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Capacity Building for Village Government Officials Toward Climate-Adaptive Villages in Segedong District, Mempawah Regency

Peningkatan Kapasitas Aparat Pemerintah Desa Menuju Desa Adaptif Iklim di Kecamatan Segedong, Kabupaten Mempawah

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Abstract

Climate change generates various hydrometeorological risks in coastal and wetland areas, including Segedong District, Mempawah Regency, which affect the agriculture and fisheries sectors. This issue has not been fully integrated into village planning and budgeting, making the strengthening of village government officials' capacity a key factor in realizing climate-adaptive villages. This community service program aims to enhance the capacity of village government officials in understanding climate change, mitigation, adaptation, and climate-adaptive village planning, as well as to examine the effectiveness of the capacity-building program. The program was implemented using a one-group pre-test–post-test design through a series of lectures, interactive discussions, and group work involving village heads, village secretaries, and other village officials from several villages in Segedong District. Quantitative data from the pre-test and post-test were analyzed descriptively to measure changes in knowledge, while qualitative data from discussions and group presentations were analyzed thematically to identify changes in understanding and planned actions. The results show a significant increase in knowledge, with the average score rising from 47% (pre-test) to 86% (post-test). Participants were also able to identify key climate risks in their respective villages and formulate initial adaptation measures, such as adjusting planting calendars, improving drainage, planting protective vegetation, and integrating climate issues into village development planning meetings. This community service activity concludes that a structured capacity-building program is effective in strengthening local readiness toward climate-adaptive villages and should be followed up with assistance in the preparation of village planning documents.

Keywords

climate change; climate-adaptive villages; capacity building; village government officials; community service; Segedong District.

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Abstrak

Perubahan iklim menimbulkan berbagai risiko hidrometeorologis di wilayah pesisir dan rawa, termasuk Kecamatan Segedong, Kabupaten Mempawah, yang berdampak pada sektor pertanian dan perikanan. Isu ini belum sepenuhnya terintegrasi dalam perencanaan dan penganggaran desa, sehingga penguatan kapasitas aparat pemerintah desa menjadi kunci untuk mewujudkan desa adaptif iklim. Kegiatan pengabdian kepada masyarakat ini bertujuan meningkatkan kapasitas aparat pemerintah desa dalam memahami perubahan iklim, mitigasi, adaptasi, serta perencanaan desa adaptif iklim dan mengkaji efektivitas program peningkatan kapasitas tersebut. Program dilaksanakan dengan desain satu kelompok pre-test–post-test melalui rangkaian pemaparan materi, diskusi interaktif, dan kerja kelompok kepada kepala desa, sekretaris desa, dan perangkat desa dari beberapa desa di Kecamatan Segedong. Data kuantitatif dari pre-test dan post-test dianalisis secara deskriptif untuk mengukur perubahan pengetahuan, sedangkan data kualitatif dari diskusi dan presentasi kelompok dianalisis secara tematik untuk mengidentifikasi perubahan pemahaman dan rencana aksi. Hasil kegiatan menunjukkan peningkatan pengetahuan yang signifikan, dengan kenaikan skor rata-rata dari 47% (pre-test) menjadi 86% (post-test). Peserta juga mampu mengidentifikasi risiko iklim utama di desa masing-masing dan merumuskan langkah awal adaptasi, seperti penyesuaian kalender tanam, perbaikan drainase, penanaman vegetasi pelindung, serta integrasi isu iklim dalam musyawarah perencanaan pembangunan desa. Kegiatan pengabdian ini menyimpulkan bahwa program peningkatan kapasitas yang terstruktur efektif memperkuat kesiapan lokal menuju desa adaptif iklim dan perlu ditindaklanjuti dengan pendampingan penyusunan dokumen perencanaan desa.

Kata Kunci

perubahan iklim; desa adaptif iklim; peningkatan kapasitas; aparat pemerintah desa; Kecamatan Segedong.

1. Introduction

Climate change is one of the greatest environmental challenges of the 21st century, bearing tangible impacts across various sectors of life, particularly in rural areas dependent on natural resources. The rise in average temperatures, altered rainfall patterns, increased frequency of extreme weather events, and rising sea levels trigger a range of hydro-meteorological risks such as floods, droughts, coastal erosion, and saltwater intrusion (IPCC, 2023). These conditions directly affect agricultural and fisheries productivity, infrastructure quality, and the socioeconomic resilience of rural communities. In Indonesia, coastal and swamp areas are among the most vulnerable regions to the impacts of climate change due to their biophysical and socioeconomic characteristics (BAPPENAS, 2014; KLHK, 2020).

Segedong district in Mempawah Regency, West Kalimantan, is part of this coastal and swamp area facing climate change pressures. The majority of the community in this District are small-scale farmers and fishers who rely heavily on stable seasons and the quality of aquatic ecosystems. Various studies indicate that changes in rainfall patterns, shifts in planting seasons, and an increase in flood and inundation events significantly impact the decline of agricultural productivity and raise the risk of crop failure (Surmaini, Runtunuwu, & Las, 2011). Similarly, in the fisheries sector, climate change affects the dynamics of fish resources and the activities of small-scale fishers (Choirunnisa, Purwaningsih, & Prasetyani, 2022). These changes not only disrupt planting and harvesting schedules but also damage essential village infrastructure, such as local roads and drainage networks.

In the context of national policy, the Indonesian government has promoted the integration of climate change issues into national and regional development. This is evident through the National Action Plan for Climate Change Adaptation (RAN-API), which stresses the importance of mainstreaming adaptation across various sectors (BAPPENAS, 2014), and the reinforcement of the climate change control agenda in relevant planning documents and strategic sector plans (KLHK, 2020). At the village level, the Ministry of Villages, Development of Disadvantaged Regions, and Transmigration (Kementerian Desa PDTT) developed the Village SDGs framework, including Goal 13: "Climate Change Responsive Villages" as a guide for villages to integrate climate issues into development based on local authority (Kementerian Desa PDTT, 2021). More operational guidelines on environmentally conscious villages have also been formulated to encourage the use of village funds for environmental conservation and disaster risk reduction activities (Kementerian Desa PDTT, 2023). Furthermore, the health sector has begun mainstreaming climate issues through the concept of Climate-Resilient Health Villages/Districts (DEKSI), which emphasizes community health resilience against climate risks (Kementerian Kesehatan RI, 2025).

However, this policy space does not automatically translate into implementation at the village level, especially when village government officials lack adequate understanding and capacity regarding climate change, mitigation, adaptation, and climate-adaptive villages. Village government officials hold a strategic role as the driving force of local development. They are authorized to lead the processes of planning, budgeting, and implementing programs funded by village funds and other sources. In the context of climate change, village officials are expected to identify the climate risks faced by their region, map vulnerable groups, and formulate priority programs that can simultaneously reduce risk and strengthen community resilience. Various studies affirm that institutional capacity and policy integration at the local government level are key factors for successful climate change adaptation (UNDP, 2010; Yulandari, Murayama, & Nishikizawa, 2023).

The situation in Segedong District highlights a gap between need and capacity. On one hand, the villages in this area face clear symptoms of climate change, such as flooding, inundation, and disruption to planting cycles. On the other hand, village officials' understanding of basic climate change concepts and their implications for development planning remains limited; climate issues often only emerge as a matter of "flood disaster" or "unpredictable weather," not as an agenda consciously integrated into planning documents like the Village Mid-Term Development Plan (RPJMDes) and Annual Village Government Work Plan (RKPDes). Experience in other coastal areas of Indonesia shows that small-scale fishers and farmers have undertaken various forms of spontaneous adaptation, but these are not yet fully

supported by formal local policy and planning (Choirunnisa et al., 2022; UNDP, 2010).

It is within this context that community service activities become relevant and crucial. As centers of knowledge, higher education institutions have a mandate not only to produce academic research but also to transfer knowledge and technology to the community and local government. Community service programs can serve as a means to facilitate capacity building for village officials concerning climate change, mitigation, adaptation, and climate-adaptive village planning, using a participatory and locally contextualized approach (UNDP, 2010). This approach is expected to better bridge the technical language of climate change into concrete terms and examples relevant to village realities, aligning with efforts to strengthen Climate Change Responsive Villages and Environmentally Conscious Villages (Kementerian Desa PDTT, 2021, 2023).

The community service activity implemented in Segedong District is designed to address this need. The program focuses on strengthening both the conceptual understanding and practical skills of village officials. At the conceptual level, the material covers an introduction to climate change and its local impacts, the difference between mitigation and adaptation, and the principles of climate-adaptive villages consistent with Village SDGs and relevant national policies (BAPPENAS, 2014; Kementerian Desa PDTT, 2021). At the practical level, the activity encourages participants to identify climate risks in their respective villages, discuss the impacts on key sectors, and formulate realistic initial adaptation steps that could potentially be integrated into village planning and budgeting.

Furthermore, this program was designed to measure the extent to which the community service genuinely impacts capacity enhancement. Therefore, a single-group pre-test–post-test design was utilized to assess the change in participants' knowledge before and after the intervention, which is common in capacity building programs for its simplicity and informative nature. In addition, group discussions and presentations of group work results were leveraged to explore changes in perspective and action plans that might not be captured by written test instruments. This combined quantitative–qualitative approach aligns with recommendations from various development agencies emphasizing the importance of the learning process in community-based adaptation programs (UNDP, 2010; Yulandari et al., 2023).

In summary, this introduction emphasizes several key issues. First, climate change is a real threat to the villages in Segedong District, which are dependent on natural resources and highly vulnerable to hydro-meteorological risks (IPCC, 2023; Surmaini et al., 2011). Second, village government officials play a crucial role in integrating climate change issues into village planning and budgeting, but their capacity needs strengthening (Kementerian Desa PDTT, 2021, 2023; Yulandari et al., 2023). Third, there is an urgent need for a community service program specifically aimed at increasing the capacity of village officials to understand and respond to climate change through a climate-adaptive village approach. Fourth, this service program is oriented not only towards knowledge transfer but also toward strengthening local readiness through risk identification and the formulation of initial adaptation steps that can be integrated into village planning documents.

Based on this description, the objectives of this community service activity are: (1) to enhance the understanding of village government officials in Segedong District regarding climate change, mitigation, adaptation, and climate-adaptive villages; (2) to strengthen the ability of village officials to identify climate risks and formulate initial adaptation steps at the village level; and (3) to provide an overview of the effectiveness of the capacity building program by measuring changes in knowledge and exploring the resulting action plans, thereby serving as a basis for the development of continuous mentoring programs and a tangible contribution to strengthening the climate resilience of villages in Segedong District in a sustainable manner.

2. Methods

This community service activity employed a single-group pre-test–post-test design without a control group. This design was selected as it is suitable for capacity building programs that focus on measuring changes in participants' knowledge and understanding before and after the training intervention, without requiring comparison to another group. In this design, all participants were initially given a pre-test to measure their baseline knowledge concerning climate change, mitigation, adaptation, and climate-adaptive villages. Following this, participants attended the training and short mentoring sessions, and were

subsequently administered a post-test to evaluate the knowledge increase resulting from the intervention. This approach allows for a simple yet informative assessment of the program's effectiveness. The change in knowledge scores before and after the activity is considered the primary quantitative indicator of the capacity building program's success. Furthermore, the discussion and group work components generated qualitative data, enriching the understanding of changes in participants' attitudes, perspectives, and action plans, ensuring the evaluation focused not only on cognitive aspects but also on practical and applicative dimensions.

The activity was conducted in Segedong District, Mempawah Regency, West Kalimantan, a coastal and swamp area characterized by high vulnerability to the impacts of climate change. The District was chosen as the location for the service due to its history of frequently reported occurrences of floods, inundation, and disruptions to planting patterns by the village governments and local community. Furthermore, Segedong District possesses a relatively complete village governance structure, making it an appropriate context for strengthening village institutional capacity.

The target participants for the activity were village government officials across Segedong District, including the Village Head, Village Secretary, Heads of Affairs, Heads of Sections, and other village staff directly involved in the village planning and budgeting process. The selection of village officials as the primary participants was based on the consideration that they are key actors in: (1) preparing village planning documents (RPJMDes, RKPDes), (2) managing village funds and other funding sources, and (3) facilitating community participation in village development planning deliberations. Thus, enhancing their capacity is expected to directly impact the quality of climate change-responsive village planning.

The service activity was carried out on February 26 and 27, 2025. The two consecutive days were chosen to allow for a continuous flow of activities: the first day focused on strengthening conceptual understanding through material presentations and plenary discussions, while the second day was dedicated to group work, practical formulation of adaptation steps, and the administration of the post-test. This division also provided participants with time to digest the first day's material and connect it to their field experiences before engaging in discussion and action plan design on the following day.

2.1. Stages of Activity Implementation

The method of activity execution was structured into several interconnected main stages: (1) preparation, (2) core implementation, and (3) evaluation and follow-up.

1. Preparation Phase

   In this stage, the community service team coordinated with the Segedong District government to determine the time, location, and participant list. Invitation letters were sent to all villages in the District to ensure adequate representation of village officials. Concurrently, the team prepared teaching materials, including presentation slides and group worksheets tailored to the local context, featuring case examples from Segedong and surrounding areas. The evaluation instruments (pre-test and post-test questions) were developed based on indicators of basic knowledge of climate change, the distinction between mitigation and adaptation, and the concept of a climate-adaptive village.

2. Core Implementation Phase

   The core implementation stage consisted of four main components: material dissemination, interactive discussion, group work/practice, and the administration of the pre-test and post-test.

   a. Material Dissemination

      Dissemination was conducted through interactive lecture-style presentations by the service team. The material covered: (1) an overview of global and national climate change, (2) the local impacts of climate change, highlighting case examples in Segedong, (3) the concepts of mitigation and adaptation, (4) the principles of a climate-adaptive village, and (5) opportunities for

Figure 1. Documentation of the Opening

integrating climate issues into village planning and budgeting. To maintain participant engagement, the material presentation was interspersed with Q&A sessions and the use of simple images and illustrations depicting climate change phenomena and their impacts on the village.

b. Interactive Discussion

Following the material presentation, participants engaged in an interactive discussion session. In this session, the facilitator posed open-ended questions related to participants' experiences with floods, changes in planting seasons, infrastructure damage due to extreme weather, and efforts currently undertaken in their villages. The discussion aimed to elicit local knowledge and connect the participants' empirical experiences with the newly presented concepts. Through discussion, various examples of spontaneous adaptation practices carried out by the community and village officials emerged, which were then analyzed together to identify potential strengthening through formal village policy and planning.

Figure 2. Discussion Activity

c. Group Work and Practice in Formulating Adaptation Steps

Participants were divided into groups based on their village or a combination of several villages sharing similar risk characteristics. Each group was facilitated to: (1) identify the main climate risks in their respective villages (e.g., floods, inundation, local drought, erosion), (2) map the impacts of these risks on the agricultural, fisheries, infrastructure, and socioeconomic sectors, and (3) formulate realistic initial adaptation steps feasible at the village level. The formulated adaptation steps were intended to be link-able to the village's authority and potentially include-able in the programs and activities within the village planning documents. The results of the group work were then presented to other participants and discussed collectively to enrich the alternative solutions.

Figure 3. Practice Guidance

d. Pre-test and Post-test

The pre-test was administered before the material presentation commenced on the first day. The pre-test questions consisted of multiple-choice and/or true-false questions measuring participants' basic knowledge of climate change, mitigation, adaptation, and the village's role in responding to climate change. The post-test was given after the training and practical sessions concluded on the second day, with content relatively equivalent to the pre-test. The comparison between pre-test and post-test scores was used to assess the increase in participants'

knowledge as one of the program's success indicators.

3. Evaluation and Follow-up Phase

This phase involved the analysis of pre-test and post-test results, joint reflection at the end of the activity, and the formulation of follow-up recommendations. In the reflection session, participants were asked to convey their impressions, perceived benefits, and concrete plans they intended to pursue in their respective villages after attending the activity. Follow-up recommendations specifically addressed the need for further mentoring in preparing climate-adaptive village planning documents and opportunities for developing advanced technical training.

To support the evaluation of this community service activity, a combination of quantitative and qualitative instruments was used.

a. Quantitative Instruments (Pre-test and Post-test)

The main instrument consisted of pre-test and post-test sheets formatted as multiple-choice and true-false questions. The indicators measured included: (1) general understanding of climate change, (2) knowledge of forms of mitigation at the village level, (3) knowledge of forms of adaptation and climate-adaptive villages, and (4) understanding of the village's role and authority in responding to climate change. A score of 1 was given for each correct answer and 0 for incorrect answers. The final score was then expressed as a percentage.

b. Qualitative Instruments (Group Worksheets and Facilitator Notes)

In addition to the written test instruments, qualitative data collection was conducted through:

Group Worksheets, which guided participants in identifying climate risks, their impacts, and proposed adaptation steps. Facilitator Notes, which contained observations during group discussions and presentations, including participation dynamics, case examples shared, and changes in participants' perspectives on climate change issues. This qualitative data is essential for providing a complete picture of the learning process and participants' readiness to implement the concept of a climate-adaptive village in their respective regions.

The quantitative data from the pre-test and post-test were analyzed using descriptive comparative analysis. Average scores, minimum values, and maximum values were calculated for each test. The increase in participants' knowledge was determined by the difference between the average pre-test and post-test scores. In the results report, this increase may also be presented in graph or table form to clarify the comparison. Qualitative data were analyzed using a thematic analysis approach. Responses in the group worksheets and facilitator notes were read repeatedly to identify key themes, such as the types of climate risks that appeared most frequently, the forms of adaptation proposed, implementation constraints in the villages, and opportunities for utilizing village funds for adaptation programs. These themes were then synthesized to construct a general profile of the climate risk profile in the participating villages and the tendency toward adaptation strategies considered relevant by village officials. The integration of quantitative and qualitative findings yields a more comprehensive understanding of the effectiveness of the capacity building program. The increase in test scores indicates success in the knowledge aspect, while thematic analysis provides information on participants' practical readiness and commitment to integrating climate issues into village planning.

3. Results and Discussion

3.1. Results

The community service activity was attended by village government officials from several villages in Segedong District, Mempawah Regency. Participants included the Village Head, Village Secretary, Heads of Affairs, Heads of Sections, and other village staff involved in village planning and budgeting. This composition was strategic as it brought together key decision-makers and technical implementer who deal with programs and activities daily. The Village Head and Secretary provided macro views on the direction of village development and shared experiences

Table 1.
Recapitulation of Pre-test and Post-test Results on Village Officials' Knowledge of Climate Change

No.	Aspect Assessed	Key Indicator	Average Pre-test Score (%)	Average Post-test Score (%)	Increase (% points)
1	Basic knowledge of climate change	Understanding the definition of climate change and its difference from weather variability	40	80	40
2	Climate change mitigation	Stating examples of mitigation efforts at the village level	45	84	39
3	Climate change adaptation				
	Identifying forms of adaptation relevant to village conditions	48	88	40	
4	Climate-adaptive villages and village roles	Understanding the concept of climate-adaptive villages and village roles/authorities	55	92	37
5	Total knowledge score	Combination of all test items	47	86	39

Note: Total participants 60 people.

regarding floods, inundation, and changes in seasonal patterns, while technical staff added perspectives on field implementation and technical challenges encountered. The involvement of these various elements is essential for driving change not only at the individual level but also within the village institution. Quantitatively, the results of the pretest and post-test demonstrated a significant increase in knowledge.

The average pre-test score before the material presentation was 47%, indicating that participants' initial understanding of climate change, mitigation, adaptation, and climate-adaptive villages was limited. After attending the two-day series of activities, the average post-test score increased to 86%. This near two-fold increase suggests that the materials and methods used were effective in strengthening participants' knowledge. The questions measuring the understanding of the definition of climate change and the distinction between mitigation and adaptation experienced the largest score increase. This indicates that the fundamental conceptual aspects, which were initially weak points, were successfully addressed through the presentation and discussion.

This knowledge increase was also reflected in the dynamics of discussion and Q&A. At the beginning of the activity, some participants tended to view floods and inundation as annual routines to be accepted, and changes in planting seasons as conditions that could not be intervened. After the material presentation and discussion, participants began to see these events as climate risks that possess patterns and can be managed through planning. They realized that the village has the authority to respond, for instance, through program work regulation, budget allocation, and the design of priority activities that support risk reduction and community resilience.

From facilitator observations and group work, a crucial shift in participants' understanding was noted. Awareness of risk increased; floods, inundation, and seasonal shifts were no longer seen merely as "disasters" arriving without pattern, but rather as part of hydro meteorological risks that could be identified, mapped, and reduced in impact. Participants also began to understand that village funds could be utilized more strategically to support adaptation activities, such as drainage repair, planting protective vegetation, or strengthening disaster management institutions at the village level. Furthermore, an initial commitment emerged from several participants to introduce the climate change issue into the village development planning deliberation forums, ensuring that the learning did not stop in the training room. Through group work, participants identified the main climate risks in their respective villages. The risks most frequently mentioned included floods and inundation during the rainy season, damage to local roads due to prolonged flooding, disruption of planting cycles for rice and other commodities due to shifting seasonal patterns, and erosion in specific areas threatening agricultural land and settlements. This identification was then linked to the impacts on the agriculture, fisheries, village infrastructure, and socioeconomic life of the community. This process helped participants connect empirical data in the field with the concept of climate change, which had previously been abstract.

Based on this risk identification, participants formulated various initial adaptation steps that could be implemented at the village level. Some of these

included adjusting the planting calendar based on local experience and rainfall information, repairing and normalizing drainage channels at frequently inundated points, planting protective vegetation in erosion-prone areas and around water bodies, and formulating simple standard operating procedures for flood management at the village level. Additionally, participants planned the integration of climate change issues into village planning documents, for example, by incorporating programs related to environmental management, disaster risk reduction, and community resilience enhancement into the RPJMDes and RKPDes.

These results indicate that participants were not only capable of understanding the concept of a climate-adaptive village theoretically but could also translate it into program ideas relevant to the local context. In other words, this community service activity promoted the formation of practical skills in designing village-based adaptation steps. The plans formulated have the potential to be formalized further through village deliberation and budgeting processes, increasing their likelihood of implementation. Besides these achievements, the activity also uncovered several limitations that serve as important notes. The duration of the activity (only two days) did not allow for a deeper dive into risk analysis techniques and detailed planning document preparation. The evaluation conducted only reached the level of knowledge enhancement and initial action plan formulation, not yet monitoring the tangible changes in village planning documents and programs in the medium term. Nevertheless, the obtained results indicate that a structured capacity building program can be an effective initial step to strengthen local readiness towards climate-adaptive villages and opens opportunities for more in-depth subsequent mentoring.

3.2. Discussion

The community service program in Segedong demonstrated a significant increase in knowledge among village officials, with average scores rising from 47% (pre-test) to 86% (post-test) among 60 participants. This improvement was consistent across four key aspects: basic knowledge of climate change, mitigation, adaptation, and climate-adaptive villages and their roles. The results table indicates that average scores for basic knowledge increased from 40% to 80%, mitigation from 45% to 84%, adaptation from 48% to 88%, and climate-adaptive villages and their roles from 55% to 92%. Scientifically, this change suggests that the program not only provided information but also strengthened the cognitive capacity essential for developing adaptive capacity at the village institutional level. This finding aligns with early service reports stating that the training led to a significant enhancement in village officials' understanding and skills in climate mitigation and adaptation.

The increase in basic knowledge of climate change from 40% to 80% indicates that the activity successfully clarified village officials' conceptual understanding of what climate change is and how to distinguish it from normal weather variability. Before the training, "climate change" was often equated with "extreme weather" or "unpredictable seasons." After receiving climate science-based explanations (as referenced by IPCC, 2023), participants began to understand that climate change refers to long-term shifts in climate patterns due to increased greenhouse gas emissions and other anthropogenic factors. From an adaptive capacity perspective, this understanding forms the foundation. The IPCC emphasizes that communities' adaptive capacity is significantly influenced by their level of knowledge and awareness of climate risks; local actors who comprehend the nature and patterns of risk are better equipped to plan appropriate responses. Without a correct conceptual framework, climate risks are often perceived as inevitable "disasters," leading villages to be reactive rather than proactive. With improved basic climate literacy, village officials in Segedong now possess a more robust foundation to interpret phenomena such as floods, inundation, and changing seasonal patterns as part of a manageable risk system through planning.

The increase in mitigation scores from 45% to 84% demonstrates that village officials are beginning to see their villages not merely as victims of climate change, but as actors capable of reducing emissions and maintaining environmental quality. In policy contexts, this aligns with the National Action Plan for Climate Change Adaptation (RAN-API), which stresses the importance of synergy between adaptation and mitigation, and the necessity of integrating climate issues into sectoral and regional planning. For villages, mitigation can take very practical forms: better waste management, reduction of open burning, protection of vegetation around rivers and agricultural lands, and the development of green village initiatives. This community service activity provided concrete examples and linked them

to village authorities as regulated by Law Number 6 Year 2014 concerning Villages, which grants villages the autonomy to regulate and manage community interests based on their origins, customs, and local-scale village authorities.

With enhanced understanding of mitigation, Segedong's village officials have greater opportunities to utilize Village Funds for climate-friendly activities. This becomes increasingly relevant with derivative regulations such as Minister of Village Regulation Number 7 Year 2023 regarding the Details of Priority Uses of Village Funds, which prioritizes community development and empowerment, including activities supporting environmental preservation and disaster risk reduction. Similarly, Minister of Village Regulation Number 2 Year 2024 concerning Operational Guidelines for the Focus Use of Village Funds in 2025 explicitly includes the focus of using Village Funds for "strengthening climate-adaptive villages" through adaptation, mitigation, and environmentally friendly village development components. This means that improved understanding of mitigation among village officials is not only theoretically important but directly relates to their ability to identify and leverage policy and funding opportunities for mitigation programs in Segedong.

The adaptation aspect saw a score jump from 48% to 88%, indicating that village officials increasingly understand various forms of adaptation relevant to the local context. Adaptation discussed in the community service activity included adjusting planting calendars, improving and normalizing drainage, planting protective vegetation in erosion-prone areas, and developing simple standard operating procedures for flood management at the village level. This finding is consistent with service reports that participants were able to identify climate risks and formulate village-based adaptation measures. Scientifically, this local adaptation is part of community-based adaptation, which is considered effective in literature because it relies on community knowledge and needs, while strengthening socio-ecological resilience. The UNDP emphasizes that community-based adaptation supported by local institutional capacity tends to be more sustainable and contextual compared to purely top-down approaches. RAN-API also stresses the importance of strengthening regional and local capacities, including village governments, to design adaptation strategies suitable for their territorial characteristics.

For Segedong, which geographically is a District with coastal and swamp areas vulnerable to floods, inundation, and with a population largely dependent on agriculture and fisheries, adaptation is not an option but a necessity. The increased understanding of adaptation among village officials means they are now better prepared to shift their response from merely "waiting for floods then evacuating" to "preventing and reducing impacts" through spatial planning, infrastructure, and farming patterns that adapt to climate change.

The increase in scores for the aspect of climate-adaptive villages and their roles, from 55% to 92%, is a strong indication that village officials not only understand the concept of adaptation but also begin to see "where the village stands" within the national policy framework. In the activity, the concept of a climate-adaptive village was linked to Village SDGs Goal 13: Climate-Responsive Villages, developed by the Ministry of Villages as a derivation and adjustment of global SDGs at the village level. Village SDGs 13 emphasizes that villages must take quick action to address climate change and its impacts, including disaster risk reduction, environmental management, and strengthening community resilience. This improved understanding is important because it shifts the position of village officials from merely "implementer of physical programs" to "policy actors" who realize that documents such as RPJMDes (Village Medium-Term Development Plan), RKPDes (Village Government Work Plan), and APBDes (Village Budget) are key instruments for realizing climate-adaptive villages. Legally, the Village Law grants villages the authority to formulate planning and budgeting based on local authority, including environmental preservation and disaster management in their areas.

When village officials understand the connection between the Village Law, Village SDGs 13, and the latest Village Fund regulations, their adaptive capacity increases not only in the realm of knowledge but also in governance. Thus, the aspect of climate-adaptive villages and their roles serves as a "bridge" connecting technical understanding of climate change and adaptation with institutional and policy mechanisms at the village level. This is the essence of institutional adaptive capacity: the ability not only to understand

risks but also to integrate them into formal rules, procedures, and work plans.

The contribution of this community service activity to strengthening the adaptive capacity of village officials can be more fully understood when the quantitative results of the pre-test and post-test are read in conjunction with the dynamics of discussions, group work, and the surrounding policy context. The average score increase from 47% to 86% among 60 participants indicates that the training did not merely add superficial knowledge, but transformed how village officials understand climate change, interpret their roles, and design response measures at the village level. In climate adaptation literature, adaptive capacity is understood as a combination of knowledge, resources, and institutions that enable local actors to effectively adjust to the impacts of climate change (IPCC, 2023; UNDP, 2010). In this context, the activities in Segedong have strengthened at least three important dimensions of village officials' adaptive capacity: cognitive, institutional, and practical capacity.

From the perspective of cognitive capacity, the increase in scores for basic knowledge of climate change, mitigation, and adaptation shows that village officials now possess a "common language" to interpret the climate phenomena they face daily. Before the intervention, floods, inundation, and seasonal shifts were largely viewed as ordinary extreme weather events that came and went without an anticipatable pattern. After the training, these phenomena began to be seen as part of long-term climate risk patterns as described in IPCC reports on changes in rainfall patterns, sea-level rise, and increased extreme weather events (IPCC, 2023). This understanding is crucial because without a correct conceptual framework, adaptation often halts at short-term reactive actions, rather than long-term planned strategies (Ayers et al., 2010). In other words, this community service activity filled knowledge gaps that previously existed at the village level and built a cognitive foundation that enables village officials to interpret climate change as a governance issue, not merely an unavoidable "natural disaster."

This strengthening of cognitive capacity also aligns with the global agenda for enhancing adaptive capacity. The UNFCCC framework and various international programs position capacity-building as a key element in the global response to climate change, especially through education, training, and empowerment of local stakeholders (UNDP, 2010). The experiences of professional capacity-building programs in other countries show that technical training on adaptation can improve local actors' ability to read risks and design responses (Yulandari et al., 2023). The same logic was applied in Segedong, but with a focus on village officials as "frontline professionals" tasked with integrating climate issues into village planning. In this way, this community service activity is in line with international principles on strengthening adaptive capacity, translated into forms and language understandable and usable by village officials in Indonesia.

The second strengthened dimension is institutional capacity. The increase in scores for the climate-adaptive village and village role aspect from 55% to 92% indicates that participants not only understood technical concepts but also began to perceive the village's position within the national policy framework. In material sessions and discussions, the concept of a climate-adaptive village was linked to Village SDGs, particularly Goal 13 "Climate-Responsive Villages," which positions villages as active actors in disaster risk reduction, environmental management, and community resilience enhancement (Kementerian Desa PDTT, 2021). Village officials were also encouraged to revisit Law Number 6 Year 2014 concerning Villages, which grants villages the authority to regulate and manage community interests based on their origins and local-scale village authorities, including environmental preservation and disaster management (Republik Indonesia, 2014).

When this conceptual understanding is paired with the latest regulations on Village Funds, such as Minister of Village Regulation regulating the details of priority uses of Village Funds and the Operational Guidelines for the Focus Use of Village Funds in 2025, the institutional space for climate actions in villages becomes much clearer (Kementerian Desa PDTT, 2024). These regulations explicitly encourage the use of Village Funds for activities supporting climate resilience, adaptation, mitigation, and environmentally friendly village development. Village officials in Segedong, after participating in the training, were able to see the connection between the authorities they possess and the funding opportunities provided by national policies. This is where institutional capacity begins to form: villages are no longer positioned merely as implementer of programs dictated from above, but as decision-makers with legal legitimacy and knowledge capacity

to design adaptation and mitigation programs at the local level.

Studies on the integration of climate change adaptation into regional development planning in Indonesia indicate that one of the main obstacles is the weak institutional capacity and coordination at the local government level (Yulandari et al., 2023). Other studies also affirm that the effectiveness of adaptation largely depends on institutions' ability to formulate policies, manage information, and maintain cross-actor coordination (UNDP, 2010). Thus, the community service activity in Segedong can be seen as filling a "void" at the smallest level of governance, namely the village, by providing conceptual and practical instruments for village officials to translate national agendas like RAN-API and Village SDGs into village-level policies and programs (Bappenas, 2014; Kementerian Desa PDTT, 2021).

The third dimension is practical capacity. Through group work, village officials were asked to identify specific climate risks faced by their respective villages and link them to impacts on agriculture, fisheries, infrastructure, and socioeconomic sectors. Common risks included floods and inundation during the rainy season, damage to local roads due to prolonged inundation, erosion at certain points, and disruption of planting cycles for rice and other commodities. These field findings are consistent with previous studies showing the high vulnerability of coastal and swamp areas in West Kalimantan to changes in rainfall patterns and tides (Surmaini et al., 2011; Choirunnisa et al., 2022). From this risk mapping, participants then formulated realistic adaptation measures aligned with village authority, such as adjusting planting calendars based on local experience and climate information, improving and normalizing drainage, planting protective vegetation around water bodies and erosion-prone lands, and developing simple procedures for flood management at the village level.

From a community-based adaptation perspective, the ability to identify local risks and design context-based responses is at the core of practical adaptive capacity (Ayers et al., 2010; UNDP, 2010). Global studies show that successful community-level adaptation initiatives are generally characterized by strong local leadership, deep knowledge of socio-ecological contexts, and space for communities to control decision-making processes (Ayers et al., 2010). In this activity, village officials played the role of a nexus between technical knowledge gained from training and local community knowledge. As a result, the adaptation formulations that emerged were not only "good on paper" but also relevant and potentially implementable according to village capacity. This is crucial for Segedong, given its character as a coastal and swamp area with dominant livelihoods in agriculture and fisheries, which are highly sensitive to climate change (Surmaini et al., 2011; Choirunnisa et al., 2022).

The contribution of this activity to the adaptive capacity of village officials can also be viewed through the lens of national policies that increasingly emphasize the role of villages in the climate agenda. Various initiatives such as the Climate Village Program (ProKlim) and the mainstreaming of climate-responsive villages demonstrate government efforts to encourage climate action at the village level (Kementerian Lingkungan Hidup dan Kehutanan, 2020; Kementerian Desa PDTT, 2021). The Village Law grants significant autonomy and fiscal resources to villages, making them strategic nodes for location-specific adaptation and mitigation actions close to community needs (Republik Indonesia, 2014). However, studies on the implementation of Village Funds indicate that without strengthening the capacity of village officials, these opportunities are often not optimally utilized; Village Funds tend to be directed towards routine physical development without a sustainability and climate resilience perspective (Yulandari et al., 2023).

In this context, the community service activity in Segedong acts as an intervention that bridges the gap between policy opportunities and the capacity of implementers' at the village level. By improving knowledge, clarifying the regulatory framework, and training practical adaptation planning skills, village officials become better prepared to identify and utilize existing program and funding opportunities. Village officials who understand the connection between Village SDGs 13, the Village Law, RAN-API, ProKlim, and Village Fund regulations are better able to propose adaptation programs in RPJMDes and RKPDes, advocate for them in village deliberation forums, and sustain them in the budgeting process (Bappenas, 2014; Kementerian Desa PDTT, 2021; Kementerian Desa PDTT, 2024). In other words, this activity shifts the position of village officials from merely recipients of orders to policy actors who can

articulate and champion the agenda of climate-adaptive villages.

For Segedong District itself, this contribution is very significant. Geographically and ecologically, Segedong is an area with a combination of swamp, coastal, and settlement lands vulnerable to floods, inundation, and hydro-logical dynamics. The majority of its population consists of small-scale farmers and fishermen who are highly dependent on climate stability and the condition of aquatic ecosystems (Surmaini et al., 2011; Choirunnisa et al., 2022). In such a situation, strengthening the adaptive capacity of village officials is not merely about improving governance quality but concerns the economic and social resilience of the community. Farmers facing seasonal uncertainty and crop failure risks require village policy support that can reduce vulnerability, for example, through local climate information systems, strengthening irrigation infrastructure, and diversifying livelihoods. Fishermen and coastal communities need policies that protect them from abrasion, saltwater intrusion, and changes in coastal ecosystems. Village officials equipped with cognitive, institutional, and practical capacities will be better prepared to formulate village development strategies that not only pursue short-term growth but also maintain long-term resilience against climate shocks (IPCC, 2023; Yulandari et al., 2023).

Scientifically, the pattern of increased adaptive capacity observed in Segedong confirms findings from various studies that local capacity building is an essential prerequisite for effective adaptation (Ayers et al., 2010; UNDP, 2010). Studies on local governments in Indonesia also highlight that the success of integrating adaptation into development planning largely depends on the capacity of local actors to understand climate issues and operationalize them in policy documents (Yulandari et al., 2023). The experience in Segedong demonstrates how these principles can be applied at the village level through a combination of training, participatory discussions, and directed planning exercises. Thus, the main contribution of this activity to strengthening the adaptive capacity of village officials can be summarized as a gradual transformation from a position of "little knowledge and reactive" to "understanding, connected to the policy framework, and beginning to proactively design adaptation."

This transformation is certainly not yet complete. Continued mentorship, measurement of medium-term impacts on actual implemented planning documents and village programs, and strengthening of support networks with district governments and other stakeholders are necessary. However, as an initial step, the community service activity in Segedong has laid a strong foundation for the establishment of climate-adaptive villages that are better prepared to face climate uncertainty and protect the livelihoods of their communities.

4. Conclusion

The community service activity conducted in Segedong District, Mempawah Regency, proved effective in enhancing the capacity of village officials regarding climate change issues and climate-adaptive villages. This is evidenced by the average knowledge score improvement among participants from 47% (pre-test) to 86% (post-test), with 60 participants involved. The enhancement extended beyond basic understanding of climate change to include key aspects such as mitigation, adaptation, and comprehension of the climate-adaptive village concept along with the strategic role of villages in responding to climate change. Substantively, the activity strengthened three primary dimensions of village officials' adaptive capacity: cognitive, institutional, and practical.

Cognitive capacity was bolstered through reinforced understanding of fundamental climate change concepts and the distinctions between mitigation and adaptation. Institutional capacity strengthened as village officials recognized that villages possess formal authorities and instruments such as RPJMDes, RKPDes, APBDes, and village deliberations, to integrate climate issues in alignment with national policies and Village Fund utilization regulations. Practical capacity was demonstrated by participants' ability to identify specific climate risks in their respective villages and formulate realistic, contextually relevant adaptation measures.

For Segedong District, characterized by coastal and swamp landscapes with communities heavily reliant on agriculture and fisheries, this capacity enhancement holds strategic significance. Village officials are now better equipped to shift from reactive responses to flood events and seasonal changes toward proactive, planned initiatives in the form of climate-friendly village programs oriented toward risk reduction. Thus, this community service represents a crucial initial step in building more resilient climate-adaptive villages in Segedong,

capable of confronting climate uncertainties and safeguarding community livelihoods.

Nevertheless, the knowledge gains and preliminary adaptation plans require sustained follow-up through more intensive mentoring, particularly in integrating them into village planning documents, strengthening technical risk analysis capabilities, and developing monitoring and evaluation mechanisms for adaptation program implementation. Moving forward, replication and reinforcement of similar service models in other villages, accompanied by multi-stakeholder collaboration, hold potential for sustainable contributions to climate resilience at the village level.

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5. References

Ayers, J., Schipper, L. F., Reid, H., & Huq, S. (2010). Community-based adaptation to climate change. Routledge.

Badan Perencanaan Pembangunan Nasional. (2014). Rencana aksi nasional adaptasi perubahan iklim (RAN-API). Kementerian PPN/Bappenas.

Choirunnisa, L. A. D., Purwaningsih, Y., & Prasetyani, D. (2022). Adaptasi nelayan pesisir Kabupaten Pacitan akibat perubahan iklim. Jurnal Wilayah dan Lingkungan, 10(2), 166–181. https://doi.org/10.14710/jwl.10.2.166-181

Intergovernmental Panel on Climate Change. (2023). Climate change 2023: Synthesis report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the IPCC.

Kementerian Desa, Pembangunan Daerah Tertinggal, dan Transmigrasi Republik Indonesia. (2021). SDGs Desa: Tujuan 13 Desa tanggap perubahan iklim.

Kementerian Desa, Pembangunan Daerah Tertinggal, dan Transmigrasi Republik Indonesia. (2023). Keputusan Menteri Desa, Pembangunan Daerah Tertinggal, dan Transmigrasi Republik Indonesia Nomor 67 Tahun 2023 tentang Panduan Desa Peduli Lingkungan.

Kementerian Desa, Pembangunan Daerah Tertinggal, dan Transmigrasi Republik Indonesia. (2024). Peraturan Menteri Desa, Pembangunan Daerah Tertinggal, dan Transmigrasi Republik Indonesia Nomor 2 Tahun 2024 tentang Petunjuk Operasional atas Fokus Penggunaan Dana Desa Tahun 2025.

Kementerian Kesehatan Republik Indonesia. (2025). Pedoman Desa/Kelurahan Sehat Iklim (DEKSI).

Kementerian Lingkungan Hidup dan Kehutanan Republik Indonesia. (2020). Pedoman penyelenggaraan Program Kampung Iklim (ProKlim).

Republik Indonesia. (2014). Undang-Undang Republik Indonesia Nomor 6 Tahun 2014 tentang Desa. Lembaran Negara Republik Indonesia Tahun 2014 Nomor 7.

Surmaini, E., Runtunuwu, E., & Las, I. (2011). Upaya sektor pertanian dalam menghadapi perubahan iklim. Jurnal Litbang Pertanian, 30(1), 1–12.

United Nations Development Programme. (2010). Community-based adaptation to climate change: A theoretical framework and overview of UNDP-GEF CBA projects.

United Nations Development Programme. (2019). Climate change adaptation framework.

Yulandari, E. D., Murayama, T., & Nishikizawa, S. (2023). Climate change adaptation through policy integration by local governments in Indonesia. Mitigation and Adaptation Strategies for Global Change, 28, 1–21.