

Incorporate Sustainable Livelihood Approach on Recovery of Fisheries Livelihood toward the Strengthening of Social Resilience: A case Study in Krueng Raya Bay, Aceh-Indonesia



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- ❑ Introduction
- ❑ Framework and Theoretical Review
- ❑ Methodology
- ❑ Result and Discussion
- ❑ Conclusions and Recommendations



Motivation

Fisheries livelihood has a significant role for people.

- ❑ 58.3 million people depended on fisheries livelihood around the world (2012) (FAO, 2014).
- ❑ 96.1% of total population in Indonesia (UNDP, 2013) and 4.3 million in Aceh live in coastal area in 2012.

Fishing communities are fragile and high vulnerability by disaster.

- ❑ The earthquake and tsunami of 2004 impact in Aceh:
 - USD 522 million lost of fisheries livelihood capital (The CGI, 2005).
 - Poverty increase from 28.5% in 2004 to 28.7% in 2005 (SAAP, 2006).
 - Change of Social vulnerability and resilience

Indigenous institution role on recovery of fisheries livelihood

- ❑ Aid delivery for fishing communities
- ❑ Sustaining the local knowledge in facing disaster impact

Can the integration of sustainable livelihood approach improve social resilience?

The Problem Statement

❑ The fisheries communities' problems:

- High depend on fisheries resources
- High vulnerability on disaster
- Non-fisheries skill livelihood limitation
- Low income
- Trapped on poverty

❑ Fishing communities capacity:

- Lack of adoption and adaptable on non fisheries livelihoods
- Faced the worst condition if livelihood capital change

❑ The greatest effect of tsunami:

- Increasing the number of poor fisheries household
- Increasing social vulnerability

?

Incorporate sustainable livelihood strategies into recovery of fisheries livelihood had an interesting played role to improve the fishing communities income and poverty.

1. What factors were affected on the change of fisheries livelihood in tsunami influenced fishing communities?
2. How did poverty increase and income decrease in the fishing communities? *and* What strategies did those affected people propose on recovery of fisheries livelihood?
3. How did the affected people suffer from social vulnerability? Did they recover social resilience?
4. How has sustainable livelihood approach been effective in the strengthening social resilience of fishing communities?

The Purpose of Research

To identify the strategies of sustainable livelihood approach toward the strengthening of social resilience in the tsunami-affected fishing communities.

The Specific Objectives

1. To examine factors affecting on changes of fisheries livelihood in the fishing communities.
2. To assess the sustainable livelihood strategies into the restoration of fisheries livelihood.
3. To identify the role of indigenous institution in building and strengthening social resilience.

Research Framework

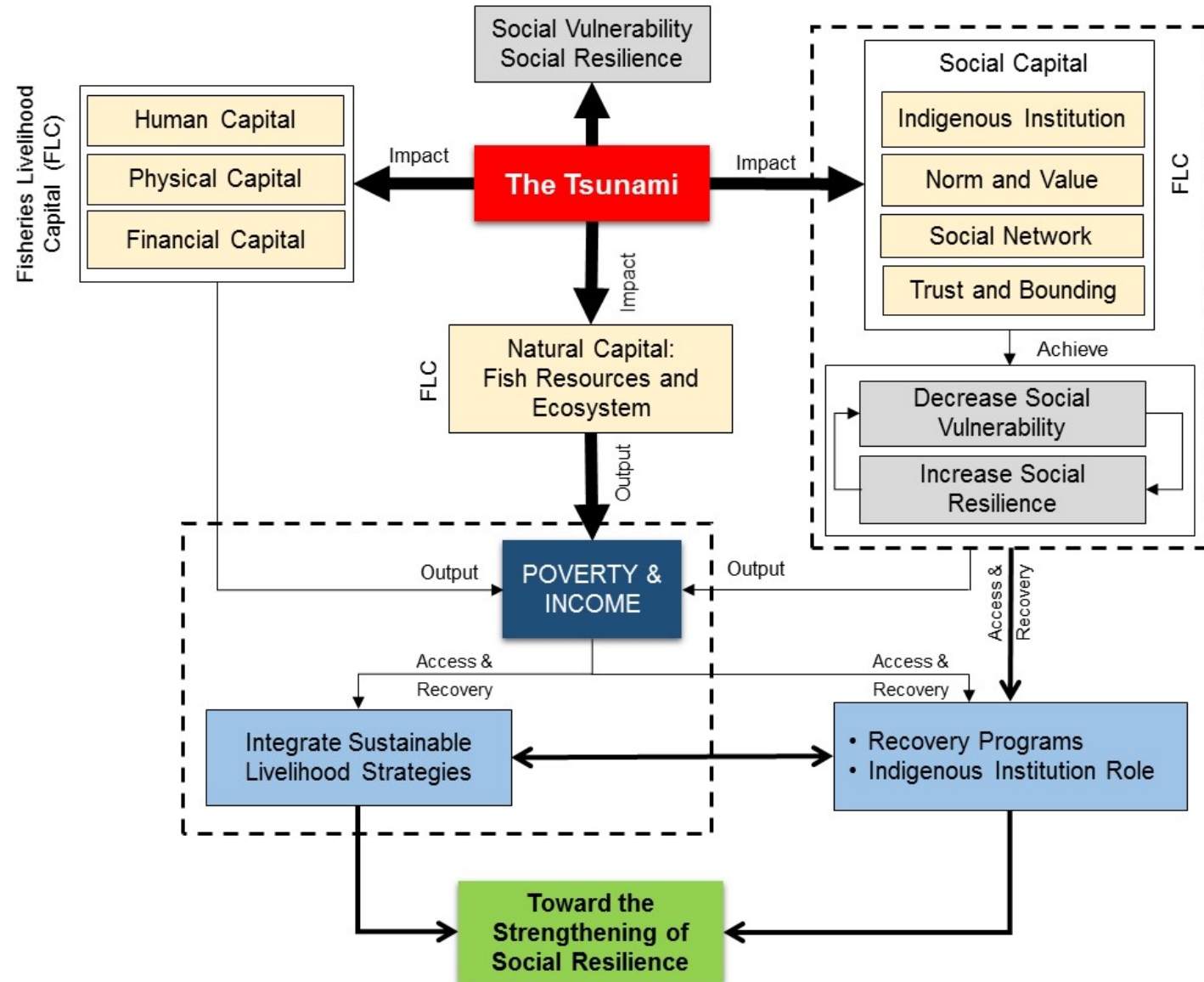


Figure 1. Research framework

Theoretical Review

Livelihood and Fisheries Livelihood

Many concepts were defined about livelihood (Figure 2)

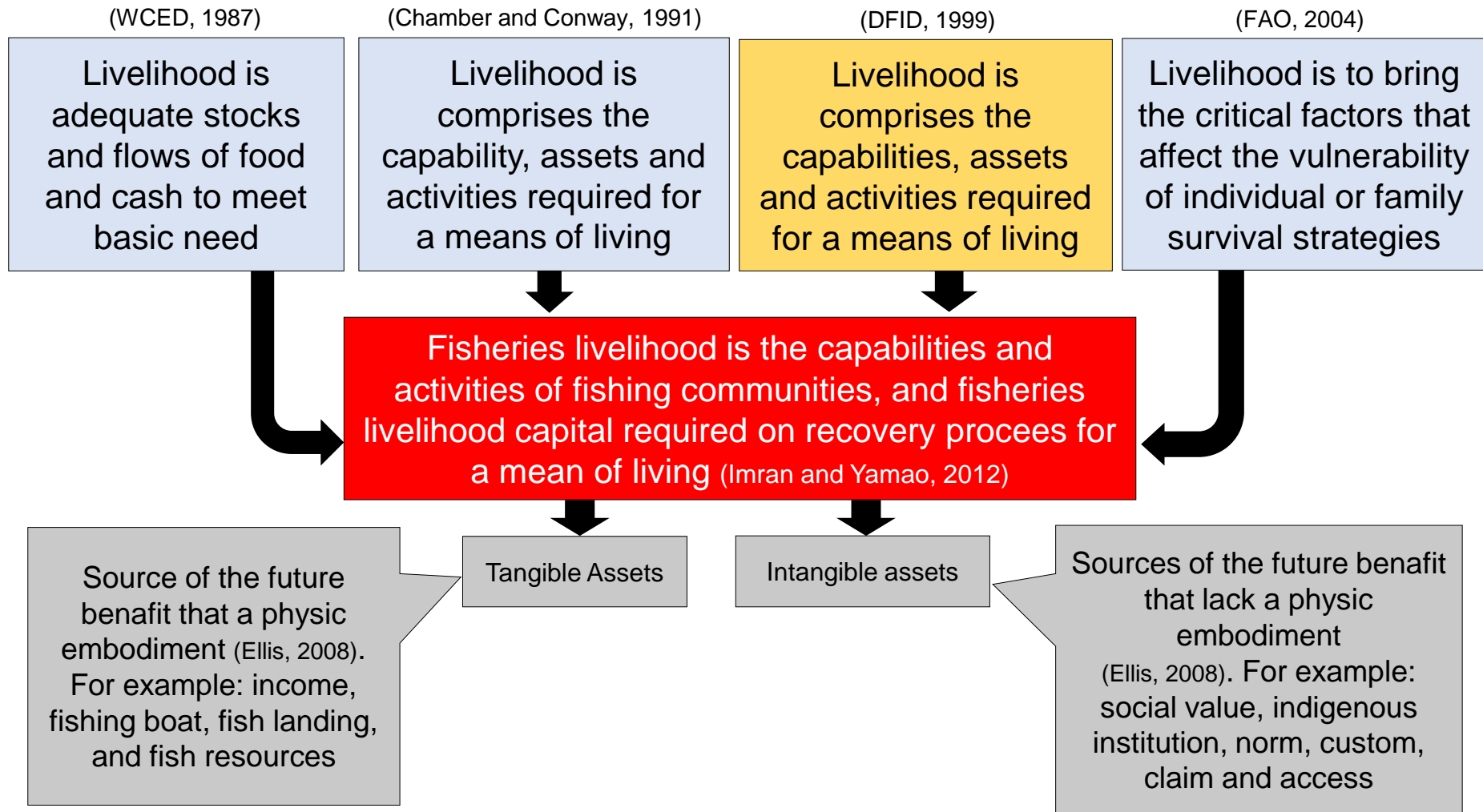


Figure 2. The concept of livelihood and fisheries livelihood

Development of Social Resilience (SR)

- **At the beginning**, SR combined the communities dependency and their interaction on risky resources and Adger (2000) emphasized on survive from external shock.
- **Second stage**, SR focused on the social system ability to respond and recover from disaster (Cutter et al., 2008).
- **Last stage**, promoted fisheries livelihood recovery in improving SR

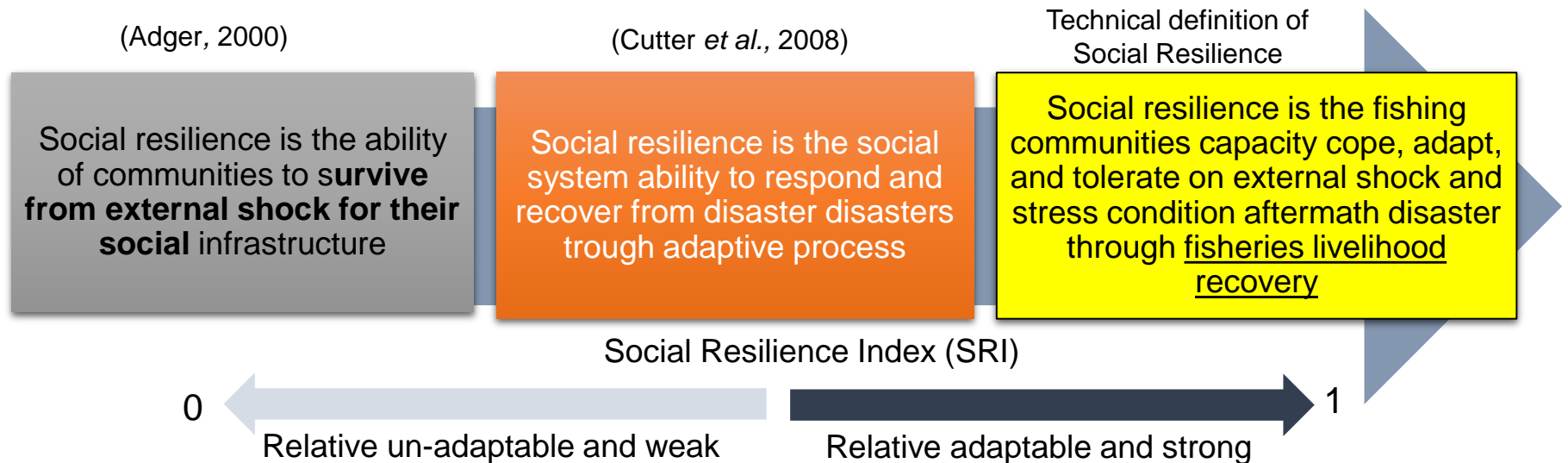


Figure 3. Social resilience and its interesting for fishing communities

If fishing communities are relative un-adaptable and weak, SRI approach to zero; and the opposite one approach to one

Factors Affected on Social Resilience

- Social resilience can analyze using SLA and it has direct and indirect relationship with social vulnerability (Figure 4) .
- Affected factors on social resilience are livelihood capital and social vulnerability change

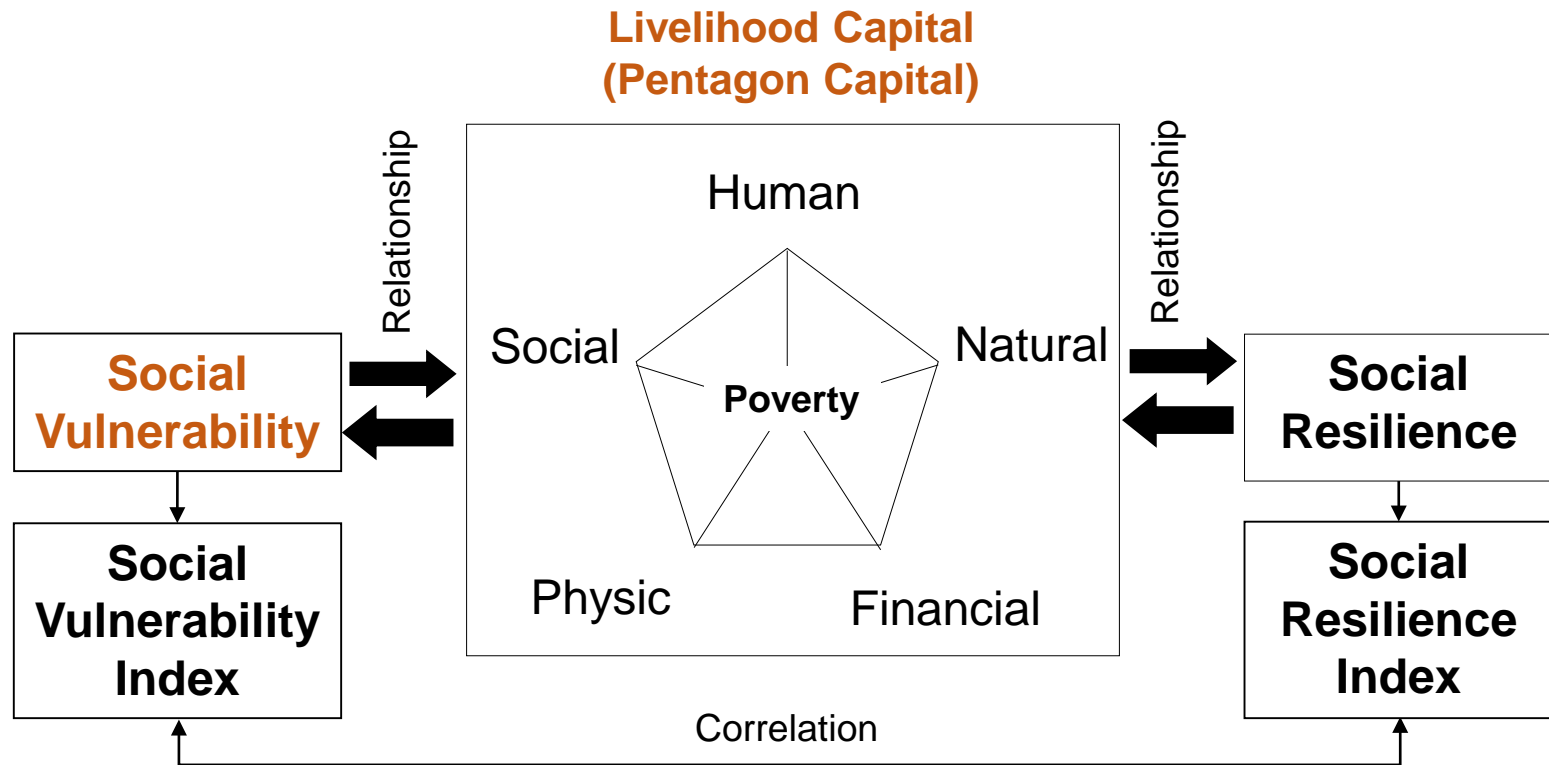


Figure 4. Factors affected on social resilience (Modified from DFID, 1999)

Selected Krueng Raya Bay as a case study area (Figure 5)

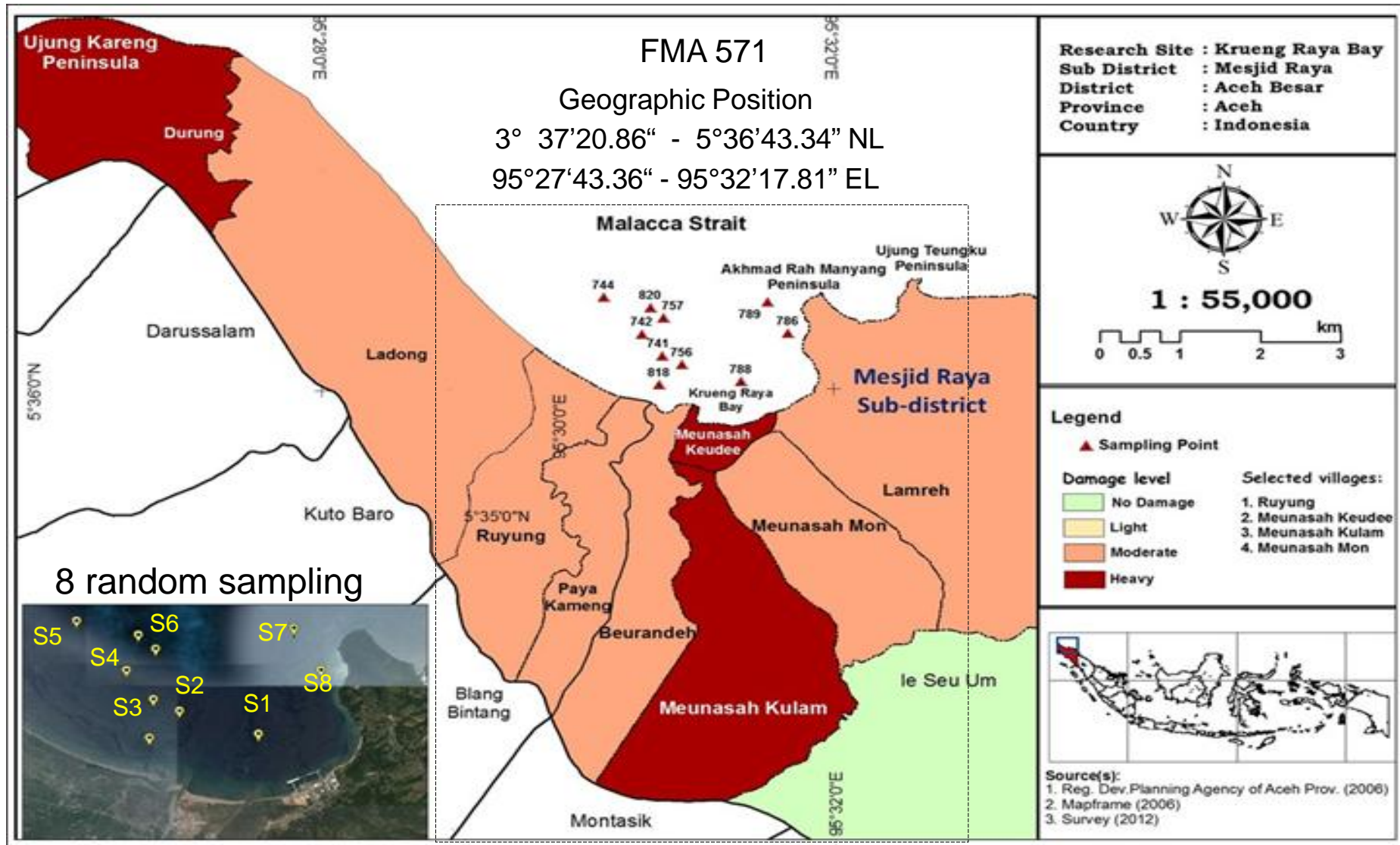


Figure 5 Study area

Table 1 shows time of survey, target object, sampling method, materials and data collection to answer the research objectives

Table 1. Survey procedure and data collection

Contents	Details
Time of Survey	March 2012 and September-October 2012
Target object	<ul style="list-style-type: none"> • Human capital: fishermen, fish processors, financial traders, key informants (120 respondents); • Natural capital: fish resources, coral reef and mangrove ecosystems; • Physic capital: lift net, hand line, beach seine, mini purse seine boat, fish processor unit • Social capital: Panglima Laot Lhok (sea commander), toke bangku, tuha peut (four members), tuha lapan (eight members) and others
Sampling Method	<ul style="list-style-type: none"> • Case study area • Fish resources: 8 points randomly in Krueng Raya Bay • Respondent: random and snow ball samplings, Interviewed and focused group discussion
Materials	Lift net boat and its fishing gear, GPS, data sheet, ruler, camera, structured questionnaires, data sheet, fish book identification
Data Collection	Primary: socioeconomic, fish catch, length-weight of fish, ecosystem condition Secondary: time series of marine capture fisheries statistics 1999-2012 Other academic documents: Report and journal

- ☐ **Descriptive, trend, and comparative analysis**
- ☐ **Inferential statistics analysis**, such as chi-square-one way ANOVA, **Linear and exponential regression**;
- ☐ **Likert type scale, aid dependency index (ADI), and qualitative content analysis**
- ☐ **Social vulnerability and social resilience index**

Main Factors Affected on Changing of Fisheries Livelihood

Factor 1: Human Capital (HC)

The structure of human capital change: escalating of productive workforce; fisheries livelihood and population dependency on fisheries livelihood

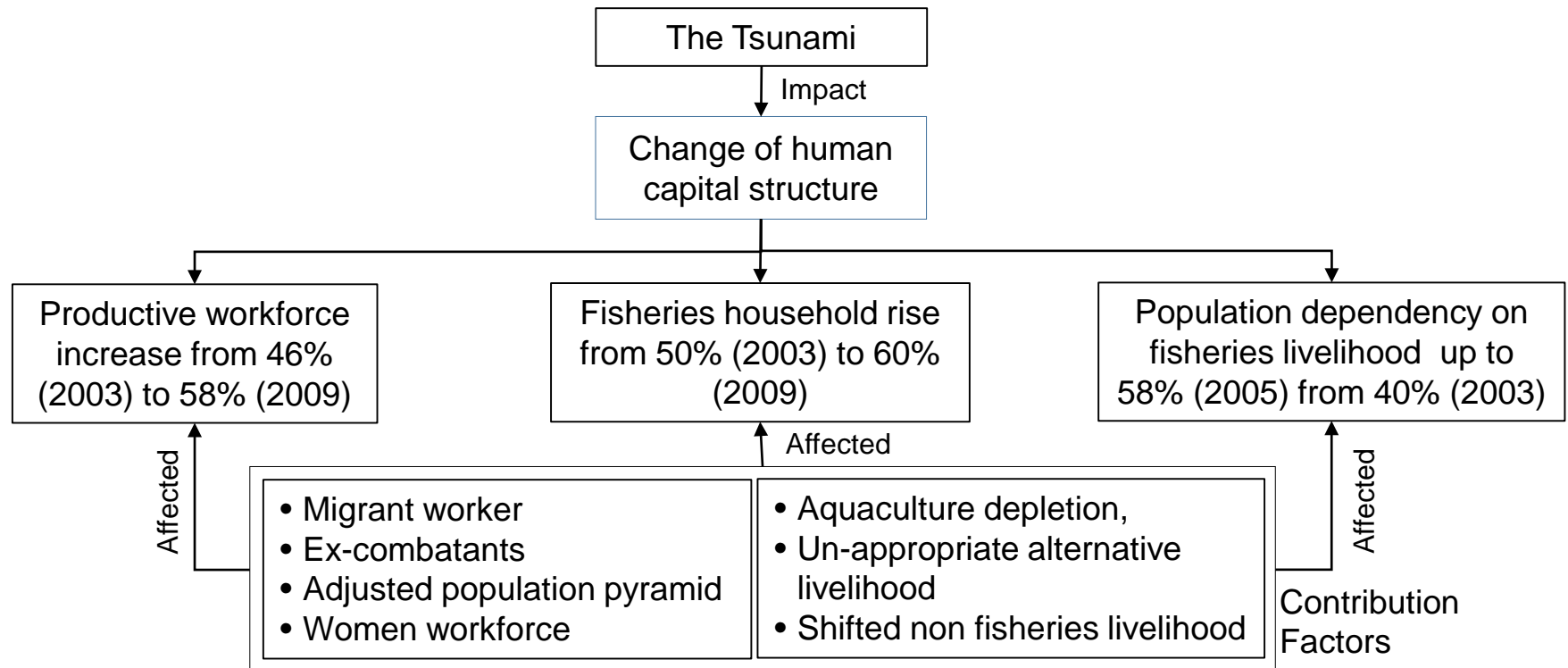


Figure 6. The tsunami impact on human capital of fishing communities

The structure of HC change might influence on fisheries livelihood because the competition among the fish resource users will increase

Factor 2: Composition of fishing boat change

- The tsunami affected on boat composition (Figure 7)
- Lift net boat determined composition before and after the tsunami, but reduce to 24% in 2012.
- Composition change to hand line boat, accounted 69% in 2012

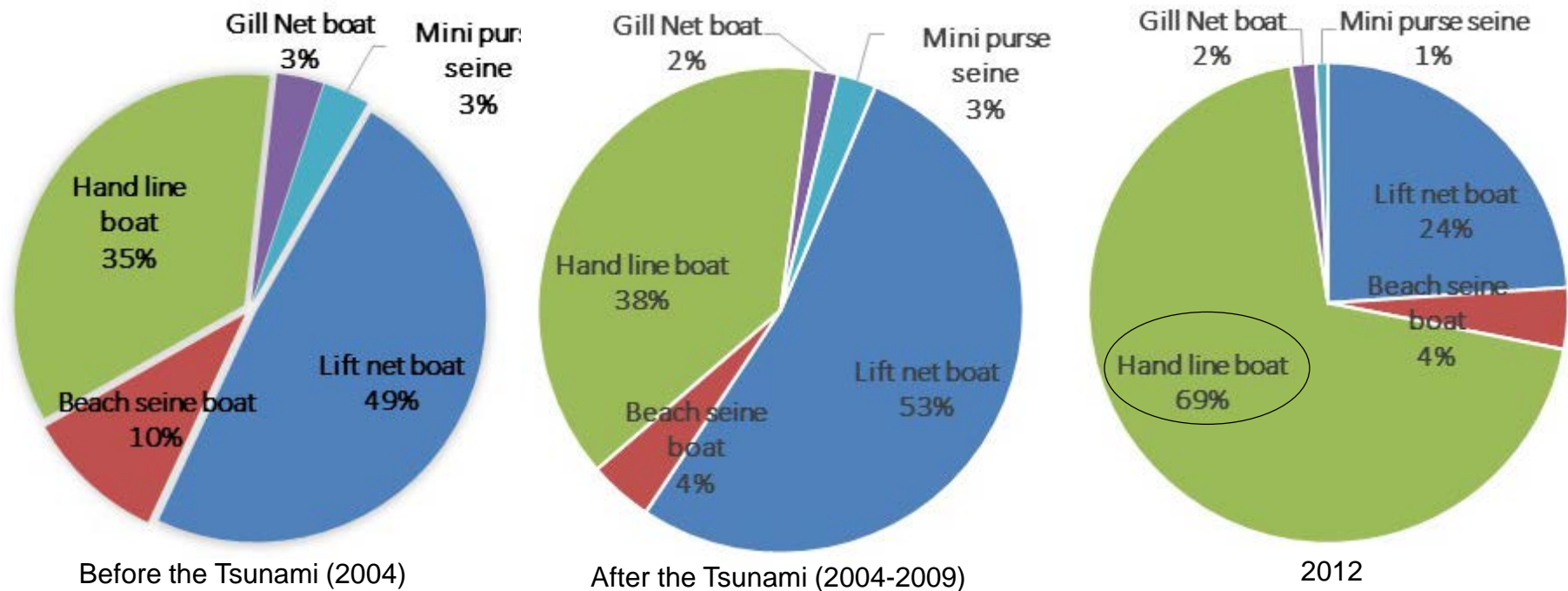


Figure 7: Composition of fishing boat (physical capital) change in Krueng Raya Bay

The composition of fishing boat change because of investment, boat quality, and aid limitation for building boat

Factor 3: Increasing of operational cost as financial capital

- The tsunami affected on operational cost (OC) of fishing boat increase (Table 2).
- The OC Lift net and hand line boat increased 50% and 55% respectively.
- The highest component of OC was fuel cost in both before and after the tsunami

Table 2. Various operational cost of boat in Krueng Raya Bay

No.	Type of Fishing Fleet	Average Operational Cost (IDR)		Fuel Cost (2012)		Ransoms Cost (2012)		Bait Cost (2012)	
		Before Tsunami	2012	Value (IDR)	%	Value (IDR)	%	Value (IDR)	%
1	Lift net boat	225,000	450,000	315,000	70	135,000	30	0	0
2	Hand line boat	20,000	50,000	10,000	20	20,000	40	20,000	40
3	Beach seiner	100,000	200,000	130,000	65	70,000	35	0	0
4	Mini purse seine and gill net boat	125,00	250,000	150,000	60	100,000	40	0	0

Sources: Field Survey (2012)

- OC increased because of increasing fuel, ransoms, and bait cost
- Reducing OC through exclusion of cigarette cost and changed fishing boat to hand line boat

Factor 4: investment of assets production (IAP) change

- Investment of assets production was changed by the tsunami affected, ranged 42.7-200% in 2006, and climbed to 41.7-66.1% in 2012.
- According to Table 3, IAP of lift net boat raised 44% in 2006, and went up again 54% in 2012 or boost more than two time of 2004's IAP.

Table 3. Investment of assets production with comparison before, after and 2012 in Krueng Raya Bay

No.	Type of Asset Production	Production cost					
		Before (2004) ¹		After (2006) ²		Estimation 2012 ³	
		IDR	USD	IDR	USD	IDR	USD
1	Lift Net	90,000,000	10,000	130,000,000	14,282	200,000,000	20,833
2	Hand Line	8,000,000	889	12,000,000	1,319	15,000,000	1,563
3	Beach Seine	63,000,000	7,000	90,000,000	9,890	130,000,000	13,542
4	Mini Purse Seine	165,000,000	18,889	300,000,000	32,967	425,000,000	44,271
5	Fish Processing	6,000,000	667	18,000,000	1,978	29,900,000	3,115

Sources : Field Survey (2012)

IAP change was led by escalating of wood, engine and fishing gear price and labour cost

Factor 5: The State of Anchovy (main target production)

Before the Tsunami

- Figure 8 point outs a negative slope and Figure 9 describes the correlation effort-MSY
- **MSY 2,363.138 ton/year** and **Optimum effort 5,435 trip/year** (Figure 9)

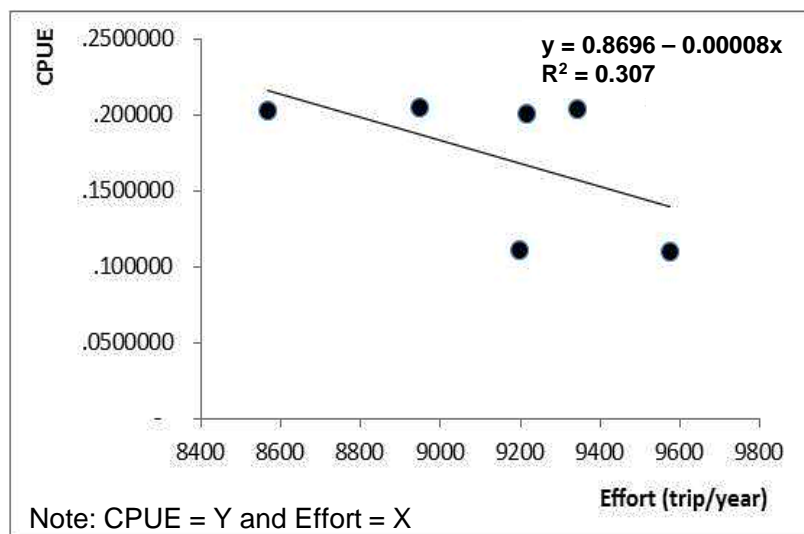


Figure 8. Correlation CPUE and Effort before the tsunami

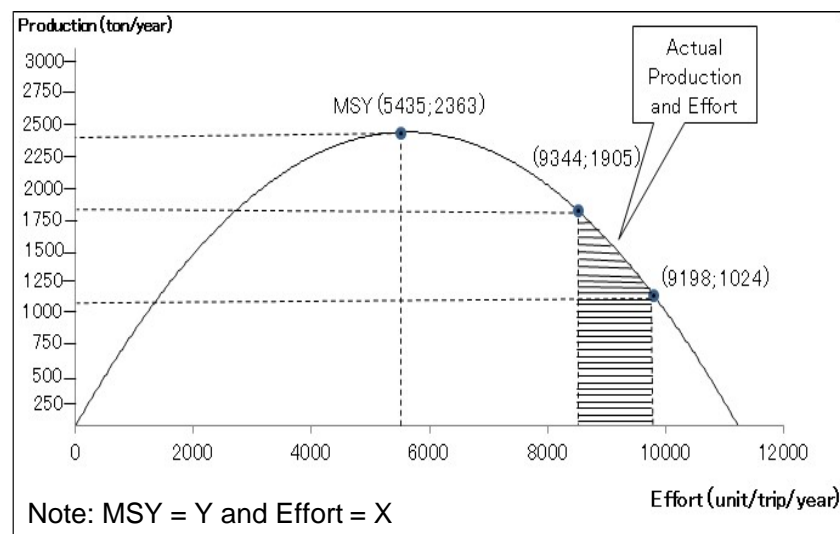


Figure 9. Correlation MSY and Effort before the tsunami

- Anchovy overfishing: the actual production < MSY, and the actual effort < optimum effort
- **Optimum number of boats 43 unit, but actual 89 unit, and effective operation 71 unit**
- Recent average catch in MSY: 53.9% (less abundant stock)

Overfishing was led by lift net boat increased, technology development, no catch selection, yearly fishing, no fisheries management and monitoring, and degradation of mangrove and coral reef ecosystem

Factor 5: The State of Anchovy

After the Tsunami

- Presented **the sharply negative slope**, if effort increase-CPUE **dramatically fall** (Figure 10)
- Figure 11 shows that **MSY 161.9 ton/year** and **Optimum effort 2,845 trip/year**

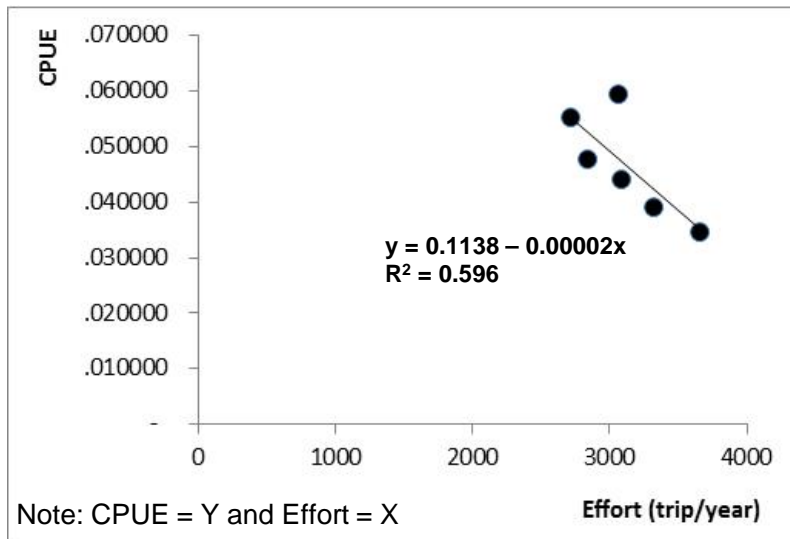


Figure 10. Correlation CPUE and Effort after the tsunami

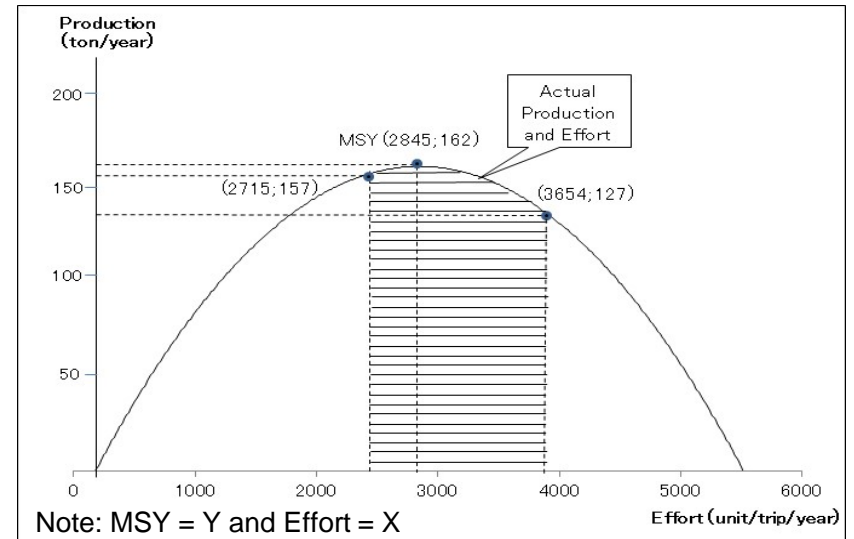


Figure 11. Correlation MSY and Effort after the tsunami

- Anchovy barely faced overfishing (Figure 10 & 11): **actual production << MSY and actual effort >> optimum effort**
- Recent average catch in MSY (%): 6% (depletion stock)

Depletion was accelerated by the tsunami impact, rapid population growth, destructive fishing, up land area activities expanding

Implication to Social Vulnerability (SV) and Resilience (SR)

- **SoVI and SRI could be illustrated how SV and SR were changed by the tsunami impact**
- Four selected villages had high **SoVI, ranged between 0.6007-0.8460 (2003)**, then gradually increased in 2005, consequently it was slightly improved in 2011 (Table 4).
- Subsequently **SRI was low (0.1540 – 0.2150) in 2003**; and dramatically declined in 2005 (tsunami), and slightly recover in 2011 (Fishery Livelihood Recovery Program)

Table 4. The changing of SoVI and SRI in Krueng Raya Bay

No	Village	SoVI/Years			SRI/Years		
		2003	2005	2011	2003	2005	2011
1	Ruyung	0.7888	0.8243	0.8153	0.2112	0.1757	0.1847
4	Meunasah Kulam	0.7936	0.8441	0.8423	0.2064	0.1559	0.1577
5	Meunasah Keudee	0.8460	0.9011	0.8511	0.1540	0.0989	0.1489
6	Meunasah Mon	0.7850	0.8459	0.7646	0.2150	0.1541	0.2354

Sources: Data Analysis (2012);

Note: - SoVI classification Low (<0,25), Moderate (0,25-0,50), and High (>0,50)

- SRI classification low (<0.25), , Moderate (0,25-0,50), and High (>0,50)

- High social vulnerability (low social resilience) were caused by high poverty, declining of fish resources, & degradation of coastal ecosystem.
- Improvement SoVI and SRI needed to spend expensive cost and long time

What is the impact on Fisheries Livelihood

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Impact 1: income of Fishing Communities Decrease

- Figure 12 shows the changing of fishing income which were affected by the Tsunami

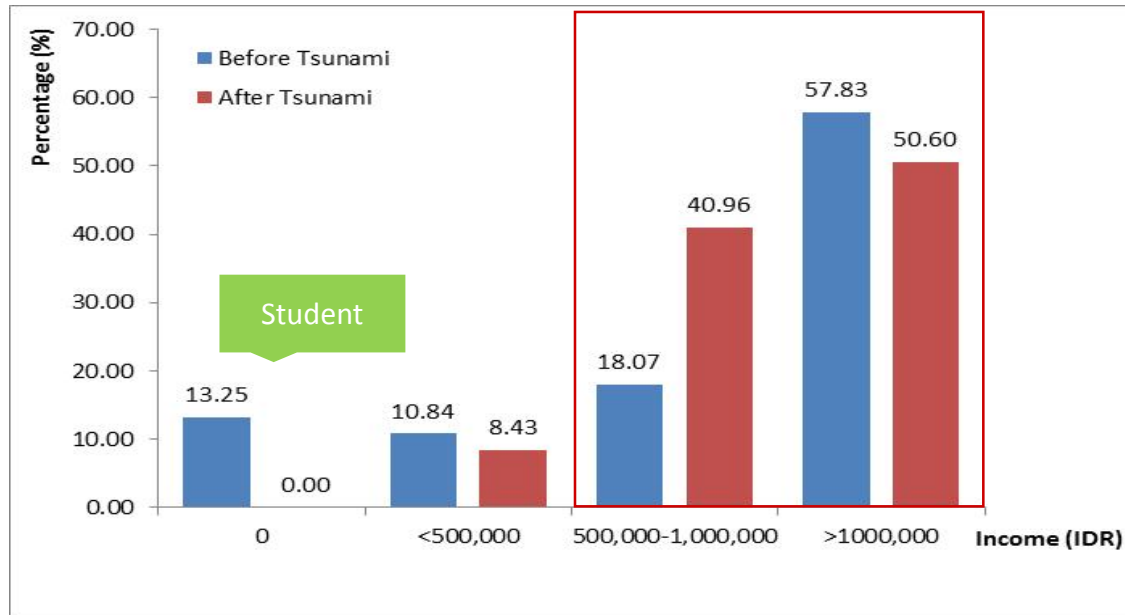


Figure 12. The changing of fishermen income structure (Data Analysis, 2014)

- The proportion of high income fisheries households were decreased (7.23%) into middle income interval (22.9%) after the tsunami disaster

Shifted income of fishing communities might be caused by asset production damage, volume and value of fish production declined, change of fishing boats composition, increasing income source from fisheries livelihood (from 69 to 78%), and changing non fisheries to fisheries livelihood

Impact 2: Increasing Poverty

- Table 5 point outs the percentage of poor people change in four villages
- Shown that 45.3% was accounted before the tsunami, then dramatically increased to 97.7% aftermath the tsunami, and became 56.6% in 2009.

Table 5. The percentage of poverty people in Krueng Raya Bay

No.	Villages	Poverty People (%)		
		2003 ¹	2005 ²	2009 ³
1.	Ruyung	61	96.7	90
2.	Meunasah Keudee	38	100	45.85
3.	Meunasah Kulam	43	94.1	71.5
4.	Meunasah Mon	39	100	18.96
Average		45.25	97.70	56.58

Some fishermen might change their livelihood to alternative livelihood such as agriculture

Sources: Data Analysis from ¹ & ²MamFrame 2006 and ³ Planning Development for Gampong 2010 Document

- Only Meunasah Mon Village could reduce the number of poor people after recovery program from 39% (2003) to 19% (2009)

The changing of poverty people might contributed by increasing number of fisheries household (FH), dependency on fisheries livelihood, unemployment, aid delivery terminated in 2007 and physical production assets damage by tsunami

Factor Contributing on Recovery of Fisheries Livelihood

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Factor 1. strong characteristics of fishing communities as social capital

- Table 6 shows some characteristic of fishing communities
- Contributed by high lesson learn from past failure and success (94%), followed by trust on informal leaders, experience in fisheries livelihood, and mental condition

Table 6. The characteristic of fishing communities in Krueng Raya Bay

NO.	Characteristics	Classification	Respondent	
			Number (N=83)	Percentage (%)
1	Experience in fisheries livelihood	Less experience if less than 1 year	1	1.20
		Good experience if 1-18 year	43	51.81
		Very good experience if more than 18 year	39	46.99
2	Mental condition	Very traumatic	38	45.78
		No traumatic	45	54.22
3	Trust on informal leaders	Very trust if more than 50% answer yes	71	85.54
		No trust if more than 50% answer no	12	14.46
4	Learning from past failure and success	High lesson learn if more than 50% answer yes	78	93.98
		Low lesson learn if more than 50% answer no	5	6.02
5	Participation in fisheries livelihood	Men	76	91.57
		Women	7	8.43

Sources: Data Analysis (2014)

The strong characteristics were influenced by resilient mentality which was reinforced by armed conflict situation, social and religious value

Factor 2: aid delivery as a source of financial capital

Table 7 demonstrates over dependency on external aid by showing a huge of aid delivery index (ADI), ranged 0.61-0.81 in all villages; and 0,72 in Krueng Raya Bay.

Table 7. Distribution of frequencies, proportion and Aid Dependency Index (ADI)

Villages/Region	Frequency of ADI					Total	Proportion of ADI (%)					ADI	Categories
	1	2	3	4	5		1	2	3	4	5		
Ruyung Village	0	1	0	0	3	4	0.0	25.0	0.0	0.0	75.0	0.81	High
Meunasah Keudee	1	9	8	8	29	55	1.8	16.4	14.5	14.5	52.7	0.75	High
Meunasah Kulam	1	2	4	4	4	15	6.7	13.3	26.7	26.7	26.7	0.63	High
Meunasah Mon	0	2	3	2	2	9	0.0	22.2	33.3	22.2	22.2	0.61	High
Krueng Raya Bay	2	14	15	14	38	83	2.4	16.9	18.1	16.9	45.8	0.72	High

Note: 1=very disagree, 2=disagree, 3=neutral, 4=agree, 5= very agree

ADI has significant correlation with productive asset damage, fishermen income; work experience, a number of dependent and education (Table 8)

Table 8. Factor correlation on ADI

Factors	χ^2 value	χ^2 Table	p-value	Conclusion
Productive asset damage	67.4	15.5	0.00	$\chi^2_{\text{value}} > \chi^2_{\text{table}} (8:0.05)$; p-value < 0.05 Significant
Fishermen income	36.4	26.35	0.03	$\chi^2_{\text{value}} > \chi^2_{\text{table}} (16:0.05)$; p-value < 0.05 Significant
Work experience	23.2	15.5	0.03	$\chi^2_{\text{value}} > \chi^2_{\text{table}} (16:0.05)$; p-value < 0.05 Significant
A number of dependent	41.7	36.4	0.014	$\chi^2_{\text{value}} > \chi^2_{\text{table}} (24:0.05)$; p-value < 0.05 Significant
Education	26.01	21.03	0.01	$\chi^2_{\text{value}} > \chi^2_{\text{table}} (12:0.05)$; p-value < 0.05 Significant

Sources: Data Analysis (2014)

Fishing communities said that 90.4% of them could not relief their livelihood by them shelf and 97.6% of them are rely depend on external aid

Factor 3: integration of Sustainable Livelihood Strategies

The fishing communities promoted: alternative livelihood development and adopted social-ecological approach as the first and second priority strategies

Table 9. The rank of sustainable livelihood strategies integration base on fishing communities proposed

Optional Strategies	Proportion (%)					Mean	Std. Deviation	Rank
	Very Disagree	Dis-agree	Neutral	Agree	Very Agree			
Engage on recovery management (S1)	0.0	3.6	13.2	26.5	56.6	4.4	0.85	5
Collaborative action (S2)	1.2	0.0	4.8	31.3	62.6	4.5	0.70	3
Strengthening indigineous institution and LGU bounding (S3)	0.0	0.0	15.7	34.9	49.4	4.3	0.74	6
Increasing capacity of indigenous institution (S4)	0.0	0.0	22.9	34.9	42.2	4.2	0.79	7
Provided technical assistance for fisheries communities (S5)	6.0	2.4	27.7	42.2	21.7	3.7	1.03	9
Integrated social, finance, human, physical and nature capital building (S6)	0.0	0.0	4.8	37.4	57.8	4.5	0.59	4
Adoption of social ecological approach (S7)	1.2	0.0	3.6	26.5	68.7	4.6	0.68	2
Women empowerment on micro enterprise (S8)	1.2	0.0	36.1	45.8	16.9	3.8	0.77	8
Alternative livelihood development (S9)	0.0	0.0	2.4	30.1	67.5	4.6	0.53	1

Sources: Data Analysis (2014)

S9 and S7 could be influenced by existing source of income, land ownership, fishing experiences, dependency on fisheries resources, over exploitation of fish resources, coastal ecosystem degradation, and awareness on sustainability of fish resources

Factor 4: Revitalize the Role of Indigenous Institution

1. Panglima Laot Lhok (Sea Commander)

- The organization structure is directive line (Figure 13)

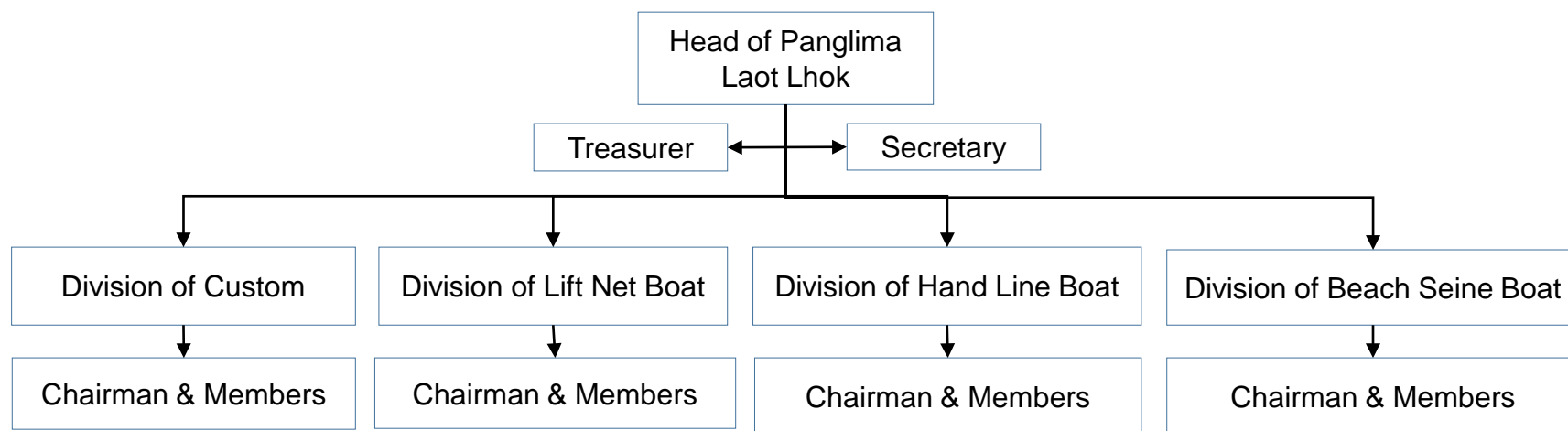


Figure 13. The structure organization of Panglima Laot Lhok

- The role and function, PLL has essential roles for network and connectedness (Table 10)

Table 10. The matrix of Panglima Laot Lhok role

The role and function			
Fisheries Livelihood Recovery	Network and connectedness	Membership	Relationship of trust, reciprocity and exchange
<ul style="list-style-type: none"> • Facilitate donor agencies in distributing fisheries aid • Involved in monitoring 	<ul style="list-style-type: none"> • Established patron-client system • Built trust and bonding • Social network development • Accessibility to other institutions 	Encourage fishermen on acceptance of the rule, norm and sanction	<ul style="list-style-type: none"> • No transaction cost • Create cooperation among fishermen to reduce poverty

Factor 5: Toke Bangku (Financial Trader)

The relationship pattern has a correlation with fish production and marketing channeling and less function in aid delivery and emergency stage of recovery process

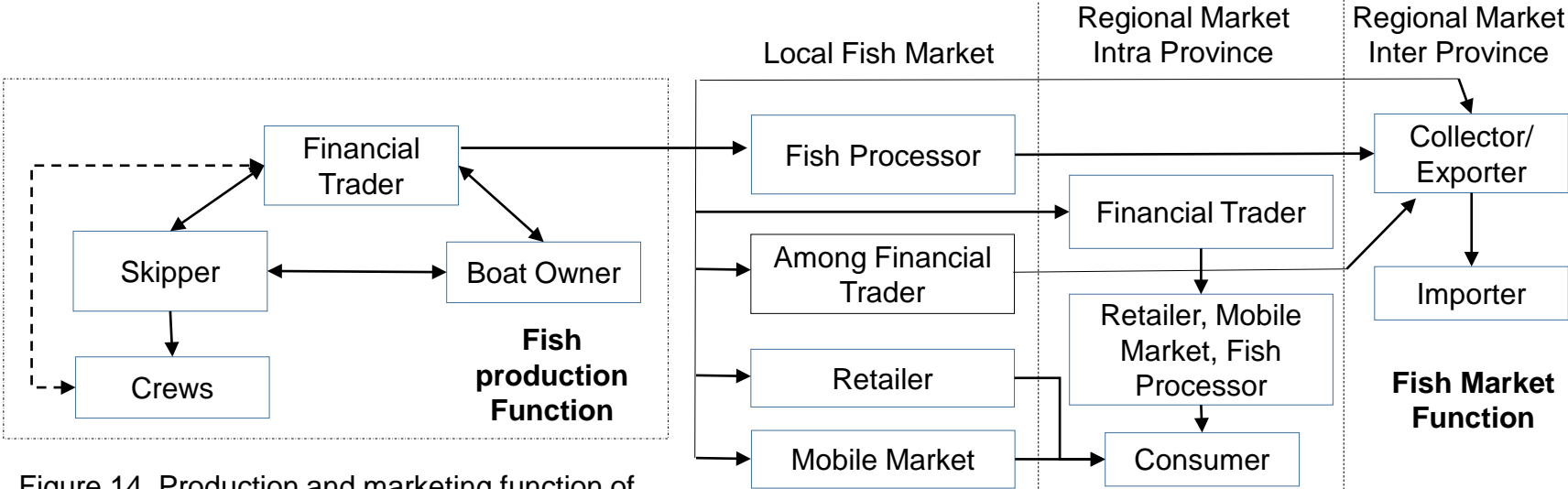


Figure 14. Production and marketing function of Toke Bangku

Table 11. The matrix of Panglima Laot Lhok role

The role and function			
Fisheries Livelihood Recovery	Network and connectedness	Membership	Relationship of trust, reciprocity and exchange
<ul style="list-style-type: none"> Facilitate donor agencies to revitalization marketing network Less engagement in aid delivery (26.5%) and emergency engagement (20.5%) 	<ul style="list-style-type: none"> Collection fish from fishermen and selling to retailer, fish processor and consumer. Provision maintenance cost Building marketing channel link network Accessibility to local and regional market 	<ul style="list-style-type: none"> No membership system No rule, norm and sanction for trustee building system Provision operational cost for fishing boat 	<ul style="list-style-type: none"> Established trust system relationship with boat ownership skipper, and crews Generated the transaction cost; Built cooperation system with boat ownership and skipper to produce fish Provision debt without collateral for fishermen

How to Strengthen Social Resilience

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Key factor 1: the fishing communities engagement and collaborative action

Fishing communities engaged in a cycle recovery of fisheries livelihood program to be the key factors contribution in implementing program (Table 12).

Table 12. Aspects and factor contribution to success of program

Aspect	Contribution factor to success
Program Management	<ul style="list-style-type: none">• Solid vision & mission understood by implementing agency;• High spirit and team work;
	<ul style="list-style-type: none">• Availability of management system (Financial and Technical System Operational Procedure, etc);• Sufficient human resources in terms of qualities & quantities
	<ul style="list-style-type: none">• Intensive participatory facilitation• Credible commitment among stakeholders;
Program Sustainability strategy/approach	<ul style="list-style-type: none">• Establishment of local economic institution for accelerating livelihood recovery
	<ul style="list-style-type: none">• Establishment of regional development committee board to facilitate the local three village leaders

Collaborative actions increased fishing communities adaptability, communities-local institution bounding, and building mutual trust among institutions

Key Factor 2: indigenous and local institution capacity building

- Impact of fisheries livelihood recovery program: directly enhance social capital and indirectly improve social resilience
- Table 13 shows the qualitative impact on social capital.

Table 13. Qualitative impact on social capital

Item	Before the Program	After the Program
Krueng Raya Charter	Established commitment among the village leaders on the strategic development plan	Krueng Raya Charter Agreement was introduced as an umbrella, to cooperate and consolidate the regional economic development
Regional Development Committee	There was no institution	Krueng Raya Committee Development was established to facilitated program planning and implementing
Fisheries Group	Lack of fishery business capacity	Increasing capacity of fisheries group on management of the fisheries business.
Local youth people	A small number of people interested on the syariah-based cooperative	Increasing the fishing community participation on management of the KSHB (Micro finance institution)
Microfinance Institutional	There was only Baitul Qirat as micro-finance	Local cooperatives, and KSHB were developed as the alternative finance institutions

Social capital improvement using communities participation could enhance social resilience

Key Factor 3: Inter-correlation among strategies of sustainable fisheries livelihood development

- Main strategies must be integrated with second & third layer strategies (Figure 15).
- The significant correlation among strategies were proved by one-way ANOVA test
- Provided technical assistance, integration approach, and women participation were closely related with main layer strategies

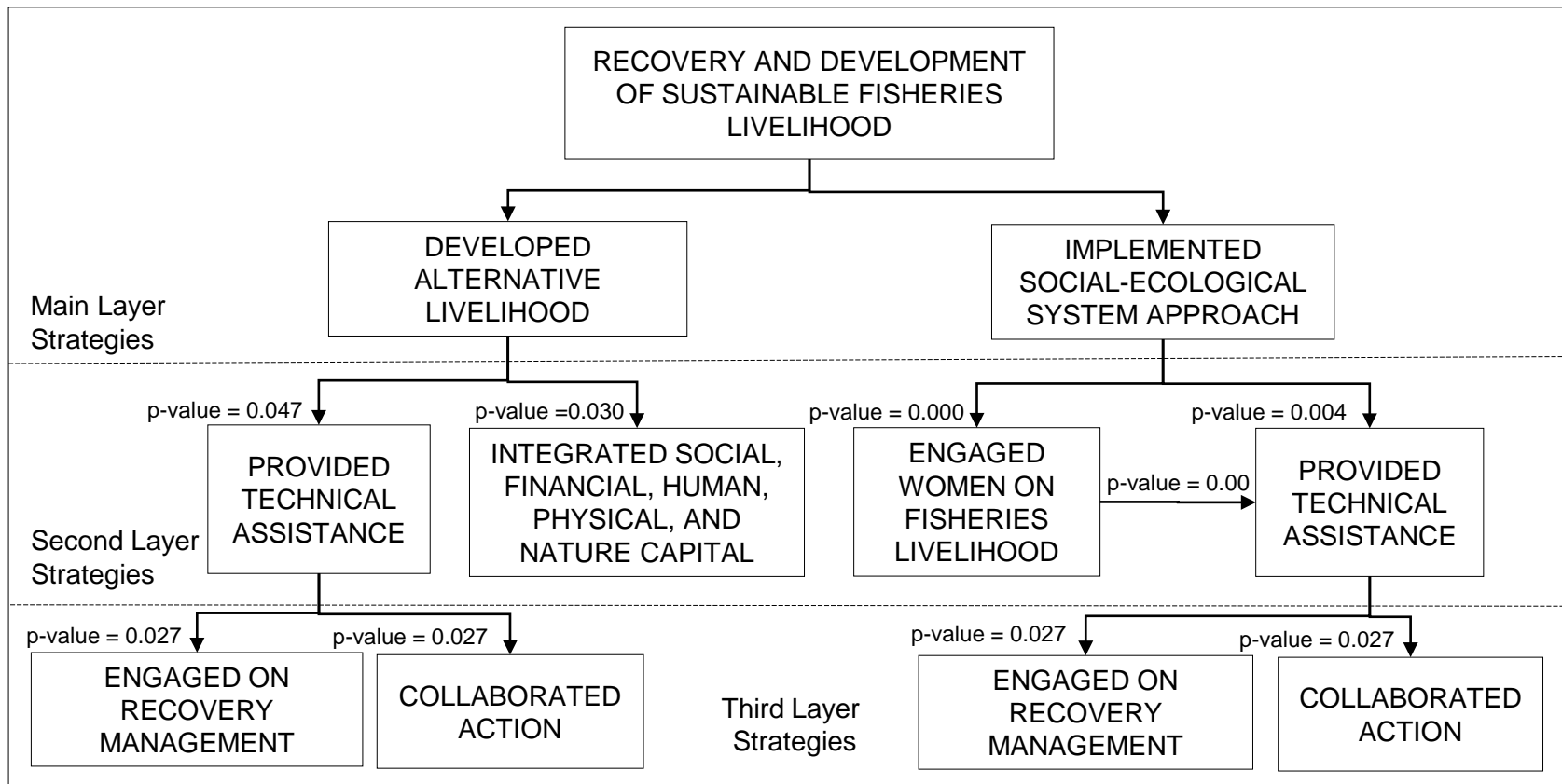


Figure 15. The hierarchy of recovery and development of sustainable fisheries livelihood strategies ($\alpha = 0.05$) 30

1. Impact of the tsunami on fisheries livelihood

- **Fishery livelihood capital:** changing of human capital, production assets, operational cost, and production assest cost had influenced the stability of fisheries livelihood.
- **Daily fishery household economic activities:** migration and mobility worker, easy accessibility for job-holder and resources, few alternative livelihood, lack of non-fisheries livelihood skill, and many non-fisheries shifted into fisheries resources base caused an increasing determination of fisheries livelihood
- **Dependency on fish resources:** the number of engagement in fisheries livelihood led an steadily increasing of the fishing community dependent level on fish resources.

2. Influenced factors on a declining of fish and anchovy resources

- **The anthropogenic factor:** fluctuation state of fish resource was led by externality of human activities before the tsunami and the tsunami to be driven factor a diminishing of fish resources.
- **The super factor:** anchovy resources met overfishing state before the tsunami and the tsunami extremely accelerated the stock of anchovy to be the depletion state.
- **Direct factors:** overcapacity of fishing boats, increasing fishing effort, and technology improvement, limitation of fish stock management.
- **Indirect factors:** population growth, degradation of coral reef and mangrove ecosystem

3. Effectiveness of sustainable livelihood strategies implemented into recovery of fisheries livelihood

- **Improvement of fisheries livelihood outcome:** the tsunami caused the negative impacts on fishery households' income and poverty; after integration of sustainable livelihood strategies could recover fishing communities' income and poverty, enrich fish and anchovy stock, and restore coastal ecosystem.
- **Adaptable for communities, and institutions:** selected strategies for practical implementation have considered environment of fishing communities, prevented an increasing of aid dependency, re-built capacity of indigenous institutions and local government units
- **Encouraged fishing communities participation :** arrangement of strategies based on the engagement and commitment process of fishing communities; alternative livelihood and social-ecological strategies implementation encouraged fishing communities' response, shelf-organizer, and lesson learnt to enhance social resilience.

4. Strengthen social resilience

- **Comprehensive approach:** the tsunami massively impacted on social capital; therefore, the reestablishment of social capital should be followed by human capital revitalize, physic capital reconstruction, financial capital recovery, and natural capital rehabilitation.
- **Collaborative action:** integration of sustainable livelihood programs emphasized on collaboration action among the recovery fishery livelihood actors
- **Capacity building:** the involvement of external institution and government in implementing fisheries livelihood program influenced improvement of indigenous institution capacity, enhancement mutual trust and bounding among communities, and reducing social vulnerability

- **To manage factors affecting on fisheries livelihood change in fishing communities**, government and external institution need to develop a local fisheries livelihood management system and training on disaster risk reduction and management, responsible fisheries management, good governance of fisheries resources management, and marine protected area.
- **To integrate sustainable livelihood strategies into fisheries livelihood recovery**, government and external institution need to integrate either indigenous or local institution and the content of value into the recovery process, implement alternative livelihood and social-ecological approach strategies into recovery of fisheries livelihood, and developing the system of fisheries aid delivery on re-building and re-financing the production assets of fisheries livelihood.
- **To enhance social resilience of the fishing communities**, government and external institution need to provide disseminating and training on social vulnerability and resilience based on local knowledge, providing entrepreneur skill on ecosystem services and non fisheries resources, promoting local disaster management system for fishing communities, indigenous and local institution.

Thank You
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