

# **Citarum Harum Project: A Restoration Model of Citarum River Basin**

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## **Abstract**

The problem of waste and sewage and the existence of the strategic Citarum River by splitting West Java Province are very supportive of economic growth, especially labor-intensive industries. Citarum, which is known as one of the dirtiest rivers in the world, urges the government to immediately issue regulations to start the restoration of the Citarum River Basin (DAS Citarum), that is Presidential Regulation No. 15 of 2018 concerning Acceleration of Pollution and Damage Control in the Citarum River Basin. Various steps and methods were taken to restore the Citarum watershed, as well as communication and coordination of the central government with various related parties such as the Environmental Service Office (DLH) of the West Java Provincial Government and Kodam III Siliwangi to be enhanced to immediately realize Harum Citarum program.

**Keywords:** Citarum River, DAS Citarum, DLH, and Kodam III Siliwangi.

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## **Citarum Harum Project:**

### **A Restoration Model of River Basin**

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#### **I. Introduction**

The Citarum River Region is a Cross-Provincial River Region designated as a National Strategic River. The management of it must meet the raw water needed by the capital of the Republic of Indonesia, and has a major impact on national development in the social, environmental and economic fields. The Citarum River water is used to fulfill human needs as a source of domestic water, agricultural irrigation, industrial activities, and drinking water sources of residents of Metropolitan Bandung, Cianjur, Purwakarta, Bekasi, and Karawang. The Citarum River also fulfills 80% of Jakarta's raw water needs, where the DKI Jakarta's raw water supply of 16.1 m<sup>3</sup>/s comes from the Bekasi River and West Tarum Canal.

The location of the Citarum River which divides West Java Province is very strategic in supporting economic growth, especially labor-intensive industries. This causes a very rapid process of urbanization and land conversion as an area of economic activity built. However, the development of the population in the Citarum River Basin has been out of balance with the increase in population awareness in preserving the environment. In the last twenty-five years, the condition of the Citarum River has declined with various complex problems occur in the upstream to downstream areas. Various negative impacts have increased accumulatively, ranging from forest encroachment, erosion, sedimentation, domestic waste, industrial waste in the upstream area, pollution of reservoir water due to sedimentation of floating net cage fish feed, as well as flooding and decreasing water quality and quantity in all river areas. This is a big challenge for the government, business entities and the community in unraveling the complexity of the problems in the Citarum River towards the Citarum Harum River.

In 2014, the Government of West Java Province analyzed indicators of poor ecosystem conditions in the Citarum River, such as the high burden of river water pollution, the increasing extent of critical land, the declining quality of river water and the increasing frequency of flood events. As a result of the decline in water quality is low health sanitation infrastructure facilities, disruption of strategic infrastructures such as hydropower dams and raw water providers. In an effort to restore the Citarum River ecosystem, the Government of West Java Province launched the Citarum Bestari Movement (Clean, Healthy, Sustainable and Beautiful) in the form of a Multiparty Action Implementation Action Plan (RAM-IP), and is stipulated in Governor Regulation No. 78/2015. The Citarum Bestari Program involves various stakeholders, such as OPD in West Java Province, Kodam III Siliwangi, West Java Regional Police, Regency/City Government and BUMN (state-owned enterprises) where the source of funding comes from the State Budget (APBN), Provincial and Regency/City Budget (APBD), CSR and other funding sources.

#### **II. Basic Concept**

The study on the Citarum River to create "Citarum Harum" is basically emphasized on the ecological restoration approach in the Citarum River Basin. Ecological restoration itself is a practical management strategy that restores

ecological processes to maintain the composition, structure, and function of ecosystems (Apfelbaum, 2014: 2). In case of ecological restoration is not carried out, based on available experiences, biodiversity in the river basin would be declining and disappearing over several years (Wilson, 1988). Therefore, ecological restoration is very important to restore the natural condition of Citarum.

The ecological restoration prefers different perspectives and approaches to ecosystem management: restoration is carried out with regard to the condition of regional ecosystems, so as to reduce the risk of regional ecosystem degradation. Yonzon and Hunter (1991) explain that the degradation of regional ecosystems could cause a decrease in the production of natural resource commodities, which results in reduced diversity and the number of species in the ecosystem.

Conventional restorations that had been done is generally oriented to human because conventional restoration occurs to satisfy human. Henceforth, ecological restoration is intended to design a restoration strategy that ultimately minimizes human intervention so that nature and the environment are maintained while still being able to meet human needs. Ecological restoration is considered successful if it results in a full understanding of ecological deficiencies in the ecosystem (Apfelbaum, 2014). In carrying out restoration, it must be recognized the dominance of human values in setting restoration goals. In addition, historical conditions which are important references to understand the composition, structure, and function of modern ecosystems must also be considered so that information from as many sources as possible is important. The experiences of the restoration and interpretation process from various sources will contribute as historical information to reveal future trends, and as a basis for understanding the past, future, and potential future (Apfelbaum, 2014).

### **III. Research Method**

The research method used in the Citarum Watershed restoration study is a qualitative study using the Observation and FGD (Focus Group Discussion) method. Observation is basically an activity carried out to create the need for additional methods and theoretical perspectives in order to be able to explore a problem, issue, case, or study being carried out (Ciesielska dan Jemielniak, 2018:34). Observation is an activity of collecting data or information that must be done by direct observation of the place to be investigated (Arikunto: 2006). In addition to using the observation method, the study of Citarum Harum also uses the FGD method which is intended to complement the data or material obtained from the case being investigated.

FGD is a method for obtaining data and information through group or individual meetings to explore issues or problems that are being studied or investigated. FGD is the social interaction of a group of individuals who can influence each other and produce data and information (Hollander, 2004). Hence, the using of two methods: observation method and the FGD method in the study of Citarum Harum are two mutually reinforcing methodologies for deepening and finding solutions to the problem being examined.

### **IV. Results and Analysis**

#### **4.1. Problem Identification**

According to the results of water quality monitoring by the Ministry of Environment and Forestry, 68% of river water quality in Indonesia is classified in the heavily polluted category. River water quality monitoring is an effort to control pollution in river water, to prevent the spread of diseases caused by water pollution.

Pollution in the Citarum River is mainly generated from industrial waste and domestic waste dumped into the Citarum River. Therefore, the current handling of waste is emphasized more about investments in the purification of waste and waste; not only cleaning mechanically but must also be chemically and biologically (Hamid, 2018:24). Water quality standards are regulated in Government Regulation of the Republic of Indonesia No. 82 of 2001 on the Management of Water Quality and Water Pollution Control. In the regulation, water quality is classified into 4 classes:

1. Class I, water that is designated as raw water for drinking water, and/or other designation that requires water quality that is the same as the used.
2. Class II, water that is intended for water recreation infrastructure/facilities, freshwater fish farming, animal husbandry, water for irrigating crops, and/or other designation that require the same water quality as these uses.
3. Class III, water that is intended for the cultivation of freshwater fish, aquaculture for irrigating crops, and / or other designations that require the same water quality as these uses.
4. Class IV, water that is intended to irrigate crops and or other uses that require the same water quality as the purpose.

The parameters used to monitor and determine river water quality are divided into physical, chemical and microbiological parameters. Physical parameters consist of turbidity, color, taste, odor, temperature, and Total Dissolved Solids (TDS). Chemical parameters consist of pH, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrates, Nitrites, Sulfates, hardness, and dissolved metals. Biological parameters consist of total coliform and *Escherichia coli*. In the results of river water monitoring, the status of water quality must be quantified and demonstrated by a single index of water quality that can be directed to operational strategies for sustainable river management. Water quality status is the level of water quality that shows the condition of a water source in a certain time and compared with the specified water quality standard.

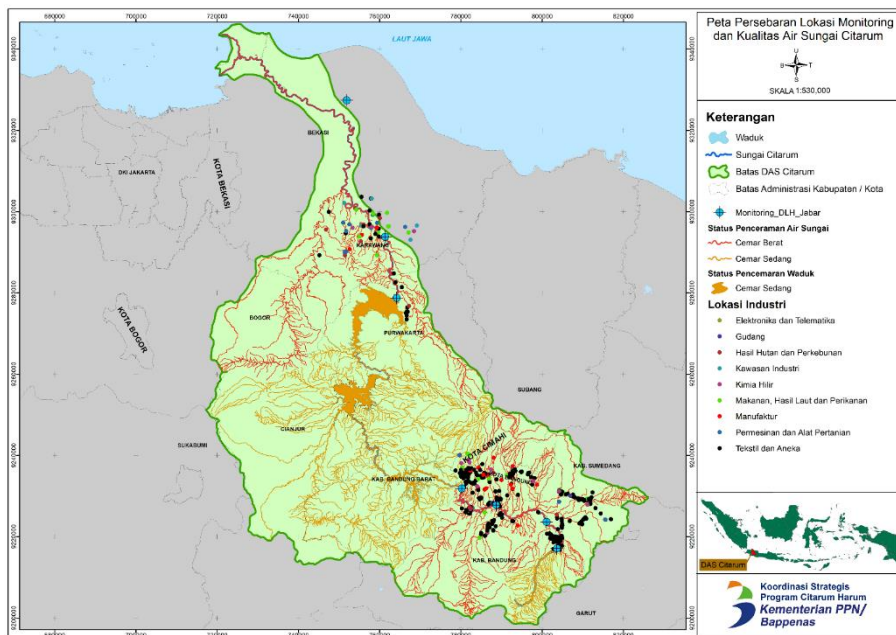
Along with technological developments, water quality monitoring can be carried out by real-time method. River water quality parameters can be detected through sensors in monitoring instruments. This real time monitoring allows water quality data to be recorded in minutes or hours, so it can be monitored anytime and anywhere. Realtime water quality monitoring is also an effort to monitor wastewater draining without treatment to river bodies by irresponsible industries.

In the Citarum River, real-time monitoring of river water quality has not yet been implemented. The Office of Environment of West Java Province (DLH Jabar), as a stakeholder in the field of environment, still monitors water quality conventionally, by taking samples to water bodies. In 2017, DLH Jabar conducted Citarum River water testing 5 times in 7 locations. The test is conducted in May to October 2017. In determining its quality status, West Java DLH uses the Pollution Index method. The quality status parameter classes obtained are Meet the Quality Standards, Lightly Polluted, Mediumly Polluted and Heavily Polluted. The following is the location of water quality monitoring by the DLH Jabar:

**Table 1.** Locations of Water Quality Monitoring by DLH Jabar

No	Locations
1	Wangisagara
2	Koyod
3	Cisirung Water Treatment Plant
4	Nanjung
5	Jatiluhur Reservoir Outlet
6	Walahaer Weir
7	Tunggak Jati

Source: The Office of Environment of West Java Province



**Figure 1.** Water Quality Monitoring Location Distribution Map of Citarum Watershed

Sources: The Office of Environment of West Java Province, The Office of Industry and Commerce of West Java Province (2017). Processed by Bappenas Strategic Coordination Team of Citarum Harum

Besides the DLH Jabar, the Citarum River Basin Authority (BBWSC) also has authority in managing water resources, as well as monitoring the water quality of the Citarum River. Similar to the DLH Jabar, BBWSC still conducts testing by taking samples directly into the river and has not yet implemented water quality monitoring technology in real-time. In 2017, BBWSC tested water quality 5 times in 40 different locations. The test was conducted from July to November on the Citarum River and its tributaries. In determining its quality status, BBWSC uses the Pollution Index method with parameter classes that meet the quality standards,

mildly polluted, moderately polluted, and heavily polluted. River water quality testing is carried out by BBWS Citarum, from the Upper Citarum (starting from Cisanti Springs to Nanjung), Middle Citarum (Cilalawi to Cirata Reservoir), and Lower Citarum (from Cikao-Sasak Beusi to the Bungin Branch). BBWSC tests the water quality of the Citarum River by measuring physical, organic and inorganic chemical parameters in grades 1 through 4 in accordance with water quality standards in Government Regulation of the Republic of Indonesia No. 82 of 2001.

Based on water quality monitoring data from DLH Jabar and BBWSC, it can be seen that water quality monitoring in the Citarum River is still very minimal. Water quality monitoring is carried out only at a few locations, especially DLH Jabar which only has 7 monitoring locations. In addition, the river water sampling method is carried out in a conventional manner, both agencies have not used technology to monitor river water quality in real-time. On the other hand, environmental violations that pollute river water quality are increasingly prevalent.

#### **4.2. Issuance of Presidential Decree**

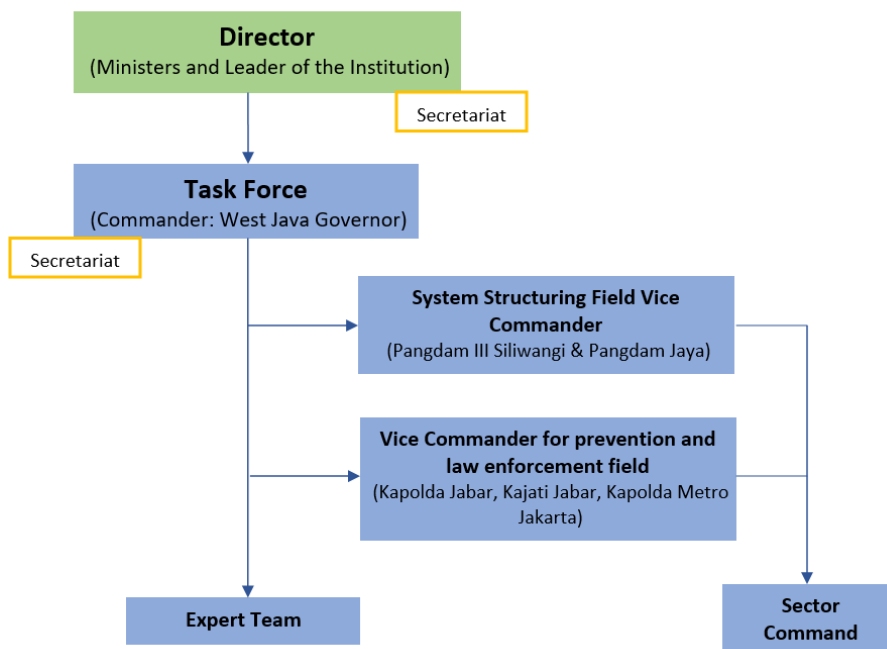
Based on facts and findings from various stakeholders, environmental pollution and ecosystems damage in the Citarum Watershed have caused great losses to health, economy, social, ecosystems, environmental resources and threaten the achievement of environmental protection and management goals. On the other hand, the Citarum River as a national strategic river is a unified whole natural ecosystem from upstream to downstream that must be protected and managed as well as possible and must be optimally developed and utilized for the greatest welfare of the people. Therefore, for the prevention of pollution and damage to the Citarum Watershed, it is necessary to take an integrated strategic pace for control and law enforcement that integrates the authority between government agencies and stakeholders related to the recovery of the Citarum watershed. To accelerate and support the process, a Presidential Decree No. 15 of 2018 on the Acceleration of Pollution and Damage Control in the Citarum River Basin was issued.

The deterioration of river water quality caused by a lot of industrial activities, domestic activities, as well as livestock that discharges its waste directly to Citarum and its tributaries without being treated. Ideally, ecological restoration should work on a larger ecosystem and ecotone mosaic (Apfelbaum, 2014). Therefore, Presidential Regulation No. 15 of 2018 contains the main substances which are as follows:

- a. The division of tasks and responsibilities of the Central Government, Regional Governments, Indonesian National Armed Forces (TNI), Indonesian National Police (POLRI), and other parties in Citarum River management.
- b. Determination of the operational structure of the Citarum Harum activities and operations.
- c. Improving regulations for strengthening law enforcement.
- d. Establishing supporting policies for plans to deal with social problems and plans for the jobs changing of people within the Upper and Middle Citarum.
- e. Involving the active role of the community through community empowerment.

In its organization, the Citarum Watershed Task Force consists of a Steering Committee and Field Unit (Satgas). The directors consist of the Coordinating Minister for Maritime Affairs as Chair, the Coordinating Minister for Politics, Law and Security as Deputy Chair I, the Coordinating Minister for Economic Affairs as Deputy Chair II, the Coordinating Minister for Human Development and Culture

as Deputy Chair III and 19 other central agencies as members who have duties in accordance with their respective authorities.



**Figure 2.** Organization Structure of Citarum River Task Force

Based on his assignment to Presidential Decree No. 15 of 2018, the Minister of National Planning Development/Head of Bappenas is tasked with making plans and programs for the integrated management of the Citarum Watershed in the national development planning document, as well as conducting a review of the implementation of the Citarum Watershed integrated management priority program. Meanwhile, the Satgas commanded by the Governor of West Java has the authority to determine the action plan to control pollution and damage to the Citarum watershed based on the policies set by the Steering Committee. In this case, Bappenas has the task to coordinate with the Satgas for the preparation of a coordinated action plan for the integrated management of the Citarum Watershed.

In the organizational structure of the Satgas, there are two deputy commanders: the deputy for ecosystem management and the deputy for prevention and law enforcement. Commander of 3<sup>rd</sup> Military Region Command/Siliwangi (Kodam III/Siliwangi) and Commander of Jayakarta Military Region Command/Jakarta (Kodam Jaya) assumed responsibility as Deputy Commander for Ecosystem Management. Thus, the Citarum River Basin along the 269 km from upstream to downstream is divided into 23 sectors which are commanded by TNI Officers as Sector Commander (Dansektor).

Dansektor and its personnel focus on conducting socialization and coaching to local residents as well as carrying out activities to stop pollution and damage in the Citarum River. In addition, the Kodam III/Siliwangi Field Units are also authorized to request data/information and conduct inspections to factories or industries along the Citarum River Basin. West Java Regional Police Chief (Kapolda

Jabar), West Java Provincial Prosecutor's Office (Kajati Jabar), and Metro Jaya Regional Police Chief (Kapolda Metro Jaya) get the responsibility of Deputy Commander for Prevention and Law Enforcement, whose duty are to prevent environmental pollution by individuals and groups (industry) and to act against environmental pollutants reported by Dansektor and other parties in accordance with applicable laws and regulations.

#### 4.3. Priority Issue

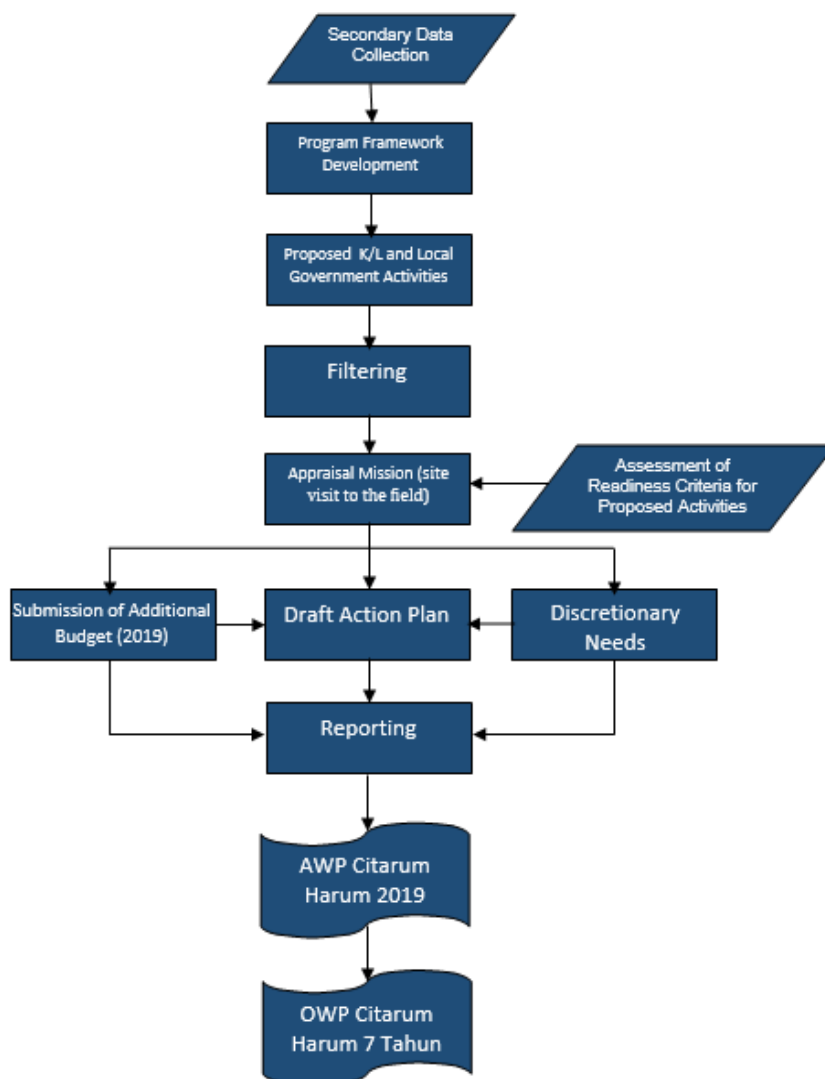
The follow up of Presidential Decree No. 15 of 2018 is the preparation of work programs or action plans to resolve priority issues that develop in the Citarum River. Therefore, on March 21, 2018, the Minister of Planning and National Development and Commander of Kodam III/Siliwangi agreed on five priority activities in the Citarum Harum Program which were carried out in 2018 - 2019. The determination of the five priority activities was based on the Citarum Roadmap has been compiled and the findings of facts in the field by the government, the military, journalists and the public.



**Figure 3.** Priority Activities 2018 – 2019

Based on the 5 priority programs above, Bappenas conducts research and analysis to develop a program framework to support the acceleration of damage control in the Citarum Watershed.





**Figure 4.** Flowchart for Action Plan of 2019-2025 Drafting

In compiling the action plan, secondary data from the Central Government (K/L) and Local Government (Pemda) is needed. Data collected based on 5 priority activities in 2018 - 2019 and based on secondary data from K/L and Pemda data; the Task Force compiled a program framework that was adjusted to 5 priority activities. Afterward, the Task Force invited the K/L and the Pemda to the Multilateral Meeting to discuss the proposed activities of each agency that supports the Citarum Harum Program. Furthermore, the proposal is adjusted to the program framework that has been prepared. To follow up the proposed program, the Task Force conducted an appraisal mission to review the readiness criteria of the proposed program. The results of the appraisal mission are used as material for review and analysis as a consideration of whether the activity is a priority or not.

Referring to the agreement of 5 priority between Head of Bappenas and Chief of Siliwangi Army Forces, the budget for Citarum Harum action in the year of 2019 is mostly allocated in the Priority 5. Priority 5 is a clean water supply and flood risk reduction, which accounts for 769.44 billion IDR. Participation from other institution, to support the other priorities are still low, especially the priority of water quality monitoring systems and waste management (including modernization of garbage disposal). It is concerning as those components are the main issue in the management of Citarum Watershed.

Execution of program in the Priority 5 is done by BBWS Citarum, including the rearranging of the riverbanks, increase the river flow capacity in 4 locations, finishing the Nanjung flood tunnel, construction of Cisangkuy floodway and routine maintenance of 20 Citarum tributaries. Studies and analysis performed by the team show that the physical component of river management could be decreased (both the budget and volume of work) and in exchange to increase the effort on the upstream conservation, and waste and garbage management.

#### 4.4. Citarum Harum in the Medium Term National Development Plan (RPJMN) 2020-2024

Aside from the waste and garbage pollutants, the land-use change as a direct effect from the increase of population in the basin is another challenge for Citarum watershed management. A substantial number of people live in the upstream area, where the landscape is terranes, rely on agriculture as their source of income. However, many of them do not own land and converting the forest and land cover with trees into an agricultural area. The conversion stress to the land with tree coverage keeps increasing (Hamid, 2018:68). This is the basis, that restoration of Citarum upstream watershed are part of the RPJMN 2020-2024.

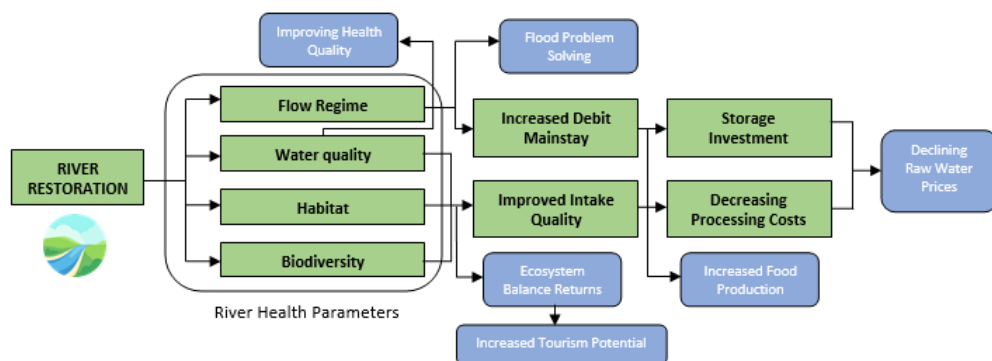


Figure 5. River restoration

Source: Directorate of Water Resources and Irrigation, Bappenas

Presidential decree Number 15 the Year 2018 on the acceleration of pollution and degradation control of Citarum Watershed is also incorporated in the RPJMN 2020-2024. The target is to restore and conserve the ecosystem of 15 critical watersheds, which are Asahan, Siak, Musi, Way Sekampung, Citarum, Ciliwung, Cisadane, Bengawan Solo, Serayu, Brantas, Moyo, Kapuas, Jeneberang, Saddang, dan Limboto. The strategies are:

1. Zoning regulation
2. Water quality monitoring
3. Wastewater treatment

3. Garbage disposal management
4. Water and land conservation
5. Flow Management

If the Citarum Harum program is successfully executed, the program can be adapted to other 14 priority watershed, considering that:

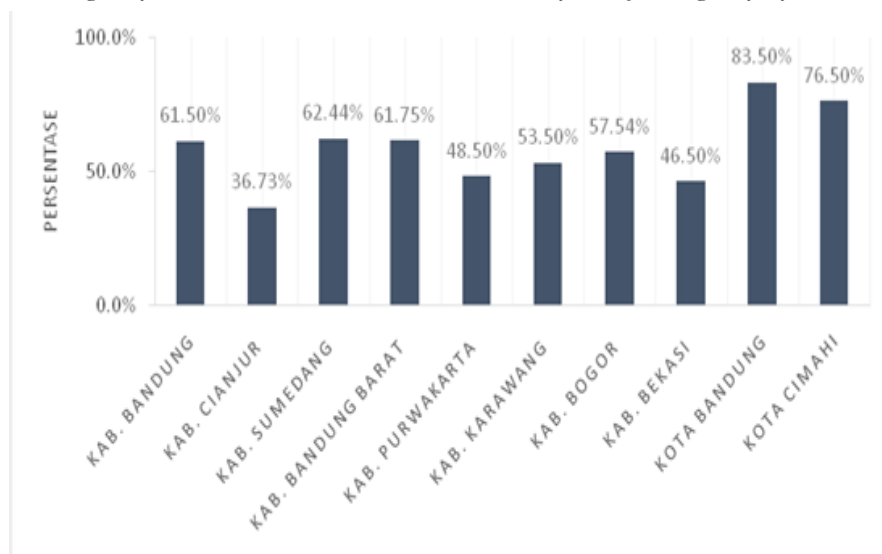
1. If the watershed restoration requires army troops, it should also involve the Ministry of Defense to ease the coordination for budget planning.
2. River restoration normally runs for 20 years or more. Therefore the output of the program might not be achieved within the one-term presidency. To ensure the continuity, the program should no be under a presidential decree, but to be under the law
3. In the execution, the task force for River Restoration should have the right to access and use the state/regional budget.
4. All water resources should be managed based on the "one river one management and one consolidated planning" principle.

#### 4.5. Citarum Restoration

##### 4.5.1. Modernisation of a garbage disposal system

Problems of Citarum river are complicated and interlinked between one issue and another. The problem that can be witnessed in daily activity is the garbage disposal by the residence. Lack of awareness and understanding of the issue of health, and also lack of garbage management infrastructure result in garbage disposal into the river body by the surrounding community.

Garbage disposal in the river also one of the main contributors to Citarum flood, aside from erosion and sedimentation. Referring to the garbage management data in the Citarum watershed by Housing and Settlement Department of West Java, in 2017 only 58.85% of garbage is managed. The highest percentage is by Bandung City which covers 83.5% and the lowest by Cianjur Regency by 36.73%.



**Figure 6.** Percentage of garbage management service in Citarum Watershed

Source: West Java Housing and Settlement Department, 2017

Aside from the coverage, the quality of infrastructure also needs modernization. One example is in Bandung City. The garbage disposal facility of Sarimukti was built without any facility or technology as it was built as an emergency facility. In the future, Bandung metropolitan needs a garbage disposal facility and must be well planned in advance, sufficient to manage all disposal, and use the latest technology which lessens the environmental impact. The planned garbage disposal facility will be (Garbage disposal and recycle facility (TPPAS) Legok Nangka. The facility will be built and operated in the scheme of public-private partnerships. The project will be funded by JICA and the financial close will be finished by the 4<sup>th</sup> Quarter of 2019 so that the sooner construction work can be started by then. With the planned construction work for 2 years, the TPPAS Legok Nangka will operate by 2021.

Additional to the modernization of garbage disposal facilities, the government reduces the amount of garbage from the source with the concept of 3R (*Reduce, Reuse, Recycle*). The government will increase the number of local garbage recycle units (TPS3R) so that the volume of garbage transported into the disposal facility can be reduced. However, the issue arises in the development of TPS3R, which is the availability of land. As in the technical guidelines of TPS3R by the Ministry of Public Works and Housings year 2017 minimum area required for TPS3R is 200 m<sup>2</sup>, with minimum capacity for 400 houses. In reality, providing such an area of land in the cities (in Citarum watershed) is difficult. To accelerate this strategy, the regional army authority are required to scan potential area and land available for the local recycle unit.

A challenge arises when the potential spaces proposed by the army unit are located along the riverbanks, which are regulated by the river basin authority (BBWS). BBWS does not recommend the use of riverbanks, as in the Ministerial Decree Number 28 the year 2015, any buildings along the riverbank must be demolished.

#### **4.5.2. Deforestation in the upstream of Citarum Watershed**

Forest resources in West Java are in big stress, leading to functional degradation. The stress factors such as illegal logging, conversion into agricultural function and forest fire. The tree also caused by a substantial amount of villages in the upstream of Citarum, where the population density is relatively high, and the ownership of land are limited. Most of these people rely on the forest and turn it into agriculture. The conversion is irreversible. The land degradation (erosion) decrease fertility, and also reduce productivity in the downstream region, such as hydropower, aquaculture, and industry.

Increase of critical land in Citarum Watershed caused by deforestation and agricultural conversion also as a result of improper planning and control. The critical land led to erosion and an increase of sedimentation in the downstream. The sedimentation decrease the capacity of the river channeled to the overflowing and flooding. In addition, the conversion of land into a settlement (as a result of rapid population growth) also reduces the infiltration capacity. Also, residence tends to exploit the landscape and water resources.

Ecosystem management in the upstream of Citarum Watershed is not only a technical aspect but rather social. 95% of the community in Kertasari District work as a farmer with limited land ownership. Still, 90% of the land owned by the state (Perhutani and PTPN VIII), and the rest 10% is private. On the other hand, chance other than the agricultural sector is limited, so the change of profession for the

community is still challenging. Here are some strategies for the conversion of Citarum upstream watershed:

- (1) Creating a database of the farmers who uses the state land,
- (2) Re-arranging the land-use, following the available space and the needs of the community,
- (3) Formulation of a community group to ease the training and raising awareness process;
- (4) Commodity conversion to accelerate the independent community economy.

The use of land in the upstream of Citarum watershed should be prioritized for agroforestry. Agroforestry is a concept that combines the tree and plantation or agriculture, so the economical and ecosystem benefit can be balanced. One of the most ideal model is multi-layered planting. This method combines the planting of a tall tree (470 trunks/ha), medium tree (fruits 1250 trunk/ha) and vegetation (coffee, vegetables, etc).

The seedling sector of the army corps developed a concept of transition from vegetables into hard trunk vegetation (tree), called tumpang sari. Tumpang sari is a planting method with a polyculture system, to plant a different kind of vegetation in one area of land. This could also boost productivity. The conversion requires assistance from the Citarum Harum task force, in this case, the corps of the army. Considering that there is a risk of economic decline in the Kertasari community, this activity requires further study.

#### 4.5.3. Floating Netcage

Fish farming with floating net cage grows rapidly, as it is a profitable business model. Centre for fish farming with floating net cage in West Java has located in the Jatiluhur and Cirata reservoir. In the Cirata reservoir, there are 98.000 floating net cage plots and contribute to 550 tons of leftover food fish into the water body. Aside from the fish food leftover, the pollutant in the reservoirs come from domestic waste (including fecal and urine) which come from 1000 fish farmers families who reside on the water.

**Table 2.** Status of reservoirs in the Citarum watersheds

Parameter	Juanda	Cirata	Saguling
Max. area of inundation	8300 ha	6200 ha	5430 ha
Max. depth	95 m	105 m	90 m
Altitude	110 mdpl	250 mdpl	625 mdpl
Trophic status	Hyper-eutrofic	Hyper-eutrofic	Hyper-eutrofic

**Source:** Directorate of Water Resources and irrigation, Bappenas

Table 2 shows that all of the reservoirs in Citarum Watershed are polluted, as in the trophic status. Two of them, Saguling and part of Cirata are located in the administrative region of West Bandung Regency. Department of Poultry and Fisheries from the two local governments engage research on the status of floating net cage those two reservoirs. The problems identified are:

- The number of floating net cage is increasing and over the environmental support capacity of the reservoir;
- The productivity of fish farm trend to decrease each year as an effect of disease and decrease of water quality;

- Increase of production cost while the selling price remains; and
- Blooming of Water Hyacinth

#### 4.5.4. Clean Water Supply and Flood Control

Water in any form is in the cycle process, so-called hydrological cycle. This process shows that the total volume of water on earth will be in the same amount. As an example, if one part of the globe experiencing drought, the other part might be experiencing a flood. Another example, the melt of ice in the pole is followed by the increase of sea-level rise. The hydrological cycle is an essential part of life on earth.

The conservation of the environment, such as conserving the water, earth, and biodiversity is key to the hydrological cycle to remain in balance. If the balance is disturbed, the effect will be bad for the human and the environment, such as floods, landslide, and drought.

The decrease of water infiltration zone, land use conversion due to population growth, deforestation, and no effort for conserving water and land led to the degradation of the upstream Citarum environment. This condition led to the frequent flood, landslide, and drought in the watershed.

Facts and problems that are identified in the Citarum river basin include the development of settlement without proper planning and agricultural activity which does not follow the conservation principle. Unconserved land led to less infiltration, erosion and sedimentation in the river, lake, and water resources infrastructure. The groundwater extraction also uncontrolled and exceeds the normal capacity. This led to another problem such as land subsidence. Land subsidence possesses damage to infrastructure and buildings and led to an increase in flood risk.

#### V. Conclusion

Restoring the Citarum River Basin (DAS Citarum) cannot be separated from the role of interrelated government institutions. In 2017, the West Java Industry and Trade Office recorded **597 large industries** spread across **7 Regencies/Cities**, namely Kab. Bandung, Kota Bandung, Kab. West Bandung, Kota Cimahi, Kab. Purwakarta, Kab. Karawang, and Kab. Sumedang. Based on data from the Bandung Regency Environmental Agency, from 176 corrected industry data, the total volume of B3 waste generated is 119,685.03 tons per month, containing fly & bottom ash, sludge, B3 waste packaging, used oil, TL lamps, cotton waste, and others. To prevent pollution and damage of the Citarum River Basin, and integrating control and law enforcement by government authorities and stakeholders related to the recovery of the Citarum River Basin, the Presidential Regulation No. 15 of 2018 concerning Acceleration of Pollution Control and Damage to the Citarum River Basin has been published.

Perpres (Presidential Regulation) that was born was one of the legal foundations for restoring the Citarum River Basin, especially in matters of waste and garbage. Year on year, the growth and increase in production of the textile industry continues to occur along with the increasing demand for the products. However, the increase in production of the textile industry is not accompanied by an awareness of industry players in waste treatment. Many industries dispose of waste containing various toxic chemicals directly into river bodies without being treated first, causing river water quality to decrease significantly, ecosystems in the

river to die and polluted environments. Based on data from DLH Bandung Regency, out of 169 industries recorded in the Regency. Bandung already has 163 industries that have Wastewater Treatment Plants (WWTP/IPAL), but when surveyed, the WWTP/IPAL results did not meet the specified standards. Weak water quality monitoring systems, especially real-time telemetry technology, making it difficult to measure the overall success of the program.

The Environmental Office (DLH) West Java tested the water quality of the Citarum River by measuring physical, organic-inorganic and microbiological parameters by including weather, season and water discharge data during the test. The restoration was carried out in several steps and methods, including modernization of waste management, the encroachment of the Citarum river upstream forest, floating net cages, and efforts in providing clean water and river discharge. The steps and methods taken are to restore Citarum to its original condition, as well as the Citarum Bestari movement (Clean, Healthy, Sustainable and Beautiful). Various efforts have been made to re-create the 'Citarum Harum' and preserve the Citarum so that it can continue to be enjoyed by children and grandchildren later.

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