

Engaging Rural Communities for Disaster Resilience: Overview of DESTANA Initiation in Panusupan, Central Java

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Abstract. The integration of local knowledge for the enhancement of disaster resilience, particularly in rural areas, is a widely adopted approach in disaster risk reduction efforts. This study centers on bolstering the disaster resilience capabilities of rural communities through the utilization of the DESTANA program. This article provides a detailed account of the various phases involved in initiating DESTANA, encompassing preliminary activities, workshops, training sessions, disaster planning, policy development, and the formation of dedicated disaster response teams. The implementation of DESTANA in Panusupan Village, Banyumas region serves as a successful case study, showcasing the active involvement of the community in disaster risk reduction, the formulation of disaster response strategies, and the establishment of platforms for disaster risk reduction discussions and preparedness teams. This study strongly advocates for the early adoption of the DESTANA initiation program in rural villages as a proactive measure to mitigate the impact of disasters, particularly those linked to hydro-meteorological hazards.

1 Introduction

Community resilience is the community's capacity to prepare, plan, and be able to adapt and recover from disasters while maintaining its functions and structures [1–3]. Building disaster resilience can be collectively implemented with prevention, mitigation, preparedness, disaster risk response, and disaster recovery efforts [4, 5]. The role of government institutions and NGOs that highlight disaster risk reduction is dedicated to strengthening the public's understanding of disasters [6]. However, these community resilience processes are the main challenge [7], but it is substantial to identify resilience efforts or predictions based on the diversity of existing community resilience [8]. Early warning systems are an influential component of disaster prevention and preparedness that affect the strength of community resilience and disaster risk reduction efforts [9]. Hence, the two essential concepts of disaster preparedness and community resilience are closely in a complex context [5].

Disaster Resilient Village (in Indonesian: *Desa Tangguh Bencana* [DESTANA]) is a rural community-based disaster risk reduction (DRR) program that is adaptive and responsive to

potential disaster threats and can recover from the impacts caused by disasters [10]. In the DESTANA program implementation, the community will be actively involved in reducing disaster risk in the area through various activities, and utilizing existing resources to facilitate disaster mitigation and achieve Sustainable Development Goals (SDGs) [11]. Until 2021, Banyumas region has formed DESTANA in 21 villages [12]. Panusupan Village, which has started developing DESTANA from the initial stage, will be encouraged to engage community-based disaster risk reduction activities. This study emphasizes strengthening the resilience of rural communities to disasters through DESTANA program and brief explanation of the stage to develop the DESTANA in Panusupan. Earlier study has shown that training vulnerable groups can reduce the impact of disasters. Oktari et al. [13], explained that DRR activities must involve women and prioritizing gender is needed to reduce the number of disaster victims. Further, Soetanto [14], stated that pregnant women are vulnerable to extreme disasters, while elderly group tends to be less reactive to disasters and is prone to disasters [11]. In addition, people with disabilities, as a vulnerable group with limited mobility and medical conditions [16], are involved because they can adapt their knowledge and experience to contribute to risk reduction [17].

The region of Banyumas has been facing various challenges related to the environment, economy, public health, and social well-being [18]. In recent years, Banyumas has experienced multiple hydrometeorological disasters that have significantly affected the local population [19]. Panusupan, a vulnerable area within the Cilongok District, is particularly exposed to floods, landslides, droughts, and strong winds [20]. Over the past three years (2020-2023), Panusupan has witnessed 23 landslides that caused damage to residences, a road, and a bridge [21]. In addition, Panusupan has been affected by recurring floods during the rainy season. These disasters had devastating consequences for the region. On the other hand, Panusupan also faces the challenge of drought during the dry season, requiring efforts to ensure a sustainable supply of fresh water. The research community has recognized a lack of preparedness in Panusupan Village for these recurrent disasters. Therefore, research is being conducted to explore strategies for enhancing community resilience in disaster risk reduction programs.

2 Method

2.1 Description of the Case Study Area

Panusupan Village is a village in Cilongok District, Banyumas, Central Java, Indonesia. Astronomically, Panusupan Village is at 7°43'-7°48' S and 109°15'-109°18' E. The area of Panusupan Village is 9.30 km² divided into 3 Hamlets, 7 Neighborhood Head (RW) and 63 Neighborhood (RT), with the eastern border bordering Patikraja District, the west bordering Jatisaba Village, next door to the south it borders the Purwojati District. In contrast, to the north, it borders the villages of Pejogol and Pageraji [22]. According to Suwarno [23] and Suwarsito [20], factors that trigger disasters in the Cilongok District area include geology, hydrology, land slope, rainfall intensity, and human activities.

Geologically, Panusupan Village is composed of the Tapak Formation, Halang Formation, and Old Eruption Rocks of Mt. Slamet [24]. Based on FAO [25], Panusupan Village is composed of Inseptisol and Entisol soil types. Structural landforms with folded mountains/hills form the geomorphology of Panusupan Village [26]. The location of this research area is at an elevation of 17-165 meters above sea level, which means that the research area has a sloping and hilly surface relief (see Fig. 1).

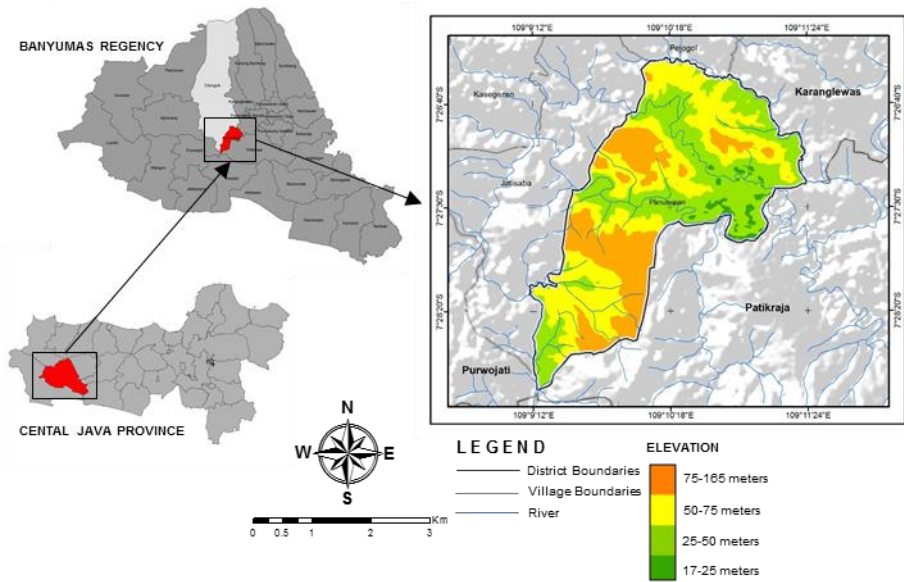


Fig. 1. Map showing the case study area and its topographical situation. Two inset maps show the location of the study area in Banyumas region and the location of Banyumas region in Central Java Province.

According to population data released by the Panusupan Village Government in 2021, the total population in Panusupan Village reached 9780 people, with a male population of 4948 people and 4832 female residents. Based on population data by age group, most of the residents in Panusupan Village are aged 19-60 years. In more detail, the demographic data graph of Panusupan Village in 2021 is below.

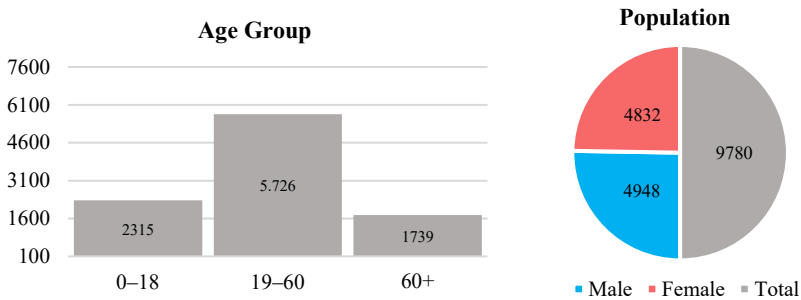


Fig. 2. Number of populations by age group and number of populations by gender (source: Panusupan Village Government in 2021).

2.2 Brief Description of the DESTANA Program in Panusupan Village

The initiation of the Disaster Resilient Village (DESTANA) program in Panusupan Village is a program built by the Geography Education Student Association, University of Muhammadiyah Purwokerto in the Student Organization Capacity Strengthening Program (PPK ORMAWA) team unit. The main focus of DESTANA initiation is to improve disaster

understanding in rural communities. This program collaborates with the Regional Disaster Management Agency (BPBD) of Banyumas Regency, the Muhammadiyah Disaster Management Center (MDMC) of Banyumas Regency, the Muhammadiyah Youth Force Preparedness Command (KOKAM), Chief of Banyumas Regency Police (Kapolresta Kabupaten Banyumas), Indonesian National Army (TNI), Indonesian Red Cross Society (PMI), and other parties. The initiation program last three months, from July to September 2023. In this program, students from the PPK-ORMAWA team act as facilitators whose job is to help the community understand DESTANA and help make plans to achieve goals. The following components are required and achieved in establishing DESTANA in Panusupan.

2.3 Overview of the Method

This study uses a qualitative approach with descriptive analysis as its methodological framework. Data collection includes observation, documentation, and interviews. The DESTANA initiative is monitored by a collaborative team, and interviews are conducted with key informants. Documentation is also used to collect information. Triangulation is used to verify the data. Data analysis follows the Interactive Model proposed by Miles et. al. [27] following data collection, the initial step involved data reduction, which entailed identifying and condensing the information gathered to yield relevant insights for addressing the research inquiries. The process involves data reduction and reporting to formulate conclusions and problem-solving solutions.

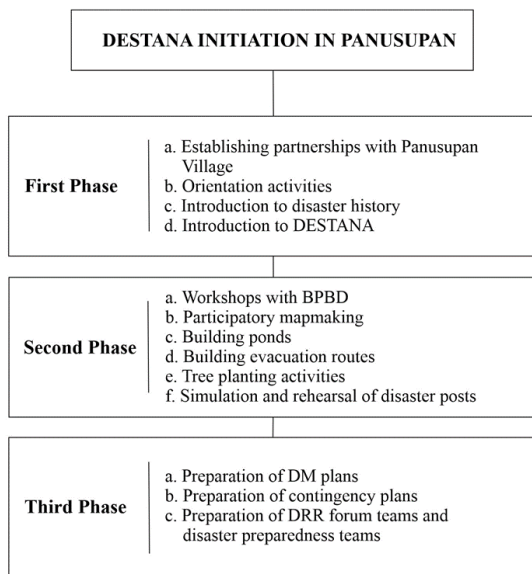


Fig. 3. Research flow

This article organizes the DESTANA initiation program into three phases. The first phase provides an overview of the context of the preliminary activity. Then, the second phase contains workshops and training activities for the community. The third phase discusses the initial efforts to formulate DRR forum policies, disaster management planning, and establishing a disaster preparedness team. The development process of DESTANA initiation in Panusupan Village presented the research flow shown in Fig. 3.

3 Results

3.1. First phase: preliminary activities

This phase contains preliminary activities intended to determine the condition of the people of Panusupan Village. Initially, to propose the initiation of DESTANA in Panusupan Village, researchers needed to conduct an initial survey to understand what the needs are and how the community is currently doing. Afterward, students partnered with the village government and DESTANA conducting in Panusupan Village (see Fig. 4a). The activity continued with orientation activities with local communities fostered by facilitators and MDMC (see Fig. 4b). The orientation activity aims to introduce and explain the purpose of initiating the village to become a disaster-resilient village, as well as aligning goals and building effective communication so that DESTANA runs in an integrated manner. The next activity is an introduction to the history of disaster and DESTANA. The introduction to history activity is a presentation about the history of disasters in Panusupan Village (as can be seen in Fig. 4c). The village community learned DESTANA material in this activity, including definitions, objectives, indicators, strategies, and DESTANA development activities (see Fig. 4d). The urgency of initiating this program includes protecting the community against disaster threats, increasing the involvement of vulnerable groups in reducing disaster risk, and increasing government capacity to support resources for disaster risk reduction [10].



Fig. 4. Preliminary activities. (a) establishing partnerships with Panusupan Village, (b) orientation activities, (c) introduction to disaster history (d) introduction to DESTANA

3.2. Second phase: workshop and training

The initiation of DESTANA in Panusupan involves a multi-phased approach, commencing with initial endeavors encompassing community capacity enhancement, disaster preparedness, and emergency response. In the subsequent phase, researchers place a heightened emphasis on bolstering knowledge and education pertaining to disaster management (DM) while concurrently enhancing community capacity. Collaboration between institutions and facilitators is pivotal in optimizing the disaster-related capacity, knowledge, and education of the local population, fostering a deeper internalization of these principles within the community. This phase of strengthening begins with an initial workshop

in which the village community actively participates, engaging with the subject of disaster management. This workshop is conducted directly by the Regional Disaster Management Agency (BPBD) of Banyumas, with residents attentively absorbing the knowledge imparted (see Fig. 5a). In addition to the community members, the training is extended to encompass all student facilitators. As part of this training, the facilitators themselves undergo a Training of Trainers (ToT) program under the guidance of Muhammadiyah Disaster Management Center (MDMC). This comprehensive training activity is designed to augment the knowledge of DESTANA facilitators, who will subsequently disseminate their acquired expertise to the broader village community (as presented in Fig. 5b).



Fig. 5. Workshop and training. (a) workshops with BPBD, (b) facilitators undergo Training of Trainers (ToT) with MDMC, (c) participatory mapping activities, (d) building ponds, (e) installation evacuation routes, (f) tree planting activities, (g) simulation and command post rehearsal, (h) establishes landslide warning sirens.

Moreover, the local community actively participates in a sequence of activities related to emergency preparedness and response for disaster management, guided by both the facilitators and the MDMC. These activities encompass the creation of participatory maps, construction of ponds, tree planting initiatives in landslide-prone areas, and disaster simulations and command post rehearsal. The first activity involves the development of a fundamental participatory map, meticulously plotting disaster evacuation routes and the designated locations for constructing ponds (portrayed in Fig. 5c). Representatives from various hamlets within the community undertake the mapping process, following training provided by student facilitators. The second activity entails the collaborative construction of ponds in several hamlets (or locally referred to *dusun*, including *Dusun I, II, and III*). The process of building the pond must be completed with assistance from MDMC, KOKAM, Kapolresta, TNI, and PMI as water suppliers of up to 30,000 liters of water after the pond construction is complete. Similarly, facilitators from students who provide instruments and materials for pond construction. In the third activity, the community partakes in the installation of evacuation routes within each hamlet, enhancing preparedness (see Fig. 5d).

The fourth activity revolves around tree planting in areas susceptible to landslides. Prior to the planting process, facilitators conduct on-site surveys to identify landslide-prone points and locations with a history of landslides. During these field surveys, local RT/RW leaders collaborate with facilitators to gather additional insights regarding landslide occurrences (Fig. 5e). The fifth activity included a comprehensive disaster simulation and command post rehearsal conducted at the village hall (Fig. 5f). This simulation encompasses a scenario of a landslide disaster within Panusupan. In this exercise, facilitators organize the community into various teams, including the Secretariat team (responsible for the Disaster Management Center or *Posko Bencana*), the evacuation team (*tim penyelamat*), the Public Kitchen (or *dapur umum*), and logistics team (or *tim logistik*), and the health team (or *tim kesehatan*). Each team is assigned specific roles and responsibilities within the context of the evacuation simulation. As a further measure, the community, in the sixth activity, establishes landslide warning sirens in three locations, namely *Dusun I* (RT 05 RW 05), *Dusun II* (RT 01 RW 07), and *Dusun III* (RT 08 RW 03) (Fig. 5h).

3.3. Third phase: preparation of disaster plans, policies and teams

In the third phase of DESTANA's implementation, the primary focus centers on the initiation of foundational efforts aimed at formulating policies for Disaster Risk Reduction (DRR) forums, crafting comprehensive disaster management plans, and establishing a Disaster Preparedness Team (DTA). This phase commences with the development of policies for DRR forums, closely integrated with Disaster Management (DM) planning. The DM plan, as an essential strategic program, encompasses all facets of disaster risk reduction, encompassing prevention, preparedness, emergency response, rehabilitation, and reconstruction, addressing the gamut of regional disaster threats [28]. Notably, the formulation of the DM plan in Panusupan Village is presently in its nascent stages, involving the preliminary preparation and the process of achieving a consensus among relevant stakeholders (see Fig. 6a).

Simultaneously, efforts are being made to prepare initial contingency plans as part of disaster management. These plans involve identifying and analyzing risks, establishing regulatory frameworks, and ensuring the community is well-prepared to respond effectively. The DESTANA initiative in Panusupan Village aims to implement these plans by providing historical data, threat assessments, and risk evaluations (see Fig. 6b). However, challenges have arisen in disseminating and integrating these plans within the multistakeholder disaster management framework due to obstacles in engaging key stakeholders.



Fig. 6. Preparation of disaster plan, policies and teams. (a) preparation of DM plans, (b) preparation of contingency plans, (c) preparation of DRR forum teams and disaster preparedness teams.

Moreover, the DRR forum has progressed to a consensus-building phase and established its organizational structure. The disaster preparedness team (DTA) is also being formed. A hierarchical position framework has been established for both the DRR forum and DTA. The DRR forum structure includes roles such as supervisors, advisors, chairpersons, secretaries, treasurers, and general members. The DTA includes positions like chairman, deputy chairman, secretary, evacuation team, public kitchen and logistics team, and health team (see

Fig. 6c). These activities in Panusupan Village mark the beginning of the DESTANA initiative's pivotal phase.

4 Discussion

Historically, communities were seen as passive recipients in disaster management. However, there has been a shift towards recognizing communities as active participants. The DESTANA program emphasizes giving communities autonomy and flexibility in implementing activities. Facilitators work with communities to establish schedules that accommodate their employment commitments. This approach aims to ensure successful assimilation of DESTANA material by the community.

In the initial stages of DESTANA initiation, facilitators focus on targeting vulnerable groups within the community. Activities engage 30 individuals representing these groups to address their heightened vulnerabilities. This approach aims to enhance the program's efficacy and inclusivity. By targeting vulnerable groups, DESTANA aims to equip at-risk populations to confront and mitigate challenges posed by disasters.

Community empowerment through workshops and training has increased community knowledge and awareness of disaster threats. The workshops allowed the community to share their ideas and experiences with the BPBD, addressing issues such as quick response during disasters and post-disaster recovery efforts. Participatory mapping and the construction of ponds also generated enthusiasm and resilience within the community, helping them recover from drought. Additionally, a range of supplementary activities were executed, including the installation of evacuation route signage and tree planting. These undertakings garnered substantial voluntary community participation, with individuals contributing their efforts until the tasks were completed. Notably, the signage was strategically distributed to ensure equitable coverage across every hamlet within Panusupan Village. In parallel, the community engaged in the planting of 100 mango trees, a selection based on the inherent benefits of mango trees, which have strong root anchoring and binding capable of withstanding slope-related pressures, soil and water retention, thus mitigating the risk of landslides [31].

In addition, the simulation activities and command post rehearsals depict a landslide disaster situation. The facilitator acts as the narrator, guiding the community's disaster preparedness team. The community carries out emergency response efforts, coordinating tasks such as victim registration, evacuation, and medical treatment. Then, sirens are installed in three hamlets, with the facilitator explaining their function and usage to the village community.

Further preparation in the initial DESTANA initiative regarding plans, policies, and disaster teams is an achievement that needs to be achieved. They are starting by preparing the DM plan, which has been completed at the initial preparation and agreement stage. The preparation of the DM plan in Panusupan Village was carried out by MDMC and facilitators who were guided by the DM plan systematics from BNPB [28]. Contingency plans are discussed in the community learning process. The community is introduced to plans and the basis for contingency planning and preparing scenarios for disaster events and impacts. The facilitator takes references from the BNPB contingency plan preparation module [32] as learning material. However, learning about contingency planning stops at the material on preparing event and impact scenarios because the community will have difficulty in the next material, which requires them to explain in more detail regarding disaster management, including strategy, policy, command, and planning in the field of operations. Therefore, MDMC and facilitators are taking steps to help the community understand the contingency plan in stages. The DRR Forum and disaster preparedness team in Panusupan Village were formed from the development of existing groups in the village. Although the DRR Forum does not take part in the official structure of the village government, the village government

can be directly involved in it. The DRR forum and disaster preparedness team in Panusupan Village have made initial decisions by forming a complete organizational structure. The DRR forum and DRA organizational structure was formed in deliberation with the community, led by the Village Official. Some things need to be underlined regarding the organizational structure that has been created, namely that the DRR forum structure needs to be improved because the member positions are still directed towards a general structure, which is not specific. The intention of designing this specific structure is to make the organizational structure more focused and organized.

In the context of Panusupan Village, the initial phase of DESTANA implementation has witnessed commendable progress; however, it necessitates a critical review and evaluation. Firstly, it is apparent that the community's engagement remains somewhat passive. Observations indicate that a limited number of individuals have actively participated in DESTANA activities, predominantly community leaders, such as RT/RW officers. Nevertheless, some enthusiastic members are willing to contribute their energy, willpower, or modest aid, underscoring underlining latent potential within the community. A second challenge pertains to the limited engagement of village officials in the sequence of DESTANA activities. The relative absence of village officials' participation is partly a result of the activities taking place during weekends, which fall outside conventional working hours. This lack of involvement from all components of the village government has implications for the overall effectiveness of DESTANA initiation. Furthermore, the absence of participation from local organizations represents another notable challenge. A third issue concerns the relatively brief duration of the initiation phase, spanning a mere three months. This condensed timeframe has implications for the depth and comprehensiveness of material coverage within DESTANA. The concentrated nature of these activities, particularly when spread throughout the day, contrasts with the intended flexible workshop approach. While the program remains principled and mindful of community conditions, a more extended initiation period with greater flexibility could potentially enhance community understanding of the material and promote more robust efforts toward enhancing rural community resilience.

5 Conclusions

In summary, the evolution in disaster management paradigms signifies a fundamental shift from viewing communities as passive recipients of disaster risk reduction to recognizing them as proactive agents in mitigating risks. The DESTANA program exemplifies this shift, emphasizing community autonomy and flexibility in program implementation, fostering community involvement, and empowerment. The targeting of vulnerable groups within the community further enhances the program's inclusivity and efficacy, addressing the specific needs of those at the highest risk of disaster impact. Nevertheless, the Panusupan implementation of DESTANA encounters challenges, including the persisting passivity among some community members, limited participation of village officials, the absence of local organizations' involvement, and a relatively short initiation period. These challenges highlight the need for continued refinement and adaptation to enhance community engagement and resilience in the face of disasters.

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