A PROPOSED FRAMEWORK FOR INTEGRATING CCA AND DRR INTO SPATIAL PLANNING IN INDONESIA

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Introduction

- The effects of **climate change (CC)** are increasingly evident and have significant implications for various aspects of global society, including Indonesia. As an archipelagic nation characterized by diverse geographical, climatic, and socio-cultural conditions, Indonesia is particularly vulnerable to the impacts of CC. Given the threats posed by climate-induced disasters, **proactive adaptation measures** are crucial **to mitigate future human and economic losses**.
- **Climate change adaptation (CCA) efforts** are important to be carried out immediately because the benefits can be felt more quickly. Although this effort must be accompanied by mitigation efforts. One promising approach to **integrating CCA and disaster risk reduction (DRR)** through **spatial planning**. It can serve as an effective mechanism to minimize exposure and vulnerability to climate-related hazards.
- However, **Indonesia's current spatial planning** process needs a more detailed integration of these two critical aspects. **Fragmented analysis of disasters and CC**, with climate data often used merely as descriptive information, underscores the need for a more comprehensive approach.
- Therefore, this study aims to **develop an integrated framework for CCA and DRR within spatial planning**, focusing on data collection, analysis, and plan formulation. Efforts to integrate CCA into the spatial planning process in Indonesia have become **an urgent need** to create spatial plans that are **resilient to climate-related disasters**. Thus, spatial planning can function as one of the tools to reduce the impact of CC.

Methodology

- The study utilizes a combination of case study analysis, literature review, quantitative analysis, and spatial analysis. in this study, climate information will be integrated into the physical analysis of the area and analysis of DRR.
- Framework of CCA and DRR into Spatial Planning in Indonesia can be seen in Fig. 1 and scope of study works can be seen Fig. 2. A case study area is in West Java Province.
- Spatial risk index (Fig. 4) is generated by combining the results of spatial hazard and vulnerability analysis (Fig. 3) using GIS software for mapping.

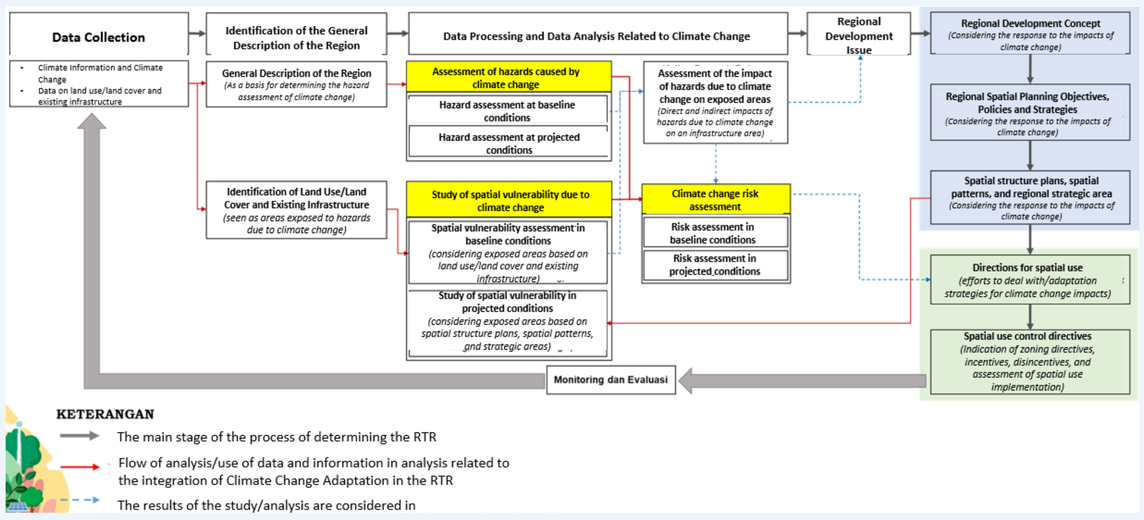

Figure 1. Integration Framework of CCA and DRR into Spatial Planning

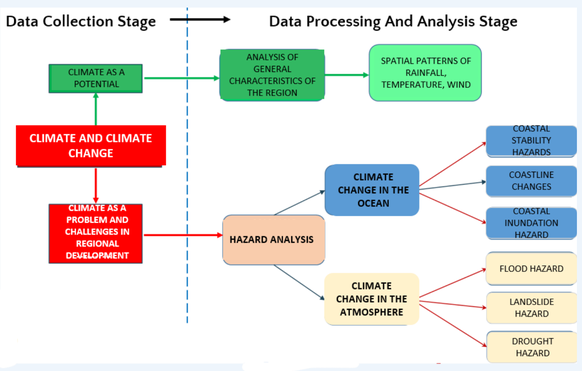

Figure 2. Scope of Works

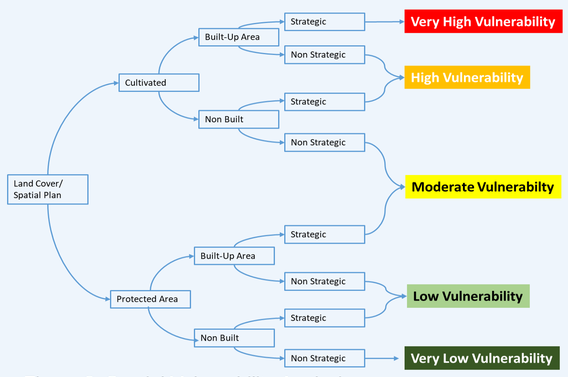

Figure 3. Spatial Vulnerability Analysis

		Hazard Level				
		Very Low (1)	*Low* (2)	*Moderate* (3)	*High* (4)	*Very High* (5)
Vulnerability Level	*Very Low* (1)	VL (2)	VL (3)	L (4)	L (5)	M (6)
	Low (2)	VL (3)	L (4)	L (5)	M (6)	H (7)
	Moderate (3)	L (4)	L (5)	M (6)	H (7)	H (8)
	High (4)	L (5)	M (6)	H (7)	H (8)	VH (9)
	Very High (5)	M (6)	H (7)	H (8)	VH (9)	VH (10)

Figure 4. Risk Assessment Method

Results

The results indicate that historical climate data can be statistically analyzed and spatially described to project future climate trends (Fig. 5). These findings inform the preparation of disaster risk projection maps (Fig. 7) and the development of spatial planning concepts tailored to climate change-induced disasters.

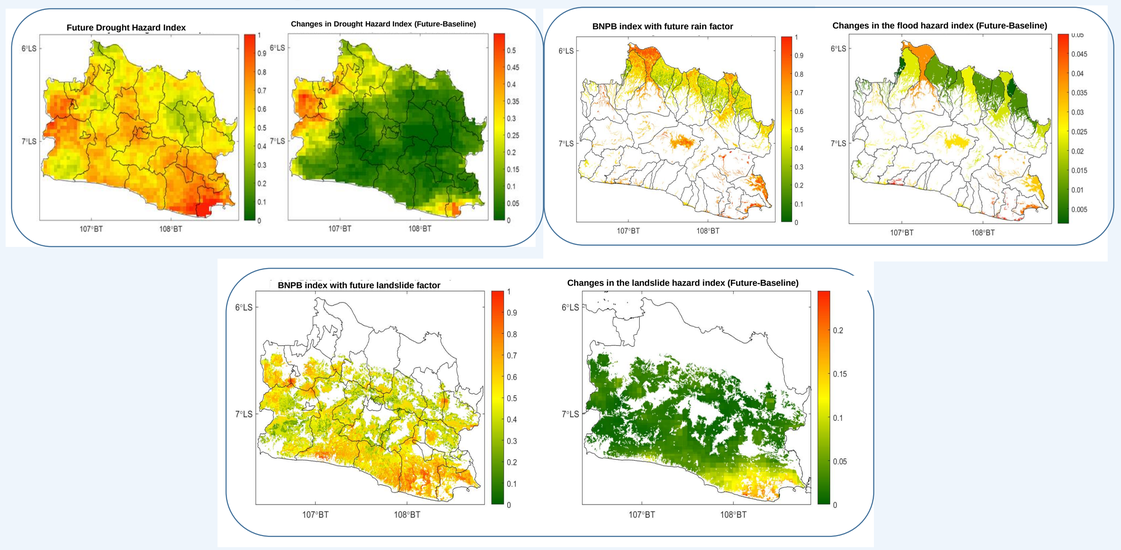

Figure 5. Climate-related disasters Projection Period

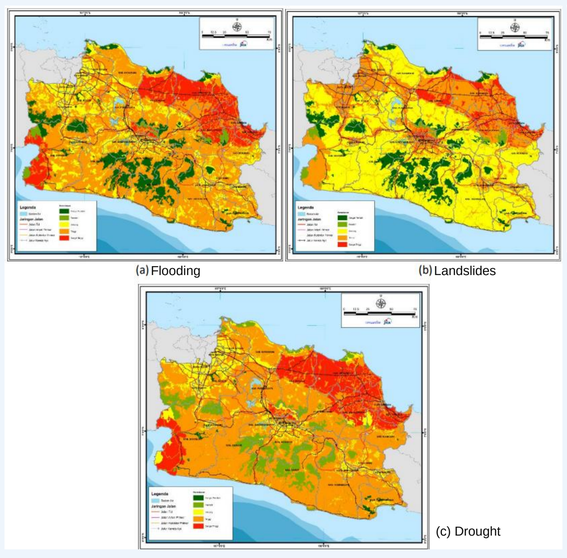

Figure 6. Spatial Vulnerability Analysis of West Java

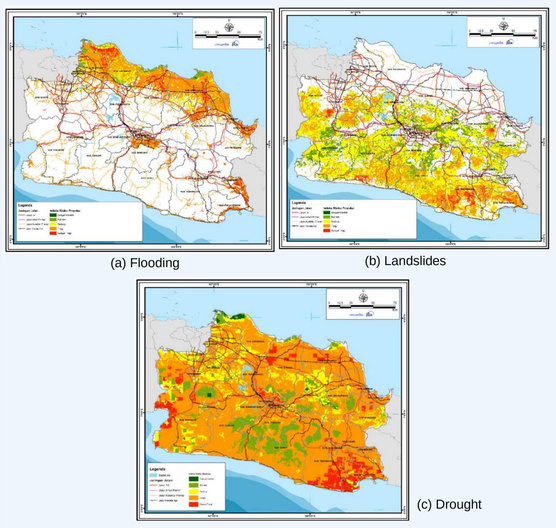

Figure 7. Projected Climate-Related Disaster Risk

Determination of the zoning regulation in the form of zoning indications in the provincial spatial planning or general provisions of zoning in the regency/city planning, as well as directions for incentives and disincentives at the provincial level, or provision of incentives and disincentives in the region/city level that integrates the results of CC studies.

CCA into Directions for Spatial Utilization Based on a Review of Landslide Hazard Impacts in West Java Province

Residential areas prone to moderate to high landslides

Adaptation Options in Spatial Utilization		
Retreat	**Accommodation**	**Protection**
• Application of the concept of LID (Low Impact Development) development by considering the appropriate KDB & KLB • Formulation of housing zoning regulation in areas with high slopes	• Construction and maintenance of retaining walls in residential areas exposed to landslide hazards • Strengthen building foundations and infrastructure	Improvement and maintenance of green open space in the residential area

Conclusion

The integration framework proposed in this study has the potential to generate **resilient spatial planning strategies** that effectively mitigate the impacts of CC. This framework suggests **increasing the capacity of relevant stakeholders**, particularly the data guardians, who are crucial in providing necessary data for informed decision-making. The success of integrating CCA and DRR into spatial planning is highly dependent on the availability and quality of information that can be integrated into the analysis phase during the preparation of spatial plans. Furthermore, the study highlights the importance of enhancing the guidelines for integrating CCA and DRR into spatial planning. It is recommended that **these guidelines be escalated into a legal product** as a Ministerial Regulation ensuring that the integration of CCA into spatial planning is systematic and mandatory, providing a robust framework for regional and local governments to follow. Such regulatory support is essential for achieving effective and sustainable spatial planning that can withstand the challenges posed by CC. The successful implementation of this integration framework will ultimately **contribute to developing more resilient communities** and environments capable of adapting to and mitigating the adverse effects of CC.

Reference/Footnotes

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