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Toward Strengthening Social Resilience: A Case Study on Recovery of Capture Fisheries after Asia's Tsunami in Aceh, Indonesia

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***Abstract*—**Social resilience has role to govern the local community and coastal fisheries resources toward sustainable fisheries development in tsunami affected area. This paper asses, explore and investigates of indigenous institutions, external and internal facilitators toward strengthening social resilience. Identification of the genuine organizations role had been conducted twice by using Rapid Assessment Appraisal, Focus Group Discussion, and in-depth interview for collecting primary and secondary data. Local wisdom had a contribution and adaptable to rebound social resilience. The Panglima Laot Lhok (sea commander) had determined and adapted role on recovery of the fishing community, particularly facilitated aid delivery to fishermen, as shown in anchovy fisheries relief case in Krueng Raya Bay. Toke Bangku (financial trader) had stimulated for reinforcement of advance payment and market channel. The other institutions supported upon linking and bridging connectivity among stakeholders. Collaborative governance can avoid conflict, reduce donor dependency and strengthen social resilience within fishing community.

***Keywords*—** Fishing community, indigenous institution, adaptive role, collaborative, social resilience.

I. Introduction

As known, on Sunday, December 26, 2004 at epicenter, an earthquake measuring 9.1 on the richter scale event off the West Coast of Northern Sumatra [1].

It is followed by a huge tsunami which struck off the coast of Aceh, Indonesia and region which close to epicentrum of disaster. Scheper et al [2] noted that there were around 166,364 (0.08%) people loss of lives from Indonesia's population (220 million) or 4% of Aceh's population at that time. Moreover, World Bank [3] noticed that over 1.5 million people lost their homes and livelihoods. The total of estimation damages and losses from this matter in Aceh was IDR 41.4 trillion or US$ 4.45 billion - equivalent to about 80 percent of Aceh's Regional Gross Domestic Product (GDP) [3].

Direct losses to the fisheries sector, both capture fisheries and aquaculture have been predicted approximately IDR 1.2 trillion; indeed, both fisheries and aquaculture production were around IDR 3.8 trillion [4].

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The Consultative Group on Indonesia [5] also reported that 15-20% of 80,000 fishermen died, with more than 64% lost in the northern part of Aceh Province. At least 4,800-7,700 out of 13,360 fishing fleet were damaged and lost with comparison to pre tsunami evident [6].

Moreover, tsunami has influenced to social resilience within the coastal community, particularly to fisheries community in which people depend their livelihood on fisheries resources as one of common pool resources (CPRs). Indeed, tsunami has affected them through the erosion of social resilience, coastal resources change and stakeholders interaction. In context of resilience, many scholars have studied on social ecological systems to cope variety of stresses. However, as Langridge et al [7] stated, there was less paid attention to the concept of social resilience, mainly to the conditions under which it is created.

In case of tsunami in Aceh, many leaders of Panglima Laot Lhok (sea commander), indigenous institution as one of social capital, has been fostered to govern the fishing community. For example, Panglima Laot Lhok Peukan Bada as the leader of fishing community was dead; as a result, it took long time to recover capture fisheries livelihood, with comparison to other fishing community.

In other words, a genuine organization has rule to strengthen social resilience for coastal fishing community to manage their fisheries resources. Ostrom [8] mentioned that CPRs may be governed and managed by wide variety of institutional arrangements, one of which can be community ownership. She also suggested that the further policy also have to fit with local culture and institutional environment of those who depend on ecosystem for their livelihood. Nevertheless, she proposed to let the users create their own system of governance for retaining the resources of common property, including ocean fisheries resources.

Noordwijk et al [9] remarked that "social capital in the coastal zone of Aceh has been an important rule base on resilience, especially the family and religious networks that absorbed survivor". And also the (re) emergence of traditional resource management institutions, such as Panglima Laot Lhok, has been relevant, especially for channeling the perspectives of the fishermen. In addition, it has significant function not only on recovering capture fisheries livelihood, but also conserving and managing the fishery resources and it's environmental.

Besides Panglima Laot Lhok, there are also other local wisdom to strengthen social capital in Aceh's society, such as "Tuha Peut (Four Members)" and "Tuha Lapan (Eigth Members)" which are established in each Local Government Unit (LGU) or Village Level System (VLS).

Both have plenty interesting rules, customary laws, to maintain social networking in VLS and social resilience in coastal village before and aftermath tsunami.

In the context on recovery of livelihood, the role of other stakeholders cannot be ignored. The function of central government, local governments, donor agencies, universities and Non Government Organization (NGOs) provided a large influence on recovery process of infrastructure facilities, housing, and livelihood recovery activities including economic, social, cultural, and religious from the emergency to reconstruction phase (2005-2009). This involvement had appeared both positive and negative impacts on the social capital system; particularly on social resilience which has long term existed in fishing community. Donor agency used differ criteria and mechanisms on the delivery of aid to beneficiaries, particularly to the fishermen. As a consequence, conflicts and distrust had occurred among people on relief their livelihood. The ultimate impact of these problems would weaken social resilience which was established in coastal community long time ago.

To studied whether a number of roles is available among stakeholders in delivering aid assistance, so that the paper will describe the result of reserch and review of the case study on recovery of fisheries livelihoods program in Krueng Raya Bay, Aceh Besar. The hypothesis put forward is the recovery of fisheries livelihoods for fishing community in Krueng Raya Bay will be toward the strengthening of social resilience, which in turn will support the management of fisheries resources on a certain boundary. The purpose of this research is to assess tsunami impact to capture fisheries production and livelihood; and to analyze the roles of indigenous institutions on recovery of capture fisheries livelihoods, and external institutional roles beyond the capacity of local institutions towards the strengthening of social resilience in the affected area.

II. Methodology

Krueng Raya Bay was selected for research site which considered to heavy affected, determination of fishing community, and a complex social ecological structure system. It is located in coastal zone area and Aceh Besar District in administratively. The research site map and general information [10] are presented in Fig. 1.

The research was a review of case study based on the experience of the implementation of Fisheries Livelihoods Recovery Program (FLRP) in cooperation between Consortium Center for Coastal and Marine Resources Studies-LEIMA Foundation (Consortium CCMRS-LEIMA) and United Nation Development Program (UNDP) in period 2005-2007. Research had been carried out to design the framework in the future research due to the previous research.

Fig. 1 The research site and general information

The primary and secondary data was collected by using Rapid Assessment, Focus Group Discussion (FGD), and in-depth interviews methods. Finally, data collection was conducted in two stages, in 2005 and March-April 2012 in research sites, related agencies and the other stakeholders. Data analysis would be used quantitative and qualitative methods (see Table I).

TABLE I
Analysis Methods

Item	Analysis Methods
Fisheries resources trend	Descriptive statistics
Loss value	Damage and loss (DaLA)
Social Vulnerability	Social Vulnerability Index [11]
Social Capital	Sustainable Livelihood [12]
Stakeholders role	Stakeholders Analysis
Program Planning	Situational Analysis

III. Result and Discussion

A. Impact of Tsunami to Capture Fisheries Production, Fisheries Livelihood and Social Capital

The Aceh capture fisheries production was showed a tendency increasing and relatively instable along period 1990-2010 (25 years). In addition, it reached 82.676 tons in 1990, then rose to 107,658.5 (19.8%) tons and 99,626.9 (8.06%) tons in 1995 and 2000 respectively. Aftermath tsunami, it was decreased dramatically to 81,162.7 tons, shown by Aceh Fisheries Statistics Data [13], which declined to 24.6% comparison to production in 1995. In case of anchovy fish production in both Layeun (located at Fisheries Management Area 571) and Krueng Raya Bay (FMA 572) shown the declining trend as well. According to Aceh Fisheries Statistics Data [13] during period 2005-2010, anchovy fish production had fallen to 285.2 tons in 2005 and 195.8 tons in 2010 respectively. The progress of total production (tons) of anchovy fish at Aceh Besar District in period 2005-2010 is presented in Fig. 2.

The declining of capture fisheries production might be caused by damage and loss of production assets, human capital and social capital that underpinned the fishing activities. The Consultative Group on Indonesia (CGI) [5] reported that the number of fishermen died reached to 15-20% of total number pre tsunami, with over 64% of fishermen lost in the northern part of the province.

In addition, around 65% of total fishing fleet [5] or at least 4,800-7,700 of 13,360 fishing fleet [6] was damaged and lost because of tsunami impact.

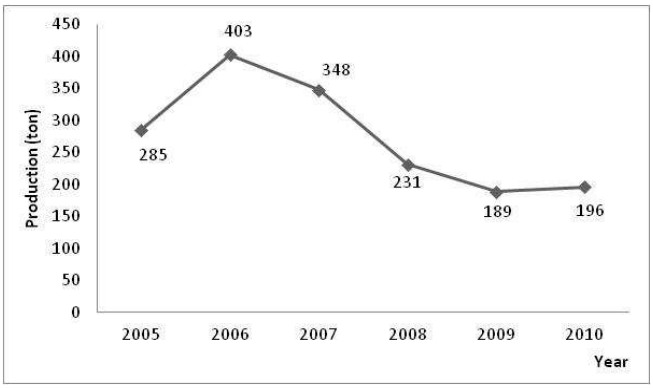

Fig. 2 The progress of total production (tons) of anchovy fish at Aceh Besar District in period 2005-2010

To give an example, the collapse of lift net fisheries activities in Krueng Raya Bay resulted in decline of anchovy fish production. Rapid Assessment (2005) recorded that there were 200 persons of fisherman lived in the three villages; however, aftermath tsunami just remained 156 persons of fisherman. They lost all fisheries facilities including fishing fleet, fishing gear, and associated infrastructure.

In fact, Panglima Laot Lhok-Pawang Zakaria and some of Toke Bangku confirmed that there was dropped down in anchovy production in Krueng Raya Bay during period 2005-2010. However, they did not know what factors have influenced the declining of anchovy fish catching. To sum up, it has had a relationship to the obvious loss of fisheries sector.

Collecting data on damage and losses from various sources and direct analysis in field survey, CGI [5] predicted that the total loss of capture fisheries up to full recovery to the pre-disaster production level is to be IDR 3.8 trillion or equal to US$ 522,143,187. Meanwhile, the estimated loss of revenue in capture fisheries livelihood, in three villages in Krueng Raya Bay (Meunasah Keudee, Meunasah Mon and Meunasah Kulam), was US$ 2,221,685.19, which approached 0.42% of total loss capture fisheries in Aceh Province (Data Analysis 2012). The percentage of direct and indirect loss to capture fisheries livelihood in Krueng Raya Bay is presented in Fig. 3.

The magnitude of the losses of fishing activities in the three villages in Krueng Raya Bay was understandable because about 90% of 723 households (651) were involved in fisheries. Only 10% of total households in this area were farmers, husbandry, trader and workers. According to Garces et al [14], livelihood activities in 15 coastal villages which were situated within Aceh Besar District, west coast and east coast including Meunasah Keudee, were comprised into three types, namely, (1) fishery resource based, (2) non-fishery resources based, and (3) non resources based. Besides that, Gibbs [15] added that the coastal community might be impacted coastal hazard far more than inland community in the new millennium.

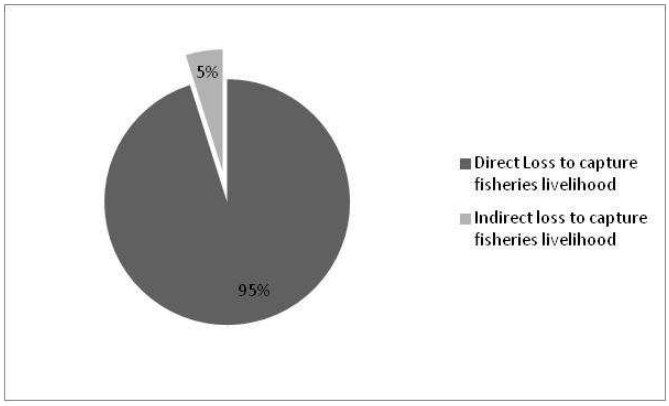

Fig. 3 Percentage of direct and indirect loss of capture fisheries livelihood in Krueng Raya Bay

Moreover, tsunami also affected to the social facilities and social capital which supported to the capture fisheries livelihood in the three villages. According to UNDP and Consortium CCMRS IPB-LEIMA [16], numerous (90%) of social facilities such as housing, fishermen meeting hall, mosque, meunasah (place for praying in village level), and schools, spread in three village as target research, were heavy damaged (see Table 2).

TABLE II
DAMAGE CONDITION OF SOCIAL FACILITIES IN MUNASAH KEUDEE, MEUNASAH MON, DAN MEUNASAH KULAM VILLAGE

Social Facilities	Village/Damage					
	Meunasah Keudee		Meunasah Kulam		Meunasah Mon	
	unit	Status	unit	Status	unit	Status
Housing	255	Heavy	144	Heavy	162	Heavy
Fisher meeting hall	1	Heavy	0	-	0	-
Meunasah	1	Heavy	1	Heavy	1	Heavy
Mosque	1	Heavy	0	-	0	-
Kindergarten	1	Heavy	0	-	0	-
Elementary school	1	Heavy	0	-	1	Heavy
Junior high school	0	-	0	-	1	Heavy
Village office	1	Heavy	1	Heavy	1	Heavy
Meeting hall	1	Heavy	1	Heavy	1	Heavy

Sources: UNDP and Consortium CCMRS-LEIMA [16], mapFrame [17]

However, the impact to social capital in three villages, it was difficult to measure with both quantitative and qualitative methods, as regards how big tsunami impact was on social capital in these villages, because it is intangible asset and rather sensitive after shock. Grafton [18] mentioned that social capital is difficult to measure; however, he proposes several aspects which it may contribute to communities' performance, namely trust and trustworthiness, civil engagement and cooperation, and social network.

It could be said that the impact of tsunami on social capital has resulted in patterns of relationships among community, social interaction, social network development, and social activities have been disrupted within the time could not be determined. Tsunami has created the negative impact to social resilience because of damage accumulation on livelihood, associated infrastructure, and social capital.

Indeed, this damage could increase the societal stress and social isolation. According to Cacioppo et al [19], life stressor and social isolation have had influenced to capacity of social resilience.

In addition, social capital in Krueng Raya Bay has established and developed through both indigenous and formal institutions that bond the coastal community due to social network, rule, norm, sanction, and relationship of trust before tsunami event (see Table 3**).** DFID [12] remarked that social capital was developed through networks and connectedness, membership of formalized group, and relationship of trust.

While Green and Haines [20] added that social capital in commonly is an emphasis on aspect of social structure, trust, norm, and social network to facilitate coordination and cooperation for mutual benefit. Putnam [21] suggested that social capital refers to connections among individuals, social networks, norms of reciprocity, and trustworthiness.

In capture fisheries livelihood in Krueng Raya Bay, the indigenous institutions who have a role to govern fishermen directly are Panglima Laot Lhok and Toke Bangku. On the other hand, others genuine organization such as Tuha Peut (member four) and Tuha Lapan (member eight) have facilitated fishermen for solving of social problem.

Meanwhile, LGU has not arranged to govern fishermen who inhabitant within a village administrative. However, among the indigenous institution and LGU, both normative and structure aspect of social capital have been tied into bond, bridges and social network. Berkes [22] stated that "the role of cross scale institution is significant to provide a means to bridge the divide between processing take place at different level".

In case rule, norm and sanction of Panglima Laot Lhok might be erupted by tsunami impact, it would be influenced to both social capital and social resilience existence. Because It has a strong patro-client relationship, trust among fishermen, social networking development, and accessibility.

According to Solihin et al [23] concluded that rule, norm and saction which related to fisheries resources and resources user have accommodated within "Hukum Adat Laot" (sea customary law). Therefore, Panglima Laot Lhok has authority to enforce it within certain both ecological and administrative boundaries, such as bay (lhok)-estuary (kuala)-local region (pemukiman)-village.

To sum up, the tsunami impacts simultaneously have driven the transformation of social resilience and it has occurred to fishing community who has lived in Krueng Raya bay. Cacioppo et al [19] explained that the unique signature of social resilience was the transformation of diversity into personal, relational, and collective growth through strengthening existing social engagement, developing new relationships, with creative collection actions.

B. Social Vulnerability on Krueng Raya Bay

Birkmann et al [24] explained that reducing the impact of a stressor often needs vulnerability approach, mainly on focusing assets and resources. This is the reason why social vulnerability became an important factor in mitigating the impact of disaster to community within sustainable livelihood development and social resilience. Bogardi [25] argued that social vulnerability and social resilience have an orthogonal relationship and they might be affected on community capacity.

Because of difficulties in quantifying the social vulnerability, many scholars have used "Social Vulnerability Index (SoVI)" to understand social vulnerability, in order to allocate the necessary resources in the happening of disasters to the right targets at the right location, Cutter et al [26] proposed the construction of SoVI as an basis for planning and action on disaster response. To simplied this concept, Indoneisa's National Agency for Disaster Management (BNPB) [11] suggested that SoVI can be measured with consider to: (1) population density (population/km2), (2) sex ratio, (3) poverty ratio, (4) disable population ratio, and (5) age population ratio. The result of SoVI in eight villages in Krueng Raya Bay is around 0.6007-0.8460 (see Table 4).

The three villages selected, i.e. Meunasah Keudee, Meunasah Kulam, Ruyung, Meunasah Mon showed a highest SoVI, which were 0.8460, 0.7936, 0.7888, and 0.7850 respectively, it was because of these villages are located the nearest of sea and flat area in geographically. Even though, others villages which are located in coastal zone area, were also high SoVI categories.

As a consequence, if SoVI was high, social vulnerability in Krueng Raya bay might be high. Its means, if this area would be struck by disaster, it would have taken huge cost on recovery of community to steady condition. As implication, social resilience in this impacted area should be low, and it was taken long time on community relief to pre tsunami condition, even toward the built back better. Bogardi [25] explained that social vulnerability was measured which were related to the cost. It can be said how much cost is needed and how many people will be affected if disaster event. While social resilience is gauged by time, its means how long it takes time by community to respond aftermath disaster, self organize, incorporate lesson learned to normal condition.

TABLE III
INDIGENOUS INSTITUTIONS ROLE ENGAGEMENT ON THE DEVELOPING OF SOCIAL CAPITAL ACCORDANCE TO THREE BOUNDARIES ADMINISTRATIVE AUTORITY IN KRUENG RAYA BAY, ACEH BESAR DISTRICT

Local Institution[1] and Boundaries[2]	Social Capital Development[3]		
	Network and Connectedness	Membership more formalized group	Relationship of Trust, reciprocity and exchange
Local Region			
Panglima Laot Lhok	• Establish patron-client fishermen system; • Increase trust among fishermen; • Social networking development; and • Can access to Panglima Laot and Fisheries Office in district and provincial level	Fishermen as membership can accept rule, norm and saction	• No transaction cost; and • Create cooperation among fishermen to reduce poverty
Toke Bangku	• Establish patron-client between fishermen and both provider operational cost and marketer system; • Create huge trust between fishermen and operation cost provider; • Social networking development; and • Can access to local and regional market	No rule, norm and saction to role fishermen as un-register membership to Toke Bangku	• Create transaction cost; • Create cooperation between fishermen and Toke Bangku to produce fish • Provision loan to fishermen without collateral
Fish Processing Association	• Create professional relationship; • Create trust among the fish processor; • Can access to local and regional market	No rule, norm and sanction to role fish processing ownership	• No transaction cost; and • Create cooperation for arranging price of fish processing product
Mosque Family Board	• Establish relationship among moslem society; • Create trust for religion problem solving; • Can access to religion office in Sub District	Rule, norm and sanction due to religion	• No transaction cost; and • Increase cooperation for social and religion action
Traditional Culture Group (Dalail)	• Establish social networking for youth generation; and • Create trust for culture development	No rule, norm and sanction	• No transaction cost; and • Increase cooperation for culture and religion development
Village			
Local Government Unit	• Establish to rule social networking in village level; • Create trust for social problem solving; and • Can access to sub district and district government level	No rule, norm and sanction due to religion	• Transaction cost for administrative arrangement; and • Encourage community cooperation for social action
Tuha Lapan	• Establish relationship among the community in village level; • Informal representative to create trust with head of village for social problem solving; and • Can access to Local Government Unit in Village Level	No rule, norm and sanction to role community but it evolve religion rule	• No transaction cost; and • Increase cooperation for working together in village level
Youth Organization	• Establish relationship among the youth society; • Representative of youth society to create trust within social problem solving; and • Can access to Local Government Unit in Village Level	No rule, norm and sanction to role community	• No transaction cost; and • Increase cooperation for working together
Arisan Group	• Establish social networking among the women in village level	No rule, norm and sanction to role women	• No transaction cost; and • Ling to social action
Meunasah Committee	• Establish social networking among moslem society in village level; • Can access to Mosque Family Board	Rule, norm and sanction due to religion	• No transaction cost; and • Increase cooperation for religion and social action
Security Community Village Committee	• Establish social networking as community representative to control LGU; and • Can access to village and sub district government unit	Create rule, norm and sanction for LGU	• No transaction cost; and • Encourage cooperation to village community in social action
Family Welfare Committee (FWC)	• Establish social networking to foster women membership in village level; and • Can access to LGU and FWC in sub district and district level	No rule, norm and sanction to role women	• No transaction cost; and • Encourage cooperation to women community in social action
Sub Village			
Tuha Peut	• Establish relationship among the community; • Social networking development; • Can access to Tuha Lapan to solve social problems;	No rule, norm and sanction to role community but it evolve religion rule	• No transaction cost; and • Increase cooperation for working together in sub village level
Head Sub Village Institution (Dusun)	• Establish social networking; • Create trust among community to solve social problems; and • Can access to others institution s in village level	No rule, norm and sanction	• No transaction cost; and • Increase cooperation for working together in sub village level
Wirid Group	• Establish social networking for women moslem; • Create trust among women community; and • Access to others institution in village level	No rule, norm and sanction	• No transaction cost; and • Increase cooperation for social and religion action

[1,2] Source : UNDP and Consortium CCMRS-LEIMA [16]
[3] Data Analysis (2012)

TABLE IV
THE RESULT OF SOVI IN EIGTH VILLAGES IN KRUENG RAYA BAY

No.	Villages	SoVI	Category of Vulnerability		
			Slightly (<0,25)	Moderate (0,25-0,50)	High (>0,50)
1	Ruyung	0.7888	no	No	Yes
2	Paya Kameng	0.7070	no	No	Yes
3	Beurandeh	0.6978	no	No	Yes
4	Meunasah Kulam	0.7936	no	No	Yes
5	Meunasah Keudee	0.8460	no	No	Yes
6	Meunasah Mon	0.7850	no	No	Yes
7	Ie Seu Um	0.6007	no	No	Yes
8	Lam Reh	0.6425	no	No	Yes

C. Case Study of Coastal Sustainable Livelihood Approach on Recovery Capture Fisheries Livelihood

FLRP was not only physical treatment such as providing fishing vessels and livelihood materials but also used comprehensive approach, integrating financial capital with other capital such as social capital, human capital and natural capital in order to obtain a livelihood strategy and livelihood outcome. Moreover, It was implied the modification of Sustainable Livelihood Analysis DFID [12] which was called Coastal Livelihood System Analysis (CLSA).

According to Consortium CCMRS-LEIMA [27], FLRP could be classified and facilitated to four activities, namely: (1) developing fishing vessel and capture equipment supply (livelihood 1), (2) mobile market and fish processing (livelihood2), (3) construction and fisheries aggregating device (livelihood 3), and (4) non fisheries and institutional capacity building (livelihood 4). The total budget allocation and proportion for all livelihood activities was around US$ 1,129,293 (72.64%). In addition, the remaining these budget, about US$ 403,562 (25.96%) and US$ 21,834 (1.40%) respectively, which were allocated both for operation and overhead cost of program (see Fig. 4)

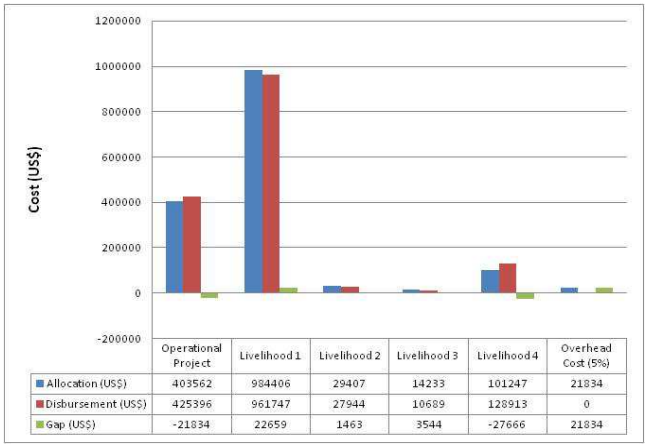

Fig. 4 The proportion of budget allocation, disbursement and gap on FLRP in Krueng Raya Bay in period 2005-2007

Shown in Fig. 4, the budget was allocated not only to livelihood 1 but also need to spent amount money for livelihood 2, 3 and 4.

Indeed, FLRP had reallocated budget around US$ 14,4887 (9.32%) to cover non capture fisheries, including for conducting institutional capacity building. As a result, it must be changed the financial strategies on stage of implementing through re-balancing budget; the contingency budget (5% of total budget) need to disburse on covering operational cost.

Although there was no budget providing for non-fisheries livelihood activities at the beginning of the implementation, FLRP had to set up of budget for the activities of agriculture, livestock, small businesses, and institutional capacity building due to consideration of the village planning process, in order to strengthen social resilience.

According to Davis [28], the community' favorable conditions are needed to cope hazard reduction at various levels, in order to increase the resilience of community at risk to absorb disaster shocks, bounce back following their impact and adapt during disaster recovery. As consequence, it might be changed to logical framework and program result in Krueng Raya Bay (Appendix 1). It could be said that implementing program in disaster affected area is needed to consider to adaptive management.

Research (2012) found that various changes in the target group and implementing stage have been carried out based on the agreement to Regional Development Committee which was established by the village planning (Duek Pakat) of three villages. These changes were also coordinated and consulted with various local (internal systems, see Appendix 1), international (UNDP), national institutions (BRR NAD-Nias, CCMRS and LEIMA Foundation) as an external institution system. Both groups were interested parties in the implementation FLRP. With reference to the UNDP and Consortium CCMRS-LEIMA [16] and research (2012), the stakeholder analysis has been carried out for Krueng Raya Bay (see Table V).

Table V shows that fisheries recovery process in Krueng Raya Bay has involved stakeholders, including formal and informal institutions, who concern to relief the affected fishermen. According to Ostrom [29], institutions had both the formal legal rule and informal social norm that govern the behavior and shape how the individual and organization to interact one each others.

However, a prominent role has performed by Panglima Laot Lhok because it has a vertical relationship with its members and tied to the value system that has become a tradition among the fishermen. Nurasa et al [30] stated that Panglima Laot Lhok has system to lead and guide the local fishing community, resolve conflict and dispute among fishermen, responsible in determination of taboo in fishing activities, and impose penalty against violators.

TABLE V
STAKEHOLDERS ANALYSIS ON FLRP IN KRUENG RAYA BAY

Stakeholders	Stakeholder's Interest	Perception of Problem	Mandate
UNDP	Contribution to recovery livelihood post tsunami the Aceh Emergency Response and Transitional Recovery Program	Collapse of livelihood on coastal community who live in affected area of tsunami on 24 December 2004	Provision budget, controlling, monitoring and evaluation program
BRR NAD-Nias	Build back better	Aftermath tsunami was affected to Aceh's economics	Coordination and implementing agency for rehabilitation and reconstruction program
Consortium CCMRS-LEIMA	Conduct need assessment, design, and implementing fisheries livelihood recovery	Damage of fisheries resources was created un sustainable fisheries livelihood	Implementing, facilitating, and assisting coastal community
Panglima Laot Lhok	Facilitation external institution agency to delivery aid to fishermen	Fishing fleet, equipment and infrastructure fisheries damage by tsunami hit	Management of fishermen due to ecological and local region boundaries
Fishermen	Beneficiaries of fishing fleet and equipment delivery	Fishing fleet destroy and lack of financial capital on recovery of livelihood	Actor of capture fisheries livelihood and user of fish resources (no mandate)
Toke Bangku	Beneficiaries of financial and marketing support to get asset and capital to recovery their livelihood	Loss their asset and capital because of tsunami and no return modal from fishermen	Actor of financial support marketing for fishermen (no mandate)
Fish Processor	Beneficiaries of fish processing to obtain unit fish processing, financial capital and assistances	Unit fish processing damage and lack of financial capital	Actor of fish processor to increase the fish value added (no mandate)
Fish trader	Beneficiaries of fish trader to get financial capital and equipment	Equipment loss and lack of financial capital	Actor of fish trader to sale fresh and salty fish to consumer (no mandate)
Farmer	Beneficiaries of agriculture and livestock to obtain financial capital	Damage and lost land farm and livestock	Actor of agriculture and livestock to produce vegetable and meat (no mandate)
Mosque Family Board	Rehabilitation of mosque facilities	Severe damage of mosque facilities	Actor of social and religion aspect
Local Government Unit	Rehabilitation and reconstruction of housing, social infrastructure and administration system	Damage and loss of housing, social infrastructure and administration system	Actor to govern the community in tsunami affected area
Tuha Lapan	Informal institution to facilitate community in village level on recovery process	Tsunami impacted to social capital	Actor to govern social capital in village level
Tuha Peut	Informal institution to facilitate community in sub village level on recovery process	Tsunami impacted to social capital	Actor to govern social capital in sub village level
Arisan Group	Informal organization to arrange women to get financial capital	Tsunami impacted to financial capital	Actor to indirectly govern women in financial lottery
Meunasah Committee	Informal religion leader to assist delivery aid from donor agency	Tsunami impacted to social capital	Actor to govern social capital in village level
Community Village Committee for Security	Community representative to facilitate aid delivery	Tsunami impacted to administration and village development	Actor to connect donor institution to LGU
Head Sub Village Institution (Dusun)	Social infrastructure reconstruction	Tsunami impacted to social infrastructure	Actor to facilitate aid in sub village level
Wirid (recital) group	Capacity building assistance relate to religion aspect	Tsunami impacted to social capital	Actor in social capital in village level (no mandate)

There were a few changes and additional functions and role of Panglima Laot Lhok aftermath tsunami. The role of Panglima Laot Lhok would be became the facilitator and assistance for donor agency aftermath tsunami. It also played role in determining the beneficiary of fishermen and distributing of aid. In the context FLRP, Panglima Laot Lhok also had played an important role as a guarantor of quality fishing fleet building after improvement by the beneficiary of fishermen group [27].

Changes in the functions and roles performed by Panglima Laot Lhok were a part of the adaptations strategies by local institutions in the face of pressure and stress to achieve and return to normal conditions. It would had a relationship to social resilience in society who affected by disaster. Cacioppo at al [19] stated that social resilience would be effective implies to smaller unit which was related to nearly all form of human association, from dyads all of types, families, small group, neighborhood, community and culture. Meanwhile, Sapirstein [31] added that the adaption process is needed to ensure that people are dealing with the situation at hand, rather than romanticizing an idealized past or harboring anger and resentment at perceived failures of government. Even, Gibbs [15] argued that resilience, on couple of social ecological system, is linked to social process both on individual and community level and intangible factors, i.e. social cohesiveness, for underpinning adaptive capacity.

Another indigenous institution, Toke Bangku, also has a significant play role to reinforcement of social resilience on recovery capture fisheries livelihood. It has close relationship to fishermen and they need each other. According to research (2012) resulted that the pattern of relationship between Toke Bangku and fishermen is personal bond, trust and mutual complement. In the process of the mutual cooperation, there is no legal commitment, Toke Bangku provides operational funding to fishermen for fishing and the fishermen are obliged to sell their catching to Toke Bangku. However, fishermen often have borrowed money to Toke Bangku to reserve daily goods during off-fishing seasons. Even if fishermen cannot afford to pay its debts, Toke Bangku has never collected again. These patterns of the relationship can built an emotional connection between fishermen and Toke Bangku.

Research conducted Garces et al [14] reported that Toke Bangku has substantial role in fish market channeling. They mentioned that after the fish catching landing, it should be sold to Toke Bangku, and then sold it to Muge (mobile market) or to other local consumers. Thus, it can be said that Toke Bangku also has a social and market network.

Tuha Peut and Tuha Lapan had arranged the bridging, bonding, and networking between Panglima Laot Lhok, Toke Bangku and formal institution such as LGU and sub village. These roles also have a significant contribution to foster social resilience aftermath tsunami. According to Adger [32] stated that social resilience of a community depends on the institutional structure of that society: both modes of socialized behavior (informal institutions) and formal structures of governance or law (formal institutions).

D. Constrains and issues toward strengthening social resilience in Aceh aftermath tsunami

Based on the experience of FLRP in Krueng Raya Bay, there were a lot of lesson learned that can be used as a reference to the strengthening of social resilience after a community shock. The learning process can be formulated at each stage of the program cycle management. For example Equal [33] has developed the project cycle which divides to a number of stages, namely, defines the policy objectives, identifies the issues, develop detail plan, implement program, monitoring and evaluation, and develop partnerships.

In case FLRP, the planning and program formulation phase, had been engaged in wider community to design program activities. The objective was to conduct verification activities have been formulated from the results of need assessment through the process of public agreement which is known as Duek Pakat in each villages. According to DFID [12], the community engagement in sustainable livelihood analysis is how to putting people at the center of development.

The result of verification indicated that there was a gap between activities proposed and community needed. Initially, the program was highly prioritized on recovery of fisheries livelihood; however, there are also other livelihood activities such as agriculture, livestock and other small enterprise. And then, the program should accommodate as community proposed. It was done to avoid a conflict among disaster victims that can undermine social resilience.

Consortium CCMRS-LEIMA coducted villages planning development meetings which were attended by representatives of each of the formal and informal institutions in a village to re designed the activities which were proposed by the coastal community. They determined the representative due to the agreement in Duek Pakat.

The purpose of this meeting, namely:

1) Overcome the limitations of available funds;
2) Formulated the activities of non capture fisheries livelihood to be financed;
3) Established village development committees which represented the various elements of formal and informal institutions;
4) Agreed on criteria and mechanisms for livelihoods beneficiaries; and
5) Agreed that the assistance provided is rolling and will be channeled through economic institutions owned by the three villages.

Communities' passion and commitment had written and signed in a charter agreement. In this process, all the rules, norms and values would be unity in a society Krueng Raya Bay to avoid conflicts of interest among the community for getting aid aftermath tsunami. In addition, the community engagement in FLRP was also performed on the stage of program implementation, monitoring and evaluation, and formulation of exit strategies of sustainability program. This collaborative process had gained the key factors successful for accomplisement program in Krueng Raya Bay (see Table VI).

TABLE VI
ASPECTS AND FACTOR CONTRIBUTION TO SUCCESS OF PROGRAM

Aspect	Factor contribution to success
Program Management	• Solid vision and mission understood by implementing agency; • High spirit and team work; • Availability of management system (Financial and Technical System Operational Procedure, etc); • Sufficient human resources in terms of qualities and quantities
Program Sustainability strategy/approach	• Intensive participatory facilitation • Credible commitment among stakeholders; • Establishment of local economic institution for accelerating livelihood recovery • Establishment of regional development committee board to facilitate the local three village leaders

Sources : Modified from Consortium CCMRS and LEIMA [27]

Collaborative actions have increased community adaptability, bounding of community and local institution, and building mutual trust among institutions. It meant, community had shown the signs of response, self organization, redundancy, learning, and adaptation to face the impact of disaster. These indications show the signs strengthening social resilience in coastal community aftershock of disaster.

In addition, the implementation of FLRP has an impact on the strengthening of economic capital and social capital. Of course, the recovery of economic assets, particularly for fisheries livelihood activities were expected to increase anchovy fish production. Unfortunately, it has no reached to pre-tsunami production (Research 2012). Even, the number of fishing fleets was operated relatively similar to pre-tsunami because they had rebuilt by donor agency, NGOs and GOI (Panglima Laot Lhok 2012). In short term, the fishermen rely dependence on the reef fish species catching that they sold directly to local community and markets both in Banda Aceh (Peunayong Fish Market) and Aceh Besar District (whole market, Pasar Induk) in order to sustain their life (Research 2012) .

Entering the last quarter of 2011 there was an increasing in fish catching in Krueng Raya Bay compare to five years after the tsunami. Indeed, the fish processors that stated dry fish anchovy product had increased delivery to the center market, Pasar Ikan Cemara, in Medan in early 2012 (Research 2012). Considered to these conditions, it can be said that strengthen social resilience would not guarantee to increase anchovy fish production because it also depends on the recovery of ecological systems. According to Adger [32] explained that social resilience system has relationship and undefined to resilience of ecological system in which social system depend.

In fact, recovery of economic capital was required substantial funds, but the restoration of social capital was mostly done by mediation, facilitation and assistance approach to society, beneficiaries and local institutions. Social capital in the context of FLRP implementation has been tended to increase, especially in terms of the improvement of the three village relationship in Krueng Raya Bay (see Table VII).

TABLE VII
QUALITATIVE IMPACT ON SOCIAL CAPITAL

Item	Before the Program	After the Program
Krueng Raya Charter	There was relatively no communication between the village leaders regarding to the development plan	Krueng Raya Charter was iniciated as an umbrella and agreed by the three local village leaders to cooperate and consolidate the regional economic development
Krueng Raya Regional Development Committee (RDC)	There was no such institution	Krueng Raya RDC was established to guarantee the facilitation of Koperasi Syariah Hidup Baru (KSHB) activities and village local leaders
Fisheries Group	Relatively few number of fishers group	Increasing capacity of fishers group both in terms of number of group as well as the management skill through training on management of fisheries business.
Local youth people	Relatively few number of people interested to the syariah-based cooperative	Increasing interests of the local people to involve to the management of the KSHB
Institutional capital	There was only one institution engaging the local micro-finance and economic institution namely Baitul Qirat.	New microfinance, KSHB was developed as the alternative for managing the economic activities of the local people

Sources : Modified from Consortium CCMRS and LEIMA [27]

Finally exit strategies were needed to be selected in order to maintain the sustainability of fisheries livelihood after accomplishment of fisheries recovery program. There were two exit strategies which were suggested by FRLP to community in Krueng Raya Bay, namely:

1) Extension and Facilitation to Krueng Raya Regional Development, the fishers group and other local economic agents including through Local University and/or NGOs;
2) Maintaining capacity of local fishers and of women group through (KSHB)

To sum up, the strengthening of economic capital and social capital and the establishment of exiting strategies upon mutually agreement had indicated that the steps forward to the strengthening of social resilience has been done. According to Sapirstein [31], there are five indicators that can be used as a reference for enhancing social resilience, i.e. redundancy, response, self organization, learning, and adaptation.

IV. CONCLUSION

The strengthening of social resilience in small scale boundaries is needed integrated effort to link and social capital, financial capital, physic capital and human capital within coastal community who depend their livelihood to fisheries resources. However, It is required appropriate budget and time, many human resources and various institutions on recovery of fisheries livelihoods due to ecological boundaries, such bay. Many community recovery programs are not focused directly on strengthening social resilience, but the implications of these program always leads to the strengthening of social capital and economic capital, ultimately leading to gain the strengthening social resilience.

One example is FLRP which focus on a recovery of sustainable livelihoods, but it has implications to evolve an integrated approach to reduce dependence on donor assistance and enhance local institutional capacity for managing fishermen lives in particular.

The key to the success of post-disaster strengthening social resilience is the capacity of a facilitator in strengthening local institutions, encouraging community involvement at every stage of program management, and build community commitment and local institutions. Technical assistance and capacity building of indigenous; such as Panglima Laot, Toke Bangku, Tuha Lapan and Tuha Peut, give significant impact on recovery of fisheries livelihood. These are alsa needed in order to revitalization and restore the response, self-organization, redundancy, learning, and adaptation of community toward the strengthening social resilience in the future, especially in the coping of disaster.

Other factors are also determination on recovery of fisheries livelihoods are growing mutual trust and bounding of roles between internal and external institutions. Besides that, local institutional role should allow and combine with external institutions to facilitate and assist them in the recovery process.

In the future, it is needed to be conducted a researh how the affected community by disaster to cope shock and strengthen social resilience. In addition, it is also needed to identify and inventory social resilience in high vulnerability areas of disasters and then integration to coastal resilience system.

APPENDIX 1
THE CHANGING OF PLANNING AND OUTPUT ON FLRP IN KRUENG RAYA BAY

Logical Framework				Program Result
Bottleneck	Objective and Activities	Target Group	Output	Impact
Collapse of fisheries asset and capital to generate income for sustainable fisheries livelihood development	Objective : Local economic and livelihood recovery after earthquake and tsunami disaster for coastal community Fisheries Livelihood 1: Developing lift net, line, beach seine mini purse seine fishing fleet and equipment supply	31 lift net, 10 line, 4 beach seine, and 3 purse seine packets of fishing fleet	24 lift net, 10 line, 4 beach seine, and 3 purse seine packets of fishing fleet	The fishermen returning to fishing with the potential of generating income around Rp.30,000-Rp.60,000/person daily
	Fisheries Livelihood 2: - Mobile market - Fish processing Unit	 10 packages 10 unit	 10 packages 1 packages	To help the increasing income of coastal community outside of fishing activity and to reduce poverty
	Fisheries Livelihood 3: - Fish Aggregate Device Reconstruction	6 packages	3 packages	Fishermen can harvest fish that conditioned in the fishing ground areas, which is relatively close to fishermen's residential
Lack of agriculture, live stock, and trading asset and capital to generated income for sustainable livelihood development	Objective: Recovery and reduce poverty of non fisheries livelihood on coastal community - Agriculture - Livestock - Home made	 No target No target No target	 3 packages 3 packages 3 packages	Reducing conflict among coastal community
Lack of trust, norm and network would be weaken social resilience	Objective: To develop and improve the capacity of local people in managing the assets and facilities produced by the project through development of social and institutional capital - Village planning development - Regional Development Committee (RDC) - Institutional capacity building - Technical assistance - Microfinance development - Social grant	 3 packages No target No target No target No target No target	 4 packages 1 packages 1 packages 1 packages 1 packages 3 packages	Capacity building of economic and social capital toward strengthening social resilience

Sources : Data analysis (2012) due to Consortium CCMRS- LEIMA [27]

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