Smart Kampung: Characterisation of Surabaya Urban Coastal Settlements through Smart City Measurement

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Abstract. Surabaya is a metropolitan city in Indonesia, with the 4 million population. Therefore, it takes the smart city system to help The Government to optimize their service for citizen needs, and increasing its life quality, by putting interaction in the community based on ICT. Surabaya as a coastal city located on north coast of East Java Province make this city has several district in coastal area, one of them is Bulak District which is known as the fishing settlement integrated with tourism. Their character, totally different with midtown settlement. So do the given policy, there will be a difference treatments between coastal and midtown settlement. Therefore, it is necessary to explore the characteristic of coastal settlements that will support Surabaya as a smart city. This study aims to determine the criteria of urban settlements development in Surabaya based on smart city concept, focused on coastal urban settlement. To achieve this goal, it will use qualitative and quantitative approach (mixed method) which focuses on field conditions and community preferences in the location of settlement in the study area and must be through the 3 stage analysis. The first stage is identifying the smart potentials of coastal settlement using qualitative descriptive analysis. The second is identifying influential variables with using Confirmatory Factor Analysis feature on SmartPLS Application. The third was a determination of smart coastal settlement criteria using Pairwise comparison-triangulation. The result is there are 13 criteria of smart coastal settlement, spread on 6 major dimension. These criteria became a basic of dynamic measurement for smartkampung prototype which has so far resulted for identification and intelligence character on Bulak coastal settlement, included an entrepreneurship activities with local resources and uses ICT in its development; good accessibility which supported by the community’s ability to follow transportation technology; ICT-based environmental management activities and community participation; creative community, open-technology-minded and able to preserve local coastal culture; sea tidal disaster free area that is equipped with mitigation facilities; developing an ICT-based tourist attraction area, and also achieving positive impact from the online Government’s service.

Key Words: coastal settlement, smart city, Surabaya

1. Introduction

Surabaya is a metropolitan city with around 4 million population, causing more problems that faced by The Government and its people. To keep the standard of living, The Government uses a smart concept, called as smart city concept, which based on ICT (information and communication technology) that can make a livable, safe, comfortable and sustainable city. This concept can be seen as an urban planning model that can reduce and fix the urban problems nowadays, so the city will be a comfort place to live [1]. Smart city is a concept that uses ICT in 6 dimensions of life as follows: smart economy, smart people, smart living, smart environment, smart mobility and smart governance [2].

Surabaya has become a smart city based on its potential and characteristics, and also manage their resources effective and efficiently to solve several challenges with innovative, integrated and sustainable
solution to provide infrastructure and service that can make quality of life up. It proved by 14 awards, achieved in the “Rating Kota Cerdas Indonesia 2017” event. However, this achievement has not completed all the dimensions yet, so it needs some efforts to make Surabaya completes all the dimension line of smart city that one of which is settlement [3].

Based on population, settlement is the most important and dominant dimension in Surabaya. There are distinguished characteristics of housing needs in Surabaya based on its process, formal housing and informal housing, so-called with the name kampung. Related to that, Surabaya is a coastal city located on north coast of East Java Province that makes this city has several districts in coastal area. This is mentioned with government policy on Detailed Urban Spatial Planning document [4,5], about the coastal settlement development located in Bulak District. To proving if a coastal settlement can support Surabaya as a smart city, needed a two-way perspective assessment through a top-down and bottom-up approach [6]. The top-down approach is used to find the smart potentials of coastal settlements based on smart city concept, and the bottom-up approach is used to build a smart perspective according to the people on the coast.

Bulak District has some smart potencies that can support Surabaya as a smart city as follows: there’s a Fish Landing Base Infrastructure development plan in it; there’s an embankment to anticipate the settlement from tidal flooding; there are several tourist attractions, one of them is a colorful settlement (kampung warna-warni); and there’s economic development such as sea result processing into new products like crackers and smoked fish.

These potentials describe the relationship between the characteristics of coastal settlements and the development of smart city in Surabaya. It’s mean that all problems in coastal settlements can be solved by the dimensions of smart city concept. Therefore, it is necessary to explore the characteristics of coastal settlements that will support Surabaya as a smart city [7], which can describe smart coastal settlements's criteria development. The question of this study is “what are the development criteria that show coastal settlements as smart kampung?”.  

2. Methods

Based on problems discussed, this study of exploration the smart coastal settlements’s criteria is using qualitative and quantitative approach (mixed method) which focuses on field conditions and community preferences in the location of settlement in the study area. Qualitative methods are needed to produce descriptive data from interviewing people and something observed. While quantitative methods are needed to reduce the subjectivity of researchers in obtaining and interpreting data. In determining smart coastal settlement’s criteria that can support Surabaya as a smart city, needed a two-way perspective assessment through a top-down and bottom-up approach [6].

There are 3 stages of analysis, the first is identifying the coastal settlements’s potencies based on smart city concept. This first identification stage is done through observation and interviews (in depth interviews) to some people who are considered capable to representing coastal communities and have knowledge of coastal settlement in this study area. Then, data that have been obtained will be processed with qualitative descriptive analysis to take the conclusion about smart potentials of Bulak coastal settlement that are aligned with the related theories.

The second stage is identifying the influential variables according to preferences of people in coastal settlements based on smart city concept. This stage is done by distributing questionnaires to coastal communities. The questionnaires contain all the variables that are expected to influence the determination of smart settlement’s criteria. The result will be obtained from assessments conducted by people on coast.
And then to sort out the variables, the results will be calculated and processed by using a Confirmatory Factor Analysis (CFA) method on SmartPls application. The research variables can be said valid with the following specifications: loading factor >0.5; composite reliability >0.7; AVE >0.5; t-statistics ≥1.96 and p-value ≥0.05.

The last stage is determining the smart coastal settlement’s criteria based on smart city concept. Different with the previous two stages, a top-down approach is used at this stage. This stage will combine some potentials from the uninfluential variables to influential variables using Pairwise Comparison method. And it will be continue with Triangulation method to combine the previous two analysis results with the policy and best practice, and also the opinions of experts who have settlement and smart city knowledge. Triangulation uses to correct the criteria by adjusting the plans that have been drafted by the government and theories that have been created by academic experts.

3. Result and Discussions

To determine the criteria of smart settlement in Bulak District, it is necessary to identify the smart potentials of the coastal settlement that will be explained by people in the Bulak coastal settlement. This first stage is done through observation and interviews (in depth interviews) with some questions about variables in each dimension of smart city concept. The variables used were obtained from several leading theories about smart city concepts, one of which was proposed by Cohen [8] who create the Smart City Wheel (Figure 1) and spreaded out the smart city in to 6 dimensions.

![Figure 1. Smart City Wheel [8].](image)

Other author [2] explained in more detail about 6 dimensions above. Smart governance emphasizes the conditions of good governance by establishing relations between the city government and its people. Smart economy which can be said as smart industries, which in its concept explains that this area is supported by various uses of information and communication technology including in the production process and carrying out its economic activities. Smart people are explained by people who have good skills and education levels, and who have good quality in integrating social life and can make a wide network of cooperation [9]. Smart living is cumulating several aspects of life to improve the quality of life of urban communities such as culture, health, security, housing, tourism, etc. Smart environment is an effort to protect the urban environment using technology. While smart mobility is a provision of access to new technology that can be used every day by the community, and the available infrastructure can share and process various information quickly from various places by users [10].

Based on the theory mentioned above, this study will distribute the dimensions of smart city to a smaller scope such as settlement in coastal area. Each variable has its own potential. The results of potentials identify from Bulak coastal settlement are described in Table 1.
## Table 1. The smart potentials of Bulak coastal settlement in Surabaya.

| No | Dimensions of Smart City | Variable                              | Potency                                                                                                                                                                                                 |
|----|--------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Household-based economic activities | This settlements has UKM-shaped economic activities with products output. |
| 2  | Entrepreneurship activities | Another professions from fisherman families as entrepreneurs, because sea resources will be produced into new products by themselves. |
| 3  | Market range              | This settlements has become a brand image for the Surabaya people as a place to buy some sea resources processed products. |
| 4  | Coasts productivity       | The community uses local sea resources to support their economic activities. |
| 5  | Quality of producing      | Seashell waste will be produced into new products such as paving, handicrafts and animal feeds. And another fish waste are easily decomposed. |
| 6  | Smart Economy             | The level of business innovation can be seen from number of types product produced and also from other trades. |
| 7  |                          | Economic activities greatly helpful to increase the income of people in this settlements. |
| 8  | The citra of area         | This settlements is known as a coastal area that can produces sea resources processed products. |
| 9  | Internet usage in economic activities | Some people have already sold their products through internet. |
| 10 | Technology usage in economic activities | Processing of marine products by UKM used several modern machine technologies. Some of this marine products are sale on Bulak Fish Center, using e-payment system (OVO). |
| 11 | Road conditions           | Paving is a kind of road pavement in this settlements. The width of the road around 2 metres with good condition. And there is 4 metre wide inspection road that can be passed by cars. |
| 12 | Smart Mobility            | Just only 2 or 3-wheeled vehicles that can pass this road. For 4-wheeled vehicles can pass by inspection road. |
| 13 | Regulation of transportation | For riders are required to turn off their engine and guide the vehicle in this settlements. |
| 14 | Transportation technology awareness | The community is able to using and following the development of transport technologies such as taxibike online. |
| No. | Category                                      | Description                                                                                                                                                                                                 |
|-----|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15  | Connecting system for land - sea transportation | • There are no connecting facilities between sea and land transportations, society parked boats marked only by ordinary wooden stakes.                                                                          |
| 16  | Environmental condition                       | • The environment is more cleaner than before, and there is a little green space.                                                                                                                             |
| 17  | Level of pollution                            | • There is only air pollution from fish fumigation activities in this settlements.                                                                                                                            |
| 18  | Building landscape                            | • The building in this settlements is quite neatly arranged.                                                                                                                                                   |
| 19  | Environmental management programs             | • There are some environmental management programs such as garbage bank system (named as bank sampah), society-cooperation work (named as kerja bakti) and seashell waste processing into new products. |
| 20  | Smart Environment                             | • In seashell waste processing, the community uses a seashell crusher and there are also some WWTPs that are still functioning.                                                                              |
| 21  | Community contributions in environmental management | • Society-cooperation work (named as kerja bakti) arranged by all settlements communities, held on unperiodic times, and the housewives do the garbage bank system (bank sampah). |
| 22  | Availability of environment facilities        | • There is a land fill and green open space around the settlements area.                                                                                                                                       |
| 23  | Availability of environment infrastructures   | • There is a trash can for each house, garbage carts for each neighborhood unit, and some WWTPs.                                                                                                              |
| 24  | Level of education                            | • The community has studied until high school and university.                                                                                                                                                |
| 25  | Level of creativity                           | • The high level of creativity can be seen from several walls drawn by murals and some handicrafts made.                                                                                                      |
| 26  | Openness                                      | • People tend to be open about new things in their settlements development.                                                                                                                                     |
| 27  | Community empowerment activities               | • There are empowerment activities such as routine recitation for adults to elder and drumband for children to adults.                                                                                      |
| 28  | Participation of community                    | • Many people participate in routine recitation and drumband activities.                                                                                                                                       |
| 29  | Internet usage in daily                       | • Most of the people in this settlements, especially young people, have used smartphones.                                                                                                                     |
| 30  | Coastal cultural resilience                   | • There are coastal cultures that still preserved such as boat racing competitions, boat decoration and istighosah on a boat using a torch.                                                                   |
| 31  | Level of crime                                | • The crime rate is low because people know each other.                                                                                                                                                      |
| 32  | Security system                               | • There is no criminal security system in this settlements. But there is a security system for fire disaster such as their own fire station.                                                              |
| 33  | Smart Living                                  | • There is no impact from tidal flood in this settlements.                                                                                                                                                   |
| 34  | The impact of tidal flood                     | • There is no mitigation system in this settlements.                                                                                                                                                         |
| 35  | Safety system for tidal flood                 | • Health facilities have been fulfilled with an affordable and easily accessible.                                                                                                                               |
|     | Health Facilities                             |                                                                                                                                                                                                           |
Education Facilities
- Education facilities have been fulfilled for the playgroup level to elementary school and are easily accessible because it is near from settlement.

Availability of internet network
- There are free Wi-Fi facilities with good quality.
- There are embankments, toas, and drone videos to prevent the impact of the tidal flood in this settlements.

Tourist attraction
- There are some tourist attractions such as Colorful Settlements (kampung warna-warni), Surabaya Bridge, Kenpark Atlantis, THP Kenjeran, coastal market named as Sentra Ikan Bulak and Surabaya Park.

IT usage in tourist attraction
- All tourist attractions have been exposed to internet.

Online-based public service
- There is an online-based public service such as e-Lampid with e-kiosk machine.
- Most people who are able to use technology in daily, can use this online-based public service too.
- It is very helpful to make it easier and shorten the time of the community in taking care of letters and registration for medical treatment.

The description above is only based on data obtained from several community leaders who are representing the coastal communities. So it needs another identification that directly involves the community in determining criteria, namely identification of influential variables. The research variables can be said valid with the following specifications: loading factor >0.5; composite reliability >0.7; AVE >0.5; t-statistics ≥1.96 and p-value ≥0.05 (Table 2a, 2b, 2c, 2d). From the 43 initial variables formed, there are 22 variables that influence according to coastal settlement communities which will be described in Table 3.

| No. | Dimensions of Smart City | Variable Code | The Influence Variables | Loading Factor Value |
|-----|--------------------------|---------------|-------------------------|----------------------|
| 1   | Smart Economy            | SEc1          | Household-based economic activities | 0.855 |
| 2   |                          | SEc2          | Entrepreneurship activities | 0.619 |
| 3   |                          | SEc3          | Market Range | 0.731 |
| 4   |                          | SEc5          | Quality of Producing | 0.567 |
| 5   |                          | SEc8          | The citra of area | 0.553 |
| 6   |                          | SEc9          | Internet usage in economic activities | 0.869 |
| 7   |                          | SEc10         | Technology usage in economic activities | 0.831 |
| 8   | Smart Mobility           | SM3           | Regulation of transportation | 0.793 |
| 9   |                          | SM4           | Transportation technology awareness | 0.833 |
| 10  | Smart Environment        | SEn4          | Environment management programs | 0.849 |
| 11  |                          | SEn6          | Community contributions in environmental management | 0.612 |
| 12  |                          | SEn7          | Availability of environment facilities | 0.783 |
| 13  |                          | SEn8          | Availability of environment infrastructures | 0.606 |
| 14  | Smart People             | SP2           | Level of creativity | 0.679 |
| 15  |                          | SP3           | Openness | 0.620 |
| 16  |                          | SP6           | Internet usage in daily | 0.622 |
| 17  |                          | SP7           | Coastal cultural resilience | 0.890 |
| 18  | Smart Living             | SL8           | The tidal flood mitigation infrastructure | 0.948 |
| 19  |                          | SL10          | IT usage in tourist attraction | 0.516 |
| 20  | Smart Governance         | SG1           | Online-based public service | 0.868 |
| 21  |                          | SG2           | Number of online access | 0.915 |
| 22  |                          | SG3           | The impact of online-based public service | 0.918 |
Table 2b. The result of reliability test

| Latent Variable | Composite Reliability | Average Variance Extracted (AVE) |
|-----------------|-----------------------|----------------------------------|
| Smart Economy   | 0.885                 | 0.532                            |
| Smart Mobility  | 0.796                 | 0.662                            |
| Smart Environment | 0.808               | 0.519                            |
| Smart People    | 0.800                 | 0.506                            |
| Smart Living    | 0.720                 | 0.582                            |
| Smart Government| 0.928                 | 0.811                            |

Table 2d. The result of P-Value test

| Latent Variable | Original Sample | T-statistics | P-Value |
|-----------------|-----------------|--------------|---------|
| Smart Economy   | 0.732           | 9,703        | 0.000   |
| Smart Mobility  | 0.828           | 26,220       | 0.000   |
| Smart Environment | 0.426          | 4,547        | 0.000   |
| Smart People    | 0.909           | 64,806       | 0.000   |
| Smart Living    | 0.859           | 36,203       | 0.000   |
| Smart Government| 0.390           | 3,638        | 0.000   |

Table 2c. The result of t-statistics test

| Latent Variable | Indicator | Loading Factor | T-Statistics |
|-----------------|-----------|----------------|--------------|
| Smart Economy   | SEc1      | 0.855          | 19,194       |
|                 | SEc2      | 0.619          | 9,391        |
|                 | SEc3      | 0.731          | 12,959       |
|                 | SEc5      | 0.567          | 9,490        |
|                 | SEc8      | 0.553          | 6,735        |
|                 | SEc9      | 0.869          | 23,296       |
|                 | SEc10     | 0.831          | 14,384       |
| Smart Mobility  | SM3       | 0.793          | 14,084       |
|                 | SM4       | 0.833          | 24,586       |
| Smart Environment | SEn4    | 0.849          | 20,806       |
|                 | SEn6      | 0.612          | 5,494        |
|                 | SEn7      | 0.783          | 10,675       |
|                 | SEn8      | 0.606          | 4,566        |
| Smart People    | SP2       | 0.679          | 10,479       |
|                 | SP3       | 0.620          | 9,132        |
|                 | SP6       | 0.622          | 7,090        |
|                 | SP7       | 0.890          | 55,817       |
| Smart Living    | SL8       | 0.948          | 39,739       |
|                 | SL10      | 0.516          | 3,659        |
| Smart Government | SG1      | 0.868          | 11,418       |
|                 | SG1       | 0.915          | 11,622       |
|                 | SG1       | 0.918          | 10,530       |
Table 3. Influential variables based on community coastal settlements preferences.

| Smart City Dimensions | The Influence Variables |
|------------------------|-------------------------|
| Smart Economy          | Household-based economic activities |
|                        | Entrepreneurship activities |
|                        | Market range |
|                        | Quality of producing |
|                        | The citra of area |
|                        | Internet usage in economic activities |
|                        | Technology usage in economic activities |
| Smart Mobility         | Regulation of transportation |
|                        | Transportation technology awareness |
| Smart Environment      | Environmental management programs |
|                        | Community contributions in environmental management |
|                        | Availability of environment facilities |
|                        | Availability of environment infrastructures |
| Smart People           | Level of creativity |
|                        | Openness |
|                        | Internet usage in daily |
|                        | Coastal cultural resilience |
| Smart Living           | The tidal flood mitigation infrastructure |
|                        | ICT usage in tourist attraction |
| Smart Governance       | Online-based public service |
|                        | Number of online access |
|                        | The impact of online-based public service |

Source: Paramasatya, D.A., et al. [6]

Based on the two steps that have been done before, the criteria will be determined by pairwise comparison and triangulation. This stage will combine some potentials from the uninfluential variables to influential variables using Pairwise Comparison method (Figure 2). And it will be continue with Triangulation method to combine the previous two analysis results with the policy and best practice, and also the opinions of experts who have settlement and smart city knowledge. Triangulation uses to correct the criteria by adjusting the plans that have been drafted by the government and theories that have been created by academic experts. This last stage obtained 13 criteria of smart settlements according to Bulak Coastal Settlements in Surabaya are described in Table 4.
| Potensi | Kode Variabel Tidak Berpengaruh | Penggabungan | Kode Variabel Berpengaruh | Variabel Berpengaruh |
|---------|---------------------------------|--------------|---------------------------|---------------------|
| Masyarakat komunitas ini menggunakan bahan baku setempat (bali nenas) untuk mendirikan kegiatan ekonomi masyarakat. | Sec4 | Sec1 | Kegiatan UKM / industri bali nenas tinggi |
| Untuk tingkat inovasi usaha di kampung ini dapat dihitung dari banyaknya jenis produk yang dihasilkan dan juga kegiatan padapanan yang dilakukan. | Sec6 | Sec2 | Kegiatan KEK tinggi |
| Kegiatan ekonomi yang dilakukan sangat membantu merevitalisasi penduduk dan masyarakat di kampung ini. | Sec7 | Sec3 | Keterjangkacauan pasar |
| Perkembangan pada kampung ini berupa paring dengan kondisi yang baik. Lebih jalan di kampung ekup sampai yang kini x2 meter, namun terdapat jalan inspeksi yang cukup lebar dan dapat dilakoni kendaraan roda-4. | Sni1 | Sec8 | Reputasi Sawasan |
| Kendaraan yang dapat melalui jalan di kampung ini adalah kendaraan roda 2-3 atau. Untuk kendaraan roda 4 dapat melalui jalan inspeksi. | Sec9 | Sec10 | Penggunaan internet dalam kegiatan ekonomi |
| Pada kampung ini belum terdapat sama penghubung antara transportasi darat dan laut, perlu yang dipertahatanya untuk peningkatan. | Sm2 | Sm3 | Penyediaan teknologi dan kegiatan ekonomi |
| Lingkungan kampung ini sudah jauh lebih bersih dan terlakukan sedikit penghijauan. | Sm5 | Sm4 | Kondisi kebersihan pengoalan lingkungan |
| Pada kampung ini hanya terdapat pelaku usaha yang berbadah dari kegiatan pengasuhan ibu. | Sen1 | Sen2 | Kegiatan pengoalan lingkungan |
| Bangunan pada kampung ini cukup terlalu dengan ragi. | Sen3 | Sen4 | Kontribusi yang dalam pengoalan lingkungan |
| Dalam pengoalan limbah kulit kerang mengoalan masin pengoalan kulit kerang dan juga terdapat beberapa IPAL yang masih beroperasi. | Sen5 | Sen6 | Terdortality satu (TPS / TPS terbuka bersama) |
| Masyarakat telah melunak pendidikan sampai SMA dan Perguruan Tinggi. | Sp1 | Sp2 | Pendidikan sampai penerapan (TPS / TPS terbuka bersama) |
| Tentap kegiatan peribadatan seperti pengoalan rumah dan rumah dan rumah untuk anak-anak hingga dewasa. Seluruh itu terdapat kegiatan penerapan seperti sosial dan kegiatan penerapan. | Sp4 | Sp3 | Pendidikan dan kegiatan penerapan (TPS / TPS terbuka bersama) |
| Banyak masyarakat yang mengoalan kegiatan pengoalan rumah, rumah dan rumah untuk anak-anak sampai penerapan. | Sp5 | Sp6 | Pendidikan dan kegiatan penerapan (TPS / TPS terbuka bersama) |
| Tingkat kriminalitas rendah karena masyarakat saling mengenal satu sama lain. | SI1 | SI2 | Kebertarakan budaya pesisir |
| Tidak terdapat sistem kemurnian kriminalitas di kampung ini. Namun untuk sistem keamanan untuk bencana kebakaran, kampung pesisir di kecamatan ini sudah memiliki Pos Damkar sendiri. | SI3 | SI4 | Sistem penerapan mitigasi bencana banjir tub |
| Sudah tidak terdapat dari nipak dari banjir rob di kampung ini. | SI5 | SI6 | Pemanfaatan TIK / Pemanfaatan TIK dalam kegiatan wisata |
| Tidak terdapat sistem keamanan atau tindakan mitigasi atau bencana banjir rob. | SI7 | SI8 | Pelatihan via online |
| Fasilitas kesehatan sudah terpenuhi dan mudah dijangkau karena dekat dengan pemerintah pemerintah. | SI9 | SI10 | Jual hal penguasa lanjutan pelatihan |
| Fasilitas pendidikan sudah terpenuhi untuk jenjang pendidikan sampai SD dan mudah dijangkau karena dekat dengan pemerintah pemerintah. Selain itu juga terdapat TBM. | Sg1 | Sg2 | Pendidikan via online |
| Terdapat fasilitas wifi gratis dengan kualitas yang cukup baik dibersamaan titik di kampung ini. | Sg3 | Sg4 | Jual hal penguasa lanjutan pelatihan |
| Pada kampung ini terdapat banyak olah wisata seperti: Jembatan Sumatera, Kecamak Advens, IOP Kampung, Sentra Ikan Bola dan Taman Sumatra. Dan kampung ini juga sebagai destinasi wisata kampung warna-warni. | Sg5 | Sg6 | Jual hal penguasa lanjutan pelatihan |

**Figure 2.** Pairwise Comparison Analysis, 2019
Table 4. The criteria of smart coastal settlements in Surabaya.

| Dimension | Criteria |
|-----------|----------|
| Economy   | There are household-based economic activities or home-based entrepreneurship that use sea resources to make products with the environmental friendly processing and use ICT in its development; There are some facilities that can give a good image to sea resources market; |
| Mobility  | The community is able to using and following the development of transport technologies; |
| Environment | There are based-technology environmental quality improvement programs by community contribution; There is implementation of waste water and waste management from sea economic activities; The quality of environment increased by the completeness of infrastructure and green space; |
| People    | A creative and open-minded society about the development, one of which is education and able to preserve local coastal culture; There are skill-improve activites such as socialization and traine which followed by the community; The community is able to implement technology usage in daily activities and supported by free internet network; |
| Living    | The area is free from tidal flooding with adequate mitigation infrastructures; There are tourist attractions with a synergy of maritime tourism concept which use ICT in its development; |
| Governance| The reacted of positive impact by public's ability to use the Online-based public service. |

4. Conclusions

This research was conducted to determine the criteria that describe the characteristics of smart coastal settlement based on the smart city concept in Surabaya. To get criteria that are suitable with the characteristics of coastal settlements, there are 3 stages of analysis that must be carried out. The first stage is identifying the smart potential of coastal settlements using qualitative descriptive analysis. After identifying the potential, it is also necessary to identify which variables are affected according to the coastal settlement community. The identified variables refer to the 6 dimensions of smart city. Then to get the results of valid criteria, the formulation of criteria obtained from a combination of potential and influential variables will be confirmed to experts in the field of housing and smart cities through triangulation analysis.

The following are the result obtained from this study which are 13 smart coastal settlements development criteria:

1. There are household-based economic activities or home-based entrepreneurship that use sea resources to make products with the environmental friendly processing and use ICT in its development
2. There are some facilities that can give a good image to sea resources market.
3. There are good accessibilities with regulation that can improve comfort.
4. The community is able to using and following the development of transport technologies.
5. There are based-technology environmental quality improvement programs by community contribution
6. There is implementation of waste water and waste management from sea economic activities
7. The quality of environment increased by the completeness of infrastructure and green space.
8. A creative and open-minded society about the development, one of which is education and able to preserve local coastal culture.
9. There are skill-improve activites such as socialization and traine which followed by the community.
10. The community is able to implement technology usage in daily activities and supported by free internet network.
11. The area is free from tidal flooding with adequate mitigation infrastructures.
12. There are tourist attractions with a synergy of maritime tourism concept which use ICT in its development.

13. The reached of positive impact by public's ability to use the Online-based public service.

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