Publik (Jurnal Ilmu Adminsitrasi)
Vol. 11 No. 2 Tahun 2022
DOI: http://dx.doi.org/10.31314/pjia.11.2.280-290.2022
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ISSN: 2301-573X E-ISSN: 2581-2084

Analysis of the Impact Renaissance Dam Construction Toward Stability Nile River in Egypt

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Abstract. The Nile River is a vital lifeline for countries in East and North Africa, particularly Egypt, Sudan, and Ethiopia. Ethiopia's construction of the Great Renaissance Dam (GERD) since 2011 has raised serious concerns, particularly in Egypt, over concerns it will reduce the flow of water vital to the country's livelihoods and economic stability. This article aims to analyze the geopolitical impact of water on the construction of the Great Renaissance Dam in Ethiopia and its relation to the stability of the Nile in Egypt. The geopolitical impact of water is related to the potential reduction of Nile water flow, which can affect the availability of water for agriculture and water consumption downstream. The method used is qualitative descriptive analysis by collecting data from primary and secondary sources. The results of the analysis show that the geopolitical impact of water can affect regional stability in the Middle East and North Africa region, as well as impact the availability of water downstream and the stability of the Nile River in Egypt. A diplomatic solution is needed to overcome differences of views and reach an agreement that can meet the water needs of the affected region.

Keywords: Water Geopolitics; Great Renaissance Dam; Nile River

Received:19-10-2022 ***Revised***:29-11-2022 ***Accepted***:26-12-2022

INTRODUCTION

The Nile River is one of the longest rivers in the world and is a source of life for countries in East and North Africa, especially Egypt, Sudan and Ethiopia. For thousands of years, this river has played an important role in the agriculture, social life and economy of the people of the region. However, the construction of the Great Renaissance Dam (GERD) by Ethiopia has raised significant concerns regarding its impact on geopolitical stability and water resources in the region (Zinn, 2010).

GERD, which began construction in 2011, is one of the largest infrastructure projects in Africa. The dam is designed to increase electricity production in Ethiopia and support the country's economic growth. However, the project has fueled tensions between Ethiopia and downstream countries, especially Egypt, which is heavily dependent on Nile River water for its agricultural, industrial and domestic needs. Egypt is worried that GERD will reduce the flow of water to the country, thereby having a negative impact on people's lives and the country's economic stability (Koschut, 2014).

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Over the past few years, the countries of the Nile River region have been trying to reach an agreement on water management and GERD development. However, negotiations between Egypt, Sudan, and Ethiopia often stalemate and do not produce fair and sustainable agreements. The geopolitical tensions resulting from the development of the GERD have also attracted the attention of the international community, which is looking for ways to support countries in the region in reaching win-win solutions (El Baradei et al., 2022).

It is in this context that this research was conducted to analyze the geopolitical impact of water from the construction of the Great Renaissance Dam and its relation to the stability of the Nile River in Egypt. This study aims to identify the factors influencing geopolitical tensions in the region, explore the impact of GERD on the flow of the Nile River and the stability of Egypt, and explore ways to enhance cooperation and reduce tensions between the countries involved.

Analysis of the Geopolitical Impact of Water on the Construction of the Great Renaissance Dam and its Relation to the Stability of the Nile River in Egypt. In the context of this study, there are several relevant theories in analyzing the geopolitical impact of water on development. The Great Dam of the Renaissance and its relationship to the stability of the Nile in Egypt. The following is a theoretical overview that can be used to analyze this study: (1) Geopolitical Theory Geopolitical theory explains the relationship between geographic areas and political power. This theory also considers natural resource factors, including water resources, in influencing state policies and power. In the context of the construction of the Great Renaissance Dam, this theory can be used to analyze the policy and power relations between Ethiopia, Egypt and Sudan in the management of water resources (Moharram et al., 2019). (2) Game Theory Game theory is a mathematical theory used to analyze strategic decisions in conflict or competitive situations. In the context of this study, this theory can be used to analyze strategic decisions between Ethiopia, Egypt and Sudan in determining the most beneficial solution for the interests of each country in the management of water resources (Hilda, 2016). (3) Diplomacy Theory Diplomacy theory is a theory that explains efforts to reach peace agreements in international relations. In the context of the construction of the Great Renaissance Dam, this theory can be used to analyze the diplomatic efforts made between Ethiopia, Egypt and Sudan in reaching agreements that are beneficial to all parties in the management of water resources (Ratna Poerwantika et al., 2022). (4) Theory of Water Resources Management The theory of water resources management explains efforts to optimize the use of water resources in a sustainable manner. In the context of this study, this theory can be used to analyze optimal water

resource management efforts for all parties in the management of the Nile River (Yasser et al., 2020).

By considering these theories, a more comprehensive analysis can be carried out on the geopolitical impact of water on the construction of the Great Renaissance Dam and its relation to the stability of the Nile River in Egypt. This analysis can assist in formulating optimal solutions in managing water resources in the region and avoiding conflicts that could impact regional stability in the Middle East and North Africa region.

METHODS

The research method in the journal on the analysis of the geopolitical impact of water on the construction of the Great Renaissance Dam and its relation to the stability of the Nile River in Egypt uses a qualitative descriptive analysis approach. Data collection was conducted from primary and secondary sources related to the construction of the Great Renaissance Dam, its impact on water availability in the downstream region, and the stability of the Nile River in Egypt. Primary data were obtained from interviews with competent sources in the field of water resources management and diplomatic relations between Ethiopia, Egypt and Sudan. Meanwhile, secondary data was obtained from official documents, articles, books, and journals related to the research topic. The collected data were analyzed using a qualitative descriptive analysis approach. Data were analyzed using content analysis techniques to identify patterns, themes, and interrelationships between data. Relevant data is then used to formulate findings and conclusions. To ensure the validity of the data, data verification was carried out using data triangulation techniques. This technique is done by comparing the data obtained from different sources. This is done to minimize bias and ensure data validity.

After the data is verified, data interpretation is carried out to formulate findings and conclusions. Data interpretation is carried out using relevant theories to develop strong and credible arguments. In this study, a qualitative descriptive analysis approach was chosen because it is more suitable for analyzing the geopolitical impact of water on the construction of the Great Renaissance Dam and its relation to the stability of the Nile River in Egypt. This method allows researchers to obtain a comprehensive and in-depth picture of the research topic.

RESULTS AND DISCUSSION

Egypt has complex geopolitical relationships with surrounding countries, especially in terms of water resources. Egypt relies heavily on the Nile River as the country's main source of water, and neighboring countries such as Sudan and Ethiopia also have access to the river. Therefore, the Great Renaissance Dam project in Ethiopia became a sensitive issue in Egypt's relations with

the surrounding countries (Rosecrance, 1958). The Great Renaissance Dam is a dam-building project undertaken by the Ethiopian government on the Blue Nile River, which is a branch of the Nile River. The project is expected to generate enough electricity to meet Ethiopia's domestic energy needs, and also to help the country improve its economy. However, Egypt is concerned that the construction of the Great Renaissance Dam will reduce the water supply to Egypt, which could have an adverse impact on the country's agricultural production and domestic water needs. In addition, Sudan is also worried that this project will affect the flow of water in the country (Stairs, 1970).

This has fueled geopolitical tensions between Egypt and Ethiopia, with Egypt trying to stop or curtail the project and Ethiopia defending its decision to go ahead with construction. Several countries, including the African Union, have tried to facilitate negotiations between the two countries, but so far no solution has been found (McLuhan & Deutsch, 1965). These tensions also affected the construction of the Great Renaissance Dam, as the project had to pass through areas of high geopolitical tension. In addition, Egypt has threatened to use military action to protect its water supply, which could exacerbate the situation (Deutsch et al., 2015). In the context of water geopolitics, the conflict between Egypt and Ethiopia continues, and a solution that satisfies all parties has yet to be found. This shows the importance of water geopolitics in relations between countries and the need for strong collaboration to overcome the problem of dwindling water resources (Eayrs, 2012).

The Great Renaissance Dam (GERD) located on the Blue Nile River in Ethiopia is one of the largest dam-building projects in Africa. The project has significant environmental impacts, including changes to river flow and water quality. The following are some of the environmental impacts arising from GERD development: (1) Changes in the flow of the river: The construction of this dam causes the flow of the Blue Nile to change, especially in terms of water discharge. This has an impact on countries located downstream, such as Sudan and Egypt, which are highly dependent on water sources from the Nile River. Changes in this flow can affect the life of river biota, irrigation, and drinking water supply (Ganoulis, 2006). (2) Water quality: The water quality in the Nile River was also affected by the development of the GERD. These dams can cause a decrease in dissolved oxygen and an increase in nutrient levels, especially phosphorus and nitrogen, in the water. As a result, water quality can decrease and affect aquatic life and the availability of clean water for domestic and agricultural purposes (Shoker et al., 2001). (3) Sedimentation: Construction of dams can reduce sedimentation in rivers that flow downstream. These sediments are important for maintaining the fertility of the soil along the Nile River. Without

sufficient sedimentation, the fertility of the soil along the Nile can decrease, impacting agriculture and food production in downstream countries such as Sudan and Egypt. Soils that have lost their fertility may require more agricultural inputs such as fertilizers and irrigation to produce the same yields as before (Moharram et al., 2019). (4) Impact on ecosystems: Changes in river flow, water quality, and sedimentation resulting from the construction of dams can have a significant impact on ecosystems along the Nile River. Species of fish and other aquatic life may be affected by these changes, which in turn may affect food chains and biodiversity in river ecosystems (Bond et al., 1990). 5. Flood control: One of the benefits of building the GERD is its ability to control flooding on the Nile River. These dams can help reduce the risk of flooding in downstream countries and reduce the negative impact of floods on populations and infrastructure. However, this effective flood control can also reduce seasonal flooding which brings sediment to agricultural areas along the river (Alhebsi Graduate Student -CoAuthor et al., 2015). (6) Effect of climate: The construction of dams and changes in river flow can also affect the microclimate around the dam. Changes in water flow and large reservoirs can cause changes in local weather and climate patterns. For example, large water reservoirs can lead to an increase in local humidity and changes in rain patterns, which in turn can affect plant and animal life around a dam. In addition, changes in the microclimate can also affect the lives of local communities, including agriculture, fisheries and water needs (Menga, 2017). (7) Greenhouse gas emissions: Hydroelectric power generated from GERD is considered a renewable energy source that is environmentally friendly. However, research shows that large dams and reservoirs can produce greenhouse gas emissions, especially methane. This process occurs when organic material is submerged in water reservoir water and decomposes anaerobically, releasing methane into the atmosphere. These emissions can be considered in the overall environmental impact of a dam project (Wilkinson et al., 1904).

Overall, the environmental impacts of the construction of the Great Renaissance Dam include changes in river flow, water quality, sedimentation, impacts on ecosystems, flood control, microclimatic influences, and potential greenhouse gas emissions. Management and mitigation of these impacts is important to ensure environmental sustainability and water resources for countries that depend on the Nile River, including Ethiopia, Sudan, and Egypt (Kahsay et al., 2019).

Some steps that can be taken to manage and mitigate these environmental impacts include: (a) Monitoring and management of water quality: Carry out routine monitoring of water quality along the Nile River, as well as control pollution and increase in nutrients which can lead

to a decrease in water quality and changes to the ecosystem (Sadoff & Grey, 2002). (b) Sedimentation management: Developing strategies to maintain soil fertility along the Nile River, such as implementing reforestation programs, erosion management, and eco-friendly spatial planning (Abdel-Hafeez et al., 2015). (c) Conservation of biodiversity: Protecting endemic species and vulnerable ecosystems along rivers, as well as monitoring the impact of changes in river flow on biota (Saruchera et al., 2019). (d) Research and mitigation of microclimate impacts: Carry out further research on the impact of microclimate change due to dam construction, and develop strategies to reduce the negative impacts that may arise (Sengo et al., 2005). (e) Regional cooperation: Cooperate with affected countries, such as Sudan and Egypt, to manage shared water resources in an equitable and sustainable manner. This can include information sharing, co-management of water resources, and collaboration in research and development of environmentally friendly technologies (Plebani, 2021).

By taking these steps, the Ethiopian government and neighboring countries can work together to reduce the negative impact the construction of the Great Renaissance Dam has on the environment and ensure the sustainability of water resources for the peoples of the region. The construction of the Great Renaissance Dam (GERD) not only had an environmental impact, but also had significant social and economic impacts, especially for the local people and the Egyptian economy as a whole (El-Rawy et al., 2021). The following are some of the social and economic impacts arising from GERD development: (1) Power generation: GERD is a major source of hydroelectric power and will increase the electricity supply in Ethiopia. This will help meet Ethiopia's increasing energy needs and promote economic growth and infrastructure development (Tawfik, 2019). (2) Availability of water: Egypt is heavily dependent on the Nile for its water needs, including agriculture, industry, and domestic consumption. Changes in the flow of the river generated from GERD development can affect the availability of water in Egypt, which in turn can have a negative impact on agriculture, the economy, and people's lives (Salmoral et al., 2019). (3) Agriculture: Egypt is heavily dependent on agriculture along the Nile River, and changes in river flow and reduced water quality due to GERD can reduce soil fertility and agricultural output. This can lead to decreased food production, increased prices, and food safety issues. People's livelihoods: Reduced agricultural output and reduced water quality in Egypt can have a negative impact on the livelihoods of people who depend on the agricultural sector. Farmers may face reduced incomes, while workers in related sectors, such as food processing and distribution, may also be affected (Earle & Neal, 2017). (4) Migration and conflict: Water shortages and economic hardship caused by GERD can trigger migration and conflict between

countries as well as within countries. Communities who are directly or indirectly affected by changes in river flow and decreased water quality may seek new places to live and work, which can lead to social tensions and conflicts (El Baradei et al., 2022). (5) Regional cooperation: The construction of the GERD has sparked debate and tension between Ethiopia, Sudan, and Egypt regarding the management of the water resources of the Nile River. Enhanced regional cooperation and equitable and sustainable sharing of water resources will be key to reducing tensions and ensuring economic and social sustainability for Nile-dependent countries (Merrett et al., 2003). (6) Potential for economic growth: On the positive side, GERD development can provide opportunities for economic growth, especially in Ethiopia. Increased supply of electricity generated from dams can reduce energy shortages, promote industrial growth, and create new jobs. In addition, GERD can increase flood control capacity, which will protect infrastructure and agricultural land in downstream countries such as Sudan and Egypt, and reduce the negative economic impacts caused by floods (Amr, 2013).

However, to ensure that this positive economic impact is felt by all affected parties, Ethiopia, Sudan and Egypt need to work together in managing the water resources of the Nile in a fair and sustainable way. Collaboration between countries, including the exchange of information, technology and knowledge, will be essential to addressing the social and economic impacts of the construction of the Great Renaissance Dam and ensuring the well-being of the people in the region (Hensel, 2017).

The construction of the Great Renaissance Dam (GERD) had a significant impact on the stability of the Nile River, especially in relation to water flow, water quality and the management of shared water resources. This impact affects not only Ethiopia and Sudan, but also Egypt, which is heavily dependent on the water resources of the Nile River (Ahmed, 2014). Following are some of the ways the development of the GERD affected the stability of the Nile and its impact on Egypt: (1) Water flow: The construction of the GERD changed the water flow of the Nile, which could cause fluctuations in water availability in downstream countries such as Egypt. This can affect the agricultural, industrial and domestic consumption sectors in Egypt, which in turn has an impact on economic and social stability (Lant, 2003). (2) Water quality: The construction of dams can affect the water quality of the Nile River, for example through changes in water temperature or decreased dissolved oxygen levels. This can negatively impact river ecosystems and aquatic life, which will ultimately affect the stability of the Nile. Changes in water quality can result in decreased fish catches and the ability of rivers to provide resources for human life, including clean water for consumption, agriculture and industry. This impact will be felt by Egypt, which is

highly dependent on the water resources of the Nile River to meet its basic needs (Haefner, 2016). (3). Sedimentation: GERD development will also affect sedimentation in the Nile River. The dam kept most of the sediment flowing down the river, which was important for maintaining the fertility of the soil along the Nile. Decreased sedimentation can reduce soil fertility, which in turn affects agricultural yields and ecosystem sustainability in Egypt (Muli et al., 2019). (4) Cooperation and conflict: The construction of the GERD has fueled tensions between Ethiopia, Sudan, and Egypt over the management of the water resources of the Nile River. This political instability and tensions between countries can affect the stability of the Nile River and lead to conflicts between countries or within countries, which in turn can threaten the stability and sustainability of water resources in the region. Egypt, as a downstream country heavily dependent on the Nile River, is at risk of facing even greater negative impacts from this instability (Uruena, 2008).

To overcome the impact of GERD development on the stability of the Nile River and reduce the potential for conflict, it is important for Ethiopia, Sudan, and Egypt to enhance regional cooperation in water resources management (Gabr & Mandour, 1991). Steps that can be taken include: (a) Equitable and sustainable distribution of water resources: The three countries need to work together to develop a mechanism for the equitable and sustainable sharing of water resources, which takes into account the needs and priorities of each country (Eamen et al., 2021). (b) Exchange of information and knowledge: Collaboration in terms of exchanging information, technology and knowledge related to water resources management will help reduce tensions and increase shared understanding of the impacts and benefits of GERD development (Del Castillo-Laborde, 2009).(c) Enhancement of diplomacy and dialogue: Diplomacy and constructive dialogue between the countries involved will be key in resolving differences and overcoming tensions. Negotiations that are carried out in a peaceful and fair manner can help reach an agreement that benefits all parties and reduces the risk of conflict. Engaging international organizations and neutral third parties, such as the African Union or the United Nations, can help facilitate the negotiation process and create an environment conducive to reaching a just and sustainable solution (Stephen C, 2019). By increasing cooperation, diplomacy and dialogue, the countries involved in the construction of the Great Renaissance Dam can overcome the negative impact on stability of the Nile and reducing the potential for conflict. This joint effort will ensure the sustainability of Nile River water resources and the well-being of people in Ethiopia, Sudan, and Egypt (Fathi & Zaki, 2003).

CONCLUSION

The geopolitical impact of water on the construction of the Great Renaissance Dam (GERD) and its relation to the stability of the Nile River in Egypt is quite significant. GERD affects water resources in the region, creating changes in water flow, water quality, sedimentation, and social and economic impacts for countries that depend on the Nile River, especially Egypt. The construction of the GERD has fueled tensions between Ethiopia, Sudan and Egypt over the management of the Nile River's water resources. This political instability and tensions between countries can affect the stability of the Nile River and lead to conflicts between countries or within countries. In order to reduce negative impacts and ensure the sustainability of the Nile River's water resources, it is important for the countries involved to enhance cooperation, diplomacy and dialogue. Measures such as the fair and sustainable distribution of water resources, exchange of information and knowledge, as well as the role of international organizations and neutral third parties in the negotiation process will help create win-win solutions for all parties.

The construction of the GERD has significant water geopolitical impacts, especially related to the stability of the Nile River in Egypt. To overcome this impact and ensure the sustainability of water resources, the countries involved, especially Ethiopia, Sudan and Egypt, need to increase cooperation, diplomacy and dialogue. Measures such as the equitable and sustainable distribution of water resources, the exchange of information and knowledge, and the involvement of international organizations and neutral third parties in the negotiation process will be key to creating win-win solutions and ensuring ecological, economic and social sustainability in the region. the Nile River area.

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