

RETURNING SUNDANESE CULTURE TO ACHIEVE RIVER SUSTAINABILITY TO CIKAPUNDUNG RIVER USING AGENT-BASED SIMULATION

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Abstract

City Cikapundung River is one of the water supply sources for Bandung City, it flows from the north to the south of the city. Over the years the environment of the river had been decreasing in the context of the water quality and the urban problem. Recently at the beginning of 2016, the mayor of Bandung City launched the new face of the river, as well as the river bank. A water recreation has been developed in the form a park, namely Cikapundung Park. This project is aiming at finding out possible active participation of surrounding community and government facilitation required in assisting the sustainability of Cikapundung Park. We develop survey protocols to collect information and opinions not only from people who lived around the river, but also several communities from various age in Bandung City, as well as from authorities of the city, academics, and researchers. At the end of the project, recommendation will be sent to the mayor of Bandung City as the initiator of the park.

Keywords: *Cikapundung Park, Cikapundung River, Bandung City*

1. Introduction

Indonesia is a beautiful archipelagic country blessed with plenty of water. It is surrounded with extensive oceans and seas while the interior is enriched with rivers spreading from Sabang to Merauke. Some of these rivers are: Musi River, Batanghari River, Kapuas River, Citarum River, Cisadane River, Ciliwung River, and many more. Generally, the use of water from the rivers play an important role in the daily lives of Indonesian people. Extensive uses are in farming, industry, households, livestock, and many more. In the old times, rivers played an important role in the economy by serving as a route for the merchants passing through it. The population growth in Indonesia in sync with the economic boom in the industrial and farming divisions had negative effects on the environment, especially rivers.

These negative effects are the results of immense waste contaminating the rivers. It doesn't only contaminate the river's ecosystem, but it also decreases the water quality and causing the rivers to overflow, The surplus water has devastated the country with, floods in all areas in Indonesia, including historic and charming Bandung City.

The city of Bandung itself has its own river named Cikapundung River. This river is divided into two parts by a railway, north and south. In terms of topography, the north side of the river is more fortunate than the south when the river starts to overflow because of its lower elevation. The south side is further burdened by its populous land which is surrounded by trash making the Cikapundung River bunged up and dirtier than ever.

Addressing these river problems, the Government of Bandung City tried to revitalize the Cikapundung River. In the first attempt, the revitalizing program failed because of local resident protests. As soon as the government changed, the revitalizing program was restarted and it succeeded. Resulting in a beautiful park named Teras Cikapundung II.

This effort is expected to restore this neglected river into a river that once was clean and pride of the city that upheld the Sundanese norms and customs.

One of the Sundanese traditions is the implementation of the *Tri Tangtu di Buwana* and *Warugan Lemah*. The *Tri Tangtu* itself consist of Kabuyutan ritual (*larangan*), residence constructions (*tutupan*), and livelihood places (*garapan*). As for *Warugan Lemah*, it tells the procedures of construction patterns in Sundanese people's environment. Both traditions are increasingly faded in Sundanese people's environment.

This paper will attempt to conduct a research about the impression of Sundanese people towards the local wisdom of Cikapundung River in the city of Bandung.

2. Content

The purpose of this research is to find out about social dynamics of Sundanese people in Cikapundung River, the city of Bandung, and the relation between Cikapundung river's people's social behavior and piles of trash around the river. As for another purpose is to find out the reason why people throw their trash in the river and introduce

one of Indonesian's culture, which is Sundanese customs and culture, to people around the world. Methods of the research are as follows:

- [1] Aerial Analysis
- [2] Interviews and Observation
- [3] Sundanese Customs and Culture
- [4] Agent-based Simulation

3. Results of Experiments

[1] Aerial analysis

Based on the aerial view from Google Maps, it can be seen that traditional people such as Baduy and Kampung Naga tend to use the river more than urban people.



Figure 1. Teras Cikapundung (2007)

The picture above is an aerial photo of Teras Cikapundung that was taken from Google Maps via satellite in 2007. It can be seen that the population density around Teras Cikapundung is really high, causing erosion towards the river and making it way smaller than before. Furthermore, the color of the river in the picture above looks very black because of citizens throwing waste in the river. The waste thrown in the river can be caused by a lot of factors, one of them are because the amount of waste thrown is relatively same with the amount of population in the area.



Figure 2. Kampung Naga



Figure 3. Baduy

A huge difference can be seen that Kampung Naga and Baduy people are well-structured than urban people in the picture before. This traditional village is more structured than urban area, the amount of people is not as much as there either. So that the population density is encouraging people to throw they trash aimlessly. Kampung Naga and Baduy, seen from above, have such clean river. There are many differences between rural and modern people towards river conservation.

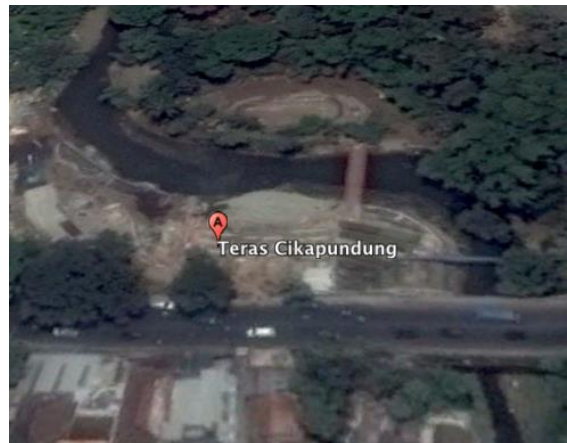


Figure 4. Teras Cikapundung (present) 1

However, after Teras Cikapundung was present, a drastic difference can be seen. There was a change in the area which is dirty, neglected, and full of trash, into a clean and neat area. It is seen from above Teras Cikapundung shows that a river that was once narrow, it's wide now. The colour also looks different to a better one.

[2] Interviews and Observation

Based on the observation results, we can conclude that the Cikapundung River is a brown-colored- river congested with trash. We witnessed rubbles in the form of plastics, wood, leaves and astonishingly even a mattress. The right and left sides of the river is concreted and house fronts. There is hardly any distance between the houses and the river which makes it appear very dense. Many houses do not have a septic tank, which

means the waste produced by the houses directly enter the river through the drainage pipes. In the settlement areas, observers noticed house helpers throwing wastes directly in the river. Unfortunately, when it rains, the water of Cikapundung River will rise even higher than ever, carrying even more trash in it.

After conducting interviews of some people living around Cikapundung River, we can appreciate the significant degradation of Cikapundung River past to present. According to the first respondent, one of the native inhabitants, when he was young, the Cikapundung River water was used for showering because it was really clean. The Cikapundung River was also used for swimming by the neighborhood kids in the 1970s. The number of houses build around the river wasn't many. Now, the river looks unbearably dirty and is used as a trashcan. The citizens are very unaware of the damage caused by their trash and seemingly don't care about the existing rules around them provided by the government. He thinks this kind of attitude leads to a very negative image of that people for lacking respect for rule of law. He also hopes that the river can be cleaned as soon as possible.

A similar opinion is also voiced by the second respondent. He thinks that the Cikapundung River now is really dirty and emits an unpleasant smell. The low initiative embraced by the citizens towards how clean the river is one of the reasons why the river is so dirty. Long ago, there were a taboo prohibiting people to throw waste or trash into the river, even though the existence of the taboo wasn't part of their tradition. The taboo started to disappear over time and was replaced by the rules provided in the area warning anyone caught throwing waste or trash into the river, a fine of IDR 200,000 (USD 16 in current exchange rates). Even though these rules exist, there are still citizens throwing trash into the Cikapundung River.

[3] Sundanese Customs and Culture

From the old times, Sundanese people seek settlement near the river as their residence, thus brought up until now, where people like to live near the river, including Cikapundung river.

Sundanese customs of river are different, between the traditional and modern people. After conducting interviews, the old Sundanese customs and culture once still upheld Tri Tangtu and Warugan Lemah, now simply has become a paradox. People who lived near Cikapundung river actually knows that Tri Tangtu and Warugan Lemah are proper Sundanese norms, but they don't apply them. However, different from other traditional people, they still hold firm the Sundanese customs such as Tri Tangtu and Warugan Lemah, hence their residence are well-structured and doesn't pollute the river. The population density is also different between the

traditional and modern people. Traditional people have population ratio standard with their land area so there will be no overpopulation that will cause their river to be polluted.

[4] Agent-Based Simulation

From the indicator above, we can see that the garbage per population often increases. It also indicates the water dirtiness and the garbage per population is comparable, as for the decreasing process is caused by the community cleaning the trash around. The residence in this simulation is designed according the Sundanese customs *Tri Tangtu* and *Warugan Lemah*

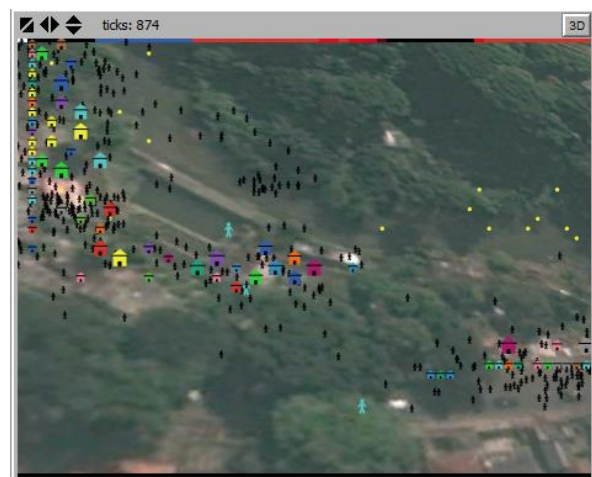


Figure 2. Teras Cikapundung simulation (before)

After being put into simulator, the results are as follows:

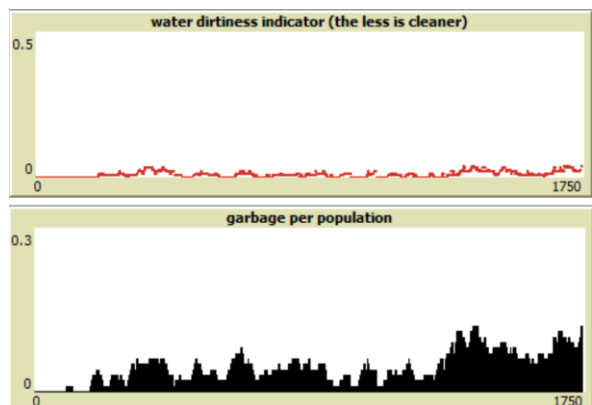


Figure 1. Graphic of Teras Cikapundung (before)

From the indicator above, we can see that the garbage per population often increases. It also indicates the water dirtiness and the garbage per population is comparable. As for the decreasing process is caused by the community cleaning the trash around.

However, after the Teras Cikapundung was made:

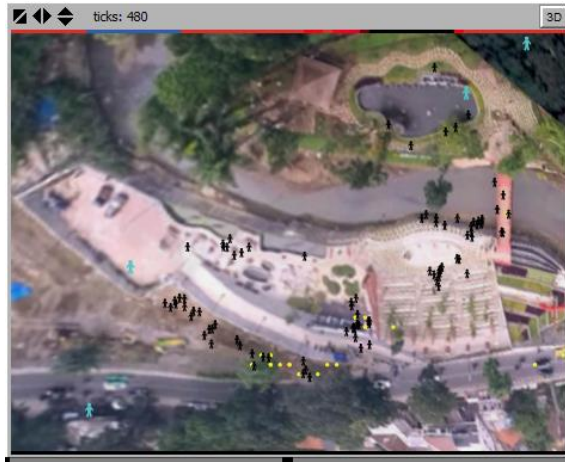


Figure 3. Teras Cikapundung (after)

After being put into simulator, the results are as follows:

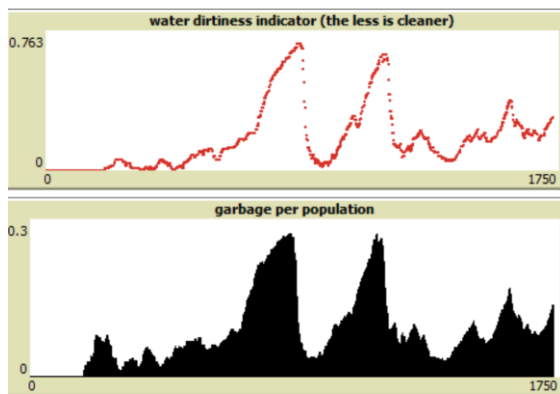


Figure 4. Graphic of Teras Cikapundung (after)

It can be seen from the indicator above that the water dirtiness indicator is low and remain constant. Even though, the amount of garbage per population is just as much. This is caused by the community's responsibility to be concern over the visitor's activities. The Teras Cikapundung is able to reduce the amount of trash disposed to the river.

4. Conclusion

Based on our research, when we use the simulator, we can see that there is a relation between how much wastes there is in the river with the density of the population. The waste spread in the river is caused by the social activities from the citizens and how unconcerned they are with the river they are living nearby. We can see the difference between the Cikapundung River now and then from our aerial analysis, observation, and interview, and put it on a simulator, the Cikapundung river is much more better when there's the park, minimize citizens. Even, visitors to throw away trash to the river. As for the next generation, the application of this project will bring goods to people around Bandung for using good, uncontaminated, and high quality water for their lives.

5. References

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