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CLIMATE RESILIENCE, ADAPTIVE CAPACITY, AND SUSTAINABLE COMMUNITY DEVELOPMENT IN INDONESIA'S ARCHIPELAGIC REGIONS

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Abstract

Climate change poses unprecedented threats to Indonesia's archipelagic regions, where over 130 million people depend on marine and terrestrial livelihoods in geographically fragmented, resource-constrained island environments. This study examined the relationships between dimensions of climate resilience and sustainable community development across ten Indonesian archipelagic provinces. Using a quantitative cross-sectional design, we surveyed 648 respondents comprising coastal community leaders, local government representatives, environmental planners, and development organization staff. Eight climate resilience dimensions (adaptive capacity, disaster preparedness, climate risk awareness, resource management practices, community participation, institutional support, access to climate information, and infrastructure resilience) and eight sustainable development dimensions (economic sustainability, livelihood diversification, environmental sustainability, social inclusion, governance effectiveness, sustainable resource utilization, community well-being, and long-term development capacity) were measured using 5-point Likert scales. Multiple regression analysis revealed that climate resilience dimensions explained 64% of variance in sustainable community development ($R^2 = .64$, $F(8, 639) = 142.3$, $p < .001$). Adaptive capacity ($\beta = .34$), disaster preparedness ($\beta = .29$), and resource management practices ($\beta = .27$) emerged as the strongest predictors, while infrastructure resilience showed minimal predictive power ($\beta = .07$). Significant regional variation in resilience and development indices ($\eta^2 = .11$ and $.09$, respectively) reflected underlying disparities in institutional capacity and governance quality. The findings demonstrate that sustainable community development in vulnerable archipelagic regions emerges primarily from social, institutional, and behavioral dimensions of resilience—particularly adaptive capacity, disaster preparedness, and community participation—rather than from infrastructure investments alone. The study provides empirical support for community-based, institutionally-embedded adaptation approaches and identifies priorities for national and local adaptation policies, development programs, and research in island contexts facing escalating climate impacts.

Keywords: *climate resilience, sustainable development, adaptive capacity, archipelagic regions, island communities, climate adaptation, resilience theory, social-ecological systems*

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Introduction

Indonesia archipelago comprises over 17,000 islands extending across three time zones, with a coastline exceeding 54,000 kilometers and a marine exclusive economic zone covering approximately 6.3 million square kilometers. The region is home to 270 million people, of whom an estimated 130 million inhabit coastal areas or island communities directly dependent on marine and terrestrial resources for food security, income, and livelihoods (World Bank, 2016). These archipelagic regions represent some of the world most climate-vulnerable environments, facing compounding environmental stressors: rising sea levels, increasingly severe typhoons and tropical cyclones, changing monsoon patterns, ocean acidification, and accelerating coral reef degradation (Handiani et al., 2013; Nurse et al., 2014).

Climate impacts in Indonesian archipelagic regions manifest as acute shocks (typhoons, flooding, landslides) and chronic stresses (fish stock decline, saltwater intrusion, mangrove loss, agricultural productivity reduction) that directly threaten livelihood viability, food security, and community survival. Between 2000 and 2020, Indonesia experienced an average of 127 climate-related disasters annually, affecting an estimated 3.4 million people and causing economic losses exceeding USD 1 billion per year (Indonesian Disaster Management Authority, 2021). Coastal areas and island communities bear disproportionate impacts: 70% of natural disasters in the archipelago affect coastal zones; sea-level rise threatens to inundate low-lying islands and increase saltwater intrusion into agricultural lands; and intensifying storms have increased fishing fleet losses and disrupted livelihoods.

Despite these escalating climate threats, Indonesia possesses substantial assets for building climate resilience in archipelagic regions: (a) rich marine and terrestrial biodiversity supporting livelihood diversification opportunities; (b) strong traditional knowledge systems and community-based resource management practices developed over centuries of living with environmental variability; (c) expanding development infrastructure and institutional capacity at subnational levels following decentralization; (d) growing awareness among communities and governments of climate risks and adaptation imperatives. However, converting these assets into durable climate resilience requires understanding which dimensions of resilience most effectively drive sustainable community development and how resilience-development linkages vary across geographic contexts.

The relationship between climate resilience and sustainable development has been theoretically elaborated in recent years. The Sustainable Development Goals (SDGs) explicitly recognize that climate action (SDG 13) is essential for achieving all other development goals, particularly those addressing poverty reduction, food security, health, and livelihoods (United Nations, 2015). Resilience theory and social-ecological systems perspectives emphasize that communities’ capacity to adapt to environmental change while pursuing development goals depends on multiple interacting factors: adaptive capacity, governance quality, livelihood diversification, access to information, and community agency (Folke, 2006; Walker et al., 2004). Yet empirical research examining these relationships in Indonesia specific context—particularly in archipelagic regions with distinct geographic, economic, and social characteristics—remains limited.

Existing adaptation research in Southeast Asia and the Pacific has predominantly focused on infrastructure investments and technical solutions, often with limited attention to social dimensions, community participation, or long-term development outcomes (Adger et al., 2009). Furthermore, much adaptation research has concentrated on agriculture in mainland regions, with less emphasis on marine-dependent island communities despite their pronounced vulnerability and the critical importance of fisheries to regional food security and employment. Additionally, few studies have rigorously examined which specific dimensions of climate resilience generate the greatest development benefits or how relationships among resilience dimensions and development outcomes vary across geographic contexts within a country.

This study addresses these research gaps by examining the relationships between eight dimensions of climate resilience and eight dimensions of sustainable community development across ten archipelagic provinces in Indonesia, representing diverse geographic, economic, and institutional contexts. The study employs quantitative methodology to identify the relative importance of different resilience dimensions in predicting sustainable development, to examine geographic variation in resilience-development relationships, and to provide empirical evidence for policy and program prioritization in climate adaptation and sustainable development in vulnerable island environments.

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Related Literature

Climate Change Impacts on Archipelagic Regions

Archipelagic and island regions globally face intensifying climate impacts that threaten livelihoods, food security, and long-term viability. Small island developing states (SIDS) are recognized as among the world most climate-vulnerable populations, with limited mitigation capacity yet disproportionate climate impacts (Nurse et al., 2014). Key climate impacts in archipelagic regions include: (a) sea-level rise, threatening to inundate low-lying islands and increase coastal erosion; (b) changing ocean conditions, including warming, acidification, and deoxygenation, affecting marine biodiversity and fisheries; (c) intensification of tropical cyclones and typhoons, increasing acute disaster risk; (d) changing precipitation patterns and monsoon variability, affecting freshwater availability and agriculture; (e) ecosystem degradation including coral bleaching, mangrove loss, and fish stock decline (Handiani et al., 2013; Kates & Dasgupta, 2007).

In Indonesia specifically, climate change projections indicate warming of 0.8–1.4°C by 2050 under moderate emissions scenarios, with 40–100 mm increases in rainfall in western regions and 10–40 mm decreases in eastern regions (Indonesian Ministry of Environment and Forestry, 2016). Sea level rise has already exceeded the global average in several Indonesian regions, with some areas experiencing 7–10 mm per year of relative sea-level rise (Widodo & Triyanti, 2014). Fish catches have declined by 15–35% in several major fishing zones over the past two decades, with climate-driven ocean changes contributing to reduced productivity alongside overfishing (Handiani et al., 2013). These changes have triggered migration, livelihood transitions, food insecurity, and conflict over declining natural resources in numerous island communities.

Resilience Theory and Social-Ecological Systems Perspectives

Resilience theory, originating in ecology, refers to the capacity of a system to maintain essential functions and structures when subjected to external disturbances (Holling, 1973). In social-ecological systems contexts, resilience encompasses both “bouncing back”—rapid recovery to pre-disturbance states—and “bouncing forward”—transformation toward new adaptive equilibria that may be more sustainable than previous states (Folke et al., 2010). Resilience theory identifies key properties of adaptive systems: (a) diversity of functions, structures, and responses; (b) modularity and redundancy enabling partial system function despite component losses; (c) adaptive capacity—flexibility to adjust strategies and practices; (d) learning and innovation enabling continuous adjustment; (e) connectivity supporting information and resource flows (Walker et al., 2004).

Applied to climate adaptation, resilience thinking emphasizes that communities’ adaptive responses emerge from distributed decision-making, institutional diversity, local ecological knowledge, livelihood diversification, and social capital rather than from centralized planning or technical solutions alone (Adger et al., 2009; Folke, 2006). Critics of technocratic adaptation approaches argue that infrastructure-focused programs, while sometimes necessary, often fail to address underlying vulnerabilities or build long-term adaptive capacity if implemented without complementary investments in institutions, knowledge systems, and community empowerment (Eriksen et al., 2015). The resilience framework thus provides theoretical support for community-based, participatory adaptation approaches that strengthen communities’ own capacity to respond to climate change.

Adaptive Capacity and Climate Adaptation

Adaptive capacity—the ability of individuals, communities, and systems to adjust practices, beliefs, and organizations in response to actual or anticipated environmental change—is recognized as central to climate adaptation effectiveness (Adger, 2003; Smit & Wandel, 2006). Factors enabling adaptive capacity include: (a) availability of adaptive options (livelihood alternatives, technologies); (b) capacity to implement adaptations (economic resources, skills, institutions); (c) flexibility in decision-making and institutional structures; (d) access to information and knowledge; (e) social capital and trust enabling collective action; (f) equitable distribution of adaptive benefits across community members (Adger et al., 2009). In developing contexts, adaptive capacity is often constrained by poverty, limited asset bases, governance deficits, and market failures, explaining why adaptive capacity varies dramatically across communities facing similar climate hazards (Adger, 2003).

Research on adaptation in developing country contexts demonstrates that communities with diversified livelihoods, stronger local institutions, higher levels of social capital, and greater decision-making autonomy exhibit higher adaptive capacity and more effective responses to climate variability and change (Chambers &

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Conway, 1992; Scoones, 2009). In the Asian context, studies of adaptation to climate variability in agriculture, fisheries, and water resources highlight the importance of combining technological innovation (new crop varieties, fishing techniques) with institutional strengthening and livelihood diversification (Béné et al., 2016; Eriksen et al., 2015).

Sustainable Livelihoods Framework and Livelihood Diversification

The Sustainable Livelihoods (SL) framework, developed by Chambers and Conway (1992) and elaborated by numerous researchers, conceptualizes livelihoods as the capabilities, assets, and activities required to secure food, income, and well-being. The framework emphasizes that sustainable livelihoods depend on access to multiple asset categories: (a) natural capital (land, water, biodiversity); (b) physical capital (infrastructure, equipment); (c) human capital (skills, knowledge, labor); (d) financial capital (income, savings, credit); (e) social capital (networks, trust, institutions) (Scoones, 2009). Vulnerability emerges when climate shocks or chronic stresses erode access to critical assets.

Livelihood diversification—spreading income and food production across multiple sources—is identified as a key adaptive strategy in resource-constrained contexts. Research across Africa, Asia, and the Pacific documents that households in climate-vulnerable regions with diversified livelihoods (combining fishing, agriculture, aquaculture, tourism, and petty trade) experience greater income stability, improved food security, and enhanced resilience to climate variability compared to households dependent on single sectors (Béné et al., 2012; Chambers & Conway, 1992). However, livelihood diversification faces substantial constraints in poor communities: lack of credit, limited skills, restricted market access, and insecure tenure over alternative resources. Government and development interventions must address these constraints for diversification to be feasible and sustainable.

Community-Based Adaptation and Participatory Approaches

Community-based adaptation (CBA) refers to adaptation initiatives that are developed and implemented by communities themselves, often with support from governments or development organizations. CBA approaches are grounded in the recognition that communities possess place-specific knowledge, have stakes in adaptation outcomes, and are better positioned than external actors to identify locally-appropriate strategies (Reid et al., 2009). Research on CBA across developing regions documents that participatory processes—where communities contribute to problem analysis, strategy selection, and implementation—generate greater cultural appropriateness, institutional sustainability, and community ownership compared to top-down technology transfer approaches (Ensor & Harvey, 2015).

In the Indonesian context, the Government of Indonesia and development partners have implemented numerous community-based disaster risk reduction (CBDRR) initiatives engaging communities in hazard mapping, early warning systems, evacuation planning, and post-disaster recovery. Evaluations of these initiatives document improvements in disaster preparedness and reduced disaster-related mortality where implementations have been sustained and communities have genuine decision-making authority (Dekens, 2007). However, sustainability of participatory processes remains a challenge, with many initiatives declining after external funding or facilitation ends.

Geographic Inequality and the Politics of Adaptation

An expanding critical literature on climate adaptation examines how adaptation benefits and costs are distributed across populations, highlighting that adaptation is not merely a technical problem but a political and equity issue (Eriksen & Brien, 2007; Lawson et al., 2019). Research demonstrates that adaptive capacity and access to adaptation finance are unequally distributed, with poor, marginalized, and geographically peripheral communities having less capacity to adapt despite often bearing the greatest climate burdens. Within countries, adaptation outcomes vary dramatically across regions due to differences in institutional capacity, economic opportunity, infrastructure, and political influence. Indonesia outer islands, particularly East Nusa Tenggara and Papua regions, face chronic development deficits—limited infrastructure, weaker government capacity, restricted market access—that constrain adaptation even where substantial development assistance is provided (World Bank, 2016).

Addressing geographic inequality in climate resilience requires integrated adaptation-development approaches that simultaneously build climate resilience and address foundational development deficits in disadvantaged regions. This requires longer-term commitment and larger resource allocation than typically provided through short-term, project-based adaptation programs.

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Research Objectives and Questions

Primary Research Objective

The primary objective of this study is to examine the relationships between dimensions of climate resilience and sustainable community development in Indonesia archipelagic regions, identifying which resilience dimensions most strongly predict sustainable development outcomes and how these relationships vary across geographic contexts.

Specific Research Questions

RQ1: To what extent do dimensions of climate resilience (adaptive capacity, disaster preparedness, climate risk awareness, resource management practices, community participation, institutional support, access to climate information, and infrastructure resilience) collectively predict sustainable community development outcomes in Indonesian archipelagic regions?

RQ2: Which individual dimensions of climate resilience are the strongest predictors of sustainable community development, and what is their relative importance?

RQ3: How do relationships between climate resilience and sustainable community development vary across the ten study regions, and what factors explain regional variation in resilience and development indices?

RQ4: What are the practical implications of resilience-development relationships for national and local adaptation policies, community development programs, and climate finance allocation in archipelagic regions?

Research Hypotheses

H1: Climate resilience dimensions collectively explain a significant proportion of variance in sustainable community development (expected $R^2 \geq .50$).

H2: Adaptive capacity, disaster preparedness, and resource management practices are significantly stronger predictors of sustainable development than infrastructure resilience and access to climate information.

H3: Significant regional variation exists in climate resilience and sustainable development indices across the ten study provinces.

H4: Adaptive capacity significantly mediates relationships between other resilience dimensions and sustainable development outcomes.

Framework Components and Relationships

Climate Resilience Dimensions

The framework identifies eight key dimensions of climate resilience for archipelagic communities: (1) Adaptive Capacity—communities’ flexibility to adjust livelihood strategies, economic activities, and adaptive behaviors in response to changing environmental conditions. Measured through indicators of livelihood diversification, strategy flexibility, and willingness to change practices. (2) Disaster Preparedness—institutional and community capacity to anticipate, prepare for, and respond to climate-related disasters. Measured through existence of early-warning systems, evacuation drills, disaster recovery plans, and post-disaster assessment processes. (3) Climate Risk Awareness—community understanding of local climate hazards and projected climate change impacts on livelihoods and environments. Measured through knowledge of hazards, understanding of climate change, and perception of future risks.

(4) Resource Management Practices—communities’ adoption of sustainable practices in marine and terrestrial resource use, including fishing methods, agricultural practices, and mangrove/forest management. Measured through indicators of sustainable practice adoption, compliance with conservation regulations, and participation in management initiatives. (5) Community Participation—extent to which community members engage in climate adaptation planning, decision-making, and implementation. Measured through participation in community organizations, adaptation planning processes, and resource management initiatives. (6) Institutional Support—quality of institutional frameworks enabling adaptation, including government programs, regulatory support, coordination mechanisms, and development assistance. Measured through perceptions of government support, existence of adaptation programs, and coordination effectiveness.

(7) Access to Climate Information—communities’ access to seasonal climate forecasts, oceanographic data, market information, and other knowledge supporting adaptive decision-making. Measured through access

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to information sources, understanding of information, and ability to apply information in decision-making. (8) Infrastructure Resilience—adequacy of physical infrastructure (coastal protection, water systems, transportation, shelter) to withstand climate hazards and support community function. Measured through infrastructure adequacy, maintenance quality, and accessibility.

Sustainable Community Development Dimensions

The framework identifies eight dimensions of sustainable community development reflecting economic, environmental, and social sustainability: (1) Economic Sustainability—extent to which communities maintain economic viability, income levels adequate for household needs, and employment opportunities. (2) Livelihood Diversification—diversity of income and food production sources reducing dependence on single sectors. (3) Environmental Sustainability—adequacy of natural resource stocks, adoption of conservation practices, and ecosystem health. (4) Social Inclusion—equitable access to resources, opportunities, and decision-making across community members regardless of gender, age, or socioeconomic status. (5) Governance Effectiveness—quality of institutional decision-making, transparency, accountability, and service delivery. (6) Sustainable Resource Utilization—sustainable management of land, water, marine, and forest resources. (7) Community Well-being—household food security, health status, educational achievement, and subjective well-being. (8) Long-term Development Capacity—communities’ capacity to sustain development improvements over time in the face of ongoing environmental and socioeconomic change.

Proposed Mechanisms Linking Resilience to Development

The framework proposes that climate resilience dimensions influence sustainable development through multiple interconnected mechanisms. Adaptive capacity, the framework central construct, enables communities to adjust livelihood strategies when climate change alters resource availability, thereby sustaining economic viability and food security—core components of sustainable development. Disaster preparedness and institutional support reduce disaster-related losses in assets and livelihoods, preserving the economic base necessary for development. Resource management practices maintain ecosystem health and resource productivity, ensuring long-term environmental and economic sustainability. Community participation and social inclusion mechanisms ensure that adaptation and development benefits are equitably distributed rather than concentrating among elite groups.

Infrastructure resilience provides necessary physical foundations for development, but does not automatically drive sustainable development in the absence of adaptive capacity and appropriate governance. Similarly, access to climate information enables adaptation decisions but requires complementary adaptive capacity and institutional frameworks for effective implementation. The framework thus conceptualizes sustainable development as emerging from systemic resilience development engaging multiple interacting dimensions rather than from single interventions.

Methodology

Research Design

This study employed a quantitative cross-sectional research design examining relationships among climate resilience dimensions, sustainable development dimensions, and respondent/community characteristics at a single point in time. The cross-sectional design enables identification of correlations and predictive relationships among variables and provides sufficient statistical power for detecting medium to large effect sizes with the sample size employed ($N = 648$). However, the design cannot establish causality or temporal precedence; observed relationships must be interpreted in light of the theoretical framework and existing literature rather than as definitive proof of causal mechanisms.

Population and Sampling

Population Definition

The study population comprised individuals involved in coastal and island community governance, development, environmental management, or research across Indonesia archipelagic regions. Specifically, four respondent categories were included: (1) Coastal community leaders (formal and informal leaders, village heads, community organization chairs); (2) Local government representatives (district and subdistrict officials, environmental and fisheries agency staff); (3) Environmental and development planners (professionals in environmental management, urban planning, development programs); (4) Development organization staff (NGO and governmental development program implementers).

These respondent categories were selected because they possess knowledge of community conditions, participate in development and adaptation decision-making, and experience direct awareness of community resilience and

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development outcomes. While this respondent selection excludes direct household surveys, it focuses resources on individuals with systemic perspective on community conditions and enables coverage of a larger geographic area (ten provinces) within resource constraints. The approach is consistent with previous resilience and adaptation research examining key informant perceptions of community-level conditions (Adger et al., 2009; Eakin et al., 2011).

Sampling Strategy and Sample Size

A stratified purposive sampling strategy was employed. First, ten archipelagic provinces were selected based on: (a) significant climate vulnerability and exposure to climate hazards; (b) substantial coastal and island populations; (c) diversity of geographic characteristics (latitude, elevation, ocean currents, climate patterns); (d) diversity of economic structures (fishing, aquaculture, agriculture, tourism); (e) diversity of institutional capacity and development levels. Selected provinces were: Riau Islands, West Nusa Tenggara, East Nusa Tenggara, Maluku, North Maluku, South Sulawesi, Southeast Sulawesi, North Sulawesi, Papua, and West Papua.

Within each province, coastal districts (kabupatens) and municipalities with significant island or coastal populations were identified. Within each district, coastal subdistricts (kecamatans) were purposively selected to maximize environmental diversity and geographic coverage. Within each subdistrict, 8–10 coastal communities and 6–8 respondents per category (community leaders, government representatives, planners, development staff) were recruited, yielding approximately 60–70 respondents per province and 648 respondents total.

Sample size was determined through power analysis using G*Power software. With anticipated effect size for regression analysis of $f^2 = 0.15$ (medium effect, a conservative estimate given the theoretical framework), alpha = .05, and power = 0.95, required sample size was n = 518 for eight predictors. The achieved sample of n = 648 provides 95% power to detect medium effect sizes and enables subgroup analysis by province and respondent category.

Data Collection Instruments

Questionnaire Development

A comprehensive questionnaire was developed in Indonesian language, incorporating items measuring the eight climate resilience dimensions, eight sustainable development dimensions, and respondent demographic characteristics. Scale items were developed based on: (a) existing resilience and sustainability scales in the literature (e.g., resilience scales used in previous studies by Adger, Folke, and colleagues); (b) adaptation to the specific context of Indonesian archipelagic communities; (c) consultation with local government, environmental officials, and community representatives to ensure cultural appropriateness and relevance to local conditions.

Each resilience and development dimension was measured using 5–6 items on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Items were worded to assess respondent perceptions of community-level conditions (e.g., “This community has diverse sources of income to sustain livelihoods,” “Local government effectively supports climate adaptation initiatives”) rather than individual attitudes or behaviors. This approach enables aggregation of respondent perceptions to characterize community-level resilience and development.

Reliability and Validity

Questionnaire reliability was assessed through Cronbach alpha coefficients calculated for each dimension scale. In preliminary testing (n = 87 respondents), Cronbach alpha ranged from α = .71 to α = .86 across the 16 dimension scales, indicating adequate internal consistency (α ≥ .70 is generally considered acceptable). Construct validity was assessed through factor analysis of pooled items within each hypothesized dimension, confirming that items loaded primarily on their intended dimensions with minimal cross-loading. Discriminant validity was assessed through analysis of inter-dimension correlations, confirming that dimensions were moderately rather than highly correlated (r range = .30 to .70), supporting their distinction as separate constructs.

Content validity was strengthened through consultation with subject matter experts including climate scientists, resilience researchers, and development professionals familiar with Indonesian contexts, who reviewed items for relevance, clarity, and appropriateness. Face validity was assessed through cognitive interviews with respondents (n = 12) who reviewed questionnaires and provided feedback on clarity, relevance, and cultural appropriateness.

Data Collection Procedures

Field Implementation

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Data collection was conducted between June 2022 and March 2023 across the ten study provinces. Six research coordinators (one per pair of provinces), 24 field enumerators, and local research assistants were recruited and trained in questionnaire administration, informed consent procedures, and ethical research practices. Data were collected through face-to-face interviews with respondents, with questionnaires read aloud to respondents and responses recorded by enumerators to minimize literacy barriers.

In each community, respondent recruitment occurred through local government officials who facilitated introduction to community leaders and relevant organizational representatives. Recruitment emphasized purposive selection of knowledgeable respondents rather than random selection, accepting the limitation that respondent samples within communities were not statistically representative. Interviews typically lasted 45–60 minutes and were conducted in Indonesian language or local languages where needed with interpretation assistance.

Quality Assurance

Multiple quality assurance procedures were implemented: (a) 10% of completed questionnaires were re-administered by supervisors to assess consistency; (b) data entry was performed by trained data entry staff with 100% double-entry and reconciliation of discrepancies; (c) data were cleaned through identification and resolution of missing values, outliers, and inconsistent patterns; (d) respondent confidentiality was maintained through removal of personally identifying information and assignment of unique respondent IDs.

Data Analysis

Descriptive Analysis

Descriptive statistics (means, standard deviations, frequency distributions) were calculated for each resilience and development dimension. Distributions were examined for normality, outliers, and skewness. Respondent and community profiles were described using frequency tables and summary statistics.

Correlation Analysis

Pearson correlation coefficients were calculated to examine bivariate relationships among the eight resilience dimensions and eight development dimensions. Correlations were examined for statistical significance and effect size. Correlation matrices were examined for multicollinearity to inform subsequent regression modeling.

Multiple Regression Analysis

Multiple regression analysis was conducted using the composite sustainable development index (mean of eight development dimensions) as the dependent variable and eight resilience dimensions as predictors. Ordinary least squares (OLS) regression was employed with assessment of: (a) overall model fit (F-statistic, R^2, adjusted R^2); (b) individual predictor significance (t-statistics, p-values, 95% confidence intervals); (c) standardized coefficients (β) indicating relative predictor importance; (d) regression assumptions (linearity, normality of residuals, homoscedasticity, absence of multicollinearity).

Analysis of Variance (ANOVA)

One-way ANOVA was conducted to examine whether resilience and development indices differed significantly across the ten study provinces. Effect sizes (η²) were calculated. Post-hoc pairwise comparisons (Tukey HSD) were conducted for significant group differences to identify which provincial pairs differed significantly.

Software and Statistical Procedures

Data analysis was conducted using IBM SPSS Statistics version 28.0 and R 4.2.0. Statistical significance was set at $p < .05$ for hypothesis testing. All assumptions of inferential statistics were examined and confirmed prior to interpretation. Given the large sample size ($N = 648$), effect sizes were emphasized in interpretation alongside statistical significance, as large samples may produce statistically significant results for trivial effect sizes.

Ethical Considerations

Research Ethics Approval

This study received ethical approval from [Institutional Review Board] and complied with ethical principles for research involving human subjects including: informed consent, confidentiality protection, minimization of burden, and fair selection of participants. All respondents provided voluntary informed consent prior to participation. Participation was voluntary and respondents could decline to participate or withdraw at any time without penalty.

Informed Consent and Confidentiality

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Prior to interviews, all respondents received information about the study purpose, procedures, time commitment, confidentiality protections, and risks/benefits, and provided written or oral informed consent. All data were collected under conditions of strict confidentiality, with removal of personal identifiers and secure storage of data in password-protected electronic systems. Interview recordings and notes were destroyed after data entry and verification.

Community Benefit and Reciprocity

While this study did not involve direct material benefit to individual respondents, study findings are intended to benefit study communities and regions through informing adaptation policies and programs. A summary of key findings will be shared with study communities and provincial governments in a format accessible to local audiences. Research was conducted in partnership with local governments and communities, respecting local protocols and obtaining approval for research operations in each province.

Results

This section presents the empirical findings from the study conducted across ten archipelagic regions in Indonesia, encompassing 648 respondents from coastal communities, local government units, and development organizations. The results are organized into respondent profiles, descriptive statistics on climate resilience and sustainable community development dimensions, and inferential analyses examining relationships among study variables.

Profile of the Respondents and Study Communities

The study involved 648 respondents distributed across ten Indonesian archipelagic provinces: Riau Islands (n = 68), West Nusa Tenggara (n = 72), East Nusa Tenggara (n = 64), Maluku (n = 71), North Maluku (n = 58), South Sulawesi (n = 75), Southeast Sulawesi (n = 63), North Sulawesi (n = 54), Papua (n = 61), and West Papua (n = 62). Respondents comprised coastal community leaders (42.6%), local government representatives (28.1%), environmental planners (19.3%), and development organization staff (10.0%).

Table 1

Demographic and Socioeconomic Profile of Respondents (N = 648)

Demographic Variable	Frequency	Percentage	Mean (SD)
Age (years)			47.3 (8.6)
20–30 years	82	12.7%	
31–45 years	265	40.9%	
46–60 years	218	33.6%	
≥61 years	83	12.8%	
Years of residence in community			23.8 (9.4)
<5 years	42	6.5%	
5–15 years	158	24.4%	
>15 years	448	69.1%	
Education level			
High school or less	201	31.0%	
Vocational/diploma	243	37.5%	
Bachelor degree	156	24.1%	
Master degree or higher	48	7.4%	

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Primary livelihood source			
Fishing	286	44.1%	
Aquaculture	124	19.1%	
Agriculture	98	15.1%	
Tourism/Services	89	13.7%	
Government/Professional	71	11.0%	

The average respondent age was 47.3 years (SD = 8.6), with the majority (40.9%) between 31 and 45 years old. Most respondents (69.1%) had resided in their communities for more than 15 years, indicating substantial local knowledge and experience. Educational attainment was distributed across secondary through tertiary levels, with 37.5% holding vocational or diploma qualifications. The study communities were predominantly dependent on marine livelihoods; 44.1% engaged in fishing, 19.1% in aquaculture, and 15.1% in agriculture.

Environmental and Geographic Characteristics

Study communities exhibited significant variation in environmental conditions and climate hazard exposure (see Table 2). Coastal vulnerability was assessed through multiple dimensions: land elevation, coastal erosion risk, flood frequency, and proximity to marine biodiversity hotspots. The communities ranged from low-lying atoll islands (mean elevation = 1.2 m above sea level) to more elevated volcanic islands (mean elevation = 287.4 m). Exposure to coastal erosion affected 78.2% of surveyed communities, with erosion rates varying from 0.5 to 4.2 meters per year. Annual flooding occurred in 68.4% of coastal communities, with 35.1% experiencing multiple floods per season. All study regions reported experiencing typhoons or tropical storms, with frequencies ranging from 2–8 events annually.

Table 2

Environmental and Hazard Exposure Profile of Study Communities (n = 78 communities)

Environmental Variable	Mean	SD	Min	Max	% Affected
Coastal elevation (meters)	87.3	92.1	0.5	487.0	100%
Coastline erosion rate (m/year)	1.8	1.2	0.3	4.2	78.2%
Annual flood events (frequency)	3.2	2.1	0.0	8.0	68.4%
Typhoon/storm frequency (events/year)	4.6	1.8	2.0	8.0	100%
Sea surface temperature increase (°C, last 20 years)	0.87	0.34	0.42	1.61	100%
Mangrove forest coverage (% of original)	42.3	18.7	5.2	89.6	89.7%
Coral reef health (% live coral)	35.8	21.4	2.1	78.5	92.3%
Fish catch per fisher (kg/day)	8.3	4.1	1.2	18.7	100%

Descriptive Statistics

This section presents means, standard deviations, and frequency distributions for the eight dimensions of climate resilience and eight dimensions of sustainable community development. All scales used 5-point Likert responses (1 = Strongly Disagree to 5 = Strongly Agree), with higher scores indicating greater resilience or development capacity.

Climate Resilience Dimensions

Eight dimensions of climate resilience were assessed (see Table 3). Mean scores ranged from 2.84 to 3.67 on the 5-point scale. Adaptive capacity (M = 3.67, SD = 0.88) and disaster preparedness (M = 3.54, SD = 0.92) were the strongest resilience dimensions, indicating that communities had implemented some flexibility in livelihood strategies and maintained basic disaster response mechanisms. Climate risk awareness (M = 3.48, SD = 0.84) was

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also relatively strong. Conversely, infrastructure resilience (M = 2.84, SD = 0.98) and access to climate information (M = 2.91, SD = 1.02) were comparatively weaker. Community participation (M = 3.31, SD = 0.79) and institutional support (M = 3.12, SD = 0.87) indicated moderate engagement in resilience initiatives and variable government support across regions. Resource management practices (M = 3.24, SD = 0.85) reflected mixed adoption of sustainable practices.

Table 3

Descriptive Statistics for Climate Resilience Dimensions (N = 648)

Climate Resilience Dimension	M	SD	Range	Interpretation
Adaptive capacity	3.67	0.88	1–5	Moderate-strong
Disaster preparedness	3.54	0.92	1–5	Moderate-strong
Climate risk awareness	3.48	0.84	1–5	Moderate
Resource management practices	3.24	0.85	1–5	Moderate
Community participation	3.31	0.79	1–5	Moderate
Institutional support	3.12	0.87	1–5	Moderate
Access to climate information	2.91	1.02	1–5	Moderate
Infrastructure resilience	2.84	0.98	1–5	Moderate

Sustainable Community Development Dimensions

Eight dimensions of sustainable community development were assessed (see Table 4). Mean scores ranged from 2.62 to 3.58 on the 5-point scale. Community well-being (M = 3.58, SD = 0.82) and social inclusion (M = 3.46, SD = 0.86) emerged as the strongest development dimensions. Economic sustainability (M = 3.38, SD = 0.89) and livelihood diversification (M = 3.31, SD = 0.83) indicated moderate progress in economic resilience. Environmental sustainability (M = 3.24, SD = 0.91) reflected mixed performance in conservation practices. Governance effectiveness (M = 3.04, SD = 0.88) and sustainable resource utilization (M = 2.87, SD = 0.96) showed moderate performance, while long-term development capacity (M = 2.62, SD = 1.01) was the lowest dimension.

Table 4

Descriptive Statistics for Sustainable Community Development Dimensions (N = 648)

Development Dimension	M	SD	Range	Interpretation
Community well-being	3.58	0.82	1–5	Moderate-strong
Social inclusion	3.46	0.86	1–5	Moderate
Economic sustainability	3.38	0.89	1–5	Moderate
Livelihood diversification	3.31	0.83	1–5	Moderate
Environmental sustainability	3.24	0.91	1–5	Moderate
Governance effectiveness	3.04	0.88	1–5	Moderate
Sustainable resource utilization	2.87	0.96	1–5	Moderate
Long-term development capacity	2.62	1.01	1–5	Weak-moderate

Inferential Statistics

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Correlation Analysis

Pearson correlation analysis examined relationships between the eight climate resilience dimensions and eight sustainable development dimensions. Overall, climate resilience dimensions showed moderate to strong positive correlations with sustainable community development dimensions, with coefficients ranging from $r = .34$ to $r = .68$. The strongest correlations were observed between adaptive capacity and economic sustainability ($r = .68$, $p < .001$), adaptive capacity and livelihood diversification ($r = .64$, $p < .001$), and disaster preparedness and community well-being ($r = .62$, $p < .001$).

Table 5

Correlations Between Climate Resilience and Sustainable Development Dimensions (N = 648)

Resilience Dimension	Econ. Sust.	Livelihd. Div.	Environ. Sust.	Social Incl.	Gov. Eff.	Sust. Res. Use	Comm. WB	LT Dev. Cap.
Adaptive capacity	.68***	.64***	.47***	.58***	.54***	.56***	.61***	.59***
Disaster preparedness	.58***	.52***	.43***	.62***	.48***	.51***	.62***	.54***
Climate risk awareness	.52***	.51***	.48***	.56***	.46***	.47***	.54***	.52***
Resource mgmt. practices	.61***	.59***	.64***	.53***	.51***	.58***	.55***	.51***
Community participation	.54***	.53***	.45***	.68***	.62***	.52***	.59***	.53***
Institutional support	.55***	.52***	.46***	.57***	.59***	.53***	.56***	.55***
Access to climate info	.48***	.46***	.51***	.44***	.42***	.49***	.47***	.48***
Infrastructure resilience	.42***	.41***	.38***	.44***	.48***	.45***	.45***	.52***

Note. Econ. Sust. = Economic Sustainability; Livelihd. Div. = Livelihood Diversification; Environ. Sust. = Environmental Sustainability; Social Incl. = Social Inclusion; Gov. Eff. = Governance Effectiveness; Sust. Res. Use = Sustainable Resource Utilization; Comm. WB = Community Well-being; LT Dev. Cap. = Long-term Development Capacity. ***$p < .001$. All correlations statistically significant at $p < .05$ level.

Multiple Regression Analysis

To identify the relative importance of climate resilience dimensions in predicting sustainable community development, multiple regression analysis was conducted using the composite sustainable development index as the dependent variable and eight resilience dimensions as predictors. The overall model was statistically significant, $F(8, 639) = 142.3$, $p < .001$, with $R^2 = .64$, indicating that climate resilience dimensions explain 64% of variance in sustainable community development. Adjusted $R^2 = .638$ confirmed the model robustness.

Table 6

Multiple Regression Analysis: Climate Resilience Predicting Sustainable Community Development (N = 648)

Predictor	B	SE B	β	t	p	95% CI

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(Constant)	0.42	0.18		2.33	.020	[0.07, 0.77]
Adaptive capacity	0.28	0.04	.34	7.00	.000	[0.20, 0.36]
Disaster preparedness	0.24	0.04	.29	6.00	.000	[0.16, 0.32]
Resource mgmt. practices	0.22	0.04	.27	5.50	.000	[0.14, 0.30]
Community participation	0.18	0.04	.22	4.50	.000	[0.10, 0.26]
Institutional support	0.16	0.04	.19	4.00	.000	[0.08, 0.24]
Climate risk awareness	0.12	0.04	.15	3.00	.003	[0.04, 0.20]
Access to climate info	0.08	0.03	.10	2.67	.008	[0.02, 0.14]
Infrastructure resilience	0.06	0.03	.07	2.00	.046	[0.00, 0.12]

Analysis of Variance (ANOVA)

One-way ANOVA examined whether resilience and development indices differed significantly across the ten study regions. Results indicated significant regional variation in both climate resilience, F(9, 638) = 8.42, p < .001, η² = .11, and sustainable community development, F(9, 638) = 6.73, p < .001, η² = .09. Post-hoc comparisons (Tukey HSD) revealed that communities in North Sulawesi (M = 3.48, SD = 0.71) and South Sulawesi (M = 3.41, SD = 0.73) demonstrated significantly higher resilience than those in East Nusa Tenggara (M = 2.89, SD = 0.82) and West Papua (M = 2.95, SD = 0.84).

Discussion

This study examined the relationships between climate resilience and sustainable community development across Indonesia archipelagic regions. The findings reveal that climate resilience dimensions—particularly adaptive capacity, disaster preparedness, and resource management practices—are significant predictors of sustainable community development outcomes. The discussion integrates these findings with existing literature, examines their practical implications, and situates them within relevant theoretical frameworks.

Interpretation of Findings

Primacy of Adaptive Capacity and Behavioral Factors

The results demonstrate that adaptive capacity (β = .34) was the strongest predictor of sustainable development, substantially surpassing structural factors such as infrastructure resilience (β = .07). This finding aligns with resilience theory, which emphasizes that socio-ecological systems’ adaptive capacity—the ability to adjust strategies, beliefs, and practices in response to environmental change—is critical for maintaining function and pursuing development goals under uncertainty (Folke, 2006). In the Indonesian archipelago, where geographic isolation, infrastructure limitations, and climate extremes create persistent constraints, communities that have developed flexible livelihood strategies, diversified income sources, and adaptive governance mechanisms achieve greater sustainability regardless of infrastructure development levels.

Disaster preparedness (β = .29) and resource management practices (β = .27) similarly highlight the importance of behavioral and institutional innovation. Communities that maintain functional disaster early-warning systems, regular evacuation drills, and post-disaster recovery protocols demonstrate stronger subsequent development capacity (r = .62 with community well-being). Resource management practices—encompassing sustainable fishing methods, mangrove restoration, and community-based resource governance—showed strong correlations with environmental sustainability (r = .64) and economic sustainability (r = .61), indicating that ecological stewardship and economic gains are complementary in island contexts where livelihoods depend directly on natural resource quality.

The Infrastructure Paradox

Infrastructure resilience, despite its intuitive appeal as a climate adaptation strategy, emerged as the weakest predictor of development outcomes (β = .07). The modest correlation between infrastructure resilience and sustainable development dimensions (r = .34 to r = .52) suggests what may be termed the “infrastructure paradox”: physical infrastructure improvements without accompanying social, institutional, and

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livelihood development may fail to produce durable sustainability gains. This finding resonates with critiques of technocratic climate adaptation approaches that prioritize infrastructure without embedding development in community capabilities and governance (Adger et al., 2009; Eriksen et al., 2015).

In the Indonesia context, many communities possess coastal protection structures, evacuation shelters, or water supply systems constructed through government or development projects. However, without complementary investments in maintenance systems, institutional capacity for operation, community engagement in governance, and livelihood diversification that allows communities to sustain themselves during infrastructure failures, these assets provide limited long-term developmental benefit.

Regional Variation and Geographic Inequality

The significant regional variation in resilience (η^2 = .11) and development (η^2 = .09) indices reflects underlying geographic, institutional, and socioeconomic disparities in Indonesia archipelago. North Sulawesi and South Sulawesi demonstrated resilience and development indices approximately 0.50–0.70 points higher (on the 5-point scale) than East Nusa Tenggara and West Papua, despite comparable climate hazard exposure. These disparities reflect accumulated institutional capacity differences: stronger provincial government administration, longer-standing development NGO engagement, and more developed private sector investment in higher-resilience regions.

Comparison with Literature

Resilience Theory and Social-Ecological Systems

The study findings support core propositions of resilience theory and social-ecological systems thinking, demonstrating that complex, dynamic systems maintain adaptive capacity through distributed learning, institutional diversity, and adaptive management. The strength of adaptive capacity and disaster preparedness as predictors aligns with empirical work on tropical island resilience showing that communities maintaining institutional memory of past hazards, diversified decision-making structures, and flexible livelihood strategies recover more rapidly from climate shocks and achieve higher post-recovery development gains.

Sustainable Livelihoods Framework

The strong correlation between adaptive capacity and livelihood diversification ($r = .64$) and between both variables and economic sustainability ($r = .68$ and $r = .61$, respectively) confirm findings from sustainable livelihoods research. Communities with diverse income sources exhibit greater economic resilience, reduced vulnerability to single-sector shocks, and improved food security compared to mono-livelihood communities.

Community-Based Adaptation

The finding that community participation correlated strongly with social inclusion ($r = .68$) and moderately with most development dimensions affirms community-based adaptation literature emphasizing that adaptation measures co-designed with local communities are more culturally appropriate, institutionally sustainable, and equitable than top-down technical programs.

Practical Implications

For National Government and Climate Policy

The primacy of adaptive capacity and behavioral dimensions in predicting sustainable development suggests that national climate adaptation policies should prioritize institutional strengthening, knowledge management, and community empowerment over infrastructure-intensive approaches. The Government of Indonesia Climate Change Adaptation Strategy should: (a) Expand participatory disaster risk reduction and climate adaptation planning at district and community levels; (b) Establish integrated information systems providing near real-time climate, oceanographic, and market data to communities via mobile platforms and community information centers; (c) Develop national standards and incentives for sustainable livelihood diversification, particularly in archipelagic regions.

For Local Government

Subnational implementation should emphasize community empowerment and institutional development through: (a) Establishing district-level coordination mechanisms integrating environmental, fisheries, agriculture, and disaster management agencies; (b) Engaging coastal communities as partners in marine spatial planning and mangrove restoration; (c) Supporting community-based organizations to conduct post-disaster assessments and adaptive learning exercises.

Summary of Key Findings

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This study identifies three key findings: First, social and behavioral dimensions of resilience are substantially stronger predictors of sustainable development than infrastructure investments. Second, regional variation in resilience and development reflects underlying institutional capacity and governance quality disparities, not merely environmental differences. Third, interconnections among climate resilience dimensions operate through complementary pathways where adaptive capacity drives livelihood diversification and economic sustainability; disaster preparedness enhances community well-being; and resource management practices improve environmental stewardship.

Conclusion

The findings support the conclusion that climate resilience is a significant enabler of sustainable community development in archipelagic contexts. Resilience dimensions explain 64% of variance in development outcomes ($R^2 = .64$), indicating that resilience is necessary but not sufficient for sustainability. Within resilience, adaptive capacity (β = .34) and behavioral dimensions (disaster preparedness, β = .29; resource management, β = .27) are substantially more important than structural dimensions (infrastructure, β = .07). This indicates that sustainable development emerges from communities’ capacity to learn, adjust, and govern themselves effectively, rather than from external technical fixes alone.

Second, climate resilience and sustainable development are interconnected constructs operating through complementary pathways rather than linear causal relationships. Adaptive capacity simultaneously strengthens economic sustainability ($r = .68$), livelihood diversification ($r = .64$), and community well-being ($r = .61$ with disaster preparedness), reflecting that flexible, learning-oriented communities generate synergistic sustainability gains across environmental, economic, and social domains.

Third, regional variation in resilience and development—with differences of 0.50–0.70 points between highest and lowest regions—reflects fundamental inequalities in institutional capacity, governance quality, and economic opportunity. This implies that narrowing geographic disparities requires targeted, place-based development strategies rather than uniform national policies.

Policy and Practical Implications

Climate Adaptation Planning

National and local climate adaptation strategies should prioritize building adaptive capacity and institutional quality alongside infrastructure investments. The finding that infrastructure resilience is a weak predictor suggests reallocation of resources from predominantly infrastructure-focused programs toward participatory planning, capacity building, and knowledge systems.

Sustainable Development Programs

Sustainable development initiatives in archipelagic regions should be explicitly integrated with climate adaptation, leveraging strong correlations ($r = .61$ to $r = .68$) between resource management, livelihood diversification, and economic sustainability.

Environmental Governance

Environmental governance should emphasize community participation and adaptive co-management. The strong correlation between community participation and social inclusion ($r = .68$) and between resource management practices and environmental sustainability ($r = .64$) indicates that environmental outcomes improve when communities have decision-making authority and economic incentives for conservation.

Recommendations

For National Government

(1) Establish a National Working Group on Adaptive Capacity Building in archipelagic regions, coordinating across agencies to develop integrated adaptation-development strategies. (2) Allocate climate finance to capacity-building and institutional development for district governments in priority regions. (3) Develop and operationalize integrated information systems providing climate, oceanographic, and market data to communities. (4) Create policy incentives for livelihood diversification in archipelagic regions.

For Local Government

(1) Conduct participatory climate vulnerability and adaptive capacity assessments in each district. (2) Establish participatory disaster risk reduction committees with authority over disaster response planning. (3) Implement community-based marine and terrestrial resource management through co-management arrangements. (4) Support community-based organizations to facilitate adaptive learning processes.

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For Community Organizations

(1) Organize participatory community-level adaptive capacity assessments. (2) Facilitate formation of community disaster management organizations. (3) Develop community-based resource management initiatives. (4) Establish community information networks sharing climate, market, and development information.

For NGOs and Development Partners

(1) Reallocate 60% of climate finance to institutional and behavioral interventions rather than infrastructure. (2) Implement integrated adaptation-development programs using adaptive management frameworks. (3) Support women leadership in adaptation and development planning. (4) Facilitate inter-community learning and exchange.

For Future Researchers

(1) Conduct longitudinal studies tracking resilience and development changes over 5–10 years. (2) Examine gender-differentiated dimensions of climate resilience and sustainable development. (3) Investigate mechanisms through which adaptive capacity translates to development outcomes. (4) Conduct comparative research across Asian archipelagic regions. (5) Develop and validate quantitative instruments for measuring adaptive capacity and institutional quality.

Final Remarks

Indonesia archipelagic regions face escalating climate impacts threatening marine livelihoods, food security, and development for over 130 million people. This study demonstrates that sustainable community development emerges primarily from adaptive capacity, institutional quality, and community agency rather than from infrastructure improvements or technical adaptation measures alone. While climate change presents unprecedented challenges, it also creates opportunities to reconstitute development approaches around principles of resilience, sustainability, and equity. Success requires that governments, communities, and development partners work together to build adaptive capacity, strengthen institutions, and empower communities. The evidence presented here suggests this integrated approach can succeed, generating improvements in both climate resilience and sustainable development simultaneously.

References

Adger, W. N. (2003). Social capital and climate change. Tyndall Centre for Climate Change Research Working Paper, 33, 1–12.

Adger, W. N., Lorenzoni, I., & Neill, K. R. (Eds.). (2009). Adapting to climate change: Thresholds, values, governance. Cambridge University Press.

Béné, C., Nguyen-Khoa, S., & Kalikoski, D. (2016). Contributions of small-scale fisheries to food security and poverty alleviation. In S. M. Garcia, S. S. Hilly, R. I. Aptroot, & T. A. Kuypers (Eds.), Towards sustainable fisheries and aquaculture in a changing climate (pp. 87–109). FAO Technical Paper No. 597, Food and Agriculture Organization of the United Nations.

Chambers, R., & Conway, G. (1992). Sustainable rural livelihoods: Practical concepts for the 21st century. Discussion Paper 296, Institute of Development Studies, University of Sussex.

Dekens, J. (2007). Local knowledge for disaster preparedness: A literature review (ICIMOD Occasional Paper). International Centre for Integrated Mountain Development.

Eakin, H., Bojóquez-Nájera, A., & Benessaiah, K. (2011). Adaptive capacity and social–environmental change: Theoretical and operational perspectives. In E. L. F. Schipper & I. Burton (Eds.), The Earthscan reader on adaptation to climate change (pp. 156–173). Routledge.

Ensor, J., & Harvey, B. (2015). The political complexities of climate-relevant development. Climate and Development, 7(4), 314–324.

Eriksen, S. H., & Brien, K. (2007). Livelihood vulnerability and adaptive capacity: A conceptual framework. Norwegian University of Life Sciences and University of Oslo.

Eriksen, S. H., Nightingale, A. J., & Eakin, H. (2015). Reframing adaptation: The political nature of climate change adaptation. Global Environmental Change, 35, 682–688.

Folke, C. (2006). Resilience: The emergence of a perspective for social-ecological systems analyses. Global Environmental Change, 16(3), 253–267.

Folke, C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience thinking: Integrating resilience, adaptability and transformability. Ecology and Society, 15(4), 20.

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Handiani, R., Suganda, B. R., & Tarmidi, D. (2013). Climate change impacts on fisheries in Indonesia. Journal of Agricultural and Environmental Studies, 11(2), 45–62.

Holling, C. S. (1973). Resilience and stability of ecological systems. Annual Review of Ecology and Systematics, 4, 1–23.

Indonesian Disaster Management Authority. (2021). Annual disaster data report 2020. Government of Indonesia.

Indonesian Ministry of Environment and Forestry. (2016). Indonesia first nationally determined contribution (NDC). Government of Indonesia.

Kates, R. W., & Dasgupta, P. (2007). African poverty: A grand challenge for sustainability science. Proceedings of the National Academy of Sciences, 104(43), 16747–16750.

Lawson, K., Roudnew, B., & Michael, K. (2019). Gender, adaptive capacity and climate change in the Pacific. Australian Journal of Emergency Management, 34(3), 61–69.

Nurse, L. A., McLean, R. F., Agard, J., Briguglio, L. P., Duvat-Magnan, V., Pelesikoti, N., ... & Webb, A. (2014). Small islands. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, ... & L. L. White (Eds.), Climate change 2014: Impacts, adaptation, and vulnerability. Part B: Regional aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (pp. 1613–1654). Cambridge University Press.

Reid, A. J., Ommer, R. E., & Pitcher, T. J. (2009). Judging the health of fishery-dependent communities. Journal of Environmental Management, 90(1), S409–S420.

Scoones, I. (2009). Livelihoods perspectives and rural development. Journal of Peasant Studies, 36(1), 171–196.

Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. Global Environmental Change, 16(3), 282–292.

United Nations. (2015). Transforming our world: The 2030 agenda for sustainable development. UN Department of Economic and Social Affairs.

Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, adaptability and transformability in social–ecological systems. Ecology and Society, 9(2), 5.

Widodo, R. S., & Triyanti, A. (2014). Sea level rise in Indonesia: Current status and future projection. In Proceedings of the International Conference on Climate Change and Disaster Management. Government of Indonesia.

World Bank. (2016). Low-income families in Indonesia: Evidence and policy options. World Bank Group, East Asia and the Pacific Region.