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Analysis of Vegetation Cover Fulfillment Strategy towards Achieving Land Quality Index in Bontang City

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Abstract

This study aims to analyze the relationship between vegetation cover, the Land Quality Index (LQI), and governance dynamics in flood management in Bontang City. The study emphasizes that environmental degradation, particularly declining vegetation cover and land quality, is closely related to governance effectiveness and regional policy implementation in managing flood risks. A descriptive qualitative approach was employed to examine institutional coordination, governance processes, and policy dynamics influencing flood management. Data were collected through interviews, observations, and documentation involving government agencies, environmental stakeholders, and community actors, and were analyzed using the Miles and Huberman interactive analysis model through data reduction, data presentation, and conclusion drawing. The findings indicate that decreasing vegetation cover and declining land quality significantly contribute to increasing flood vulnerability in Bontang City. However, flood management challenges are not solely environmental issues but are also shaped by fragmented governance structures, weak institutional coordination, overlapping authority, and inconsistent policy priorities among stakeholders. The study further reveals that the stagnation of the Draft Regional Regulation on Flood Management reflects broader governance constraints that hinder the effectiveness of regional flood mitigation policies. These conditions demonstrate that environmental management and governance capacity are closely interconnected in determining the sustainability of flood management strategies. This study contributes to the discourse on environmental governance and disaster management by highlighting how ecological degradation and institutional governance problems interact within regional flood management processes. The findings suggest that strengthening collaborative governance, institutional integration, and policy coordination is essential to support more effective and sustainable flood management in Bontang City.

Keywords: *Vegetation Cover Management 1, Land Quality Index 2, Stakeholder Engagement 3,*

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INTRODUCTION

Land quality has become an increasingly critical issue in contemporary environmental governance, particularly in urban areas experiencing rapid spatial transformation and ecological pressure. As cities expand, the demand for infrastructure, housing, and industrial activities often competes with the need to preserve ecological balance through adequate vegetation cover. Vegetation plays a fundamental role in stabilizing soil structure, regulating hydrological cycles, enhancing biodiversity, and mitigating environmental degradation. In Indonesia, one of the key frameworks used to measure environmental sustainability at the local level is the Land Quality Index (Indeks Kualitas Lahan or IKL), which serves as a performance indicator for regional governments in managing land-based environmental components. Bontang City, characterized by its industrial-driven economic activities and diverse ecological zones, faces particular challenges in maintaining optimal levels of vegetation cover required to achieve targeted IKL standards. Understanding the strategies for fulfilling vegetation cover in this context is essential to ensure sustainable urban development and to support policy interventions that strengthen the ecological resilience of the region.

Bontang City, located in East Kalimantan, is known as a strategic industrial hub with significant contributions from the energy and petrochemical sectors. The economic dynamism of the city, while beneficial for local and national development, has resulted in increasing pressure on land resources. Industrial expansion, urban settlement growth, and land clearing have contributed to a gradual decline in vegetation cover across several areas (Richards & Belcher, 2019; J. Wang et al., 2018). This decline threatens the city's ecological stability by increasing the risks of soil degradation, erosion, declining water infiltration capacity, and loss of habitat for local flora and fauna. Recognizing these risks, the local government has committed to achieving national targets, which require cities and regions to maintain specific vegetation cover thresholds as part of broader environmental quality metrics. However, achieving these targets is not merely a technical environmental task; it demands careful planning, coordinated governance, and strategic interventions that incorporate ecological, social, and economic considerations.

The Land Quality Index is a composite environmental indicator that evaluates the condition and sustainability of land resources through parameters such as vegetation cover, erosion levels, land use patterns, and soil fertility (De Laurentiis et al., 2019; Zambon et al., 2017). Its application encourages local governments to monitor land conditions systematically and implement policies that prevent further degradation. Within this analytical framework, vegetation cover emerges as one of the most significant parameters due to its direct influence on land stability and ecological function. Adequate vegetation cover ensures that land surfaces remain protected from external pressures such as rainfall intensity, pollution, and human extraction activities. It also enhances the city's capacity to adapt to climate change impacts, including rising temperatures and extreme weather events. Therefore, analyzing strategies for fulfilling vegetation cover is strategically important, as it aligns environmental protection goals with sustainable urban planning and community-based initiatives.

In Bontang City, the challenge of meeting vegetation cover requirements is multifaceted. The city's spatial planning patterns show a considerable portion of land allocated for industrial zones, which inherently limits the space available for natural vegetation. Additionally, areas surrounding industrial sites often experience secondary impacts, such as declining soil quality and reduced vegetation diversity due to exposure to chemical emissions and mechanical disturbances. Urban settlement growth also contributes to the reduction of green spaces, as residential development frequently replaces previously vegetated land. The tendency of urban communities to prioritize built-up areas over green landscapes further exacerbates the reduction in vegetation cover. In this context, the local government must develop strategies that balance economic needs with ecological sustainability, ensuring that industrial and urban growth does not undermine long-term environmental health (Arslan et al., 2022; Maes et al., 2019; Uwaga Monica Adanma & Emmanuel Olurotimi Ogunbiyi, 2024).

Strategic interventions aimed at fulfilling vegetation cover can take multiple forms. These include regulatory approaches such as enforcing green open space requirements, restoring degraded land through reforestation or rehabilitation programs, and strengthening land-use control to prevent unauthorized land clearing. In addition, the city can adopt innovative strategies like integrating green infrastructure into urban design, promoting vertical and horizontal greening systems, and incentivizing community-based vegetation initiatives through urban farming and neighborhood greening programs. Such strategies align with sustainable development principles and provide opportunities for citizen engagement in environmental stewardship (Caputo et al., 2023). In Bontang, community participation is particularly vital, as local groups, schools, and non-governmental organizations have increasingly shown interest in contributing to environmental preservation efforts. Their involvement can significantly support the government's objectives in expanding vegetation cover in densely populated and industrially dominated areas.

Another important dimension in analyzing vegetation cover fulfillment strategies is the role of inter-sectoral collaboration (Bakhtiari et al., 2022; Bezerra & Guerriero, 2019; Herdiana et al., 2018). The success of environmental management, especially in a complex urban-industrial landscape like Bontang, depends on the coordination between government agencies, private industries, and local communities. Industries operating within the city are required to comply with environmental regulations, including the provision and maintenance of green buffers around industrial zones. Furthermore, corporate social responsibility (CSR) programs can be leveraged to support large-scale greening initiatives, provide resources for land rehabilitation, and improve public awareness regarding the importance of vegetation cover for environmental and public health. Collaboration at this level ensures that vegetation fulfillment is not seen merely as a government mandate but as a shared responsibility across sectors.

Scientific and technological advancements also offer valuable tools for supporting the achievement of targets. Remote sensing technology, GIS-based land monitoring systems, and drone-assisted mapping can provide accurate data on vegetation distribution, density, and changes over time. These tools help

policymakers identify priority areas for intervention, evaluate the effectiveness of implemented programs, and optimize land management strategies (Dunnett et al., 2018; Salvia et al., 2021). For Bontang City, enhancing data accuracy is crucial, especially given the environmental risks associated with industrial activities. High-quality data enables early detection of land degradation and supports timely policy responses. The integration of technology in monitoring vegetation cover also strengthens transparency and accountability in environmental governance, contributing to the credibility and consistency of reporting processes.

Considering the strategic importance of vegetation cover in environmental sustainability, achieving targets in Bontang requires a comprehensive understanding of existing challenges, potential opportunities, and strategic pathways. This research aims to analyze the strategies that can be effectively implemented to fulfill vegetation cover requirements in Bontang City, emphasizing the alignment between policy objectives and ecological conditions. The study explores how government policies, community initiatives, technological tools, and inter-sectoral collaboration can collectively contribute to improving the city's vegetation cover and enhancing land quality. By examining the interplay of ecological, social, and institutional factors, this research provides valuable insights for policymakers, environmental practitioners, and stakeholders seeking to strengthen land quality management in rapidly developing urban regions (Adeyinka Alex Bansa et al., 2023; Patel & Raval, 2024).

Ultimately, this research underscores the importance of adopting an integrated approach to vegetation cover fulfillment. Achieving targets is not a one-time effort but an ongoing process that requires sustainable planning, adequate funding, continuous monitoring, and active participation from all sectors of society. As Bontang City continues to evolve as an industrial and urban center, ensuring environmental sustainability must remain a central priority. Strategies that strengthen vegetation cover contribute not only to land quality but also to broader goals such as climate mitigation, biodiversity conservation, public health, and community well-being. Therefore, analyzing and implementing effective vegetation fulfillment strategies is essential for creating a balanced and sustainable future for Bontang City.

RESEARCH METHOD

This study employed a descriptive qualitative approach to analyze the institutional, political, and administrative dynamics underlying the stagnation of the Draft Regional Regulation on Flood Management in Bontang City. A qualitative approach was considered appropriate because the study focuses on understanding governance processes, actor interactions, and policy coordination dynamics that cannot be fully explained through quantitative or GIS-based approaches. Informants were selected purposively based on their involvement and knowledge regarding the policy discussion process, including government officials, legislative members, environmental agencies, and community representatives. Data were collected through interviews, observations, and documentation to enable triangulation across multiple sources of evidence. The data were analyzed using the Miles and Huberman interactive model through data reduction, data presentation, and conclusion drawing. Interpretive validity was strengthened through continuous comparison among interview findings, observational data, and documentary evidence to ensure consistency and analytical reliability in

explaining the stagnation of the regional regulation discussion process (Furidha, 2024).

RESULTS AND DISCUSSION

The current conditions and spatial distribution of vegetation cover in Bontang City reveal a landscape undergoing continuous transformation due to urban expansion and industrial development. Field observations and spatial data indicate that significant portions of land in industrial zones and rapidly growing residential areas have experienced a gradual reduction in vegetation density. Although certain regions, particularly conservation and protected zones, still maintain relatively stable vegetation, the fragmentation of green areas has become increasingly visible. This uneven distribution reflects the pressures exerted by economic activities, where land conversion often prioritizes infrastructure and industrial facilities over ecological preservation. As a result, areas that once supported diverse plant species are now dominated by built-up structures, leading to diminished ecological functions and reduced land quality.

The implementation and effectiveness of government policies designed to support vegetation cover fulfillment demonstrate both progress and persistent challenges (Chen et al., 2015; Szantoi et al., 2020). Local regulations mandating green open space, land rehabilitation programs, and monitoring mechanisms for vegetation management have been introduced to align with national targets. However, the enforcement of these policies remains inconsistent, particularly in areas adjacent to industrial operations where compliance pressures are minimal. Government initiatives, such as reforestation programs and community greening campaigns, have yielded visible improvements in selected areas, yet these efforts are often limited by budget constraints, low community participation in certain districts, and insufficient integration between policy planning and spatial realities. Consequently, despite the presence of regulatory instruments, their capacity to effectively increase vegetation cover has not reached its full potential.

Stakeholder engagement and collaborative efforts play a central role in shaping outcomes related to vegetation cover enhancement, and the findings highlight both promising collaborations and gaps in intersectoral coordination (Jansen & Kalas, 2024; Ndlovu, 2025). Industrial actors, through their corporate social responsibility (CSR) programs, have contributed to reforestation and environmental education activities, although the scale of these initiatives varies significantly among companies. Community groups, environmental volunteers, and educational institutions have also been active in promoting urban farming, tree planting, and neighborhood greening activities, demonstrating a growing awareness of the importance of vegetation cover. Despite these positive contributions, the overall collaboration framework remains fragmented, as communication between stakeholders is not always continuous, and shared targets for vegetation fulfillment are not consistently articulated. This situation underscores the need for a more structured and strategic partnership model that aligns the roles of government, industry, and civil society.

The analysis of the three result areas suggests that achieving the Land Quality Index targets in Bontang City requires a more integrated and long-term approach. The uneven spatial distribution of vegetation, combined with policy

implementation challenges and fragmented stakeholder collaboration, indicates that current strategies need refinement to effectively address the complexities of environmental management. Strengthening institutional coordination, enhancing enforcement mechanisms, and fostering inclusive partnerships are essential steps toward improving vegetation cover outcomes (Carrapatoso & Geck, 2018; Kusters et al., 2020; Schweizer et al., 2021). Additionally, leveraging technological tools for monitoring, expanding rehabilitated areas, and promoting community-driven greening initiatives could substantially contribute to the city's progress toward sustainable land quality management. In this context, the fulfillment of vegetation cover is not only a technical requirement but also a collective responsibility that demands sustained commitment across all sectors of society.

Current Conditions and Spatial Distribution of Vegetation Cover in Bontang City

The current conditions and spatial distribution of vegetation cover in Bontang City illustrate a landscape that is increasingly shaped by rapid urbanization, expanding industrial activities, and shifting land-use patterns. As one of Indonesia's industrial hubs, Bontang has experienced significant pressure on its natural land cover due to the development of petrochemical industries, the growth of residential settlements, and the expansion of supporting infrastructure. Remote sensing observations and field assessments indicate that vegetation cover has become highly fragmented, with dense vegetated areas now concentrated primarily in designated conservation zones, riparian corridors, and pockets of remaining forested land at the city's periphery. Meanwhile, central and industrial districts show noticeable declines in vegetation density, reflecting the cumulative effects of land clearing, soil compaction, and continuous land conversion for economic activities. These dynamics have resulted in marked spatial disparities in vegetation distribution, with ecological functions weakened in several urban and semi-urban regions (W. Deng et al., 2024; Payéne et al., 2025; Sharma et al., 2022).

Spatial patterns of vegetation cover in Bontang also reveal an increasing dominance of built-up areas that disrupt the continuity of green spaces, limiting ecological connectivity across the city. Urban expansion has led to the reduction of tree canopy coverage in residential neighborhoods, where vegetation is often replaced by impermeable surfaces, such as roads, commercial facilities, and housing clusters. This pattern is particularly evident in growing suburban zones where population density is rising but urban planning does not always incorporate sufficient green open space (Bille et al., 2023; Haaland & van den Bosch, 2015). In industrial zones, although regulations require the provision of green buffers, vegetation in these areas tends to be structured more as engineered green spaces rather than naturally occurring ecosystems, leading to lower levels of biodiversity. As a result, the city's overall vegetation structure has become increasingly patchy, creating ecological imbalances that affect microclimatic conditions, water infiltration capacity, and soil stability.

Despite these challenges, certain areas of Bontang still maintain relatively strong vegetation cover that contributes positively to the city's environmental integrity. Protected areas, mangrove forests along coastal regions, and reforested sites initiated through government or CSR-driven programs provide crucial ecological services that help offset vegetation loss in more developed zones. These green pockets serve as essential carbon sinks, temperature regulators, and biodiversity habitats, demonstrating the importance of strategic conservation and restoration efforts. However, their spatial isolation limits their ability to function

as interconnected ecological networks, underscoring the need for more comprehensive planning to link these green areas with urban green spaces. Overall, the spatial distribution of vegetation in Bontang reflects a city at a critical juncture, where sustainable land management policies and integrated spatial planning will be vital to maintaining ecological resilience while supporting ongoing urban and industrial development.

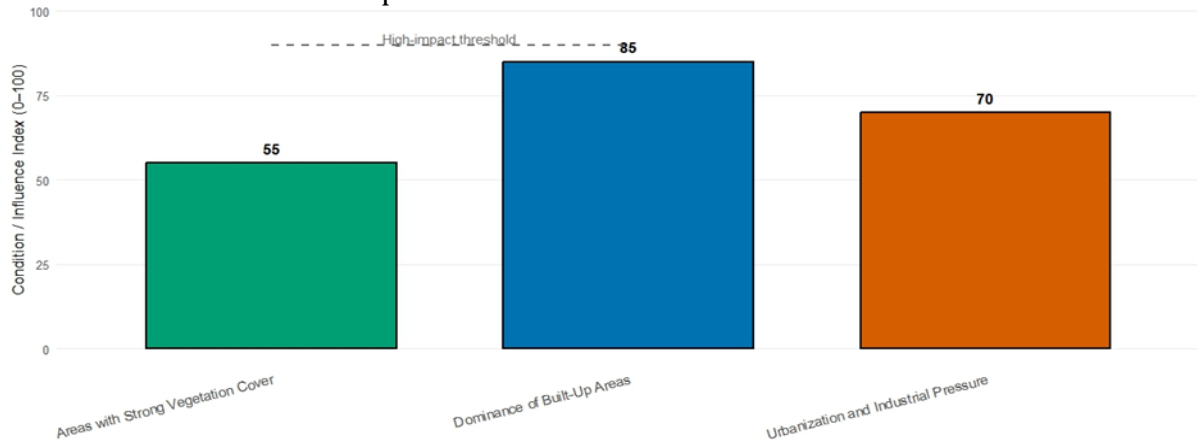


Figure 1. Advanced Visualization: Vegetation Cover Conditions in Bontang City Source Data Processes by the Author 2026

Figure 1 compares three main factors influencing vegetation cover in Bontang City: urbanization and industrial pressure, the dominance of built-up areas, and the presence of areas that still maintain robust vegetation cover. The figure illustrates how these factors vary in their influence on the spatial pattern of vegetation, with index values highlighting the relative magnitude of each driver. Clear color coding reinforces the distinctions between categories, offering a clear and accessible visual representation that aids in understanding environmental dynamics and land-use changes occurring within the city.

The highest bar, representing a score of 85 in the built-up area dominance category, indicates that the expansion of built-up areas has the strongest impact on vegetation change. This finding aligns with the intensification of housing growth, infrastructure development, and public facility construction that increasingly shape Bontang's urban landscape. As built-up areas continue to expand, green open spaces become fragmented, natural vegetation is reduced, and impervious surfaces expand. Therefore, this graph underscores that urban sprawl is a critical issue requiring attention in vegetation restoration efforts and improved urban land-use planning (Alshayeb, 2025; Fazia et al., 2024; Karimi & Sultana, 2024).

A score of 70 in the urbanization and industrial pressure category reflects that industrial activity, particularly in sectors such as energy and petrochemicals, also has a significant impact on vegetation decline. While slightly lower than the impact of built-up area dominance, industrial expansion contributes substantially through land conversion, logistics activities, and the concentration of development in coastal zones and economic corridors. This figure captures how urban-industrial pressures intensify ecological changes, increasing the vulnerability of vegetation cover in parts of the city (Keong, 2025; Liu et al., 2025).

Meanwhile, the bar representing a value of 55 for areas with strong vegetation cover indicates that some areas in Bontang still maintain relatively stable and

healthy vegetation conditions. Although this value is lower than other categories, these areas play a crucial role in maintaining ecological balance by providing green buffers, mitigating the impacts of intensive development, and conserving biodiversity. This graph highlights that while these areas still exist, they are increasingly constrained by land-use changes and surrounding development pressures.

This figure provides a comprehensive overview of how these three factors interact to shape the spatial distribution and condition of vegetation cover in Bontang City. The inclusion of the "high impact threshold" annotation further emphasizes that the dominance of built-up areas has exceeded the critical influence level, signaling potential risks to urban ecological sustainability. Consequently, this graph serves not only as a statistical illustration but also as an analytical tool that reinforces the urgency of implementing integrated, evidence-based strategies to support vegetation restoration and maintain environmental resilience amidst ongoing urban and industrial development.

Implementation and Effectiveness of Government Policies in Supporting Vegetation Cover Fulfillment

The implementation and effectiveness of government policies in supporting vegetation cover fulfillment in Bontang City reflect a complex interplay between regulatory frameworks, spatial planning instruments, and enforcement mechanisms. Over the past several years, the local government has issued a range of policies aimed at protecting existing vegetation, increasing green open space, and promoting sustainable land-use practices. These include zoning regulations that designate conservation areas, requirements for industrial zones to provide green buffers, and urban planning directives that mandate the integration of vegetation into residential and commercial developments. Despite the existence of these policies, their implementation has often faced challenges due to inconsistencies in policy interpretation, limited interagency coordination, and competing development priorities (Xu, 2021). As urbanization accelerates and industrial activities expand, the capacity of these policies to maintain adequate vegetation cover is increasingly tested, making policy coherence and enforcement more crucial than ever.

In assessing policy effectiveness, it becomes evident that the degree of compliance among stakeholders ranging from industries and developers to local communities plays a central role in determining outcomes. Industrial actors, for instance, are obligated to establish green belts and apply environmentally friendly practices, yet the extent of compliance varies depending on monitoring frequency, clarity of guidelines, and the presence of incentive or penalty mechanisms. Residential developers are likewise required to allocate space for vegetation within housing clusters, but market-driven pressures often lead to minimal compliance unless strict oversight is applied (Volland et al., 2022; S. Wang et al., 2025). Furthermore, community engagement programs designed to encourage household-level greening initiatives, such as urban farming and tree planting, have shown positive contributions but remain limited in scale. This uneven compliance across sectors reveals that policy effectiveness is closely linked not only to regulatory strength but also to governance capacity, institutional commitment, and the availability of resources for supervision and evaluation.

Despite implementation challenges, government policies have nonetheless contributed to meaningful improvements in certain areas, particularly where long-term planning and cross-sector collaboration are prioritized. Initiatives such as reforestation programs, coastal mangrove rehabilitation, and vegetation restoration in degraded zones demonstrate that when policies are backed by adequate funding, technical support, and multisector partnerships, their impact on vegetation cover can be significant. Additionally, the incorporation of vegetation indicators into environmental quality assessments such as the Land Quality Index has strengthened the policy framework by ensuring that vegetation targets are integrated into performance evaluation systems. These successful cases illustrate that policy measures can be effective when they transcend administrative boundaries and involve various stakeholders in shared commitments (Janssen et al., 2023; Nadeem, 2024; Scarlett & McKinney, 2016). However, to enhance long-term vegetation sustainability in Bontang, policy reforms must continue to emphasize consistency, accountability, and adaptive management, ensuring that development objectives remain aligned with ecological stewardship.

Table 1. Implementasi dan Effectiviness of Government Policies Supporting Vegetation Cover Fulfilment in Bontang City

Policy Category	Implementation Description	Effectiviness Score
Regulatory Framework Strength	Zoning regulations, conservation area designation, and land-use directives.	75
Enforcement & Monitoring	Monitoring frequency, enforcement mechanisms, and institutional oversight.	60
Stakeholder Compliance	Compliance from industries, developers, and local communities.	55
Cross-sector Collaboration	Coordination between government, private sector, and civil organizations	70
Restoration Program Implementation	Reforestation, mangrove rehabilitation, and degraded land restoration	80
Urban Green Space Allocation	Provision and maintenance of green open spaces in urban planning	65

Industrial Green Buffer Enforcement	Mandatory green belts and vegetation buffers in industrial zones	58
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Source: data collected by researchers through documents, 2025

Table 1 presents an overview or summary of the various government policy categories that play a role in supporting vegetation cover compliance in Bontang City, along with the effectiveness scores assigned to each policy area. Each category includes a description of its implementation, and effectiveness scores range from 0 to 100. This presentation reveals differences in regulatory strength, stakeholder compliance levels, and cross-sector coordination, all of which collectively impact the quality of environmental management and the sustainability of urban vegetation.

The first category, Regulatory Framework Strength, reflects the robustness of regulations related to spatial planning and vegetation conservation. With an effectiveness score of 75, this policy area is considered relatively strong due to the existence of zoning regulations, conservation area designations, and land-use directives. This indicates that the government has established a relatively clear legal framework for controlling land use change and maintaining vegetation. However, this score which falls short of the "very effective" range also indicates that increased consistency and enforcement are still needed to improve regulatory outcomes.

In the Enforcement & Monitoring category, the effectiveness score was 60, indicating that monitoring and enforcement mechanisms still face several challenges. Although monitoring and enforcement procedures have been implemented, constraints such as limited resources, inadequate inspection frequency, and weak institutional coordination hamper optimal implementation (Friday et al., 2022; Ngcamu & Mantzaris, 2023; Tama et al., 2021). These limitations reduce the overall effectiveness of the policy, as a robust monitoring system is crucial to ensuring compliance among stakeholders.

The Stakeholder Compliance category received a score of 55, one of the lowest scores in the table. This reflects limited compliance among industry, developers, and local communities. Divergent interests, economic pressures, and a lack of incentives have contributed to inconsistent compliance with requirements related to the provision of green open space and vegetation protection (Davies & Laforteza, 2017; Green et al., 2016; Hermawan & Khoirunisa, 2024). In comparison, Cross-Sector Collaboration received a higher score of 70, indicating that coordination across government, the private sector, and civil society actors is functioning relatively better than individual stakeholder compliance. Cross-sector collaboration improves planning integration and strengthens shared commitment to vegetation conservation.

The Restoration Program Implementation received the highest effectiveness score of 80, indicating significant success in programs related to reforestation, mangrove rehabilitation, and degraded land restoration. This score indicates that with adequate technical support and funding, restoration initiatives can result in substantial increases in vegetation cover. Meanwhile, Urban Green Open Space

Allocation, with a score of 65, indicates that the provision and management of urban green open space still require improvement, both in terms of planning and land use. Finally, Industrial Green Buffer Enforcement has a score of 58, indicating that although requirements for industrial green belts have been implemented, monitoring and enforcement efforts are still suboptimal (Fatima et al., 2023; G. Li et al., 2023).

Stakeholder Engagement and Collaborative Efforts in Enhancing Land Quality Index Achievement

Stakeholder engagement and collaborative efforts play a pivotal role in enhancing the achievement of the Land Quality Index, particularly in regions experiencing rapid development pressures such as Bontang City (Kurniawan et al., 2022; Novita, 2025). Effective engagement ensures that all relevant actors including government agencies, private sector industries, community groups, and environmental organizations actively participate in decision-making processes related to land management. When stakeholders are meaningfully involved, policies and programs designed to improve land quality become more contextually grounded, socially acceptable, and technically feasible. This inclusive approach also enables the integration of local knowledge, community priorities, and practical insights that may otherwise be overlooked in top-down environmental planning.

Collaborative efforts are equally essential in strengthening the implementation and monitoring of activities that contribute to Land Quality Index improvement. Cross-sector collaboration fosters the pooling of resources, expertise, and institutional capacity, allowing for more comprehensive and coordinated interventions. For instance, industries may contribute through corporate environmental responsibility programs, such as reforestation or soil rehabilitation initiatives, while government agencies provide regulatory frameworks and technical guidance. Community groups, in turn, support these efforts through on-the-ground participation, such as tree planting, neighborhood greening, and community-based monitoring. When these elements operate synergistically, the overall impact on land quality becomes more substantial and sustainable (Akhtar et al., 2021; X. Deng et al., 2016; Shah et al., 2021).

Moreover, collaboration encourages accountability and shared responsibility, creating a system in which each stakeholder understands their role in achieving land quality targets. Transparent communication, participatory evaluation mechanisms, and joint planning forums help ensure that progress toward the Land Quality Index is continually assessed and adjusted according to emerging challenges and opportunities. Such collaborative governance not only strengthens environmental outcomes but also builds trust among stakeholders, fostering long-term commitments to ecological stewardship. Ultimately, strong stakeholder engagement and collaboration form the backbone of effective land quality management and significantly enhance the prospects of achieving targeted improvements in the Land Quality Index.

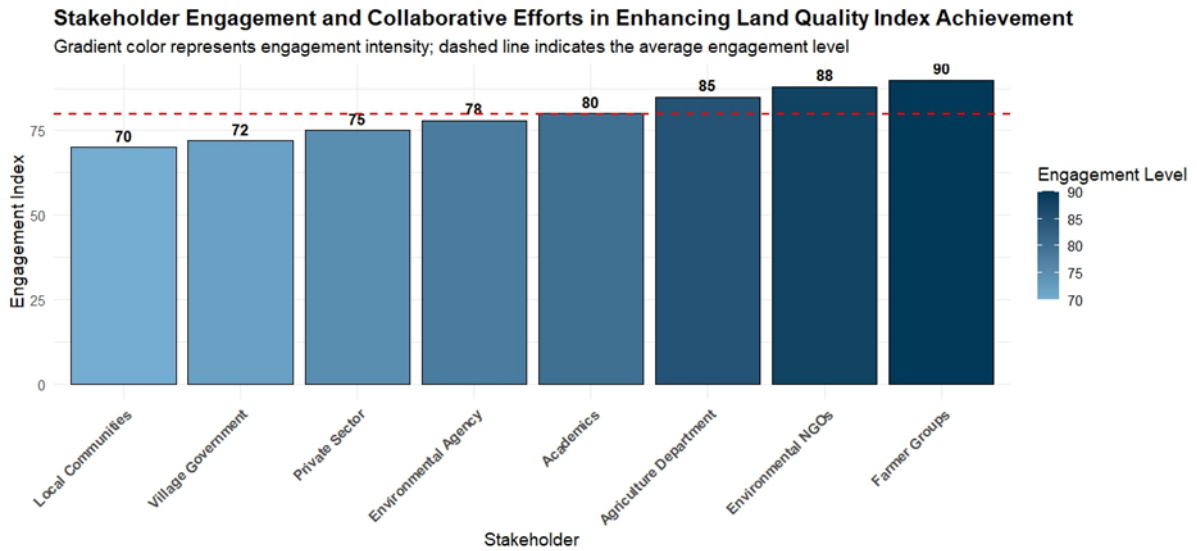


Figure 2. Stakeholder Engagement and Collaborative Efforts in Enhancing Land Quality Index Achievement

Source Data Processes by the Author 2026

Figure 2 shows the level of stakeholder engagement in collaborative efforts to improve the Land Quality Index, a key indicator used to assess environmental quality and sustainable land use management. The bar chart illustrates the variation in engagement intensity among various stakeholder groups through numerical index values, highlighting the differences in capacity and contribution of each group in supporting land quality improvement. The blue gradient indicates engagement intensity, while darker shades indicate higher engagement. Furthermore, the red dotted line serves as a reference for the average engagement level, making it easy to identify which groups are performing above or below the overall benchmark.

The chart shows that the Farmers' Group has the highest engagement index, at 90, followed by the Environmental NGO (88) and the Agriculture Service (85). These groups contribute significantly due to their direct roles in land conservation, vegetation restoration, sustainable agricultural practices, and environmental advocacy. Their high engagement scores reflect strong technical capacity, close interaction with land-related issues at the field level, and strong commitment to the collaborative initiative. This also shows that improving LQI relies heavily on stakeholders who interact directly with natural resources and have a deep contextual understanding of local environmental challenges (Adade Williams et al., 2020; Bayala, 2024; Siangulube, 2024).

Meanwhile, groups such as the Environment Agency (78%), academia (80%), and the private sector (75) fall into the moderate involvement category. Their roles are important but not yet fully optimized. For example, the Environment Agency is responsible for regulation and oversight, but its effectiveness can be limited by coordination gaps and resource constraints. Academia contributes through research and scientific data, but challenges arise when research findings are not fully integrated into policy or field implementation. The private sector, on the other hand, has substantial potential for financing and technological

innovation, but its level of involvement is often affected by compliance with government regulations and incentives.

The stakeholders with the lowest levels of engagement were Local Communities (70) and Village Governments (72). Despite their lower ranking, these groups play a strategic role because they live and operate directly in areas affected by land quality changes. Their lower engagement scores may reflect limited technical capacity, inadequate environmental literacy, and minimal involvement in data-driven planning processes. Village governments, as the administrative units closest to the local ecosystem, ideally act as key drivers of implementation at the field level, but this requires stronger institutional support and ongoing capacity building to enhance their participation.

This chart provides a clear picture of the distribution of engagement among stakeholder groups involved in improving the Land Quality Index. This visualization not only maps the relative contributions of each stakeholder but also indicates which areas require policy intervention, increased coordination, or capacity building. Stakeholders with lower levels of engagement require targeted empowerment programs, training, and technical assistance, while those with higher levels of engagement can be key drivers of cross-sector collaboration. Strategically, such analysis is important to ensure that future land quality improvements are integrated, effective and sustainable (Izakovičová et al., 2018; Keesstra et al., 2018; Xie et al., 2020).

The discussion highlights that the dynamics of vegetation cover in Bontang City are strongly influenced by rapid urban development, large-scale industrial activities, and intensive land-use changes. The uneven distribution of vegetation is evident from the concentration of green areas only in conservation zones, riparian buffers, and peripheral urban forests, while central and industrial zones show significant declines in vegetation density. This pattern reflects ecological pressures resulting from physical development that lacks adequate spatial control. Vegetation fragmentation and the loss of ecological connectivity have implications for soil stability, hydrological regulation, and the environment's adaptive capacity to climate change. These findings reinforce the need to integrate ecological principles into spatial planning to ensure that urban growth does not compromise long-term land quality (Hersperger et al., 2018; Mersal, 2016; Oliveira et al., 2018).

The study also indicates that the implementation of government policies related to vegetation cover fulfillment still exhibits inconsistencies between regulatory frameworks and on-the-ground execution. Although Bontang has established relatively strong regulations such as conservation zoning, requirements for green open space, and green buffer obligations for industrial zones their effectiveness remains limited due to low stakeholder compliance, weak enforcement, and insufficient cross-sector harmonization. The policy effectiveness table demonstrates varying scores that reflect disparities in implementation, ranging from highly effective measures such as land rehabilitation programs to weaker areas such as stakeholder compliance and industrial green belt enforcement (Kirby & Scott, 2023; T. Li et al., 2017; Lisina et al., 2024). These findings suggest the need for strengthened institutional capacity, more robust

incentive and sanction mechanisms, and better alignment between planning documents and ecological realities in the field.

Beyond policy considerations, stakeholder engagement emerges as a critical factor influencing the success of vegetation cover fulfillment and Land Quality Index achievement. The stakeholder engagement chart reveals differences in participation levels among actor groups, with farmer groups, environmental NGOs, and the Agriculture Department displaying the highest engagement due to their direct roles in land conservation and rehabilitation. Conversely, village governments and local communities demonstrate lower engagement levels, indicating the need for capacity-building, enhanced environmental literacy, and greater technical support to enable more effective participation (Adom et al., 2025; Chisika & Yeom, 2024; Iyer, 2025). These disparities imply that the success of LQI improvement efforts depends heavily on the strength of collaboration between government, private sector entities, and civil society, thereby underscoring the importance of establishing structured and sustainable cross-sector partnerships.

This discussion shows that vegetation cover fulfillment in Bontang City is a multidimensional issue involving ecological conditions, governance quality, spatial planning effectiveness, and socio-economic dynamics. Challenges such as vegetation fragmentation, weak policy implementation, and uneven stakeholder engagement require comprehensive and long-term approaches. Integrating spatial data technologies, strengthening institutional coordination, adopting more adaptive spatial planning (De Vries, 2022; Nadin et al., 2021; Sjoukema et al., 2017; Wijaya et al., 2017), and enhancing community participation are essential elements for ensuring sustainable improvements in land quality. Consequently, strategies for vegetation cover fulfillment must be framed within a sustainable development perspective that balances economic growth with environmental protection, enabling Bontang to maintain land quality while supporting ecological resilience in the future.

CONCLUSION

This study concludes that the stagnation of the Draft Regional Regulation on Flood Management in Bontang City is not solely caused by technical administrative delays, but also reflects broader governance problems involving institutional coordination, bureaucratic fragmentation, and competing political interests within the regional policy-making process. Although flood management has become an increasingly urgent public issue, the policy discussion process remains constrained by weak inter-agency collaboration, overlapping institutional authority, and inconsistent political commitment toward disaster governance priorities. The findings demonstrate that policy stagnation in flood governance should be understood as a multidimensional governance problem shaped by the interaction between bureaucratic structures, political dynamics, and institutional capacity limitations. This study contributes theoretically to the discourse on public policy and governance by emphasizing that delayed regional regulation processes are not merely procedural inefficiencies, but also manifestations of structural governance fragmentation within local policy systems. Unlike previous studies that primarily focus on technical flood mitigation or environmental management, this research highlights the importance of institutional coordination and political-administrative relations in determining the effectiveness of regional flood governance policies.

Accordingly, strengthening flood governance in Bontang City requires not only the acceleration of regulatory formulation processes but also the improvement of inter-institutional coordination, policy integration, and collaborative governance mechanisms among stakeholders. Future studies are recommended to develop comparative analyses across regions and integrate governance perspectives with spatial or environmental approaches in order to produce a more comprehensive understanding of flood policy implementation and regional disaster governance.

REFERENCE

- Adade Williams, P., Sikutshwa, L., & Shackleton, S. (2020). Acknowledging Indigenous and Local Knowledge to Facilitate Collaboration in Landscape Approaches—Lessons from a Systematic Review. *Land*, 9(9), 331. <https://doi.org/10.3390/land9090331>
- Adeyinka Alex Banso, Julie Olajumoke Coker, Ngozi Samuel Uzougbo, & Seun Solomon Bakare. (2023). THE NEXUS OF LAW AND SUSTAINABLE DEVELOPMENT IN SOUTH WEST NIGERIAN PUBLIC POLICY: A REVIEW OF MULTIDISCIPLINARY APPROACHES IN POLICY FORMATION. *International Journal of Applied Research in Social Sciences*, 5(8), 308–329. <https://doi.org/10.51594/ijarss.v5i8.585>
- Adom, R. K., Afuye, G. A., Kalumba, A. M., & Simatele, M. D. (2025). Integrating the Perspectives of Youth, Women, and Marginalised Communities in Addressing Global Environmental Management Challenges. *Environmental Management*, 75(12), 3261–3282. <https://doi.org/10.1007/s00267-025-02254-7>
- Akhtar, N., Syakir Ishak, M. I., Bhawani, S. A., & Umar, K. (2021). Various Natural and Anthropogenic Factors Responsible for Water Quality Degradation: A Review. *Water*, 13(19), 2660. <https://doi.org/10.3390/w13192660>
- Alshayeb, M. J. (2025). Evaluating Ecosystem Service Trade-Offs and Recovery Dynamics in Response to Urban Expansion: Implications for Sustainable Management Strategies. *Sustainability*, 17(5), 2194. <https://doi.org/10.3390/su17052194>
- Arslan, H. M., Khan, I., Latif, M. I., Komal, B., & Chen, S. (2022). Understanding the dynamics of natural resources rents, environmental sustainability, and sustainable economic growth: new insights from China. *Environmental Science and Pollution Research*, 29(39), 58746–58761. <https://doi.org/10.1007/s11356-022-19952-y>
- Bakhtiari, A., Takian, A., Majdzadeh, R., Ostovar, A., Afkar, M., & Rostamigooran, N. (2022). Intersectoral collaboration in the management of non-communicable disease's risk factors in Iran: stakeholders and social network analysis. *BMC Public Health*, 22(1), 1669. <https://doi.org/10.1186/s12889-022-14041-8>
- Bayala, E. R. C. (2024). Stakeholder Perceptions on Landscape Governance in Northern Ghana: A Q-Study to Identify Common Concern Entry Points for Integrated Landscape Approaches. *Environmental Management*, 74(1), 31–51. <https://doi.org/10.1007/s00267-023-01881-2>
- Bezerra, P. M., & Guerriero, I. C. Z. (2019). *Analysis of partnerships for actions intra-sectoral and inter-sectors for health in areas of high socio-environmental*

vulnerability in the city of São Paulo/Brazil: a mixed method study.
<https://doi.org/10.21203/rs.2.13974/v2>

- Bille, R. A., Jensen, K. E., & Buitenwerf, R. (2023). Global patterns in urban green space are strongly linked to human development and population density. *Urban Forestry & Urban Greening*, 86, 127980. <https://doi.org/10.1016/j.ufug.2023.127980>
- Caputo, F., Magliocca, P., Canestrino, R., & Rescigno, E. (2023). Rethinking the Role of Technology for Citizens' Engagement and Sustainable Development in Smart Cities. *Sustainability*, 15(13), 10400. <https://doi.org/10.3390/su151310400>
- Carrapatoso, A., & Geck, A. (2018). Multiple Wins, Multiple Organizations—How to Manage Institutional Interaction in Financing Forest Landscape Restoration (FLR). *Sustainability*, 10(3), 757. <https://doi.org/10.3390/su10030757>
- Chen, C., König, H., Matzdorf, B., & Zhen, L. (2015). The Institutional Challenges of Payment for Ecosystem Service Program in China: A Review of the Effectiveness and Implementation of Sloping Land Conversion Program. *Sustainability*, 7(5), 5564–5591. <https://doi.org/10.3390/su7055564>
- Chisika, S. N., & Yeom, C. (2024). Enhancing E-government in Machakos and Nakuru Counties: Strategies for Sustainable Development in Kenya's Devolved Units. *Asia-Pacific Journal of Convergent Research Interchange*, 10(8), 251–270. <https://doi.org/10.47116/apjcri.2024.08.19>
- Davies, C., & Laforteza, R. (2017). Urban green infrastructure in Europe: Is greenspace planning and policy compliant? *Land Use Policy*, 69, 93–101. <https://doi.org/10.1016/j.landusepol.2017.08.018>
- De Laurentiis, V., Secchi, M., Bos, U., Horn, R., Laurent, A., & Sala, S. (2019). Soil quality index: Exploring options for a comprehensive assessment of land use impacts in LCA. *Journal of Cleaner Production*, 215, 63–74. <https://doi.org/10.1016/j.jclepro.2018.12.238>
- De Vries, W. T. (2022). Trends in The Adoption of New Geospatial Technologies for Spatial Planning and Land Management in 2021. *Geoplanning: Journal of Geomatics and Planning*, 8(2), 85–98. <https://doi.org/10.14710/geoplanning.8.2.85-98>
- Deng, W., Jiang, Z., Zhang, S., Ren, P., Zhang, H., & Wang, Z. (2024). Dynamic Identification and Evolution of Urban-suburban-rural Transition Zones Based on the Blender of Natural and Humanistic Factors: A Case Study of Chengdu, China. *Chinese Geographical Science*, 34(5), 791–809. <https://doi.org/10.1007/s11769-024-1455-4>
- Deng, X., Li, Z., & Gibson, J. (2016). A review on trade-off analysis of ecosystem services for sustainable land-use management. *Journal of Geographical Sciences*, 26(7), 953–968. <https://doi.org/10.1007/s11442-016-1309-9>
- Dunnett, A., Shirsath, P. B., Aggarwal, P. K., Thornton, P., Joshi, P. K., Pal, B. D., Khatri-Chhetri, A., & Ghosh, J. (2018). Multi-objective land use allocation modelling for prioritizing climate-smart agricultural interventions. *Ecological Modelling*, 381, 23–35. <https://doi.org/10.1016/j.ecolmodel.2018.04.008>

- Fatima, T., Li, B., Malik, S. A., & Zhang, D. (2023). The Spatial Effect of Industrial Intelligence on High-Quality Green Development of Industry under Environmental Regulations and Low Carbon Intensity. *Sustainability*, 15(3), 1903. <https://doi.org/10.3390/su15031903>
- Fazia, C., Nahiduzzaman, K. M., Al-Ramadan, B., Aldosary, A., & Moraci, F. (2024). Counteract Soil Consumption through Ecosystem Services and Landscape Restoration for an Efficient Urban Regeneration. *Land*, 13(3), 323. <https://doi.org/10.3390/land13030323>
- Friday, S. C., Lawal, C. I., Ayodeji, D. C., & Sobowale, A. (2022). Strategic Model for Building Institutional Capacity in Financial Compliance and Internal Controls Across Fragile Economies. *International Journal of Multidisciplinary Research and Growth Evaluation*, 3(1), 944–954. <https://doi.org/10.54660/IJMRGE.2022.3.1.944-954>
- Furidha, B. W. (2024). COMPREHENSION OF THE DESCRIPTIVE QUALITATIVE RESEARCH METHOD: A CRITICAL ASSESSMENT OF THE LITERATURE. *Journal of Multidisciplinary Research*, 1–8. <https://doi.org/10.56943/jmr.v2i4.443>
- Green, O. O., Garmestani, A. S., Albro, S., Ban, N. C., Berland, A., Burkman, C. E., Gardiner, M. M., Gunderson, L., Hopton, M. E., Schoon, M. L., & Shuster, W. D. (2016). Adaptive governance to promote ecosystem services in urban green spaces. *Urban Ecosystems*, 19(1), 77–93. <https://doi.org/10.1007/s11252-015-0476-2>
- Haaland, C., & van den Bosch, C. K. (2015). Challenges and strategies for urban green-space planning in cities undergoing densification: A review. *Urban Forestry & Urban Greening*, 14(4), 760–771. <https://doi.org/10.1016/j.ufug.2015.07.009>
- Herdiana, H., Sari, J. F. K., & Whittaker, M. (2018). Intersectoral collaboration for the prevention and control of vector borne diseases to support the implementation of a global strategy: A systematic review. *PLOS ONE*, 13(10), e0204659. <https://doi.org/10.1371/journal.pone.0204659>
- Hermawan, S., & Khoirunisa, Z. A. (2024). The Emergence of Green Banking: A Sustainable Financing Strategy for Protecting Against Deforestation in ASEAN. *The Journal of Environment & Development*, 33(1), 96–124. <https://doi.org/10.1177/10704965231211591>
- Hersperger, A. M., Oliveira, E., Pagliarin, S., Palka, G., Verburg, P., Bolliger, J., & Grădinaru, S. (2018). Urban land-use change: The role of strategic spatial planning. *Global Environmental Change*, 51, 32–42. <https://doi.org/10.1016/j.gloenvcha.2018.05.001>
- Iyer, D. S. S. (2025). Indian Community Development – A bottom-to-top Prospective. *Global Journal of Humanities and Social Sciences*, 04(03), 23–59. <https://doi.org/10.55640/gjhss/Volume04Issue03-03>
- Izakovičová, Z., Špulerová, J., & Petrovič, F. (2018). Integrated Approach to Sustainable Land Use Management. *Environments*, 5(3), 37. <https://doi.org/10.3390/environments5030037>
- Jansen, L. J. M., & Kalas, P. P. (2024). Customised Methodology to Assess and

- Measure Effectiveness of Integrated Landscape Management Relevant Multi-Stakeholder Transformative Governance, Incorporating Rights-Based Planning and Tenure Aspects, Applied in Kenya, Nigeria, and Viet Nam. *Sustainability*, 16(21), 9312. <https://doi.org/10.3390/su16219312>
- Janssen, M. J., Wesseling, J., Torrens, J., Weber, K. M., Penna, C., & Klerkx, L. (2023). Missions as boundary objects for transformative change: understanding coordination across policy, research, and stakeholder communities. *Science and Public Policy*, 50(3), 398–415. <https://doi.org/10.1093/scipol/scac080>
- Karimi, F., & Sultana, S. (2024). Urban Expansion Prediction and Land Use/Land Cover Change Modeling for Sustainable Urban Development. *Sustainability*, 16(6), 2285. <https://doi.org/10.3390/su16062285>
- Keesstra, S., Mol, G., De Leeuw, J., Okx, J., Molenaar, C., De Cleen, M., & Visser, S. (2018). Soil-Related Sustainable Development Goals: Four Concepts to Make Land Degradation Neutrality and Restoration Work. *Land*, 7(4), 133. <https://doi.org/10.3390/land7040133>
- Keong, C. Y. (2025). The Vicious Cycle Atlas of Fragility: Mapping the Feedback Loops Between Industrial–Urban Metabolism and Earth System Collapse. *Urban Science*, 9(8), 320. <https://doi.org/10.3390/urbansci9080320>
- Kirby, M. G., & Scott, A. J. (2023). Multifunctional Green Belts: A planning policy assessment of Green Belts wider functions in England. *Land Use Policy*, 132, 106799. <https://doi.org/10.1016/j.landusepol.2023.106799>
- Kurniawan, N. P., Purwanto, E., & Daryono, Z. N. A. (2022). Participatory Management of Bontang Mangrove Park East Kalimantan, Indonesia. *Agro Bali: Agricultural Journal*, 5(3), 443–453. <https://doi.org/10.37637/ab.v5i3.977>
- Kusters, K., De Graaf, M., Buck, L., Galido, K., Maindo, A., Mendoza, H., Nghi, T., Purwanto, E., & Zagt, R. (2020). Inclusive Landscape Governance for Sustainable Development: Assessment Methodology and Lessons for Civil Society Organizations. *Land*, 9(4), 128. <https://doi.org/10.3390/land9040128>
- Li, G., Wang, Y., Zhou, S., Lu, Z., & Yin, T. (2023). Effectiveness and challenge of environmental impact assessment in industrial park, a case study in Northeast rust belt China. *Innovation and Green Development*, 2(4), 100072. <https://doi.org/10.1016/j.igd.2023.100072>
- Li, T., Lü, Y., Fu, B., Comber, A. J., Harris, P., & Wu, L. (2017). Gauging policy-driven large-scale vegetation restoration programmes under a changing environment: Their effectiveness and socio-economic relationships. *Science of The Total Environment*, 607–608, 911–919. <https://doi.org/10.1016/j.scitotenv.2017.07.044>
- Lisina, N., Ushakova, A., & Ivanova, S. (2024). Green Belt Legislation Regulation: Comparative Legal Research. *Laws*, 13(5), 58. <https://doi.org/10.3390/laws13050058>
- Liu, K., Du, R., & He, J. (2025). Fluctuating Development Traits of Industrial Land Mismatch and Its Influence on Urban Ecological Modernization. *Land*, 14(5), 1035. <https://doi.org/10.3390/land14051035>

- Maes, M. J. A., Jones, K. E., Toledano, M. B., & Milligan, B. (2019). Mapping synergies and trade-offs between urban ecosystems and the sustainable development goals. *Environmental Science & Policy*, 93, 181–188. <https://doi.org/10.1016/j.envsci.2018.12.010>
- Mersal, A. (2016). Sustainable Urban Futures: Environmental Planning for Sustainable Urban Development. *Procedia Environmental Sciences*, 34, 49–61. <https://doi.org/10.1016/j.proenv.2016.04.005>
- Nadeem, M. (2024). Distributed leadership in educational contexts: A catalyst for school improvement. *Social Sciences & Humanities Open*, 9, 100835. <https://doi.org/10.1016/j.ssaho.2024.100835>
- Nadin, V., Stead, D., Dąbrowski, M., & Fernandez-Maldonado, A. M. (2021). Integrated, adaptive and participatory spatial planning: trends across Europe. *Regional Studies*, 55(5), 791–803. <https://doi.org/10.1080/00343404.2020.1817363>
- Ndlovu, N. P. (2025). Cross-sectoral coordination in the implementation of agroforestry in Malawi. *Frontiers in Forests and Global Change*, 8. <https://doi.org/10.3389/ffgc.2025.1533326>
- Ngcamu, B. S., & Mantzaris, E. (2023). Policy enforcement, corruption and stakeholder interference in South African universities. *Journal of Transport and Supply Chain Management*, 17. <https://doi.org/10.4102/jtscm.v17i0.814>
- Novita, A. A. (2025). Revitalizing Malang's Environmental Future: Harnessing the Green Economy through Collaborative Governance. *KnE Social Sciences*, 10(4), 245–261. <https://doi.org/10.18502/kss.v10i4.18039>
- Oliveira, E., Tobias, S., & Hersperger, A. (2018). Can Strategic Spatial Planning Contribute to Land Degradation Reduction in Urban Regions? State of the Art and Future Research. *Sustainability*, 10(4), 949. <https://doi.org/10.3390/su10040949>
- Patel, J. B., & Raval, Z. (2024). The Impacts of Urbanization on Ecological Systems: A Comprehensive Study of the Complex Challenges Arising from Rapid Urban Growth. *Research Review Journal of Indian Knowledge Systems*, 1(1), 1–10. <https://doi.org/10.31305/rrjiks.2024.v1.n1.001>
- Payéne, L., Gnamederama, K., Fousseni, F., Madjouma, K., Pikabe, Y. G., Graw, V., Bohnett, E., Dourma, M., Kperkouma, W., & Komlan, B. (2025). Urbanization Impacts on Wetland Ecosystems in Northern Municipalities of Lomé (Togo): A Study of Flora, Urban Landscape Dynamics and Environmental Risks. *Conservation*, 5(3), 28. <https://doi.org/10.3390/conservation5030028>
- Richards, D. R., & Belcher, R. N. (2019). Global Changes in Urban Vegetation Cover. *Remote Sensing*, 12(1), 23. <https://doi.org/10.3390/rs12010023>
- Salvia, M., Simoes, S. G., Herrando, M., Čavar, M., Cosmi, C., Pietrapertosa, F., Gouveia, J. P., Fueyo, N., Gómez, A., Papadopoulou, K., Taxeri, E., Rajić, K., & Di Leo, S. (2021). Improving policy making and strategic planning competencies of public authorities in the energy management of municipal public buildings: The PrioritEE toolbox and its application in five mediterranean areas. *Renewable and Sustainable Energy Reviews*, 135, 110106.

<https://doi.org/10.1016/j.rser.2020.110106>

- Scarlett, L., & McKinney, M. (2016). Connecting people and places: the emerging role of network governance in large landscape conservation. *Frontiers in Ecology and the Environment*, 14(3), 116–125. <https://doi.org/10.1002/fee.1247>
- Schweizer, D., van Kuijk, M., & Ghazoul, J. (2021). Perceptions from non-governmental actors on forest and landscape restoration, challenges and strategies for successful implementation across Asia, Africa and Latin America. *Journal of Environmental Management*, 286, 112251. <https://doi.org/10.1016/j.jenvman.2021.112251>
- Shah, K. K., Modi, B., Pandey, H. P., Subedi, A., Aryal, G., Pandey, M., & Shrestha, J. (2021). Diversified Crop Rotation: An Approach for Sustainable Agriculture Production. *Advances in Agriculture*, 2021, 1–9. <https://doi.org/10.1155/2021/8924087>
- Sharma, S., Joshi, P. K., & Fürst, C. (2022). Exploring Multiscale Influence of Urban Growth on Landscape Patterns of Two Emerging Urban Centers in the Western Himalaya. *Land*, 11(12), 2281. <https://doi.org/10.3390/land11122281>
- Siangulube, F. S. (2024). The Role of Multistakeholder Platforms in Environmental Governance: Analyzing Stakeholder Perceptions in Kalomo District, Zambia, Using Q-Method. *Environmental Management*, 74(1), 13–30. <https://doi.org/10.1007/s00267-023-01806-z>
- Sjoukema, J.-W., Bregt, A., & Cromptvoets, J. (2017). Evolving Spatial Data Infrastructures and the Role of Adaptive Governance. *ISPRS International Journal of Geo-Information*, 6(8), 254. <https://doi.org/10.3390/ijgi6080254>
- Szantoi, Z., Geller, G. N., Tsendbazar, N.-E., See, L., Griffiths, P., Fritz, S., Gong, P., Herold, M., Mora, B., & Obregón, A. (2020). Addressing the need for improved land cover map products for policy support. *Environmental Science & Policy*, 112, 28–35. <https://doi.org/10.1016/j.envsci.2020.04.005>
- Tama, E., Khayoni, I., Goodman, C., Ogira, D., Chege, T., Gitau, N., & Wafula, F. (2021). What Lies Behind Successful Regulation? A Qualitative Evaluation of Pilot Implementation of Kenya's Health Facility Inspection Reforms. *International Journal of Health Policy and Management*. <https://doi.org/10.34172/ijhpm.2021.90>
- Uwaga Monica Adanma, & Emmanuel Olurotimi Ogunbiyi. (2024). A comparative review of global environmental policies for promoting sustainable development and economic growth. *International Journal of Applied Research in Social Sciences*, 6(5), 954–977. <https://doi.org/10.51594/ijarss.v6i5.1147>
- Voland, N., Saad, M. M., & Eicker, U. (2022). Public Policy and Incentives for Socially Responsible New Business Models in Market-Driven Real Estate to Build Green Projects. *Sustainability*, 14(12), 7071. <https://doi.org/10.3390/su14127071>
- Wang, J., Lin, Y., Glendinning, A., & Xu, Y. (2018). Land-use changes and land policies evolution in China's urbanization processes. *Land Use Policy*, 75, 375–387. <https://doi.org/10.1016/j.landusepol.2018.04.011>

- Wang, S., HOEKSTRA, J. S. C. ., & Elsinga, M. (2025). *Market-Driven Urban Regeneration and Affordable Housing: Unpacking Institutional Barriers in Shenzhen*. <https://doi.org/10.2139/ssrn.5186760>
- Wijaya, N., Bisri, M. B. F., Aritenang, A. F., & Mariany, A. (2017). *Spatial Planning, Disaster Risk Reduction, and Climate Change Adaptation Integration in Indonesia: Progress, Challenges, and Approach* (pp. 235–252). https://doi.org/10.1007/978-3-319-54466-3_9
- Xie, H., Zhang, Y., Wu, Z., & Lv, T. (2020). A Bibliometric Analysis on Land Degradation: Current Status, Development, and Future Directions. *Land*, 9(1), 28. <https://doi.org/10.3390/land9010028>
- Xu, J. (2021). Conflicts in multi-level governance: an analysis of international climate policy implementation at the sub-national level. *Global Public Policy and Governance*, 1(4), 401–420. <https://doi.org/10.1007/s43508-021-00029-4>
- Zambon, I., Colantoni, A., Carlucci, M., Morrow, N., Sateriano, A., & Salvati, L. (2017). Land quality, sustainable development and environmental degradation in agricultural districts: A computational approach based on entropy indexes. *Environmental Impact Assessment Review*, 64, 37–46. <https://doi.org/10.1016/j.eiar.2017.01.003>