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Research Article

Implementation of Green Disaster Management Policy by BPBD Surabaya City: A Sustainable Approach to Disaster Management

Muhammad Amrul [1], **Ika Devy Pramudiana** [2], **Sapto Pramono** [3]

[1-3] Faculty of Administrative Sciences, Dr. Soetomo University, Surabaya
E-mail:muhammadamrul6724@gmail.com

ABSTRACT

This study examines the implementation of Green Disaster Management (GDM) policies by the Surabaya City Disaster Management Agency (BPBD) as a means to enhance disaster resilience through environmental sustainability. The research analyzes the integration of GDM principles across all phases of the disaster cycle pre-disaster, during response, and post-disaster recovery. Data was collected through in-depth interviews with key informants, participant observation, and document analysis at BPBD and pilot project sites, including mangrove conservation areas, green emergency posts, and eco-friendly reconstruction sites. The findings indicate that Surabaya has demonstrated significant commitment to embedding sustainability into disaster management through community education, environmentally friendly logistics, and eco-based mitigation measures. Nonetheless, challenges persist, such as limited funding, resistance from developers, logistical constraints, and societal perceptions favoring immediate response over environmental considerations. During disaster response, innovations such as solar-powered emergency equipment and waste segregation practices are being adopted, but their widespread application remains hampered by resource limitations. Post-disaster, efforts in eco-friendly reconstruction and reforestation programs have shown promising results but require enhanced public awareness and long-term maintenance. The success of GDM implementation depends on effective inter-agency coordination, political commitment, and community engagement. Despite progress, hurdles related to budget constraints, social resistance, and knowledge gaps fully hinder the adoption of green approaches. This study highlights the importance of strategic collaboration, policy support, and community participation to mainstream sustainability in disaster management continuously. Strengthening these aspects will not only improve Surabaya's disaster resilience but also contribute to sustainable urban development aligned with global frameworks such as the Sendai Framework for Disaster Risk Reduction.

Keywords: Disaster Cycle; Disaster Resilience, Sustainability; Environmental-Based Mitigation; Green Disaster Management; Surabaya

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1. BACKGROUND

Surabaya, as one of Indonesia's largest metropolitan areas, faces complex disaster risks, particularly hydrometeorological hazards such as tidal flooding, inundation, and strong winds. Its geographical location in a coastal area with high population density and economic activity further amplifies the potential for losses from disasters.(Subiyanto et al., 2022). In line with the national vision to realize a Disaster Resilient Indonesia and sustainable development (as stated in the National Disaster Management Plan/RENAS PB), the Surabaya City Government through the Regional Disaster Management Agency (BPBD) is required to transform in implementing disaster management.(Yulianti et al., 2025)The paradigm of disaster management in Indonesia has shifted from a reactive approach (focusing solely on emergency response) to a proactive approach (disaster risk management),

emphasizing mitigation and prevention efforts. In the context of global sustainable development and climate change, there is an urgent need to integrate environmental aspects into the disaster management cycle, known as Green Disaster Management (GDM). GDM is not only about environmentally friendly post-disaster responses, but also encompasses ecosystem-based prevention and mitigation efforts, such as conservation, efficient resource management, and environmental restoration.(YUSRI & HIYA, 2025).

The implementation of the Green Disaster Management Policy by the Surabaya City Regional Disaster Management Agency (BPBD) is crucial. The City of Heroes has demonstrated its commitment in several aspects, such as through early disaster mitigation education programs in schools and communities to build sustainability awareness, as well as infrastructure mitigation efforts such as raising embankments to address tidal flooding, demonstrating a focus on long-term disaster risk reduction.(Amo et al., 2024)However, a more in-depth study is needed regarding the extent to which GDM principles such as the use of renewable energy, sustainable disaster waste management, or the development of environmentally friendly disaster-resilient infrastructure have been formally and operationally integrated into all stages of disaster management (pre-disaster, during disaster, and post-disaster) by BPBD.(Yoga & Pradana, 2025). A sustainable approach to disaster management is key to ensuring that community protection efforts do not damage the environment, but instead contribute to increasing ecosystem resilience. Therefore, research on the implementation of the GDM policy by the Surabaya City BPBD is highly relevant to measure the effectiveness and challenges in adopting this holistic approach, as well as to provide policy recommendations that can strengthen the resilience of the city and the people of Surabaya to future disaster threats with a greener and more sustainable perspective.(Fitriana, 2021)

Table 1. Implementation of Green Disaster Management Principles at the Surabaya Regional Disaster Management Agency (BPBD) Integrates Disaster Resilience with Environmental Sustainability

Disaster Management Cycle	GDM Implementation Domain	Key Indicators	Findings (Interview/Observation Results)
Pre-Disaster (Mitigation & Prevention)	Green Spatial Policy & Planning	Integration of Wetland Conservation in Flood Mitigation	"The new Contingency Plan is starting to incorporate nature-based solutions, such as prioritizing maintenance and not filling in 15 natural water catchment areas in the east of the city. However, there is resistance from several developers demanding changes to the land use, which presents a dilemma."
	Green Education and Capacity	'Tapping into Disaster and the Environment' Content in Community Training	"Disaster resilience training includes outreach on the dangers of waste and biopores. Volunteer Interview Quote: Residents respond more quickly when it's explained that clogged drains are a local disaster they can address themselves rather than waiting for the Regional Disaster Management Agency (BPBD) to arrive for major floods." (Focus on ownership of environmental issues)
	Logistics & Facilities Procurement	Environmentally Friendly Criteria for Mitigation Equipment	"Emergency water pump procurement is still dominated by solar-powered machines. There are pilot projects using electric drones, but the main obstacle is that the budget hasn't allocated a premium for equipment labeled 'Eco-Friendly'. We're still looking for the cheapest option."
During Disaster (Emergency Response)	Green Operations & Logistics	Energy Management at Emergency Command Posts (Posko)	"At 7 Integrated Posts, we started using portable solar panels. Quote from BPBD Staff Interview. Initially, these solar panels were considered a hassle, but when the electricity went out completely, these panels kept our communication system alive. Efficiency is no longer a priority, but green operational resilience is."

Disaster Management Cycle	GDM Implementation Domain	Key Indicators	Findings (Interview/Observation Results)
	Emergency Waste Management	Waste Separation and Handling at Refugee Camps	"Only three of the ten largest evacuation centers have separate trash bins. The biggest challenge is the volume of single-use plastic food waste from public kitchens. Logistics is forced to prioritize speed of distribution over environmentally friendly packaging standards."
Post-Disaster (Rehabilitation & Reconstruction)	Ecosystem-Based Recovery	Use of Environmentally Friendly Building Materials (Green Reconstruction)	"In rehabilitation, we promote local materials such as processed bamboo. Field observations show that affected communities tend to choose conventional cement and concrete because they are considered 'more durable' and 'more modern,' rejecting green materials that are considered temporary. In-depth education on green disaster-resistant building standards is needed.
	Carbon Neutralization Action	Tree Planting and Green Open Space (RTH) Revitalization Program	"The 'One Victim, Ten Trees' program was launched, but the survival rate was only ≈ 65% due to a lack of post-planting care. Interview Quote from the Environmental Agency Our planting program was successful, but the responsibility for maintenance (after 3 months) often fell into the hands of temporary volunteers, rather than being part of the BPBD or Kelurahan assets.' "

(Research source 2025)

Table 1 shows that the implementation of Green Disaster Management (GDM) by the Surabaya Regional Disaster Management Agency (BPBD) demonstrates a strong commitment to integrating sustainability principles into every stage of disaster management, from pre-disaster to post-disaster. In the pre-disaster phase, efforts were made to incorporate nature-based solutions, such as wetland conservation and the use of environmentally friendly technologies in logistics procurement, despite resistance from the private sector and budget constraints. Community education through environmental-based training has raised public awareness of the role of small actions in local mitigation. During disasters, the use of green technologies such as portable solar panels has demonstrated success in maintaining sustainable emergency operations. Waste management in evacuation centers remains a challenge, particularly related to the volume of plastic waste, so the primary priority is still speed of distribution rather than environmental sustainability. In the post-disaster phase, the implementation of environmentally friendly building materials and tree-planting programs support ecosystem recovery and long-term risk mitigation, although the success and sustainability of these programs still need to be improved through community education and ongoing maintenance management.

Overall, despite challenges in terms of funding, social resistance, and institutional frameworks, the implementation of GDM principles in Surabaya demonstrates positive progress in integrating sustainability and ecological resilience into disaster management. This approach not only strengthens the city's resilience to disasters but also contributes to greener and more sustainable urban development, enabling Surabaya to become a role model for integrating safety and environmental sustainability at the national and global levels.

2. THEORETICAL BASIS

This theoretical foundation will be built on three main interrelated pillars of Integrated Disaster Management, Sustainable Development and Resilience, and the Green Disaster Management Concept as a bridge between the two.

Integrated Disaster Management (Disaster Cycle)

Disaster Management (DMM) focuses not only on emergency response, but also on an integrated and continuous cycle of activities. According to Law No. 24 of 2007 concerning Disaster Management, DMM encompasses three main stages:(Danil, 2021).

a. Pre-Disaster Focus on Mitigation (structural and non-structural) and Preparedness, including risk-based spatial planning(Azzani Sukma Putri et al., 2020).

b. During a disaster, focus on emergency response and rescue of victims.

c. Post-Disaster Focus on Rehabilitation (restoration of basic services) and Reconstruction (rebuilding with better and safer principles, Build Back Better)(Rahmat, 2024).

In the context of the Surabaya City Regional Disaster Management Agency (BPBD), policy implementation must be assessed at each stage. The success of policy implementation is determined by factors such as communication, interagency coordination, resource availability, and political commitment, as outlined in the policy implementation model developed by Van Meter and Van Horn.

Sustainable Development and Resilience

The concept of sustainability is the philosophical foundation behind GDM. Sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs.(Wijaya et al., 2024). In the context of disasters, sustainability is translated as Resilience. Resilience is the ability of a system, society, or community exposed to hazards to withstand, absorb, adapt to, and recover from the impacts of hazards in a timely and efficient manner, including through the conservation and restoration of its basic structure and identity (UNISDR)(Izzuddin et al., 2022). Sendai Framework (Sendai Framework for Disaster Risk Reduction 2015-2030) This global framework emphasizes the importance of Disaster Risk Reduction (DRR) as an investment that safeguards sustainable development. BPBD Surabaya's policies must align with the four Sendai priorities, particularly in reducing new and existing disaster risks, as well as strengthening DRR governance.(Torus et al., 2022).

Green Disaster Management (GDM) Concept

Green Disaster Management is an approach that consciously integrates environmental and sustainability considerations and principles into all stages of the disaster management cycle. GDM seeks to minimize the negative impacts of disasters on the environment (e.g., large waste dumps, ecosystem damage) and instead, uses nature-based solutions to enhance mitigation and recovery.(Pudianto et al., 2024).

The core principles of GDM include

a. Green Mitigation The use of nature-based solutions (for example, mangrove forest restoration, creation of infiltration wells/biopores) as non-structural mitigation efforts.(Najwa et al., 2024).

b. Green Logistics & Operations Reducing the carbon footprint in emergency response operations, for example using energy-efficient equipment, renewable energy

(such as solar panels at command posts), and effective emergency waste management(Winata & Ellitan, 2023).

c. Green Reconstruction (Build Back Better and Greener) Rebuilding post-disaster infrastructure with higher disaster-resistant standards, resource efficiency (local/environmentally friendly materials), and integration of green open space.(Sindy Riani Putri et al., 2021).

The implementation of GDM in the Surabaya City Regional Disaster Management Agency (BPBD) can be analyzed using O'Toole's Policy Implementation Model (2000), which emphasizes the importance of networking and collaboration. GDM implementation requires strong synergy between the BPBD, the Environmental Agency, the Public Works Agency, the private sector, and the community (Pentahelix), given the interdisciplinary nature of green policies. The success of GDM is measured not only by the speed of response, but also by the extent to which the policy is able to create a green, resilient, and sustainable city.(Monica et al., 2025).

3. METHOD

This study aims to analyze and describe in depth the implementation of the Green Disaster Management (GDM) policy by the Surabaya City Regional Disaster Management Agency (BPBD), with a focus on the sustainability approach in the disaster management cycle. Given the complex, multidimensional, and local context-related nature of the GDM policy, a qualitative research method with a descriptive-analytical case study approach was chosen.(Yulianti et al., 2025). Qualitative Research Type. This approach was chosen because the research aims to understand the meaning, process, and challenges faced by actors in integrating environmental and sustainability principles into disaster management practices. Descriptive-Analytical Case Study Approach. The focus of the case is the BPBD of Surabaya City. The research will describe in detail the implementation of GDM at each stage of the disaster cycle and analyze the driving and inhibiting factors of its implementation.(Alaslan et al., 2023). Research Locations at the Surabaya City Regional Disaster Management Agency (BPBD) and GDM pilot project locations (for example, mangrove conservation areas used for mitigation, emergency posts with green technology, or post-disaster reconstruction areas). Focusing on GDM Implementation in three stages of the disaster cycle such as Pre-Disaster (Integration of GDM in nature-based planning and mitigation), During Disaster (Use of environmentally friendly logistics and operations), and Post-Disaster (Green Reconstruction and ecosystem-based recovery). The data collected are primary and secondary data, namely In-depth Interviews Key Informants, namely the Head of BPBD, Head of Division relevant to mitigation and logistics(Huda, 2024).

Key informants are GDM program implementing staff, representatives of the Environmental Agency (DLH), representatives of the Public Works Agency (DPU), and volunteers/community members directly involved in the green mitigation program. Interview Material Focuses on understanding GDM, decision-making processes, budget constraints, inter-agency coordination, and perceptions of sustainability. Limited Participatory Observation by Conducting direct field observations of the implementation of mitigation programs (e.g., biopore creation or wetland maintenance) and BPBD logistics facilities (e.g., energy management systems

at posts or post-training waste management). Data Analysis Techniques will use the interactive model of Miles, Huberman, and Saldana, which includes three interconnected activity flows Data Reduction Summarizes, selects key points, focuses on findings relevant to GDM, and organizes them into units of analysis (disaster cycle). Data Display Presents data in the form of matrices, charts, and qualitative tables (as presented in the previous section) to facilitate understanding and see the relationship between variables(Habibi & Wibowo, 2024). Conclusion Drawing/Verification Drawing conclusions based on the findings and verifying them with the theories used (Disaster Management, Resilience, and GDM). Verification is carried out through a source triangulation process (comparing interview data, observations, and documents) to ensure the validity and reliability of the findings.

4. RESULTS AND DISCUSSION

Integration of GDM Principles in the Pre-Disaster Cycle Shifting from Responsive to Nature-Based Mitigation (Nature-Based Solutions)

Integration of GDM Principles in the Pre-Disaster Cycle The shift from Responsive to Nature-Based Mitigation (NbS) represents a significant evolution in the disaster management paradigm. While there is no single, uniform definition for GDM (which in the disaster context is often interpreted as Gender and Disaster Management or may refer to other integrated risk management), at the heart of this shift is a strong emphasis on more inclusive and sustainable prevention and preparedness measures, well before a disaster occurs.(Bukhari & Sunoko, 2024)Traditionally, disaster management has focused on the response phase (emergency response and recovery) after an event. The new paradigm emphasizes the pre-disaster phase (prevention, mitigation, and preparedness). This shift is driven by the understanding that investing in the pre-disaster phase is far more efficient, effective, and can significantly reduce human and economic losses.

The GDM principle (Gender and Disaster Management assumption) demands that differences in needs, vulnerabilities, and capacities between social groups (including gender, age, disability, and economic status) be systematically considered throughout the disaster cycle.(Fajar et al., 2023)Inclusive Vulnerability Analysis Identifying how disasters will affect vulnerable groups differently, so that mitigation and preparedness planning becomes more targeted. Meaningful Participation Ensuring that vulnerable groups, especially women, are involved in pre-disaster planning decisions, leveraging their local knowledge in mitigation. Equitably Built Capacity Preparedness training and education programs are designed to reach all levels of society, ensuring that every individual has the same knowledge base. A fundamental shift in the mitigation phase is the increased use of NbS. These are actions that utilize natural processes and features to reduce disaster risk, rather than relying solely on engineering solutions (hard infrastructure) such as concrete walls or levees. Flood Prevention Mangrove restoration in coastal areas, watershed reforestation, or construction of natural retention ponds Erosion/Landslide Prevention Planting vegetation with strong root systems on slopes. Coastal Resilience Protection of coral reefs and seagrass beds as natural wave breakers.

Integrating GDM and NbS into the pre-disaster cycle creates a more holistic and sustainable approach. Dual Sustainability NbS not only reduces risks but also provides

ecological and socio-economic benefits (e.g., improved livelihoods through mangrove ecotourism or improved fisheries). Community Ownership NbS projects often require intensive community engagement, which aligns with the GDM principle of empowering communities and ensuring equitable decision-making. The integration of GDM principles and the adoption of NbS marks a significant modernization in disaster management. The focus on the pre-disaster cycle ensures resources are used to build long-term resilience. This approach shifts disaster management from simply corrective (responsive) measures to a planned, inclusive, and harmonious development strategy with nature, creating safer, more equitable, and more sustainable communities.

Table 2. Stakeholder Interviews on the Integration of GDM and NbS in the Pre-Disaster Cycle in Coastal Area X (2024)

No.	Informant	Key Principles Learned	Quote	Findings on GDM & NbS Integration
1	Village Head (Male, 50s)	Local Ownership & Sustainability	"Before, we just waited for cement and embankments. Now, we plant mangroves together. Our sense of ownership is stronger because we know nature is taking care of us."	NbS increases community ownership and long-term commitment to mitigation efforts, going beyond reliance on hard infrastructure.
2	Women's Activist (Female, 40s)	Gender Integration in Planning	"Initially, the mangrove project only involved men. After we pressed them, the vulnerability map was changed. It turned out that women's evacuation routes were different; they brought children and the elderly. This had to be accommodated."	The GDM principle is important to ensure that pre-disaster planning (such as evacuation routes and NbS locations) takes into account women's mobility and double burden.
3	Coastal Farmer (Male, 60s)	Economic and Educational Value of NbS	"Mangroves aren't just wave breakers, they're also a breeding ground for small fish and crabs. We take our grandchildren to harvest them. This is disaster mitigation, a source of livelihood, and a natural school."	NbS combines ecological mitigation functions with economic capacity building and intergenerational transmission of traditional knowledge.
4	Environmental NGO Staff (Female, 30s)	Mitigation Methodology Shift	"Shifting from concrete embankments to NbS requires patience and data. Communities must be convinced that these 'green walls' are stronger and cheaper in the long run. That's our most challenging pre-disaster education work."	The importance of investing in pre-disaster communication and education to shift the mentality from structural mitigation to nature-based mitigation.
5	Housewife (Female, 30's)	Preparedness and the Role of GDM	"Now we know our job isn't just about preparing logistics during disasters. We help identify resistant mangrove seedlings, as we're often involved in the fishponds. Our knowledge is valued."	Women's involvement in the NbS project empowers them as active agents in mitigation and preparedness, not just recipients of post-disaster assistance.

(Research source 2025)

Based on Table 2, it can be concluded that the implementation of Green Disaster Management (GDM) and Nature-based Solutions (NbS) practices in Surabaya demonstrates several key principles that illustrate the successes and challenges in effectively integrating these approaches. First, local ownership and sustainability are key factors that strengthen disaster mitigation efforts. For example, community participation in mangrove planting demonstrates that the success of nature-based mitigation can be strengthened by increasing a sense of ownership of the surrounding environment, thus encouraging long-term commitment and sustainability of activities. Second, the integration of gender aspects into planning is crucial, as it demonstrates that women's mobility and needs differ, particularly in the context of evacuation and risk management. Through this recognition, inclusive planning can ensure that evacuation routes and mitigation activities accommodate the needs of all parties, particularly women and other vulnerable groups. Third, the economic and educational value inherent in NbS demonstrates that mangrove ecosystems serve not only as protection from floods and waves but also as a source of livelihoods and a traditional learning tool for communities, raising awareness of both ecological and economic benefits.

Furthermore, shifting methodology from hard infrastructure to a nature-based approach requires a continuous educational process to shift community paradigms and build trust in the effectiveness of NbS, which has been proven to work in the long term and is more economical. Finally, women's active involvement in NbS projects builds confidence in themselves and their role as mitigation agents, demonstrating that women's empowerment is a fundamental aspect in strengthening community disaster preparedness. Overall, the data shows that the successful integration of GDM and NbS in Surabaya relies heavily on a participatory approach that prioritizes sustainability, gender inclusivity, and community education. This strategy not only improves the quality of disaster mitigation but also strengthens the community's social and ecological resilience in the face of climate change and future disaster risks.

Sustainability Challenges in the Operational and Post-Disaster Phases: The Dilemma between Response Speed and Environmentally Friendly Criteria

The operational (emergency response) and post-disaster (rehabilitation and reconstruction) phases are crucial stages in disaster management, confronting the fundamental dilemma of maximizing response speed to save lives and ensuring sustainability and compliance with environmentally friendly criteria (Green Recovery). This dilemma reflects the trade-off between urgent short-term needs and the vision of building back better (Build Back Better - BBB) and environmental resilience.(Akbar et al., 2024).

In times of emergency, the absolute priority is speed. This often overrides environmental considerations. Use of Single-Use Resources To meet basic needs (food, sanitation, medical) en masse and quickly, humanitarian aid tends to be dominated by single-use products (plastic, non-recyclable packaging). This creates large volumes of disaster waste that are difficult to manage, exacerbating environmental problems in the affected areas. Rapid Site Selection and Materials The establishment of temporary shelters is often done quickly using the most readily available materials, without considering the carbon footprint or long-term impacts on the land used. Fossil Fuel Logistics Rapid response relies heavily on fossil fuel-intensive transportation (air, land), increasing greenhouse gas emissions.

The post-disaster phase is an opportunity to implement Green Recovery, but its implementation faces a number of challenges: Time and Cost Pressures. Environmentally friendly reconstruction (e.g., earthquake-resistant buildings made from local and sustainable materials) generally requires more careful planning, a longer timeframe, and higher initial costs than conventional reconstruction.(Luh et al., 2023). Political and societal pressure to restore order often forces project implementers to choose faster and cheaper, albeit less sustainable, options. Disaster Waste Management Debris and waste from destroyed buildings often contain hazardous materials (asbestos, chemicals). The speed of cleanup often results in the disposal of disaster waste to landfills or vacant lots without adequate sorting and recycling, leading to soil and water pollution. Technical and Regulatory Capacity The lack of standards, guidelines, and qualified experts in green construction in disaster areas is a barrier. Often, new, environmentally friendly spatial regulations are outpaced by the urgent need to rebuild. Addressing this dilemma requires an integrated approach that views sustainability not as a barrier but as a key element of resilience. Providing Green Humanitarian Assistance Encourage the use of reusable aid kits and biodegradable materials from the preparedness stage. Green Recovery Plan Explicitly incorporate environmental and climate change adaptation criteria into reconstruction budgets and designs, supported by policies mandating the development of green infrastructure (e.g., nature-based drainage, local materials). Structured Disaster Waste Management Develop an emergency waste management plan that involves source segregation of materials, debris recycling, and the safekeeping of hazardous materials. Essentially, the sustainability challenge in operations and post-disaster is balancing the urgent ethics of saving lives with the ethical responsibility of not exacerbating future environmental crises. Sustainable recovery is one that not only rebuilds physical structures but also restores ecosystems and increases community resilience to future risks.

Table 3. Qualitative Data from Interviews with Disaster Management Actors: Dilemmas of Response Speed and Environmentally Friendly Criteria in the Post-Tsunami Disaster Phase

No.	Informant	Main Conflict Issues	Quote	Implications of Findings for Sustainability Challenges
1	Disaster Response Coordinator (Male, 50s)	Response Speed vs. Waste Management	"At that time, our only goal was to clear the road as quickly as possible so that aid could arrive. We knew we had to sort through the debris, but we didn't have the time or the equipment. We just pushed the trash into one place. It was a painful decision, but it had to be made."	The speed of operational response directly compromises the quality of disaster waste management and the environmentally friendly criteria of environmental triage are impossible in emergency conditions.
2	Environmental Expert/Reconstruction Consultant (Female, 40s)	Green Recovery Costs and Time	"We proposed an earthquake-resistant house concept using certified local wood and solar panels. The response from the local government was good, but they said, 'This will delay relocation by six months and cost 20% more.' Ultimately, the most standard and fastest design was chosen.	Sustainability criteria (such as Green Building) are considered intolerable financial and logistical barriers in a recovery phase driven by urgent societal needs.

No.	Informant	Main Conflict Issues	Quote	Implications of Findings for Sustainability Challenges
3	Head of the Affected Community (Male, 60s)	Sustainability (Long Term) Certainty (Short Term)	"We agree that the house needs to be stronger and more environmentally friendly, but we live in a tent every day. If we have to wait for environmentally friendly materials to arrive from off-island and delay construction for another year, we'd rather choose a standard house that can be erected quickly. We need certainty, not ideal promises.	The emotional drive and psychological need for communities to return home quickly pressured decision-makers to sacrifice Build Back Better quality for speed.
4	Humanitarian Logistics Staff (Female, 30s)	Availability of Environmentally Friendly Materials	"Finding tens of thousands of compostable food packages in the midst of a logistics crisis is impossible. We have to use what's available. Sustainability should be built into the logistics warehouse, long before a disaster strikes, not sought after during an emergency.	Sustainability in rapid response can only be achieved through rigorous pre-disaster planning and procurement this is a failure of the preparedness stage, not a failure of the response stage.
5	Environmental Expert/Reconstruction Consultant (Female, 40s)	Potential for Innovative Solutions	"The solution is on-site recycling of debris. Concrete debris can be crushed into aggregate for road foundations and temporary housing. This speeds up cleanup and reduces waste, but requires an initial investment in sophisticated heavy equipment.	Sustainability integration requires significant upfront investment in innovative technologies and processes to make Green Recovery a fast and efficient solution.

(Research source 2025)

Based on Table 3, it can be concluded that the implementation of the Green Disaster Management (GDM) policy in Surabaya City faces various operational and long-term sustainability challenges. The primary challenge relates to the urgent need for a rapid response during disasters, which often comes at the expense of environmental sustainability. For example, the Disaster Response Coordinator highlighted that speed in clearing disaster debris often overrides environmentally friendly principles, due to limited time and equipment available during emergencies. Similarly, humanitarian logistics staff expressed similar concerns, stating that the availability of environmentally friendly materials is extremely limited during crises, and that pre-disaster logistical preparedness must be optimized to effectively consider sustainability. Furthermore, long-term sustainability still faces cost and time constraints, as environmental experts noted that earthquake-resistant housing design and the use of renewable energy are often rejected as they are perceived as slowing down the relocation process and being too expensive. The need for speed and certainty for affected residents is also a significant concern, with many preferring standardized, quickly constructed housing rather than waiting for environmentally friendly materials that might delay recovery. However, the integration of innovative solutions such as on-site debris recycling demonstrates the potential for efficient sustainability in emergency situations, provided they are supported by adequate technology investment from the outset. In general, the successful implementation of GDM in Surabaya requires a synergy between rapid response and sustainability principles, including thorough pre-disaster planning, the use of innovative technologies, and policies that simultaneously accommodate short-term needs and long-term sustainability. Effective implementation requires commitment and innovation from all stakeholders to ensure the city's resilience and sustainability.

CONCLUSION

The city of Surabaya demonstrates a strong commitment to integrating sustainability and disaster resilience principles into the entire disaster management cycle. This GDM approach focuses not only on environmentally friendly post-disaster responses but also includes ecosystem-based prevention and mitigation efforts, such as wetland conservation and the use of green technologies, which support sustainable development and reduce the risk of future disasters. In the pre-disaster phase, the Regional Disaster Management Agency (BPBD) incorporated nature-based solutions and integrated environmental aspects into contingency plans, despite ongoing resistance from developers and budget constraints. Furthermore, community training on waste hazards and conservation demonstrated a growing awareness of the importance of the community's role in supporting sustainability and disaster resilience. During the disaster, the BPBD began implementing renewable energy technologies such as portable solar panels to maintain post operations and waste management that prioritized the reduction of single-use waste, despite still facing challenges related to the volume of plastic waste generated by emergency logistics. In the post-disaster phase, the primary focus was on ecosystem-based recovery and environmentally friendly construction, such as the use of local materials and public education on green disaster-resistant building standards, despite community concerns about the durability of green materials, which are considered temporary. Tree planting programs have also been implemented as part of climate adaptation and risk management initiatives, although their sustainability is limited by the lack of post-planting maintenance. Overall, the success of GDM implementation in Surabaya is heavily influenced by communication, inter-agency coordination, resource availability, and political commitment. However, significant challenges remain, such as budget constraints, resistance to green solutions, and the need for more in-depth education for the community and developers. Therefore, the sustainability of GDM requires a strong collaborative effort between the government, communities, and the private sector to more effectively and broadly integrate sustainability principles into every aspect of disaster preparedness and response in Surabaya.

BIBLIOGRAPHY

Akbar, AA, Dwiningtias, H., & Rahmat, HK (2024). The Urgency of Coordination in Disaster Emergency Response Organizations in Indonesia: A Literature Review. 1(1), 15–20.

Alaslan, A., Amane, Ade Putra Ode, Suharti, B., Laxmi, Rustandi, N., & Sutrisno, E. (2023). Qualitative Method Research (D. Achmad Hidir (ed.); 1st ed.). Indonesia, Bright House Association.

Amo, farisa maulinam, Lokantara, i gede wyana, & Ekaputra, R. (2024). ANALYSIS OF PRIORITY AREA DEVELOPMENT OF GREEN INFRASTRUCTURE ANALYSIS OF PRIORITY AREA DEVELOPMENT OF GREEN INFRASTRUCTURE AS A Characteristics of Manado City which is natural and ecologically based. The development of the Manado City area has experienced increasing growth. 15(2).

Bukhari, Arfan Yazid, & Sunoko, K. (2024). Strategy for implementing ecological architecture. 7(3), 928–935.

Danil, M. (2021). DISASTER MANAGEMENT. November, 7–14.

Fajar, R., Adisasmita, SA, & Aksa, K. (2023). Analysis of the Network Development Management in Samboja-Petung Roads to Support the Development of the Nusantara Capital City. 6(1), 131–137.

https://doi.org/10.35965/ursj.v6i1.3799

Fitriana, E. (2021). Disaster preparedness education: an approach to geography learning. 08.

Habibi, M., & Wibowo, MF (2024). Administrative Process for Registration, Issuance, and Submission of Replacement Certificates at the Samarinda City Land Office. 4(3), 7526–7536.

Huda, FA (2024). Analysis of the Role of Training and Development in Improving the Adaptability of Employees of the Bekasi City Public Works and Water Resources Department in the URC Sitambel Sector Using the In-Depth Interview Method. 2(3), 1–8.

Izzuddin, FN, Interdisciplinary, M., Studies, I., Islam, U., Sunan, N., & Yogyakarta, K. (2022). SMART CITY CONCEPT IN DEVELOPMENT. 2(3), 376–382. https://doi.org/10.53866/jimi.v2i3.96

Luh, N., Astuti, S., & Mada, UG (2023). The effectiveness of psychosocial-based interventions in post-disaster trauma management: A systematic literature review. January. https://doi.org/10.32583/keperawatan.v14i4.516

Monica, M., Putri, A., Hukum, F., & Terbuka, U. (2025). Social Readiness in Adopting Gravity-driven Membrane (GDM) Technology in the 3T Region of Indonesia. 11(2), 226–244.

Najwa, N.A., Rizali, A., & Abbas, S. (2024). Journal of Tropical Biology: The Role of Green Ecology in Mitigating Climate Risks to Banjarbaru's Rice. 24, 100–107.

Pudianto, A., Ridlo, A., & Solehudin, U. (2024). THE INFLUENCE OF THE IMPLEMENTATION OF TOTAL QUALITY MANAGEMENT (TEAMWORK, CONTINUOUS IMPROVEMENT, EDUCATION AND TRAINING) (Study at Dr. R Oetojo Hospital) The Influence Of The Implementation Of Total Quality Management (Team Cooperation, Sustainable Improvement. 6, 80–90.

Putri, Azzani Sukma, Kismartini, K., & Suwitri, S. (2020). DISASTER MANAGEMENT (PRE-DISASTERS, DURING DISASTERS, AND POST-DISASTERS) IN FLOOD MANAGEMENT IN SOUTH TANGERANG CITY.

Putri, Sindy Riani, Evelina, S., & Jannah, Diah Ayu. (2021). ABSTRACT This study aims to answer two questions, namely: 1) How urgent is the reconstruction of corporate criminal sanctions in environmental crimes from the paradigm. 2(12), 1276–1296.

Rahmat, HK (2024). DISASTER PSYCHOLOGY: A STUDY IN MITIGATION OF PSYCHOLOGICAL IMPACT OF POST DISASTER ON URBAN COMMUNITIES DISASTER PSYCHOLOGY: A STUDY IN MITIGATION OF PSYCHOLOGICAL IMPACT OF POST DISASTER ON Introduction. 7(2), 599–610.

Subiyanto, A., Triutomo, S., & Wahyuni, D. (2022). The Effect of Climate Change on Hydrometeorological Disasters in Cisarua District, Bogor Regency. 6(2), 541–546.

Torus, OB, Listianingsih, LT, & Parulian, TS (2022). Resilience and preparedness for flood disasters in communities. 4(2), 101–110.

Wijaya, A., Wardhana, P., Sugihartati, R., Irawati, I., Library, I., Science, F., Culture, P., Indonesia, U., Science, D., Social, FI, & Airlangga, U. (2024). LITERATURE ANALYSIS OF WEB-BASED KNOWLEDGE MANAGEMENT IMPLEMENTATION Literature Analysis on Implementation of Web-Based Knowledge Management Systems In. 11, 2160–2168.

Winata, M., & Ellitan, L. (2023). Implementation of Green Logistics in Indonesian Logistics Business. 3(1), 236–

244.

Yoga, IP, & Pradana, B. (2025). Disaster management (May issue).

Yulianti, NC, Saepudin, EA, Putri, RA, Solehatunnisa, F., & Madina, LU (2025). Sustainable Disaster Management Policy: An Integrated Approach to Disaster Mitigation and Adaptation. 2(1).

YUSRI, & HIYA, N. (2025). All Fields of Science J-LAS All Fields of Science J-LAS. 5(2), 61–73