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RESEARCH PAPER

Mitigating sea-level rise in Indonesia: A policy approach through social protection and sustainable water governance

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Abstract. Sea-level rise constitutes a pressing challenge for Indonesia, a nation acutely vulnerable due to its archipelagic geography. This article employs a normative legal research method to critically examine Indonesia's legal and policy framework for addressing these impacts, with a particular attention to the intersection of social protection and sustainable water governance. The study analyzes the coherence and implementation of key statutes, including Law No. 32 of 2009 on Environmental Protection and Management, Law No. 17 of 2019 on Water Resources, Law No. 24 of 2007 on Disaster Management, and Law No. 40 of 2004 on the National Social Security System, as well as relevant development plans and international commitments. By systematically interpreting these instruments in relation to constitutional mandates and empirical vulnerability data, the analysis reveals persistent fragmentation that undermines Indonesia's adaptive capacity. Specifically, the findings demonstrate a disjunction between social protection and climate adaptation, alongside water governance frameworks that remain under-equipped to address slow-onset hazards such as salinity intrusion, groundwater depletion, and permanent inundation. This gap results in inadequate legal and institutional safeguards for vulnerable coastal populations, including displaced communities and informal workers. Based on these findings, the article argues for the codification of a unified Climate Resilience and Social Protection Law that integrates sustainable water governance. Such a law would embed climate justice and constitutional rights within a cohesive governance framework, ensuring a more equitable and resilient national response to the unprecedented challenges posed by sea-level rise.

Keywords: Sea level rise; Social protection system; Sustainable water governance; Climate displacement

1. Introduction

In recent decades, sea level rise has emerged as one of the most urgent and multidimensional global environmental challenges (Masterson et al., 2024). It is no longer merely an environmental phenomenon, but a systemic threat to sustainable development, state governance, and the fulfillment of fundamental human rights (Beck, 2016). According to data from the United States National Aeronautics and Space Administration (NASA), global sea levels have risen by more than 10 centimeters since 1993, an unprecedented increase within the last 2,500 years (NASA, 2023). The World Economic Forum further estimates that by 2100, over 410 million people will be

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directly affected (ADB, 2014). These facts underscore that sea level rise is not a distant hypothetical risk but a present and accelerating reality with profound social, ecological, and legal implications (Horton et al., 2018).

From a scientific standpoint, sea level rise is conceptually divided into two principal categories: Global Mean Sea Level (GMSL) rise and Relative Sea Level (RSL) rise. GMSL reflects the overall increase in ocean height relative to a fixed terrestrial reference point, whereas RSL accounts for local factors, including land subsidence, tectonic uplift, and groundwater extraction. As Mimura (2013) explains, these distinctions are crucial for policy-making and adaptive responses, given the significant geographical variations in exposure and vulnerability. The classification also holds normative significance in public law, particularly in determining responsibility, regulatory priority, and resource allocation.

The primary drivers of global sea level rise are twofold: the melting of ice sheets in Greenland and Antarctica, and the thermal expansion of seawater due to global warming (Mimura, 2013). The Intergovernmental Panel on Climate Change (IPCC) attributes approximately one-third of global sea level rise since 2004 to ocean warming (IPCC, 2021, 2022, 2023). Furthermore, anthropogenic activities, such as the extraction of groundwater and hydrocarbons, have accelerated local subsidence in coastal urban areas, with Jakarta being a paradigmatic example. This process compounds the effects of global sea level rise by adding localized geological vulnerabilities (Ma'muri et al., 2025).

This phenomenon poses acute legal questions for the modern state, particularly regarding its constitutional and statutory duties to protect the environment and ensure the welfare of its citizens (Polk, 2023). Article 28H (1) of the 1945 Constitution of the Republic of Indonesia guarantees the right to a good and healthy environment. Likewise, Law No. 32 of 2009 on Environmental Protection and Management obligates the State to prevent and mitigate environmental degradation, including that caused by climate-related phenomena. Failure by the State to act effectively in response to rising sea levels, therefore, implicates its responsibilities under national law and may amount to a breach of fundamental rights (Pelengkahu, 2024a).

Indonesia's vulnerability is accentuated by its unique geography (Solehudin, 2024). As an archipelagic State with over 81,000 kilometers of coastline, it is home to approximately 42 million people living in low-lying coastal zones at elevations below 10 meters above sea level (Pelengkahu, 2024a). According to USAID, sea level rise could submerge up to 2,000 of Indonesia's smaller islands by 2050, and by 2100, over 5.9 million people may be exposed to annual coastal flooding (Iffat, 2020). Empirical research has revealed that several inhabited islands, such as Rondo, Berhala, Nipah, Miangas, and Workbondi are experiencing annual reductions in land area due to sea intrusion (Sari & Muslimah, 2014; Rahmadi et al., 2022). Urban centers such as Jakarta and Bekasi face existential threats, with projections indicating that sea level rise combined with land subsidence could result in permanent inundation of vast residential and economic zones (Hsiao, 2023).

These physical threats are paralleled by legal and policy deficiencies. The National Development Planning Agency (Bappenas) has identified critical climate-vulnerable sectors, including coastal areas, agriculture, water resources, and public health (KPPN, 2021). The vulnerability matrix reveals differentiated impacts, with over 1,800 kilometers of Indonesia's coastline categorized as "extremely vulnerable" (ADB, 2022). By 2045, key regions such as Java and Nusa Tenggara are expected to suffer from severe water scarcity, while agricultural output, particularly rice production, is projected to decline by more than 25% in several provinces (Safura & Sekaranom, 2016). Additionally, climate-induced shifts in precipitation and temperature are predicted to exacerbate the incidence of vector-borne diseases, such as dengue, malaria, and pneumonia (Caminade et al., 2019).

These developments raise fundamental concerns regarding the adequacy of Indonesia's social protection system as a legal and policy response to climate risk (Sutiyo, 2023). Although

efforts to develop social safety nets have intensified since the 1997–1998 Asian Financial Crisis, overall coverage remains limited (Knowles et al., 1999). As of 2020, only 27.8% of the population was covered by at least one non-health-related social protection benefit (ILO, 2021). Given the multifaceted nature of climate impacts, ranging from livelihood disruptions to forced displacement, social protection must be reconceptualized as a central pillar of climate adaptation policy. It serves not only as a mechanism of distributive justice, but also as a legal instrument to uphold socio-economic rights in the face of environmental degradation (Loewe & Schüring, 2021).

Despite the legal mandate under Article 34(2) of the Constitution, which requires the State to develop a social security system for all citizens, current regulatory instruments remain fragmented and under-integrated across sectors (Karjoko et al., 2022). This results in limited fiscal space, a lack of interoperability among programs, and institutional inefficiencies that compromise both coverage and effectiveness. Such gaps are particularly consequential for communities inhabiting high-risk coastal zones that often lack the resources needed for autonomous adaptation (Mursyid et al., 2021).

In view of the above, there is an urgent legal and policy imperative to develop an integrated framework that synchronizes climate change mitigation, sustainable water management, and social protection. Such a framework should be grounded in the principles of environmental justice, intergenerational equity, and resilience governance. The intersection of environmental vulnerability and socio-economic inequality must be addressed through legal reforms that empower adaptive institutions and uphold constitutional rights in the Anthropocene (Wienhues, 2020). Without such a paradigm shift, the sea will not only erode our coasts, but also the foundations of legal certainty, social solidarity, and ecological citizenship.

2. Materials and methods

This study employs a normative legal research method grounded in constitutional interpretation, statutory analysis, and policy evaluation, enriched by an interdisciplinary orientation that integrates insights from environmental science, development planning, and human rights law. The normative approach is adopted to critically assess the coherence, adequacy, and responsiveness of Indonesia's legal and policy instruments in addressing the multifaceted risks posed by sea-level rise, with particular attention to their integration with social protection systems and sustainable water governance. The selection of legal frameworks was based on their direct relevance to climate adaptation, social protection, and water management. At the constitutional level, the study focuses on Article 28H (1) and Article 34(2) of the 1945 Constitution, which establish the right to a healthy environment and the state's obligation to provide social security. At the statutory level, it examines Law No. 32 of 2009 on Environmental Protection and Management, Law No. 17 of 2019 on Water Resources, Law No. 24 of 2007 on Disaster Management, and Law No. 40 of 2004 on the National Social Security System. Policy instruments such as the National Medium-Term Development Plan (RPJMN) and the National Action Plan for Climate Change Adaptation (RAN-API) are evaluated.

In addition, the study incorporates Indonesia's international commitments under the Paris Agreement, the Sendai Framework, and the Sustainable Development Goals. The analysis proceeds by interpreting these instruments doctrinally and systematically to assess their normative structure, legal intent, and operational effectiveness in safeguarding vulnerable communities. Integration between social protection and water governance is assessed by mapping cross-references, overlaps, and gaps across these frameworks, and by evaluating whether mandates for coordination, funding, and institutional responsibility are clearly defined. This doctrinal analysis is complemented by a contextual method that incorporates empirical evidence, including climate modeling from IPCC reports, spatial vulnerability assessments from Bappenas and BNPB, and demographic exposure data from Statistics Indonesia (BPS). These datasets situate normative claims within the actual conditions of ecological vulnerability and institutional capacity. Through triangulation of legal interpretation and empirical context, this

methodology enables a comprehensive critique of fragmentation and institutional gaps within Indonesia's adaptive governance. It also provides a normative foundation for recommending the codification of a unified Climate Resilience and Social Protection Law. Overall, this approach reflects both legal rigor and interdisciplinary relevance, ensuring that the analysis is doctrinally grounded while responsive to the complex realities of governance in the Anthropocene.

3. Result and discussion

3.1. The implication of sea level rise on the fulfillment of social protection in Indonesia

The impact of sea level rise has caused extensive damage and disruption across various aspects of human life. The social dimensions of this crisis, such as gender, age, and indigenous ethnicity, interact dynamically with climate-related events, while the resulting transformations in natural and cultural landscapes have led to an often irreversible erosion of historical and cultural identity (Putri et al., 2021). Climate change has also radically altered natural physical environments, including glacial retreat and rising seas, posing serious legal and policy implications for the protection of cultural and social rights (Dasgupta et al., 2007). The consequences of sea level rise are evident globally and regionally through spatial transformations, land degradation, subsidence, and escalating ecological disasters (Shivanna, 2022).

Indonesia, with more than 81,000 kilometers of coastline and approximately 42 million inhabitants living in low-lying coastal zones at elevations under 10 meters above sea level, ranks fifth globally in terms of population exposure to the slow-onset disaster of rising seas (ADB, 2021; World Bank, 2025). Projections estimate that by 2050, Indonesia may lose approximately 2,000 small islands, with up to 5.9 million people affected by annual coastal flooding by 2100 (ADB, 2021; Bappenas, 2021; World Bank, 2025). A one-meter rise in sea level could inundate 405,000 hectares of land, shrinking Indonesia's territorial integrity and submerging its smaller islands (ADB, 2021).

Purba and Rahmad (2021) documented land losses across several inhabited islands; Pulau Rondo in Aceh loses 1,856 m^2 annually due to a 1.3 mm/year sea level rise; Pulau Berhala and Pulau Nipah, both in the Strait of Malacca, record annual land loss of 3,178 m^2 and 3,409 m^2, respectively, due to sea level increases of over 3.4 mm/year (Rahmadi et al., 2022). In the past decade, land degradation in West Java has reached approximately 0.05–0.09 km^2 annually, equivalent to the size of 13 football fields. Pulau Miangas has lost 0.02% of its landmass yearly since 2004, while Pulau Sekatung in the Riau Islands has experienced a 0.66% annual loss (Purba & Rahmad, 2021). Similar risks are observed in Papua's northern coast and Java's southern islands, where small islands such as Candikian and Gosong are nearly submerged, and Pulau Biawak is losing land each year equivalent to half the area of Vatican City each year (Purba & Rahmad, 2021). Pulau Miangas and Pulau Sekatung have been losing land at annual rates of 0.02% and 0.66% respectively, and similar erosion threatens small islands from Papua's northern coast to Java's southern waters, where Candikian and Gosong are nearly submerged, and Pulau Biawak continues to shrink each year significantly

Densely populated regions like Jakarta and Bekasi face high vulnerability. A 50 cm rise in sea level, coupled with subsidence in Jakarta Bay, could permanently inundate these areas, affecting up to 270,000 people (ADB, 2021). Indonesia's coastline is also home to mangrove forests and coastal woodlands that are now under threat of flooding and salinization (ADB, 2022). Indonesia's 2020–2024 National Mid-Term Development Plan recognizes the increasing frequency and severity of hydro-meteorological disasters (Bappenas, 2021). Between 2016 and 2018, approximately 3,000 coastal villages experienced flooding (PDSI Pusdatinkom BNPB, 2024). Seasonal rainfall fluctuations and annual sea level rise are expected to exacerbate the intensity of coastal disasters (Dong et al., 2024). Bappenas has identified critical sectors at risk (see Table 1) and has prioritized response strategies accordingly (KPPN, 2021).

These sectoral projections, while grounded in empirical and scientific modelling, demand stronger legal accountability and more adaptive institutional responses. From a legal perspective,

Table 1. Climate hazard sectors in Indonesia

Sector	Projected Hazards Description
Marine and Coastal	The Ministry of National Development Planning (Bappenas) projects that by 2045, wave heights will increase across nearly all Indonesian waters, covering an area of approximately 5.8 million km^2. This poses a significant risk, particularly for vessels with a capacity of less than 10 Gross Tonnage (GT). Additionally, Indonesia's coastal zone, stretching around 102,000 kilometers, exhibits varying degrees of vulnerability, with an estimated 1,800 kilometers classified as highly vulnerable.
Water sector	By 2045, water availability is projected to decline across Java and the Nusa Tenggara region, potentially reaching levels of extreme drought. Currently, the average annual reduction in water availability is approximately 439.21 m^3 per capita in Java and 1,654.82 m^3 per capita in East Nusa Tenggara.
Agriculture sector	Agricultural output, particularly rice production, is expected to decline significantly, with projected losses exceeding 25% in the provinces of Gorontalo, Maluku, and North Maluku by 2045.
Health sector	Bappenas projects a significant increase in dengue fever (DF) cases in major Indonesian cities, including Kupang, Bali, Semarang, Ambon, Kolaka, Pekanbaru, Banjarmasin, Palembang, Banjarbaru, and Tarakan. This trend is associated with anomalies in rainfall and temperature patterns. In addition, a rise is also projected in malaria and pneumonia cases across various regions in Indonesia.

Source: KPPN (2021).

the cumulative and systemic nature of climate impacts necessitates a reconfiguration of the State's social protection mechanisms. While Article 34(2) of the 1945 Constitution mandates the establishment of a comprehensive social security system, current schemes remain fragmented and limited in scope. Indonesia's social protection infrastructure, largely designed for poverty reduction and short-term shocks, has yet to integrate climate risk as a core component.

As depicted in Figure 1, the architecture of social protection in Indonesia spans multiple ministries and institutions, including the Ministry of Social Affairs (Kemensos), the Social Security

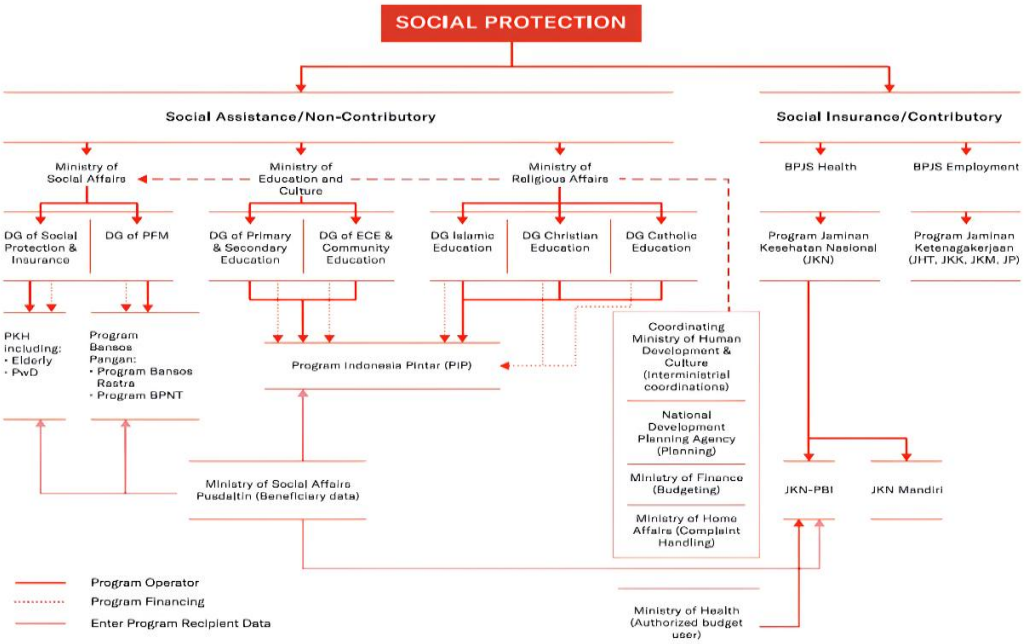

Figure 1. Institutional framework of social protection governance in Indonesia (Sources: World Bank Indonesia, 2020)

Administering Bodies (BPJS Kesehatan and BPJS Ketenagakerjaan), the National Development Planning Agency (Bappenas), and regional governments. However, this fragmented arrangement hinders coordinated climate adaptation, especially in high-risk coastal zones where institutional capacity is weakest (World Bank Indonesia, 2020). The absence of a unified, climate-informed protection system limits the State's ability to proactively address structural vulnerabilities exposed by sea level rise.

Moreover, the uneven spatial distribution of climate impacts introduces a challenge of adaptive equity: regions most affected by sea level rise often lack institutional capacity, infrastructure, or fiscal resources to implement localized adaptation measures. For instance, the sinking of Jakarta, potentially one of the world's first capitals to become uninhabitable due to sea level rise, demonstrates that climate impacts are no longer abstract but materially disruptive to governance, the economy, and the rule of law (Gilmartin, 2019). The intersection between sea level rise and social protection is also visible in projected labor displacement and forced migration. Studies suggest that climate-induced migration in Indonesia will have the largest GDP impact in Asia (Pycroft et al., 2016). Migrant flows triggered by land loss and salinization are expected to intensify urban congestion, raise housing and welfare costs, and strain national labor markets (Institute for International Law of Peace and Armed Conflict, 2021). Recurrent flooding in urban centers such as Jakarta, Bandung, and Medan further underscores the need for anticipatory and inclusive legal frameworks that secure both mobility rights and access to basic services (ADB, 2022).

In the labor sector, flooding disrupts agricultural cycles, destroys fisheries and plantations, and increases occupational hazards, particularly for informal and low-income workers (ILO, 2021). The destruction of factories in flood-prone zones has led to layoffs and temporary wage losses. Agricultural workers often face long-term income disruptions due to salinization and the destruction of arable land, conditions that are costly to rehabilitate post-disaster. These cascading risks reveal critical gaps in Indonesia's social protection regime, particularly in terms of adaptive coverage, accessibility, and sustainability. Finally, the weakening of food security due to climate-induced disruptions in agricultural output, especially rice production, constitutes not only an economic crisis, but also a legal failure to protect fundamental rights to food, livelihood, and welfare.

As such, the legal framework must evolve from a reactive model to a resilience-based model of social protection that explicitly integrates environmental vulnerability as a structural determinant of social risk. Accordingly, sea level rise not only poses a long-term environmental and economic threat but also exposes fundamental legal and institutional deficiencies in Indonesia's current social protection. If left unaddressed, these gaps may constitute a breach of the State's constitutional obligation to protect vulnerable populations under Article 34 (2) of the 1945 Constitution. Therefore, a paradigm shift toward a climate-responsive, rights-based social protection system is not merely preferable, but legally imperative in safeguarding the dignity, security, and adaptive capacity of Indonesia's coastal and at-risk communities.

3.2. Legal and policy instruments in responding to the climate change threat

Indonesia's legal and policy architecture for responding to climate change, particularly in the context of rising sea levels, is deeply embedded in a multi-layered framework that interweaves constitutional imperatives, statutory mandates, development planning instruments, and international commitments (Rahmadi et al., 2022). This framework reflects both the State's normative obligations of its strategic efforts to balance environmental sustainability, socio-economic equity, and institutional resilience (Busch, 2021). At the constitutional level, the 1945 Constitution of the Republic of Indonesia serves as the foundational legal document mandating environmental protection and social welfare. Article 28H (1) establishes the right of every citizen to "live in physical and spiritual prosperity, to have a good and healthy environment, and to receive medical care" (Pelengkahu & Satria, 2023). Simultaneously, Article 34(2) obliges the State

to develop a system of social security for all citizens, thereby anchoring the legal responsibility to protect individuals from social and economic vulnerability, including that induced by environmental degradation (Oral, 2024; Pelengkahu & Satria, 2023).

These constitutional provisions not only provide the moral basis for public policy but also operate as legally enforceable obligations that guide statutory interpretation and programmatic implementation (Handayani, 2013). From a statutory perspective, Indonesia has adopted a suite of sectoral legislations intended to address various dimensions of climate vulnerability. Law No. 32 of 2009 on Environmental Protection and Management (UU PPLH) plays a pivotal role in establishing the legal foundations of climate adaptation (Pelengkahu & Satria, 2023). The statute mandates environmental preservation, incorporates the precautionary principle, and requires environmental risk assessments as integral components of development planning. Under this law, the government is obligated to integrate anticipated climate-related impacts, including sea level rise, into environmental management and the environmental permitting process (Pelengkahu, 2024b).

Law No. 17 of 2019 on Water Resources is another critical instrument, particularly in the context of coastal inundation and freshwater salinization caused by rising sea levels. The statute reaffirms the public nature of water and mandates its allocation based on principles of equity, sustainability, and conservation. In the context of sea level rise, these provisions imply a legal duty to preserve and restore water quality in coastal and island communities, many of which face the threat of permanent inundation and the loss of potable water sources (Griggs & Reguero, 2021). The statute also recognizes community-based water governance mechanisms, which are particularly vital for adapting to climate-induced water scarcity. Further statutory support is provided by Law No. 24 of 2007 on Disaster Management, which incorporates disaster risk reduction (DRR) (Article 5-6) as a mandatory component of national and regional development strategies. This law obligates both central and regional governments to integrate disaster risk assessments into spatial planning and to implement adaptive measures in disaster-prone areas. With sea level rise increasingly recognized as a slow-onset disaster, the failure to incorporate climate risk data into spatial and urban planning would constitute a breach of this statutory obligation.

Complementing the legislative regime is Indonesia's development planning apparatus, most notably the National Medium-Term Development Plan (RPJMN) 2020–2024. This plan explicitly prioritizes climate resilience, outlining cross-sectoral measures including integrated coastal zone management, climate-resilient agriculture, infrastructure retrofitting, and social protection reform. The RPJMN envisions a mainstreaming of climate risk across all ministries and regions, although its operationalization remains contingent upon political coordination and fiscal commitment. In addition, elaborating this policy direction is the National Action Plan on Climate Change Adaptation (Rencana Aksi Nasional Adaptasi Perubahan Iklim–RAN-API), which provides a multi-sectoral adaptation framework encompassing the water, health, agriculture, and urban planning sectors (Bappenas, 2019b).

RAN-API emphasizes vulnerability assessments, resilience indicators, and adaptive capacity-building at both the community and institutional levels. Despite its comprehensiveness, the implementation of RAN-API has encountered persistent obstacles, including institutional silos, overlapping mandates, and insufficient cross-sectoral data integration (Bappenas, 2019b). Institutionally, the Bappenas is charged with leading and coordinating the national climate adaptation agenda. Through the Low Carbon Development Initiative (LCDI), Bappenas promotes the integration of emissions reduction, climate resilience, and inclusive growth into the national development strategy (Bappenas, 2019a). The LCDI is intended not only to fulfill Indonesia's climate obligations but also to serve as a platform for mobilizing climate finance and encouraging public-private partnerships.

Additionally, Bappenas has developed the social protection strategic response framework, which identifies vulnerable groups at greatest risk from climate-related shocks, including coastal communities, informal workers, and low-income households, and calls for the development of adaptive social protection systems. This framework recognizes that climate resilience cannot be achieved without strengthening the socio-economic safety nets that underpin livelihood security, mobility, and access to essential public services during periods of environmental stress. Indonesia's legal framework is further shaped by its international commitments, particularly under the 2015 Paris Agreement. As a ratifying party, Indonesia is bound by its Nationally Determined Contributions (NDCs), which outline both mitigation and adaptation targets. Notably, the adaptation component identifies sea level rise as a critical national threat and prioritizes coastal protection, integrated water resources management, and community-based adaptation (Pelengkahu & Pratama, 2024). The NDCs, therefore, provide both normative guidance and an international accountability mechanism that reinforces the domestic legal imperative to act.

Beyond the Paris Agreement, Indonesia is also bound by the Sendai Framework for Disaster Risk Reduction, the Sustainable Development Goals (SDGs), and other multilateral environmental agreements that mandate proactive governance of environmental and social risks. Collectively, these instruments reinforce principles of precaution, participation, and equity, which must guide national and local responses to rising sea levels (Pelengkahu, 2024a). Despite this comprehensive architecture, substantial legal and institutional gaps persist. Foremost is the absence of a unified legal instrument that harmonizes social protection, disaster risk management, and environmental governance into a single climate adaptation framework. Current arrangements are fragmented across ministries, agencies, and legal regimes, leading to inconsistencies in implementation, inefficiencies in resource allocation, and uncertainty regarding jurisdictional responsibilities. In particular, programs related to relocation, income restoration, and infrastructure adaptation are often reactive, underfunded, and delivered on an ad hoc basis.

3.3. Policy strategies for addressing sea-level rise in Indonesia through the social protection system and sustainable water governance

According to Siagian et al. (2022), the success of a nation in addressing the accelerating effects of climate change, particularly those manifesting as rising sea levels, depends on policymakers' ability to identify emerging challenges and translate them into effective preventive and mitigative strategies. This approach requires foresight, legal consistency, and strong administrative coordination to anticipate risk and reduce vulnerability across sectors. By 2045, when Indonesia marks a century of independence, the government aims to achieve high-income status and eliminate extreme poverty.

Toward this goal, the Ministry of National Development Planning has outlined the Vision of Indonesia 2045, which is structured around four foundational pillars: (i) Human Development and Mastery of Science and Technology; (ii) Sustainable Economic Development; (iii) Equitable Development; and (iv) National Resilience and Good Governance (Muhyiddin, 2019). Among these, Pillars II and IV are directly relevant to climate mitigation and social protection because they emphasize the importance of safeguarding workers' rights, providing recovery support during climate-related crises, and ensuring that all segments of society, including informal, gig-based, and non-wage workers, are accounted for within an equitable development model. As such, social protection becomes not only an economic instrument but also a constitutional commitment. Consequently, social protection has emerged as a critical policy tool in many low- and middle-income countries.

According to the International Labor Organization (ILO) World Social Protection Report 2020–2022, only 47% of the global population is effectively covered by at least one form of social protection benefit. This leaves approximately 4.1 billion people, 53% of the global population, excluded from any national protection system (ILO, 2021). Coverage disparities are particularly stark across regions. Europe and Central Asia have the highest average coverage at approximately

84%, followed by the Americas with 64.3% (SESRIC, 2024). By contrast, Southeast and East Asia register 44%, Arab States and West Asia around 40%, and Sub-Saharan Africa the lowest at 17.4% (SESRIC, 2024). These disparities reveal both global inequities and domestic institutional weaknesses in extending protection to the most vulnerable.

Loewe and Schüring (2021) identify several structural factors that limit the reach and efficacy of social protection systems, including the absence of intersectoral policy coherence, institutional fragmentation, duplicative administration, corruption, and irrational budget prioritization. Expanding on this, Hickey & Seekings (2017)argue that since the early 2000s, social protection has evolved into a global policy imperative intersecting economic, political, social, and environmental agendas.

Today, social protection functions as a multifaceted instrument capable of generating broad benefits (Yokobori et al., 2023). It supports public health, facilitates educational access, promotes social equity, and enhances sustainable economic development. It can also help regulate migration and uphold core rights enshrined in both domestic and international law. Importantly, its benefits extend beyond national borders, reinforcing global resilience through shared social and environmental goals. As defined by the ILO, social protection encompasses a wide array of policies and programs designed to reduce and prevent poverty, vulnerability, and social exclusion across the life course(ILO, 2021).

These include: child and family benefits; maternity protection; unemployment support; employment injury benefits; sickness benefits; medical care; old-age pensions; disability benefits; and survivor benefits. Social protection systems typically rely on a blend of contributory (insurance-based) and non-contributory (tax-funded) mechanisms. Contributory schemes are often supported by general tax revenue to ensure broader coverage and financial sustainability. Non-contributory schemes may be universal, categorical, or means-tested. Additionally, social protection can be augmented by active labor market policies, such as public employment programs (e.g., cash-for-work, food-for-work) and vocational training services that help affected workers reintegrate into or adapt to new employment contexts.

In Indonesia, the scope and depth of social protection remain insufficient. As of 2020, only 27.8% of the population received at least one form of non-health-related social protection benefit (OECD, 2019). While poverty levels have declined, economic inequality has worsened, with the Gini coefficient increasing from 0.30 in 2000 to 0.38 in 2019 (ADB, 2021). These trends suggest that social protection has not kept pace with demographic or economic shifts. Historically, Indonesia began institutionalizing social protection in the aftermath of the 1997-1998 Asian Financial Crisis, leading to incremental reforms under successive administrations since 2004 (Basri, 2018). Article 34(2) of the 1945 Constitution mandates the state to develop a comprehensive social security system for all citizens, providing a firm legal foundation for its expansion.

However, overlapping programs, limited coverage for informal workers, and jurisdictional fragmentation have impeded the system-wide integration. In this context, the integration of social protection with climate adaptation, particularly with water governance, is crucial. Sea level rise not only damages land and infrastructure but also displaces communities, exacerbates poverty, and disrupts livelihoods (IPCC, 2023). Hence, adaptive social protection must incorporate support for at-risk coastal populations, disaster-induced migrants, and climate-displaced workers. Programs must include relocation subsidies, livelihood transition support, public employment guarantees in affected regions, and access to financial services for rebuilding after flooding or salinization events.

These schemes must also address employment injury and sickness benefits for workers affected by climate-induced hazards. Furthermore, the linkages between social protection and sustainable water governance must be institutionalized. Rising sea levels lead to salinization of groundwater, threatening freshwater availability in coastal zones. By coupling social assistance

with sustainable water infrastructure, e.g., desalination projects, equitable water distribution systems, and flood mitigation technologies, policymakers can build holistic resilience strategies. To do so, legal and institutional reforms must be implemented. This includes harmonizing disaster management, water resource governance, and social welfare laws under a comprehensive climate adaptation framework.

Institutional coordination between Bappenas, the Ministry of Social Affairs, the Ministry of Public Works and Housing, and local governments is vital. Financing mechanisms must also be diversified, including through climate adaptation funds, green bonds, and public-private partnerships. Crucially, social protection and water governance must be situated within a constitutional and rights-based legal framework. The Indonesian Constitution, as noted, guarantees the right to a healthy environment and to social security. These are not discretionary policy goals but binding state obligations. Therefore, strategies to address sea level rise must be formulated and implemented in ways that uphold these rights, rather than treating them as secondary to economic development.

There is also a growing recognition that climate adaptation requires the active participation of local communities, particularly those most vulnerable to coastal hazards. Community-based adaptation programs, participatory risk assessments, and local capacity building initiatives can enhance the effectiveness and legitimacy of national strategies. These approaches help ensure that solutions are context-specific, culturally sensitive, and socially inclusive. Moreover, demographic analysis must inform policy design. For example, women, children, older persons, and persons with disabilities often face disproportionate risks during displacement and natural disasters. Therefore, social protection systems must be gender-responsive and disability-inclusive, offering tailored support services and ensuring non-discrimination in access to assistance.

Labor markets will also require adaptation. Coastal industries, including fisheries, tourism, and agriculture, are likely to experience significant disruption due to sea level rise. Policymakers should anticipate these trends by investing in workforce reskilling, climate-resilient livelihoods, and green jobs. Vocational training programs should target populations at risk of economic displacement, while public employment schemes can serve as stabilizing mechanisms during transitional periods. Finally, data and technology should be leveraged to strengthen adaptive governance. Geographic Information Systems (GIS), remote sensing, and predictive modeling can improve hazard mapping, vulnerability assessments, and early warning systems.

These tools support more efficient targeting of social assistance and enhance coordination across government agencies. Building resilience to sea level rise in Indonesia will require more than technical fixes; it demands a fundamental reorientation of the legal and institutional architecture governing social protection and environmental management. By grounding adaptation strategies in constitutional mandates, integrating cross-sectoral policies, and investing in inclusive, evidence-based programs, Indonesia can confront the rising tides with equity, dignity, and legal integrity.

4. Conclusion

This analysis has demonstrated that Indonesia's response to sea level rise must transcend fragmented policies and evolve into an integrated national strategy grounded in constitutional obligations, climate justice, and institutional coherence. The country's long-term development vision, Vision Indonesia 2045, provides both a legal and strategic foundation for such a transition, particularly through Pillars II and IV, which emphasize sustainable and equitable development. Within this framework, social protection and water governance, when aligned and reinforced, can serve as dual pillars of climate resilience, simultaneously safeguarding vulnerable communities and advancing socio-economic progress. To ensure an effective and lawful response, Indonesia must urgently draft and enact legislation that explicitly integrates climate adaptation, social protection, and water governance into a unified legal framework. Such legislation should mandate inter-ministerial coordination, establish clear institutional responsibilities, and ensure fiscal

sustainability. Alongside this, climate-responsive social protection mechanisms are needed to address the unique vulnerabilities of coastal communities. These should include relocation support, livelihood recovery programs, and guaranteed access to healthcare and education during displacement, thereby preserving both dignity and resilience.

Strengthening decentralized water governance is equally crucial. Local governments require technical assistance, budgetary support, and community-based water management systems to effectively manage water-related climate risks. At the same time, the state must invest in data-driven policymaking, including climate risk mapping and socio-economic vulnerability assessments. Such investments would allow interventions to be more targeted, improve forecasting, and facilitate the monitoring of long-term impacts. Institutional reform also remains indispensable. Existing social protection schemes must be rationalized to eliminate overlaps, broaden coverage, and increase accessibility for informal and marginalized workers. Beyond domestic measures, international cooperation is vital. Indonesia should mobilize support through climate finance mechanisms, South-South collaboration, and multilateral frameworks to strengthen adaptive capacity and accelerate institutional reform. In conclusion, the convergence of social protection and sustainable water management in addressing sea level rise is not only a pragmatic innovation but also a constitutional and moral imperative. Only through a coherent, legally grounded, and equity-focused response can Indonesia safeguard the rights, dignity, and future of its people in the face of this unprecedented environmental challenge.

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