

Integrated Multi Criteria Decision Making for a Destitute Problem

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Abstract—The principal issue in neediness diminishment in Indonesia has various in definitions and pointers of destitution. Granting model for a destitute problem can be gained through an integration of Multi Criteria Decision Making (MCDM) with the information of the destitute. The main objective of this study is to create a model of an integrated MCDM techniques (AHP, ELECTRE, PROMETHEE, TOPSIS, and SAW) for the determination eligible poor in poverty alleviation programs and integrates data from various sorts of destitution information. The granting model can be an alternative model for support to the policy makers in multi-decision making, information, reference services, and sources, and efforts to ensure the accuracy of the distribution of the assistance program. In the context of programs audit, this model can be used to verify the validity of poverty information, that support the target of achieving Sustainable Development Goals (SDGs).

Keywords—poverty; multi-criteria-decision-making; indicator; poor

I. INTRODUCTION

Analyze the causes of poverty is not easy and it is unclear should start from the point where, poverty it's was not an accident, as in Mandela's speech " Like slavery and apartheid, poverty is not natural. It is man-made and can be overcome and eradicated by the actions of humans [1].

Poverty is a phenomenon that occurred a long time and is a problem for countries in the whole world [2]. In the perspective of global demand has become an issues [3], a concern of the international community, "End poverty in all its forms everywhere", has become a global commitments contained in the (SDGs) as the form of the sustainable Declaration is the result of an agreement heads of state and representatives more than 190 countries of the United Nations (UN), in the form of 17-point goal to be achieved by 2030 [4].

In order to realize the SDGs targets, efforts and strategies to be undertaken by each country, but there are still problems differences definitions of the discussion [2, 5, 6], i.e. the issue of the poverty line, how is poverty measured? how to measure poverty are accurate and precise? how would they know whether their efforts have an impact? This question is important because there are various approaches to measuring poverty [6, 7, 8, 9], and no one is perfect and could become the standard general conditions. Not necessarily world standards

appropriate for each country, where the economic situation is quite diverse societies and cultures [2, 3].

The global poverty is also a fundamental issue in Indonesia, Indonesia, with a large population, the geography, and area, various cultural and other factors, making the government must make efforts to find the precise strategy to overcome the problem of poverty [10]. The government has launched efforts to reduce poverty from year to year, various poverty reduction policy has been produced with a level of intensity and magnitude different. As a result, aside from there are several of poverty reduction programs have been quite successful, there are also many poverty policies that fail to achieve its objectives, and the decline in the number of poor people in Indonesia is still not significant, a decline in numbers, but slowly [11, 12].

In general, the main problems in poverty reduction in Indonesia are the differences in definition, poverty indicators, and data collection. During this time, the determination of the poverty measure used Indonesia is very diverse, based on the study of literature [13, 14] there are more than five government agencies that issued the poverty criterion, 2 independent or civil society organizations, and plus the 33 provinces in Indonesia which also use local criteria based on the needs of each local government, this shows that the lack of forms of institutional coordination in poverty reduction in an integrated and comprehensive among these institutions. Coordination and synergy among state institutions in central government and its local government yet to be explained properly, especially in terms of tasks and functions in the agenda of poverty reduction programs.

The multi-perspective, various sources, criteria, and indicators to show that poverty is a multidimensional phenomenon [15, 16]. This phenomenon makes the measurement of poverty is not easy. however, poverty must be measured as an overview and base material for policy making into poverty reductions, there must be standard indicators used to measure of the poverty, if there is just a little change in measuring used, then would lead changes in the number of the poor people which is quite significant [2, 17].

Inequalities of data ultimately it will affect the measurement of poverty, due to differences in poverty measurement tool has implications for the quantification of poverty is different. Data discrepancies eventually led to a

different priority to poverty reductions programs implemented. We cannot judge what is right or wrong, this issue is not just to counting the poor, but it is also related to the measure of poverty used, measure of poverty is not just a technical or methodological issue, but contains policies in the decisions selection made in face of opportunity, a certain situation, and even politics [18, 19, 20].

Thus, many of the problems related to poverty indicator because it is not clear where the poor people who should be ideal or precise being targeted for poverty reduction programs. because it was necessary to make adjustments in order to determine the poverty indicators of poor families are not misplaced. There need to be strategic steps to collect data poverty indicators in a management model that can be used as a data source or a reference in the decision making on poverty reduction programs.

The purpose of this study resulted in a destitute problem data management model that can be:

- Architecture and destitute personal data storage models; that collect data indicators, and source data of poverty reduction programs, and the poor-data.
- Integrate models of destitute problem data and Multi Criteria Decision Making (MCDM) methods.
- Decision-making models for management of destitute problem reduction programs.
- Verification and validation models for the poor.

II. METHODOLOGY

A. Multi-criteria Decision Making (MCDM)

Reference [21] explained that the multi criteria decision making is the most well-known branch of decision making. It is a model which deals with decision problems under the presence of a number of decision criteria, and very often known by the name multi criteria decision making or MCDM and multi-attribute decision making or MADM.

There are many techniques in MADM method, some of the techniques described in [22, 23, 24, 25, 26], and this study will apply the technique of Analytic Hierarchy Process (AHP) [27], elimination and choice expressing the reality (ELECTRE) [28], Preference Ranking Organization Method for Enrichment Evaluations (PROMEE) [29], Technique for Order Preference by Similarity to Sdeal Solution (TOPSIS) [30], Multi Criteria Optimization and Compromise Solution, with Pronunciation (VIKOR) [31], Simple Multi-Attribute Rating Technique (SMART) [32], and Simple Additive Weighting (SAW) [33] in the decision-making process and methodology.

B. Profile of Poverty Data in Indonesia

The Poverty and inequality are problems encountered by each local government and any country well. These conditions make the poverty reduction target into the main targets in the Sustainable Development Goals (SDGs). Many countries have issued substantial funds for poverty reduction but did not give a significant effect on poverty reduction in countries, such as

Indonesia, has distributed substantial funds to reduce poverty, but not comparable to the size of the budget is distributed. As reported in [34], whose achievements incline to be slower.

Based on [34, 35] poverty profile, although in terms of the amount of poverty in rural areas declined, the percentage of poor people increased. The effort and strategies have been implemented the government of Indonesia for the alleviation of poverty, such as providing assistance to the poor in a program, some programs are described in [36, 37], a series of these programs have the same goal for the people of Indonesia on poverty reductions.

However, these programs have not yielded optimal results, as expected, these programs have not been able to solve existing problems, until now there are many poor families who cannot access various government services program because in general they are not registered as poor as they were considered not fit the criteria or indicators that have been determined. This shows that the indicators were not able to include them as poor. In this issue at the root of the problem are data. The role of poverty data become very important in the successful implementation of the programs [38].

III. RESULT AND DISCUSSIONS

The proposed reasonable model is an information administration model of destitution that still be the distinctions, for example, marker information, criteria, the sources information pointers, and the information is neediness lightening programs. This information will an incorporated are for the most part utilized as a part of the arrangement of the issues that have numerous criteria, for example, the instance of destitution into a basic leadership demonstrate from the MADM strategy, i.e. AHP, ELECTRE, PROMETHEE, SMART, TOPSIS, VIKOR, and SAW. These methods are generally used in the solution of the problems that have many criteria such as the case of poverty data.

A. Architecture Models

The architecture of the proposed model is divided into several sub-models, and each sub-model has an internal process management respectively. The architecture model can be shown in Fig. 1.

1) Poverty Measurement

To measure the progress of development of a nation in general use macro poverty level, or aggregate that indicates the proportion and number of poor people living below the poverty line, with poverty calculation used is the approach of the ability to meet basic needs (basic needs approach). The numbers of poor people like this are also known as Poverty Headcount Index or P0. Another poverty measure that is often used is the Poverty Gap Index or P1. This index describes the difference (in percent of the poverty line) between the average expenditure of the poor and the poverty line. Another measure of poverty is the Poverty Severity Index or P2. Poverty Severity Index is the sum of the squares of the difference (in percent of the poverty line) between the average expenditure of the poor and the poverty line.

2) Government

The effort and strategy will be made of each country to achieve these targets, including Indonesia, has instructed all components of existing governments, at both the ministries, departments, in local government such as; provinces, regencies or district level. In the implementation of these agencies have a difference in determining the poverty indicators.

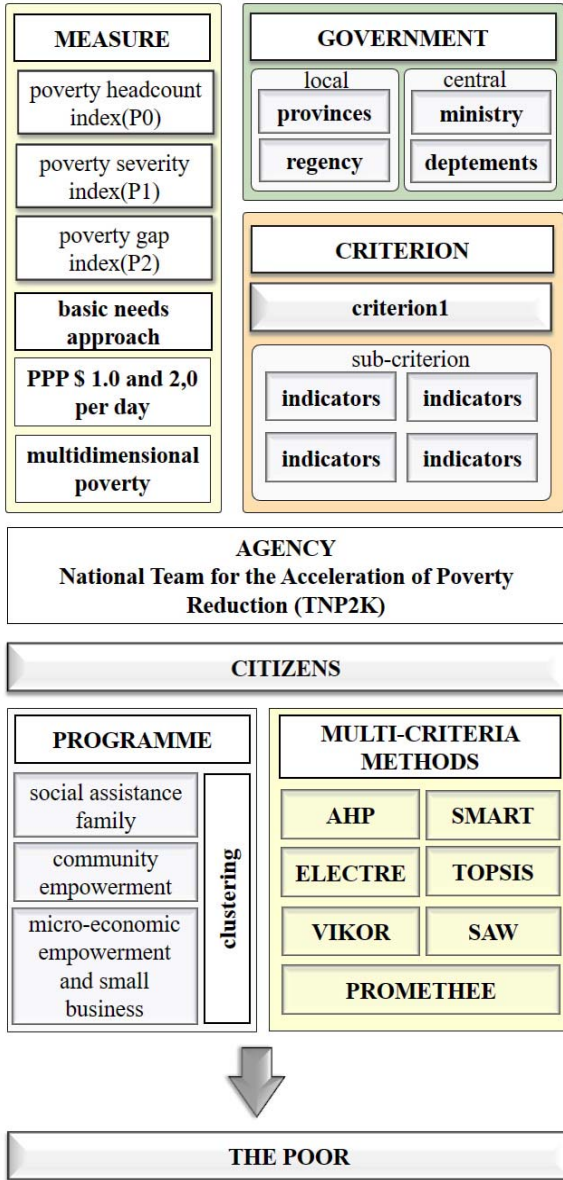


Fig. 1. The architecture model of management decision-making.

3) The Poverty Criteria

The government agencies have its own criteria or indicators in determining the poor, which is the reference criteria and guidelines on poverty reduction programs in Indonesia. Some agencies and the indicator can be seen in Table 1.

TABLE I. AGENCY AND INDICATORS

Source	Indicators
National Socioeconomic Survey (SUSENAS)	Approach to the basic needs of food (equivalent to 2100 calories per capita per day) and non-food, the determination of household's characteristics approach by using 14 qualitative explanatory variables of poverty.
Indonesia, Central Bureau of Statistics (BPS)	Uses the concept of the ability to meet basic needs (basic needs approach), The method used is to calculate the poverty line, which consists of two components, Food Poverty Line (FPL) and Non-Food Poverty Line (N-FPL)
National Development Planning Agency (BAPPENAS) - Indonesia	Use a rights-based approach, defining poverty as the non-fulfillment of certain basic rights, 5-11 criteria.
National Population and Family Planning Board (BKKBN) - Indonesia	Targeting poor families who were divided into 5 categories of welfare: disadvantaged families (Pre-KS), prosperous family 1 (KS1), prosperous family 2 (KS2), prosperous family 3 (KS3), family welfare 3 plus (KS3 Plus). in the determination of family welfare, uses 23 indicators.
Ministry of Social, Indonesia	11 indicators contained in the Decree of Social Minister: No. 146 / HUK / 2013.
Local Government	Based on the indicators typical of the region (local wisdom in the region)

4) Agency of national team for acceleration of poverty reduction (TNP2K)

TNP2K is an agency that was formed as a coordination across sectors and stakeholders at the national level, which aims to harmonize the various activities of the acceleration of poverty reduction.

5) The Poverty Reduction Programs

In efforts to accelerate poverty reduction, the Indonesian government has set three track poverty reduction strategies, which are grouped in clusters:

- a) Cluster 1: family-based integrated social assistance, which aims to reduce the burden on poor households through improved access to health care, education, clean water, and sanitation.
- b) Cluster 2: community-based poverty reduction, which aims to develop the potential and strengthen the capacity of poor communities to engage in development based on the principles.
- c) Cluster 3: based poverty reduction micro-economic empowerment and small business, which aims to provide access to and strengthening the economy for micro businesses and small.

In addition to the three main instruments of poverty alleviation, additional cluster IV in improving and expanding pro-people programs. Some programs can be seen in Table 2.

TABLE II. POVERTY ALLEVIATION PROGRAMS

Poverty Alleviation Programs in Indonesia	
Card Family Welfare (KKS)	Family Hope Programme (PKH)
Smart Indonesia Cards (KIP)	School Operational Assistance (BOS)
Healthy Indonesia Cards (KIS)	Cash transfers for poor students (BSM)
Saves Family Welfare Program (PSKS)	Social Health Insurance program (JAMKESMAS)
Healthcare Insurance (BPJS)	Rice for the poor (RASKIN)
National Community Empowerment Program	National Community Empowerment Program in Urban Areas
Social Welfare Problems (PMKS)	National Community Empowerment Program in Rural Areas
National Health Insurance (JKN)	Smallholder Agribusiness Development Initiative (SADI)
Peoples Business Credit (KUR)	Expansion and Development Of Employment / Labor-Intensive Productive
Credit Joint Venture (KUBE)	Water Supply and Sanitation Community Based (PAMSIMAS)
Productive Economic Business (UEP)	Remote Indigenous Community (KAT)

B. Management Poverty Data models and MCDM methods

1) MCDM methods for selection of program indicators. The model can be seen in Fig. 2.

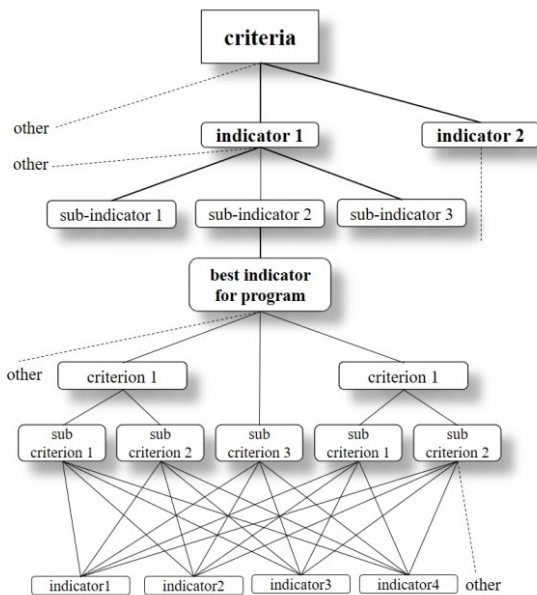


Fig. 2. MCDM methods for selection of criteria-indicator.

Decision-making methods in Fig. 2 explain the selection process and appropriate indicators used as an indicator of the poverty alleviation program, the process of MCDM methods will select the best indicators among other indicators.

2) MCDM methods for determinations of eligible poor.

Multi-criteria decision model in Fig. 3, explain the selection of eligible people poor to assistance the poverty alleviation program using MCDM techniques, in the process, each criterion and alternatives compared to one another to give

priority output intensity value that results in an output that provides an assessment of each candidate.

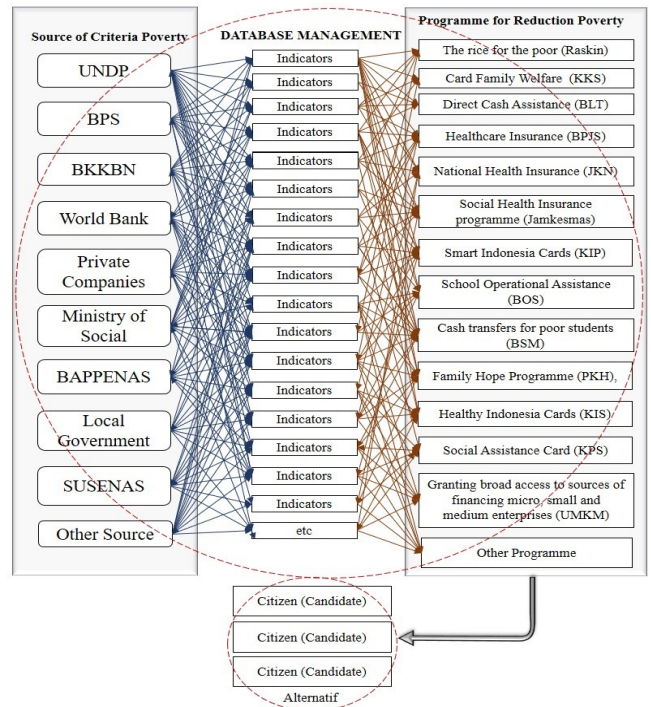


Fig. 3. MCDM methods for determinations of eligible poor.

C. Integrate Multi-criteria and Poverty Data

Fig. 4, is a unification of the model decision-making methods and the model poverty data.

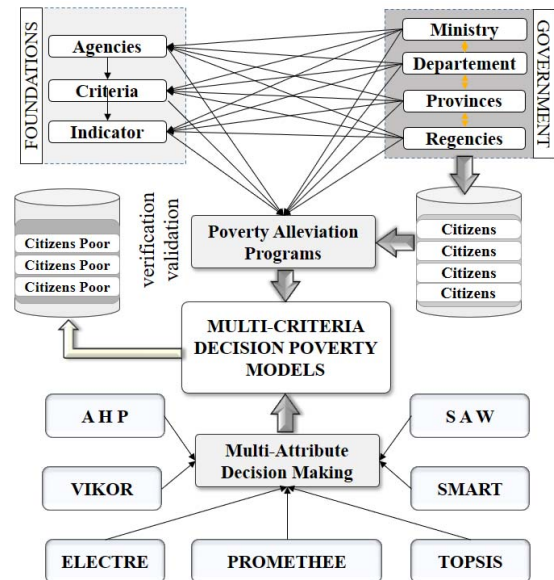


Fig. 4. Unification of the model decision-making and model poverty data.

Prior to the underlying essential parts (weights) are computed, relationship and multicollinearity testing were led to decide criteria from the last MCDM rank record display. For

example in granting of RASKIN, each given data have been clustered as cluster 1 and will be analyzed through the variance inflation factor to decrease the standard mistakes and width of the certainty interim for the assessment criteria. The rest of the criteria were utilized to produce the important vectors utilized as a part of the model of all algorithm and the assessment criteria were accumulated into a general rank list and each related criteria will be selected to measure the poverty citizen candidates that suit with the granting program. Next, the segmented cycle of models shown in Fig. 5.



Fig. 5. Segmented cycle of framework multi-decision poverty models.

Indonesian government already has an integrated database (BDT), an electronic data system that contains the name, address, NIK (Population Identification Number) and a basic description of the socioeconomic household and individual households in Indonesia. a model that we propose can be combined with the BDT as in the Fig. 6.

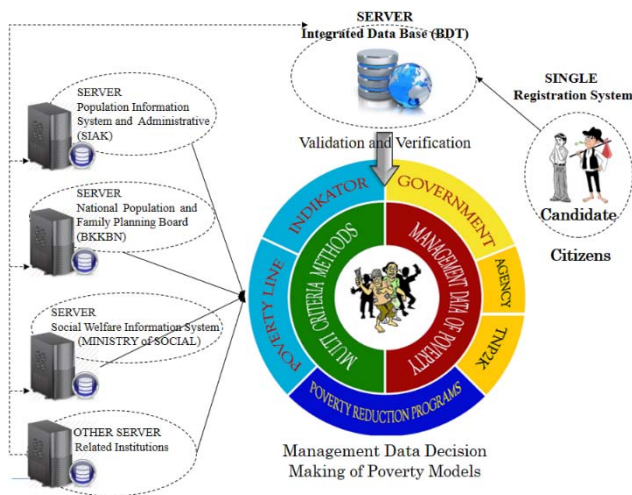


Fig. 6. The concept of integration of multi-decision poverty models into the government's database system (BDT).

In Fig. 4, has explained how the process of the multi-decision models to manage the data, and then like in Fig. 6, the data of citizens (candidates) who will be given assistance

program has been registered in the system, the system will perform verification and validation of data, and a framework of the multi-decision will do the decision-making process based on the program, indicators and techniques that have been created, be set or selected before. The outcome of the process is the output of ranking the data of citizens, citizens' data list that is the preference and recommendation to get assistance program to reduce poverty.

IV. CONCLUSIONS

From the work and result concluded that a model of integrated decision-making to determine the appropriate indicators and ideal for use in a poverty reduction program and decision-making to determine the eligible poor people get assistance on poverty reduction programs that integrates data on poverty and multi-criteria decision-making methods can be made through the government's integrated poverty database.

An implementation of the integrated poverty database in the future be required as part of efforts to ensure the accuracy of the distribution of aid. Also, to avoid any overlap and accumulation of funds in the hands of a group, the poor as a source of exploitation to obtain government funding, and often move from one agency to another agency, from one area to another. Therefore, the availability of an integrated database, problems like this will be eliminated. For the government, it is known who the beneficiaries so that it can be integrated with the government's poverty alleviation program to another. In the context of the audit program, this database can be used to verify that the information of the agencies.

An additional mind, that poverty alleviation programs in Indonesia, which have tended to focus on the distribution of social assistance for the poor, efforts such as this will be difficult to resolve the problem of poverty because the nature of the aid is not to empowerment, it can even lead to dependence. Assistance programs oriented government's generosity can exacerbate the poor morals and behavior, the aid program for the poor should be more focused to foster productive economic culture and capable of liberating dependence permanent residents. On the other hand, social assistance programs could also cause corruption in the distribution.

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