SETTING LOCAL GOVERNMENT PRIORITIES IN HEALTHCARE INFRASTRUCTURE USING THE ANALYTICAL HIERARCHY PROCESS APPROACH: THE CASES OF LOCAL GOVERNMENTS IN WEST JAVA PROVINCE

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Abstract

Infrastructure and health are considered to be crucial investments in many countries in order to sustain their economic growth, including Indonesia. Furthermore, after decentralization in 2001, Indonesian local governments have had the authority to expand both sectors in order to support the acceleration of national economic growth. However, policymakers in the regions are often confronted with many factors in the investment decision-making process, one of which is budget constraints. Therefore, this study aims to prioritize policy in the healthcare infrastructure sector determined by local government administrators in West Java province. A benefit-cost approach was used as an element for characterizing the positive and negative impacts (benefit for positive impact, and cost for negative impact) by period and categories to set the projects' prioritization which was measured by Analytical Hierarchy Process (AHP). The result shows that the majority of policy makers in the regions provide an assessment with the highest cost-benefit ratio for public health enhancement compared with other alternatives. This means that accessibility to primary healthcare facilities is still the main focus for prioritization and local government administrators prefer to focus on policy where the impact is to increase the health enhancement through expanding coverage of primary health facilities in the sub-district areas. As a policy recommendation, AHP was demonstrated for the effectiveness in the decision-making process for public budgeting, especially in terms of infrastructure investment.

Keywords: healthcare infrastructure; prioritization; Analytical Hierarchy Process (AHP), decision-making; public budgeting.

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Introduction

Infrastructure and health are considered to be crucial investments in many countries in order to maintain their economic growth. In Indonesia, investment in infrastructure increased by about 22.3% between 2016 and 2017, even though the budget of the health sector is stagnant at 5% of expenditure (Ministry of Finance, 2017). In spite of the budget rising, the financial needs of both sectors are very large. Based on the Indonesian government's National Medium-Term Development Plan 2015–2019 (2015), priority infrastructure funding needs to reach Rp 1,915 trillion, while the budget available is only Rp 1,289 trillion, therefore there is a gap of Rp 626 trillion. In addition, Indonesia's health sector still requires a lot of improvement. Such a budget limitation also creates crucial problems in healthcare. Prevention of incidents, for example the incidences of malaria, tuberculosis, and infant mortality, is still inadequate, all of which have resulted in the Indonesian health sector being placed in 94th position among 137 countries (World Economic Forum, 2017). Other than that, the life expectancy of Indonesians is 69.1 years, which ranks 101st out of 137 countries.

In particular, since 2001, Indonesia has applied regional autonomy and fiscal decentralization to local authorities. As a result, local governments now play an important role in supporting the acceleration of national economic growth especially in the infrastructure and health sectors. Because the general condition of local governments is also limited by budgets and financing is costly, local administrators must be able to prioritize projects and distribute the available funds effectively. Therefore, research about prioritizing infrastructure investment in Indonesia is a very important topic to investigate.

There have been few studies about infrastructure prioritization where intangible criteria are taken into account as assessment factors. For instance, Chan (2004) investigates three alternative infrastructure projects based on five intangible criteria, including health and safety issues. Another research was conducted by Dehe and Bamford (2015) who used a case study in which selecting a healthcare infrastructure location was based on seven criteria, including environmental and safety issues. AHP as a tool for previous research in this area has focused on certain factors; however, the qualitative or intangible factors (such as impact of infrastructure) is rarely used as a criteria in prioritizing public infrastructure provision. Thus, this study investigates the impacts as a tangible criteria, where the benefit cost approach is used as an element for characterizing the positive impact and negative impact by period and categories in order to set

the priority projects. Andres, Biller and Dappe (2017) state that when not all components influencing priority setting can be analyzed in monetised or quasi monetised forms, a technical method can be utilized, including multi attribute and multicriteria decision theory.

In this research, the object of the study is about healthcare infrastructure policy setting by local governments in West Java Province, an area which represents almost one-fifth of the total population of Indonesia. Based on the West Java Provincial government database (2017), up until June 2017, the number of hospitals (as part of healthcare infrastructure) in West Java was 328, consisting of 70 public hospitals (21.34%) and 258 private hospitals (78.66%). The dominance of privately-owned hospitals indicates that people's demand for hospitals is high, and as the public sector is limited in its financial ability to provide and maintain hospitals, the private sector has come into the health market to fill that demand, normally doing so primarily to obtain financial benefits. Public health services at the district level can be accessed by people in more local or rural areas, but these services are limited (only primary health services, similar to those of a clinic) and are less costly than building a hospital. Meanwhile, development of special hospitals, such as lung hospital, can manage tuberculosis cases for example (the impact of which can contribute to solving a national health problem) but will be costly to finance.

In order to investigate the above situation, a prioritizing policy for healthcare infrastructure in West Java local governments is analyzed using the AHP method in three project alternatives: the development of a special hospital, the capacity to upgrade a public hospital, and public health service enhancement. Hence, this study endeavors to create the prioritization of three healthcare infrastructure projects in local governments. The results of this paper will contribute to assisting government authorities because this study provides an analytical method that is useful in the decision-making process for public budgeting, whereby local government could resolve several policies and thus accelerate the decision-making process, which may in turn result in efficiency of time.

In summary, this study aims to prioritize policy in the healthcare infrastructure sector that will be determined by local government administrators in West Java province. A total of six local governments are examined: four regencies and two municipalities. The benefit-cost approach is used as an element for characterizing the positive impact and negative impact by period and categories to set the priority projects that will be measured by the technical analysis. The period of impact is divided into two categories: short term and long term. In addition, we take into account: economic impact, social impact, and environmental impact, as categories of impact in the hierarchy.

Healthcare infrastructure in Indonesia: Literature review

Infrastructure, as defined by the World Health Organization (WHO), is the necessary services or social investment of a nation, or part of it, which implement the possibility of economic and social actions. In relation to pub-

lic health, these are "the formal and persisting structures that support public health, having both tangible and intangible aspects and existing inside and outside the government sector" (WHO, 2017, Public Health Infrastructure and Knowledge section, para. 2).

The facilities can protect health issues or may support other purposes that enhance health. In all these cases, there are three elements whereby enhancement of public health can happen:

a) Institutions and competency to manage issues;
b) Knowledge (professional), and
c) Necessary services, such as physical infrastructure (WHO, 2017).

Therefore, this research is generalizing the terms of necessary services into healthcare infrastructure. In particular, three kinds of healthcare infrastructure in Indonesia as necessary commodities are analyzed: public hospital, special hospital, and public health service.

First, the public hospital provision in Indonesia is arranged by the Regulation of The Minister of Health of the Republic of Indonesia No.54/2014. A public hospital means a facility that supports many areas of the health services and takes care of many types of diseases. However, services among hospitals are different based on their capability. There are 4 types, or class – A, B, C, and D. The differences are shown in Table 1.

Table 1

Differences between Types of Public Hospital

Kind of Services	Types of public hospital			
	A	B	C	D
Medical	18 general practitioners, 4 dentists, 6 medical specialists	12 general practitioners, 3 dentists, 3 medical specialists	9 general practitioners, 2 dentists, 2 medical specialists	4 general practitioners, 1 dentists, 1 medical specialist
Bed capacity	> 1000	B1: 300–500 B2: 500–1000	100–500	< 100

Source: Minister of Health Regulation No.54/2014

Until 2016, based on the West Java Health Agency database (2017), the ratio of total inpatient beds per thousand of the population was 0.64. This means that the public hospital capacity in Indonesia is inadequate because the ideal ratio is 1 (NIHRD, 2013). However, the condition is better than a decade ago because decentralization in 2001 made regional government expand public hospitals at the district level (Regency or Municipality). Therefore, the capacity upgrading of public hospitals is proposed as a policy which can improve the capacity of the regional public hospitals.

Furthermore, among the six local governments in the case area of this research, there are some differences in the types of public hospitals. Table 2 shows the recent condition of the public hospitals in six areas of the case study, based on their types as related to the Minister of Health Regulation.

Table 2

Type of Public Hospital in Area of Case Study

Regency/Municipality	Name of Public Hospital	Type
1. Garut Regency	RSUD Dr. Slamet RSU Guntur RSUD Pameungpeuk	B * **
2. Ciamis Regency	RSUD Ciamis	C
3. Pangandaran Regency	–	***
4. Tasikmalaya Regency	RSUD Singaparna	C
5. Tasikmalaya Municipality	RSUD Dr. Soekardjo	B
6. Banjar Municipality	RSUD Banjar	B

Source: Created by the author.
* Army hospital, managed by Indonesian army.
** Its ownership is taken over by the provincial (state) government of West Java.
*** Not available (new autonomous region).

Second, special hospitals are hospitals that provide services in a specific case or one special type of disease or other specificities. Some examples of special hospitals are orthopedic hospitals, mental hospitals, leprosy hospitals, lung hospitals, heart hospitals, and maternal and child hospitals. In Indonesia, tuberculosis incidences and infant mortality are special cases in healthcare that need specific treatment. Tuberculosis has been a major problem in Indonesia which ranks badly at 131st among 137 countries for tuberculosis incidences. Moreover, at 22.8 deaths per thousand live births, Indonesia is ranked at 94th out of 137 countries for infant mortality (World Economic Forum, 2017). Thus, special hospital provision, such as lung hospitals and maternal and child hospitals should be taken into account as government policy alternatives.

Lastly, public health services (in Indonesian: *puskesmas*) are also regulated by the Rule of The Minister of Health of the Republic of Indonesia No.54/2014. Puskesmas is a health service facility that organizes public health endeavors and individual health endeavors at the basic level by prioritizing promotive and preventive endeavors in its area. The purpose is also to achieve the highest degree of public health which is also handled by local governments. As the first level of primary health services, puskesmas should be held in every sub-district of every regency or municipality. Therefore, the existence of *puskesmas* is considered to reduce geographical access disparities to healthcare facilities because the *puskesmas* are more accessible than the hospitals. Although the populations in some regions face longer travel time to reach puskesmas, recently, the average distance to a health facility in Indonesia is only 5 km and needs 16–30 minutes of travel time(NIHRD, 2013). To summarize, three alternatives of healthcare infrastructure have importance. However, local authorities have a limitation in their budgets. Therefore, local administrators need a practical method to prioritize the projects. The Analytical Hierarchy Process method is useful for the decision makers to solve this kind of problem.

Previous studies

There have been several studies of the AHP approach in infrastructure investment prioritisation. This section discusses some papers which identify the project priority among the alternatives. In addition, there is a table which describes the application of AHP in industries and government institutions.

A study by Chan (2004) carried out a research in Canada which investigated the capital investment of municipal governments in order to prioritize a project based on certain criteria: health and protection issues, financial impact, asset maintenance, growth-related needs, and service enhancement. Through questionnaires administered to a random sample of Canadian municipal governments, Chan determined three alternatives as a result to be prioritized. With the AHP result value of 0.554, remodeling of the public buildings project receives a better assessment than the two other alternatives: reconstruction of a water treatment facility component (0.242) and boulevard reforestation (0.204). Dehe & Bamford (2015) investigated a case of healthcare infrastructure selection in the UK. They combined the use of AHP with the Evidential Reasoning (ER) method which is requested by the National Health Service of the UK to make a reliable and transparent decision making process. The AHP model which is used is based on seven criteria: population profile, design, risks, accessibility, total cost, size, and environmental and safety issues. The purpose of using these methods is to define the best location among the alternatives.

Ziara, Nigim, Enshassi and Ayub (2002), developed a policy for infrastructure projects in Palestine. The AHP approach was used for project prioritization based on the expectancy and life-cycle of the projects. The respondents were a group of players including the decision makers, the stakeholders, and the analysts who could influence the decision. Smith & Tighe (2006) examined another use of AHP for infrastructure policies. In their first research, AHP was used to evaluate products (concretes and road materials) set by a public agency. A total of 16 criteria were used to compare the products with the involvement of project procedures and its properties. In the second research, AHP was used to compare nine alternatives to asphalt pavements using the criteria of rehabilitation, maintenance and reconstruction strategies. The AHP approach is used in many industry areas, both public and private. Many companies have adopted AHP as a method for determining various policies within the organisation.

Methodology

This research is qualitative-quantitative analysis which aims to capture the best alternatives in healthcare infrastructure projects based on a benefit-cost approach regarding their impacts. The qualitative analysis is the process of making research design, where hierarchy of AHP is made by theoretical analysis and approved by three experts who are also included as respondents. The quantitative analysis is the calculation of the benefits and the cost itself.

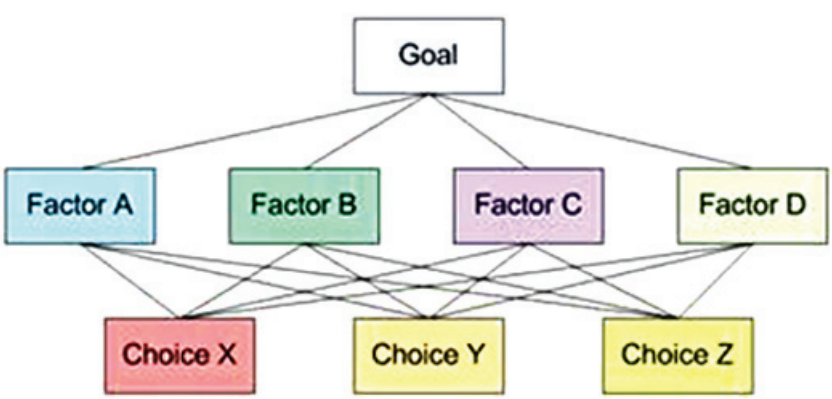
The calculation is conducted separately by arranging two different hierarchies: positive side hierarchy and negative side hierarchy. The total benefit analysis is then compared to the total cost analysis. There are two ways that this can be used in comparing the benefits and costs, namely the ratio and the difference. By using the ratio, the selection of an alternative is done by comparing the benefit and cost ratios generated by each alternative. The greater the ratio is, the better the alternative; the critical point is 1. This means that the ratio between benefits and costs is the same. By using the difference, the values of benefits and costs are analyzed, where the greater the difference the more feasible an alternative and vice versa.

In this study, the data used are primary data obtained from practitioners by in-depth interviews and completed questionnaires. The objects of the study are the representatives of six local governments – 4 regencies and 2 municipalities – in West Java Province, Indonesia: Garut Regency, Tasikmalaya Regency, Ciamis Regency, Pangandaran Regency, Banjar Regency, and Tasikmalaya Municipality. Respondents are the chief administrators of local government, in particular, echelons of the planning agency, health agency, and public works agency, where the selection is through snowball sampling (Cohen, 2016). Judgement sampling, which is conducted by considering the respondent's understanding of the problems in public budgeting, especially for healthcare infrastructure, was used to select respondents in the study.

Analytical Hierarchy Process

Analytic Hierarchy Process (AHP) was developed by Prof. Thomas L. Saaty as the decision-making algorithm for multi-criteria (Multi-Criteria Decision Making or MCDM) issues. The multicriteria issue in AHP is simplified in the form of a hierarchy consisting of three main components: the objective of the decision making, assessment criteria, and alternative options. The general hierarchy structure of the AHP is shown in Figure 1.

Figure 1: **General hierarchy Structure of AHP**



Source: Adapted from the AHP what it is and how it is used (p. 162), by R. W. Saaty, 1987.

To set a decision, we need to decompose it into several steps that generate priorities in an organized way.

In general, the procedure for AHP can be described in the following steps (Saaty, 2008, p. 85):

1. Structure a decision problem and selection of criteria.
2. Priority setting of the criteria by pairwise comparison (weighting).
3. Pairwise comparison of options on each criterion (scoring).
4. Obtaining an overall relative score for each option.

To make the comparison, a scale of number is needed that indicates the importance of one element to another element. Table 3 describes the scale that is used to compare the relative importance of elements.

Table 3

Definition of Scale of Assessment and Numerical Scale

Intensity of Importance	Definition	Explanation
1	Equal Importance	Two activities contribute equally to the objective
2	Weak or slight	
3	Moderate importance	Experience and judgement slightly favor one activity over another
4	Moderate plus	
5	Strong importance	Experience and judgement strongly favor one activity over another
6	Strong Plus	
7	Very strong or demonstrated importance	An activity is favored very strongly over another; its dominance demonstrated in practice
8	Very,very strong	
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
Reciprocal of above	If activity *i* has one of the above nonzero numbers assigned to it when compared with activity *j*, then *j* has the reciprocal value when compared with *i*	A reasonable assumption
Rationals	Ratios arising from the scale	If consistency was to be forced by obtaining n numerical values to span the matrix

Source: Saaty (2008).

In addition to some of the above axioms (reciprocal and rational), Saaty (1982) describes several advantages of the AHP model:

1. Unity: implies that the AHP gives a single, easily understood, flexible illustration for a wide area of unstructured issues;
2. Process reiteration: means that the AHP empowers individuals to refine their definition of the issue and to progress their judgement through reiteration;
3. Judgement and agreement: suggests that the AHP does not demand on agreement but synthesizes an agent result from assorted judgements;
4. Trade-offs: recommends that the AHP takes into consideration the relative needs of components in a framework and empowers individuals to select the most excellent alternative based on their objective;
5. Synthesis: implies that the AHP prompts a general estimate of the allure of each option;
6. Complexity: means that the AHP incorporates deductive and framework approaches in taking care of complex issues;
7. Interdependence: implies that the AHP can manage the reliance of components in a framework and does not demand linear reasoning;
8. Hierarchic organizing: means that the AHP illustrates the regular propensity of the mind to sort components in a framework into various levels and to group like components in each level;
9. Measurement: implies that the AHP gives a scale to estimate intangibles and a technique for making priorities;
10. Consistency: suggests that the AHP tracks the coherent consistency of judgements utilized in deciding priorities;

However, in spite of the advantages it has, the AHP model also has weaknesses. The dependence of the AHP model on an expert's perception input in the form will make the end result of this model meaningless when the expert gives a false judgment.

This condition coupled with the absence of clear criteria for an experimenter, make people often hesitate in responding to solutions produced from this model. Most people will ask whether the perception of an expert can represent the interests of the people or not and whether the respondent deserves to be considered an expert or not. This skepticism is due in part to the fact that everyone has a different perception than others (Forman, 1993; Saaty, 1982). Moreover, AHP is not as sophisticated as the ANP method because AHP is not applicable for many problems with various schemes such as turning to a network scheme, while ANP allows interaction and feedback from elements in the cluster (inner dependence) and between clusters (outer dependence) (Saaty, 2008; Zandebasiri & Pourhashemi, 2016).

Research Design

Research design is made by theory analysis of several studies that shows criteria of impacts in infrastructure. These studies involve empirical cases about setting priority of projects, including AHP application. Tabel 4 shows some theory analysis of criteria in this study.

Table 4

Theory analysis/ review of criteria impact of Infrastructure

No.	Reference	Criteria
1	Annala, Batina, Feehan (2008)	Economic: positive employment impact to surrounding area.
2	Cox, Alwang, Johnson (2000)	Environmental: waste/emission (chemical), land use, run-off through construction and water quality issue
3	Madadian, Amiri, Abdoli (2012)	Economic: investment and operational cost, income to cost ratio (revenue) Environmental: land use
4	Palei (2015)	Economic: Employment Social: education and health enhancement
5	Snieska, Simkunaite (2009)	Economic: regional competitiveness, Social: inequality (social gap)

Source: Created by the author.

Furthermore, the completed criteria are proposed by consensus between three experts of local administrators:

1. Drs. Bambang Alamsyah, MM, Head of the Public Work Agency of Tasikmalaya Regency, 30 years of work experience, including five years at the public work agency (as top manager) and three years as secretary of Health Agency.
2. Dr. H. Oman Rohman, M.Si, Head of the Health Agency of Banjar Municipality since 2013, 24 years of work experience, including two years as a director of Banjar Public Hospital.
3. Yuni Sri Handayani, ST, MT, M.Ec, expert planner certified Bappenas, 13 years of experience, government officer of a spatial agency and has worked in an environment agency in Tasikmalaya Regency for three years.

Research design through the AHP method is divided into several steps of hierarchy based on the benefit-cost approach, where a positive impact is identified as benefits, and negative impact as costs. Thus, there are two hierarchies: the positive and the negative sides, consisting of five levels:

Level 0: Focus

The focus of the hierarchy, in general, is the impact of healthcare infrastructure. The formulation of this focus is based on the importance of planned development in order to provide great benefits to the community, especially in the local area. The focus on the positive side hierarchy and the negative side hierarchy is the same because the judgement is the positive and negative impact of the same object.

Level 1: Impact Period

At this level, the periods of the impacts felt from the policy taken are compared. Regarding healthcare infrastructure sectors, given the development

is conducted not only to provide benefits in the near future or for just one period of government, but also to be sustainable so that the benefits can be felt in the future, short term and long term are thus identified as elements of the impact periods.

Level 2: Categories of Impact

At level two, the impact categories are seen. Each impact period, either on the positive side hierarchy or in the negative side hierarchy, has three categories of impacts. The three categories of impacts in infrastructure provision are: economic impact, social impact, and environmental impact (Bellos, 2010).

Level 3: Impact

At this level, the impacts of development policies on each category are presented. There is a difference between the positive side hierarchy and the negative side hierarchy. In the positive side hierarchy, the categories of economic impacts consist of employment (Annala, 2008) and local revenues (Madadian et al., 2009). Furthermore, Palei (2015) states that the employment impact is realized not only during the period of construction work (employments between construction and maintenance), but also during the period of the operation of facilities. Social impact categories address local pride. Furthermore, it also has a positive impact on education and public health enhancement (Palei, 2015). The environmental impact consists of the impact on environmental insights (awareness of the community in protecting the environment) and environmental safety (reduced endemic area of diseases, such as tuberculosis and malaria). The negative side hierarchy involves the negative impacts caused in each category. The economic category includes the operational costs (Madadian et al., 2009) which are costs required in the construction, its operational, and maintenance. Another is product competition (output) with other regions (Snieska et al., 2009). The social category includes local labor competition with outside labor and the social gap (Snieska et al., 2009) including changes in people's lifestyles such as the shifting values of indigenous cultures. Moreover, in the case of the environmental impact, the negative impact is not only waste (Cox et al., 2000) or pollution but also land degradation (for example: land-use and the decrease of groundwater level).

Level 4: Policy setting

At this level, alternative policies of healthcare infrastructure projects are compared in order to set the prioritization that can be implemented in order to accelerate the economic growth of the area. There are three development alternatives that are the ultimate goal of this analysis and which are placed at the last level in both hierarchies. The three alternatives are the development of special hospitals, capacity upgrading of the public hospital, and public health services development.

As part of the research design, the figures below illustrate the hierarchy of positive impacts and negative impacts in healthcare infrastructure.

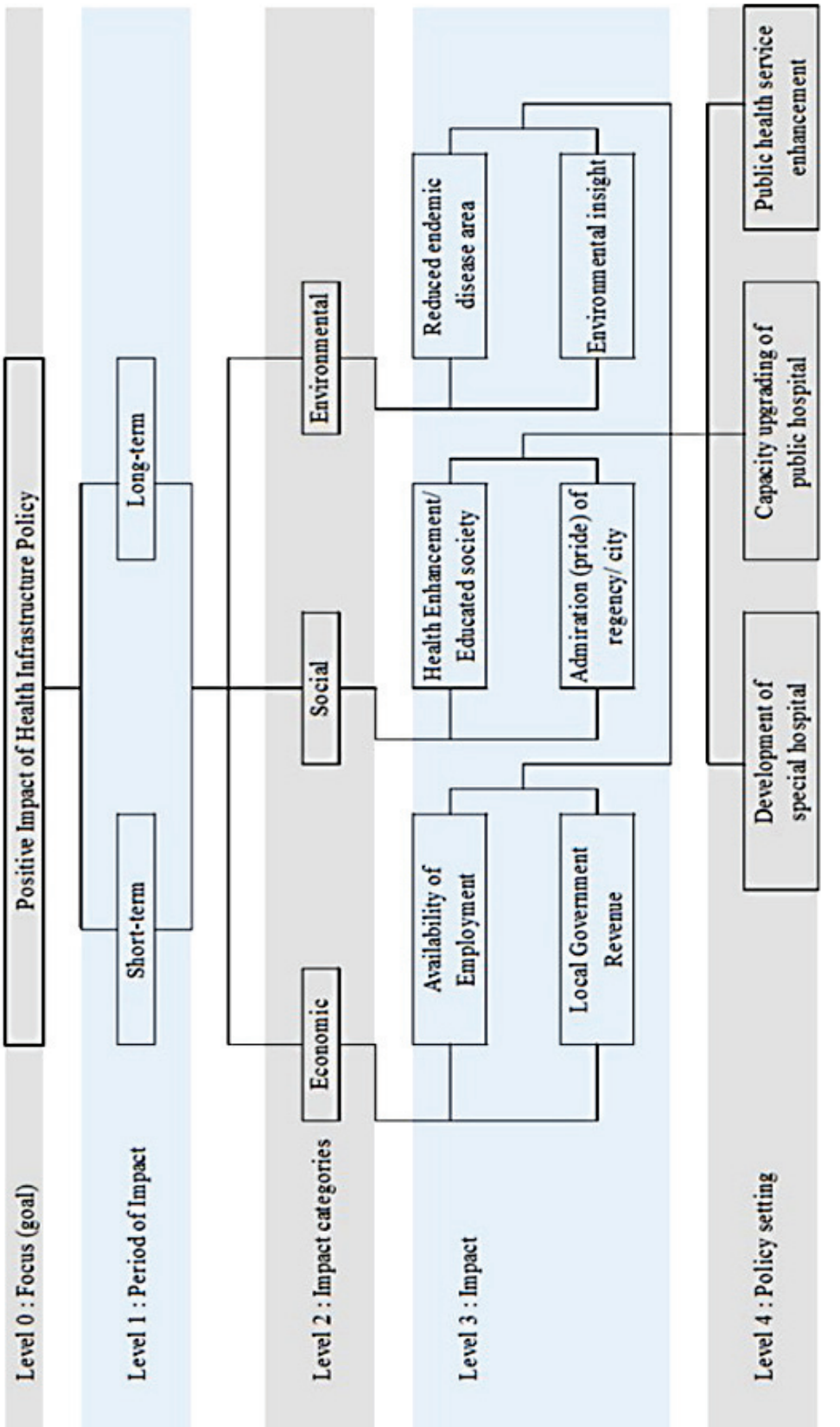


Figure 2: Hierarchy of Positive Impact

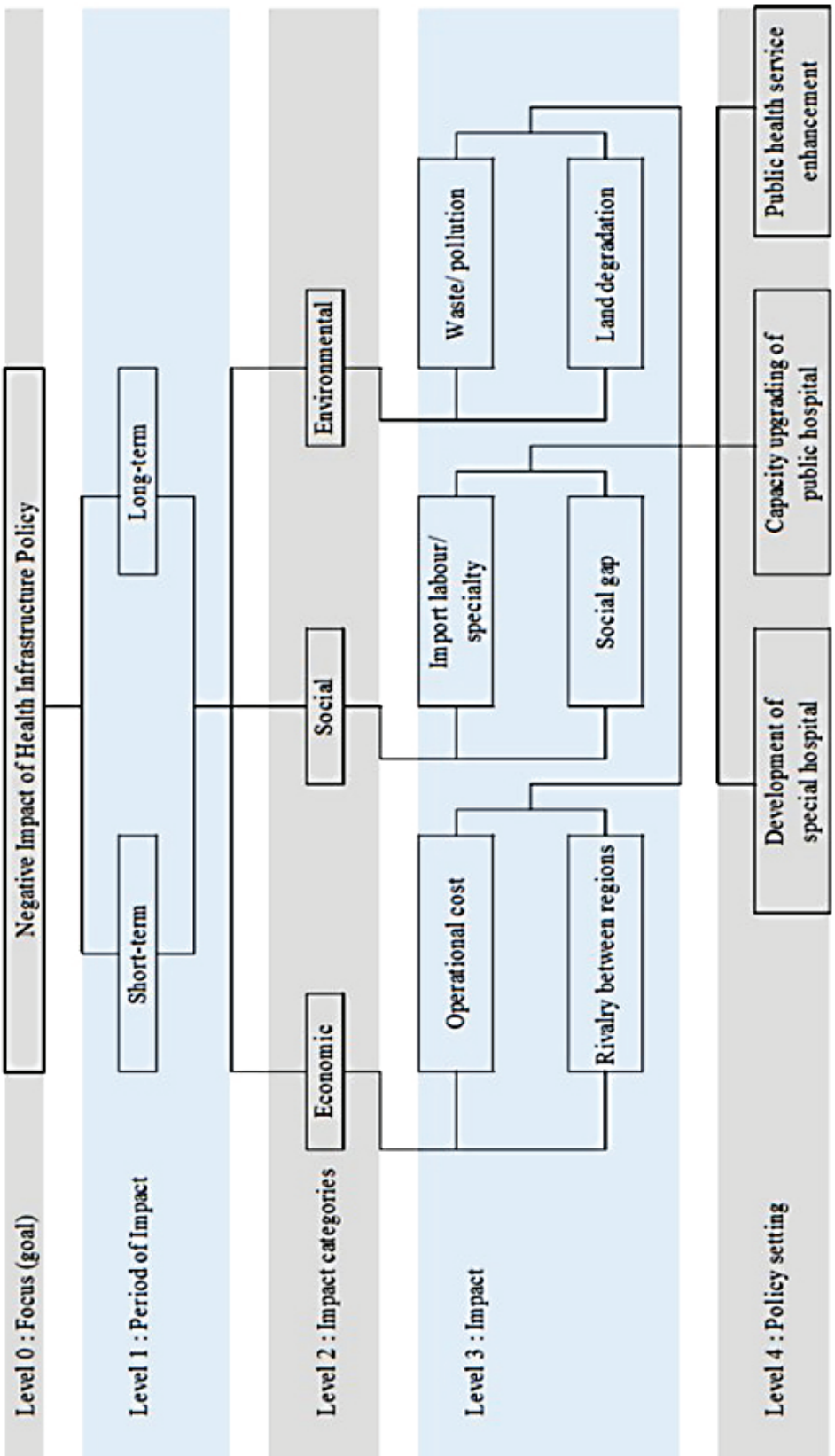


Figure 3: Hierarchy of Negative Impact

Results And Discussion

This section presents information regarding brief results of the AHP calculation. The discussion presents further explanation regarding the results from the previous subchapter. The assessment result of the hierarchical elements are processed using the Super Decisions 2.8 program, so that the priority and the final synthesis (global) are obtained for each regency and municipality. To simplify the result, the value of benefit and cost will be presented in tables including the calculation of ratio between alternatives.

Results of Priority Weight and Benefit-Cost Ratio

a) Garut Regency

Table 6 shows the result of the Garut regency priorities. Based on the result, the benefit value of public health service enhancement (0.397) is the highest, while the benefit of development of a special hospital is 0.347 and capacity upgrading of a general hospital is 0.255. This means that the positive impact of public health service enhancement policy is greater than other alternatives. Meanwhile, the cost value of development of a special hospital is the highest (0.510) followed by a moderate gap of capacity upgrading of general hospital policy (0.369) and the significant least value of 0.121 for public health service enhancement policy.

Table 5

Garut Regency Priority Weight and Benefit-Cost Ratio

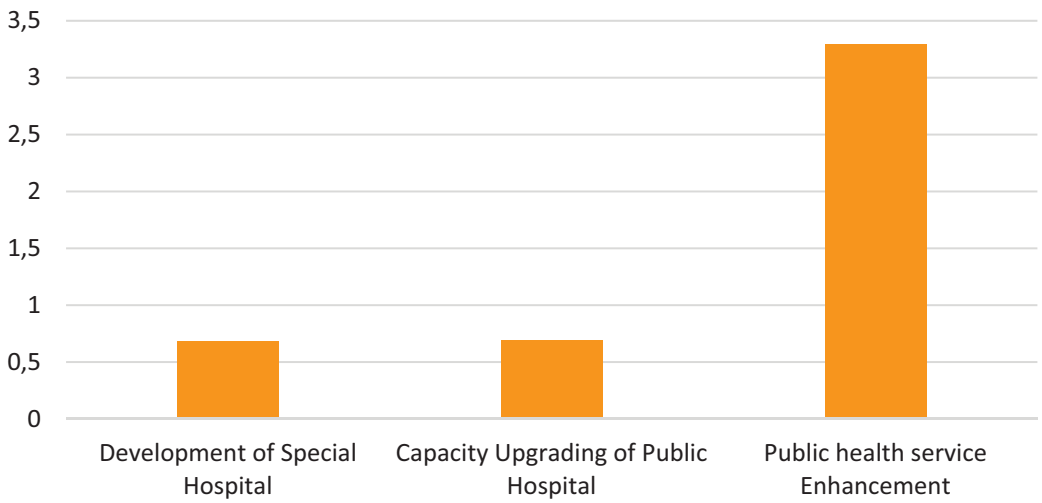
No.	Alternatives	Value	Rank
	Benefit		
1.	Development of Special hospital	0.347	(2)
2.	Capacity upgrading of public hospital	0.255	(3)
3.	Public health service enhancement	0.398	(1)
	Cost		
1.	Development of Special hospital	0.510	(1)
2.	Capacity upgrading of public hospital	0.369	(2)
3.	Public health service enhancement	0.121	(3)
	Ratio Benefit – Cost		
1.	Development of Special hospital	0.680	(3)
2.	Capacity upgrading of public hospital	0.692	(2)
3.	Public health service enhancement	3.290	(1)

Source: Created by the author.
Kendall's Coefficient of Concordance (W) = 0.5120
Consistency Ratio (CR) = 0.003

Based on the ratio between benefit and cost in Figure 5.1 below, we can see, from the significant ratio of 3.290, that the administrators of Garut regency prefer public health service enhancement as their priority to other alternatives.

The ratio result of other alternatives are below critical value 1. This means that both the special hospital and general hospital have more negative impact than the positive impact, according to the assessment.

Figure 4: **Garut Regency Alternatives Ratio**



b) Ciamis Regency

Table 7 shows the feedback from the Ciamis regency administrators. The benefit value of public health service enhancement (0.380) is the highest, followed by development of special hospital policy with 0.313 and capacity upgrading of general hospital with 0.307.

Based on the benefit value, the gap between the positive impact of development of a special hospital and the others is small. Otherwise, the cost value of public health service enhancement policy, this is less than other alternatives (0.174), the value capacity upgrading of a public hospital being 0.429 and the development of a special hospital 0.397.

Table 6

Ciamis Regency Priority Weight and Benefit-Cost Ratio

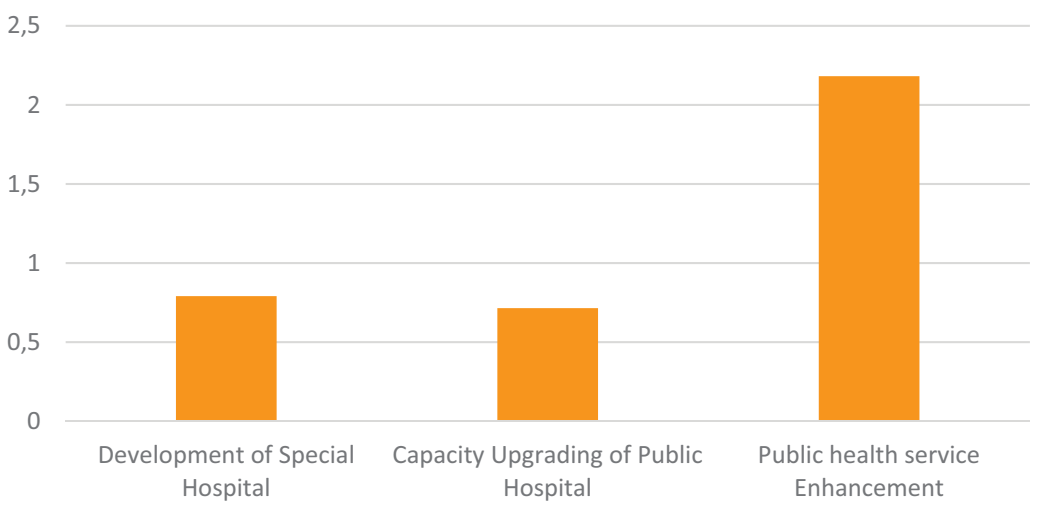
No.	Alternatives	Value	Rank
	Benefit		
1.	Development of Special hospital	0.313	(2)
2.	Capacity upgrading of public hospital	0.307	(3)
3.	Public health service enhancement	0.380	(1)

No.	Alternatives	Value	Rank
	Cost		
1.	Development of Special hospital	0.397	(2)
2.	Capacity upgrading of public hospital	0.429	(1)
3.	Public health service enhancement	0.174	(3)
	Benefit – Cost Ratio		
1.	Development of Special hospital	0.790	(2)
2.	Capacity upgrading of public hospital	0.714	(3)
3.	Public health service enhancement	2.181	(1)

Source: Created by the author.
Kendall's Coefficient of Concordance (W) = 0.6230
Consistency Ratio (CR) = 0.001

Based on the ratio benefit-cost, Figure 5 illustrates the significant value of the public health services enhancement over the others. Thus, Ciamis regency authority would like to enhance the public service than the other policies, because based on the ratio between benefit and cost, the ratio is 2.181, which has more positive impact than negative impact.

Figure 5: **Ciamis Regency Alternatives Ratio**



c) Pangandaran Regency

In the case of Pangandaran Regency, Table 8 shows the biggest value of benefit of capacity upgrading of a public hospital with 0.412, followed by public health service enhancement (0.297) and development of a special hospital (0.291). Otherwise, the cost value of special hospital development is the biggest (0.385) followed by capacity upgrading of public hospital (0.340) and public health enhancement (0.275).

Table 7

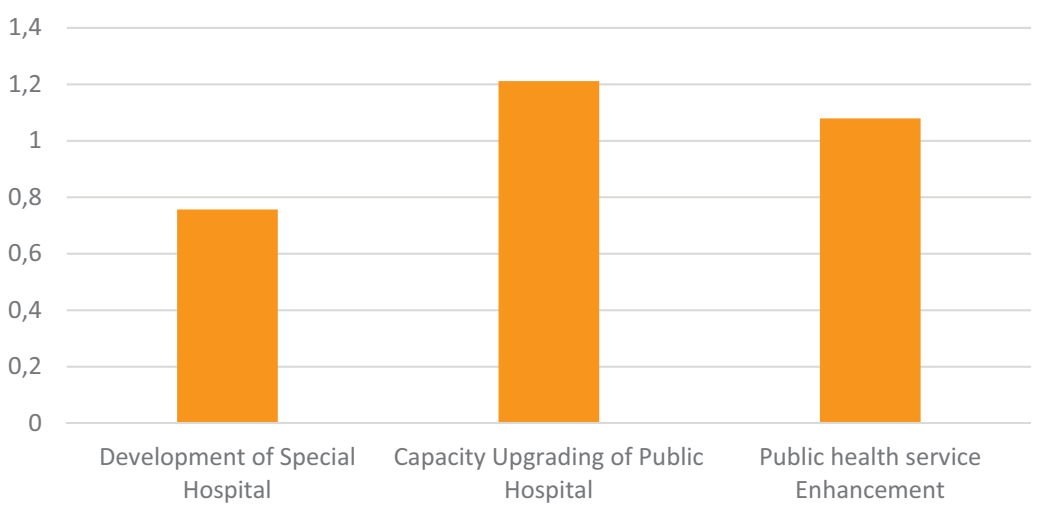
Pangandaran Regency Priority Weight and Benefit-Cost Ratio

No.	Alternatives	Value	Rank
	Benefit		
1.	Development of Special hospital	0.291	(3)
2.	Capacity upgrading of public hospital	0.412	(1)
3.	Public health service enhancement	0.297	(2)
	Cost		
1.	Development of Special hospital	0.385	(1)
2.	Capacity upgrading of public hospital	0.340	(2)
3.	Public health service enhancement	0.275	(3)
	Benefit – Cost Ratio		
1.	Development of Special hospital	0.757	(3)
2.	Capacity upgrading of public hospital	1.211	(1)
3.	Public health service enhancement	1.079	(2)

Source: Created by the author.
Kendall's Coefficient of Concordance (W) = 0.5121
Consistency Ratio (CR) = 0.009

Figure 6 shows the ratio between benefit and cost for Pangandaran Regency projects where there are two alternatives with a resulting ratio above 1, which are capacity upgrading of a public hospital with 1.211 and public health service enhancement with 1.079. Among the alternatives, development of special hospital has the least ratio value with 0.757.

Figure 6: **Pangandaran Regency Alternatives Ratio**



d) Tasikmalaya Regency

The Tasikmalaya Regency result is shown in Table 9, where the value of benefit is almost the same among the alternatives.

The biggest benefit value is development of a special hospital (0.358), followed by capacity upgrading of a public hospital (0.335) and public health service enhancement (0.307).

Otherwise, cost values are much different. The biggest value of cost is development of a special hospital with 0.496, the second is capacity upgrading of a public hospital with 0.325, and the third is public health services enhancement with 0.179.

Table 8

Tasikmalaya Regency Priority Weight and Benefit-Cost Ratio

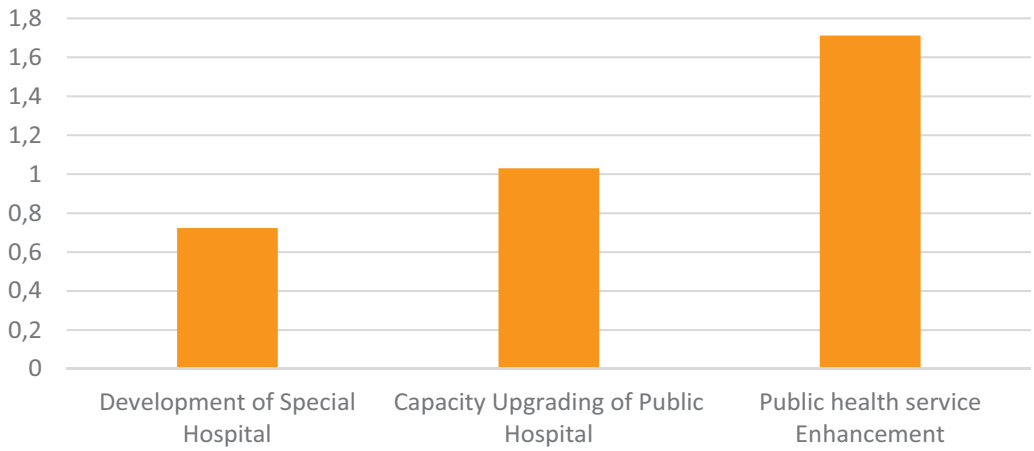
No.	Alternatives	Value	Rank
	Benefit		
1.	Development of Special hospital	0.358	(2)
2.	Capacity upgrading of public hospital	0.335	(3)
3.	Public health service enhancement	0.307	(1)
	Cost		
1.	Development of Special hospital	0.496	(2)
2.	Capacity upgrading of public hospital	0.325	(1)
3.	Public health service enhancement	0.179	(3)
	Benefit – Cost Ratio		
1.	Development of Special hospital	0.723	(3)
2.	Capacity upgrading of public hospital	1.030	(2)
3.	Public health service enhancement	1.712	(1)

Source: Created by the author.
Kendall's Coefficient of Concordance (W) = 0.5412
Consistency Ratio (CR) = 0.002

Moreover, the result of Tasikmalaya Regency ratio has two values above 1, which are public health service enhancement (1.712) and capacity upgrading of public hospital (1.030).

Nevertheless, the ratio of development of a special hospital is 0.723 which is the lowest ratio among the alternatives. Figure 7 below shows the Tasikmalaya Regency alternatives ratio.

Figure 7: **Tasikmalaya Regency Alternatives Ratio**



e) Tasikmalaya Municipality

Tasikmalaya Municipality has a benefit value of 0.386 for the development of a special hospital, which is the highest, followed by capacity upgrading of public hospital policy with 0.324 and public health enhancement with 0.290. Otherwise, the cost value of public health service enhancement policy is less than other alternatives (0.192), where the value capacity upgrading of public hospital is 0.338 and development of special hospital is 0.470, which is the highest cost value. Table 10 shows the result of the priority weight of Tasikmalaya Municipality administrators.

Table 9

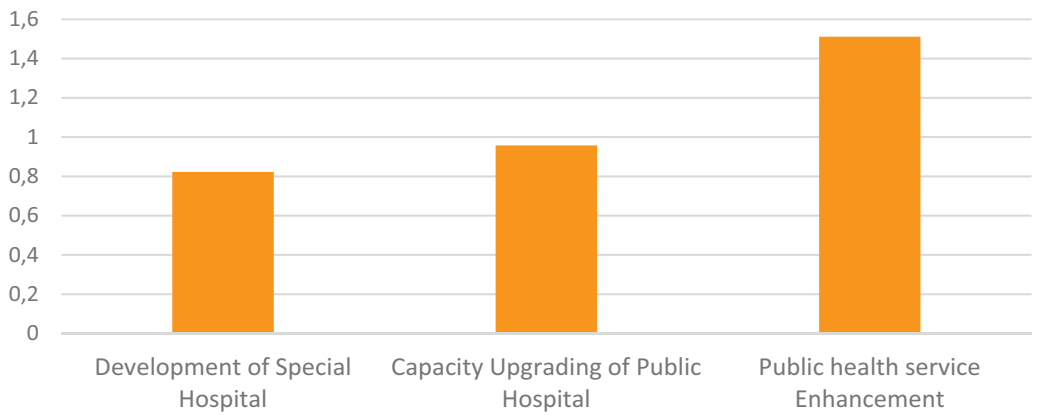
Tasikmalaya Municipality Priority Weight and Benefit-Cost Ratio

No.	Alternatives	Value	Rank
	Benefit		
1.	Development of Special hospital	0.386	(1)
2.	Capacity upgrading of public hospital	0.324	(2)
3.	Public health service enhancement	0.290	(3)
	Cost		
1.	Development of Special hospital	0.470	(1)
2.	Capacity upgrading of public hospital	0.338	(2)
3.	Public health service enhancement	0.192	(3)
	Benefit – Cost Ratio		
1.	Development of Special hospital	0.822	(3)
2.	Capacity upgrading of public hospital	0.957	(2)
3.	Public health service enhancement	1.511	(1)

Source: Created by the author.
Kendall's Coefficient of Concordance (W) = 0.7213
Consistency Ratio (CR) = 0.002

Based on the ratio benefit-cost, Figure 9 illustrates the ratio value, where the public health services enhancement ratio is higher than the others. Thus, Tasikmalaya Municipality authority would like to enhance the public service rather than the other policies, because based on the ratio between benefit and cost, the ratio is 1.511, which has more positive impact than negative impact. Otherwise, the other alternatives ratio is below the critical point 1.

Figure 9: **Tasikmalaya Municipality Alternatives Ratio**



f) Banjar Municipality

Table 11 shows the result of the Banjar municipality priorities. Based on the feedback, the benefit value of capacity upgrading of public hospital (0.349) is the highest, where the benefit value of public health enhancement is 0.341 and the benefit value of development of a special hospital is 0.310. It means that the positive impact of capacity upgrading of public hospital policy is greater than the other alternatives, even though the benefit values among the alternatives are similar. Meanwhile, the cost value of development of a special hospital is the highest (0.398) followed by a little gap between it and capacity upgrading of general hospital policy (0.356) and the least value of 0.246 for public health service enhancement policy.

Table 10

Banjar Municipality Priority Weight and Benefit-Cost Ratio

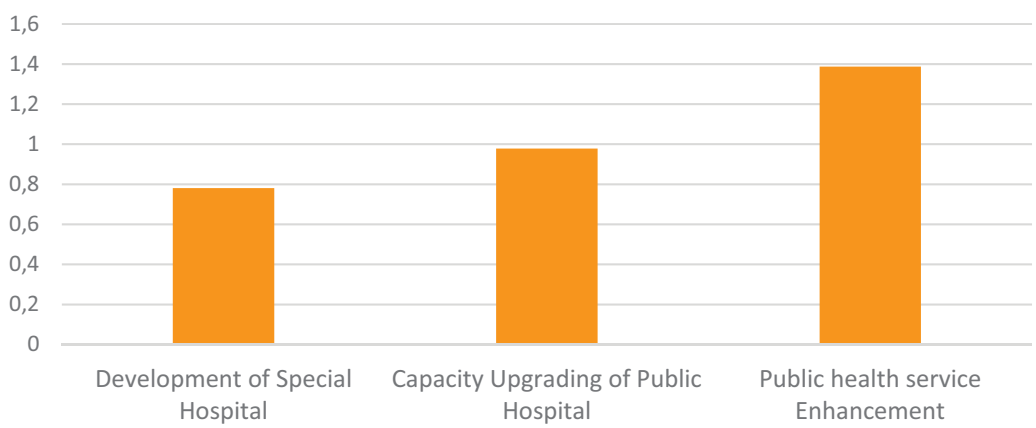
No.	Alternatives	Value	Rank
	Benefit		
1.	Development of Special hospital	0.310	(3)
2.	Capacity upgrading of public hospital	0.349	(1)
3.	Public health service enhancement	0.341	(2)
	Cost		
1.	Development of Special hospital	0.398	(1)
2.	Capacity upgrading of public hospital	0.356	(2)
3.	Public health service enhancement	0.246	(3)

No.	Alternatives	Value	Rank
	Benefit – Cost Ratio		
1.	Development of Special hospital	0.780	(3)
2.	Capacity upgrading of public hospital	0.978	(2)
3.	Public health service enhancement	1.387	(1)

Source: Created by the author.
Kendall's Coefficient of Concordance (W) = 0.8110
Consistency Ratio (CR) = 0.002

Based on the ratio between benefit and cost in Figure 10 below, we can see that, with the ratio 3.290, the administrators of Banjar municipality prefer public health service enhancement as their priority. The ratio result of other alternatives are below critical value 1. This means that both a special hospital and general hospital have a more negative impact than positive, according to the assessment.

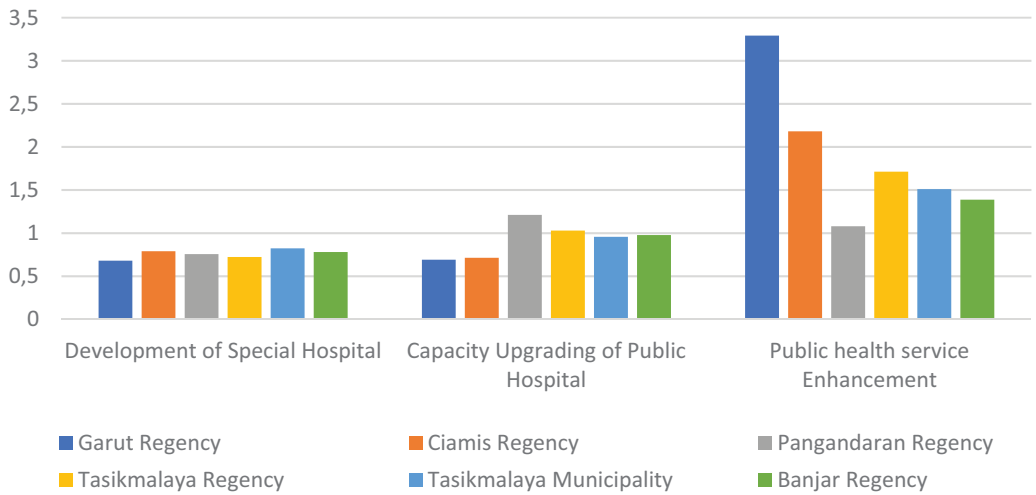
Figure 10: **Banjar Municipality Alternatives Ratio**



Discussion

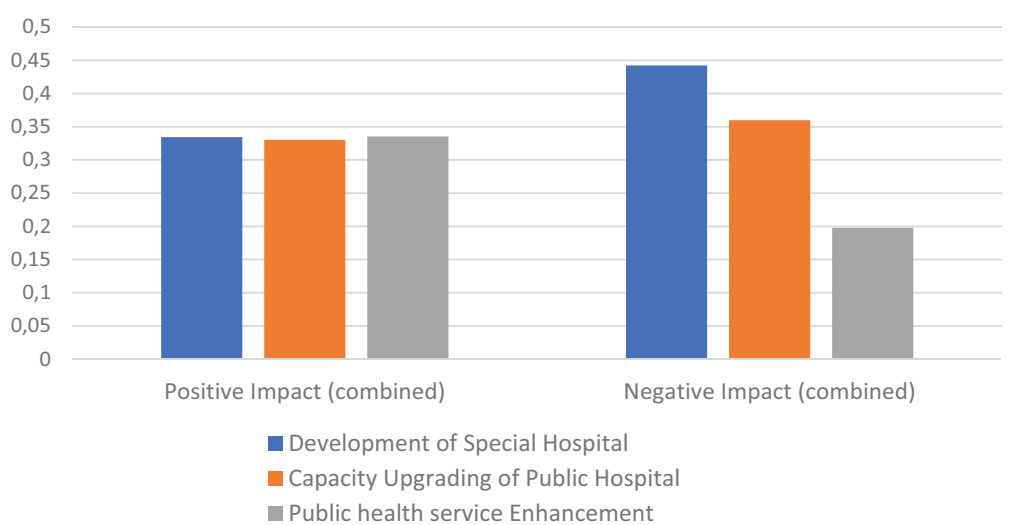
This subchapter explains further analysis about the result of AHP from the previous subchapter. Moreover, the priority of policy focus is compared with its overall result. Furthermore, the result of the policy focus analysis from each category of impact is also discussed. Figure 5.7 illustrates the overall graph of ratio value where public health enhancement has a higher value than other alternatives. The condition indicates that the policy of public health services (*puskesmas*/ clinic) has the highest priority even though it has fewer services than hospitals. Policy focus for public health enhancement in a sub-district area is important because the effect of such a type of policy can increase the accessibility of rural people to health facilities. This means that healthcare infrastructure in local government areas still tend to be inadequate. Thus, local government administrators prefer to focus on policy where the impact is to increase the enhancement through expanding coverage of primary health facilities in the sub-district area.

Figure 5.7: **Regencies/Municipalities Alternatives Ratio (Combined)**



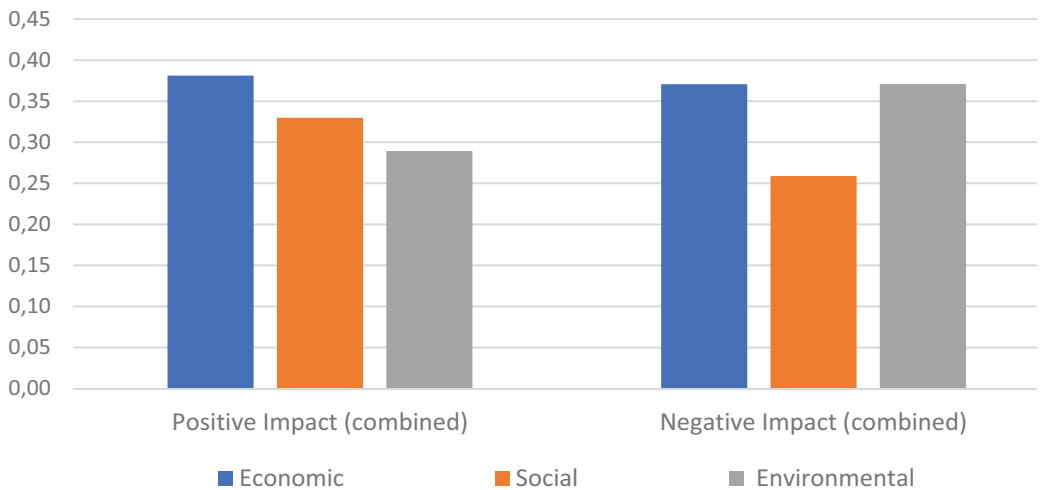
Furthermore, as illustrated in Figure 5.8 below, the positive impact of the development of a special hospital is slightly the bigger than that of the others. However, from the overall combination, the positive impact of three alternatives is relatively similar. Otherwise, the negative impact of policy alternatives has significant differences. It can be seen that even though the development of a special hospital has the biggest positive impact, the negative impact is also very high. It also indicates a huge cost to commence a development activity that starts from scratch. Thus, from the point of view of local government administrators, this alternative cannot be a top priority. Otherwise, public health enhancement has the lowest cost among the alternatives. The effect of a very low cost is better preferences for local authorities, since the ratio between benefit and cost will be higher and also development from an existing condition is relatively easier than development from zero condition.

Figure 5.8: **AHP Benefit-Cost Assessment of Alternatives (Combined)**



Moreover, the results of synthesis using AHP show that of the three categories of impacts that affect the benefits of healthcare infrastructure, economic impacts are considered by local administrators as the most influential impacts rather than social and environmental impacts because in general a less developed country still needs to boost its economic growth where the economic factor can be more important than others factor. Figure 5.9 shows how the positive impact of the economy is higher than the social and environmental factor. The graph also illustrates the negative impact of three categories where environmental and economic have a similar contribution regarding cost and the influence of social impact has the least cost.

***Figure 5.9:* AHP Benefit-Cost Assessment of Impact Criteria (Combined)**



Conclusion, Limitation and Recommendation

In respect of the lack of recommendation about which approach should be used in prioritizing the projects, there is little emphasis and analysis on deciding whether the benefits of the projects are more noteworthy than the costs, both tangibles and intangibles (Chan, 2004). Although cost-benefit analysis and quantitative analysis have been applied as main components of the decision making, Farazmand and Neill (1996) describe how after the 1990s, strategies of measurements have yet to be consolidated into the qualitative impact on the budgeting process. As numerous results are possible, cost-benefit analysis can be utilized if weights are tangibles or given by prices (willingness to pay). This study provides important empirical contributions or novelty among others by applying cost-benefit analysis if weights are intangible, the feasible alternatives become multi-criteria decision-making (MCDM). The major issue is that cost tends to be reasonably clear, whereas it is more difficult to characterize the benefits of projects in the public sector than in the private sector. For example, in the public sector, healthcare infrastructure provision by governments is needed to ensure that public health services are offered for all members of society and at all levels of society. Thus, the benefit is identified as equality for society.

This study aims to examine the local government priorities in healthcare infrastructure policy where the implementation of AHP has proved to be an effective and efficient method of prioritizing projects. The AHP approach can not only reduce the complexity of a process that requires multiple meetings between administrators but also conduct an accountable result as part of a scientific analysis. As the estimation of the benefit and cost of infrastructure projects are more complex and intangible, especially in public sector, the AHP approach is used as the method to measure the positive impact and negative impact of the policy. Many of the positive impact criteria identified as benefits of the project, while criteria of negative impact identified as costs of the project. The priority ranking of projects is conducted by creating a ratio between benefit and cost. The greater the ratio means the potential project to prioritize. When the critical ratio is 1, it means that the positive impact of the project is the same as the negative impact.

In this study, snowball sampling of respondents including some authorities from the planning agency, health agency, and public works agency of six local governments in West Java Province, Indonesia participated in completing the AHP questionnaires. Judgment sampling is used to select respondents in the study which was conducted by considering the respondent's understanding of the problems in public budgeting, especially for healthcare infrastructure.

Based on the result of the AHP calculation, public health enhancement has the biggest value of the ratio in five regencies/municipalities, while in Pangandaran Regency, the biggest ratio in its policy is capacity upgrading of the public hospital. The result shows that the majority of respondent local governments administrators have a similar perspective on the priority of policy focus. However, there were various preferences in regards to the judgment of criteria of impact, even though the result of policy focus is similar. In addition to the result, although the greatest benefit is generated through the development of special hospitals, the greater cost value of this alternative result in a small benefit-cost ratio. On the other hand, the ratio of the public health service enhancement is greater among the other alternatives because the cost is relatively small compared to other alternative costs.

Because development of public goods, which is handled by government, needs to deal with many issues that are too intangible to be measured, the AHP method can make a contribution to the government to provide an effective decision-making process to implement the priority needs through possible selection; and establish priority project as the solution. AHP provides an analytical method that is useful in the decision-making process of public budgeting, especially in terms of infrastructure financing. In particular, this research can be helpful for decision makers to set the ideal projects that should be prioritized when there are substantial budget limitations.

Based on the advantages and disadvantages of the AHP approach, the use of the AHP method in this research is to accommodate experts at local government level. The structure of hierarchy indicates a simplicity that is easy to understand for the administrators of local governments. However, this research can be applied to further development. In the case of problems of complexity and the need for feedback among criteria in the structure of hierarchy, the ANP method could be used as further solution to these problems.

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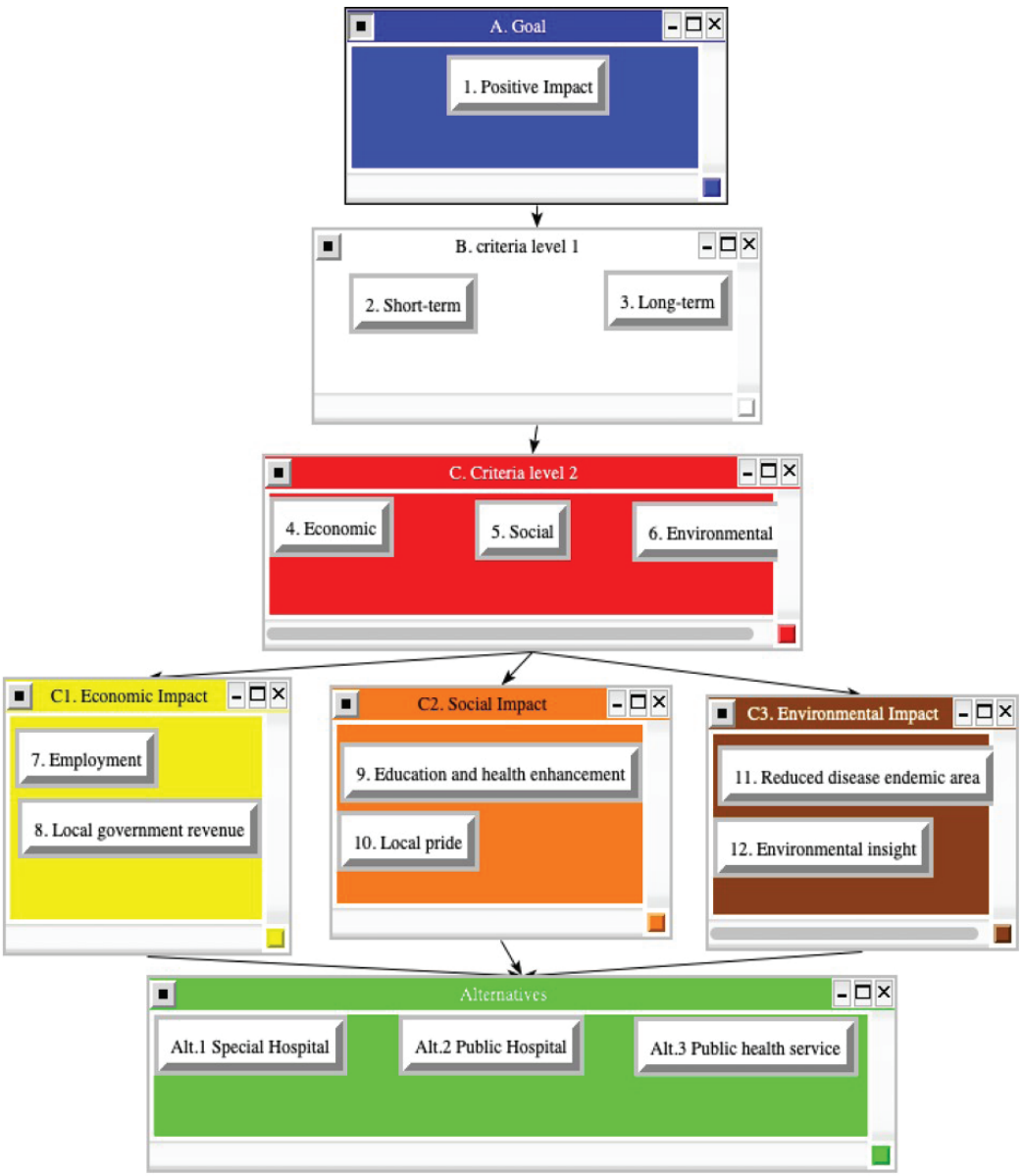
APPENDIX 1:

AHP chart with Super Decisions – Hierarchy of Positive Impact (Benefit)



APPENDIX 2:

AHP chart with Super Decisions – Hierarchy of Negative Impact (Cost)