Urban environmental management: an effort toward
Magelang smart city

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Abstract. The city of Magelang presently belongs to the Movement of 100 Indonesian Smart Cities. It is conducted by the Ministry of Communication and Information Technology of the Republic of Indonesia. One of the elements that needs to be studied to support a smart city is smart environment. To support the achievement of a smart city, it is necessary to establish a well-managed urban environment. Therefore, this research is aimed at analysing the smart urban environmental management of the city of Magelang, identifying the management of urban environment related to the aspect of smartness, and identifying the role management of urban environment toward the achievement of smart city. The result of the research shows that the presently-implemented environmental management has supported the achievement of smart city for the city of Magelang. The local government, private sectors, and local community have played an important role to achieve the environmental management in supporting the implementation of the smart city for the city of Magelang.

1. Introduction
The city of Magelang is located in the middle of Regency of Magelang. It borders the sub-district of Secang in the north, the sub-district of Tegalrejo in the east, the sub-district of Mertojordan in the south, and the sub-district of Bandongan in the west [1]. According to the DataGo, the population of the city of Magelang in the first semester of 2018 is 130,030 people. Meanwhile, in the same semester of 2019 the population has reached up to 130,440 people [2]. The increasing number of people in the area inevitably affects the need for spaces for settlement, green-open spaces, and other public facilities. They are all related to environmental management. When the number of people increases in an area, this will certainly have something to do with the sustainability of its environment. The city of Magelang presently belongs to the program of the Movement of 100 Indonesian Smart Cities conducted by the Ministry of Communication and Information Technology of the Republic of Indonesia.

The concept of Smart City is the one that in 1980s it was used to visualize an urban context. Since then, the concept has been experiencing changes rapidly. So far, the concept of smart city has emphasized on the contents and digital services in urban areas to tackle environmental challenges [3]. Smart City constitutes a concept with the purpose of running urban management in a modern way. The
use of the latest technology such as information technology is considered environmentally friendly so that it is expected to manage natural resources in such a way and that the desired results can be achieved [4]. There are six dimensions/clusters of the concept of smart city. They are smart governance, related to participation; smart human capital, related to people; smart environment, related to natural resources; smart living, related to the quality of life; and smart economy, related to competition [5].

Smart environment, one of the concepts in a smart city, becomes a dimension that is particularly important to study for its implementation in order that the city of Magelang is able to undergo the environmental management in a smart way along with the increasing number of people. The dimension of smart environment in the concept of a smart city is the one of city management that is able to make use of energy consumption in an optimum way by utilizing energy that is renewed and that emission waste can be minimized in line with the management policy to establish sustainable development [4]. To support such environmental activities, it is necessary to run education in environmental management to the local community.

Environmental management is a concept closely related to law, especially environment law. In addition, environmental management is also a strategy from the government in its implementation to form or change people’s environmental behavior in the area to a better one. Thing that becomes the primary object in environmental management is the regulation related to the activities of its subjects, products, and services found in the environment [6]. The imbalance between the availability of natural resources and the dynamics of community requires the policy of living environmental management with the management system of the existing natural resources. [7]. This comprises an institutional system with those involved in the living environmental development so that more effective and efficient policies related to environment can be made [7]. In addition to normative regulations, living environmental management also requires the awareness of the government apparatus, supervision improvement, betterment of system or law for environmental preservation, sector of private businesses, and the need for the application of technology that is friendly to environment [7].

The vision of the development of the city of Magelang in the years 2016 – 2021 that is determined in the RPJMD (Rencana Pembangunan Jangka Menengah Daerah / Mid-Term Regional Development Plans) is ‘Magelang as a Smart and Modern Service City based on Religious and Prosperous Community’. One of the elements in the vision is Smart City. The elements of a smart city that will be realized in the city of Magelang are Smart Governance, Smart Infrastructure, Smart Economy, Smart People, Smart Living, as well as Smart Environment related to IT-based environmental management, IT-based natural resource management, and the utilization of renewed energy [8]. The aims of this research are to undergo internal and external analysis toward smart environmental management, identify urban environmental management related to the aspects of smartness, and identify the roles of urban environmental management toward the achievement of smart city.

2. Research method

The method applied in this research is qualitative method. To collect the data, there were two ways to do i.e. secondary and primary datum collections. The secondary data were taken from planning documents and other related documents. Meanwhile, to collect the primary data, the methods of Focus Group Discussion and In-depth Interview were implemented. The participants of this Focus Group Discussion were stakeholders focused on Smart Environment dimension consists of Kebangpolimas (Kesatuan Bangsa dan Politik Perlindungan Masyarakat / Unit of Nation and Politics for Community Protection), DLH (Dinas Lingkungan Hidup / Agency for Living Environment), and BAPPEDA (Badan Perencanaan Pembangunan Daerah / Regional Development Planning Board). In-depth interview was implemented as well on those stakeholders yet with the different person. It was carried out as a triangulation method to gain thorough information and do a crosscheck of it in achieving validity and reliability of data. Meanwhile, qualitative descriptive analysis is used for the technique of data processing and data analysis.

3. Result and analysis

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3.1. **Internal and external analyses toward smart environmental management**

The city air in the city of Magelang is of a very good quality. The value of the city air is still lower than that of the air standard value. The quality of the city air is controlled 20 times annually. In addition, the smoothly-running garbage bank system has been able to contribute to the reduction of garbage volume. Moreover tidy arrangement of the city that is in line with what a city needs has been a strength of the city of Magelang toward smart environmental management. However, there are still weaknesses found behind its strength. They are, among others, settlement areas and houses that are not proper to live in, efforts to maintain and lengthen the existing settlement facilities that are not optimally done as well as the management and innovation in utilizing energy that is still limited. Included in the environmental management are air pollution, water pollution, and garbage management.

The city of Magelang has lots of opportunities to achieve smart environmental management with the help of technological advances of GPS and CCTV. In addition, the number of trucks available is also able to help remove garbage in a more effective and efficient way. The community organizations that pay attention to garbage such as Organic Kampong as well as the availability of various alternatives for energy can be of a great opportunity for the city of Magelang. A challenge that is presently faced in connection with the 100-0-100 program is 100 percent access to clean water, 0 percent of dirty areas, and 100 percent sanitation. Another challenge and threat is the subjects of the city of Magelang themselves. Not all of them are aware of the importance of keeping their physical environment healthy. They are basically well informed that the height of present TPA (Tempat Pembuangan Akhir / Last Landfill) has reached up to 8 meters. However, they prefer to pay for the contribution fee rather than separate and select their own garbage (processing garbage directly from its origin).

3.2. **Urban environmental management and the aspects of smart environment**

The concept of smart environment covers the reduction of garbage, the reduction of pollution, pollution, economizing on energy, the quality of human resources, and technology. Smart environment comprises all aspects of people’s life for all age groups with the purpose of establishing comfort for its citizens, ease in services, and increase of competitiveness. The city of Magelang is currently focusing on reducing the volume of garbage so that the garbage reduction will have reached up to 30% by 2025. It only has one landfill that has to be located outside the city of Magelang due to the limited area in the city. The landfill is located in Banyuurip. The Banyuurip landfill itself is now more than 8 meters high, higher than it should be. What the government has done to overcome this landfill problem is by building TPST (Tempat Pengolahan Sampah Terpadu / Place for the Integrated Garbage Processing). TPST is defined as a place where the activities of separating and processing garbage in an integrated way take place. The function of TPST is as a place where the process of separating, cleansing, packaging, and delivering the products of recycled garbage takes place. There have been two places for TPST, one in north Jurangombo and the other one in the Village of Magersari. In fact these two places for TPST are still not able to accommodate the garbage discarded by the people from the city of Magelang. Therefore, the city government of Magelang is currently building several new places for TPST. They are the ones in Rusunawa Potrobangsan, Bojong, Dumpoh, and Sukorini. What is going on now in developing these places for TPST is making road construction for transportation access so that trucks can go there.

Another thing that the Agency for Living Environment has done is reducing the amount of garbage directly from its origin, in this case the community or people. The target of this program is 8%, 4.13% of which has been achieved. The program that is launched by the Agency for Living Environment in cooperation with the Agency for Agriculture and Food in reducing the amount of garbage from its origin is through the program of SI IPAH. SI IPAH is an innovation in garbage management by separating organic and inorganic garbage. The following is the draft of the program concept of SI IPAH as shown in Figure 1.
SI IPAH program is the result of transformation program of Organic Kampong implementing the 3R-based garbage management (Reuse, Reduce, Recycle). Organic Kampong has been in its existence since 2013. In 2013, the districts where organic kampong is implemented received some help from the mayor in the forms of program and financial aid so that the program of organic kampong could run well. After 2013, however, they did not receive any support from the government anymore. Therefore, the number of organic kampongs had been decreasing from 60 to 29 by the end of 2018. The implementation percentage of organic kampong, according to the Agency of Living Environment, is only 10%. Meanwhile, the program of organic kampong itself is in the condition of being stagnant in 2019. The mindset of the people has also been changing, from previously aimed at reducing the amount of garbage to merely planting organic vegetables. Meanwhile, inorganic garbage is only collected at the garbage bank and then taken by a picker (someone who is willing to buy certain selected items from garbage). The city of Magelang has 40 garbage banks spreading in every RW (Rukun Warga / administrative unit as the next-to-lowest level in city) They are able to make products made from recycled items taken from the garbage such as bags from packs of sachet drinks, artificial flower from plastic bags etc. Even though they are able to make products from recycled items, there is an obstacle faced. The obstacle is that there are hardly any buyers. Consequently, the local government is forced to buy them. Most of the products are purchased by the local government and they are used in certain events.

Another problem dealing with garbage management in the city of Magelang is means of garbage transportation. The transportation of garbage that is still mixed between organic and inorganic has also still been an obstacle in succeeding the SI IPAH program. This is because most of the people do not provide buckets or cans for organic garbage. In addition, the number of means of garbage transportation provided by the Agency for Living Environment is also still limited.

In addition to the reduction of garbage, the coverage of smart environment that needs to be achieved is the reduction of water pollution. Water pollution in the city of Magelang is mostly caused by domestic waste directly dumped into rivers. In relation to this, there has been no regulation in this case. This is related to the effective law that the quality of water is the authority of the Agency for PSDA with its provincial coverage of Central Java. Therefore, there should be cooperation between the provincial and local governments in making regulations in this case. What the city of Magelang has done so far to preserve the quality of water is by socializing the prohibition of BABS (Buang Air, Buang Sampah sembarangan / having bowel motion & waterworks, and dumping garbage into rivers).
The program and socialization related to smart environment mentioned above is of a conventional way, not applying the ICT. The resource person from BAPPEDA is quoted as saying that technology is not of primary importance because the community system does not have awareness in relation to the garbage management.

Even though smart city is inevitably directed to the use of technology, I would rather the system were developed first. Technology is only a supporting means in order that the system could run well. I prefer to emphasize on the human factor first. Technology is only a supporting means when the people have become aware. Therefore, system, in my opinion, needs to be established first. Being smart is how to make the system run well. It is the technology that helps the system become better. Smart environment is possibly related to the use of technology, e.g. the scheduling in this place is using which vehicle to take. It is technology, isn’t it? The way to process compost also applies technology. In my opinion, the understanding of being smart tends to be the system (informant).

SI IPAH program that becomes an outstanding one of the city of Magelang has not also been in the agenda of bringing it into technology. It focuses on empowering community in order that they become aware of the existing problems. Meanwhile, the city of Magelang through the Agency for Living Environment working together with the provincial government is developing an application called SIPOLA (Sistem Pengolahan Sampah / Garbage Processing System). The implementation progress of this application has reached to the stage of inputting data by the related OPDs so that the local community still cannot make use of it. This application is predicted to be launched into the public of the city of Magelang and the Central Java in the beginning of 2020.

The implementation of smart environment in the city of Magelang has been signed with the existence of blogger Kampong in Menowo, the Village of Kedungsari. The availability of hotspots in certain public places is also another implementation of smart environment. In addition, a program that has been implemented related to smart environment is KissMe (the program providing the data of poor families and it can be accessed transparently). It is used to support the program of poverty eradication. In addition, another program found is Si Bahenol (service for online regional tax payment – BIHTP online). Other programs related to smart environment are DataGo, the use of SIG (Sistim Informasi Geospasial / Geospatial Information System), e-Filling, e-budgeting (LPSE), SIMDA Keu and asset, and payment services for vehicle tax in one place.

3.3. The role of urban environmental management toward smart city

Environmental management of water and soil belongs to the dimension of smart environment in the concept of smart city. The government, private sectors, and community have to work together as a team in the environmental management. The city government of Magelang is presently encouraging OPDs, elementary schools, and junior secondary schools to reduce the volume of garbage. The role of the government in the environmental management is by making some regulations into effect. One of them is by not providing any fund for packed or canned drinks so that OPDs are obliged to have their own drink container to their office. The same case is when there is lunch in offices during meetings. Lunch meal is forbidden to be served in boxes. Instead, the meal is put on the table or it is called a buffet lunch. Thus, they have to use plates for lunch. This regulation has been effective since May 2019 and it leads to a positive effect in reducing garbage. The city government of Magelang has been socializing this regulation step by step, beginning with OPDs and then schools. When this program is successfully implemented, OPDs and schools can be a good example and that socializing this regulation to community is then easier implemented.

Good quality of air in the city of Magelang is supported the existence of Tidar hill. In addition, the slogan “A City with Millions of Flowers” also plays an important role in environmental management in achieving as a smart city. The BAPPEDA of the city of Magelang is presently making a masterplan to make use of Tidar hill into UPTD Tidar Hill Garden of Magelang. This garden will provide several
benefits. They can be, among others, facilities for RTH (Ruang Terbuka Hijau / Green Open Space), education, research, environment (mildness and oxygen), and tourism. This masterplan has been formally agreed by LIPI because it fulfils some requirements related to the criteria of a botanical garden, i.e. facilities for parking, visitors, offices, and conservation. When Tidar hill turns into a botanical garden, this can be one of the ways of the city government of Magelang to avoid the management transfer from the city government to the central government. This is because it is in line with Law no. 23 Year 2014 on Regional Government, saying that forest belongs to the authority of central government. In the future, Tidar hill is expected to function as a green zone. Any activities related to tourism and religious rites that have been in existence there do not experience any change.

The quality of water in the city of Magelang also needs to be maintained by the Agency for PSDA (Pengelolaan Sumber Daya Air / Water Resource Management) together with other Agencies for Living Environment of the Province of Central Java. This is because water is the responsibility of the city/regency government and the provincial government of Central Java. There should be an integral management among the government, private sectors, and community in environmental management. Good cooperation among them will lead to the creation of social, cultural, and economical transformations to the local community so that they will become aware of their own environment and that a system can be established. It is this system that can be accelerated with the help of the most advanced technology. By doing so, good environmental management that is supported with the most advanced technology will help make the city of Magelang as a smart city come true. The efforts of Magelang City in becoming smart environment city is quite good, yet the role of ICT is still not implemented well, as stated by an informant from regional development planning board. The same thing was said as well by other informants.

4. Conclusion
From the results of the research, it can be concluded that in relation to environmental management the city of Magelang is supported with several factors of good quality of air, well-run garbage banks, and well-arranged city as what a city needs. Environmental management has supported the establishment of a smart city in the city of Magelang by doing activities like the reduction of garbage, the reduction of pollution, economizing energy, improving the quality of human resources, and the use of technology. The role of the government, private sectors, and community will result in an integrated system. Since the role of technology and ICT in this research is still limited, in the future research needed more detailed data collecting from other sources as well as the community. In addition, government should apply ICT in boosting smart environment.

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