

# DSS Model for the Adipura Trophy



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**Abstract:** Every year the Indonesian government presents challenges to the regional and city governments to obtain the adiputra trophy. The Adipura Cup is given to the municipal and regional governments in Indonesia who meet several requirements such as cleanliness, beauty, peace and several other criteria. During this time the criteria assessment process is done manually and this research aims to create a Decision Support System to help provide an assessment of the Indonesian government to determine the winner of The Adipura trophy. The research method uses Analytical Hierarchical Processing (AHP)

The results of this research are DSS models for The Adipura trophies. The conclusion of this research is that the resulting model facilitates the process of selecting the The Adipura cup.

**Keywords:** AHP,DSS,, Adipura.

## I. INTRODUCTION

Adipura is a Indonesia government program to create a healthy, sustainable environment as outlined in the Republic of Indonesia Minister of Environment Regulation [1]. The aim of this program is to create a city with a healthy natural environment that is in harmony with economic and social life. The city government is given motivation and challenges to make the city environmentally friendly with the complexity of economic and social problems. The assessment process begins with a physical assessment of environmental, economic and social conditions. After the physical monitoring team finishes carrying out their duties, they produce a report on the results of the physical assessment. This report document will be used as the deciding winner of the The Adipura trophy. The assessment process of the physical monitoring team's report conducted by the central government is carried out manually and this research aims to create a DSS model that will help the central government determine the winner of the The Adipura trophy better.

Decision Support system is a method used to assist the decision making process to produce alternative decisions that will be considered by management or decision makers. Analytical hierarchical processing AHP is used to solve complex problems into simpler parts. DSS and AHP can be used to help the assessment process for The Adipura cup winners. The previous research used AHP for Bekraf [2] and Promethee to assistance SMEs [3], choose Leader Culling

using AHP-Promrthee Methodology [4], to use Mining Method Selection by Integrated AHP and Promethee Method [5], and to Applying Promethee Method Based on Entropy Weight for Supplier Selection [6]

## II. LITERATURE STUDY

### A. Analytical Hierarchical Processing

AHP was first introduced and developed by Dr. Thomas L. Saaty from the Wharton School of Business with alternative features and criteria that form a major part of the AHP [7]. AHP is a way that aims to divide the complexity of the problem and not patterned or unstructured into smaller parts. The AHP also organizes parts of this section into a hierarchical orderly arrangement. after the test is arranged hierarchically, each part is compared with other parts by determining the level of importance or priority level with numerical numbers or weights for each section. the level of importance or priority will influence the decision situation.[9]

AHP uses subjective judgment to determine the level of importance or priority, for example if there are two parts A and B where A is 3 times more important than B, then giving score 3 in part A is a subjectivity provided by AHP[10]. so the possibility of differences will be very large depending on the perception of individuals who determine them.

AHP also combines individual individual judgment with logical thinking. the way of thinking logically will be greatly influenced by individual's knowledge and experience and imagination. thus the logic on AHP is strongly influenced by the ability of individuals who compose it [5].

AHP has the following procedures:[11]

1) Arranging problems into a level hierarchy that will be used for the next stage. At this stage it is necessary to determine the objectives of the whole system. The next step is to determine criteria for consideration in determining priority levels. One criterion can have several criteria below that have different values or scores.

2) Elements of priority determination

After determining the priorities that have been done in the previous stage, the next step is to compare one criterion with other criteria in pairs, meaning that one criterion is compared with a partner with another criterion. To facilitate pairwise comparisons the comparison process uses a matrix. The resulting matrix not only makes it easy to compare criteria in pairs but also helps to see the consistency of the results of the comparison between criteria. The matrix can also show the priority sensitivity values in general of all criteria. Finally the matrix can be used to analyze the level of sensitivity that might change considerations. The highest level is first in the pairwise comparison process [12]

After compiling the criteria in a matrix the next step is to use numbers to determine the relative importance of one criterion with other criteria.

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## DSS Model for the Adipura Trophy

Numbers used use a scale of 1 to nine to determine the relative importance of one criterion with other criteria, which means the scale is positive for one digit.

The scale can be 1 if one criterion is compared to the criterion itself and usually exists on a matrix diagonal line. A quantitative scale from one to nine is shown in table 1

**Table 1**

| Scale of priority | Explanation         |
|-------------------|---------------------|
| 1                 | Equal importance    |
| 2                 | Weak                |
| 3                 | Moderate importance |
| 4                 | Moderate plus       |
| 5                 | Strong importance   |
| 6                 | Strong Plus         |
| 7                 | Very Strong         |
| 8                 | Very, very strong   |
| 9                 | Extreme strong      |

### B. Decision Support System (DSS)

Decision Support System (DSS) is used to help decision makers in overcoming existing problems. SPK is not intended to automate decision making. SPK is able to provide interactive tools for decision makers to carry out various data analyzes, using available models [18].

### C. Model

The model is defined as the representation of the real object. The model consists of many types such as mathematical models, graphic models, 3-dimensional models and others that are used in accordance with the interests of the model users. For example 3-dimensional models are needed to depict real objects such as houses, vehicles, people and others. While the graph model is used to explain data flow, sequence processing and so on.[8]

## III. RESEARCH METHODOLOGY

A. The Adipura participants must meet several criteria divided into general criteria and specific criteria. General criteria are general and only for group determination based on city or district level. While special requirements include environmental conditions related to water and air and all matters relating to water and air health. The table below explains in more detail about adipura-winning criteria.

General Requirement

|    |   | 3    | 2    | 1   |
|----|---|------|------|-----|
| P1 | The population is in accordance with the established criteria | Good | Fair | Bad |

Specific Requirement Water Condition

**Table 2. The criteria for feasibility assessment**

| Specific requirements Non Physic Water Condition |  |      |      |     |
|--|--|------|------|-----|
| No   | Program  | 3    | 2    | 1   |
| Q1   | Implementation of water pollution control      | Good | Fair | Bad |
| Q2   | Availability of clean water                    | Good | Fair | Bad |
| Q3   | Water quality monitoring                       | Good | Fair | Bad |
| Q4   | Availability of domestic wastewater management | Good | Fair | Bad |

| facilities                                   |   |      |      |     |
|--|---|------|------|-----|
| Q5   | Human Resources support, facilities and facilities in implementing water pollution control            | Good | Fair | Bad |
| Specific requirements Physic Water Condition |   |      |      |     |
| No   | Program   | 3    | 2    | 1   |
| R1   | Surface water quality   | Good | Fair | Bad |
| R2   | Availability of domestic wastewater management with a centralized or communal system                  | Good | Fair | Bad |
| R3   | Availability of wastewater management from small scale business with a centralized or communal system | Good | Fair | Bad |

| Specific requirements Non Physic Air Condition |   |      |      |     |
|--|---|------|------|-----|
| No   | Program   | 3    | 2    | 1   |
| S1   | Air quality monitoring activities from mobile source emissions                                      | Good | Fair | Bad |
| S2   | Activities reduce the level of air pollution from mobile source emissions                           | Good | Fair | Bad |
| S3   | Activities related to awareness of the issue of air pollution / air quality                         | Good | Fair | Bad |
| Specific requirements Physic Air Condition     |   |      |      |     |
|  | Score   | 3    | 2    | 1   |
| T1   | Measurement of road air pollution   | Good | Fair | Bad |
| T2   | Urban traffic performance   | Good | Fair | Bad |
| T3   | Motor vehicle emissions and noise tests   | Good | Fair | Bad |
| T4   | Quality of environmentally friendly fuels   | Good | Fair | Bad |
| T5   | Motor vehicle testing facilities  | Good | Fair | Bad |
| T6   | Ambient air monitoring  | Good | Fair | Bad |
| T7   | Transportation management (the existence of public transportation, facilities, intermodal, service) | Good | Fair | Bad |
| T8   | Regional noise monitoring (ports, airports, stations, terminals)                                    | Good | Fair | Bad |
| T9   | Regional air quality monitoring (ports, airports, stations, terminals)                              | Good | Fair | Bad |

The above table is a reference to give a score on each criterion. Scores 1 to 3 for bad, fair and good where the use of short intervals is intended to facilitate the weighting process. The range of scores can be adjusted according to the needs if a longer interval is required, the score can be used further.

### B. Method

Table 1 becomes the main reference to build DSS where all data generated will be stored in a database. The table below explains the matrix used to compare criteria in pairs and the table below is an alternative that will later contain The Adipura participants

Table 3 Weight comparison matrix

|            |            |     |            |
|------------|------------|-----|------------|
|            | Criteria 1 | ... | Criteria n |
| Criteria 1 |            |     |            |
| ...        |            |     |            |
| Criteria n |            |     |            |

|             |        |       |     |        |
|-------------|--------|-------|-----|--------|
| Alternative | f1(.)  | F2(.) | ... | fm(.)  |
| a1          | f1(a1) |       | ... |        |
| a2          | f1(a2) |       | ... |        |
| ...         | ...    | ...   | ... | ...    |
| an          |        |       | ... | fm(an) |

Consistency testing can be seen from the AHP results that will determine the final ranking of the The Adipura winner selection process. Table III shows preliminary analysis data.

IV. DIAGRAM OF RESEARCH

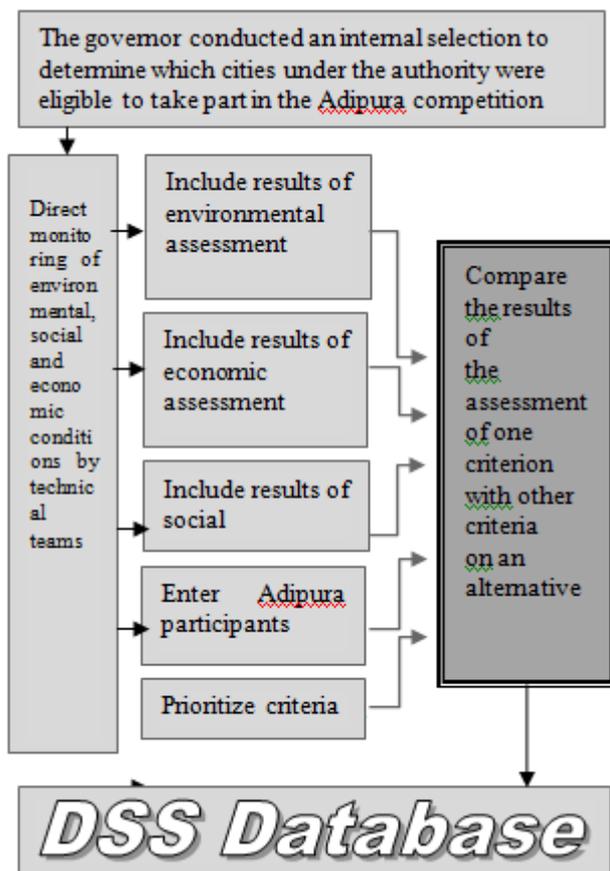


Figure 1

The figure 1 explains the process of selecting The Adipura winners. The first step is the governor conducts an internal selection aimed at selecting areas under his authority to follow the The Adipura. This selection uses standard general and specific criteria as outlined in the legislation so that candidates for the city or district have sufficient requirements as The Adipura participants.

After that the technical team will receive participant data and conduct direct monitoring in the field about environmental conditions related to economic and social aspects. The results of the assessment from the technical team will be raw data that is processed by comparing criteria in pairs for all alternatives and then stored in the DSS Database which will be used to build the DSS application.

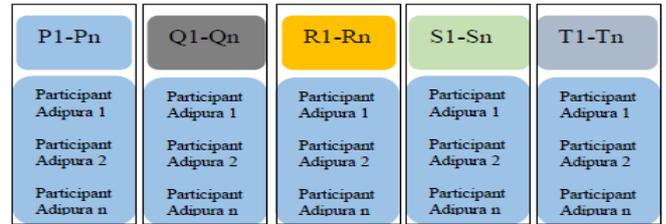


Figure 2

Figure 2 explains the process of comparing one criteria for all alternatives where:

P1-Pn is the Criteria for General Requirement,  
Q1-Qn is the Non-Physical Air Condition Specific criteria  
R1-Rn is the specific criteria for Physic Air Condition  
S1-Sn is the specific criteria Non Physic water Condition criteria  
T1-Tn is the specific criteria for Physic water Condition  
The picture also explains that each The Adipura participant was assessed according to the criteria above.

Figure 3 through Figure 6 explains each The Adipura participant will be assessed for all criteria. From the combination for all The Adipura participants with all the criteria, an adipura winner will be obtained.

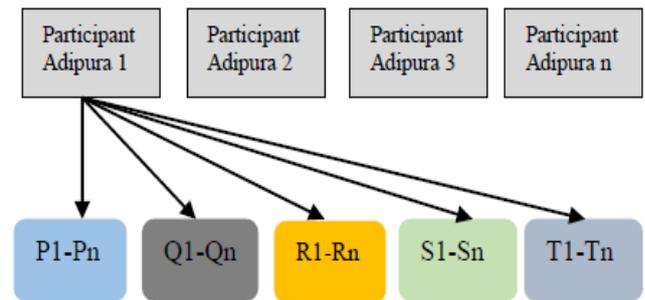


Figure 3

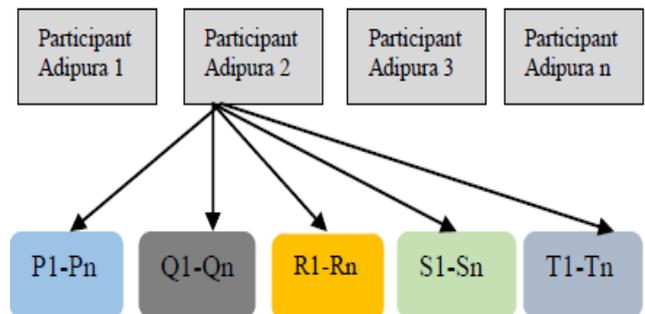


Figure 4

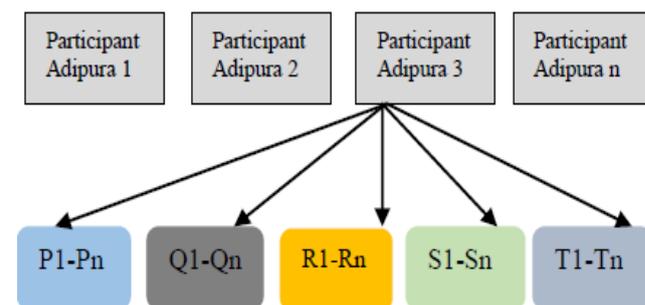
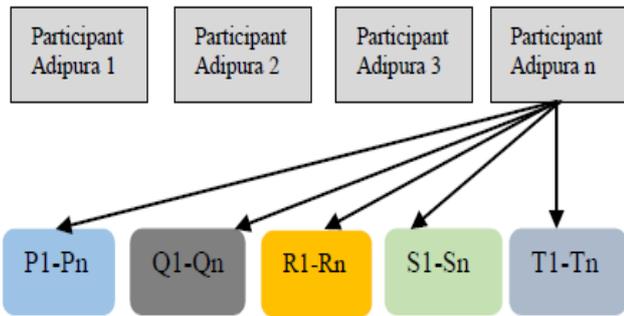


Figure 5

## DSS Model for the Adipura Trophy



**Figure 6**

### Criteria comparison

Criteria comparison is comparing the relative pairing between one criterion with another criterion by giving a score on each criterion

For example Q1 Implementation of water pollution control is 3 times more important compared to Q2 Availability of clean water, then fill in the matrix as follows

|    |   |   |   |   |    |   |   |   |   |
|----|---|---|---|---|----|---|---|---|---|
| Q1 |   |   |   |   | Q2 |   |   |   |   |
| 5  | 4 | 3 | 2 | 1 | 1  | 2 | 3 | 4 | 5 |

If Q2 Availability of clean water is 5 times more important than Q3 Water quality monitoring then the filling is as follows:

|    |   |   |   |   |    |   |   |   |   |
|----|---|---|---|---|----|---|---|---|---|
| Q2 |   |   |   |   | Q3 |   |   |   |   |
| 5  | 4 | 3 | 2 | 1 | 1  | 2 | 3 | 4 | 5 |

If Q5 Human Resources support, facilities and facilities in implementing water pollution control is more important 4 times compared to Q4 Availability of domestic wastewater management facilities, the filling is as follows:

|    |   |   |   |   |    |   |   |   |   |
|----|---|---|---|---|----|---|---|---|---|
| Q5 |   |   |   |   | Q4 |   |   |   |   |
| 5  | 4 | 3 | 2 | 1 | 1  | 2 | 3 | 4 | 5 |

If R1 Surface water quality is more important 2 times than R2 Availability of domestic wastewater management with a centralized or communal system, then the filling is as follows:

|    |   |   |   |   |    |   |   |   |   |
|----|---|---|---|---|----|---|---|---|---|
| R1 |   |   |   |   | R2 |   |   |   |   |
| 5  | 4 | 3 | 2 | 1 | 1  | 2 | 3 | 4 | 5 |

If R2 Availability of domestic wastewater management with a centralized or communal system is more important 5 times compared to R3 Availability of wastewater management from a small scale business with a centralized or communal system, then the filling is as follows:

|    |   |   |   |   |    |   |   |   |   |
|----|---|---|---|---|----|---|---|---|---|
| R2 |   |   |   |   | R3 |   |   |   |   |
| 5  | 4 | 3 | 2 | 1 | 1  | 2 | 3 | 4 | 5 |

If T1 Measurement of road air pollution is more important 3 times than T2 Urban traffic performance, then fill it as follows:

|    |   |   |   |   |    |   |   |   |   |
|----|---|---|---|---|----|---|---|---|---|
| T2 |   |   |   |   | T1 |   |   |   |   |
| 5  | 4 | 3 | 2 | 1 | 1  | 2 | 3 | 4 | 5 |

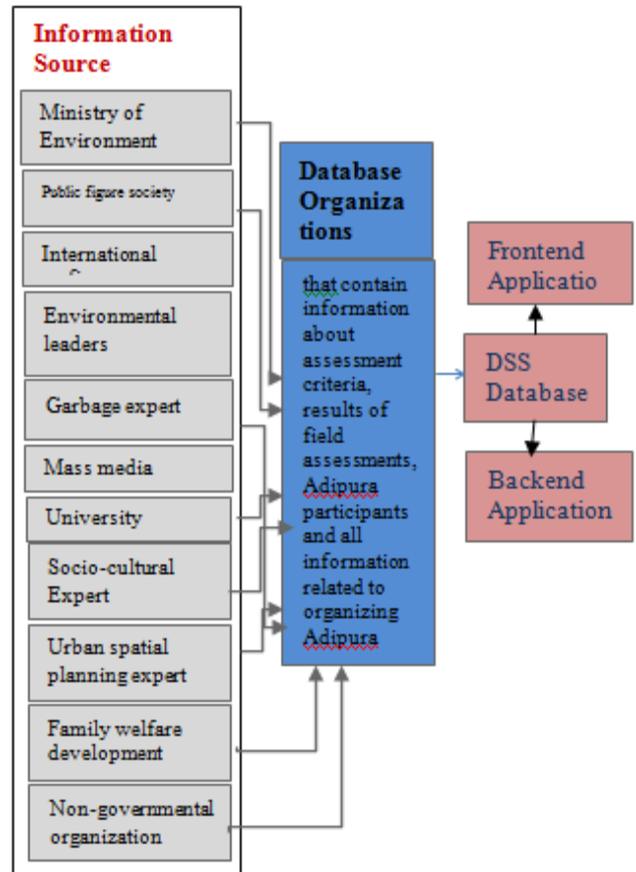
If T3 Motor vehicle emissions and noise tests are more important 4 times than T4 Quality of environmentally friendly fuels, then the writing is as follows:

|    |   |   |   |   |    |   |   |   |   |
|----|---|---|---|---|----|---|---|---|---|
| T4 |   |   |   |   | T3 |   |   |   |   |
| 5  | 4 | 3 | 2 | 1 | 1  | 2 | 3 | 4 | 5 |

If the T5 Motor vehicle testing facility is more important 2 times than the T6 Ambient air monitoring, then the writing is as follows:

|    |   |   |   |   |    |   |   |   |   |
|----|---|---|---|---|----|---|---|---|---|
| T5 |   |   |   |   | T6 |   |   |   |   |
| 5  | 4 | 3 | 2 | 1 | 1  | 2 | 3 | 4 | 5 |

## V. RESULT AND DISCUSSION



### A. Information Source

Is part of the DSS model for The Adipura that explains the source of information about the assessment criteria of The Adipura participants. The source of information comes from

- a. public figure;
- b. international figures;
- c. environmental leaders;
- d. garbage expert;
- e. mass media;
- f. College;
- g. socio-cultural;
- h. urban spatial planning;
- i. family welfare development group;
- j. non-governmental organization;

All of which are members of the Adipura Advisory Council. The main party as a source of information is the Ministry of Environment.

### B. Database Organization

All information obtained from the The Adipura Advisory Board will be stored in the organizational database.

In the organization's database there are also The Adipura participant evaluation criteria and all information related to the The Adipura trophy

**C. DSS Database**

Database organizations are connected directly with DSS databases and daabase applications. This is where the automatic calculation process will be carried out by the system. The output of the system is a list of The Adipura participants with the highest score to the lowest score. Management can consider the results of the DSS assessment because in essence DSS and AHP only help with decision making but do not replace the decision making function by management.

**MODEL EVALUTION AND FEEDBACK**

Based on environmental observers and some experts relevant to the implementation of The Adipura there are some suggestions for the DSS model that was made.

| No | Model                 | Feedback   |
|----|-----------------------|--|
| 1  | Information source    | 1. Information sources should be classified in more detail. The Adipura Advisory Board consists of many components of society if information is not classified then overlapping will occur. Sources of information must be grouped based on areas of expertise, for example environmental experts provide input on the environment. Community leaders, universities and other figures who don't have special expertise with the environment and the economic and social needs of the people must be clarified as to what information is given. |
| 2  | Database organization | It is necessary to provide guidelines for members of the The Adipura consideration board in providing information. With guidelines will facilitate the process of transforming information   |
| 3  | DSS Application       | DSS applications that are described in the DSS model need to be clarified supporting components and not only display the frontend and backend. Need to add other components such as table design, user interface design and others.  |

**VI. CONCLUSION**

The DSS model for The Adipura implementation can help The Adipura organizers to provide alternative candidates for the The Adipura trophy winner. AHP can help The Adipura organizers provide an assessment of The Adipura participants with several predetermined criteria.

This model still needs to be improved as suggested by The Adipura observers. Advice from The Adipura observers will be the subject of future research.

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