 is present. The 2014 framework on Villages acknowledges the rights of indigenous peoples in resource management; however, it is often overlooked in practical applications (Maturbongs, 2017).

Third, Indonesian policies do not effectively guarantee distributive justice. The water crisis in Nusa Dua illustrates significant disparities similar to those observed in Cape Town: luxury hotels account for 40 per cent of PDAM Badung's water supply, whereas residents in Sawangan village face a lack of access (WALHI Bali, 2025). In contrast to South Africa, which implements redistribution instruments such as the Free Basic Water Policy, Indonesia lacks a water allocation scheme that targets explicitly impoverished populations. Fourth, Indonesia's technocratic approach overlooks the significance of local wisdom. Bali's Subak system, acknowledged by UNESCO as a world heritage site, lacks integration into spatial planning policy. In contrast, the Netherlands has successfully revived the traditional practice of terpen (natural dykes) through the RvR project.

Conclusion

Achieving equitable water resources governance in Indonesia necessitates a robust integration of the welfare state principle alongside Penta helix collaboration. The welfare state principle emphasises that every citizen has a fundamental right to clean water and a healthy environment. Consequently, public policies should be crafted to guarantee equitable distribution of benefits and enhance social protection rather than simply catering to short-term investment interests. Meanwhile, Penta helix collaboration—which involves the government, private sector, academia, civil society, and media—embodies mechanisms for participation and enforcement of accountability, ensuring that each water management policy or project is informed by scientific data, supported by capital and technology, aligned with local aspirations, and subject to public oversight. Insights from the Philippines, South Africa, and the Netherlands indicate that the absence of rigorous enforcement of environmental laws—such as the public trust doctrine, constitutional guarantees of water rights, and multi-stakeholder adaptive frameworks—coupled with a lack of political commitment to promote socio-economic redistribution, significantly heightens the risk of marginalising vulnerable communities and harming ecosystems.

In Indonesia, instances like the restoration of the Citarum River and the potential reclamation projects in Bali illustrate that inadequate regulatory enforcement, restricted technical capacity at the local level, and insufficient participation of indigenous peoples—despite the provisions of the Village Law—impede the achievement of environmental justice. Consequently, enhancing a transparent regulatory framework, enforcing the polluter pays principle with rigorous penalties, building community technical capacity, and acknowledging local knowledge (such as the Subak system in Bali) are essential conditions to ensure that Penta helix collaboration transcends mere rhetoric and effectively yields inclusive, sustainable, and equitable water governance across all societal levels.

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