

# Communicating climate change: the role of nature-based community development program in enhancing stakeholders engagement

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**Abstract.** Climate change is a global problem that affects not only the elite but also local communities. Climate change has an impact on both urban and rural inhabitants, with droughts and crop failures among the most severe. In Indonesia, specifically in the village of Sungai Pakning, Bengkalis Regency, Riau Province; the Plaju sub-district, Palembang City, South Sumatra Province; and Klayas village, Sorong Regency, Southwest Papua Province. Climate change poses concern such as peatland fires, coastal erosion, rising temperatures, and limited availability to clean water and local food. This study is a case study undertaken in three places, concentrating on climate change communication initiatives carried out through the use of nature-based community development program. Climate change communication is carried out through the empowerment program by adopting a participatory approach, using local evidence as the primary information basis, involving local actors or local figures, conducting capacity-building training, and forming local community networks, all of which are executed through the implementation of nature-based community development program. The result is that by effectively implementing climate crisis communication, community empowerment programs can strengthen stakeholder engagement.

## 1 Introduction

Climate change has emerged as one of the most urgent global concerns of this century, significantly affecting ecosystems, human health, and the economy [6]. The Intergovernmental Panel on Climate Change [9] assessment indicates that rising global temperatures, alterations in weather patterns, and an increase in the frequency of natural catastrophes, including floods, droughts, and wildfires, are direct consequences of climate change. The oil and gas industry is a significant contributor to emissions and has a role in mitigating climate change. Consequently, enterprises in the oil and gas sector, particularly in processing, must assume responsibility for the prevention, mitigation, and adaptation to

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climate change, especially concerning the communities surrounding their operational sites. The corporate social responsibility initiative, particularly within the oil and gas processing sector, exemplifies their commitment to mitigating climate change. They provide initiatives through corporate social responsibility that emphasize awareness and tactics for climate change mitigation and adaptation.

Nature-based community development programs contribute to climate change adaptation [3] and mitigation measures. Communities can mitigate the risk of climate-related disasters and sustain critical natural resources for daily life by maintaining and restoring ecosystems, including forests, wetlands, and coastal areas [10]. Reforestation and peatland repair serve as carbon sinks while also mitigating floods and preserving biodiversity [18,19,20]. Moreover, these programs facilitate bilateral communication between the community and stakeholders, such as the government, NGOs, and scientists, thereby augmenting sustained participation and dedication. Active community engagement enhances understanding of climate change effects and nurtures a collective responsibility for environmental sustainability [13].

In Indonesia, oil and gas processing firms significantly contribute to the climate change initiative. Alongside regulatory motivations, corporations in this sector have heightened their understanding and readiness to address climate change with their communities. In this context, climate crisis communication is crucial for informing the public and galvanizing collective efforts for mitigation and adaptation. Effective communication regarding the climate problem necessitates a strategy that actively engages the community. One widely acknowledged strategy involves nature-based community development programs. Community empowerment initiatives not only improve comprehension of climate hazards but also provide communities with the skills and information necessary to participate in sustainable solutions) [24]. This empowerment is crucial as local populations, particularly in vulnerable regions, are frequently the most impacted by climate change, necessitating their capacity to adapt [1].

This study investigates the execution of community empowerment initiatives focused on environmental conservation conducted by oil and gas processing firms in Indonesia, specifically three oil refineries: the refinery in Sungai Pakning, Riau Province; the refinery in Palembang, South Sumatra Province; and the refinery in Sorong, Southwest Papua Province. These three oil refineries were selected due to their implementation of community empowerment initiatives focused on environmental preservation for over three years. The oil refinery in Sungai Pakning, Riau Province, executes the Independent Peat Village Program, which aims to rehabilitate former burned peatland into productive land and empower the people via sustainable agriculture. The oil refinery in Palembang, South Sumatra Province, executes the Innovative Food Village Program, which emphasizes the management of urban environments and the establishment of healthy and clean local food industry centers. The Sorong oil refinery in Southwest Papua Province is executing the Klayas Mandiri Program, which aims to supply clean water and establish local food centers for the indigenous Mooi Tribe in the region. The community empowerment programs implemented by these three companies aim to enhance community adaptation and mitigation to climate change, thus efforts need to be made to raise public awareness of the urgency of climate change adaptation and mitigation through effective climate change communication.

This research examines climate change communication through community empowerment aimed at environmental preservation, conducted by three oil refinery firms in Indonesia, with a comparative analysis of their implementations. This research seeks to investigate how climate change communication, in conjunction with community empowerment initiatives focused on environmental conservation, might improve community preparedness, adaptation, and proactive measures in addressing the effects of climate change. This project aims to offer novel insights into communication techniques and policies that enhance community resilience to climate change.

## **2 Method**

This research is a qualitative case study focusing on three places in Indonesia where oil refinery corporations undertake community empowerment programs aimed at environmental preservation. This research examines three programs: the Independent Peat Village Program, aimed at transforming burned peatland into productive land and empowering the community through sustainable agriculture, implemented by the oil refinery in Sungai Pakning, Riau Province; the Innovative Food Village Program, which emphasizes urban environmental management and the establishment of healthy local food industry centers, executed by the oil refinery in Palembang, South Sumatra Province; and the Independent Klayas Program, dedicated to providing clean water and developing local food centers for the indigenous Mooi Tribe community in Sorong, Southwest Papua Province, implemented by the oil refinery there.

The study was carried out from January to December 2023 utilizing data gathering techniques including in-depth interviews and participant observation. Researchers are engaged in the execution of the community empowerment initiative focused on environmental conservation in three areas. In-depth interviews were performed using purposive sampling to choose local personalities, including religious leaders, customary authorities, community leaders, or those deemed representative of the local community's expertise. Comprehensive interviews can investigate the community's experiences with the empowerment process, the obstacles they encounter, and their assessments of the program's efficacy in assisting them to manage the effects of climate change [14]. Comprehensive case studies on particular individuals or areas might yield a more nuanced understanding of the program's impact.

## **3 Result and Discussion**

Climate change is a multifaceted subject that impacts numerous facets of existence, including the economy, health, and the environment. Effective communication regarding climate change is crucial to tackle this challenge, particularly at the local level via community empowerment initiatives. The three oil refinery businesses execute corporate social responsibility initiatives focused on community empowerment and environmental conservation. The execution of these community empowerment initiatives is governed by various regulations, including the Minister of Environment and Forestry Regulation No. 1 of 2021 regarding the Corporate Performance Rating Program (PROPER) and the State-Owned Enterprises Minister Regulation No. 1 of 2023 pertaining to Social and Environmental Responsibility. By implementing community empowerment programs focused on environmental preservation, the corporations employ a localized communication strategy that actively involves the surrounding communities in their operations areas.

According to the findings from the data collection process, the Company implements climate change communication through various methods, including participatory approaches, utilization of local evidence, engagement with local actors or figures, provision of capacity-building training, and establishment of local community networks.

### **3.1 Participatory Approach**

The participative approach entails engaging the community in decision-making concerning climate change solutions. This approach is crucial as local populations possess extensive knowledge of their environment and can offer significant insights in formulating adaption plans tailored to the local situation [7]. This engagement also fosters a sense of ownership of the program, so augmenting participation and ensuring its sustainability [17].

Community empowerment initiatives may commence with focus group discussions (FGDs), seminars, and community assemblies. The discourse elucidated the subject of climate change in accessible language, supplemented by tangible examples of local effects that have already transpired or may transpire [15]. The community is asked to engage in the development of solutions pertinent to their needs, including water resource management, sustainable agriculture, and reforestation. His findings indicate that this participatory approach corresponds with the peripheral route of the Elaboration Likelihood Model [17], wherein information dissemination occurs not solely through direct means but also via alternative forums that adopt a more personal methodology, supplemented by relatable examples for community comprehension.

All three companies employ a participatory strategy in climate change communication, though in varying forms. The Oil Refinery in Sungai Pakning, situated inside the Coastal Malay Community, utilizes a participatory methodology grounded in community meetings and cultural practices. This pertains to the development of social capital between the Company and the Community in executing the Community Empowerment initiative [23]. The Oil Refinery in Plaju employs a participatory approach by incorporating local government representatives, including neighborhood heads (RT), community leaders (RW), and village heads. This is executed because, in the context of climate change communication, the Company undertakes a social campaign necessitating the involvement of formal stakeholders, such as local government entities, to guarantee the communication proceeds as intended [4]. Simultaneously, the Oil Refinery in Kasim is adopting a participatory strategy by engaging religious and traditional authorities. This occurs because, culturally, the community in that region regards religious and traditional leaders as pivotal characters who regulate communal life; these individuals are perceived as influential opinion shapers in society.

**Tabel 1.** Participatory Approach

<b>Company</b>	<b>Participatory Approach</b>
Oil Refinery Company in Sungai Pakning	Discussion on climate change is conducted through <b>group discussion forums, community meetings, and cultural activities.</b>
Oil Refinery Company in Plaju	Discussion on climate change is conducted through socialization <b>involving local government, community meetings, and group member meetings.</b>
Oil Refinery Company in Kasim	Discussion on climate change is conducted through community meetings via <b>religious forums and customary forums.</b>

### 3.2 Local Evidence-Based Information

A primary challenge in climate change communication is its global and abstract character. It is essential to link the effects of climate change with the community's real experiences [12]. Empowerment programs might utilize local facts, such as the rising incidence of floods in peatlands, alterations in planting seasons, or diminishing crop yields, to elucidate the tangible effects of climate change.

Utilizing local examples to convey climate change facilitates community comprehension of the connection between human activities and climate change, as well as their potential contributions to mitigation and adaptation initiatives [11]. Utilizing evidence-based local information, the community may more readily identify the manifestations of climate change in their surroundings. The Oil Refinery in Sungai Pakning, with its community empowerment initiative, encourages local residents to tackle challenges such as peatland degradation, flooding, and peatland fires resulting from the severe drought impacting the area. The Oil Refinery in Plaju urges the community to identify indicators of climate change, including temperature fluctuations, infrastructure degradation such as obstructed drainage systems, and

the heightened risk of climate-related diseases. Concurrently, the Oil Refinery in Kasim, via its community empowerment initiative, promotes awareness among residents of local indicators, like the diminishing fish catches, the scarcity of sago trees as a food source, and the challenges in obtaining clean water. The three types of local evidence are more comprehensible to the community than scientific metrics of climate change, such as greenhouse gas emissions and global warming.

**Tabel 2.** Local Evidence-Based Information

<b>Company</b>	<b>Local Evidence-Based Information</b>
Oil Refinery Company in Sungai Pakning	Conducting evidence-based local communication around <b>peatland degradation, flooding, and peatland fires</b> resulting from severe <b>drought</b> conditions.
Oil Refinery Company in Plaju	Implementing evidence-based local communication of <b>elevated temperatures, obstructed rivers, and heightened disease prevalence</b> within the community attributable to climate change.
Oil Refinery Company in Kasim	Implementing evidence-based local communication regarding the <b>decline in fish catches</b> at sea, <b>challenges in locating sago trees as a primary food source</b> , and <b>obstacles in acquiring clean water</b> .

### 3.3 Engagement of Community Leaders and Local Leaders

Community leaders and local leaders exert considerable influence in molding public opinion and catalyzing collective action. Consequently, engaging them in community empowerment initiatives constitutes a successful communication technique. These individuals can serve as climate change ambassadors, disseminating information to the public and inspiring engagement in environmental conservation efforts [5].

Religious leaders can communicate moral imperatives about environmental stewardship, whereas traditional leaders can associate climate change concerns with indigenous cultural values. This will enhance the message's relevance and facilitate community acceptance. The three Companies utilize community personalities and local leaders in their climate change communication activities. Community and local leaders are perceived to comprehend the socio-cultural dynamics of the community, hence the messages and information crafted and communicated by them are more effectively received by the community.

The oil refinery in Sungai Pakning engages Islamic religious leaders and Malay traditional elders to influence public perception. Forums addressing community empowerment initiatives are conducted with the participation of these leaders to secure community endorsement. The Oil Refinery in Plaju engages local government officials, including the RT Chairman, RW Chairman, and the Subdistrict Head, in executing its community empowerment program. This occurs due to the urban qualities of the Plaju community, which are more inclined to adhere to directives from the local administration. The Oil Refinery in Kasim employs Christian religious leaders and traditional leaders of the Mooi Tribe, who are esteemed and recognized by the community, to facilitate climate change communication.

**Tabel 3.** Engagement of Community Leaders and Local Leaders

<b>Company</b>	<b>Engagement of Community Leaders and Local Leaders</b>
Oil Refinery Company in Sungai Pakning	Approaching local figures, such as <b>Islamic religious leaders and Malay customary leaders</b> , as representatives of the community.
Oil Refinery Company in Plaju	Approaching <b>local government officials at the local level</b> , such as RT heads, RW heads, village heads, and sub-district heads.
Oil Refinery Company in Kasim	Approaching local figures, such as <b>Christian religious leaders and Mooi tribal customary leaders</b> , as representatives of the community.

### 3.4 Local capacity building

Community empowerment initiatives must incorporate training and sustainable capacity development. The community requires information and practical skills applicable to their daily life to mitigate the effects of climate change. This instruction may encompass sustainable agriculture practices, water resource management, renewable energy utilization, and the preservation of local ecosystems [16]. Equipping communities with these skills enhances their preparedness for the impacts of climate change and enables them to participate to long-term mitigation efforts. This training program must incorporate practical field experience to enable the community to immediately observe the outcomes of their efforts.

Enhancing local capacity is essential for the community's initiatives to adapt to and mitigate climate change. The community gains fresh insights on approaches, methods, and strategies for achieving sustainable livelihoods through adaptation and mitigation initiatives. The local capacity enhancement initiatives, encompassing training, outreach, and social campaigns, correspond with the Diffusion of Innovations theory [21], which delineates the phases of new knowledge acceptance within the community. In practice, there exists a cohort of individuals that oppose adapting to new circumstances, specifically climate change. Nevertheless, within society, there are typically innovators who serve as catalysts for change, including the acknowledgment and initial comprehension of climate change by individuals in this cohort.

The Oil Refinery in Sungai Pakning implemented training on peatland fire suppression, peatland agricultural processing, peatland water filtering, and peatland ecotourism services to enhance capability for climate change adaptation. The Oil Refinery in Plaju conducted training on fire extinguishing in densely populated areas, training on the operation of wastewater treatment facilities for domestic industries, and training on the use of confined spaces for agriculture through hydroponic methods. The Oil Refinery in Kasim is augmenting the capabilities of the indigenous Mooi tribe population by providing training in clean water maintenance and distribution, sago processing, and local food marketing and distribution.

**Table 4.** Local capacity building

<b>Company</b>	<b>Engagement of Community Leaders and Local Leaders</b>
Oil Refinery Company in Sungai Pakning	Training in <b>peatland firefighting, peatland agricultural processing, peatland water filtering, and peatland ecotourism service development.</b>
Oil Refinery Company in Plaju	Instruction in <b>firefighting in densely populated communities, training in the operation of wastewater treatment systems for domestic industries, and education in the application of hydroponic methods for agriculture</b> in confined places.
Oil Refinery Company in Kasim	Capacity enhancement for the <b>indigenous Mooi tribal community</b> via <b>training in clean water maintenance and distribution, sago processing, and local food marketing and distribution.</b>

### 3.5 Establishment and Involvement of Community Networks

Establishing working groups or community networks is an excellent method for conveying information about climate change. These organizations can function as a forum for the community to exchange information, deliberate on the difficulties they encounter, and disseminate solutions. This network can function as a conduit between the local community and many stakeholders, including the government, NGOs, and scientists [8]. This community network facilitates more effective and efficient communication, particularly in distributing information regarding the newest advancements in climate change and pertinent adaptation policies.

The three companies employ community network creation and engagement tactics to execute community empowerment initiatives in their respective regions. The establishment of this community network is seen effective in sustaining social integrity and enhancing social cohesiveness, therefore fostering social institutions within the community and encouraging social autonomy. Based on diverse research, the three companies promote community social independence by enhancing social institutions, including formal reinforcement through institutional legalization and substantive reinforcement through group financial management and the establishment and fortification of institutional regulations.

The Oil Refinery in Sungai Pakning established Fire Care Community Groups at both the Village and District levels to enhance communication and coordination between the Community and stakeholders during peatland fire incidents. Furthermore, they established the Tunas Makmur Farmers Group and the Harapan Bersama Mangrove Group, tasked with overseeing community empowerment initiatives in pineapple cultivation and mangrove nursery and conservation. The Oil Refinery in Plaju established the Plaju Ulu Tempe Craftsmen Association as a social entity that regulates traditional tempe artisans in the region. The Company advocates for local government support through the issuance of a letter from the Palembang City Government to preserve the traditional tempe industry in Palembang City. Simultaneously, the Oil Refinery in Kasim emphasizes institutional fortification initiatives, specifically regarding the rapport between the community, the ecclesiastical institution, and the chief of the Mooi Tribe customary council. The socio-cultural context of the Mooi Tribe community in Kasim necessitates active involvement from both the church and the customary chief in the execution of community empowerment projects, since the community exhibits strong adherence to their directives.

**Tabel 5.** Establishment and Involvement of Community Networks

<b>Company</b>	<b>Establishment and Involvement of Community Networks</b>
Oil Refinery Company in Sungai Pakning	<b>Establishment of the Fire Care Community Group</b> to strategize for peatland fire suppression. <b>Establishment of the Tunas Makmur Farmers Group</b> for the management of pineapple cultivation on peatland. <b>Establishment of the Harapan Bersama Fishermen Group</b> for the management of mangrove nursery and conservation initiatives.
Oil Refinery Company in Plaju	<b>Establishment of the Plaju Ulu Tempe Craftsmen Association</b> serves as a platform for tempeh artisans in Plaju Ulu Village.
Oil Refinery Company in Kasim	<b>Establishment of the Water Council Group</b> , comprising Church Leaders and the Traditional Chief of the Mooi Tribe, to oversee and allocate clean water to the community.

Analysis of the climate change communication strategies employed by three companies across distinct regions reveals a participatory approach that utilizes locally sourced, evidence-based information, engages community figures and local leaders, and establishes community networks. The efficacy of climate communication is evident in community empowerment initiatives focused on environmental issues, assessed through metrics such as heightened awareness, shifts in attitudes, collective actions, and the sustainability of programs.

A primary indication of effective climate change communication is the enhancement of public knowledge and understanding regarding climate change and its consequences. This knowledge encompasses a grasp of the causes of climate change, its impacts on the local environment, and the mitigation and adaption strategies that can be implemented following climate change communication initiatives [12].

Alongside enhanced information, alterations in societal attitudes and views regarding climate change serve as significant indicators of effective communication. An effective empowerment program ought to transform the community's perspective on environmental

concerns, cultivating a greater feeling of stewardship and responsibility for environmental preservation. Research indicates that alterations in perception are frequently associated with the manner in which communication links climate change to local effects that can be immediately experienced by the community [13]. The efficacy of climate change communication can be assessed through alterations in community behavior and their participation in collective actions pertaining to climate change mitigation or adaptation. An effective community empowerment program must organize the community to do tangible actions, such as implementing sustainable agricultural practices, conserving water, or engaging in reforestation efforts. Studies indicate that behavioral modification typically necessitates a synthesis of enhanced information and robust incentives or social support to initiate action [22].

The degree of participation and community engagement that fosters collective action in empowerment initiatives is a significant measure of communication efficacy. Increased involvement of community members in program activities enhances the probability of widespread dissemination and collective adoption of the climate change communication message. Participation may manifest as attending workshops, engaging in group discussions, or actively contributing to environmental projects. Significant participation signifies that the community comprehends the communicated message and is inspired to collaborate in action [18].

The efficacy of climate change communication campaigns can also be assessed by the sustainability of the initiatives generated. Effective empowerment initiatives typically yield enduring modifications in behavior and collaborative efforts, persisting beyond the program's conclusion. This may entail the persistence of community working groups involved in mitigation or adaptation initiatives, or the enactment of municipal policies that facilitate climate change adaptation. The program's sustainability can be assessed by examining the institutionalization of local climate change measures, including the establishment of environmental groups that persist after the initial intervention. Effective programs frequently promote the development of robust local leadership about climate change matters [2].

## **4 Conclusion**

Climate change communication plays an important role in building understanding and the successful implementation of community empowerment programs, especially those oriented towards environmental preservation. Through this research, at least five dimensions in communication have been identified that can be used to build public awareness about climate change, namely by adopting a participatory approach, using local evidence as the main information base, utilizing local actors or local figures, conducting capacity-building training, and finally forming local community networks. These five dimensions of climate change communication are key to the success of climate change communication. Based on this research, it was found that five dimensions in climate change communication can have a significant impact on the success of enhancing public understanding and skills regarding climate change adaptation and mitigation.

Then, in measuring the success of climate change communication through community empowerment programs, a multidimensional approach is required, encompassing knowledge enhancement, attitude and behavior changes, participation levels, and program sustainability. What the three oil refinery companies in Indonesia have done shows that there is no single approach used in the three regions in building climate change communication. This can be understood due to the differences in socio-cultural backgrounds in each location, which have their own characteristics and uniqueness. This research also shows that the presence of socio-cultural backgrounds plays a significant role in building climate change communication strategies, especially related to stakeholder engagement. Through this research, the



researchers believe that joint efforts to reduce the adverse effects of climate change can continue to be pursued by various stakeholders. However, this research also has limitations related to the form and quality of climate change communication in each region, so this is still very likely to be explored in future research.

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