

Retention Ponds Function Improvement integrated with Green Open Spaces improvement as Strategic for Water Management Plans in Palembang City

By

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1. Background

Palembang is the capital city of South Sumatera province. This city has area around 358,55 Km² with population of 1.602.071 (2016) and density of 3.945 inhabitants/km² (2015). Palembang is located 0-20 m above sea level with mostly flat landscape; this city consists of 50% swamp areas. Musi River (the largest and one of famous rivers in Indonesia) is divided the city into two regions (upstream and downstream) with 24 watersheds in total and canals.

Life culture of the people in the city is largely inseparable from water like the river, ponds, canals etc; since the finding of the city of Palembang, people had lived on the river banks of or on the marshes. The needs of clean water continue to increase along with the increasing number of population. Source of clean water provided by PDAM reached more than 93% coverage, but some parts of the city still do not have access yet, there are still some of those have to use water from river and artificial canals even though the condition is contaminated.

The river pollution has been occurring for a long time, and this continues to increase along with the city development, the pollution occurs either in the upstream or downstream areas of the river. The water continuously contaminated physically, chemically and biologically due to the physical condition of the land in the upper part of the river has been deforested and land degradation due to land use and land cover change caused by illegal logging, land clearing for both public and private plantations, mining (coal) with open mining system. And also due to the establishment of factories along the river, such as rubber processing factories, palm oil mills, acid mine drainage produced by mining industries, oil treatment (Pertamina), where almost all of the oil processing plants released their waste into the rivers; even though there were wastewater treatment plants have been operated (but they still do not operate optimally). Lastly, domestic solid and wastewater also significantly pollute the river and the trends are increasing.

Pollution caused the water quality decreasing; this is very detrimental to society both economically and socially such as (water tariffs increasing and poor sanitation and health). Besides Pollution, another consequence of the rapid development of a city due to changes in land use and land cover is the change of landscape. The need for land cannot be avoided but sometimes not followed by a good spatial plan or even follow the spatial plan that has been made. Similarly, what happened in the city of Palembang, the price of land in the city center is so expensive that people are looking for land in the suburbs that are still affordable as in the location of swamp areas around the city of Palembang. This is generally detrimental to the existence of green open spaces that act as reserves. In relation to soil and water conservation in a region, the proportion of green open space (G) should be the focus of attention.

Green Open Space or Ruang Terbuka Hijau (RTH) in Palembang from classical to current era

Palembang is one of the oldest cities in Indonesia that has experienced various periods of urban development, ranging from Classical to Independence. Palembang is a dynamic city that continues to grow since the Classical with many physical, social, economy and cultural changes. This positively and negatively affects the development of the city. Development of Palembang at the Classical period (683-1407), the city of Palembang has been well laid out according to that concept based on religion, such as the concept of cosmology, parallel between macrocosm (the universe) and the microcosm (the human world). Places considered sacred, like temple and temple buildings placed in high distant areas from the banks of the Musi River, while settlements are placed close to the river or at the edges.

At the era of the Sultanate (1407-1821), most of Palembang City was still dominated by swamp areas. In this era, the port in city of Palembang was known as the safest and had the most and best port's rule of the time.

At colonial eras (1821-1945), the only available information for the city was taken from the map of year 1919. At this time, the city of Palembang was still dominated by green open spaces (approximately 90.34%), of the total area about 224 km. At that time built space was 2.74%, water body 6.92% and open space 0.01%. Green open space was dominated by swamp, which amounted to 73.84% of the total area of the city (Hasbullah, 1996).

In the days of Independence I (1945-1965) no complete map was found, so the state of the land at that time wasn't available.

In the era of Independence II (1965-1999), the data used was taken from the landsat image of Palembang City in 1978 and 1989. At this time, the percentage of green open space in the city still dominant although there was a decline trend. The percentage of green open space in 1978 was 84.42%; it was dominated by swamps of 49.48%, while the percentage of land was built only 5.95%. In 1989 the percentage of green open space decreased to 66.04% which was dominated by swamps of 28.13% and the percentage of constructed land increased up to 19.46%. In these days, many development that had been done, such as construction of roads, crossings bridges, market plots in a self-help community, shopping centers, municipal government center buildings, city parks, hospitals and funerals. The population was 582,581 in the year 1971, and then continued to increase until 1995 reached 1,352,301.

In the era of independence III (1999-2007) was signed by the existence of increasing of constructed land at 2001 and it was continuously increased until 2007. From the available data interpretation, it was obtained that the proportion of green open space in 2001 was 61.94% which was dominated by swamps of 20.41% and in 2007 was 58.04% which was also predominantly swamp 15.99% of the total area of Palembang City, while there was an increase in built land to 24.27% in 2001 and 35.74% in 2007. Based on the population registration result in 2006 the total population was 1,451,776 people with population growth value of 2.27%.

The changing trend of the proportion of green open space declined from Colonial times until the days of Independence III. This is because the number of switching functions of the green open space into waking land. One type of the decreased green space occurred in the Colonial era until the Independence Day III was swamp. A percentage analysis of green open space (GOS or RTH) area in Palembang at the time was as much as 58.04% from the size of Palembang City. Ideally (according to Law No. 26 of 2007) a city has a RTH of 30% of its total area city area. Percentage of RTH area in Palembang city is more than 30%, in theory it should be able to reduce the impact of flooding, but in reality in the City Palembang, the percentage of flood area increased until 2004.

There are several types of green space such as swamp, mixed gardens, rice fields, forest / park tours, moor, grass and shrubs. Each type of green space has different water conservation functions and capabilities. In fact, in Palembang, the RTH which was formerly dominated by swamp now has been dominated by mixed plantation of 24.78%. This was occurred due to the result of land conversion from swamp to mixed plantation. Though it is known that the ability of swamp water conservation is much better than in mixed gardens; the land conversion still increase. In addition, the unevenly distributed of RTH is one of the causes of flooding.

In the implementation of spatial plans (RTRW) 2005-2015, many areas formerly swamp, now has become rice fields, mixed gardens, grass and shrubs, moor and water bodies will be converted again into constructed land (settlements, offices, trade and services, industry and sport facilities). In fact at the location there has been a flood. If it continues and not done flood prevention, estimated the flood will be widespread.

Beside the land cover changes, there is also land use changes at some locations in Palembang City. The changes are happening both physically and functionally. There are some aspects influences the changed of both land closure and land use in Palembang such as population, its position as the capital of South Sumatra province, the physical condition of land and government policies. Increasing the green open spaces has been implemented by many cities in many countries to overcome the environmental conditions; the green open spaces act as a bioengineering technique and biofilter which is considered relatively cheaper, safer, healthier and more comfortable.

The geographical condition of Palembang City which is 54 percent of its area is swamp; rapid urbanization caused a number of swamps to be reclaimed. The deterioration caused flooding in certain locations. This situation has a negative impact on the environment. The city government of Palembang has issued a special regulation on the control and development of swamp areas, namely Perda No 13 year 2002, which began in 2003. The positive spirit of the local regulation (Perda) on swamp conservation was aimed for water catchment area. In 1999 the remaining swamp in Palembang City was 30.35% serves as conservation swamp area or as a water catchment area, cultivated swamps and swamps reclamation.

In general, public open space (open space) in urban areas consists of green open space and non-green open space. Open space is an environmentally sound component, which means as a landscape, hardscape, park or recreation space within the urban sphere. The role and function of Green Open Space (GOS) is stipulated in Instruction of Minister of Home Affairs no. 4 year 1988, which states "Green open space whose population is dominated by natural or plant cultivation, in the utilization and function is as the area of ecological function and the buffer of urban life (Direktorat Jendral Departemen PU Tahun 2006, Ruang Terbuka Hijau).

Provision and utilization of green open space in RTRW Kota / RDTR Kota / RTR Strategic Area City / RTR Urban Area, intended to ensure the availability of sufficient space for : conservation areas for hydrological sustainability; the running water control area by providing a retention basin; areas of biodiversity development; areas of microclimate creation and pollutant reductions in urban areas; community recreation and sports venues; public cemetery; limiting city development in an unexpected direction; safeguarding natural, artificial and historical resources; provision of green space that is private, through density restrictions and utilization criteria; disaster mitigation / evacuation areas; and signage space in accordance with the law and does not interfere with the main function of the green space.

The main (intrinsic) function is ecological function are including to guarantee the procurement of green open space into part of the air circulation system (urban lung); microclimate regulator for the natural air and water circulation system to proceed smoothly; as a shade; oxygen producers; rainwater absorber; provider of wildlife habitat; absorbent air, water and soil pollutants, and; windbreak.

Some additional functions (extrinsic) are: Social and cultural functions such as describe local cultural expressions; is a medium of communication for the citizens of the city; Recreation areas; containers and objects of education, research, and training in the study of nature. Economic function such as sources of products that can be sold, such as flowering plants, fruits, leaves, vegetables; can be part of agriculture, plantation, forestry and others. And aesthetic functions such as enhance comfort, beautify the urban environment both from the micro scale: home page, neighborhoods, and macro: urban landscape as a whole; stimulate creativity and productivity of the townspeople; architectural beauty factor formers; create a harmonious and balanced atmosphere between waking and non built areas. In an urban area, these four main functions can be combined in accordance with urban needs, interests and sustainability such as water supply protection, ecological balance and biodiversity conservation.

The benefits of RTH based on its function are divided into: Direct benefits (in the sense of fast and tangible), that is to form the beauty and comfort (shady, fresh, cool) and get the materials for sale (wood, leaves, flowers, fruit), and indirect benefits (long-term and intangible), which is a highly effective air purifier, maintenance of continuity of groundwater supply, preservation of environmental functions and all the contents of the existing

flora and fauna (biological or biodiversity conservation). Green open space in Palembang, both naturally and artificially formed has decreased in size; this resulted in water absorption in the city of Palembang increasingly reduced.

Efforts for Palembang city in anticipating clean water crisis are contained in Mayor Regulation No. 8 year 2015 on Water Supply System, one of which is the construction of a reservoir to anticipate the clean water crisis in the future; this construction achievement was 30% (it was 70 reservoirs will be built, currently 24 of those were completed).

Vision

Indonesia has committed to participate in the implementation of sustainable development goals (SDGs). The Asian Water Development Outlook (AWDO) which was initiated by Asian Development Bank (ADB) and the Asia-Pacific Water Forum (APFW) had highlighted the important water management issues in Asia and the Pacific. AWDO 2013 provided and established concept of water security by identifying its five key dimensions and approaches for quantifying the dimensions by means of indicators. AWDO 2013 presented the water security status of 49 economies in Asia and the Pacific. Based on National Water Security Index Score which was assessed as the composite results of five key dimensions of household water security, economic water security, urban water security, environmental water security and resilience to water related disaster, Indonesia was in the level 27th among the 49 countries, the NWS stage is engaged (range of score was 36<56), at this stage means more than half of the people have access to modest drinking water and sanitation facilities; water services still developed, water quality is needed to be improved, and first attempts for addressing water-related risks are being made; therefore hard jobs and big homework for the Indonesian policy makers to increase the scores (AWDO_ADB, 2016).

Objectives of Water Action Plan

- Create more City Green Open Spaces (GOS), and the focused plan was in retention ponds areas.
- Improves roles and functions the existing GOS such as Law enforcement on the Implementation of swamp land areas used district regulation number 31, year 2012; it is emphasized on swamps roles not only as bio-filter for pollution prevention, and flood controller, but also for water infiltration, and recreation.
- Curriculum Revisions, Research Road Maps and Student Learning Activities for Water wise and Water Education (Students, educators, community) by initiate a Centre of Excellence for Water Management
- Reduce the spread of waterborne diseases through upper and down part water streams treatment for pollution remediation and prevention; technologies will be applied including floating constructed wetlands, wetlands restoration activities and planting more trees for improving the GOS.
- Retention ponds are part of GOS, currently unmanaged and inadequate monitoring activities. Its role as one of ecosystem services site are not empowered and socialized as well as regulated. Currently, the retention ponds function only for flood control and water absorption, therefore changes needed to be made.

Current retention ponds, river, lakes, canals and watersheds condition

Retention ponds are one form of freshwater body that has received minimal research with regards to the management of toxic cyanobacteria. Within such systems, the health and environmental risks associated with cyanobacterial may result in further indirect health, ecological and economic concerns. Cyanobacterial blooms are a serious problem in these systems, where they result in substantial increases to operational and maintenance costs of these assets. Hence the timely management of blooms in such reservoirs is essential.

One of this action plan aspects is to measure the current watersheds, ponds and lakes condition for the next management and regulation. At the moment, parts of the sampling locations condition are highly polluted.

There are potential algal toxins spread occurred and still unregulated. Location maps of samplings point conducted to support this action plan is presented in figure 1.

Retention ponds are one part of green open spaces, currently their conditions under measurement for future management plans and strategies. Initial observations and sampling sites data of 15 retention ponds in Palembang are included as part of this action plan. Sampling locations included in this action plan is presented in Figure 1.

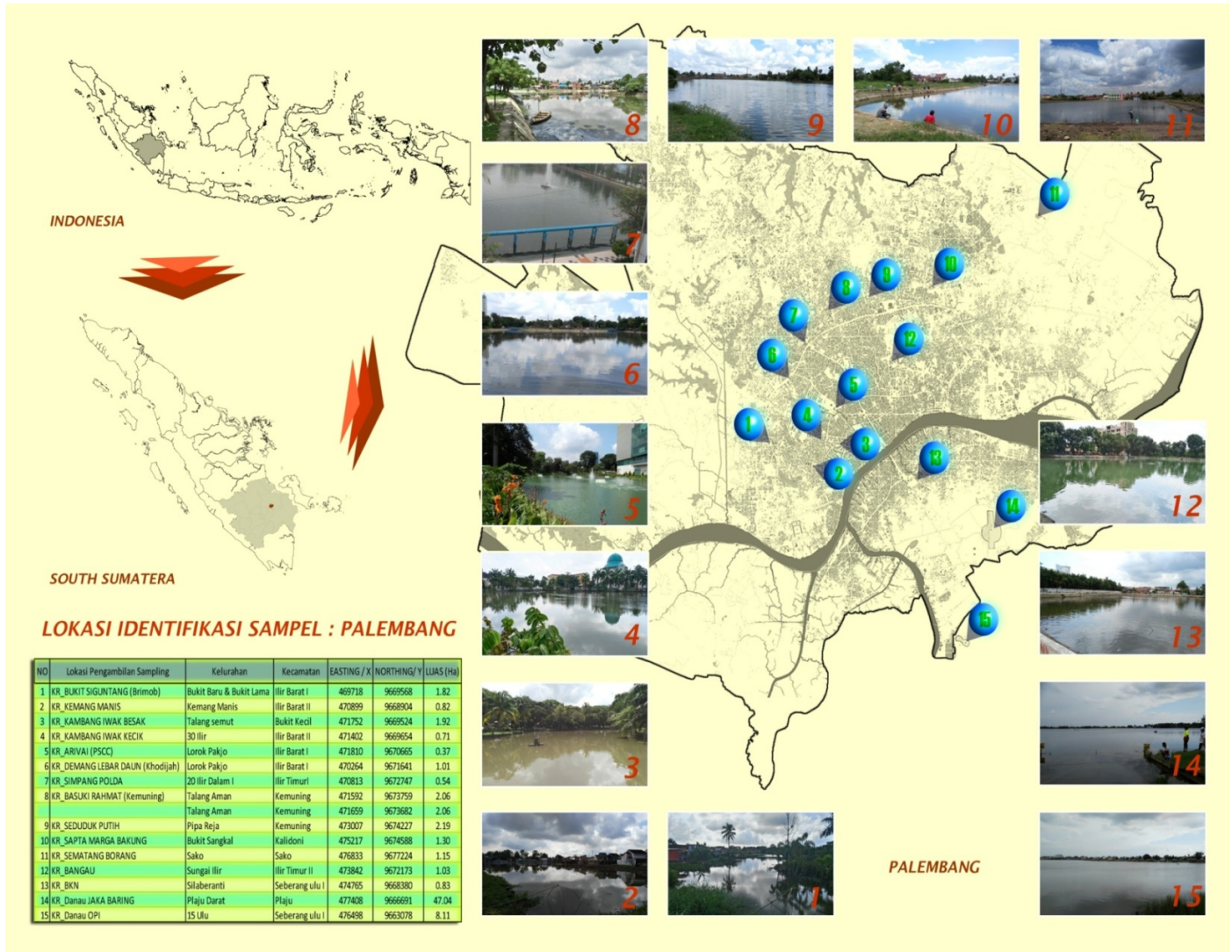


Figure 1. Sampling locations (14 retention ponds and lake) measured and studied under this action plan.



Figure 2. Sampling locations (Suround Sekanak River) studied under this action plan.



Figure 3. Sampling locations (Suround Sekanak River) studied under this action plan.



Figure 4. Sampling locations (Muhajirin watersheds) studied under this action plan.



Figure 5. Sampling locations (Muhajirin watersheds) studied under this action plan.



Figure 6. Sampling locations (Muhajirin watersheds) studied under this action plan.



DJI_0084



DJI_0085



DJI_0086



DJI_0087



DJI_0088



DJI_0089



Figure 7. Sampling locations (Kambang Iwak retention pond) studied under this action plan.

Problems currently identified under this action plan

- *Water Quality decreasing*
Population growth, high water demand, industrial and domestic wastewater pollution without accompanied by the application of adequate technology in reducing levels of pollutants entering water bodies has led to significant water quality degradation.
- *Water Quantity decreasing*
 - The raw water source of Palembang City consists of the Musi River and Ogan River, in recent years the decrease of the water flow cycle decreased to 600 L/sec, in addition to increased turbidity of water. In addition, climate change causes an increase in temperature from the normal rate. Data 2015 shows a decrease of debit up to 3 meters, the previous PDAM has a production capacity of 900 L / sec is now that affects the soil pores and groundwater supplies, besides, dry season cause water resources debit decreasing that affected water supply.
- *Other problems have been identified such as:*
 - Potential invasive alien species (IAS) threat to the socio-economic and public health which currently unregulated, infrequently monitored and unlisted. Its socio-economic loss and biodiversity impact needed further studies.
 - Health impact needed further studies including monitoring and environmental protection from the pathogen and infectious diseases through water-borne disease spreads.
 - Additional points are needed to be included in the current regulation.
 - Innovate and apply for some of potential technologies for restoration and protection for future water security.
 - Human resources needed capacity building for some of new potential environmental threats affecting the future of water security.
 - Inter-department coordination and regulation are needed to support the future water and environmental protection and security acts (trade-transportation-ships-customs and also sampling for trades goods for environmental security from invasive species threats for future water and biodiversity security).
 - Retention ponds monitoring, evaluation restoration and management for ensuring their ecosystem service function condition.
 - Environmental Agency had to be audited by other independent board in for ensuring the quality of their activities and meet the national standard for ensuring community security toward their services (currently there are no auditor for this agency/board).
 - Agriculture fertilizer needed some regulation for nutrient maximum daily load prior to enter water streams and reservoirs.
 - Garden, bio-pores and constructed wetlands introduction and implementation for solving urban water pollution run off and domestic wastewater treatment.
 - Environmental health education for community to accelerate the clean water effort improvement.
 - Strict regulation and implementation of wetland protection and restoration.

Even though water is a vital necessity for life, most societies still have a low level of awareness of the conservation of sustainable water resources. Even the majority of urban people seem to have a dualism of perception of water; this is reflected in the low level of their treatment of water in the environment around them. As communities living on the edge of water flows (canals and retention ponds) have actually experienced difficulties when PDAM's water supply service is halted and they have to keep water supplies for several days until the water flow is active again, but their bad habit of disposing household waste (even animal dung and animal carcasses) to bodies of water does not seem to be perceived as dangerous, they treat rivers or canals and waterways connected to large rivers like open sewers. This is a tough task for all concerned, but the work must be done to awaken the community to improve sustainable water management and ensure the resilience and security of water resources in the future.

Waterways pollution problems are commonly similar and typical due to the absence of proper sewage facilities and discharge controls which turned rivers into open sewer. In relation to that, the open sewer related to the poor sanitation and low people awareness to protect their neighborhood and kept them clean. And also the seasonal floods occurrence in low lying areas especially during the intense rainy seasons coincided with high tides. It is generally less expensive to prevent contaminants from entering storm water than to treat contaminated water. Good management practices can prevent contaminants to enter into storm water such as reducing fertilizer and pesticide use on lawns, gardens, cemeteries, and golf courses; and properly managing community hazardous waste and waste oil recycling.

Public Value:

Green Open Space in urban environments provides many advantages: clean water, fresh air, formal and informal sport and recreation, preservation of natural environments, provision of green space and even urban storm water management. Green city benefits community by improving clean environment, water resources and reduced potential water scarcity flood risk even and natural disaster, all of these will create better living quality, improve health and economy, and reduce stress, ultimately create more livable and resilience city.

Current operating capacity and water utility performance (end of 2011)

Table 1: Performance Parameters of Water Utilities, End of 2011

City	City Population In Service Area	Production m3/d	Total Connections	Population with 24/7 supply %	NRW %
Palembang	1,384,918	251,784	178,006	48	31
Average Tariff (US\$/m3)	Operating Ratio Persons Per Connection	Collect 98%	Daily Consumption (m3/ connection)	Sewer Connection	STP Capacity (m3/d)
0.40	0.78	7.8	0.98	negligible	negligible

Table 2: Street Survey of 20 Water Bills in Low-Income Areas^a

City	Average Persons/HH	Average HH Water Bill/Month (US\$)	Average HH Consumption/ month (m3)
Palembang	5.1	7.79	25.40
Average Tariff (US\$/m3)	Per Capita Consumption (l/c/d)	24/7 Supply	Cost of 10 m3 (US\$)
0.31	165.0	No	2.70

^a In terms of the general situation of each utility these figures are not statistically significant. However, they do identify issues that can be followed up by the utility

One of customer survey on the PDAM Palembang 24-hour service availability comment that he has been using PDAM water for the last 2 years but he still store some water for the bathroom even though the service was 24/7 water. This suggested that *Next to poor water quality, intermittent supply is the most common complaint of people connected to piped water.*

National Water and Sanitation Policies

Scarcity and water quality damage caused by environmental degradation has been the cause of various disasters, such as food crisis, the spread of various diseases, floods, and so on. Along with the population of Indonesia which reaches more than 250 million people, the need for clean water becomes more urgent. The trend of water consumption is estimated to continue to increase by 20% -35% per capita per year, while the availability of clean water tends to decrease due to natural damage and pollution. The National Development Planning Agency says about 38%, or 96 million Indonesians have not yet enjoyed clean or hygienic water. On the other hand, rivers in some areas are generally highly polluted by domestic waste.

In comparison to the other Asian countries, Indonesia has no consolidated policy for urban water supply or sanitation. Viet Nam embodies its water supply and sanitation policies in laws, decrees, circulars, and decisions; the Philippines has water acts, presidential decrees, and roadmaps, but no specific policy for urban water supply (although it did have a National Policy on Urban Sewerage and Sanitation in 1994); and Thailand's Department of Water Resources is responsible for the country's water policy. Therefore Indonesia needs to consider for some policies changes. Some of Existing Regulations are not fully implemented; Still dominated by community bad habits which were affected by poor education and low awareness of the important of health environment. This is a home work for university academicians to offer solution for the problem.

Governance of Indonesian water resources

After the Decree of the Constitutional Court Number 85 / PUU-XI / 2013 Dated 18/2/2015 which canceled the Law Number 7 Year 2004 on Water Resources (SDA), the form of natural resource management in Indonesia has changed. Natural resources management used Law No. 11 Year 1974 on Water. However, it needs to be a refinement of the Act related to the sharpening of the vision of natural resources governance. This is considered necessary considering Indonesia has wider waters of the mainland.

Indonesia needs to have a vision of natural resources management holistically. We need to implement natural resource management that includes at least ownership, utilization, and sovereignty aspects. First, the ownership aspect: In this aspect it is time for water to become a public ownership right that must be fully managed by the state. The recognition of these basic rights is actually contained in Article 33 of the 1945 Constitution which states, "The earth, water and natural resources contained therein are controlled by the state and used for the greatest prosperity of the people". On that basis, the presence of the state is necessary in realizing the prosperity of the people. Second, the utilization aspect: This can be done by direct utilization by the general public. River water, groundwater, seawater, well water, lake water, etc. are objects that can be utilized directly by every individual of the people as long as it does not pose harm to other individuals, anyone can take water.

In this context also the governments as the state organizers through BUMN or BUMD need to ensure the utilization of clean water to be distributed equally to every layer of individual society and monitor it. The condition of water supplied from PDAM pipes, which are still turbid and smelly, need to be addressed in order to be utilized. Raw water must qualify for no more pollution and harm to health. In addition, the government needs to build infrastructure of integrated water supply facilities and infrastructure. Based on various studies that have been conducted related to water balance conditions in some river areas, the average urban areas will experience water deficit starting from 2020 for irrigation, drinking water, industry, mining, animal husbandry, and fisheries. Third, the aspect of sovereignty: In this context, a country capable of managing the potential of natural resources well and not dependent on other countries will be able to emerge as a strong country, both in terms of human and the supply of food. Therefore, sovereignty over water needs to be upheld. The state is obliged to meet the most basic water needs for its people. The state's sovereignty over water needs to be demonstrated by the sophistication of management, water purification technology, human resources, and facilities in managing water so that the proper distribution of water resources in the form of clean water can be distributed evenly to all layers of the community, especially in the outer islands, difficulty getting clean water. This is in line with the target of President Jokowi targeting in 2019, the entire population of Indonesia has been able to access clean water and have good sanitation. From here, the investment of clean water by the state becomes important and brings profit. Thus, sovereignty over water becomes absolute. The government should have a new legal umbrella to ensure that business activities related to control and supply of natural resources still prioritize the aspect of sovereignty. Finally, the implementation of natural resource management becomes urgent, we hope that the state can provide protection to the people by applying the principles of natural resource management in harmony with environmental conservation comprehensively.

Indonesia Clean Water Policy

The framework of clean water policy in Indonesia refers to the development of urban water supply by relying on to investment. The investment approach is influenced by three factors: (a) the characteristics of raw water, which take into account the types of water sources, quantity and quality, and the mainstay discharge; (b) government policy, which focuses on spatial planning, economic growth and investment, and demography; and (c) production technology, which considers economic efficiency, distribution, and service coverage. These factors are the standard (policy) framework in the implementation of SAB development. Technically and operationally, it is implemented by Perusahaan Daerah Air Minum (PDAM), as an economic institution providing clean water. The implication is that PDAM's performance is an important measure and a hope for the success of the SAB policy.

Provision scenario Drinking Water Supply System KSDP-SPAM of Palembang City refers to 3 (three) objectives as follows:

- a. National Goals (MDGs, Minimum Service Standards (SPM), Long Term Development Plans (RPJP) and National Medium Term Development Plan (RPJMN)) for drinking water services are: Access to safe drinking water by 2015 by 68.87%; SPM 2019 of 81.7% corrected with RPJMN to 100%; Access to safe drinking water by 2019 is 100% (RPJMN 2015-2019).
- b. The target of local government as stated in RPJMD and RISPAM / Business Plan PDAM; In 2020 access to safe drinking water by PDAM 88.43% (Business Plan PDAM) besides private 5% (JP).
- c. Based on points a and b, the target to be achieved by 2019 is 100% access to safe drinking water through the Network Piping (JP) by PDAM, Private and community groups, as well as Non Piping Network (BJP) are protected by the community with scenarios: Network Piping (JP) by PDAM 88.4%, Network Piping (JP) by Private and Pokmas 5.0%. Non Piping Network (BJP) Protected by Society 6.6%

Policy and Strategy of Implementation of Drinking Water Service System (SPAM)

SPAM Implementation Policy is formulated to address strategic issues and issues in SPAM Implementation. Based on the policy group formulated above, policy guidelines are established as a basis for achieving SPAM Implementation objectives directed to meet RPJMD 2018 goals and MDG's 2015 targets, as well as RPJMN 2019 targets. The policy directives are:

1. Increasing safe access of drinking water to all communities through piped networks and not protected piped networks;
2. Improvement of operational funding capabilities and Implementation of alternative sources of financing;
3. Improvement of institutional capacity of the implementation of SPAM Implementation;
4. Implementation and application of Norms, Standards, Procedures and Criteria (NSPK) at the Central and Regional Offices;
5. Increasing the provision of raw water for drinking water in a sustainable manner;
6. To enhance the role and partnership of business entities and communities;
7. Implementation of SPAM technology innovation.

As the main implementer of the Regional Water Supply System Strategy and Strategy (SPAM Training) is the Public Works Office (SKPD PU) supported by the Regional Secretariat, the Regional Development Planning Board, the KSDM Office, the public health Office, the PDAM.

Recommendation :

1. To improve the quality of river water by reducing river water pollution
 - Reduce pollution that will enter the river
 - Reduce pollution that has entered into the river
2. To increase the quantity of clean water by increasing the amount of green space / retention / reservoir

- Build artificial retention ponds / reservoirs
- Maintaining green space is primarily natural

Action Plan:

1. Reduce river water pollution (support government program cleaner program (PROKASIH))
 - a. *Reduce pollution that will enter into the river*
 - Develop and apply floating constructed wetlands
 - b. *Emerging contaminant candidate list*
 - The need for research on the biological contaminant especially Invasive Alien Species (IAS) that potentially damage and cause our biodiversity lost, threaten public health.
 - c. *Reduce pollution that has entered into the river*
 - It important to conduct research to investigate what is the most suitable method used in the river in the city of Palembang.
 - The inclusion of an Integrated Research Center (IRC) on developing a simple technology to reduce water pollution in the city of Palembang.
2. Increase the number of green space (green open space) that serves as flood control and water absorption. (SUPPORTING PERDA RAWA IN PALEMBANG)
 - a. *Build a retention pond / reservoir*
 - Local government plans to build 70 existing retention pools 24 to live 46 again
 - Location of retention development inside (away from the crowd), in addition to declaring the distribution of green open space in the area of Palembang
 - b. *Maintains natural green open space*
 - Implement municipal regulations and impose tough sanctions on violations.
 - c. *Increase the benefits of green space, in addition to flood control and water absorption:*
 - As a tourism spots
 - As a bio filter for both water and air pollution
 - Bio-pori socialization and demonstration
3. Current conditions have not prioritized water issues and water-related policies. This is quite ironic, because some people and leaders think that Palembang is not scarce water yet, because according to most of the people when the number of water sources is still abundant, they do not realize that the quality has decreased greatly. Currently more political issues put forward. Leaders are not yet fully concerned about the environment.
4. Need policies that prioritize handling water to ensure the future water security problem. Reorganizing water resources management governance systems such as making all governing agencies relevant to water issues to be in one roof and not separated as it is now for example sanitation is in the health service, irrigation under the agricultural service infrastructure irrigation (drainage) is located under the Public Works (PU) service, clean water service under the PDAM. Water management will be more effective and efficient when controlled through a one-stop system.

Obstacles

1. Bad habits: There are many communities still live surround the river, swamps/peat and create slums areas, majority the community showed low public awareness that still become challenges for change.
2. Mindset: It is still difficult to change and educate unless a committed strong leader ask them to change.
3. Innovations: budget allocation for research in Indonesia still in less priority, thus invention grow very slow
4. Unwise inland /land used; in this case, there are regulations had been made, but mostly poorly and mostly unimplemented
5. Deforestation and land degradation still occurred due to very low and even lack of law enforcement and more favorable to the ruling group and their concerned.
6. Lack of proportion and distribution of the distribution of GOS locations.
7. Low government budget allocation due to not in the priorities in water, sanitation and environmental protection sectors.

Major problems of social aspects such as low awareness of Indonesian society towards a healthy environment; still a lot of Indonesian population conducted open defecation which cause poor water quality, especially at water which should be a source for their daily needs. Their population trends still increase, it combined with low environmental awareness has worsens the condition. Problems of economic aspects include low of Budgets and Local Revenue (APBD) for each region being allocated to improve water supply and sanitation services. Problems of technological aspects, Indonesia still face high complexity of the problems, this is due to beside Indonesia still limited of adequate technology to overcome the problem of access to clean water and sanitation, even if Indonesia wants to adopt high technology from other countries, it is still constrained by the readiness and participation of people who still have very low awareness. Awareness of the community in managing and maintaining the facilities is the key for technology application. Therefore, community empowerment and involvement in clean water and sanitation management is a central point.

Main outcomes/goals are hoping can be achieved in this action plan:

There are two main goals that are hoping can be achieved under this action plan; firstly, the water quality improvement, and secondly the water quantity improvement to ensure our future water security.

Some inspiring water stories and things can be learnt from the programme

PUB ABC programme: everyone is encouraged to play their part and to make **water conservation** a way of life.

Statements of the inspiring world famous water leaders such as Mr Lee Kuan Yew (First Prime Minister of Singapore in peiod of 1959-1990) recognized **water security as a priority that dominated every other policy**. His remark was also immortalized on the monument during the opening of the Upper Pierce Reservoir in 1977:

“it should be a way of life to keep the water clean, to keep every stream, every culvert, and every rivulet, free from unnecessary pollution.”

"The Ministry of Environment should make it a target: In 10 years let us have fishing in the Singapore River and Kallang River. It can be done," he added.

And also

“This dominated every other policy making. Every other policy has to bend to the kness of our water survival.”

Dialogue Sessions at SIWW (2008)

Other water history to be remarked for our water future change such as news from The front page headline of *The Straits Times* newspaper declared: “Singapore to step up war on pollution”. And on the front line of this war, Singapore had a new weapon in its arsenal: the newly-formed Ministry of the Environment (ENV). When Lim Kim San was sworn in as the first Minister for the Environment, he warned that if Singapore did not take immediate measures to keep its environment clean, pollution would reach a stage where “it will be too late... We will find it impossible to live.”

And also story of the heavily polluted Ganges River made headlines recently, but this time for the right reasons. India's Prime Minister Narendra Modi has promised a clean-up of the river - and the rest of the country - by the 150th anniversary of Mahatma Gandhi's birth in 2019.

The first river chief was appointed by the government of Wuxi, a city in Jiangsu on the northern shore of Lake Tai, to treat a blue-green algae bloom 10 years ago. They were then installed across the entire province in 2012 and neighbouring Zhejiang in 2013, with their main duties being to organise check-ups and respond to public complaints. Greenpeace East Asia campaigner Deng Tingting said “one hopeful sign is that Jiangsu, where the river chief system originated, has seen significant improvement in water quality over the past six years”.

Recently also the construction began on the sustainable, carbon-negative city, which was commissioned by the Liuzhou Municipal Bureau of Urban Planning, designed by Italian architect Stefano Boeri, who specializes in forest-styled developments. The idea behind the Liuzhou Forest City, which will snake along the Liujiang River just North of the Liuzhou in China's Guangxi Region, is to integrate as many plants into the architecture as possible. As such, the city is projected to significantly improve the air quality of the region while also removing greenhouse gasses from the atmosphere. According to architect Boeri's website, “an innovative urban settlement will combine the challenge for energy self-sufficiency and for the use of renewable energy with the challenge to increase biodiversity and to effectively reduce air pollution in urban areas — which is really critical for present-day China — thanks to the multiplication of vegetable and biological urban surfaces.” By covering the city with about 1,000,000 plants and 40,000 trees, it's expected that the Liuzhou Forest City will absorb about 10,000 tons of carbon dioxide every year along with 57 tons of other air pollutants.

Two aspects of water safety are including water contamination events and integrated water quality management are two crucial elements which are very low managed in Indonesia in including this case in Palembang. Problems could be outlined which hindrance the water management in my opinions are including aspects of good leaders who are both committed and empower others, plans implementations are very low, poor education and involvement drive action, lack of coordinator and coordination for water monitoring system including very limited human resources in charge, poor available tools, plans with clear visions, goals and action items are not socialized effectively. People mind set towards water in their neighborhood mostly divided between clean water supply from PDAM that they consumed for daily living and water flow in their environment are treated as open sewer without understanding them as resources for water supply.

Conclusion

- Committed leader is strongly needed for ensuring the law enforcement and implementation of regulations for the successful of the goals to put water policies in priority.
- Environment exploitation need a balance nurture such as by opening more Green Open Spaces, garden city concept or water wise city are promising ways for self water bodies purification for reducing water pollution related problems.
- Educate people to change their mindset is urgently need for the city better future.

ACTION PLAN

No	Activities	Schedule									Output
		2017						2018			
		Jul-Aug	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
1	Problem identification										
2	Literature Review										
3	Team Meeting										
4	Surveys and Mapping										
5	Samples and Data Collection										
6	Data Analyses										

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