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ID-STM: A FRAMEWORK OF REGIONAL GAP FOR SUSTAINABILITY OF AN UNDERDEVELOPED AREA

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Abstract

The purpose of this article is to propose a framework for regional inequality in the Southern part of West Java, Indonesia. There are two methods adapted, namely the Ishikawa Diagram (ID) and the Sociotechnical Method (StM) which are generally used in engineering studies. In this study we apply them in analysing social problems that cause regional inequality in the southern part of West Java, Indonesia. These two interdisciplinary approaches resulted in the framework that we propose. The main novelty of ID-StM compared to the Ishikawa Diagram and Sociotechnical Method which are applied separately, is that the framework that we developed from the two methods allows it to be applied interdisciplinary, both in technical studies and social studies, especially in overcoming development inequality in the southern West Java region. The ID-StM framework is expected to assist further studies. The indicators of research problems in the framework that we found are more detailed than the results of previous studies. Meanwhile, for policy holders, the ID-StM Framework can be used as material for consideration in formulating development plans to minimize regional inequality in the southern part of West Java, Indonesia, and also in other areas.

Keywords: Framework, Regional inequality, Southern West Java, Underdeveloped regions.

1. Introduction

"Micro-national" inequalities are experienced by developed countries, such as health inequality in the slums of Ahmedabad, in the Maori community in New Zealand, the British Coventry city, Brazil, Slovenia, and Taiwan and even Thailand [1]. Employment inequality also occurs in Germany, Italy, and the UK [2]. Another inequality is the inequality in rural communities that occurs in the new member countries of the European Union, with the exception of Latvia [3]. The gap was even in the need for assistance to micro-entrepreneurs, tourism, and agriculture in North Carolina, United States [4]. Such an inequality, especially regional inequality is also experienced by Indonesia. Not only does it happen in east (Papua Province) and West (Aceh Province), but it also occurs in central Indonesia including southern West Java, West Java Province, Indonesia. In fact, the span of control is only about 250 km away from the capital city of the Republic of Indonesia.

Inequality experienced by the southern part of West Java is "macro-regional" inequality as it includes such aspects as the low human development index (HDI); low index of economy, education, and health services [5]. There are also limited infrastructure [6-8], supporting facilities and means of production as well as lack of superior regional management such as in agriculture, plantations [9, 10], animal husbandry, fisheries, marine, and tourism [11,12]. Basic public services in the field of village administration [12], disasters and tsunami threats in the Indian Ocean, and the environment are also still very lacking [13,14]. Even the potential for defence and security disturbances in the Indian Ocean is a separate problem, considering that the southern part of West Java is located on a stretch of the Indian Ocean coast along 420 kilometres from the border of Banten Province to Central Java Province [14,15].

The southern part of West Java is generally located on the southern coast, which mainly consists of mountains, agricultural land, and plantations. The lagging condition is very striking when compared to the Central West Java region (provincial capital, urban areas, and industrialization) and the northern part of West Java, namely Sumedang, Majalengka, Cirebon, Subang, Indramayu, and Kuningan regencies, as well as Cirebon City known as "Rebana" which has been more rapidly developing as urban and industrialization. The gap rate between developed regions and underdeveloped regions in West Java Province reaches 0.403%, which is above the national figure (0.381%). The disparity occurs between areas located around the province of the natural development of DKI Jakarta [5]. The average value of the economic index in the northern coastal area is 0.0261, while in the southern coastal area it is 0.0085. This means that the southern coastal area is smaller than the northern coastal area so that economic disparities in 2016 in the southern coastal area are more evenly distributed than that in the northern coast of Java Island [16]. From the aspect of agricultural resource management, local farmers' privileges are not given much attention; the management of rural agriculture is dominated by the power of the rich [9]. Inequality of agricultural land ownership in the southern part of West Java is caused by the exploitation of small farmers (tenants) and the agricultural production sharing system so that it can preserve land ownership that rents out [17]. Meanwhile, from the aspect of education, literacy culture in the southern part of West Java is generally still low [18]. The disparity in the condition of road and bridge connectivity of the primary road network system has not been met, 71.76% of the road network is in the northern region (Rebana) while in the southern region it is only 28.24%, the level of movement of goods and services in

the southern region is still relatively small [5]. Division of the province of West Java can be seen in Fig. 1.

Fig. 1. Division of the province of West Java.

The problem of regional inequality in the southern part of West Java needs to be studied in depth. Considering that the results of previous studies are still limited and there is no adequate framework, the purpose of this study is to find a framework model for mapping regional disparities that have not been found before. For researchers, the framework model can help further study of scientific research groups, help find research problems and development issues as well as add new paradigms and scientific references in the field of regional development and regional inequality. As for the government, the framework model can be taken into consideration in determining the formulation, implementation, analysis, and evaluation of policies in overcoming the backwardness of the southern part of West Java.

2. Overview of Regional Inequality

2.1. Regional inequality in developed countries

Inequality among regions within a country does not only occur in underdeveloped countries or developing countries such as Indonesia but is also experienced by developed countries. Globally, inequality between developed countries, developing countries, and underdeveloped countries occurs as in the health sector [1]. In the employment sector, regional disparities in unemployment rates are experienced by developed countries, such as Germany, Italy, and the UK. In the period 1984-1994, unemployment at the national level was closely related to the high level of unemployment inequality in the respective regions of the three countries. Several government policy options in the long term can be done through subsidizing temporary jobs, increasing the productivity of workers who are still low in competence through training, encouraging the growth of private sector companies in the regions, and investing in economic infrastructure in the regions [2]. The same is true in European Union countries. Since the integration of Central and Eastern Europe into the economy of the European Union, the new member countries, except for Latvia, have disparities. Likewise in rural areas, there are no major changes compared to the period before integration. In the Gross Domestic Product (GDP) of countries dominated by urban areas, inequality has doubled or even tripled with countries that are predominantly rural, with the exception of the Czech Republic. In the case of Bulgaria and Romania, after four years of joining, economic

development experienced a disparity with developed countries that were members of the European Union [19].

Economic agglomeration is still cantered on countries that were more advanced before joining. Some sectors that experience inequality include public services, such as rural services, tourism services, renewable energy, liberalization of agricultural products, and employment in the agribusiness sector [3]. On a micro scale, regional disparities occur in developed countries such as the United States, in the field of transfer of agrotechnology, namely in the Wyoming region. The potential to increase biomass and reduce the gap in maize silage yields in the region can be managed well if irrigation water is built and sufficient nitrogen (N) water is well developed [20]. The gap in the need for assistance to micro-entrepreneurs, tourism, and agriculture occurs in North Carolina, United States. Coaching as mentors is a strategy that enables successful agricultural tourism micro-entrepreneurs in North Carolina [4]. Similarly, in river restoration, there has been a gap in the management of lotic ecology and applied technology in the Indiana watershed, United States of America. Carrying out continuous evaluation, improving regulation, and management of river ecological systems is very important in addressing the Indiana River flow [21]. The regional disparity in Andhra Pradesh, India, has been growing since its formation in 1956. Hyderabad as the largest urban center and economic center has an impact on the imbalance of development of the periphery. Government policy intervention in increasing development progress in rural areas to reduce regional disparities is very important [22]. The study of regional disparities at the macro level in India shows that India's regional income per capita in the period 1990-1991 to 2017-2018 experienced a lot of inequality, namely 0.75 percent; Net State Domestic Product (NSDP) increased by 18.6 in the southern region of India, as Tamil Nadu developed into an industrial-based state so that its industrialization graph was the most advanced and highest, at least until 2013-2014 amounted to 37,378 factories, an increase of 14,617 factories after 1990-2014. 1991. Over the past 25 years, the state's industrial growth rate has increased more than 2.5 times [23]. China is also experiencing regional inequality. Reducing inequality has a small negative effect on growth in the short term but has almost no effect on growth in the long run. Increased growth, on the other hand, reduces inequality in all development sectors [24]. The North and Northeast regions of Brazil have the worst levels of regional inequality, the central regions have the medium levels, and the South and Southeast regions have the best. Although indicators have improved over the last few decades, spatial disparities persist [25]. National and local development plans in Malaysia, Indonesia, Thailand, the Philippines, South Korea, Brazil, Mexico, Nigeria, Ivory Coast, Niger, and other countries experience serious regional disparities. Economic growth is uneven, the agglomeration of the industrial sector is concentrated in urban areas, these countries do not have "*development poles*" to encourage industrial development in the regions, industrialization is concentrated in urban areas [26].

2.2. Regional inequality in Indonesia

As a developing country, Indonesia experienced development inequality between western Indonesia and eastern Indonesia during 2004-2013 [27, 28]. Every reduction in development inequality between regions and agglomerations always has a positive impact, by reducing poverty levels. Several crash programs that can be carried out by the government in overcoming inequalities between regions

include infrastructure development, such as port infrastructure, road repairs, additional power and electricity capacity, construction of hospitals and community health centres, and educational facilities and infrastructure [6]. Economic growth has a positive sign direction but has not significantly affected income disparities in 33 provinces in Indonesia during the 2013-2018 research period, because each province has a much different amount of economic growth between one province and another. Government policies need to encourage the flow of development and investment to underdeveloped or less developed regions and limit the development of large business activities in existing growth centres. Economic concentration needs to be avoided so that the distribution of public services and connectivity between regions can be felt by less developed people [29].

The infrastructure gap between regions is considered as one of the factors that encourage economic inequality between regions in Indonesia. The economic gap (GRDP per capita) is quite high between provinces in Indonesia during the 2011-2015 period. The positive correlation between the per capita GRDP gap and the infrastructure gap between provinces is very strong. The government needs to accelerate development equity programs proportionally, especially in areas that are considered to be underdeveloped [8]. Regional Original Income (PAD) has a significant positive effect on regional disparities in Java and Bali. This means that every one unit increase in PAD will reduce the Gini index value, and every one unit increase in Foreign Investment (FDI), will also increase the inequality index value in the two islands [30]. Indonesia also experiences inequality in children's health, especially in cycling [31]. In terms of antenatal care (ANC), namely pregnancy checks, there are disparities, among others, from 34 provinces in eastern Indonesia (Maluku and Papua regions) which have the lowest distribution, the westernmost region (parts of Sumatra) has a distribution at one level above eastern Indonesia. , while the best ANC is cantered in the central region, namely Java-Bali [32]. Variables of development inequality and agglomeration have a positive and significant influence on poverty. Meanwhile, the GRDP and investment variables have a negative and significant effect on poverty in Indonesia. The government must carry out a crash program to further address development inequality, so that poverty can decrease even more significantly in Indonesia [6].

3. Ishikawa Diagram and Socio-technical Methods

The method in this study was adapted from the Ishikawa Diagram (ID) [28, 33-35] and the Socio-technical Method (StM) [36-40] which were combined and developed with decomposition. Therefore, it is deep-rooted and inspired many scientists around the world, the practical tool Ishikawa Diagram by Best and Neuhauser [34] calls the “fishbone to world peace”. ID includes 4M dimensions, namely “method, material, machine, and manpower” (Fig. 2). These methods have been applied, among others, in assessing new models of machine construction quality and developing them into 5M and 6M [41], new models for improving the quality of higher education resources [42], analysing and grouping multiple problems to produce quality problem solving [43], evaluate logistics supply operations by considering the objective conditions of the company's environment [44], and 4M is applied in Design for Assembly (DfA) to support production cost reductions in product design, ergonomics *workstation*, and electric spindle motor assembly. In this study, we adopted the 4M type which consists of material, method, machine, and man [45]. We then use the 4M dimension as a dimension for

mapping the main problem, and we break down each of these dimensions into several indicators so that the four dimensions produce a *fishbone* ID.

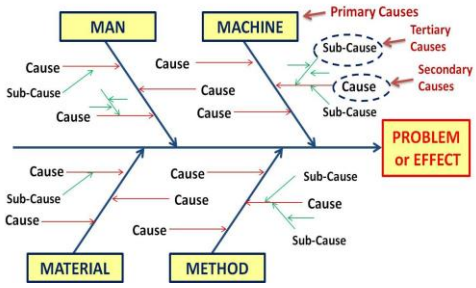


Fig. 2. Ishikawa diagram [46].

While StM was adapted from several experts, including the implementation of Socio-technical theory in the social sciences, namely the study of political intervention based on the point of view of social interaction [47], Socio-technical applications in designing and engineering systems with a new model of socio-technical systems engineering (STSE) for interdisciplinary research [48], sociotechnical based on Social Network Analysis (SNA) approach which was applied in analysing bio-refinery production in Foggia, Apulia, Italy [49]. In this study, we use a socio-technical system framework with decomposition development [50, 51]. Consists of 6 hexagonal dimensions which include "infrastructure, people, processes, goals, technology, and culture" (Fig. 3). In this study, we adapted it as an analytical tool to identify regional inequality problems in the southern part of West Java.

We compare the two methods, namely ID and StM horizontally to produce an Interdisciplinary Tabulation. With the aim of obtaining a mapping of the main problems and analytical tools to identify regional inequality problems in the southern part of West Java.

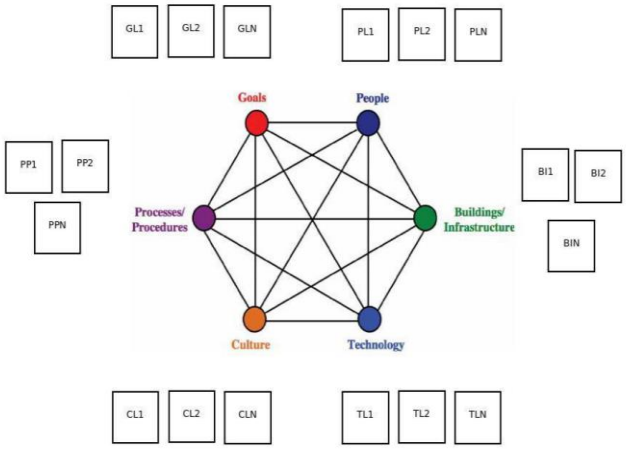


Fig. 3. Socio-technical framework (adopted from [40]).

4. ID-StM Interdisciplinary Framework for Regional Inequality in Disadvantaged Regions

4.1. Factors of development growth index

Starting from the theory of ID and StM as well as data from studies that have been carried out previously, we can see some of the factors that cause regional inequality, which we assume are as follows: *First*, "method". Agglomeration methods and policies have caused a lot of inequality in services [3]; economic growth is uneven, only concentrated in urban areas [26]. There are eight districts/ cities in West Java that are industrially agglomerated, namely Kab. Bogor, Kab. Bandung, Kab. Sukabumi, Kab. Karawang, Kab. Purwakarta, Kab. Bekasi, Bandung City and Cimahi City. Industrial agglomeration variables, infrastructure, human capital, capital, and labour have a positive and significant impact on the economic growth of West Java [52,53]. Improvements in the quality of human and infrastructure must be further enhanced so that economic growth can be further increased in West Java Province [54]. The eco-friendly agropolitan-rural economic area development model will tend to be better than metropolitan-urban development with industrialized agglomeration systems which in some cases can cause ecosystem damage. For example, the accumulation of chemical waste disposal in industrial areas, both carried by rivers from upstream rivers and discharges from rice fields and aquaculture areas as well as decreasing land use values in the coastal area of North Karawang [55]; industrial estates in West Java Bekasi (Jababeka) and Bekasi have problems with wastewater that damages the local environment so that the direction of the policy model is to prioritize improving the quality of industrial wastewater [56]; Seven industrial areas in Bekasi Regency in a number of cases have an impact on environmental damage so it is necessary to concentrate industry in a place, which is called an industrial area, intended to suppress the spread of environmental impacts caused by industry. Government policies need to be directed at environmentally sound industrial estates or EIPs [57]. Broadly speaking, the concept of sustainable development in West Java includes four dimensions, namely ecology, socio-economic-cultural, socio-political, and legal institutions [58].

In terms of factors of industrial agglomeration and economic growth in the post-New Order era, inequality between districts/cities in West Java Province showed serious figures. Sukabumi Regency, Cianjur Regency, Garut Regency, Tasikmalaya Regency, and Ciamis Regency (including the New Autonomous Region of Pangandaran Regency, as a division of Pangandaran Regency) which are located in the southern part of West Java, are in Quadrant III, namely disadvantaged areas [59]. The disparity occurs because development is only concentrated in a few areas, especially in the northern part of West Java, while the southern part of West Java has received less attention from the government [60]. There are several factors that influence regional inequality in West Java Province, namely differences in the quality of human resources, differences in unemployment rates, differences in public health levels/levels, differences in education and health facilities, differences in infrastructure quality, differences in the amount of investment, differences in PAD [7]. The poverty rate for regions in the form of urban administrative areas is generally lower than for regions in the form of districts. The difference in poverty levels between the two forms of the region is greater when viewed from non-monetary factors, such as in the district in the southern part of West Java [61]. Development assistance funds in reducing income inequality in West Java are not

effective; does not have a positive effect on income inequality. Variables that have the potential to minimize income inequality include education, health, and the industrial sector [62]. Although the health budget sourced from the West Java Regional Budget every year is given to the district/city area, it is still not optimal to meet basic health needs for the community, because only 50% of it is used for the procurement of health facilities and services, while the rest is used between others for the provision of health facilities and services [63].

Second, "material". The southern part of West Java has several natural resources (natural materials), including marine, agribusiness potential, marine, fisheries, plantation, agriculture, animal husbandry, and tourism. South West Java is very rich in agribusiness potential [64]; agricultural potential [10]; various marine fisheries such as lobster (*malacostraca; palinuridae*) [65]; the potential of high-value and economical crabs, but has not been managed properly [66]; potential for mountain tourism, jungle tourism, sea tourism, beach tourism (Gurilap) and other natural tourism such as river and waterfall tours, special interest tours such as rock climbing, diving tours, motocross tours, and others, very exotic tourism potential that scattered along the coast of the Indian Ocean [11]; access to information and promotion is still difficult [67]; Ciletuh Geopark tourist destination which has been officially designated by UNESCO as a Geopark area, does not yet have a destination branding [10]; the exotic tourist attraction of Pangandaran has experienced a decline in tourist visits in the last 25 years; so that these conditions require the regulation of strategic planning and development of tourism objects located on the coast of the Indian Ocean [68].

Management of natural wealth, especially forests and tree growth stands, is directed at efforts to maintain ecosystem function and sustainability, maintain ecosystem diversity and resilience, and protect species that are valuable to humanity [69]. Thus, the method of managing and utilizing natural resources in the southern part of West Java, which is very rich in biodiversity, requires a commitment to preserve ecosystems that have human value. Utilization of various potentials such as in the fields of marine, agribusiness, marine, fishery, plantation, agriculture, animal husbandry, tourism and the like needs to be oriented towards economic and sustainable environmental insight.

Third, "machine". The limitations of infrastructure and appropriate technology (TTG) in the southern part of West Java are still very limited. Infrastructure services in West Java are getting worse (inadequate), while electricity infrastructure services are getting better. Of the 22 regencies analysed, due to lagging infrastructure, 13 of them have economic growth rates below the West Java average. Of the 13 areas, 4 of them are in the southern part of West Java, except for Garut Regency [54]. The results showed that (1) The condition of road infrastructure, education, and health was getting worse, but electricity infrastructure was better than before in West Java, (2) Electricity infrastructure, labour and development spending had a positive and significant impact on economic growth. That is, if the three previous variables increase, then economic growth will also increase and vice versa. Road infrastructure and education have a positive but not significant effect on economic growth. On the other hand, health infrastructure has a negative correlation and has no significant effect on economic growth [62]. In fact, infrastructure development in the power of international development is a must in developing the right area and spatial planning strategies are widely used to integrate the region with global production and trade networks. Large-scale infrastructure projects can link resource

constraints and subnational urban systems because they can form links with resources, logistics integration, and industrial production [70].

Fourth, "man". Since 1990, the United Nations Development Program (UNDP) has established the Human Development Index (HDI) which includes measuring life expectancy, literacy, education, and living standards [71]. HDI such as poverty level indicators, the contribution of Gross Regional Domestic Product at Constant Prices (PDRB ADHK), and the Economic Growth Rate (LPE) in the Southern West Java region compared to the existing conditions in West Java Province and the Rebana area. The average HDI in 2020 (57.51) is much lower than Tambourine (69.78) let alone West Java (72.09). However, the poverty rate (9.06%) is below the Tambourine average (11.04%) and the West Java average (7.88%). Meanwhile, AD KH's (2020) GRDP contribution is only 11.59% below Tambourine (13.56%). Meanwhile, the LPE for the Southern West Java region is only 4.7 below Tambourine (5.6) and West Java (5.07).

4.2. Regional development model

In regional development there are at least two models that are used as references in setting government policies, namely the Brazilian growth poles model and the South Indian development model.

Regional development policy in Brazil that uses the concept of "*growth poles*" has shown the failure of this concept. Economic agglomeration, mining exploration centres, plantations, the growth of private investment in the North of Brazil has an impact on the increasingly lagging development in the South of Brazil [72]. Meanwhile, the South India development model shows success. The amount of central government assistance to the regions, increasing government investment rather than the role of the private sector, increasing budget allocations to disadvantaged areas, and nationalization of banking encourage growth and increase the income of the population of South India [72]. Power, political ideology, social stability, and political stability determine public policy in developing South India's development [73]. If social and political stability can determine the development of South India, it is different with Brazil, in fact the murder rate in Brazil has increased in 30 cities and has even become a new homicide center with a high homicide rate [74], and this social instability can hinder development in Brazil.

In addressing regional disparities in the southern part of West Java, we assume that the Southern India development model is relatively more adaptive in the development of the region we are studying, for the following reasons; In addition to many who think that they have succeeded in overcoming regional inequality, they also have regional characteristics similar to the southern part of West Java, such as geographically both on the coast of the Indian Ocean, both have potential for agribusiness and coastal tourism, government policies prioritize government investment than the private sector, and receive priority assistance from the central government to disadvantaged areas.

The development model for the southern part of West Java needs to be adapted to the natural characteristics of the area adapted from South India so that the development of the southern part of West Java is directed at the "agropolitan area" with a development strategy as a "green economic" area, "foreign economics", "non-polluting" areas. , and relies on the natural typology of mountains, jungles,

plantations, and rice fields that vary with the stretch of coast of the Indian Ocean that is still virgin and natural. The local wisdom-based approach model is very possible to be developed in the area, because in the area they have lived naturally and maintained their ancestral culture, such as the Sirnaresmi indigenous community [75], the Ciptagelar indigenous community [76], and the Banten Kidul indigenous community [77, 78] in South Sukabumi and the indigenous peoples of Kampung Dukuh [77] and [79] in South Garut. Their indigenous peoples naturally grew up before independence and the implementation of the modern development system in Indonesia. The southern part of West Java is very suitable to be developed with an "agropolitan" area development model. Public awareness of forest-agricultural and agroforestry land management and maintaining ecosystem integrity in rural communities in West Java is very positive as long as their economic needs are met [80].

The development model is in accordance with the direction of government policy in the development of 6 districts in the southern part of West Java, including: (1) Pangandaran Regency is directed at tourism and fisheries development; (2) Ciamis Regency is directed at the development of agribusiness; (3) Tasikmalaya Regency is directed to fishery development; (4) Garut Regency is directed to the development of agribusiness and fisheries, (5) Cianjur Regency is directed to the development of agribusiness and fisheries; and (6) Sukabumi Regency is directed to the development of fisheries and tourism [5]. The southern part of West Java is directed at its potential, with the targets of developing agribusiness activities, agro-industry, marine industry, integrated tourism based on local potential, development of supporting infrastructure for agribusiness, agro-industry, marine industry and integrated tourism as well as economic activities based on environmental sustainability [53]. To support this policy direction, the southern part of West Java is divided into 3 Growth Center zones, including (1) Palabuhanratu Growth Center; (2) Pangandaran Growth Center; and (3) Rancabuaya Growth Center [52].

The development of an area requires innovation, such as the “triple helix” collaboration model consisting of business actors, government, and academics. At the regional level, local non-governmental organizations can also be involved. In development planning, the government does not only rely on central or regional bureaucrats (top down), but also involves and cooperates with local government and local community participation (bottom up). With the "triple helix" model, regional development innovation can develop, and innovation becomes endlessly sustainable [81]. From a socio-economic point of view, the development of an area basically can be developed dynamically and flexibly while maintaining the uniqueness of its natural comparative advantage [82]. The sustainable development model requires the application of cognitive socio-economic analysis, in order to predict the target factors, model the situation, develop scenarios, and implement strategies [83].

4.3. ID-StM interdisciplinary framework architecture

Designing a framework that can overcome regional disparities is very necessary [74]. Starting from data based on literature studies, ID theory, and StM, the ID-StM Framework proposal is formulated in an effort to map problems and potentials in the southern part of West Java with the following stages:

First, carry out mapping of regional inequality problems with a deductive approach model, namely inequality regional experiences experienced by developed countries with data sources from reputable international journal references. We need this to get a general picture that the problem of inequality is not only experienced by developing countries such as Indonesia, but also to developed countries. To get an overview of the regional inequality experienced by Indonesia, we also describe the regional inequality experienced by Indonesia with references from national and local journals.

Second, start from the ID and 4M approach models as indicators, we can understand that "**methods**" are indispensable in designing and implementing service improvement activities so that they can be efficient and effective in solving quality problems [22-27]. Thus, the method that we design in the *fishbone* that we formulate refers to the government policy approach model [5, 69, 70] that the development of the southern part of West Java is directed at a regional development model that is environmentally friendly, non-polluting, green economic, and blue economic in the fields of agribusiness, agro-industry, marine industry, and ecotourism so that the southern part of West Java becomes an area " agropolitan", not "metropolitan" with agglomeration models that damage the environment as happens in urban areas. While "**material**" is the potential and natural wealth that is only limited to "potential" has not been optimally empowered in encouraging backwardness in the southern part of West Java. These potentials include the coastal landscape of the Indian Ocean with a number of potentials in it such as marine fisheries, ecology, tourism, minerals, pharmaceutical materials, marine minerals and the like. In addition, the southern part of West Java is also very potential in agriculture, plantations, animal husbandry, and inland fisheries. Meanwhile "**machine**" or applied technology as a means of processing production equipment in agriculture, plantation, animal husbandry, and fisheries and the like is still very limited to be developed in the area. In addition, as the reference we obtained, regional disparities in the fields of road and bridge infrastructure, education, health, and economic production facilities are very striking, so we need to describe this in the *fisbone* that we will formulate. Meanwhile, "**manpower**" is a separate problem that causes the southern part of West Java to lag, both skilled workers in processing the potential of the natural surroundings and competence in education, health, economic services, village government services, and so on. The lack of educational institutions, especially higher education, is a real problem in the region.

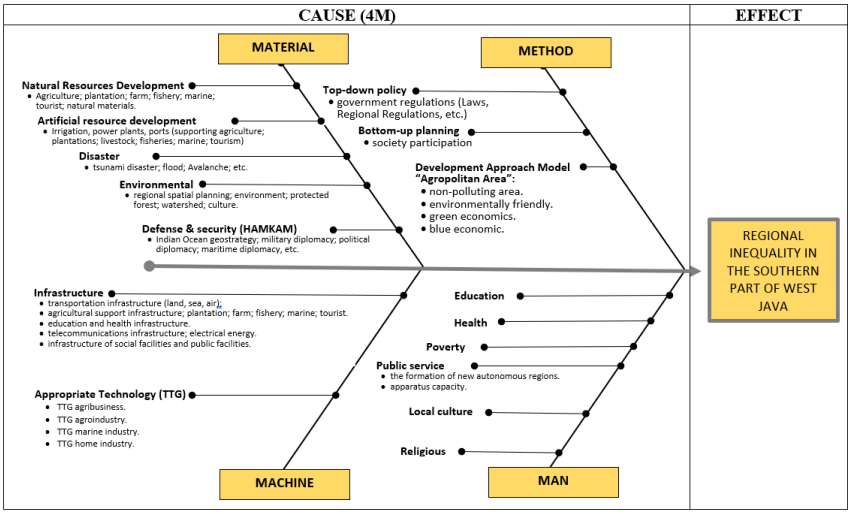
Apart from ID, we have also adapted this framework from StM, which has been applied in the social sciences, among others [28-30]. Based on the results of our analysis, the two indicators of the method overlap a lot, such as "processes" in StM coincides with "method" in ID; "culture/environment" in StM coincides with "material" in ID; "technology" and "infrastructure" indicators in StM coincide with "machine" in ID, and "people" in StM coincide with "manpower" in ID. While the "goal" in StM is not listed in the ID, but ID also has an "effect" as a result of the 4M problem so that it needs to be fixed to achieve the goal (goal) according to the plan, and it is relevant to what is meant "goal" in StM.

Third, identify problems and comparative advantages that are different from other regions in the southern part of West Java based on the indicators set out in the "second step" above as stated in the "interdisciplinary tabulation" in Table 1.

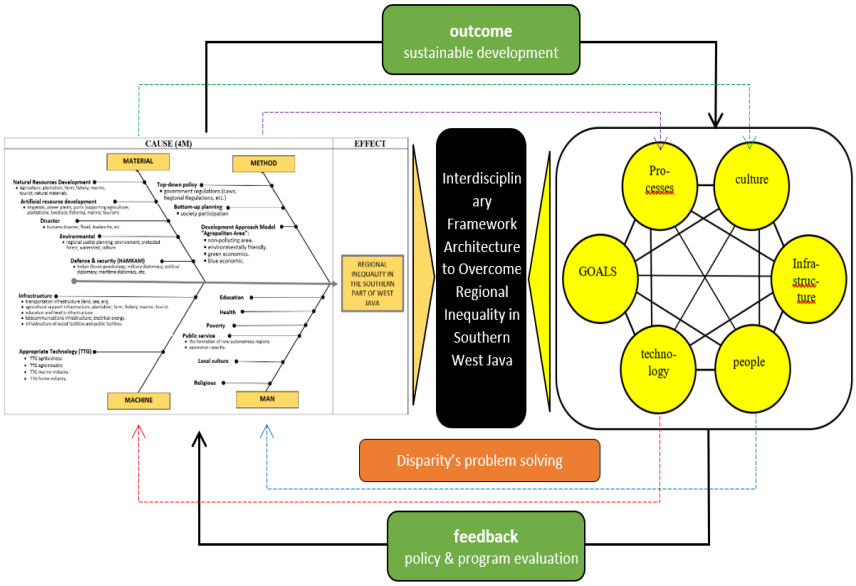
Fourth, start from "the third step" above, the proposed Interdisciplinary Framework Ishikawa Diagram & Socio-technical Method is formulated; which we refer to as the ID-StM Framework, in Fig. 4.

Table 1. Interdisciplinary tabulation Ishikawa diagram and socio-technical method in identifying problems and alternative solutions to overcoming regional inequality in the Southern West Java Region.

Ishikawa Diagram		Regional Gap Solutions Indicator	Socio-technical Method	
Indicator	**Cause & Effect (As Assumption)**		**Goal (As Hope)**	**Indicator**
Method	The method of developing the southern part of West Java is still "top-down policy", does not involve bottom-up participations, government policies in the field of environmental issues are still only conceptual, thus impacting the threat of increasing environmental damage and regional inequality.	Development approach models: agropolitan, non-pollutant, green economic, blue economic	The realization of environmentally friendly agropolitan areas; Increased government investment (APBN and APBD) rather than private investment that threatens damage to the biological environment; Freezing of exploration and exploitation that damage coastal landscapes (iron sand, marine life, and the like) on the coast of Southern West Java;	Processes
Material	The potential of natural resources in the fields of marine, agriculture, plantation, fishery, animal husbandry, and tourism has not been managed optimally, resulting in the local community's economy experiencing a gap with industrial agglomeration urban communities.	The Human Development Index/HDI (economy, health, education) of the community increased above the average for the Province of West Java.	Management of natural resources and artificial resources supporting the production of marine, agricultural, plantation, fishery, livestock and tourism potentials is developed so that the HDI (economy, health, education) of the community increases above the average of West Java Province.	Culture/ Environment
Machine	infrastructure (land, sea, air); health, education and economic infrastructure, supporting infrastructure in the fields of marine, agriculture, plantation, fishery, animal husbandry, and tourism, appropriate technology in agribusiness, agroindustry, marine industry, and tourism as well as social infrastructure (social facilities and public facilities) are still very limited so that it has an impact on the backwardness of the local community.	The infrastructure index and appropriate technology index in the southern part of West Java are above the West Java average.	Development of transportation infrastructure (land, sea, air); health, education and economic infrastructure, supporting infrastructure in the fields of marine, agriculture, plantation, fishery, animal husbandry, and tourism, appropriate technology in agribusiness, agroindustry, marine industry, and tourism as well as social infrastructure (social facilities and public facilities) can overcome the *span of control*, increase the mobility of goods and services, increase production, and promote the welfare of the local community.	Technology & Infrastructure
Manpower	Human Development Index (IPM), community competence, and apparatus capacity are still very limited so that it has an impact on the quality and productivity of human resources in the southern part of West Java.	HDI, gross enrolment rate in education (primary and secondary, and higher education), and community service index increased above the West Java average.	Increased Human Development Index (HDI), community competence, and apparatus capacity, vocational education (agriculture, plantation, animal husbandry, marine, and tourism) as well as higher education institutions in the southern part of West Java.	People



(a)



(b)

Fig. 4. (a) Architecture framework interdisciplinary ID (b) ID-StM interdisciplinary framework architecture.

5. Conclusions

This article adapts two methods, namely the Ishikawa Diagram with the Socio-technical Method which we apply in analysing social problems that cause regional inequality in the southern part of West Java. These two interdisciplinary approaches resulted in a framework that we propose and named the Ishikawa Diagram-Sociotechnical Method (Framework ID-StM framework). The ID-StM framework is expected to help further studies because it provides more detailed indicators of

research problems than the results of previous studies. As for policy holders, the ID-STM Framework can be taken into consideration in formulating development plans to minimize regional inequality in the southern part of West Java.

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