
Restored Karst Areas: A Multi-Case Study of Community-Based Conservation in Gunungkidul

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Abstract

This study underscores the importance of conservation movements, which relies on local knowledge to sustain the environment and enhance community welfare, by examining the Resan Gunungkidul Community as a representative case from Indonesia's Gunungsewu Karst Landscape. We using qualitative descriptive methods through multi-case approaches, and the data were collected through in-depth interviews and participatory observations with some communities in field. This study analyzes the KRG's educating strategies for common pool resource management with any local movements. The results of the study confirmed that KRG successfully developed a conservation model in the name "resan". That conservation model through the use of a broad social network, the application of a common-pool resources (CPR) approach, and the horizontal leaders. The emergence of KRG does not only affect its core movement, but also significantly impacts the development of other communities. Even with limitations, such as a small scale of action, low member flexibility, limited segmentation, and minimal financial resources, KRG was able to maintain local conservation movements. Their educating innovations boosted biodiversity, improved pest monitoring, expanded conservation knowledge, and strengthened collaboration networks. This study highlights that multidisciplinary engagement and the application of similar models in other contexts are essential to strengthen the impact of community-based conservation in ecologically vulnerable areas.

Keywords: Community-based Conservation; Common-Pool Resource; Environmental Sociology; Gunungkidul's people; Karst Landscape

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Introduction

Environmental movement has received global attention as a strategy that can balance biodiversity protection— from environmental problems (Nelson et al. 2021; Sele and Mukundi 2024). This balance is sought by various civil society movements to achieve the well-being and sustainability of the life of the community itself (Suharko 2023). In this study, we have observed some literatures of the success of community-based conservation (CBC) from local movements. We found several studies on CBC as a paradigm and system (Berkes 2004, 2007). In Nepal, Costa Rica, and USA, Some communities are paying attention conservation Policy Shifts at the International Level (Kothari, Camill, and Brown 2013). Taiwan CBC project successfully compares forms and patterns of relationships institutionalization in the context of conservation and development (Tai 2007).

The success of CBC is relative, such as in Southeast Asia (Dove, Sajise, and Doolittle 2011; Duker and Klanarongchao 2022; Sarok and Britin 2017). In Indonesia, the role of local movements in resource management is increasingly marginalized (Sulistiyawati 2011; Winarto 2011). They experience various gaps, such as the uniqueness of institutions and structures, financial uncertainty, deepening local knowledge and, specific environmental problem solving .

Especially Gunungkidul, along with the existence of the development of karst landscape areas carried out by the government and UNESCO in the form of the Gunungkawu Geopark (Sulistiyowati, Setiadi, and Haryono 2021). As a field study, karst areas are landscapes resulting from the dissolution of carbonate rocks that form caves, crevices, and groundwater systems (Akhmad Fauzi, Setia Hadi 2019; Cahyadi 2017). The existence is in the special authority of the Special Region of Yogyakarta— with an area of 807 km² or 53% of the district area— where the purpose of the land management pattern is for the welfare of the community through tourism schemes (Dewi et al. 2018; Widyaputra and Setyaningrum 2024).

This research highlights the Resan Gunungkidul Community (KRG or Komunitas Resan Gunungkidul), a local movements that emerged in response to the environmental problems of the karst area. These communities respond to the origins of natural disasters,

the impact of tourism, limestone mining, and the bioprospecting industry (Assalimi and Yuanjaya 2023); even until now there is no certainty regarding the spatial management of the Gunungkidul karst landscape (DPMPT Gunungkidul 2020; Kusumayudha et al. 2022). In addition, KRG does not only carry out ecological conservation education, such as the preservation of rean trees and lake restoration. Rather, the trust system of the members provides a guarantee scheme formed on the figure of an ecological conservation leader. They also revive the history, cultural and spiritual identity of the people in Gunungkidul. They build inclusive social networks that involve a number of parties, including local communities, academics, government organizations, the media, and the private sector. At the same time, the KRG leverages digital media to document practices and disseminate local knowledge (Adam and Smith 2023).

This article provides an analysis of how the CBC fills gaps that are overlooked by formal conservation policies and projects. In addition, the researchers sought to strengthen the CBC literature as an environmental movement topic's in sociology perspective (Sele and Mukundi 2024), and demonstrate the potential of local initiatives in community-based shared resource management (Aims 2013; Ekarini and Koestoer 2022). These findings confirm that an effective CBC does not always rely on institutional structures, but can also be realized through initiative, influence and flexibility.

Community-based Conservation Framework

Community-based conservation is understood—by most ecological and social researchers—as a conservation approach that places local communities as the main actors (Berkes 2004). We finding some literature explane, local communities can integrate biodiversity protection with livelihood improvement (Fariss et al. 2022; Gerolemou, Russell, and Stanley 2022; Zylstra et al. 2014). They also recognize that the meanings of nature, resources, and conservation are socially constructed (Berkes 2007; Brosius, Tsing, and Zerner 2005; Sowman 2017; Suharko 2023). Artinya, CBC tidak hanya menjadi sebuah fenomena lokal ke global, melainkan paradigma komunitas menjaga lingkungan hidupnya.

In enveronmental sociology, we view that CBC cannot be separated from the topic of the environmental movement which will continue to develop along with its problems. The

complexity of problems, such as the climate crisis, pollution, clean water crisis, the impact of industrialization, and more, have threatened humans and other biophysicals. Despite the large number of non-governmental organizations (NGOs) in the environmental sector, an expert-based approach is not able to counteract these threats (Varvarousis 2020). This leads to three shifts in the ecological view (Berkes 2004), including: first, the environment is seen as an object, but a nonlinear and finite system. Second, humans are seen as the main subjects, but they are part of the ecosystem and vulnerable. Third, expertise is considered as a driver of development, but where is the direction of development. Therefore, this shift in ecological direction prompted the CBC as a newly formed (Ostrom 2015), initiative and participatory institution (local communities and indigenous peoples) to maintain, care for and protect other human and biophysical conditions.

The conservation movement in today's world, CBC has more freedom of movement and is growing rapidly. Berkes (2007) explained that CBC can take various complementary forms. Co-management or co-governance involves jointly managing protected areas between the government and local communities, sharing responsibilities and decision-making rather than leaving control to a single party. Customary institutions or local wisdom leverage traditional laws and practices, positioning communities as natural guardians of their territories. CBC can also be livelihood-oriented, integrating conservation with community economic well-being through initiatives like ecotourism or sustainable non-timber forest product use. Participatory adaptive monitoring and management further engages communities in ecological observation, resource management, and decision-making based on real-world conditions. Finally, CBC is not always formal; informal community institutions and multisectoral partnerships foster collaboration among communities, NGOs, and governments, particularly in multiscale or globalized contexts. Together, these approaches highlight that successful conservation depends on active community involvement and the recognition of local knowledge.

Theoretically, CBC is not just an initiative, but is evident in the physiology and rationality that forms communities in treating the adaptive environment. When described, there are three key principles of CBC, including: first, local persons or communities play an active role in controlling and making decisions on the use of local resources. Second, local

persons or communities already have an habituation and integration of cultural-ecological heritage. Third, local persons or communities have their own values and measures for integrating ecological and socio-economic benefits (Brosius et al. 2005). Based on these principles, CBC has become an important set of concepts in protecting the environment of local communities.

Empirical evidence from several previous studies has received attention from both the state and the private sector. For example, the influence of management with the CBC principle is able to reduce the rate of deforestation expansion and its impact (Khongswasdi 2022; Nelson et al. 2021). Its use strengthens socio-ecological resilience — through practices such as agroforestry, ecocultural tourism, and the protection of sacred sites (Ghayoumi, Charles, and Mousavi 2023; Ruiz-Mallén et al. 2015). Recent findings confirm the contribution of community actions—from community patrols that reduce environmental crime to ranking priority actions based on expert assessment—as a lever for conservation effectiveness (Barua 2024; Milner-Gulland et al. 2014).

Like a framework, CBC works through the strengthening of social capital—such as individual initiative, networks, beliefs and norms—and collective learning that produces local/adaptive knowledge (Colchester 1994) The key to the success of CBC is not about the intervention process. Because it is this collective learning that explains why the same intervention can produce different results across communities (Sele and Mukundi 2024). Recent research highlights enabling conditions—such as local organizational capacity, legitimized access rules, participatory monitoring, and cross-actor networking—as important determinants of ecological and social outcomes in community areas (Oldekop et al. 2025).

Meanwhile, the study of trend patterns identifies new threats and opportunities for CBCs, such as the digitalization of monitoring, ecosystem services markets, and climate change pressures, that require adaptive institutional design (Esmail et al. 2023). At the practical level, previous research—quasi-experimental findings and longitudinal evaluations—has shown that strong local governance correlates with increased conservation income, compliance, and biodiversity outcomes (Nelson et al. 2021).

In terms of theoretical gaps, the global CBC literature is well established, but studies examining CBC dynamics in Southeast Asian karst landscape (KBAK) areas, especially Indonesia, are limited (Sulistiyowati et al. 2021). For the most part, karst conservation model has been marginalized by the state and the private sector (Gadgil, Berkes, and Folke 2021; De Koning et al. 2017; Ruiz-Mallén et al. 2015). This dominance shows three main gaps in the phenomenon of various regions and the KRG, including: first, it is not known that the process of local knowledge of the KRG is negotiated — even standardized into the rules of the collective game. Second, the structure of the KRG network has not been proven to influence the adoption of conservation practices. Third, there is no evidence that the KRG's actions are able to spread and scale without eroding local meaning.

Recent research provides directions, including: a number of studies show the role of community and collective restoration networks in scaling action; Even other findings formulate a framework for participatory collaboration in socially difficult landscape areas (Díaz-Pinzón et al. 2024; London et al. 2023). Another study of community-based natural resource management (CBNRM) emphasizes empowerment, leadership, and self-reliance as core "development as freedom"—in line with the CBC's normative assumptions—but also reminds that achievement is so heterogeneous, that intervention design must depart from local definitions of value and benefit (Büscher, Dressler, and Fletcher 2019). Meanwhile, a community-based commons-pool resource (CPR) study is also a consideration. This framework provides a clear explanation of boundaries and rules of shared choice into an ideal form of community institution in their environment.

Methods

This study uses a qualitative method with a multi-case study approach (Sievers-Glotzbach et al. 2021; Stake 1995; Yin 2017) to explore community-based conservation (CBC) practices in the Gunungkidul Karst Landscape Area. This approach was chosen because, following Stake (1995) view, cross-case comparison is an effective way to reveal significant patterns and relationships within complex socio-ecological contexts. The Resan Gunungkidul Community (KRG) was placed as the main case, accompanied by four

comparative cases—the Nglangse Gunungkidul Community, the Peduli Telaga Dondong Community, the Wonosadi Forest Farmers Community, and the Rumah Bibit Resan Community—which were selected through purposive sampling (Creswell and Poth 2017). We use this multi-case design as a support to explain the influence of KRG on other local communities in Gunungkidul.

Data was collected over eight months through participatory observation, snowballs approach, in-depth interviews, and review of local documents and publications (Boblin et al. 2013). In field study, I have met the leader of the KRG, Edi Padmo (EP), to tell us about the emergence and movement space of conservation with his “Resan” trees. His story provides information on some of the KRG’s links with several other communities. Then, I met the names of other community leaders and members (such as, Ngadiran (NG) in the Nglangse community of Gunungkidul (KNG), Bayu (BY) in the Wonosadi forest guard community (KPHW), Cahyo (CY) in Dondong lake Community, and Budi (BD) in Rumah Bibit Resan (RBR)). Then, I recorded a summary of their movements into pieces of data with coding. Once the data is considered sufficient, through the triangulation process, I arrange it in the form of a table to make it easy to analyze. The table helps me to determine the cases so that they are mutually confirmed. The analysis followed an interpretive paradigm (Boblin et al. 2013; Merriam and Grenier 2019) through four iterative stages—open coding, axial coding, cross-case pattern analysis, and source triangulation. This process ensured the integration of empirical data and the CBC conceptual framework, resulting in a deep understanding of the dynamics of communities in managing shared resources and the factors that influence the sustainability of conservation.

Results

Background of Emergence and Rooting: Resan Community in the Gunungkidul Context

The rapid changes to the karst landscape of Gunungkidul show how social-ecological pressures can trigger community mobilization when formal institutions fail to manage them adaptively. Within the framework of the social–ecological system (Berkes 2004), Local communities are often key actors responding to environmental instability, development

inequality, and the collapse of cultural mechanisms that previously underpinned sustainability. Our field findings show a similar pattern: prior to the emergence of the Gunungkidul Resan Community (KRG), residents faced three waves of change that not only increased vulnerability, but also encouraged the formation of local adaptive capacity.

Based on illustrated (**Table 1**), the first wave emerged from the pressure of development and expansion of karst tourism since 2016, especially after the establishment of the Mulo Geopark Information Center and the post-2020 commercial tourism industry. This activity causes regional inequality and environmental degradation. EP affirms,

"Tourism is already crowded with visitors, but our environment has begun to be damaged. So, local people do not enjoy welfare."

This quote shows the incompatibility between the narrative of formal development (BAPPEDA Gunungkidul 2013; DPMPPT Gunungkidul 2020) and the ecological experience of citizens, thus giving rise to the need for collective articulation.

The second wave is marked by the degradation of socio-cultural values. Traditions such as *nglangse*, *rasulan*, and *sadranan* loss of its ecological function due to commodification and lack of regeneration. The COVID-19 pandemic accelerated the collapse of social spaces; NG said,

"During the Pandemic (COVID-19), indigenous peoples' (activities) stopped completely. No one (thinks) about who is fighting for the fate of the indigenous people."

This process confirms the premise that structural pressures can weaken cultural reproduction mechanisms, thus encouraging the search for alternative spaces to nurture local knowledge.

The third wave emerged after Typhoon Cempaka in 2017, when ecological vulnerability was felt directly through underground river flooding, strong winds, crop failures, and physical changes in the Luweng Belimbing. A resident of Pacarejo, CY stated,

"... Here (settlements) are used to being dry (even dry), but (shocked by asking) how can we mitigate flooding up to (as high as half a door of a house)."

These catastrophic experiences reinforced the perception of risk and sparked intensifying citizens' discussions about disaster mitigation and karst degradation.

The accumulation of these three pressures shows the existence of multiple stressors that are not responded effectively by the government structure, thus opening up space for community-based self-organization mechanisms. It is in this context that the KRG emerged: as a collective response to negotiate risks, restore local knowledge practices, and reorganize people's relations with karst ecosystems. Thus, the emergence of KRG is not only a social phenomenon, but a manifestation of the community's adaptive capacity in the face of rapid and unbalanced social-ecological change.

Table 1. the emergence of KRG in Three Waves

	Timeline	Key Triggers	Social-Ecological Change Process	The Impact That Led to the Formation of the KRG
Wave 1: Karst Development and Tourism Pressures	2016–2020	- 2016: Mulo Geopark Information Center (Gunung Sewu Storefront) - 2020: Rapid expansion of commercial tourism (HeHa Ocean View and other new destinations)	- Growth of commercialization-based tourism - Increased waste production & karst environmental stress - Inequality of development between regions	Fostering early awareness that large-scale development is not in line with karst ecological sustainability; The need for a movement of citizens is beginning to be felt
Wave 2: Degradation of Traditions, Local Identity, and the Impact of Covid-19	2017–2021	- Decreased interest in traditions (nglangse, rasulan, sadranan) - Local wisdom is commodified for tourism - 2020–2021: The Covid-19 pandemic made cultural activities stop completely and social space narrowed	- Traditions lose their ecological and social functions - The regeneration of local values weakens drastically - The pandemic is accelerating the loss of space to gather, discuss, and care for ecological values	The community is increasingly aware of the importance of alternative spaces to maintain local knowledge; KRG emerged as a forum for caring for community-based ecological identity
Wave 3: Awareness of Socio-Ecological Vulnerability (Post-Typhoon Cempaka)	2017–2022	- 2017: Hurricane Cempaka (flooding of underground rivers, strong winds, crop failures, loss of livestock) - Physical changes in the Luweng Belimbing and karst land shape dynamics	- Ecological vulnerability and disaster risk are becoming more pronounced - Citizens' discussion increased on disaster mitigation and karst degradation - Pandemic emphasizes the economic and ecological vulnerability of karst communities	It became a turning point for the emergence of a collective movement; triggered the birth of KRG as a response to disaster risks, karst degradation, and loss of cultural space

Source: results of data processing of researchers (2025)

The story of the discussion then focused on the establishment of the Gunungkidul Resan Community (KRG) as a community awareness institution to care about the function of the karst area. The awareness effort was carried out by them through three main activities, namely education, information, and direct community involvement, as well as various environmentally-based initiatives. Not an official matter or not, the KRG begins its role by raising thematic issues according to the challenges faced by initiative and volunteers.

On the first trip, this community shared their main values about "wong Gunungkidul". Although this was still limited at an early stage, the KRG utilized internal actors as a group of artists. They took advantage of the exhibition and artwork titled Value. However, there is a lack of mapping and supporting data as movement capital, but the KRG continues to carry out its awareness of the main functions of karst areas.

The next movement journey, KRG was developed as a forum community in connecting various environmental communities in Gunungkidul. This role not only fills the void of post-disaster response, but also serves as a forum for the consolidation of local ecological values amid increasingly intensive economic and tourism pressures.

Local knowledge lacks the capacity to handle and calculate typhoons and their losses. Therefore, KRG created a forum for networking and knowledge sharing. The founders of this community — not a few are cultural activists and NGO activists — many of them have discussed and debated such social change. EP said that "Gunungkidul people" have a pretty good lifestyle and livelihood. However, they changed their lifestyle due to modernity, financial problems, and development that made them objects. Nevertheless, their consensus directs community change. The KRG has become aware of the function of degraded karst areas, and the community does not have the capacity to protect them. So as a consequence of the passage of time, this community has succeeded in taking an important role in conducting mitigation education and solving environmental problems thematically, based on toponymic maps (Conedera et al. 2007).

The transformation of the KRG is still ongoing as an asymmetrical cross-sector community. Initially, their movement was carried out with sporadic grassroots-based collaborations. They show this with the toponymic map of Gunungkidul as empirical evidence of their journey to collaborate with rural communities in karst areas. Then, the

grassroots movement experienced semi-institutionalization with grassroots-based cultural system activities. Although the formal structure is not the goal, the movement is able to sustain its agenda in a sustainable manner. The consistency of its activities has received the support of civil society at large, and cross-sectoral participation. Thus, the close relationship with the grassroots, area identification, and institutionalization system, makes KRG already have a strong position as an environmental care community at the local level.

Grassroots recognition as an important factor for the KRG strengthens its legitimacy as a conservation actor's reputation. The KRG algorithm as a list of resource persons for the community concerned about the environment, it is enough as proof of this recognition. With the condition of the KRG that is established with the local socio-cultural reality, and their consistency has initiated beneficial activities directly. The findings reveal four strong cases (**Table 2**) demonstrating how various communities interact with the KRG, illustrating its expanding socio-ecological influence. **First**, the Nglangse community of Gunungkidul (KNG) collaborates with the KRG in water conservation by maintaining 'resan' trees (It is an old, large tree that is believed by the local community to be a "guardian" of the natural environment (e.g. for the availability of water, animal feed and other plants)) through Javanese traditions once considered obsolete (AW 2022). Rituals, symbolic attire, and community participation reinforce cultural identity while supporting ecological protection. KRG's documentation of KNG's ceremonial activities increased public visibility but also created tensions, as authorities responded to public misconceptions labeling them "tree worshippers." Through strategic reframing, the KRG shifted these spiritual practices into ecological narratives, strengthening its legitimacy as both a cultural and conservation actor.

Second, KRG's activities around Dondong Lake inspired local residents to institutionalize lake restoration (Asih 2024; Kerido 2025). Planting the symbolic kedondong tree highlighted its hydrological significance and attracted attention from village authorities, facilitating trust and dialogue. Regular community discussions during "Rebo Wage" gatherings eventually led (Kalurahan Banjarejo 2019), to the creation of an independent lake-care community. Over time, this initiative expanded into broader socio-cultural forums, ecotourism efforts, and local water governance, demonstrating how KRG catalyzed new community institutions.

Third, the Wonosadi Forest Guard community (KPHW), led prominently by women, gained recognition for defending the Wonosadi customary forest from exploitation (Padmo 2022). Although smaller in scale, KPHW's efforts were amplified when KRG used *resan.id* to highlight their community-based conservation model. This collaboration emphasized women's leadership and inspired KRG to further promote inclusivity, youth participation, and cross-community solidarity. Both groups experienced institutional transformation as they reframed identities and strengthened ecological justice narratives.

Lastly, KRG's interaction with these networks enhanced its capacity to collaborate, innovate, and regenerate leadership. By engaging youth groups in 'resan' tree nurseries, KRG facilitated the formation of Rumah Bibit Resan (RBR), a new youth-led conservation community (Padmo 2024). This development ensured generational continuity and broadened KRG's role as a connector between tradition, local knowledge, and youth innovation.

Overall, KRG's transformation illustrates how conservation evolves through cultural grounding, social interaction, and adaptive networking. The group's strength lies in integrating ecological protection with local identity, engaging diverse stakeholders—from farmers and artists to government agencies. Collaborations such as 'resan' tree planting with village authorities and discussions with BKSDA on wildlife conflicts demonstrate KRG's ability to bridge customary knowledge with formal institutions. Distinct from national conservation models, KRG practices "identity conservation," situating karst protection within local symbols and rituals, consistent with community-based conservation literature. This model shows that effective conservation can emerge not from formal structures but from solidarity, shared memory, and collective commitment across generations.

Table 2. Results of a multi-case cross-study of the KRG movement and four other communities

Aspect	Case 1: KNG	Case 2: Telaga Dondong Community	Case 3: KPHW	Case 4: RBR
Main Interaction with KRG	Cultural-based conservation collaboration (sacred ceremonies, Javanese identity).	Toponymic tree planting and formation of regular discussion forums.	Network strengthening through publications and enhanced legitimacy of women forest guardians.	Leadership regeneration and youth collaboration in resan nurseries.
Activity Focus	Cultural rituals to protect large trees (resan) through Javanese tradition.	Ecological restoration of Telaga Dondong & formation of a self-sustaining community.	Protection of customary forest and ecological advocacy led by women.	Environmental education, nursery activities, and youth ecological activism.
Role of KRG	Bridge for publication and legitimacy of KNG activities; reframing cultural practices into ecological action.	Catalyst for the emergence of a new community; connector between residents & village government.	Platform to amplify KPHW narratives; expanding cross-community conservation networks.	Facilitator and mentor; broadening movement scope through youth involvement.
Key Impacts on Society / Environment	Strengthened legitimacy of tradition as conservation; some tension with authorities.	Emergence of Telaga conservation community; increased community control over water resources.	Empowerment of women as conservation actors; increased public attention.	Enhanced youth capacity; continuity of cross-generational conservation movement.
Impact on KRG Transformation	Strengthened KRG identity as guardian of cultural values and conservation.	Expanded KRG role from local community to catalyst for new movements.	Encouraged KRG to embrace inclusivity & narrative advocacy.	Signaled a regeneration phase, strengthening movement sustainability & network expansion.
Key Values / Themes	Tradition; Identity; Cultural legitimacy.	New institutions; Community participation; Water sovereignty.	Women; Customary forest; Social networks.	Regeneration; Social innovation; Ecological education.

Source: results of data processing of researchers (2025)

Dynamics of Cross-Community Networking

The dynamics of social networks are one of the important factors that shape the way the Resan Gunungkidul (KRG) movement works and is sustainable. This network not only serves as a means of coordinating activities, but also as a forum for building trust, strengthening solidarity, and expanding the reach of conservation actions. In its development, KRG developed a distinctive social network pattern (**Table 2**), combining the value of togetherness, the principle of solidarity, cross-group collaboration, cultural narratives, and the use of digital media. This combination provides social power that allows the community to mobilize various parties in supporting the preservation of karst areas.

The KRG's decision-making is based on local rules sourced from Javanese ethics. Values such as mutual respect, and prioritizing common interests. In addition, the community is also aware of the power imbalance and potential conflicts between them and state actors, which have been still being improved in management practices. Community capital sector by developing socio-cultural strengths and traditional environmental knowledge. Although, they are aware of how vulnerable conservation areas can be taken over by the state and private or other interests. This is marked by the ratification of the Special Region Regulation of Yogyakarta Number 1 of 2017 concerning the Management and Utilization of Sultan Land and kadipaten Land.

Because formal institutions are less supportive, the Javanese version of environmental ethical values—which are reflected in the Resan concept—become the KRG's guidelines in every action, discussion, and decision-making process. According to BD Informant,

“All our decisions always refer to ‘Resan’, so that every step taken is in harmony with existing customs and customs.”
(Interview, 2024).

Meanwhile, KRG manages finances independently as a community-based community organization. EP explains,

"We manage our own funds, independent of outside parties, because almost, there are no activities without non-governmental organizations." (Interview, 2024).

In terms of transparency, the KRG faces limitations because it does not have a formal management system capable of presenting public reports. As non-formal institutions, they also have no obligation for formal administrative accountability. EP adds,

"I am aware of this limitation, so accountability is done directly, in fact, if I come from anywhere, I will definitely make activities or share with friends... Decisions remain through the deliberations of members... and there is no written report." (Interview, 2024).

Awareness of power imbalances and potential conflicts with state actors emphasizes the importance of a more explicit explanation of how the KRG regulates internal as well as external interactions. By combining community norms and participatory discussions, the KRG is able to maintain social cohesion and functional governance, so that community-based decision-making can be understood comprehensively and rationally.

Even so, this togetherness that has been built creates an inclusive space for the community to collaborate in karst area conservation actions without technocratic demands. All members are trustworthy, regardless of social background, to have the opportunity to be involved in activities, both at the planning and implementation stages. This pattern is in line with the KRG practice of determining the location of tree planting to the preparation of seedlings. KRG coordinates with its members and they apply for seed assistance to various regions. Even when it comes to choosing to plant trees, this community has only two choices, namely based on external requests or internal desires. The inclusive decision-making structure is a determining factor for the success of the joint resource management carried out by the KRG.

CBC model in KRG movement

In this context, social networks play a crucial role in shaping the social structure and sustainability of ecosystems. The KRG case study shows how local Indonesian communities developed a distinctive social network model, combining the principles of togetherness, solidarity, collaboration, cultural narratives, and the use of digital media. This model is not only effective in local conservation, but it also offers new theoretical contributions to the understanding of CBC. **First**, togetherness as an internal foundation in the community. Togetherness is not just a value, but also a social structure—an individual's belief in a community—that is dynamic for them. The community adopts consensus principles in decision-making, uses local rules rooted in Javanese ethics, and implements independent financial management. This creates an inclusive space for members to collaborate in karst area conservation actions. This approach is in line with the forest guard community in Wonosadi. However, they implement an inclusive and consensus-based decision-making structure, although KRGs in shared forest management tend to come from heterogeneous and cosmopolitan members.

Second, horizontal leadership that is inclusive in the form of a figure. The model of coherence in the KRG emphasizes horizontal leadership that prioritizes equality and inclusivity. The founder of the KRG plays the role of a facilitator who connects members, not as a vertical authority. Every decision is made through a collaborative process that emphasizes the importance of social networks in ecosystem management. They not only voted, but entrusted the sustainability of KRG management to EP. Although this charismatic has not been really measured by researchers, it has a direct impact on community regeneration.

This doubt is because KRG members in joint forest management tend to come from heterogeneous and cosmopolitan backgrounds. This diversity includes differences in professions, life experiences, education levels, and social networks that go beyond the boundaries of the Gunungkidul karst area. This diversity enriches conservation perspectives and strategies because each member brings different knowledge, resources, and connections. However, at the same time, these differences also present challenges in building understanding, especially when values and priorities are not fully aligned.

In the midst of this diversity, the KRG adopted a model of coherence that emphasized horizontal leadership. The principles of equality and inclusivity are the main foundation, so that each member has an equal position in decision-making and the implementation of activities. Therefore, KRG and KNG experienced a paradigm shift. KNG sees the world from the perspective of Javanese spirituality, while KRG tends to be opportunistic for socio-ecology.

The leader of KRG acts as a facilitator who connects members. This role is not carried out as a vertical authority that rules, but rather as a driving force that ensures all parties can actively participate. Although the role of EP looks like reducing conservation activities in the Gunungkidul karst area. All community decisions are taken through a collaborative process that involves open discussion, allowing a wide range of views to be conveyed and considered before reaching a mutual agreement.

Nevertheless, the sustainability of KRG management is still largely entrusted to the figure of EP. This trust was born from members' views on EP's capabilities and charisma in maintaining the direction of the movement. However, so far there have been no measurements that show the exact extent to which this charisma has an impact on the community regeneration process.

Third, collaboration as the main life in maintaining KRG conservation actions in the Gunungkidul karst area. This community shows that cross-sectoral collaboration—including academia, government, society, and the private sector—is an effective strategy in conservation. For example, the restoration of the function of the Dondong lake involves various parties through collaborative economic mechanisms such as Corporate Social Responsibility (CSR) and technology. Their cross-sectoral cooperation resulted in various activities centered on the lake. Such as doing the traditional Nglangse ceremony with KNG, even though their relationship did not go smoothly. In addition, they performed a flag ceremony on the anniversary of the country's independence when the Dondong lake dried up. The activity was carried out with the support of the village government, local communities and other communities as well as students. As a recovery step, the KRG also held the tradition of *ngledrek* as an effort to coat the bottom of the lake. Through this series of activities, Dondong Lake is not only restored as a water ecosystem, but also positioned as

a cultural and social space that brings together various actors. This collaboration shows that conservation is not only about protecting natural resources, but also building cross-community solidarity on the basis of local identity.

The results of the study show that cross-sector collaboration is a key factor in maintaining KRG conservation actions in the Gunungkidul karst area. The KRG not only relies on the internal capacity of the community, but also develops networks with academics, governments, local communities, and the private sector. This pattern of collaboration shows that conservation cannot be carried out exclusively, but requires recognition and support from various actors.

Field studies show that the return of the function of Telaga Dondong is a real example of how collaboration works. The process of restoring the well involves a collaborative economic scheme, including the utilization of CSR programs and the application of technology. With the support of various parties, the lake is not only restored as an ecological resource, but also functions as a center of social and cultural activities. This fact suggests that economic and technological mechanisms can be integrated with local knowledge bases to achieve conservation goals.

In addition to the technical aspects, other findings show that collaboration also reinforces the cultural dimension in conservation. KRG and other communities are involved in the implementation of traditional rituals such as Nglangse. They also hold a flag ceremony on the anniversary of independence when the lake is dry, a symbol of the connection between ecological space and national identity. On the other hand, the tradition of ngledrek that is carried out to coat the bottom of the lake has become a local practice that has been revived as part of the recovery strategy.

Overall, the findings of this study confirm that conservation in Gunungkidul cannot be understood solely as an ecological practice. Through cross-sectoral collaboration, KRG has succeeded in placing conservation as a meeting space that brings together various actors with their own interests. Dondong Lake is no longer seen only as a water ecosystem, but as a socio-cultural space that binds solidarity and community identity. Thus, community-based conservation in Gunungkidul represents a transformation model that simultaneously unites ecological, social, and cultural dimensions.

Fourth, the cultural narrative of the KRG as a tool of social binding. These communities utilize local cultural narratives, such as toponymy and sacred symbols, to reinforce community identity and conservation goals. The return of 'resan' trees in Wunung Village, for example, is not only an ecological action, but also an effort to reinterpret the living space and cultural heritage. This is in line with the commoning approach in natural resource management, which combines ecological and socio-cultural aspects in a single unit.

The KRG actively uses elements of local culture, such as toponymy and sacred symbols, to build collective awareness. Naming natural places or objects with terms that carry historical and spiritual significance helps community members feel emotionally connected to their living space. As EP explained,

"Each name of a place, tree, or water source in our region has its own story and meaning, which is always remembered and respected by the residents" (interview, 2024).

CY adds,

"Symbols that are considered sacred are not just decorations, but a reminder for us to protect the environment and preserve the activities of indigenous peoples" (interview, 2024).

Through these practices, the community strengthens a sense of belonging and shared responsibility, ensuring that cultural values directly inform environmental stewardship and daily actions..

One prominent example is the return of 'resan' trees in Wunung Village (Padmo and Fatmayanto 2024). This action is not only an ecological restoration activity, but also a process of redefining the living space that has been part of the cultural heritage of the local community. Through this action, the KRG seeks to maintain the continuity of cultural values while preserving the environment.

This approach reflects the understanding that environmental preservation and strengthening cultural identity are mutually reinforcing units. In practice, the KRG combines these two aspects to ensure that conservation efforts not only have an impact on the

sustainability of the ecosystem, but also on the sustainability of the socio-cultural life of the community.

Fifth, the use of digital media for the mainstreaming of the KRG movement. This community uses digital media such as websites and social media to document activities and expand the reach of public participation. The use of this media allows the community to share information, educate the public, and rally support, creating an inclusive and participatory discussion space. This approach is in line with the community's style in the use of social media, which plays an important role – for example, developing community-based ecotourism – in increasing social participation and solidarity.

The KRG community uses digital media as one of the main strategies to mainstream the conservation movement. One of the important channels used is the *resan.id* website, which serves as the official community information center. Through this site, the KRG documents activities, publishes the findings of local sites, and builds a narrative that the existence of these sites is important to maintain. The content in *resan.id* is designed to construct a public understanding that the preservation of karst areas is not just an ecological affair, but also part of a cultural heritage worthy of being preserved.

In addition to the website, KRG's Instagram social media is a bridge that connects community members, local conservation activists, and the wider public. This platform is used to visually share documentation of activities, announce agendas, and invite direct participation in conservation activities. Instagram facilitates two-way interaction between communities and communities, thus forming a dynamic participatory network.

Sometimes, the dissemination of information is also carried out personally by EP through his personal Facebook account. These channels are used to inform activities, invite participation, and reach social circles that may not be directly connected to the official KRG channels. Thus, digital media serves as a layered communication ecosystem, combining formal and informal channels to expand reach and strengthen support for conservation movements.

This approach is in line with the experiences of conservation communities and other environmentally-minded communities (Ni'am 2019; Osazuwa et al. 2024)—e.g., ecotourism—where social media plays an important role in the development of community-

based ecotourism. There, increased participation and social solidarity proved to be a supporting factor for the success of community-based initiatives.

The findings from the KRG offer a new perspective on the CBC approach by emphasizing the importance of integration between social networks, local culture, and technology in conservation. KRG's fluid and dynamic social networking model, supported by the principles of togetherness and solidarity, makes an important contribution to understanding how local communities can manage natural resources sustainably. This approach enriches the CBC literature by emphasizing the importance of social and cultural aspects in the success of community-based conservation.

Table 3. Models KRG Conservation

CBC Elements of KRG	Practices / Implementation	Impact / Function	Challenges
1. Togetherness	<ul style="list-style-type: none"> - Decision-making based on consensus - Referring to local rules grounded in Javanese ethics - Independent financial management 	<ul style="list-style-type: none"> - Creates an inclusive space for collaboration - Strengthens social cohesion in conservation 	<ul style="list-style-type: none"> - Difficulty aligning diverse member perspectives - Reliance on understanding the <i>Resan</i> values
2. Horizontal Leadership	<ul style="list-style-type: none"> - Leaders act as facilitators rather than vertical authorities - Decisions are made collaboratively - Leader's role in maintaining the movement's direction 	<ul style="list-style-type: none"> - Ensures active member participation - Supports the sustainability of KRG's movement 	<ul style="list-style-type: none"> - Dependence on the Leader figure - Difficult to measure the impact of leader charisma on community regeneration
3. Cross-Sector Collaboration	<ul style="list-style-type: none"> - Cooperation with academics, government, private sector, and local communities - Telaga Dondong restoration: CSR, technology, traditional rituals (Nglangse, Ngledrek, flag ceremonies) 	<ul style="list-style-type: none"> - Sustainable ecological conservation - Strengthens community solidarity and identity - Provides socio-cultural space for multiple stakeholders 	<ul style="list-style-type: none"> - Divergent interests among stakeholders - Conflicts implicit with other communities (e.g., KNG)
4. Cultural Narrative	<ul style="list-style-type: none"> - Use of toponymy and sacred symbols - Replanting of '<i>resan</i>' trees - Linking environmental preservation with cultural identity 	<ul style="list-style-type: none"> - Reinforces collective awareness - Maintains continuity of cultural and environmental values 	<ul style="list-style-type: none"> - Different interpretations of symbols and cultural meaning across generations - Risk of cultural values being forgotten if new members lack understanding
5. Use of Digital Media	<ul style="list-style-type: none"> - Official website (resan.id) - Instagram and Facebook for documentation, publication, and public participation 	<ul style="list-style-type: none"> - Increases public engagement - Builds a public narrative on karst conservation - Expands social networks 	<ul style="list-style-type: none"> - Limited digital access for some members - Challenge of keeping content relevant and engaging

Source: results of data processing of researchers (2025)

Strategies for Defending Action

The KRG's conservation strategy integrates local wisdom, ecological innovation, and community social networks, aiming not only to protect natural resources but also to revive cultural values and local identity (Sowman 2017). Central to this approach is a local philosophy that motivates and guides conservation practices, such as lake revitalization and

the preservation of ‘resan’ trees (Kothari et al. 2013). Principles like “gathering bones” emphasize consensus-building, collaboration, and engagement of the younger generation, fostering a socio-ecological awareness that strengthens community identity.

Social networks act as catalysts for action, expanding participation and collaboration through initiatives like the Rumah Bibit Resan program and the digital platform resan.id. These platforms connect communities, academics, government, and the private sector, enabling public input, documentation, and broader engagement while reinforcing the legitimacy of local conservation efforts (Berkes 2007; Mazé, Calabuig Domenech, and Goldringer 2021).

Local innovation links traditional knowledge with ecological solutions adapted to the context, such as the bais planting system and the restoration of dry lakes (with “ngedrek” (or restoring the bottom of the well by pressing cow feces, mud and hay using cow's feet or a group of people)), alongside cultural practices like nglangse to protect old trees. By combining philosophy, networks, and innovation, KRG creates an inclusive, collaborative conservation model that integrates social, cultural, and technological dimensions, offering a new theoretical framework for community-based conservation.

Critical Reflections on the KRG Case

This study shows that the KRG’s community-based conservation strategy can be critically understood through the lens of Common-Pool Resources (CPR). Four key elements characterize their approach (Agrawal 2001; Berkes 2004; Varvarousis 2020): clear local rules and institutions, participatory decision-making, collective monitoring and knowledge exchange, and cross-sector networking with external actors. These principles align with both classic and recent CBC literature and allow KRG to document and manage shared biocultural resources, addressing local welfare challenges and vulnerabilities from anthropogenic pressures and climate change.

KRG begins with careful resource identification, engaging local “gatekeepers,” academics, and communities to build motivation and consensus without imposing top-down solutions. The organization ensures local participation in managing cultural symbols and resources, fostering trust, collaboration, and a shared identity among Gunungkidul

population. Initiatives like restoring Dondong's Lake involve volunteers from multiple sectors, creating spaces for knowledge exchange and long-term ecological and social benefits.

Despite its successes, KRG faces institutional limitations. Its role is largely facilitative, constrained by national conservation policies, market-based development pressures, and organizational fragility. While KRG effectively bridges communities and stakeholders, its dependence on active founders and local support poses a risk to sustainability. Strengthening institutionalization and formal recognition is essential to maintain and expand its conservation impact while navigating local and external challenges.

Conclusion

In conclusion, the KRG case demonstrates that effective community-based conservation relies on multidimensional engagement, combining resource identification, cross-sector collaboration, and knowledge sharing grounded in local cultural values. The integration of these dimensions not only strengthens socio-ecological cohesion and adaptive learning but also enhances the legitimacy and sustainability of conservation practices in the Gunungkidul Karst Landscape Area.

These findings highlight the practical value of multidisciplinary involvement—bringing together local communities, academics, government, and private actors—as a key driver for participatory and resilient conservation. Moreover, the KRG model offers a replicable framework for other regions, showing that culturally informed, locally rooted, and networked conservation strategies can be scaled up to address broader environmental challenges while maintaining alignment with local wisdom and social priorities.

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