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# Analysis Of The Impact Of Jakarta-Rotterdam Sister City Cooperation In Flood Water Management

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***Abstract***

*Flood is a problem that often occurs in Jakarta and has encouraged Jakarta to collaborate with Rotterdam in the Netherlands thru Sister City which also has the same problem, but now Rotterdam has become a flood-free city. This cooperation is carried out on the basis of the similarities shared by Jakarta and Rotterdam. In conducting this research the authors used qualitative research methods. By collecting various information related to the Jakarta-Rotterdam cooperation from previous research and all sources from the internet, this research seeks to analyze its impact by looking at several aspects including environmental, developmental, transportation, political, and economic aspects. In this study the authors use the concepts of paradiplomacy, sister city, and water management. From this research, it was found that although this sister city collaboration has not been able to reduce floods one hundred percent, still, this collaboration has brought several good impacts.*

***Keywords:*** *Flood, Jakarta, Rotterdam, Sister City*

## Introduction

Along with the development of the times, interaction in international relations has also developed, until the term sister city emerged, where the interaction of foreign cooperation is no longer carried out only by the central government. The city or regional government has the opportunity to carry out foreign cooperation relations, which of course is for the interests of the city or region. Sister City is also known as Twinning City which means twin cities, where there are similarities between the 2 parties who work together (Chandra, 2017).

In other countries such as Moscow, Russia calls the term sister city only used for cooperation between two cities that were once part of the Soviet Union (fractional countries). According to the ex-Soviet Union countries, the terminology for referring to sister cities can be used if the country has had historical relations in the past (heritage) and is emotionally strong. Other mentions of the term sister city that they use include Jumelage, partnership city, friendship city, partnertstald, and twin cities (Gunawan, 2019, 16). There have been many cities/regions in Indonesia that have collaborated with sister cities, one of which is Jakarta. Jakarta is the largest city that has carried out a lot of sister city collaborations with cities/regions abroad. The problems that occurred prompted Jakarta to work together to deal with these problems. One of the problems of the city of Jakarta is flooding.

Floods are a frequent problem in the capital city of Jakarta, especially during the rainy season. This phenomenon is usually marked by the overflow of reservoirs

or waterways such as reservoirs and rivers, creating stagnant water in places where it shouldn't be. Flooding can also be interpreted as an inundation phenomenon that occurs in flat lowland areas that were previously not inundated. Floods are caused by overflowing river water which can no longer be dammed because the river discharge exceeds the capacity of the river due to high rainfall (Sang Ariyora et al., 2015).

Floods in Jakarta have often occurred, and the 3 main causes are:

**1. Flood Rob**

There has been an increase in tidal flooding due to land subsidence in northern Jakarta. Vulnerable to being hit by sea tides (rob). Usually, this happens around the Jakarta waterfront or coastal areas.

**2. Shipment Flood**

Jakarta has thirteen rivers. It will carry rain that has a high intensity from upstream, namely what happened in Banten and West Java to Jakarta. Before the water ends up in the sea, it will flow through Jakarta, while the capacity of the rivers in Jakarta is insufficient to hold water due to the high-intensity rains so they flow and cause flooding.

**3. Local Rain Flood**

If there is local rain in Jakarta which has a high intensity and for a short period, it will potentially cause flooding. Drainage dimensions in Jakarta can only accommodate 120 mm per day. Meanwhile, if there is a rain of high intensity and with a period that is not short, it will cause the drainage to become over capacity (DKI Jakarta, n.d.).

This article discusses Jakarta and Rotterdam, which are collaborating with sister cities because they have similarities. Jakarta and Rotterdam are both located in the lowlands and have flood problems. In 1953 there was a major flood in Rotterdam, and from that time technology was developed to manage water which later produced results, as evidenced by Rotterdam being a city free from flooding (Arisandy, 2017). The transportation network of the two cities is equally good. Not surprisingly, because Rotterdam is the second largest city in the country of the mill, the Netherlands, which has the largest port in the European region, is even the busiest no longer in the European region, but in the world (Universitas Stekom Pusat, n.d.). Holding an important role as the location of the busiest and most influential port, of course, Rotterdam must continue to develop its technology and water management. This city, which is located in the south of the Netherlands, has actually been carrying out urban development since after World War II. However, a development that focused on downtown infrastructure began to be carried out optimally after Germany lifted its foot in 1945. After about eight years of only focusing on downtown infrastructure and paying little attention to water infrastructure networks, on February 1, 1953, there was a flash flood that hit The Netherlands, Belgium, and England is referred to as the Great North Sea Flood

event. This flood event killed more than 1,800 people because the water covered 160,000 hectares of land in the South of the Netherlands. So, the Great South Sea Flood certainly made the Dutch government start developing water network infrastructure and studying water management to prevent the same flood from happening again.

The development of a flood prevention infrastructure network carried out by the Dutch government is summarized in the Delta Works project which focuses on the construction of dams, sluice gates and storm surge barriers allocated on the Rhine, Meuse and Scheldt rivers (Esteban et al., 2020). The Netherlands is serious about working on the Delta Works project so that the storm surge barrier named Oosterschelde becomes the largest flood prevention infrastructure in the world with 62 floodgates. In addition, the Delta Works project has been named the most prestigious hydraulic engineering project according to the Rijkswaterstaat in 2013 and is also included in the Seven Wonders of the Modern World. This very clearly illustrates the success of the Netherlands, especially Rotterdam in the history of handling the floods that occurred in their territory.

In working on this paper, the authors adopt some existing knowledge from several previous studies. Arisandy (2017) whose research title is "*Kerjasama Sister City Jakarta Rotterdam dalam Penanggulangan Banjir Jakarta"*, where from this research it is known that the problem of flooding is not something that can be completely avoided, but preventive measures can be taken to reduce the impact caused by flooding. There are several ways to prevent flooding that Rotterdam has shared with Jakarta, namely by implementing two project components including operation and maintenance and capacity building. Even though the sister city cooperation carried out by Jakarta and Rotterdam has ended, problems regarding flooding in Jakarta still occur in Jakarta. Therefore, Jakarta still has to make other efforts so that the problem regarding this flood can be dealt with immediately. It also requires community participation to deal with this flood.

The second discussion is contained in Gunawan's thesis (2019) entitled *"Kerjasama Sister City Antara Daerah Khusus Ibukota Jakarta Dengan Kota Rotterdam Dalam Upaya Penanggulangan Banjir Periode Tahun 2010-2015"*. In this study, the results were similar to the research conducted by Arisandy (2017) in that the problem of flooding has not been thoroughly handled. However, the problem of flooding can be prevented in several ways that are obtained through this collaboration. The prevention methods suggested by Rotterdam are Capacity Building, Dutch Training and Exposure Program (DUTEP), as well as Operation and Maintenance.

Discussion of the collaborative relationship between the sister cities of Jakarta and Rotterdam is also discussed in Leyte (2022) entitled *"Cities bouncing forward – A multiple case study on the balance of the resilience dimensions reflected by the policy arrangements in Jakarta and Rotterdam"*. In this research, it is discussed how the resilience of the cities of Jakarta and Rotterdam in the face of climate change. The

two cities also have two different patterns where Jakarta's balance of resilience is more dominated by adaptability or the ability to reduce the impact of climate change. Meanwhile, Rotterdam has shown a balanced resilience which leads to robustness or the ability to reduce the possibility of climate hazards. The two regions have shown two different patterns in dealing with climate change, where Jakarta has only been able to reduce the impact while Rotterdam has been able to prevent climate change from occurring. This is due to the history of the Netherlands which has prepared mature infrastructure to tackle climate change, especially floods.

Furthermore, the author also received additional knowledge from the research of Peranginangin (2020) entitled *"The Implementation of Paradiplomacy Through Sister City Cooperation Between Jakarta and Rotterdam in Resolving Flood Disaster"*. This research discusses the dynamics of para-diplomacy that occurs between the City Government of Jakarta and Rotterdam. This research is descriptive and qualitative in nature, which explains the process of the collaboration, the realization of the collaboration, as well as several factors in it. From this study, the results were similar to those of previous studies, in that the floods that occurred in Jakarta had not been completely resolved. However, the impact of the flood can be reduced with the prevention efforts that Jakarta gets from this collaboration.

Then to add insight into writing this research, the author also draws from Putuhena and Ginting's research (2013), with the title *"Pengembangan Model Banjir Jakarta atau Development on Jakarta Flood Modelling System"*. This research discusses the development of an integrated model between hydraulic and hydrological models to find out the flood model experienced by Jakarta and evaluate the effectiveness of alternatives for flood control in Jakarta. Where the hydraulic model that has been built is then calibrated with flood data in 2007 and validated by flood data in 2008. From the calibration and validation, it results that the development of the flood model is good enough to deal with the flood behavior experienced by Jakarta. From previous research, no one has analyzed the impact of cooperation between Jakarta and Rotterdam in flood water management from environmental, development, transportation, and political aspects.

The author also gets additional knowledge from the writings written by Fathun and Sari (2018) regarding a book review entitled *"Disaster Diplomacy: How Disaster Affects Peace and Conflict"*. Where it is presented about how and why a disaster can produce or not produce conflict or peace, both after and before the disaster occurs. To see beforehand what happened before, Disaster Diplomacy refers to mitigation, prevention, and loss reduction and also tries to intersect with what happened before on the scene. Meanwhile, to look at the aftermath of a disaster, Disaster Diplomacy focuses on emergency response, reconstruction and recovery. Disaster Diplomacy is more about looking at situations where there is a conflict or peace from those affected by the disaster. Apart from that, another part of Disaster Diplomacy is that when the results obtained are not satisfactory, then we have to

see if it is possible that this can change the existing situation. This study also discusses various natural disasters that can affect diplomacy. Problem Formulation are about what is the impact of cooperation in flood water management to optimize the potential of the Jakarta-Rotterdam sister city?. This research aims to analyze the impact generated by the sister city cooperation between the governments of Jakarta and Rotterdam in flood water management. This research can be a source of information for the academic community, especially the International Relations study program in studying the effectiveness of the sister city program in advancing a city through sustainable paradiplomacy activities.

## CONCEPTUAL BASIS

### 1. Paradiplomacy Concept

Paradiplomacy is an activity related to foreign countries or foreign parties. This activity is almost the same as diplomacy, except that it is carried out by sub-state entities or local governments. This paradiplomacy is carried out with the aim of specific regional interests. The concept of paradiplomacy is a continuation of globalization, where as globalization develops, more and more non-state actors will take roles in international relations (Octavia, 2017, 690). So that not only does the central government carry out diplomacy, but the regions also contribute to advancing their territory through paradiplomacy activities.

In Indonesia, there are laws that regulate paradiplomacy activities. It is in Undang-Undang No. 32 of 2004, which contains the authority of autonomous regions to carry out foreign cooperation. Article 42 paragraph 1 states that DPRD has the duty and authority to give approval to plans for international cooperation to be carried out by regional governments (Octavia, 2017, 690). In this research, the paradiplomacy cooperation carried out by the City of Jakarta and Rotterdam is in the form of a sister city program. This program has been running since the signing of the MoU (Memorandum of Understanding) by Mr. Fauzi Bowo who served as Governor of DKI Jakarta at that time with the Mayor of Rotterdam, Mr. Ivo W. Opstelten on June 12, 2008 at the Jakarta City Hall Building. The cooperation period lasted from 2008 to 2010.

### 2. Sister City Concept

Sister city is a term commonly used to refer to cooperation between cities in Indonesia and cities in other countries. The cooperation is broad in nature, has an official agreement, and has a long term. In the Peraturan Menteri Dalam Negeri (Permendagri) No. 1 of 1992, it was explained that sister city is a cooperation program implemented by the government under the central government, namely the government equivalent to cities, regencies, and domestic administrative cities with city governments that are at the same level overseas. The main purpose of carrying out this sister city activity is to advance the two cities that work together through the experiences of each city in solving problems. Each city can share

experiences, ideas, and strengthen good government relations (Arisandy, 2017, 981).

Several fields that are often used as programs for sister city cooperation include the economic sector which includes investment, trade, employment, and science and technology. The social and cultural fields which cover education, health, arts and sports, as well as various other forms of cooperation required and approved by the two relevant city governments. In this research, we will discuss the sister city collaboration carried out by the City of Jakarta and the City of Rotterdam in managing flood water, so that this will enter the field of science and technology and is a program that is approved by both parties of the city government. Here, the City of Jakarta needs Rotterdam's assistance in flood water management technology.

**3. Water Management Concept**

Water Management is a water management process that has planning and design. Water management does not only focus on managing water resources, but also focuses on flood management. The concept of water management includes policies and strategies, clean water management so that it can be consumed by the public, techniques for managing water resources, modeling and simulating water management tools, laws that regulate water management processes, paying attention to water use from an economic and social perspective, as well as ways to control floods by paying attention to urban and building structures. The difference between the focus of water resources management and flood management is that water resources management focuses on managing clean and suitable water for public consumption, while flood prevention is an effort made to overcome flood problems and alleviate the resulting impacts such as casualties, infrastructure and environmental damage, property damage, and other disturbances, for example, in the socio-economic field (Arisandy, 2017, 980).

This concept is in accordance with the research that will be discussed regarding the sister city program conducted by Jakarta and Rotterdam in managing flood water. Several strategies that can be implemented to tackle flooding include managing spatial planning and urban planning, regulating water volume/discharge, anticipating flood-prone areas by facilitating the flow of water, and urging the public to participate in preventing flooding by adhering to flood prevention regulations.

## RESEARCH METHODS

This research, which looks at the cooperation between Jakarta and Rotterdam as a paradiplomacy phenomenon, uses a qualitative research method with reference to existing literature studies sourced from the internet. By selecting sources whose credibility is guaranteed, this research can be accounted for. Not using statistical tools in this study, which is then called using qualitative research methods (Ardianto, 2019). According to Miles, Huberman, and Saldana (2014), the qualitative method itself is a research method which states that the activities carried

out in the analysis are interactive and continuous until finished so that data saturation occurs where there is no more data and new information. Adhering to the above understanding, this method is compatible with the research we are conducting because the period of cooperation between Jakarta and Rotterdam regarding flood water management has ended so that the data is saturated or final.

## DISCUSSION

Indonesia has considered the Netherlands as a partner, where various cooperation has been carried out for a very long time, even having a long history. The foundation of the relationship between Indonesia and the Netherlands is also quite strong, especially since the Netherlands has acknowledged politically and morally the Proclamation of Indonesian Independence. Because the relationship between the two countries has been going on for quite a long time, quite several agreements have been produced that Indonesia and the Netherlands have agreed on (Filovia, 2021). The cooperation between Indonesia and the Netherlands then continued to develop, even today. After the development of cooperation, namely sister city cooperation, there is sister city cooperation from the two countries, specifically cooperation between Jakarta and Rotterdam. The sister city cooperation between Jakarta and Rotterdam is based on the similarities between the two big cities. The similarities are as follows:

1. **Topographical location**

Jakarta and Rotterdam are both located in the lowlands. The location of Jakarta and Rotterdam is below sea level, and Rotterdam's land surface is even lower if we compare it to the city of Jakarta.

2. **Big City**

Jakarta and Rotterdam are big cities in their respective countries. Jakarta is the largest city in Indonesia and is known as the capital city, while Rotterdam is the second largest city in the Netherlands.

3. **Problem commonality**

Floods are the same problem in these two big cities. Not much different from Jakarta, Rotterdam is also experiencing problems in terms of climate change related to water management. Where there was an increase in sea level because the glaciers in the Alps melted which resulted in a major flood in 1953.

4. **Good Transport Network**

The transportation network of the two cities is equally good. Because Rotterdam has the largest port in Europe, making Rotterdam the economic center of the Netherlands. Jakarta is the largest city in Indonesia with a relatively good transportation network. It is not surprising since these two cities are major cities in the country.

Jakarta and Rotterdam have been Sister Cities since 1986 to cooperate in the fields of museum management, waste management, and flood management for the 2008-2010 period. This cooperation is contained in the MoU signed by the two cities

on August 1, 1986. Although the flood management cooperation between the two cities has ended, at the U20 Mayor Summit 2022 meeting yesterday, Jakarta and Rotterdam discussed it again considering that Jakarta still experiences frequent flooding. The Mayor of Jakarta, Anies Baswedan said that his meeting with Rotterdam Mayor Ahmed Aboutaleb at the U20 forum mostly discussed water management because of the prominent similarities between the two cities, which are both cities on the coast. Rotterdam is considered to be more expert in dealing with floods because the Netherlands continues to develop its water technology so that the Great North Sea Flood of 1953 that killed more than 1,800 people does not happen again. Notable examples of Rotterdam's water management technology are the construction of the Water Square in Benthemplein and the creation of The Dakakker. The Benthemplein Water Square is a square basin that serves as a reservoir or water storage when heavy rain falls. The capacity prepared for this excessive rainwater is estimated at 1,700,000 liters of water. Later, the excessive water collected will be gradually channeled into the ground and nearby channels for play and exercise. Meanwhile, The Dakakker is a vegetable and fruit plantation planted on top of the Schieblock Building. This plantation can function as a rainwater-absorbing sponge that can reduce global warming and as a way to optimize existing land. The Dakakker on top of the Schieblock Building, Rotterdam became the first roof that can be used as a plantation in the Netherlands and is one of the largest in all of Europe. These perfect technologies are what make Rotterdam confident even though almost 80% of Rotterdam is above sea level. This knowledge of Rotterdam's water management technology is invaluable for Jakarta, especially when we look at the last ten years where Jakarta's flooding has gotten worse and worse.

This technological advancement was owned by Rotterdam, which then encouraged Jakarta to establish sister city cooperation with Rotterdam. The sister city cooperation that occurred between Jakarta and Rotterdam was carried out in 2008-2015 to cope with flooding, which began with the signing of the MoU and continued with the donation of several heavy equipments to Jakarta and the promotion of three programs, namely the Deutsch Training and Exposure Program (DUTEP), Capacity Building, and Operation and Maintenance. Where the DUTEP Program itself is a capacity-building program for Jakarta Provincial Civil Servants who work in the field of water management, which this program has the support of the Royal Netherlands Embassy and is carried out by a consortium consisting of the Jakarta and Rotterdam city governments, Waterboard Defland, Van Oord, Nufic Neso Indonesia, and also the Rotterdam University of Applied Sciences. Furthermore, the Capacity Building program is a development program by way of training for human resources who carry out work on dredging projects regarding the correct dredging techniques, as well as a development program for the community so that the community also participates in flood management programs carried out by the government. In addition to the two programs already described,

the next program is the Operation and Maintenance program. Operation referred to here is a program to provide knowledge in operating the technology donated by Rotterdam, namely the Rotating Drum Separator and dredger (Floating Bulldozer). Meanwhile, maintenance refers to various activities to improve facilities such as damaged embankments and pumps, dredging waterways so that they can accommodate water capacity as before, and for long-term maintenance a database is also created (Gunawan, 2019).

This sister-city cooperation has had an impact on Jakarta, where there has been a reduction in the percentage of flooding in Jakarta for the northern and eastern regions by around 30%. This has affected around two million people who live in these areas. In addition, the impact of this cooperation can also be seen in the faster reduction of floodwater inundation than during floods in the past few years. This is shown by the reduction in the survival time of the floodwater from 72 hours to 14 hours. In addition to the reduction in flood time, the flood height for some points has also decreased. During the big flood in 2007, where at several flood locations, the water depth reached five meters, which resulted in around 60% of DKI Jakarta being submerged by floods. Then in 2008, the flood water level ranged from 10-160 cm; in 2009 the flood water level ranged from 5-257 cm; in 2010 the flood water level ranged from 100-175 cm; and in 2011 the flood water level ranged from 40-50 cm (Arisandy, 2017). From the data that has been described, it is very clear that from 2008-2011 there has been a decrease in flood water. It can be concluded that the sister city cooperation carried out by Jakarta-Rotterdam is quite effective and has had an impact on the decreasing percentage of floods in several areas of Jakarta, then the faster time for floods to recede, and the decrease in water levels during floods.

Although it can be said to be quite effective, several things make Jakarta still experience flooding, especially when rainfall is high and causes flooding to worsen. The first thing is due to the low enthusiasm and participation of the community in the flood management process even though socialization has been carried out and many billboards about flood alerts have been installed. This can be seen from the fact that people still often throw garbage in rivers and waterways and some residents who live on the banks of the river still refuse to be relocated. The second thing is the topography of Jakarta itself, which despite various efforts, flooding can still occur. Where the condition of Jakarta is a lowland with an average altitude of 7 meters above sea level, then 40% of the Jakarta area is also below sea level, passed by many rivers, and has high rainfall in the January-February range. In addition, Jakarta's spatial and regional development plan has also deviated from Jakarta's original master plan. This has led to land development in Jakarta that is not by its designation and capabilities, as well as not considering the problem of flooding (Gunawan, 2019). Therefore, flooding in Jakarta still cannot be handled one hundred percent despite the Jakarta-Rotterdam sister city cooperation.

By establishing a sister city cooperation with Jakarta, the impact or benefits received by Rotterdam are economic and cultural exchanges and collaboration in the field of education. The occurrence of this economic exchange means that this cooperation has increased opportunities for economic relations between these two cities. Where many companies in Rotterdam and Jakarta can make partnerships and investments in each of these cities. This can also help improve the economy and encourage the creation of new business fields. In addition to economic exchange, this cooperation also encourages cultural exchange between Jakarta and Rotterdam, so that Rotterdam can add insight and knowledge about Indonesian culture, especially Jakarta. This can happen because of various cultural exchange programs, for example with art exhibitions, traditional music performances, and various other cultural events, which can enrich the cultural repertoire for Rotterdam and also increase appreciation of Jakarta's culture. In addition, this cooperation has created opportunities for collaboration of educational institutions for Jakarta and Rotterdam. This is implemented by student exchanges, joint research, and various other academic programs that make the educational experience in Rotterdam more diverse. Of course, this also allows Rotterdam to exchange knowledge and practices in science with schools and universities in Jakarta.

The conversation between Anies Baswedan and Ahmed Aboutaleb on water management, food, inflation, and sustainable development sparked the possibility of collaboration between the two cities. In addition, this collaboration also has an impact on how the two cities conduct further paradiplomacy activities. The relationship between Jakarta and Rotterdam is still going well today. This is evidenced by the fact that in 2022, Ahmed Aboutaleb as the Mayor of Rotterdam visited Jakarta for U20 (Urban 20 Forum) purposes. He took a walk accompanied by Anies Baswedan around on foot. The Mayor of Rotterdam enjoyed his trip around Jakarta and felt there was a difference between the old Jakarta and the current Jakarta. He spent more time outside to enjoy his trip in Jakarta than spending time in his room (Naufal, 2022).

Apart from discussing the impact felt by Rotterdam, this paper will also analyze the impact of the cooperation on Jakarta from several aspects, namely:

**Environment**

The cooperation between the City of Jakarta and Rotterdam has a significant impact on the environmental conditions of Jakarta. This is because the technologies that will be used in the program require the initial step of repairing and cleaning all waterways in the Jakarta area. Of course, this first step will have a good impact on Jakarta's environment because the waterways will be cleaner than before, thereby reducing the potential for flooding. In addition to the cleaning program carried out by the government, this sister city collaboration also encourages the community to participate and create a community of environmentalists, for

example, Green Community and Sobat Bumi Indonesia Indonesia (Arisandy, 2017, 989). This will certainly change people's bad behavior and habits toward the environment. The floating bulldozer and rotating drum separator technology distributed by the Rotterdam government also significantly brought changes to the environmental conditions of Jakarta. This floating bulldozer or dredger technology is a tool for dredging sludge and waste. The dredger has been used on various rivers in Jakarta such as the Ciliwung River, Mati River, Pademangan Barat, and Pandangan Lima. The dredging activity succeeded in dredging 76 Jakarta canals, including 95,000 cubic meters of solid waste that had been successfully disposed of at the disposal site (Arisandy, 2017, 990). This dredging is an improvement for Jakarta which in previous years could only remove waste from the embankment. The success of the waste dredging program in Jakarta's rivers certainly has an impact on the cleanliness of the water in the Jakarta area, given the large amount of water that is polluted by waste. Then, the Rotterdam government's rotating drum separator, which functions to separate waste from sediment, also succeeded in cleaning up the garbage that had settled in the sediments of Jakarta's rivers.

According to Lembaga Ilmu Pengetahuan Indonesia (LIPI), the main cause of flooding in the Jakarta area is urban planning errors (Megapolitan Kompas, 2014). The city of Jakarta was not built to adapt to natural conditions from the start. Jakarta should have two areas for green space (water catchment area) in the south and blue space (water catchment area) in the north of Jakarta. However, the reality is that Jakarta is very densely populated by buildings and structures. The difficulty of absorbing water, coupled with the massive extraction of groundwater, has resulted in a decrease in Jakarta's land surface. This also ultimately affects the condition of the rivers in the Jakarta area. Some of Jakarta's rivers are shallow due to land subsidence. According to the staff of the geotechnology research center, Dr. Ir Jan Sopaheluwakan, land subsidence makes the river shallow and produces coarse deposits, thus affecting the drainage function which is quite small in size and filled with garbage (Megapolitan Kompas, 2014). This cooperation program between Jakarta and Rotterdam is quite helpful in overcoming the problems of sediment and garbage in the Jakarta rivers. Back to remembering the flood disaster that hit the city of Jakarta in 2007, causing the embankment in the West Flood Canal or Banjir Kanal Barat (BKB) to break, this event was caused by poor drainage plus high rainfall which flushed the capital city area. The overflowing water also submerged residents' housing and the city area. Several areas in the Jakarta area, such as Jatibaru, Tanah Abang, and Petamburan, were submerged by floods as high as 2 meters due to a breach in an embankment (Merdeka.com, 2021). As a result of the flood, nearly 82,150 square meters of Jakarta's streets were damaged. The damage suffered was quite diverse, ranging from small potholes to quite deep roads, as well as asphalt that had been peeled off due to water erosion. West Jakarta experienced the worst road damage reaching 22,650 square meters, then in North Jakarta road damage reached 22,520 square meters, Central Jakarta reached 16,670 square

meters, and the lightest road damage occurred in the East Jakarta area, which was only 11,090 square meters (Merdeka.com, 2021).

**Development**

If you look at it from the development aspect, the floodwater management cooperation between Jakarta and Rotterdam has certainly increased significantly. In preventing and managing flood waters as well as sustainable development caused by floodwaters, the first step taken by Jakarta and Rotterdam is to provide knowledge to the people of Jakarta to improve the quality of human resources. The knowledge provided is in the form of daily behavior that can be implemented in preventing flood problems to improve the mentality of the general public to dredging training and the application of large equipment for the DKI PU team called the UPT (Technical Implementation Unit). To attract the attention of the people of Jakarta regarding this flood issue, the governments of the two cities must do this slowly but surely in an interesting way. The steps taken by the government include making banners and billboards regarding the rules for disposing of waste properly, holding inter-regional cleanliness competitions and competitions for making handicrafts that use waste, and creating waste banks that serve as separators between organic and non-organic waste. so that people have an understanding of sorting out recyclable and non-recyclable waste (Gunawan, 2019, 56).

After ensuring that human resource development had been carried out, Jakarta and Rotterdam began to move on to physical development, such as infrastructure that could prevent and deal with the problem of flooding that often occurs in Jakarta. With Rotterdam's experiences, the city government from the Netherlands advised Jakarta to carry out maintenance activities, meaning that it needed to repair existing facilities such as rebuilding damaged embankments and pumps, developing databases as part of a long-term maintenance program, and dredging. river to restore its water-holding capacity to pre-damage levels. Floods which occur most often during the rainy season, are alerted by the repair of embankments and pumps. Damaged water pumps, such as in North Sunter and Pluit, are repaired so they can suck up stagnant water. The knowledge facilities provided by Rotterdam are certainly very useful for sustainable development regarding Jakarta's flood waters. Especially if we look at Jakarta's conditions during the floods in the years before 2008 or the years before the two cities finally formed a partnership. Apart from being caused by high rainfall, in the past, flooding in Jakarta was usually caused by the construction of a drainage system that was not well designed. In addition, the people of Jakarta do not know how to maintain the existing drainage system. The government also does not evaluate the maintenance of flood water prevention infrastructure, so the government does not know which infrastructure has been damaged. Therefore, the development suggestion that was first suggested by Rotterdam was to carry out maintenance activities for existing infrastructure

that only need to be repaired. Bearing in mind that if we build from scratch or buy new infrastructure, the costs that will be incurred will be very high.

**Transportation**

Jakarta has a relatively good transportation network, and this is not surprising because Jakarta is the largest city in Indonesia, even the cities around it have had a good impact on the transportation network. This is evidenced by the KRL Commuter Line which is a rail transportation system that can take residents to the nearest city. In the Jakarta-Rotterdam sister city collaboration, 3 experts from the Rotterdam Gementee were brought in so they could teach the DKI PU team to improve human resources. Such as the provision of provisions to try to deal with flood problems, to dredging training. The knowledge gained is also useful in infrastructure development (Arisandy, 2017). Jakarta gets ideas for development, one of which is the development of transportation infrastructure. In addition, the modification of the TransJakarta route (BRT and non-BRT routes) due to the flooding that occurred in Jakarta is one of the measures to divert, one of which comes from the Rotterdam cooperation (CNN Indonesia, 2020). East Jakarta is one of the areas affected by flooding which has drainage channels of up to hundreds of thousands of meters, namely 893,000 meters of drainage channels (Sari, 2018). The condition of Jakarta's transportation in 2008 was backward, where flood problems often had many impacts, one of which disrupted the mobility of Jakarta's residents. Many problems have arisen as a result of flooding in Jakarta, such as traffic jams. Previously, Jakarta's drainage conditions were not good enough, but over time, drainage revitalization in Jakarta has been carried out. This was not spared from the provision of insights gained, one of which was the result of the collaboration between the sister cities of Jakarta and Rotterdam.

**Political**

The existence of this sister city collaboration program has an impact on diplomatic relations between the two cities, namely Jakarta-Rotterdam, and also bilateral relations between Indonesia and the Netherlands. This is evidenced by the signing of the MoU which focused on various programs regarding water management as well as the exchange of delegations sent by each city. Sending official delegations carried out by the two cities will then increase political dialogue between the two political officials in the two cities. In addition, this will also have an impact on the strengthening of bilateral relations between the countries of each of these cities, namely Indonesia and the Netherlands. Aside from being a means of strengthening diplomatic relations and bilateral relations, this sister-city collaboration is also a place for the two cities to exchange experiences and information about flooding and ways to deal with it, which includes maintenance and dredging programs. From the exchange of experience and information this then resulted in three series of cooperation. With the existence of the MoU and

several cooperation programs, it will certainly affect the political field which will enrich perspectives and approaches to making decisions in the future.

**Economy**

The city of Jakarta is a region that is the center of the economy of Indonesia. Flood problems certainly greatly affect the economic sector that takes place in the surrounding area. Therefore, the cooperation in flood water management carried out by Jakarta and Rotterdam also has an impact on the economy, especially in the Jakarta area. The Capacity Building program was carried out to strengthen the quality of human resources and attract community participation in the Jakarta area first. This program succeeded in empowering the community to manage used waste such as plastic waste to make valuable handicrafts. Of course, this will create a creative economy in the Jakarta community. Communities that had experienced economic problems due to flooding slowly revived their economy. Before this cooperation in flood water management, Jakarta's economic condition had deteriorated due to flooding. If we look back, Jakarta experienced the biggest flood in the last three centuries, in February 2007 to be precise. The total economic losses experienced by Jakarta at that time reached more than IDR 4.1 trillion. Losses were also experienced by Indonesian businessmen, with total industrial losses reaching IDR 1 trillion in just five days since the floods occurred. This flood also had an impact on the macroeconomy. Starting from the increase in the prices of necessities, causing a higher inflation rate (Kurniawan, 2008). Floods also disrupted economic activity in stock trading on the Indonesia Stock Exchange (Kurniawan, 2008). This was because the news that Jakarta was experiencing a major flood spread widely throughout the world, thus affecting the intentions of investors who became reluctant to make buying and selling transactions on the stock exchange.

**Conclusion**

The research that we have described is sister city cooperation between Jakarta and Rotterdam to overcome flood problems. The reason for choosing the City of Rotterdam as a partner in this sister city collaboration is due to the success of the City of Rotterdam in dealing with floods. However, it is also the result of nearly 200 years of Rotterdam hard work to build flood management infrastructure. In this collaboration, Rotterdam donated several heavy equipment and also provided several tips for tackling floods in Jakarta. This is reflected in several programs that were run during the sister cities of Jakarta and Rotterdam. Some of these programs are the Deutsch Training and Exposure Program (DUTEP), Capacity Building, and Operation and Maintenance. Where in each of these programs, in outline it contains improvement and development programs both in terms of building infrastructure and the community. In other words, Rotterdam is helping Jakarta not only in procuring heavy equipment to revitalize rivers in Jakarta, but Rotterdam is also helping Jakarta to develop its human resources so they can participate in flood

prevention. However, the various efforts made in the Jakarta-Rotterdam sister city collaboration have not been able to optimally overcome the flood disaster that occurred in Jakarta, so that floods in Jakarta still occur frequently. This is also due to several factors, namely the lack of public awareness and the topography of Jakarta which is prone to flooding. Even so, the existence of this sister city cooperation has brought good impacts in several fields. These fields include the fields of environment, development, transportation, politics and the economy. In the environmental field, the impact of this collaboration is that the waterways and rivers in Jakarta are getting cleaner due to technological assistance from Rotterdam. In the field of development there has also been a significant increase both in terms of infrastructure and human resources. Furthermore, in the field of transportation there is also an increase in transportation infrastructure such as the modification of the Transjakarta route. Apart from that, the political sector also received a good impact from this cooperation, namely the strengthening of diplomatic relations between the two cities which of course could have an impact on increasing bilateral relations between Indonesia and the Netherlands. Other impacts are also felt in the economic sector where economic activities can run smoothly since the intensity of the floods can be reduced.

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