PROJECTION OF HUMAN RESOURCE DEVELOPMENT SCENARIOS AS A GLOBAL TREND THROUGH YOUTH POLICIES TOWARD EMBRACING INDONESIA'S GOLDEN GENERATION IN 2045 BASED ON SYSTEM DYNAMIC MODELING

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Abstract

The demographic bonus discourse indicates that the population phenomenon in Indonesia will yield advantages. By employing system dynamic modeling to project scenarios of Human Resource Development through analyzed youth policies, it creates a simulation model assuming strategies for human resource development prioritizing youth policies to face the challenges of Indonesia Emas 2045. The simulation results of the Business as Usual (BAU) scenario show enhanced capabilities maximized through collaboration among private sector, government, and community organizations. All simulated scenarios demonstrate a positive impact on the development of human resources, particularly youth, as variables are interrelated, starting from youth policies to the components of the 4 Pillars of Indonesia Emas 2045. Synchronization can drive the progress of Human Resource Development.

Keywords: Human Resource Development; Demographic Bonus; Youth Policies; Indonesia Emas; System Dynamic Modeling.

INTRODUCTION

The discourse on demographic bonus in Indonesia is currently a hot topic. This is understood as an advantage, namely the expected increase in productivity due to a large population in the working-age range (1). Fundamentally, this can serve as a development asset when there is a surge in the productive age group, a phenomenon known as demographic bonus (2). Indonesia defines the working-age population in the range of 15 to 64 years old, a significant number given that Indonesia is one of the countries with the largest population in the world, and this population continues to grow each year.
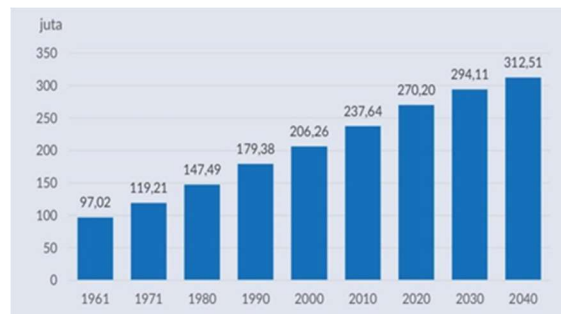

Figure 1. Population of Indonesia (Million People), Source (3)

The increase in the population from year to year experienced by Indonesia has successfully maintained its position as the fourth most populous country based on estimated results (4).
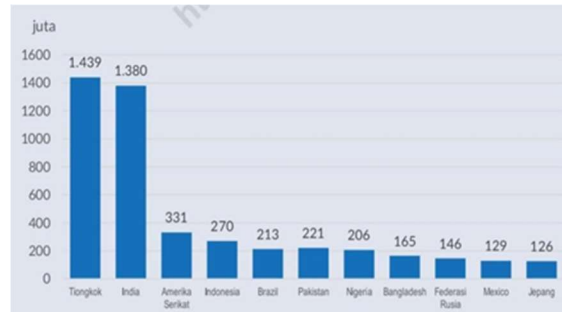

Figure 2. Countries with the Highest Population in the World (Million People), Source (4)

The most rational anticipation to face this demographic bonus is to prepare an excellent human resource (5). This aligns with the vision of Indonesia Emas in 2045, focusing on the creation of competitive human resources (6) (7). Human resources that need to be prepared are prioritized in the working-age range, where the estimated population of the working-age group will continue to increase until reaching its peak in 2045 (3).
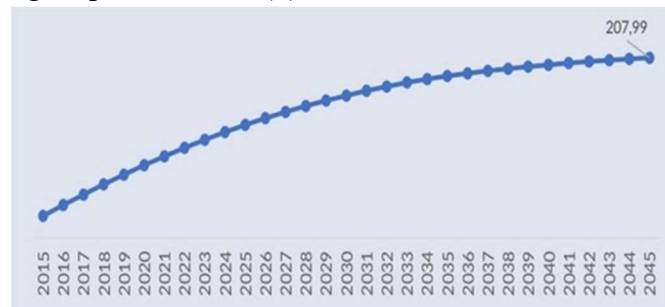

Figure 3. Development of the Working-Age Population in Indonesia 2015-2045 (Million People)
Source (3)

However, in the Human Development Index (HDI), Indonesia only manages to rank 107th out of 189 countries (8). Despite experiencing improvement each year, Indonesia has not yet achieved a top position globally and is only able to secure the 5th position in ASEAN. This indicates that the competitiveness of Indonesia's human resources is inversely proportional to the potential they possess (9).
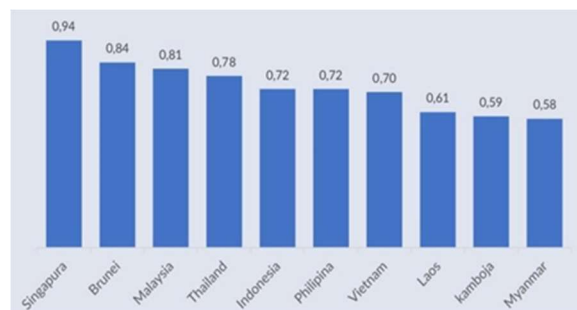

Figure 4. Human Development Index Data in ASEAN for the Year 2019, Source (8)

In this way, there must be a resolution to address human resources issues as a step to improve the population condition through a policy. Public policy, being a set of rules created urgently for problem resolution within a societal context, plays a crucial role (10). Considering the issues with human resources, the demographic bonus faced, and the goals of Indonesia Emas in 2045, one of the prioritized policies is youth policy. There is a categorization of the population into generations based on their birth years (11).

Table 1. Population Generation Categorization, Source (11)

No	Generation	Year of Birth
1	Post Generation Z	2013-Present
2	Generation Z	1997-Present
3	Generation Y (Millennials)	1981-1996
4	Generation X	1965-1980
5	Baby Boomer Generation	1946-1964
6	Pre-Boomer Generation	Before the year 1945

Reviewing the data released in 2020, the most populous productive age group is the millennial generation, comprising 37.23%, followed by the Generation X with a percentage of 30.21%. Subsequently, the Generation Z follows with 21.62%, and the least represented is the Baby Boomer generation at 10.94% (3).
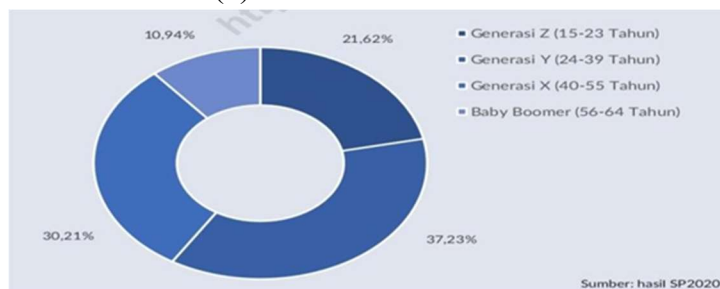

Figure 5. Categorization of the Productive Age Population in the Year 2020,

Source (3)

It means that the most populous age group and with significant potential to play a crucial role during the peak of the demographic bonus is the millennial generation, which currently constitutes the youth age group, and the Generation Z, which will be in the youth age group at the peak of the demographic bonus. Referring to Article 1 of Law No. 40 of 2009 Regarding Youth, the youth age group ranges from 16 to 30 years, so it makes sense to prioritize preparing human resources in the youth age group as an essential step towards realizing the Golden Generation of Indonesia in 2045.

Considering Indonesia's population condition reaching the lowest population dependency ratio from 2020 to 2030, the demographic bonus becomes an opportunity to improve the country's condition by maximizing the productive population through youth policies to enhance human resources (2)(12)(13)(14). The development of human resources or Human Resource Development is a way to create quality human resources in terms of knowledge and skills, making them competitive as a manifestation of superior human resources (15).

Therefore, a new model in building human resources in the midst of rapid developments is highly necessary. The researcher chose the system dynamic approach, considered the most ideal in obtaining the base model and the best scenarios (16). This research is based on previous studies to project Human Resource Development in facing the challenges of the demographic bonus faced by Indonesia through youth policies.

Considering the formulation of the problems above, the researcher establishes the objectives of this study as follows:

1) Identify the variables of youth policies and internal as well as external factors that will influence Human Resource Development, thus enabling the advancement of the Golden Generation of Indonesia in 2045.

2) Obtain projections of Human Resource Development scenarios based on youth policies to anticipate the Golden Generation of Indonesia in 2045.

LITERATURE REVIEW
2.1. Theoretical Framework
2.1.1. Demographic Bonus

There are approximately 273.8 million total population in Indonesia's development from 1960 to 2021 (17). Population is defined as individuals who continuously interact with each other in a specific space and are positioned in a geographical location or region, bound by regulations, or constitutionally entitled to reside in a certain area, leading to a regenerative impact on the country they occupy (18)(19). The science that studies the distribution, structure, and size of the population, known as population dynamics, is referred to as demography (13). The current population condition is experiencing a demographic bonus, which is currently impacting Indonesia.

The condition results from a decrease in death rates and increased productivity in a country. It is a continuation of changes in the population structure of that country, leading to rapid economic growth, known as a demographic bonus (12). The decrease is interpreted as an increase in the proportion of the working-age population (15 to 64 years old) and a decrease in the proportion of the young population (0 to 14 years old). This implies a reduction in the cost of providing for the young population, leading to a shift in financing focus from meeting basic needs to driving welfare and economic growth (1). Additionally, Indonesia is expected to achieve the lowest population dependency ratio from 2020 to 2030, where in that year, there will be a ratio of 45 unproductive people supported by 100 people in the working-age range (2).

The increasing population in the working-age group presents an opportunity for the affected country to utilize it as a capital to improve its condition through the productive population it possesses (13). Therefore, to optimize human resources, fundamental support is needed, in line with clear constitutional policies. The issuance of policies that can assist in accelerating the improvement of the population's quality is essential (12).

2.1.2. Public Policy

Whether directly or indirectly, public policy always involves many stakeholders, from formulation to policy evaluation. Therefore, public policy is always a primary topic for every stakeholder (20). There is a shift in the roles of stakeholders in public policy; currently, the public is the primary actor in public policy, no longer just the government, as the public knows its needs (21).

Public policy is comprehensively understood as a form of regulation through decision-making by the government in carrying out its functions. Public policy, in its entirety, must be understood correctly, as it is not merely rigid laws. From a legal perspective, public policy is a set of rules regarding the ways of living together, binding due to the obligation to comply (22). This means that various interconnected actions taken by the government to influence people's lifestyles, impacting many individuals, constitute public policy. The implementation of policies involves the participation of the community, economic power, political power, and social power, along with various interest groups in the execution of programs related to the role of administrative institutions with obligations (23)(10).

Government wisdom in creating public policy is highly anticipated, ensuring that public policy has a positive impact on society and does not create new problems that result in losses for the community (22). he key to creating public policy with a welfare orientation is the interaction between the government and society in decision-making to address existing problems, formulated with a public scope (24). Therefore, to create effective policies, formulation should not only be conceptual but also oriented towards implementation and evaluation in line with the policy's framework, from formulation to implementation and evaluation as a problem solver and an alternative to achieving specific goals (25)(26). Various policies have been established as guidelines to promote the improvement of human resources, such as youth policies (14).

2.1.3. Human Resources

2.1.4. The human resources possessed by a country are equivalent to the settled population in that country. The driving force of an organization or any entity it oversees is referred to as human resources. Human resources are the assets that serve as the primary pillar in any organization, including a country. These resources are essential for the success of the organization in implementing its strategies, constituting a vital and non-repositionable asset (5) (15) (27).

All components of human resources, from motivation to competencies, are sources of organizational competitiveness. Through these resources, human resources can provide support to their organization (5). Therefore, in achieving prosperity and advancement, human resources

become a crucial indicator for a country (28). Thus, quality human resources are necessary to support a country's success (27).

With an abundant human resource condition and the predicted demographic bonus leading to the realization of Indonesia Emas in 2045, these human resources need to be well-prepared (7). To address this situation, especially in this era of rapid development, the key is the development of human resources or human resource development as a way to create quality human resources in terms of knowledge and skills, making them competitive as a manifestation of superior human resources (15).

Two aspects need to be emphasized in human development in Indonesia: physical aspects that impact or support behavior as subjects, which imply human existence itself, and human resource development related to quality improvement through potential such as intelligence or intellectual capacity (28). Additionally, a new model is needed to build human resources or human resource development in the midst of rapid developments. The most ideal approach to obtain the base model and best scenarios is the system dynamic approach (16).

2.1.5. System Dynamic Modeling

The definition of a model is a tool or medium that can be used to reflect and simplify a reality (the actual world) in a measurable way. The model can explain how a system works and the measurable relationships between systems (29). Modeling a system must meet several criteria, namely the model must represent the real system, and the model is a simplification of the complexity of the system. The system approach attempts to uncover the most important elements that contribute significantly to the system's goals and help understand the specified problems related to the nature, environment, generator phenomena, and response phenomena. Essentially, the selection of the model is adjusted to the needs of the modeling itself. The following are some methodologies related to model selection, including: SSM (Soft System Methodology), SD (System dynamics), VSD (Viable System Diagnosis), TSI (Total Systems Intervention), IP (Interactive Planning), CSH (Critical System Heuristics), AHP (Analytical Hierarchy Process), and Cognitive Mapping (30).

2.2. Previous Research

In Table 2, the researcher presents previous research related to the research theme based on the results of literature search and compilation.

Table 2. Results of Literature Search and Compilation

No	Research Title	Researcher, and Year of Research
1	System Dynamics Modeling for Demographic Bonus Projection In Indonesia	(31)
2	System Dynamics Modeling of Indonesia Population Projection Model	(32)
3	System Dynamics Applications to Public Policy	(33)

4	A System Dynamics Simulation Model to Evaluate Project Planning Policies	(34)
5	System Dynamics Models For The Simulation Of Sustainable Urban Development: A Review and Analysis and The Stakeholder Perspective	(35)
6	Policy Innovation and Emergence of Innovative Health Technology: The System Dynamics Modelling of Early COVID-19 Handling in Indonesia	(36)
7	Scenario Simulation for the Urban Carrying Capacity Based on System Dynamics Model in Shanghai, China	(37)

2.3. Conceptual Framework

Based on the literature review and previous research, this researcher employs the system dynamic modeling method to project scenarios of Human Resource Development through youth policies. These are analyzed to create a simulation model assuming a strategy for human resource development prioritizing youth policies in facing the challenges of Indonesia Emas 2045. In the conceptual framework, the researcher provides an illustration of the system transformation in this study, depicted in Figure 6 and Figure 7:
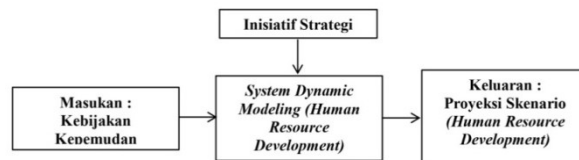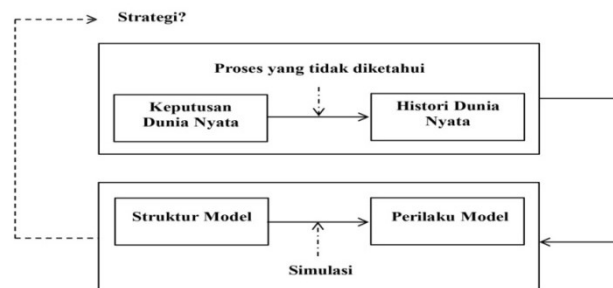

Figure 6: Research Conceptual Framework

Figure 7: Model Conceptual Framework

METHOD

3.1. Research Methodology

The qualitative-quantitative approach is the method used in this research. These two approaches represent two systemic ways of thinking, utilizing them integrally by considering the needs of this research, along with other considerations such as substantive considerations and context analysis. The qualitative approach is employed to examine youth policies and internal as well as external factors. It is also utilized to draw conclusions from the overall system analysis activities (38). Meanwhile, the quantitative approach is used to understand the variables of youth policies and internal as well as external factors influencing Human Resource Development. Time series data are used to observe a trending condition and to analyze the dynamic simulation patterns formed by understanding the cause-and-effect relationships. These time series data are used when the quantitative approach analyzes integrated data at a single point in time. The use of combined data also aims to analyze the trends in formed behaviors. In other words, both approaches are utilized by the researcher as a way to depict what happens in the field when the researcher is directly involved in the research location.

Both approaches are applied in the system dynamic method, which is an extension of system thinking. This method is established based on the background, problem formulation, and conceptual framework. Through observation results, it is evident that Human Resource Development is dynamic, with more than one feedback structure inherent in its phenomenon. Hence, the system dynamic method is chosen with the aim of developing a model.

1. Results and Discussion

4.1.   Projected Results of the Productive Age Group 2025-2045

The results of the youth projection using system dynamics modeling for the years 2025-2045 are depicted in Figure 8. The trend for each age group and the total population continues to increase, except for the age group of 0-14 years. The population growth trend provides an overview of the demographic structure in the youth age group from 2025 to 2045 and the demographic bonus projection.
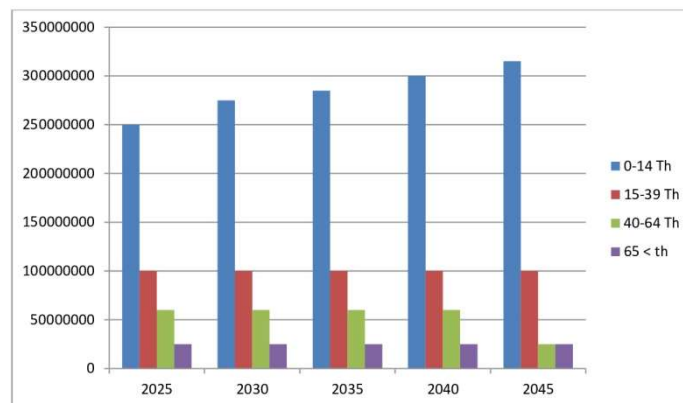

Figure 8: Results of Productive Age Projection using System Dynamics Modeling

In 2025, the estimated population of Indonesia is projected to reach 280,266,236 people and increase to 317,343,466 people by 2045. The population of the age group 0-14 years is experiencing a decreasing trend, reaching 67,646,995 people in 2025 and decreasing to 67,157,077 people in 2045. The population of the age group 15-39 years continues to increase, reaching 111,892,143 people in 2025 and increasing to 116,398,016 people in 2045. The population of the age group 40-64 years also increases, with a population of 82,565,204 people in 2025 and increasing to 98,092,886 people in 2045. Meanwhile, the elderly population continues to increase, reaching 18,161,793 people in 2025 and becoming 35,695,485 people in 2045.

4.2. Youth Policy

Youth Policy in Indonesia is generally regulated in Law No. 40 of 2009 concerning Youth. In this law, one of the key articles is youth services, which includes Youth Awareness, Youth Empowerment, and the Development of Youth Leadership, Entrepreneurship, and Youth Leadership. This can be the spearhead in preparing for the 2045 Golden Generation. This is supported by Presidential Regulation No. 43 of 2022 concerning Cross-Sectoral Coordination, which can be the basis for strategic youth service programs.

4.3. Indonesia Emas 2045

There is an aspiration for Indonesia to face the peak of the demographic bonus in 2045, based on the 4 pillars of the vision of Indonesia Emas: Human Development and Mastery of Science and Technology, Sustainable Economic Development, Strengthening National Resilience and Governance, and Strengthening National Resilience and Governance.

4.4. Model Develpoment

The dynamic waste management system model consists of four sub-models: waste generation at the source, technical operational sub-model, financing sub-model, and emission load sub-model. The relationships between the variables that make up the model are depicted through a causal loop diagram (CLD) shown in Figure 3. Then, in the next stage, stock flow diagrams (SFD) are created for each sub-model (Figure 9, Figure 10, Figure 11). Interactions between variables are indicated by symbols of arrows. A positive sign on the arrow line means that a change in the value of one variable results in a change in the value of another variable in a directly proportional direction. Meanwhile, a negative sign means that a change in the value of one variable results in a change in the value of another variable in an inversely proportional direction. If a loop is formed in the diagram, it is marked as a feedback loop. There are two types of feedback loops: positive/reinforcing loops (R) indicating continuous growth in the system and negative/balancing loops indicating opposing relationships in the system (39)
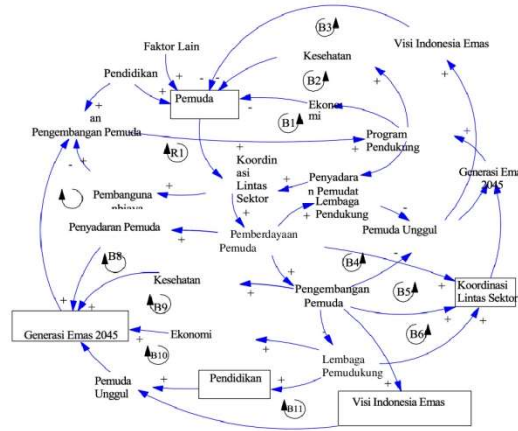
Figure 9 Casual Loop Diagram Human Resource Development

The CLD (Causal Loop Diagram) developed in this study illustrates a conceptual model aimed at accommodating many variables supporting Human Resource Development found in youth policy (Figure 3). Excellent youth is influenced by three main factors: education, economy, and health. Through youth policy, it is expected to ensure these three factors. The coverage of this youth policy includes youth services and cross-sector coordination. With the improvement of cross-sector coordination, it is expected to directly impact youth awareness, empowerment, and development. This youth policy is essential to guarantee the Golden Generation in 2045 at the peak of the demographic bonus, focusing on the development steps of the youth and referring to the 4 Pillars of Indonesia Golden 2045. Additionally, there are other factors that also play a role in Human Resource Development. In this model, it is evident that youth policy is crucial in building the youth, marked by the numerous outgoing arrows from this variable, and youth policy related to youth services is highly influenced by cross-sector coordination.

4.5. Youth Policy Submodel

Figure 10 shows the SFD (Stock Flow Diagram) of the youth policy submodel in influencing the Golden Generation 2045. This submodel depicts the prediction of how two related youth policies mutually influence each other, simulating along with the increase in the population. Additionally, other simulation results that also influence other policies are obtained.
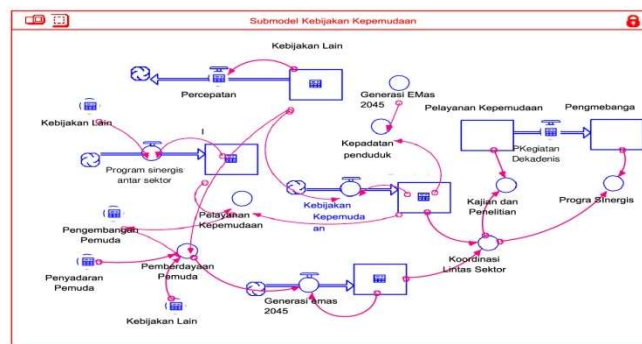
Figure 10 SFD Submodel Youth Policy

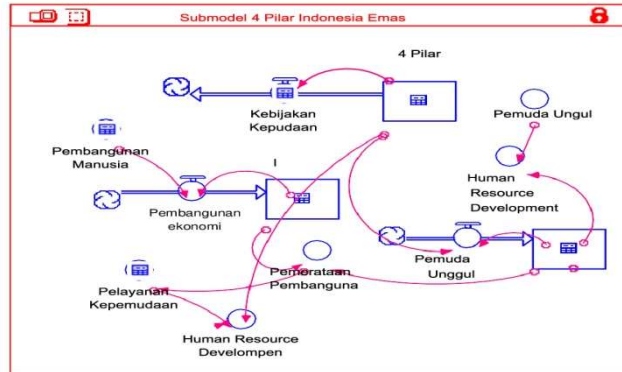## 4.6. Submodel 4 Golden Pillars of Indonesia Emas 2045

Figure 11 SFD Submodel 4 Golden Pillars of Indonesia Emas 2045

The SFD in Figure 11 aims to understand the dynamics of the needs of the 4 Pillars of Indonesia Emas 2045 as one of the targets to be achieved. The results obtained from this submodel are three main things: human development, economic development, and development equality for the realization of the intended goals.

4.7. Model Validation

The model was validated by comparing its outputs with real-world conditions and ensuring its acceptability. Validation was performed against historical data on youth development related to youth services. The data figures and assumptions used during model validation were based on the business-as-usual conditions. Not all data from several variables were validated, and the obtained mean comparison (E1) < 5% and error variance (E2) < 30%. Thus, the simulation results from this model can be considered valid.

Table 4 Results of Model Validation Test

Variabel	Mean Comparison (%)	Error Variance (%)	Keterangan
Awareness of Youth	0,000816%	0,011115%	Valid
Youth Development	0,007850%	0,285636%	Valid
Empowerment of Youth	0,006925%	0,636451%	Valid
Quality of Youth Life	4,497615%	6,510310%	Valid

Simulation of the model is conducted from 2023 to 2045. In the formulation of alternative scenarios, it is assumed that by 2025, service coverage has reached 100%. The media for youth development through the implementation of youth policies involve all strategic institutions, including Social Organizations, Private Sector, and Government, obligated to carry out such actions. The simulated scenarios include: first, the business as usual scenario (BAU), aimed at observing future changes if left to follow the current trends. Second, scenario A is designed to

assess the impact of optimizing youth capabilities when the youth service level reaches 100%. Scenario A has no specific focus. In scenario B, it is assumed that there is an improvement in youth capabilities through EPR and the addition of BSU. Fourth, scenario C aims to examine the significance of youth capabilities when youth policy targets are achieved and maintained over the following years. In scenario C, there is assumed improvement in youth capabilities through EPR, private sector involvement in contributing to youth development, and the addition of BSU, UPS, and TPST. Based on the formulated scenarios, parameters and values are determined for each scenario as shown in Table 5

4.8. Policy Scenario Formulation
Table 5. Parameters and Assumptions in Scenarios

Parameters	Unit	Basis (2019)	Scenario A	Skenario B	Skenario C
			Target 2045		
Percentage of EPR	%	-	-	10% [a]	10% [a]
Percentage developed by the Government	%	65,5%	100%[a]	90% [a]	80% [a]
Percentage developed by Private	%	-	-	-	10% [a]
Percentage not developed	%	34,5%	-	-	-
Increase in the percentage of EPR	%/year	-	-	2%	2%
Increase in the percentage handled by the Government	%/year	1,00%	5,75%	4,08%	2,42%
Increase in the percentage of Private	%/year	-	-	-	2%

Note: (a) target achieved by 2025; (b) percentage of youth capacity increases as it is assumed that all policies are implemented; and assumption of increased youth capacity.

2. Conclusion

The results of the projection of the productive age population using system dynamics modeling show that the period from 2025 to 2045 is a demographic bonus momentum for Indonesia, and after 2045, it will experience a decline again. In 2025, the proportion of the productive age population reaches the highest point, namely 69.38 percent, and continues to decrease in the following years. The total dependency ratio in 2025 is at its lowest point, at 44.13 percent, but it continues to increase in the following years. Additionally, we need to be aware that the proportion of the elderly population continues to increase, reaching 11.25 percent, and the elderly dependency ratio reaches 16.64 percent in 2045. This is a sign that Indonesia will soon experience population aging.

The criteria used to choose the best scenario are scenarios that result in the lowest value for the increase in youth capacity through youth services and cross-sector coordination. The simulation results of the BAU scenario show that capacity improvement is maximized through cooperation between the private sector, government, and community organizations. All simulated scenarios show positive outcomes for the development of human resources, especially youth. This

is because the variables are interconnected, from youth policy to the components of the 4 Pillars of Indonesia Emas 2045, and synchronization can drive Human Resource Development.

3. Acknowledgments

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