

Social Engineering Strategy of Waste Management in River Banks of Martapura

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Abstract The aim of this study is to develop a strategy of social engineering, especially on the waste management in river banks of Martapura. This research is expected to become data base in improving waste management system to be better and sustainable. There were three types of analysis methods which were used in this study, i.e. SWOT, EFAS and IFAS analysis. We also used three strategies to improve waste management, to develop social engineering of waste management in the river bank of Martapura, e.g. *concentric strategy*, *diversifying strategy* and *normative – re-educative strategy*. The result showed that social engineering was very important to change the behaviour of people toward waste management in the river banks of Martapura. Responsibility of waste management in the banks of the Martapura River is not only for government but also for all community surround the area. Related with it, social engineering is necessary to lead people around the area in the way of better waste management and responsible to their environment, thus maintain the environment, social, and economic balance.

Keywords Behaviour, EFAS, IFAS, Martapura River Bank, Social engineering, SWOT, Waste management

1. Introduction

Some problems in waste handling were lead to imbalance between production and capability in management. Thus waste volume increase continuously in line with population growth, life quality changes and dynamics of community activities. Some negative effects also occurs when waste was not well managed, e.g. health problems, causing bad odour, soil and water pollution, and environment become less clean and less beauty. In Indonesia, waste management still become essential problem for government and community. People less aware about the negative effect of waste accumulation and they have less participation to handle it. Besides that, the government budget was still not sufficient to fulfil the proper and qualified waste disposal.

In Banjar Regency, most of wastes were come from household or settlements as much as 69.40%, from temporary market and Batuah Bauntung Market for 17.34%, 6.32% from public facilities area and 6.94% from other sources [1]. Related to this fact, in the study site of Antasan Senor Ilir village, most of waste was derived from

household which reached 7.34 m³ per day, while 1.41 m³ per day from trade area, 2.07 m³ per day from public facilities area and 1.23 m³ from public roads. If the whole wastes were not handled properly, it will influence the environment health. Based on this data, waste management efforts in the banks of Martapura River are still very limited. This means that the budget allocation is lack for socialization, planning, and implementation of waste management services along the river. The results of Ministry of Environment publication in 2009 about Environmental Quality Index showed that South Kalimantan was ranked in 26 out of 33 provinces with 48.25 point. South Kalimantan has 8.40 for water quality index. Banjar regency was ranked 10 out of 13 regencies/cities with heavily water polluted conditions criteria. It was shown by the water quality index i.e. BOD value was 8.29 mg.lt⁻¹ and COD value was 17.008 mg.lt⁻¹ [1]. This fact showed that the level of pollution in the river is fairly high.

Wastes were defined as something that is not useful anymore, so it discarded by the origin owners or users [2-5]. In this case, the Government must responsible to provide some facilities to collect and dispose waste from settlement adequately. However in fact, it was still not implemented as expected, because there were other things that should be prioritized in area development as well as the lack of funds allocated for waste management operations. This condition

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was strengthened by the principles for producer is not implemented yet. This principle tells that simultaneous producing process must also have waste management process from goods proficiency level.

Generally, waste problems arise because of low community engagement efforts and internalization process since they developed the program. Soekanto [6] and Sunarto *et al.* [7] reported that changes have been planned in advance by those who want to make changes in society; which was called *agent of change*. They usually are person or group of people with public confidence as a leader of one or more social institutions. This social engineering is needed in order to make social change thus the consciousness and behaviour of the public on waste management can be improved. Assessment of social engineering of waste management is a very interesting and strategic study. This study is an attempt to overcome the problem of waste on the banks of the Martapura River related to the increasing amount of waste.

Social engineering is the art of scientific manipulation movement from certain ideal vision. The aimed of this manipulation is to influence social changes which can be either good or bad things. It can also be honesty or lie. Social change was arisen through social problems which has differences between what supposed to be and reality. Collective action to solve social problems was usually marked by changes in the form and functioning of groups, organizations or important social order [8]. Social engineering can also be interpreted as a process of planning, mapping, and implementation in the context of changes in the structure and culture of a community's social base [9]. Through development of thinking, there are three forms of social change: *the evolution, revolution and reform*.

The aim of this study is to develop a strategy of social engineering on the waste management in the banks of Martapura River. This study was expected to be data base for appropriate strategy on waste management. It was emphasize on behavioural changes that can be applied in areas along the river, especially in the banks of Martapura River.

2. Research Method

This study used a qualitative approach with field observation and structured interviews data collection. Data were analysed using the SWOT analysis (Strength, Weakness, Opportunity, Threats), EFAS (External Factors Analysis Summary) and IFAS (Internal Factors Analysis Summary). Determination of some factors in SWOT analysis was important as database to determine some strategies to improve corrective planning of waste management.

2.1. Study Site

Criterion based selection method was used to determine study sites. It was based on some criteria that include background and certain events in that place, in order to get

complete information [10]. Based on six criteria, this study has been held in the banks of Martapura River, Antasan Senor Ilir village, East Martapura Sub-regency. This criteria were consist of (1) absence of waste management services from government and non-government institutions, (2) shabby environment, (3) absence of water network (*PDAM*), (4) the behaviour of people around the area who inclined littering the wastes into the Martapura River, (5) absence of access for four wheels, and (6) toilet activities were still done in the river.

2.2. Data Collection

The primary survey was conducted with field observations and structured interviews. Field survey was carried out for six months (January - July 2014). Communities around the banks of Martapura River and the government as policy maker were used as respondents. Society as respondents was drawn randomly in three study sites. There were three steps that used in primary survey. First step was identified the strengths and weaknesses of physical characteristics, economic and social culture of community along the banks of Martapura River. The second step was identified the potential and problems, as well as detecting the macro environment (external) that may affect current and future waste management. And the last one was formulate the strategy options that can be implemented with combine and reflect on four indicators: strength (S), weaknesses (W), opportunities (O), and threats (T) which has been found in the two previous steps.

2.3. Data Analysis

SWOT, IFAS and EFAS analysis were used to determine the waste management strategy of social engineering on the banks of Martapura River. SWOT analysis was useful for determine some factors that may influence waste management development along the river. Besides that, it was necessary to identify and inventory the Strengths, Weaknesses, Opportunities and Threats factors. These factors were necessary as database for determining the next development corrective plan [11-13].

Basic concepts to develop waste management were determined by SWOT analysis and through some assessment (weighting) using IFAS-EFAS analysis. The results of the assessment were displayed in quadrants form. Each quadrant was used to determine further management strategy. Assessment was done in each aspect with give a value from 0.00 to 1.00. If each aspect of the factors (internal/external) were accumulated, it will score 1. Beside assessed, each aspect were ranked to show the level of interests (1 = not important; 2 = slightly important, 3 = important, 4 = very important). After that, assessment score multiplied with predetermined rating, and sum each factors (both internal and external). The total sum was used to find the position of each aspect in SWOT quadrant, thus development strategy could be determined easily [11, 14].



Figure 1. Study Sites (Source: Bapedda Banjar)

There were variations of strategy Options in each quadrant. In quadrant I, the situation was very advantageous because the area has the opportunity and strength in waste management in the banks of Martapura River. Aggressive strategy was adopted for waste management in the banks of Martapura River. In quadrant II, there were some threats and also internal strengths in waste management in the banks of Martapura River. Diversifications strategy was adopted to manage wastes in the banks of Martapura River for the long term program. In quadrant III, Martapura River has the opportunity at once the internal weaknesses have been overcome during waste management. Minimize internal problems was become the best strategy to solve it. In quadrant IV, the internal situation around Martapura River was very unfavourable. Waiting a response and the activity of the government and communities may become suitable strategy [13, 15].

3. Results and Discussion

3.1. SWOT Analysis

SWOT analysis was used to interpret the location of waste management planning, particularly in very complex conditions which internal and external factors may play important role. Through SWOT analysis, strengths and open opportunities were ascertainable as a positive factor,

whereas weaknesses and threats as negative factor [16, 17]. Some strategies which called as core strategy must contain three principles such as:

- Strategy that utilized the existing strengths and opportunities
- Strategies that solved the existing threats
- Strategies that improve the weaknesses

Literally, SWOT is an acronym that consists of four concepts:

- *S (strength/force)*: a state or condition that is considered good.
- *W (weakness/problems)*: a state or condition that is considered as weaknesses or problems
- *O (opportunity/chance)*: a state or condition that exists or that will occur around the area that may useful for potential development
- *T (Threat/inhibition)*: a situation/condition that exists or that will occur around the area that is considered to inhibit/threatening potential development.

Social engineering can be interpreted as a process of planning, mapping, and implementation in the context of the changes of structure and culture of a community's social base [9]. Each variables and indicators in the SWOT analysis were related to each other and it may directly affect on waste management in the bank Martapura River.

Identification process of each variables and indicators were needed to determine the management strategies. SWOT variables identification describes as follow.

3.1.1. Strength

- a) Some people in the banks of Martapura River were already have the source of clean water
- b) Some people were already has a place to shower, washing and toilet, although still used jointly
- c) There was physical development in the Martapura River Bank by the government of Banjar Regency
- d) Most people along the Martapura River Banks were at productive age
- e) Communities' knowledge along the Martapura River Banks about waste management are at moderate level
- f) Waste management were accepted well by communities along the banks of Martapura
- g) Waste management mechanism which created by the government of Banjar Regency has been clear
- h) Maintenance of facilities and waste management is running well.

3.1.2. Weaknesses

- a) There were still people's habit who inclined littering the wastes into the river
- b) There was long distance between temporary landfill and the Martapura River Banks
- c) There was long distance between landfill and the Martapura River Banks
- d) Many people were still has income less than Rp.1.000.000,-
- e) Education level of many people in the banks of Martapura river was still low
- f) Communities in the Martapura river banks were not active in social organizations yet
- g) The ability to synthesize the knowledge about waste management in the Martapura river banks was still low
- h) There was no public figure who was concerned on waste management in the Martapura river banks

3.1.3. Opportunity

- a) Facilities and waste trucks were already adequate
- b) Landfill has been appropriate with the rules
- c) Composting activities could reduce volume of wastes. It was conducted with collecting the wastes and separating the most of organic material
- d) Reducing emissions of greenhouse gases (CH₄, CO₂)

- e) Composting activity were produced compost which has economic value
- f) The presence of waste was provide new jobs for the community
- g) Reducing the environmental burden
- h) Utilization of methane gas which was flowed from productive waste through filtration process. It could be alternative energy as positive value for the community around the area of landfill *Cahaya Kencana* in Banjar Regency

3.1.4. Threat

- a) They still very dependent to the river
- b) The scope of waste management services in the Martapura District as much as 46.87%, while in the East Martapura District as much as 5.83 %
- c) The level of waste management services in Banjar Regency was reached 11.64 %
- d) The conditions of topography and demographics are not enough to support the waste management. It shown from the distance between the landfill which was very far from city central. Besides that, the road conditions was damaged which make the garbage trucks difficult to access
- e) Waste accumulation were increased each year continually in line with population growth rate in Banjar Regency
- f) Flood disaster was caused by accumulation of waste in Martapura River
- g) Dengue disease was caused by condition of dirty environment around the banks of Martapura River

3.2. IFAS Matrix

Based on analysis of strengths and weaknesses variables, IFAS (*Internal Factor Analysis Strategy*) matrix was obtained (Table 1). This analysis was conducted especially on internal factors of waste management in the banks of Martapura River.

There were many internal factors that support waste management in the banks of Martapura River. It was shown by total score of strength variable was higher than weakness variable, respectively 1.28 and 1.11 (Table 1).

3.3. EFAS Matrix

According to the opportunities and threats variables which predetermined in SWOT analysis, metrics of EFAS (*External Factor Analysis Strategy*) analysis was obtained (Table 2). This metrics was focus on external environment factors of waste management in the banks of Martapura River.

Table 1. Matrix of IFAS Analysis

Internal Factors	Score	Rank	Score x Rank
Strength :			
• Most households were already have the well as source of clean water	0.09	3	0.27
• Some people were already has a place to shower, washing and toilet activities, although still used jointly	0.08	2	0.16
• There was physical development in the Martapura River Bank by the government	0.07	2	0.14
• Most people along the banks of Martapura River were already at productive age	0.05	3	0.15
• Communities' knowledge along the banks of Martapura River about waste management are at moderate level	0.04	2	0.08
• Waste management was well accepted by communities along the banks	0.04	3	0.12
• Waste management mechanism which created by the government has been clear	0.09	2	0.18
• Maintenance of facilities and waste management is running well.	0.06	3	0.18
Total of Strength	0.52		1.28
Weakness			
• There were still people's habit who inclined littering the wastes into the river	0.08	3	0.24
• There was long distance between temporary landfill and the Martapura River Banks	0.07	1	0.07
• There was long distance between landfill and the banks of Martapura river	0.03	1	0.03
• Many people were still has income less than Rp 1.000.000,00	0.06	2	0.12
• Education level of many people in the banks of Martapura River was still low	0.07	2	0.14
• Communities in the banks of Martapura River were not active in social organizations yet	0.06	2	0.12
• The ability to synthesize the knowledge on waste management in the banks of Martapura River was still low	0.07	3	0.21
• There was no public figure who was concerned on waste management in the banks of Martapura River	0.06	3	0.18
Total of Weakness	0.5		1.11
Total of IFAS	1.02		2.39

Table 2. Matrix of EFAS Analysis

Internal Factors	Score	Rating	Score x Rating
Opportunity:			
• Facilities & waste trucks were adequate	0.09	2	0.18
• Landfill has been appropriate to the rules	0.08	2	0.16
• Composting activities could reduce volume of wastes. It was conducted with collecting the wastes and separating the most of organic material	0.09	3	0.27
• Reducing emissions of greenhouse gases (CH ₄ , CO ₂)	0.07	3	0.21
• Composting activity were produced compost which has economically value	0.06	2	0.12
• The presence of waste provide new jobs for the community	0.05	1	0.05
• Reducing the environmental burden	0.06	2	0.12
• Utilization of methane gas which was flowed from productive waste through filtration process. It could be an alternative energy as positive value for the community around <i>Cahaya Kencana</i> landfill in Banjar Regency	0.04	3	0.12
Total of Opportunity	0.54		1.23
Threat			
• They still very dependent to the river			
• The scope of waste management services in the Martapura district as much as 46.87%, while in the East Martapura District as much as 5.83 %	0.09	3	0.27
• The level of waste management services in Banjar regency was reached 11.64 %	0.08	3	0.24
• Conditions of topography and demographics are not enough to support the waste management. It shown from the distance between the landfill which was very far from city central. Besides that, the road conditions was damaged which make the garbage trucks difficult to access	0.09	2	0.18
• Waste accumulation were increased each year continually in line with population growth rate in the Banjar Regency	0.07	2	0.14
• Flood was caused by accumulation of waste in Martapura River	0.09	3	0.27
• Dengue disease was caused by condition of dirty environment around the banks of Martapura River	0.08	3	0.24
Total of Threat	0.58		1.58
Total of EFAS	1.12		2.81

Waste management in the banks of Martapura River were indirectly influenced by external factors, especially threat variables. In other words, these variables could become inhibitor to waste management project. It was support with total score of threat variables which higher than opportunity variables, respectively 1.58 and 1.23.

3.4. Matrix of SWOT Analysis

SWOT analysis (Table 3) is useful to determine strategies in optimizing the strength and opportunities. Besides that, it is necessary to minimize the weaknesses and threats. The existing indicators were used to determine strategies. Weakness or threats were not only plays as an inhibiting factor, but also as a supporting factor. It is also useful for optimizing the utilization of strengths and weaknesses [14, 18].

Table 3. Matrix of SWOT Analysis

IFAS EFAS	Weakness (W)	Strengths (S)
Opportunities (O)	<p>2nd Quadrant D & O Self Corrections Strategy / Strategy D & O (WO)</p> <ol style="list-style-type: none"> 1. It is necessary to optimize the means and infrastructure which support waste management. Thus, it is capable to transport the waste which located far from last garbage dump and landfill 2. It is important to increase economic income of households through waste management activities 3. Open some training about waste treatment activities become something with economically value which can absorb the labor force 4. It is necessary to prepare environment cadre who will build communities in the banks of Martapura River, which started from separation activities of household waste until composting process 5. It is necessary to add the volume of methane gas for the communities around the landfill of <i>Cahaya Kencana</i> 6. It is necessary to start the development for providing clean environment, especially in the banks of Martapura River 7. Provide some training for housewives around the banks of Martapura River about waste separation 8. Making Banjar become <i>Green City</i> with concern on waste management and green open space management using compost which self-produced 	<p>1st Quadrant D & O Aggressive Strategy / Strategy D & O (SO)</p> <ol style="list-style-type: none"> 1. The addition of better solid waste facilities and infrastructure to be reached by the communities 2. Socialization of waste management knowledge to the community which will involve cadres of the environment and public figures. 3. Involve communities who has productive age for waste management activities in order to earn extra money 4. Socialization knowledge of waste management to the communities continuously and sustainably 5. Provide some training for housewives about waste recycling into something with economically value 6. Making some training about compost production and opening distribution channels for compost which produced by the community 7. The quantity of methane gas must be added so the benefits of waste can be felt by communities around the landfill of <i>Cahaya Kencana</i> directly 8. Conduct training on healthy lifestyles by introducing source of clean water and a clean and healthy environment.
Threats (T)	<p>3rd Quadrant D & O Defensive Strategy / D & O (WT) Strategy</p> <ol style="list-style-type: none"> 1. Develop a culture to maintain the cleanliness of the river, to make the environment along the river to be clean and not shabby 2. Improving the infrastructure of waste management along the banks of Martapura River as prevention toward the habits of people who inclined to throw the waste in the river 3. Improving the technological innovation of waste management to avoid waste accumulation 4. Optimizing the role of public figure in order to change people's behavior in management of waste's household, which is include the separation of wet and dry waste 5. Provide some waste trucks which the suitable with the conditions of the region difficult to reach 6. Provide and prepare some cadres to raise public awareness in order to avoid the diseases which caused by unhealthy environments 7. Training about waste processing into goods that have economic value must be provided 8. Quantity and quality of waste management and their benefits must be improved 	<p>4th Quadrant D & O Deversification Strategy / Strategy D & O (ST)</p> <ol style="list-style-type: none"> 1. The water supply program in the banks of Martapura River must be conducted 2. It is necessary to improve the number of place to shower, washing and toilet for communities along the banks of Martapura river 3. It is necessary to increase waste management services through increasing the number of place to dump waste and repairing facilities and infrastructure 4. Increasing public knowledge about waste management through some cadres and public figures 5. Periodically, clean up contest among village must be held in order to develop the intention and spirit of the people to maintain a healthy environment 6. Together, communities and public figure must clean up the river to avoid flooding and dengue fever 7. Improving waste management mechanism in Banjar Regency as problem solving of service coverage and quantity of waste. 8. Reducing the dependence of communities toward the river, which will be conducted through develop and addition of infrastructure for waste management activities

3.5. Analysis of Grand Strategy Matrix

The results of internal and external data processing showed that there were variations of factor's total score i.e. weaknesses, opportunities, strength, and threat respectively as much as 1.11; 1.23; 1.28 and 1.58. According to the results, total score of internal factor was lower than external factor, respectively 2.39 and 2.81. It suggests that external factors may affect the waste management in the banks of Martapura River more than internal factors. It is necessary to optimize external factor and solve the existing threats well, in order to improve waste management in the banks of Martapura River. Concern to internal factors such improve the strength and minimize the weaknesses may important too. Carpenter and Sanders [19] has been reported that external factors influenced more than internal factors. It means that the strategies which have been chosen to maximize the strengths and minimize the weaknesses and find out the existing opportunities.

Beside to determine some alternative strategies, score of external and internal factors are also necessary to determine the coordinate's point of development strategy, through the grand strategy matrix analysis. In this case, internal factors play role as horizontal axis (X), while external factors as vertical axis (Y). The value of the X coordinates = $(1.28 \text{ to } 1.11) = 0.17$, while Y coordinates = $(1.23 \text{ to } 1.58) = -0.35$.

The results of IFAS EFAS matrix and strategy quadrant of social engineering for waste management in the banks of Martapura River was shown in Fig.2.

Social engineering strategies of waste management in the banks of Martapura River were in quadrant IV, space G (Fig.2). This quadrant described a condition which has very big strength to be developed by avoid the existing and next threats. Thus, the suitable strategies that can be used are minimizing the external threats in order to maximize and find out the large internal strength [17, 20]. Concentric strategy may become suitable strategies and important to develop the empowerment model. This strategy is focus on object development strategy which carried out simultaneously in one shade or coordinator by one party. In additions, it use *Strength Threats* (ST) strategy which will be applied based on the utilization of existing strengths in order to minimize the existing threat in waste management in the banks of Martapura River.

Previous researches reported that diversification strategy [21, 22] was needed to be implemented in waste management of the banks of Martapura River. Communities along the banks of Martapura River were not only able to face the emerging threats, but also have internal strengths during waste management in the area.

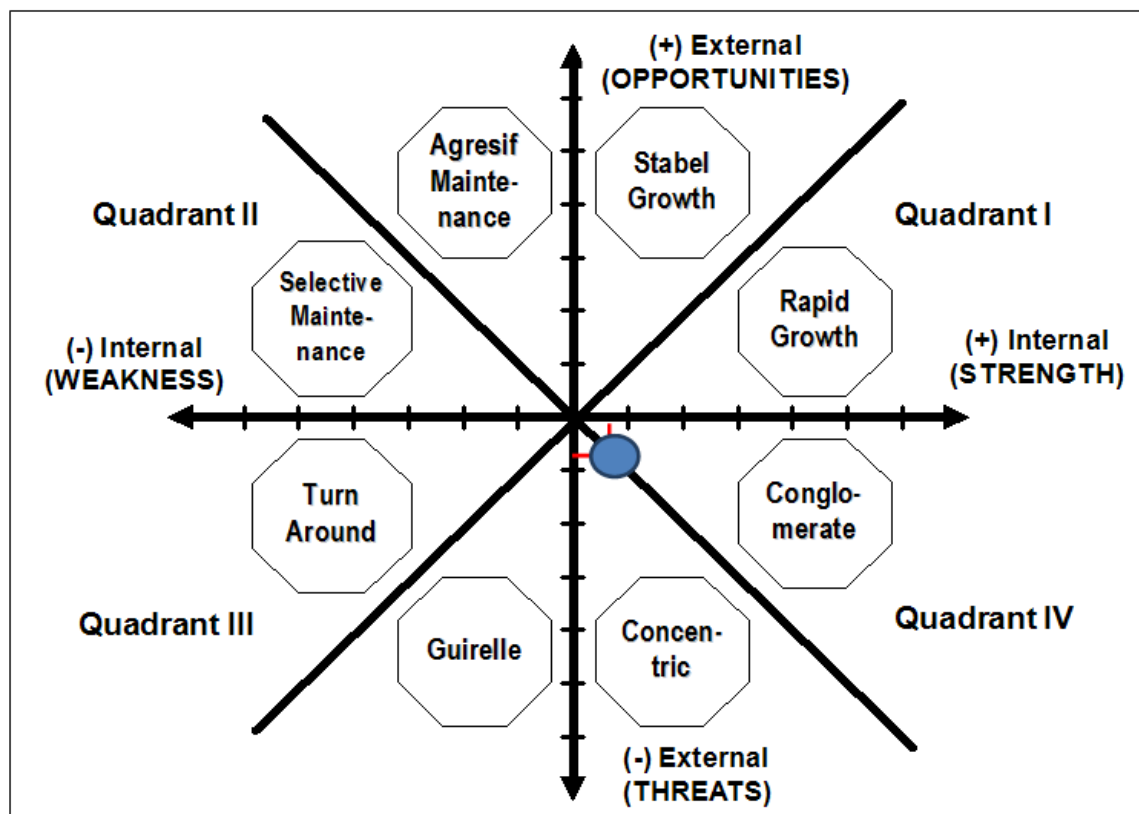


Figure 2. Quadrant of Analysis of IFAS - EFAS

Related with it, waste management was started from waste collection process and involve a variety sectors which coordinated by one coordinator to be more focused. Waste management strategies involve the existing strengths, weaknesses, opportunities and threats which will be support and solve some problems [17, 23, 24] in the banks of Martapura River. Social engineering strategies in the banks of Martapura River as diversification strategy are:

1. Water supply program in the banks of Martapura River
2. Addition of place to shower, washing and toilet for communities along the banks of Martapura River
3. Waste management services must be increased by improving the number of place and facilities for garbage dump
4. Increasing the knowledge of community about waste management was very important. It was conducted by some cadres and public figure in the area.
5. The intention and spirit of people to maintain environment health will growth well, through cleanliness contest among village
6. Communities and public figure must clean up the river to avoid dengue fever and flooding disaster
7. Waste management mechanism in Banjar Regency must be increased to solve waste problems such as services coverage and quantity of accumulation
8. Infrastructure development and addition of facilities to handle process of wastes necessary to reduce the dependence of people to the river.

The strategy in this study is appropriate with social engineering theory of waste management in the banks of Martapura River which called normative – re-educative strategy. This strategy is focus on provide knowledge, education or a new paradigm to the community to change the old paradigm. This strategy is executed gradually and slowly by educating. The aims of this education are to change the old behaviour, beliefs and targets values [9, 25, 26].

4. Conclusions

Social engineering strategy of waste management in the banks of Martapura River was in quadrant IV space G. Concentric strategy is suitable strategies and important to develop the empowerment model, which focus on object development strategy which carried out simultaneously in one cope/coordinator by one party. While the relevant strategies that was needed to be applied in the development of social engineering on waste management in Martapura River Bank is diversification strategy. This strategy was focus on the ability of community to face the emerging threats and improve their internal strengths during project process. This strategy was adopted for the long term. This strategy was adopted for the long term. Related with it,

normative – re-education strategy was used as social engineering strategy. Besides that, this study was shown that social engineering is very important to change the behaviour of people toward waste management in the banks of Martapura River.

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