

Adaptive Social Protection To Accelerate Stunting Prevention

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ABSTRACT

Accelerating stunting reduction requires a social protection system that is adaptive to social, economic, and environmental shocks. This study aims to analyze the interlinkages among elements and across the building blocks of Adaptive Social Protection (ASP) in supporting responses to risks that may exacerbate stunting. The study was conducted in West Bandung Regency (KBB) using an exploratory qualitative approach through Focus Group Discussions, in-depth interviews, and document review. The findings show that although conceptually the four ASP building blocks—institutions, data, financing, and programs—are positioned as equal, in practice a functional hierarchy emerges. Institutions determine mandates and governance, data provide risk information, financing enables response capacity, and programs serve as the front line of implementation for vulnerable groups. When adaptive elements in upstream blocks are weak, downstream blocks lose their operational prerequisites, resulting in slow and poorly targeted responses. These findings enrich the understanding of ASP by demonstrating that in contexts of limited local capacity, relationships among building blocks can shift from non-hierarchical to operationally hierarchical. Strengthening ASP to accelerate stunting reduction should therefore begin with reinforcing institutional capacity, cross-sector governance, and data systems, before addressing financing and program design.

KEYWORDS: adaptive social protection, stunting prevention, building blocks, shocks

INTRODUCTION

Stunting is one of the major challenges to human development as it reflects chronic malnutrition during the first 1,000 days of life and has long-term impacts on health, cognitive development, and individual economic productivity [1]. Children who experience stunting face higher risks of illness, learning difficulties, and lower earnings in adulthood, thereby reinforcing the intergenerational cycle of poverty [2][3][4]. The macroeconomic consequences are also significant due to increased healthcare costs and potential losses in national productivity. Given these characteristics, reducing stunting has become a global and national development priority [5].

Various nutrition-specific and nutrition-sensitive interventions have been developed; however, their effectiveness is strongly influenced by household socio-economic conditions. Poverty, limited access to food, and disruptions to health services contribute substantially to the incidence of stunting [6][7]. The COVID-19 pandemic demonstrated how shocks can rapidly reduce household income, weaken food security, and disrupt health and nutrition services, ultimately increasing the risk of stunting [8]. Poor households often resort to negative coping strategies, such as reducing food quality or selling productive assets, which adversely affect children's nutritional status [9].

Beyond health crises, the increasing frequency of disasters and the impacts of climate change further heighten household vulnerability to poverty and food insecurity [10][11]. Disruptions to food production, infrastructure, and health services caused by disasters contribute to a higher risk of child malnutrition [12][13]. These conditions indicate that addressing stunting requires systems capable of sustaining household well-being over time, including during crises. In this context, social protection plays a crucial role in ensuring access to basic needs and preventing worsening vulnerability [14][15].

However, many social protection systems remain routine and reactive, making them less prepared to cope with large-scale shocks [16][17][18]. To address these challenges, the concept of Adaptive Social Protection (ASP) has emerged, integrating social protection with disaster risk reduction and climate change adaptation to enhance the resilience of vulnerable groups [11][19].

The ASP framework is generally understood through four main building blocks: institutions and partnerships, data and information systems, financing, and programs. These four blocks are viewed as mutually reinforcing elements in building a system that is responsive to risk [20]. Nevertheless, existing studies tend to examine each block separately, while research analyzing the interlinkages among blocks as an integrated system remains limited, particularly in the context of chronic nutrition issues such as stunting. In reality, adaptive responses depend not only on the quality of individual components but also on how these four blocks are interconnected and support one another in practice. This gap is especially relevant in regions with varying capacities, where weaknesses in one block can hinder overall system performance. Therefore, analysis is needed that views ASP as a systemic architecture composed of causal relationships among building blocks.

This article aims to analyze the interlinkages among the four building blocks of Adaptive Social Protection—institutions and partnerships, data and information systems, financing, and programs—in the context of accelerating stunting reduction. By positioning ASP as an analytical lens, this study seeks to explain how relationships among blocks influence the capacity of social protection systems to maintain the continuity of nutrition services and maternal–child protection during shocks. The findings are expected to enrich the conceptual development of ASP while providing policy insights for strengthening more adaptive and effective social protection systems in reducing stunting.

METHODOLOGY

This study employs a qualitative approach using an exploratory case study method. It focuses on West Bandung Regency, a region with a relatively high prevalence of stunting and limited local capacity to cope with disasters. Despite having a stunting prevalence rate above the national average, West Bandung Regency has consistently reduced its stunting prevalence. The research data were obtained from informants as primary data sources and documents as secondary data sources. Informants included representatives of local government as program implementers, academics or practitioners as experts, and community members as program beneficiaries. To obtain data relevant to the study, data collection techniques included Focus Group Discussions, in-depth interviews, and documentation review. Data analysis involved examining, categorizing, tabulating, and recombining evidence to develop the study's initial propositions [21]. The analytical steps followed the framework of Miles and Huberman, consisting of data collection, data condensation, data display, and conclusion drawing or verification. Data validity was ensured through source and method triangulation.

RESULT

A. Institutions and Partnerships

1. Government Leadership

The commitment of regional governments in Indonesia to reduce stunting is reflected through the formulation of specific regulations and programs that engage multiple stakeholders in delivering nutrition-specific interventions and monitoring pregnant women and children under five who are at risk. These formal policies support a comprehensive and integrative approach to stunting reduction, encompassing cross-sectoral collaboration, dedicated funding, and structured monitoring and evaluation

mechanisms [22]. One strategic move is the designation of stunting reduction as a regional performance indicator, which ensures its inclusion in every stage of local development planning. The mobilization of all regional apparatus to support stunting-priority villages demonstrates a systematic and inclusive governance strategy that promotes equitable intervention delivery. However, previous studies highlight that many local governments have yet to incorporate adaptive social protection systems focused on preemptive measures and the resilience of poor households to socio-economic shocks [23]. As a result, current interventions tend to be reactive rather than anticipatory, and the lack of integration between stunting reduction and broader socio-economic resilience frameworks may leave vulnerable populations exposed to recurring risks during crises.

2. Policy Coherence and Cross-Sector Cooperation

Existing regulations provide a clear legal basis for accelerating stunting reduction in a holistic and integrated manner. The Regional Government has shown seriousness in dealing with stunting by adapting national regulations, as well as drafting various supporting policies such as circulars and instructions related to changes in community behavior. Programs such as "Pelita Bening," owned by the Regional Government, encourage collaboration between regional apparatus, ensuring that each sub-district receives assistance in accelerating stunting reduction. Policies include improving nutrition, food security, sanitation and environmental health, demonstrating a comprehensive approach to tackling stunting. Regional Regulations encourage corporate social responsibility in nutrition and health programs, while various circulars help build awareness and change in people's behavior. However, there are still weaknesses where the Regional Government has not established a social protection system that directly focuses on preventing and strengthening the resilience of poor households to economic and social shocks. In addition, existing regulations have not fully internalized the concept of household resilience to shocks, so social protection is still more reactive than proactive and adaptive.

3. Governance Structure

The Regional Government has formed the Stunting Reduction Acceleration Team (TPPS) at various levels by involving various elements such as the central and regional governments, academics, professional organizations, NGOs, community organizations, and others. TPPS covers the health, education, agriculture, economy, and social sectors, with clear duties and responsibilities, minimizing overlapping authority, and increasing the effectiveness of program monitoring and evaluation. Existing regulations are a clear legal basis for the implementation of strategies to accelerate stunting reduction in a holistic and integrated manner. The Regional Government has adapted national regulations by reviewing existing regulations in the regions to ensure policy alignment with the national strategy to accelerate stunting reduction. However, disaster actors have not been formally included in the TPPS structure, resulting in disaster impact preparedness that is less integrated with social protection strategies and responses to stunting.

4. Institutional Capacity

The Regional Government has carried out capacity building for 165 village governments, ensuring that all village governments receive guidance in accelerating stunting reduction. Action 5 in the Stunting Convergence ensures that actors at the village level have a clear and coordinated role in reducing stunting rates. Cadre development has been carried out by the relevant agencies, reaching all villages and sub-districts, and adjusting interventions to local conditions. The government uses the EMO-DEMO approach and

education modules to ensure that cadres are able to provide counseling in accordance with recommendations for pregnant women and children, so that nutrition-based interventions can run more optimally. However, many cadres leave the system without formal attachment, so it is necessary to carry out continuous retraining to replace cadres who are no longer active. Cadres and assistants have diverse capacities, so education and assistance for the community are not optimal, especially in terms of changing the behavior of aid recipients related to stunting.

B. Data and Information Systems

1. Household Risk and Vulnerability Assessment

West Bandung Regency already has data on families at risk of stunting, audits of stunting clowns, and stunting prevalence data at various levels, including health centers, sub-districts, and villages. Efforts to update data are carried out periodically through the Family Information System (SIGA) as well as regular reporting to Bappelitbangda and related OPDs to ensure the accuracy and effectiveness of interventions. The government has implemented direct data collection through field surveys, as well as validation and verification processes to ensure that the data used represents the actual conditions. Disaster management actors utilize population data, health data, and environmental data in emergency conditions to ensure appropriate interventions, including in the aspects of nutrition and health services. Updated data through digital-based applications allows for faster decision-making and responsiveness to changing situations, including in crisis conditions. However, time and resource constraints led to a quick approach that lacked depth in data analysis, resulting in the program being more generalized. A considerable gap from different measurement sources indicates differences in sample coverage, measurement quality, and frequency of data collection, potentially affecting the accuracy of the analysis results. There are still limitations in data collection and input officers, and there are no agreed-upon standard criteria, so the mapping process of target groups has not been maximized. Inappropriate measurement tools, complex application systems, and limited budget allocations cause data validation to be suboptimal, potentially hindering the effectiveness of social protection interventions.

2. Social Listings

Action 6 ensures that Bappelitbangda is the person in charge of coordination, while the regional apparatus is responsible for the availability and utilization of data, which is then discussed in the regular TPPS meeting. Data in the regional apparatus is systematically matched, including synchronization of social and health data, as well as the implementation of a single NIK to reduce duplication of aid recipients. The field survey process, validation of social assistance recipients, and data blending with the DTKS system ensure that the data collected truly represents real conditions in the field. Local Governments are committed to updating data through the Family Information System (SIGA) and periodic reporting, enabling data-driven decision-making. The use of technology in data management ensures real-time monitoring, increases transparency, and accelerates responses to changing conditions. The change from DTKS to DTSN (Single Social and Economic Data) managed by BPS is a strategic step in improving data alignment for social assistance targeting. However, the validation system still faces obstacles, including a lack of transparency in automated criteria, as well as limitations in feedback mechanisms for social companions. Errors in data collection cause eligible families to be not recorded (exclusion error), while those who are not entitled are actually included as recipients (inclusion error). West Bandung Regency still faces obstacles in harmonizing data between sources, so the available information is not fully accurate and integrated. Different programs apply non-uniform definitions, formats, and indicators, causing

difficulties in combining data efficiently. Data related to the integration of social assistance recipients, access to nutritious food, and the condition of households at risk of stunting are still not systematically available, hampering the effectiveness of adaptive social protection policies.

3. Early Warning System

The Regional Government has implemented monitoring of the nutritional status of children and pregnant women through monthly weighing of toddlers, which allows for early detection of stunting risks and faster intervention. The data collected is analyzed using an application provided by the Ministry of Health, so that the identification of the nutritional conditions of children and pregnant women can be carried out more accurately and in a timely manner. Robust data infrastructure and early warning systems contribute to ensuring a rapid response in the distribution of aid and nutrition interventions, especially for vulnerable groups. The Health Office routinely updates child and maternal health status data, which is used in the early detection of stunting vulnerability in disaster areas, allowing for more effective allocation of assistance. Disaster management actors have established disaster-resilient villages and disaster-resilient families, enabling communities to understand disaster threats, including those related to nutrition and health. However, the collected health data has not been integrated with the data of disaster management actors, so there is still no system that can detect disaster-prone areas that are at risk of disruption of access to clean water, food, and health services. Disaster management actors collaborate with the Health Office and the Social Service in handling stunting in disaster-affected areas, but coordination is only carried out on a case-by-case basis, without a regular communication forum. Disaster management actors do not yet have an integrated program with relevant agencies to prepare the community to face nutritional risks when a disaster occurs, so intervention is still limited to response after the event. Monitoring of food prices in disaster-affected areas or extreme poverty has not been used as part of the early warning system, so the potential for scarcity of nutritious food is still difficult to detect proactively.

4. Crisis Paca Needs Assessment

Local governments have implemented regular monitoring and updating of maternal and child nutrition status data, even outside of disaster conditions, allowing for early detection and faster intervention. Analysis of the impact of the crisis on access to food, sanitation, and health services has been carried out by relying on data reports from the Health Office, ensuring a more targeted and targeted response. Disaster management actors are responsible for monitoring post-crisis conditions, including the distribution of social assistance and mapping of affected populations, ensuring the continuity of social protection. The Health Office has an update system that allows data changes to be followed up immediately, so that decisions can be made based on the latest information. Disaster management actors, the Health Office, and the Social Service have worked together in dealing with the impact of the crisis, including the distribution of aid and monitoring the health status of families at risk of stunting. However, the validation of social assistance recipients is still carried out by requesting manual data matching to the Social Service, causing potential inaccuracies in the distribution of assistance. Disaster management actors and related agencies are still evaluating needs incidentally, rather than as a structured mechanism that can systematically adjust social protection to changing conditions. The lack of a social data update system can cause eligible families to be excluded (exclusion error) or recipients who are not eligible to be included in the list (inclusion error).

5. Data Sharing Protocol Platform

Regional Governments have easy access to data for all regional apparatus, including those who are not members of TPPS, with a simple login system and regular coordination forum support. Data from various regional devices is systematically matched to avoid overlapping program objectives, including synchronization with DTKS and P3KE systems. Data can only be accessed through written requests and news releases, as well as access restriction mechanisms to ensure data is used responsibly and cannot be edited directly. An app-based system has been provided by the government to ensure that data remains up-to-date and accurate, as well as to assist in monitoring nutritional status and social protection. Regional data provider apparatus is open and willing to assist in understanding and utilizing data, including training for cadres and officers who need access to information. However, the Regional Government does not yet have a public platform to provide data, making it difficult for the general public to access information about social protection programs. There is no clear access mechanism from the relevant ministries, causing limitations in the use of national data, such as Regsosek, which has not been fully approved. Nationwide concurrent access schedules cause servers to go down frequently, leaving officers to work outside of operating hours to avoid access disruptions. Application training is still a challenge, especially for cadres who are not familiar with technology, hampering the speed and efficiency of data utilization in the field. Many families are unaware of the existence of social protection programs or are confused about how to register, so more active education and data clarification, and correction mechanisms are needed.

C. Funding

1. Estimated Response Costs

Disaster management actors have evaluated the impact of the crisis, using data from the Health Office, Health Centers, and Posyandu, ensuring that health and nutrition interventions are carried out based on accurate information. West Bandung Regency already has a mechanism for monitoring and evaluating post-crisis conditions, especially in the aspects of health, sanitation, and access to clean water, helping in the preparation of post-disaster recovery strategies. The sharing of the costs of health and nutrition interventions (Health Office), social assistance (Ministry of Social Affairs), and the restoration of infrastructure and basic services (related OPDs) is clear, ensuring that each sector has specific responsibilities. Disaster management actors, the Health Office, and the Social Service have worked together in handling post-disaster recovery, including in the aspect of providing cash assistance and economic recovery support for vulnerable groups. However, the calculation of social assistance is still carried out based on the number of previous years, without considering the risks and impacts of disasters more dynamically, causing a potential shortage of funds allocation when there is a sudden increase in needs. Limited access to social data causes difficulties in compiling the calculation of adaptive social protection costs, making the aid distribution process less evidence-based. An evaluation of basic service infrastructure has been carried out, but there is no mechanism that considers the impact of the crisis on vulnerable groups, specifically in the preparation of social assistance budget allocations.

2. Risk Financing

Disaster management actors have allocated dedicated funds for crisis and disaster management, ensuring that affected communities receive prompt and targeted assistance. West Bandung Regency has achieved Universal Health Coverage (UHC), allowing people to access health services for free with only an ID card, as well as financing class 3 BPJS contributions for those who are not covered by health insurance. Funding

comes from various sources, including the APBD, State Budget, Village Fund, Special Allocation Fund (DAK), CSR, and funding for assistance tasks from the central government. West Bandung Regency has implemented a budget allocation based on risk, including a basic financing layer from the APBD for health programs, contingency funds for high-risk groups, and responsive funds for major shocks. West Bandung Regency has collaborated with international companies and organizations to support the funding of various nutrition intervention programs and family economic empowerment. The central government has allocated funding of 5 billion to support West Bandung Regency's efforts in achieving zero stunting, ensuring the sustainability of intervention and program monitoring. However, financing of human resources for apparatus, community, logistics, and vehicles is still insufficient, leading to limitations in the broader crisis response. There is no policy that allows the use of emergency funds for post-disaster prevention or recovery, so social protection interventions are still more reactive than preventive. The calculation of social assistance is carried out based on the previous year's data, without considering the risk of changing conditions due to crises or economic shocks. Social data is not publicly accessible, causing difficulties in compiling evidence-based cost estimates and considering socio-economic aspects more holistically.

3. Disbursement Mechanism

The Regional Government has implemented a beneficiary validation system based on actual health conditions, so that nutritional interventions such as the provision of PMT can be carried out in a timely manner without being constrained by an integrated data system. Puskesmas can directly submit and validate recipients, including hospitalization for undernourished toddlers, ensuring immediate intervention without protracted administrative procedures. Assistance is provided in the form of PMT that has been processed as needed, avoiding the risk of misuse of cash funds by beneficiaries. The Regional Government has used a technology-based application system to monitor the nutritional status of toddlers and pregnant women in real-time, increasing the effectiveness of the program. However, E-wallets, QR codes, and digital transfers have not yet been implemented, causing the distribution of cash assistance to still be done manually, which has the potential to slow down the disbursement process and transparency monitoring. Because the DTSN data will only be completed in February 2025, data matching has not been carried out, causing the potential for duplication of aid recipients that could hinder the effectiveness of distribution. The use of AI-based algorithms and big data to assess needs based on economic conditions, health, and stunting risk has not yet been implemented. The Regional Government does not have a public platform to display beneficiary data and distribution progress in real-time, so monitoring by the community is still limited.

4. Long-Term Financing

Local governments have implemented long-term fund allocations, ensuring that nutrition interventions and social protection remain sustainable in each planning cycle. Local governments have set a special ceiling for accelerating stunting reduction in budget planning documents, making stunting a prioritized key performance indicator (KPI). Programs that are national or regional priorities are advocated to continue to obtain financing despite facing fiscal limitations, ensuring that important interventions continue to run. The Regional Government has utilized the State Budget, Regional Budget, Village Fund, DAK, CSR, and partnerships with international organizations such as BISA and Save the Children to support programs to accelerate stunting reduction. Local governments have implemented a basic financing layer from the APBD for health programs, contingency funds for high-risk families, as well as a response fund for major shocks,

ensuring a more efficient allocation of funds according to the level of need. The Regional Government has developed a monitoring system for budget absorption and performance achievements, including routine reporting by Bappelitbangda to maintain funding transparency. However, funding still has to compete with the needs of other sectors, such as education and infrastructure, so that some programs do not get as much allocation as expected by the regional apparatus. CSR and funding from the private sector are not always available every year, leading to uncertainty in the sustainability of funding for certain programs. Regional governments still face obstacles in integrating social and economic data, so financing estimates have not fully considered aspects of social vulnerability. There is no dashboard or public platform that allows the public to access information about budget distribution and the effectiveness of using funds in reducing stunting.

D. Program

1. Social Protection Coverage

Local governments have combined nutrition, health services, education, clean water, and sanitation interventions, ensuring broader and targeted social protection coverage. Programs that have been running such as PMT for pregnant women and toddlers, immunization, administration of blood supplement tablets (TTD), and worm testing, are adapted to support the acceleration of stunting reduction. The Regional Government has developed Pelita Bening, Getol, Gobang, and Salting, as well as community-based intervention approaches and direct assistance for groups at risk of stunting. Social assistance and health programs such as PMT are not only provided to poor families, but also based on real-time health status, allowing program goals to be more dynamic and effective. PMT is provided based on local foodstuffs, involving the community in the provision and processing, as well as educating them about the importance of consuming nutritious food. The government ensures that interventions are adjusted to the level of need, such as toddlers with underweight receive PMT for 28 days, while undernourished toddlers receive PMT for 56 days. In the event of a disaster, assistance is adjusted to the impact that occurs, including the fulfillment of nutritious food, health services, and trauma healing, based on data updated monthly by the Health Office. However, many programs come from various sectors and regional apparatus, so there is a risk of duplication of interventions if there is no more systematic coordination mechanism. There is no public dashboard that allows the public to access information on the coverage of beneficiaries and the progress of social protection interventions in real-time. Some programs do not have a specific mechanism to prioritize stunting prevention, so the allocation of assistance has not been fully directed. Post-disaster aid distribution is not yet fully optimal, still relying on a manual assessment process that takes longer.

2. Program Design Parameters

The Regional Government has implemented a situation analysis as the basis for the formulation of interventions, ensuring that service targets are in accordance with the distribution of stunting prevalence and the coverage of existing health services. Target groups were based on risk and vulnerability, including pregnant women, breastfeeding mothers, children aged 0-23 months, children aged 24-59 months, women of childbearing age, and adolescent girls, ensuring interventions were more targeted. The Regional Government has implemented quarterly monitoring and evaluation every semester, including monitoring of performance targets and intervention coverage by Bappelitbangda and related regional apparatus. If the stunting reduction target is not achieved, obstacles are identified and strategies are improved, including an annual review in the Stunting Convergence Action to optimize the effectiveness of the program. This

program oversees direct intervention in stunting locus sub-districts, strengthening the coordination of regional apparatus so that assistance is more targeted. Monitoring is given every 7 days for toddlers receiving PMT, ensuring that the intervention is effective, as well as an examination by a doctor if there is no improvement in the condition. However, food security and access to health services have not been included in the eligibility parameters, so the risk-based approach is still not optimal. The Regional Government does not have a systematic evaluation mechanism for the level of community satisfaction, so the response to needs and feedback from beneficiaries is still limited.

3. Program Feature Design

The Regional Government has optimized existing programs in the regional apparatus, such as health services, social assistance, and education, to support the acceleration of stunting reduction without having to create new programs. Although there is no special budget, the Pelita Bening program continues to run thanks to the strong support of government leaders, showing the seriousness of the local government in overcoming stunting. Nutrition monitoring dashboards and routine health surveys help in detecting the condition of pregnant women and toddlers at risk of stunting, allowing for faster and more targeted interventions. In emergency response conditions, all disaster victims immediately receive assistance without having to go through further assessments, including nutritious food assistance, baby kits, and housing facilities that prioritize pregnant women and toddlers. The Regional Government guarantees balanced, nutritious food intake three times a day for affected victims, helping to meet nutritional needs during the crisis. Health programs such as PMT delivery have been tailored to real-time health conditions, ensuring that assistance is delivered to those who really need it. The Regional Government has implemented Universal Health Coverage (UHC), ensuring free access to health for people who do not have health insurance to avoid financial barriers in obtaining health services. The local PMT program involves the community in food processing and distribution, as well as providing education on healthy eating and how to process nutritious food. However, although there has been real-time data-driven nutrition monitoring, there is no automatic notification system for at-risk families, so interventions cannot always be carried out in a timely manner. Nutritious food e-vouchers or health consultation applications have not been implemented, so the distribution of aid in emergency situations still has logistical obstacles. When families are separated by disasters, access to aid is disrupted, so there is a need for a more structured reunification system to ensure that protection for vulnerable groups continues.

DISCUSSION

The interlinkages among adaptive elements within each building block of Adaptive Social Protection (ASP) show that the system operates in layers, starting from the institutional foundation to program implementation. Each block has a distinct function but is hierarchically interdependent; upstream blocks determine the capacity of subsequent blocks. Therefore, relationships among elements within each block, as well as across blocks, should be understood as a systemic sequence: Institutions → Data → Financing → Programs. This hierarchy is not merely conceptual but determines how adaptive responses can (or fail to) be activated during shocks.

Within the institutions and partnerships block, interlinkages among elements are fundamental as they determine leadership, cross-sector collaboration, and decision-making when risks increase. Policy coherence provides direction and legitimacy, while strategic partnerships offer cross-sector support networks. However, without adaptive leadership, institutional capacity, and cross-sector governance, such direction and support cannot be translated into operational mechanisms. In other words, policy

coherence and partnerships become only “normative capital” that cannot function in the absence of technical institutional components. This marks the starting point of system maladaptiveness: weaknesses in this upstream block automatically weaken downstream blocks, particularly data and financing.

In the data and information systems block, elements function as an analytical chain: risk assessment provides the geographic and demographic basis for social registries; social registries feed into early warning systems; early warning systems trigger responses; post-crisis needs assessments complement the understanding of post-crisis conditions; and the entire system can operate only with data-sharing protocols. Each element depends on the previous one and on the institutional mandates that govern them. Therefore, without adaptive leadership or cross-sector governance in the first block, there is no foundation for building data interoperability in the second block. Failure in one element—such as the early warning system—automatically undermines the data block’s ability to signal risks needed by financing and programs.

Elements within the financing block also operate hierarchically. Response cost estimation is a prerequisite for risk financing; risk financing is only effective when supported by rapid disbursement mechanisms; and long-term financing ensures investment sustainability. These interlinkages show that adaptive financing cannot emerge without credible risk data or governance arrangements specifying who can activate funds. Thus, the financing block fully depends on the strength of the institutional and data blocks. When data and governance are not adaptive, financing functions only through regular cycles, rather than as a response mechanism aligned with evolving risks.

Adaptive design, adaptive coverage, and delivery features determine whether services and assistance can be adjusted when shocks intensify. These three elements can function only if the previous three blocks provide adaptive mandates, data, and budgets. When institutions do not establish triggers, data do not provide targeting information, and financing does not supply contingency funds, programs cannot transform in line with risk severity. Therefore, the lack of adaptiveness in the program block stems from the accumulation of weaknesses in blocks 1–3.

The institutional block is the primary determinant of the existence and quality of the data block. Without adaptive leadership, there is no mandate to build social registries, no decision to integrate early warning systems, and no governance structure to establish data-sharing protocols. This means the data block cannot be adaptive if its institutional foundation lacks adaptive capacity, structure, and roles. The data block is the source of information for adaptive fiscal planning. Response cost estimation, contingency needs calculations, and decisions on program expansion all require risk data, updated registries, and early warning signals. When risk mapping is unavailable, registries are not updated, and data-sharing protocols are absent, risk financing becomes imprecise or impossible. Thus, non-adaptive data systems directly hinder financing. Financing, in turn, links risk information to program implementation. Without response cost estimation and risk financing, there is no fiscal basis for horizontal or vertical expansion, emergency packages, or alternative delivery features. Consequently, even well-designed programs remain rigid without adaptive financing. The program block is the system’s endpoint, determining whether children and pregnant women receive protection when risks increase. Non-adaptive programs lead to service disruptions, slower outreach, and limited scalability, directly increasing stunting risks during disasters, climate disturbances, or sudden socio-economic shocks.

These interlinkages indicate that ASP system adaptiveness follows a hierarchical logic: institutions form mandates, data form information, financing forms execution capacity, and programs form impact. When upstream blocks—especially institutions—are not adaptive, downstream blocks lose their basic prerequisites. Conversely, strong upstream

blocks can strengthen the entire chain and promote layered adaptiveness. In West Bandung Regency (KBB), three adaptive elements—policy coherence, strategic partnerships, and long-term financing—provide important initial capital, but are insufficient to build a full ASP system because critical elements in other blocks remain underdeveloped. The lack of adaptiveness in blocks 1–3 prevents block 4 (programs) from transforming when risks increase. Therefore, strengthening adaptiveness must begin upstream, with adaptive leadership, cross-sector governance, and data-sharing protocols, before improving financing and programs.

Conceptually, the ASP framework as formulated in [11] does not establish a sequence or hierarchy among building blocks. The four blocks—institutions and partnerships, data and information systems, financing, and programs—are positioned as equal and mutually reinforcing dimensions, not as layered structures. This aligns with earlier perspectives by Bastagli [24] and O'Brien [25], emphasizing that system adaptiveness requires all building blocks to function simultaneously rather than sequentially. Thus, in theory, there is no formal hierarchy placing one block as a prerequisite for another.

However, empirical findings in West Bandung Regency show that when adaptive elements are unevenly fulfilled, relationships among building blocks shift from parallel to functionally hierarchical. This aligns with Ebrahim and Zald's [26] argument that disparities in institutional capacity create causal relationships and structural dependencies in local governance practice, even if the theoretical framework is non-hierarchical. In practice, the institutional block becomes the determining factor influencing data, data become a prerequisite for adaptive financing, and adaptive financing becomes the enabling condition for adaptive programs. This hierarchy emerges from operational needs rather than theoretical design.

In KBB, the absence of adaptive leadership, institutional capacity, and cross-sector governance leaves the data block without mandates, structure, or protocols. This supports Roelen's [27] finding that institutions are upstream enablers of social information systems. When data are not adaptive, financing cannot function effectively because response cost estimation and contingency fund formation rely on accurate risk data, as explained by Maher [28] and Hallegatte [29]. Finally, non-adaptive financing constrains program development, consistent with Béné's [20] findings on the dependence of adaptive programs on risk financing and rapid disbursement mechanisms.

Thus, while ASP theory positions the four building blocks as equal, empirical analysis shows that in regions with weak adaptive capacity such as KBB, relationships among blocks become functionally hierarchical: institutions underpin data, data underpin financing, and financing underpins programs. This pattern does not contradict the Bowen framework, as the hierarchy is not theoretical but arises from uneven fulfillment of adaptive elements that shape causal pathways in implementation.

These research findings complement and enrich ASP theory [11]. Although the ASP framework is conceptually non-hierarchical, empirical evidence from West Bandung Regency shows that when adaptive elements are unevenly developed, relationships among building blocks become interdependent and functionally hierarchical. This does not contradict the theory but expands understanding of how ASP operates in contexts of limited local capacity. The following table presents a summary synthesis of the interlinkages among elements and building blocks of Adaptive Social Protection.

CONCLUSION

This study shows that the adaptiveness of the Adaptive Social Protection (ASP) system in supporting the acceleration of stunting reduction is determined by the close interlinkages among elements within each building block as well as across blocks as a whole. Although the ASP framework conceptually positions four blocks—institutions and partnerships,

data and information systems, financing, and programs—as equal elements, empirical findings indicate that in practice these relationships form a functional hierarchy. The institutional block serves as the foundation by providing mandates, adaptive leadership, institutional capacity, and cross-sector governance. This foundation determines the functioning of the data block, which in turn becomes a prerequisite for risk financing, and ultimately enables programs to transform adaptively as risks increase.

Interlinkages among elements within each block are also hierarchical. In the data block, the failure of a single element, such as an early warning system, can paralyze the entire analytical function. In the financing block, the absence of response cost estimation or rapid disbursement mechanisms constrains risk financing. In the program block, the lack of mandates, targeting data, and contingency budgets results in rigid and unresponsive services. Thus, maladaptiveness in downstream blocks represents the accumulation of weaknesses in upstream blocks. In the context of West Bandung Regency, several adaptive elements—such as policy coherence, strategic partnerships, and long-term financing—are already present, but they are insufficient to establish a fully functional ASP system. The absence of adaptive leadership, operational institutional capacity, cross-sector governance, and data-sharing protocols prevents the data block, risk financing, and adaptive programs from functioning optimally. This condition explains why the existing social protection system has not been able to transform responsively when socio-economic, health, or disaster risks increase—ultimately contributing to heightened vulnerability to stunting.

These findings enrich the theoretical framework of ASP by demonstrating that in contexts of weak local capacity, relationships among building blocks that are theoretically non-hierarchical can shift into an operational hierarchy due to uneven fulfillment of adaptive elements. This hierarchy does not represent a deviation from theory but rather reflects functional requirements in implementation. Therefore, efforts to strengthen ASP for accelerating stunting reduction should begin with upstream blocks—namely strengthening adaptive leadership, cross-sector governance, and data interoperability—before intervening in financing and program design. This approach underscores that social protection adaptiveness is a systemic prerequisite for sustaining nutrition services and maternal–child protection amid increasingly complex risk dynamics.

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