

# ADAPTATION AND MITIGATION OF CLIMATE CHANGE BASED ON COMMUNITY EMPOWERMENT

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**Abstract: Adaptation and Mitigation of Climate Change Based on Community Empowerment.** Bengkalis Regency, one of the significantly affected areas for climate change. Bantan Subdistrict, Bengkalis Regency Beach abrasion which is getting worse every year is almost 30 cm losing land area. This is a threat to the coastal ecosystem, the condition of mangroves along the coast has been damaged. Mangrove damage is caused by exploitation and exploration by companies and communities around for economic interests. In response to this, the government (central and regional) created the Climate Village Program (ProKlim) to encourage active participation of the community and all parties in carrying out local actions to increase resilience to the effects of climate change and reduce greenhouse gas (GHG) emissions. Activities in ProKlim are climate change adaptation and mitigation. This research was conducted with a qualitative approach. The research subjects came from the community in Bantan Subdistrict and related institutions. The technique of collecting data through in-depth interviews, observations, and documentation. Data were analyzed by interactive analysis techniques. The results of the study found that the community in Bantan Subdistrict had realized that the area experienced severe abrasion due to the destruction of the mangrove ecosystem and the impact of ocean waves from the Malacca Strait, for which the community, business world and local governments had adapted and mitigated in the form of empowering the people living in coast to do mangrove conservation, utilization of non-timber mangroves, and make tourism areas.

**Abstrak: Adaptasi dan Mitigasi Perubahan Iklim Berbasis Pemberdayaan Masyarakat..** Kabupaten Bengkalis, salah satu daerah yang paling terkena dampak perubahan iklim. Kecamatan Bantan, abrasi Pantai Kabupaten Bengkalis yang semakin parah setiap tahun hampir 30 cm kehilangan luas lahan. Ini merupakan ancaman bagi ekosistem pantai, kondisi hutan bakau di sepanjang pantai telah rusak. Kerusakan mangrove disebabkan oleh eksploitasi dan eksplorasi oleh perusahaan dan masyarakat sekitar untuk kepentingan ekonomi. Menanggapi hal ini, pemerintah (pusat dan daerah) menciptakan Program Desa Iklim (ProKlim) untuk mendorong partisipasi aktif masyarakat dan semua pihak dalam melakukan tindakan lokal untuk meningkatkan ketahanan terhadap dampak perubahan iklim dan mengurangi gas emisi rumah kaca (GRK). Kegiatan di ProKlim adalah adaptasi dan mitigasi perubahan iklim. Penelitian ini dilakukan dengan pendekatan kualitatif. Subjek penelitian berasal dari masyarakat di Kecamatan Bantan dan institusi terkait. Teknik pengumpulan data melalui wawancara mendalam, observasi, dan dokumentasi. Data dianalisis dengan teknik analisis interaktif. Hasil penelitian ini menemukan bahwa masyarakat di Kecamatan Bantan telah menyadari bahwa daerah tersebut mengalami abrasi parah akibat kerusakan ekosistem mangrove dan dampak gelombang laut dari Selat Malaka, di mana masyarakat, dunia usaha dan pemerintah daerah memiliki adaptasi dan mitigasi dalam bentuk memberdayakan masyarakat yang tinggal di pantai untuk melakukan konservasi bakau, pemanfaatan bakau non-kayu, dan membuat kawasan wisata.

**Kata Kunci:** Pemberdayaan masyarakat, ekosistem mangrove, kawasan wisata

## INTRODUCTION

Facing climate change, all parties including the community need to take adaptation actions to adjust to the impact and mitigation to reduce emissions of Greenhouse Gases (GHG). By making efforts to adapt to climate change, community resilience is expected to increase so that the risks that may occur can be minimized. In addition to reducing GHG emissions, mitigation efforts undertaken can

reduce the costs of adaptation, because the greater the concentration of GHGs that trigger climate change, will lead to greater climate change impacts, which will have an impact on the cost of implementing adaptation efforts.

By making efforts to adapt to climate change, community resilience is expected to increase so that the risks that may occur can be minimized, among others by preparing infrastructure that is resistant to climate disas-

ters, strengthening economic capacity, social capacity, education level, and implementing climate change adaptation technologies that according to local conditions. In addition to making adaptation efforts, communities need to continue to be encouraged to carry out mitigation actions that will contribute to the reduction of global GHG emissions.

Climate change adaptation and mitigation efforts can be integrated with environmental management activities that have been carried out at the local level by taking into account climate risk factors and the impacts of climate change that may occur. All efforts that have been carried out by the community need to be inventoried and properly recorded so that their contribution can be measured towards achieving the target of reducing GHG emissions and increasing national adaptive capacity.

Data collection on local action on climate change adaptation and mitigation can be carried out through a bottom-up approach, namely by encouraging various parties to collect information about activities that have been implemented by the community and can provide tangible benefits to efforts to tackle climate change.

Some views on community empowerment, among others are as follows:

1. Structural

Empowerment is an effort to liberate, fundamentally structural transformation, and structural elimination or oppressive systems.

2. Pluralist

Empowerment as an effort to increase the power of someone or a group of people to be able to compete with other groups in a particular 'rule of the game'.

3. Elitism

Empowerment as an effort to influence elites, form alliniation with these elites, and try to make changes to elitist practices and structures.

4. Post-Structuralist

Empowerment is an effort to change discourse and respect subjectivity in understanding social reality.

The essence of empowerment conceptualization is centered on humans and humanity, in other words human and humanity as normative, structural and substantial benchmarks. Thus the concept of empowerment is an effort to build personal, family, community, nation, government, state and world order existence within the framework of a just and civilized process of humanitarian actualization.

Community empowerment is a concept of economic development that summarizes social values. This concept reflects the new paradigm of development, namely those that are "people centered, participatory, empowering, and sustainable" (Chambers, 1995). This concept is broader than merely fulfilling basic needs or providing a mechanism to prevent the process of further impoverishment (safety net), whose thoughts have recently been developed as an effort to find alternatives to the concept of the concept of growth in the past. This concept evolved from the efforts of many experts and practitioners to find what, among others, Friedman (1992) referred to as alternative development, which requires 'inclusive democracy, appropriate economic growth, gender equality and intergenerational equity'. Community empowerment, especially in rural areas is not enough just by increasing productivity, providing equal business opportunities or providing capital, but must also be followed by changes in the socio-economic structure of the community, supporting the development of community potential through increased role, productivity or efficiency and improving four accesses, namely access to resources, access to technology, access to markets, access to financing sources.

Mardikanto (2015) formulated four main efforts in each community empowerment, namely human development, business development, community development and institutional development.

- a. Human development is the first and foremost effort that must be considered in every effort of community empowerment. This is based on the understanding that the

purpose of development is to improve the quality of life or human welfare.

- b. Business development is related to increasing technical knowledge, primarily to improve productivity, improve quality and add value.
- c. Environmental development in the context of the amount of environmental damage that has a negative impact as the biggest forest destroyer, environmental pollution from industrial / agricultural / household waste, and destruction of land from mining activities. Facing this matter, efforts to empower the community towards environmental awareness (natural resources and other living environment) are time to get serious attention.
- d. Institutional development is not enough to form the necessary institutional institutions, but far more important than its formation, is how far the institutions that have been formed have functioned effectively.

Meanwhile, the principles of applying participatory community empowerment techniques that must be carried out are as follows:

- a. Society is seen as a subject, not an object.
- b. Community empowerment cadres try to position themselves as “insiders”, not “outsiders”.
- c. In determining the standard parameters, it is better to approach right than to be completely wrong.
- d. Communities that make maps, models, diagrams, sequencing, give numbers or values, study or analyze, provide examples, identify problems, select priori problems, present results, review and plan action studies.

## **METHODS**

This research approach /method uses a qualitative approach/method with data collection techniques by means of interviews and field observations. The location of this study was in Bantan District, Bengkalis Regency. The consideration in the selection of the location of this research is that Bantan Sub-district feels strongly the impact of climate

change, namely in the form of abrasion that occurs along the coast. This is due to the activities of the community and entrepreneurs who explore and exploit mangrove forests so that the condition of mangrove forests is increasingly alarming.

## **RESULTS AND DISCUSSION**

### **Climate Change Adaptation and Mitigation Implementation**

The description of activities that can be implemented by the community in the implementation of community empowerment-based climate change adaptation and mitigation according to the Chair of the Community Group for Conservation of Coastal Environmental Care (KMKPLP) are as follows:

#### **Adaptation Activities**

Efforts to adapt to climate change impacts can be carried out through activities such as:

#### **Control of drought, floods and landslide**

##### **1. Rainwater harvesting**

Rainwater harvesting is collecting and storing rainwater, including the flow of surface water, as much as possible when high rainfall can be used and utilized in handling or anticipating drought. Rainwater can be collected for example by making water reservoirs, ponds and rainwater reservoirs (PAH). The shape and size of the rainwater reservoir are adjusted to the conditions and abilities of the local community, can be on an individual or communal scale.

##### **2. Water absorption**

Water infiltration is an effort to increase water infiltration and restore water to the maximum extent possible in the soil related to handling or anticipating drought, for example through the production of bio-pores, infiltration ponds, Water-Collected Buildings (BTA), rorak, and Water Management Channels (SPA).

##### **3. Saving water use**

Saving water use is an effort to use water effectively and efficiently so that it does not experience waste, for example the reuse of water that has been used for certain

purposes and restrictions on water use. Provision of facilities and infrastructure for flood control Making flood safety facilities and infrastructure is needed in anticipating changes in rainfall patterns due to climate change that can increase the risk of flooding. Flood control strategies for regulating flood discharge are carried out for example through the construction and management of flood dams and reservoirs, flood embankments, river troughs, flood splitters or overflows, flood retention areas, and polder systems.

#### 4. Adaptive design

In anticipating the risk of flooding due to climate change, one of the adaptation efforts that can be done is to design or modify building construction, for example by increasing the structure of the building, applying the design of a stilt house or floating house.

#### 5. Terraces

With the potential for increasing rainfall due to climate change, one of the efforts that can be done to minimize the risk of landslides and erosion is through the manufacture of terracing on land with a certain slope. Terracing is soil conservation or soil preservation that is parallel to contour lines that are equipped with infiltration channels, drainage channels, and terrace reinforcement plants that function as erosion and landslide control.

### **Handling or anticipating sea level rise, rob, seawater intrusion, abrasion, ablation or erosion due to wind, high waves**

Communities in Bantan Subdistrict have realized that the area has experienced severe abrasion due to the destruction of mangrove ecosystems and the impact of ocean waves from the Malacca Strait, for that the community, business world and local governments have adapted and mitigated in the form of empowering people living on the coast to do mangrove conservation, non-timber mangrove utilization, and making tourism areas. The impacts of climate change in coastal areas can

be minimized by building or implementing the following activities:

#### 1) Natural protective structure

The manufacture of coastal natural protective structures is one of the efforts to maintain and rehabilitate coastal areas to anticipate the impacts of climate change and protect the coast through the planting of coastal vegetation (such as ketapang, sea cypress, mangroves, and coconut trees), protecting sand dunes and coral reef management.

#### 2) Artificial protection structure

The manufacture of artificial protective structures aims to protect the coast against damage caused by wave attacks and currents, among others by:

- a. Strengthen the beach or protect the beach to be able to withstand damage due to wave attack;
- b. Change the rate of sediment transport along the coast;
- c. Reducing wave energy reaching the coast;
- d. Reclamation by increasing the supply of sediment to the coast or by other means.

In accordance with its function, coastal buildings can be classified into three groups: construction built on the coast and parallel to the coastline, construction built perpendicular to the coast, and construction built offshore and parallel to the coastline. Several types of coastal protective structures include groin (groyne), wave breakers (jetty, breakwater, seawall artificial headland), beach nourishment, artificial reefs and tidal water doors.

#### 3) Building construction structure

One effort that can be done to anticipate the impacts of climate change in coastal areas is to modify the structure of the building, which is adjusting to changes in environmental conditions that occur such as increasing the height of the building floor or building a house on stilts and floating structures to anticipate sea level rise.

#### 4) Relocation

Resettlement relocation and other important assets are the transfer of residential locations or important assets to other safer locations because the old location is not habitable due to rising sea levels and other climate change impacts.

5) Provision of clean water

To anticipate water scarcity due to climate change, it is necessary to make efforts to provide clean water in coastal areas, both individually and communally. Individual water supply facilities for example are wells (eg dug wells, hand pump wells, boreholes, shallow hand pump wells) and rainwater storage tanks. While the communal water supply system, for example, is the construction of public hydrants, public faucets and water terminals.

6) Integrated coastal management system

Integrated coastal management is stated as the process of utilizing coastal and marine resources and space by paying attention to conservation and sustainability aspects. The context of integration includes sector dimensions, ecology, hierarchy of government, and disciplines. The application of an integrated coastal management concept that considers climate risk will strengthen community resilience to the effects of climate change.

7) Alternative livelihoods

Climate change can increase the frequency of occurrence of high waves, storms and also sea level rise which threatens the business activities of fishermen and coastal communities in meeting their daily basic needs. Because one of the adaptation efforts that needs to be done is to develop alternative livelihoods to improve the economic level of people who are resistant to climate disasters.

The concept of developing alternative livelihoods refers to the principle of integration between economic and ecological interests. The livelihoods of fishermen and coastal communities need to be adjusted to changes in environmental conditions due to climate change, for example crab

cultivation and replacement of fish species that are adaptive to climate change.

For this Mentayan Village, the one who led the birth of the KMKPLP was Adi Sutrisno, who works at the Public Relations Department now. Even though he is not a graduate of the environment, he is the one who is most diligent in inviting him to go directly to planting mangroves or mangroves. Because of the lack of experience, many mangrove seeds planted were killed. For mangrove seeds, obtained from the assistance of donors raised by Adi Sutrisno. "Even though many die, we remain enthusiastic," the Chair of the KMKPP.

The Chairperson of the KMKPLP said in 2012, along with funding assistance from the Marine and Fisheries Agency, a KMKPLP was formed. This group covers a number of small groups of 20 people. "With the attention of the Bengkalis Regency Government, we are getting excited and Alhamdulillah, now we still exist."

### Control of climate-related diseases

Activities that can minimize the risk of an increase in disease outbreaks due to climate change such as dengue fever, malaria, diarrhea and other vector-borne diseases include:

1) Vector control

Vector is an arthropod that can transmit, move and / or become a source of transmission of diseases to humans. Vector control is all activities or actions aimed at reducing the population of vectors as low as possible so that their existence is no longer at risk for the transmission of vector borne diseases in an area or avoiding community contact with vectors so that transmission of vector borne diseases can be prevented. Integrated Vector Control (PVP) is an approach that uses a combination of several vector control methods that are carried out based on the principles of security, rationality, and effectiveness of its implementation and by considering the sustainability of its success.

Vector control can be carried out with

physical or mechanical environmental management, the use of biotic agents, both for vectors and for breeding and / or changes in community behavior and can maintain and develop local wisdom as an alternative. Some examples of activities that can be implemented to control vectors are:

- a) 3M (draining, hoarding, closing) mosquito nests;
  - b) control of breeding mosquitoes and mice;
  - c) improve the environment so that there is no standing water;
  - d) put fish in a pond / plant pot;
  - e) forming a Jumantik Team (larvae monitor).
- 2) Early alert system  
It is an effort of the community to find out earlier about the conditions of the disease related to climate change, for example is the implementation of an early awareness system to anticipate the occurrence of diseases related to climate change such as diarrhea, malaria, DHF.
- 3) Sanitation and clean water  
Sanitation is an effort to control all human physical environmental factors, which may cause or can cause adverse things, for physical development, health, and endurance of human life. Environmental sanitation can be interpreted as an activity aimed at improving and maintaining basic environmental conditions that affect human well-being. These conditions include:
- a) clean and safe water supply
  - b) efficient disposal of waste from animals, humans and industry
  - c) food protection from biological and chemical contamination
  - d) clean and safe air
  - e) a clean and safe house.
- 4) Clean and healthy living behavior (PHBS)  
PHBS is all health behavior carried out on awareness so that family members or family can help themselves in the health sector and can play an active role in health activities in the community. Efforts to disseminate and institutionalize PHBS, for

example washing hands with soap, using healthy latrines and using clean water. Implementation of PHBS can strengthen community resilience in anticipating climate-related disease outbreaks.

### **Mitigation Activities**

Mitigation efforts to reduce GHG emissions can be carried out through activities including:

A waste and solid waste management, in the form of:

#### **1) Collection and Collection**

Waste storage is a way of storing garbage before it is collected, transported, transported and disposed of to landfills. The main objectives of the inventory are:

- a. avoid the occurrence of scattered garbage so that it disrupts the environment from health, hygiene and aesthetics
- b. facilitate the process of collecting waste and do not endanger garbage collection officers, both city officials and the local environment. Garbage collection system is a method or process of collecting garbage starting from the place of storage / garbage collection from the source of waste generation to the place of temporary collection / transfer station or at the same time to the final disposal site (TPA). Waste collection and collection needs to be done to prevent decomposition or decomposition of waste that is not in place both at the household and communal levels, which will contribute to GHG emissions.

#### **2) Processing**

Waste processing is part of handling waste which according to Law No. 18 of 2008 is defined as the process of changing the form of waste by changing the characteristics, composition, and amount of waste. Waste processing in general is a process of transformation of waste both physically, chemically and biologically. Waste processing is an activity intended to reduce the amount of waste, in addition to utilizing the value that is still contained in the waste itself

(recycled materials, other products, and energy). Waste processing can be done, among others, by composting or using incinerators that meet technical requirements.

### 3) Utilization

Community efforts to utilize solid waste and methane gas produced from waste treatment processes, for example by conducting 3R (Reduce, Reuse, and Recycle), use methane gas from organic waste as an energy source, and use organic fertilizer from the composting process.

### 4) Application of the zero-waste concept.

Community efforts to treat traditional waste from household activities so that no waste is disposed of in the environment, by maximizing the reduction in the amount of waste, household level composting and the operation of waste banks.

## Prevention and control of forest and land fires

### 1) Control system for forest and land fires

Forest fire control is the activity of protecting forests from wild fires and the use of fire to achieve forest management objectives, by carrying out activities of prevention, suppression and post-fire handling

### 2) Management of peatlands

Community efforts to manage peatlands in a sustainable manner by clearing land without burning and managing the water management of peatlands. Forest and peat land fires can increase the amount of GHG emissions so they need to be controlled.

## Factors That Influence The Implementation of Community Empowerment-based Climate Change Adaptation and Mitigation

### *Coaching Factor*

The people of Bantan Subdistrict need guidance from the local government, especially from the Environment Agency in implementing climate change adaptation and mitigation activities that they have implemented. The community feels that the coaching carried out by the dive government still feels lacking and seems indifferent to the activities

carried out by the community. So that people now feel that what they are doing is not getting support, as a result the community is starting to reduce attention to their environment.

### *Fund Factor*

Funds are a very influential factor in the implementation of climate change adaptation and mitigation, so far the community uses its own funds (self-financing) and funds from the village government to implement adaptation and mitigation actions. We cannot deny that the implementation of climate change adaptation and mitigation can cost a lot of money, if relying on self-help from the community, the goal of the community to protect and overcome environmental problems will be difficult to overcome. As a result, people use forest products in the form of wood by cutting them down to meet facilities they cannot buy.

### *Actors of Facilities and Infrastructure*

Facilities and infrastructure factors also affect the implementation of climate change adaptation and mitigation in Bantan District. We know that Bantan District in terms of infrastructure is very concerning. Starting from the conditions of roads, buildings and other public facilities. This is inseparable from the condition of Bantan sub-district whose area is peatland. As long as the facilities and infrastructure to support adaptation and mitigation actions are needed by the community. The road conditions were badly damaged and there were still many roads that had not yet been built, making the people gain weight in carrying out adaptation and mitigation activities.

## CONCLUSION

The conclusions in the study The implementation of climate change adaptation and mitigation based on community empowerment in Bantan District, Bengkalis Regency is encouraging the community to increase adaptation capacity to the impacts of climate change and greenhouse gas emission reduction and a series of activities carried out in an effort to

reduce the level of greenhouse gas emissions as forms of efforts to mitigate climate change impacts on climate change adaptation and mitigation activities which include: controlling drought, floods and landslides; handling or anticipating sea level rise, rob, sea water intrusion, abrasion, abrasion and high waves; controlling climate-related diseases; waste and solid waste management; processing and utilization of waste water; and prevention and control of forest and land fires. The results of the study found that people in Bantan Sub-district had realized that the area was experiencing severe abrasion due to the destruction of mangrove ecosystems and the impact of ocean waves from the Malacca Strait, for that the community, business and local governments have adapted and mitigated in the form of empowering people living in coastal areas to conduct mangrove conservation, non-timber mangrove utilization, and make tourism areas.

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