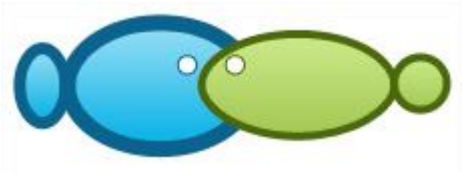

# The problems and capture fisheries development strategy in the border area (case study: Nunukan Regency, Indonesia)

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**Abstract**. The problems of capture fisheries in Nunukan Regency are relatively complex. Such complexity is due not only to its fishery resource management context, but also to its geography which is adjacent to another country. These problems can be categorized into four major ones; namely, improving catch production, marketing catch, capture fisheries management institutions, and strategic environment. This research is trying to formulate strategies to develop capture fisheries by adopting Soft System Methodology (SSM). The strategies required to be carried out to overcome the problems are: (i) to establish management policies in the forms of master plan or blue print of the development of capture fisheries at border regions, (ii) to enforce fisherman institutions, (iii) to improve fisherman's skills, (iv) to strengthen fisherman's capital, (v) to identify suitability of catching technology, (vi) to optimize functions and accelerate the establishment of fishing port and processing industries, (vii) to optimize IUU fishing handling, (viii) to optimize the roles of fishing extention, (ix) to build cooperation in capture fisheries (marketing and processing) with Malaysian entrepreneurs and government, and (x) to reformulate fisherman's partnership systems.
**Key Words**: border, capture fisheries, soft system methodology, Nunukan.

**Introduction**. In fact, the aim of development is to improve people's welfare and reduce welfare's gap among society groups and regions. Todaro & Smith (2012) said that the purpose of development is a guarantee of a better life. However, hitherto, such welfare has not yet been undergone by majority of society. Such a gap occurs particularly between rural and urban areas, between Java and outside Java, between western and eastern parts of Indonesia, and between hinterland and border regions (Siregar 2008). A number of gaps which appear include the ones on economic and social welfare levels. This is unfortunately worsened by factors on uneven resource potential, particularly, human resources and natural resources as well as government's policies which are too centralised both in planning and decision making process (Anwar 2005).

One of the imbalance development is found in outer regions, forming borders between neighborhood countries and home regions. The condition of majority of outer region is far from adequate compared to other areas. The main problem of such backwardness in border area development is the regional development policy which tends to be *'inward looking'* oriented; viewing that these areas are only the backyard of the country's development. As a result, border regions are not given priority by both central and regional governments in this development. Meanwhile, small islands in Indonesia are difficult to expand due mainly to their isolated and inaccessible locations. Some of these are either uninhabited or hardly populated and untouched by government's basic services.

This has then become a crucial matter as there have been great pressures from other foreign countries regarding political, economic, social and cultural ones. Society from certain regions are even more familiar to and have more interaction with people from other neighbouring countries than do with Indonesian people (Siregar 2008). If such

a situation continues to occur, Indonesian integrity as a country and nation will likely be threatened. Several cases on border disputes reveal how much loss Indonesian underwent due to the loss of border regions such as Sipadan and Ligitan.

Based on the decree of the President of Indonesian Republic, Number 78 Year 2005 on outer small islands management, there were 92 outer islands. The natural resource potential of most of these islands includes marine and fishery resources due to the fact that Indonesia is an archipelago, in which marine aspect is dominant. In other words, it is both fishery and marine sectors that may become the basis and mainstay for developing the economy in those border regions.

Nevertheless, border regions with fishery basis have not yet been expanded. Limited access from and to these regions causes economic and development activities not optimal to realize. On the other hand, access from these regions to other neighbouring countries are relatively good. Consequently, interaction between society in Indonesian outer regions and society in their neighbouring countries is more intensive than that with other society within Indonesia.

In the past, development in such outer regions was focussed more on security approach, but it did not integrate it with other aspects. This kind of approach certainly has a weakness as the regions to watch are relatively vast, while the number of human resources and military tools are restricted. Whereas one of the obstacles in the development of the border region is the low quality of human resources (Rani 2012). The case studies in Europe where security approach in the border region have failured (Andersson 2016). Hence, there is a need to have other development approaches to guard those regions. One essential yet forgotten factor in the past was the active participation of local society in guarding border areas – which, in fact, are the defence frontline, that is, "the front yard or the gate of the country". The core of all development policies in border regions is to provide welfare for local society. The manifestation of such ideal goal, furthermore, has to be reflected in various regional development related to local potential, as the border area issue is always related to "security approach". The consequence of security approach predominated in previous government regime has had an impact on the absence of welfare improvement for the society in the country's frontline – the defence spearhead of the country itself.

This kind of approach, therefore, has to be altered – not only through security approach but also through economic and social approach in order to improve the welfare of society in the borders. Thus, programs/activities leading to economic activity encouragement needs to be boosted and developed in these outer regions. Focus on development of physical structure, such as road, markets, and other public facilities, has to be accompanied with development of humans who are able to identify and utilize local potential so as to improve their life quality. In areas with access on immense fishery potential, activities on fishery-based economy becomes a strategic thing to carry out.

As capture fisheries characteristics in a border area such as Nunukan Regency is specific, the development strategies arranged are also specific, taking into account resource interaction within these two countries. This writing is trying to explain various strategies that can be conducted to develop capture fisheries in border areas.

**Material and Method**. The establishment of strategies for capture fisheries development adapted Soft Systems Methodology (SSM) approach, referring to Checkland & Scholes (1990). SSM is an approach to solve complex but unstructured problem situations based on holistic analysis and systemic thought (Figure 1).

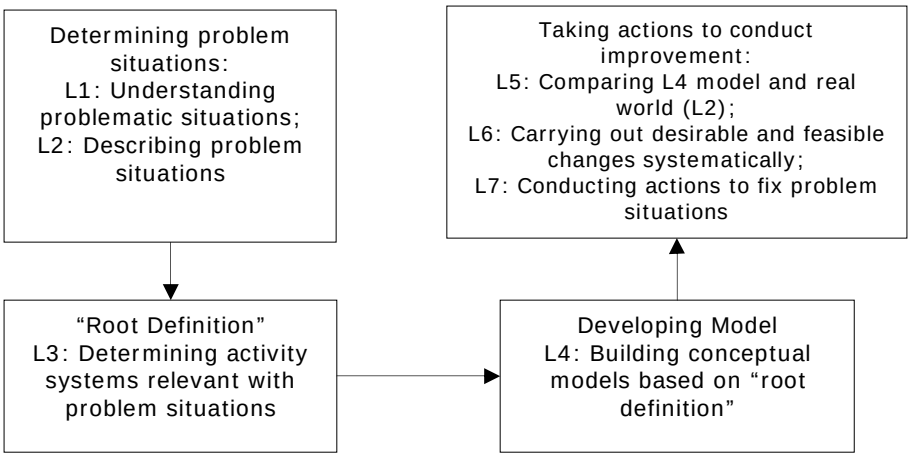


Figure 1. Soft System Methodology (SSM) stages.

## Results and Discussion

***Description of capture fisheries development problems***. Capture fisheries problems in Nunukan Regency can be categorized into: catch production improvement problems (relatively low catching productivity, illegal fishing, unsatisfied fishing port and low qualified human resources/fishermen), catch marketing problems (relationship between fishermen and middlemen, undeveloped domestic management industry and absence of fisherman's organization/associations), capture fisheries management institution problems (ineffective coordination systems, overlapped authority, and the absence of specific regulations organizing capture fisheries management in border areas), and finally, strategies environment problems (insufficient basic infrastructure in border areas, ineffective coordination system among government institutions, low absence regarding bilateral relationship and export from Nunukan in the form of raw materials). Whereas fisheries development can impact the socio-economic growth of a country and finding employment (Nedumaran 2014; Department of Fisheries Ministry Agriculture and Cooperative Thailand 2015; Nazir et al 2015), contributing to the national income as happened in Thailand (Teh et al 2015).

Aspects of development are closely related to the intention or hope for a condition in the future. Such a hope or output, however, cannot always be realized due to the problems faced. In other words, there is a gap between current condition and the hope in the future. This is why there is a need for intervention at present time in order to realize the expected future, called transformation.

Based on the facts in the field, the current conditions are as follow: (i) fisherman income level is very low. Catching productivities amounting to approximately 3.97 kg person$^{-1}$ day$^{-1}$ have not yet provided satisfied welfare. Thus, the most expected output is adequate fisherman's income, indicated by production increase and income raise. This can be realized when there is a transformation in production increase and value added; (ii) inadequate independence and bargaining position of fishermen. The expected output concerning this is independent fishermen who have better fish selling prices; (iii) low efectivity of capture fisheries management, viewed from various unfinished fishery problems, such as Illegal Unreported Unregulated (IUU) fishing practice, fisherman poverty, low contribution of capture fisheries in regional economy and, (iv) insufficient support of regional infrastructure in economic development. Based on these issues, then formulated objectives/aspects desired in the future as the indicators of achievement as presented in Table 1.

Table 1

Results of element analysis as future target

| *Present input* | *Transformation (systems to change)* | *Target output* | *Indicator* |
|---|---|---|---|
| Fisherman's low level income | Production and vallue added | Sufficient fisherman's income | Production increase; Income raise |
| Fisherman's inadequate independence and bargaining position | Catch marketing and social relationship | Independent fisherman | Better catch selling prices |
| Low management effectiveness | Management institutions | Effective management institutions | Effective management |
| Inadequate support for regional infrastructure | Strategic environment | Sufficiently well regional infrastructure | Increase of accessibility; Economic growth |

**Conceptual model for capture fisheries development**. The existence of fish becomes crucial in capture fisheries management in the border areas. The majority of fish resource potential in Nunukan region include demersal and small pelagic fishes. Accordingly, based on the characteristic of these fish, they are not the ones swimming accross the nation's administrative borders so that they need management regulation with adjacent countries. However, aspects of IUU fishing is now becoming a dominant problem. The location of Nunukan Regency, which is in adjacent to other countries, often leads to the occurence of IUU fishing, not only those performed intentionally, but also the ones due to unclear borders between the two countries. Such an IUU fishing will trigger conflict between local and foreign fishermen, affecting fish capture business and resulting in the decrease of catch as fish were caught by foreign fishermen. Thus IUU fishing that needs to be counted is not only the capture carried out by foreign ships but also formation of collaboration among Indonesian fisherman with foreign entrepreneurs.

The management of IUU fishing to lower fish resource theft level will give an impact on availability of fish caught by fishermen in Nunukan Regency. They will have bigger opportunity to obtain vast amount of catch at each trip. Another crucial factor is the use of effective catch gear. The ones mostly used at Nunukan Regency are pelagic danish seine (payang) and gillnet – suitable with the kinds of targetted fish. The types of fish becoming superior commodity based on LQ analysis, production growth and average price include narrow barried spanish mackerel (*Scomberomorus* spp.), white shrimp (*Penaeus merguiensis*), anchovies (*Stolephorus* spp.), silver pomfret (*Pampus argenteus*) and black pomfret (*Formio niger*).

Nevertheless, current capture fisheries activities have not been supported by adequate infrastructure. Furthermore, fishery ports available have not functioned well as mandated by the Law no 31 year 2004. This Law explains that there are 14 functions carried by fishing ports, only two of which, however, has been performed by this fishing port (Sebatik Fish Landing Place).

Basically, fishery ports are vital for fishery development in one region, not only in the context of fishing base but also as a tool to push economy in that particular region. In addition, marketing is the crucial key in capture fisheries development. Based on the discussion on fishery product market in Nunukan Regency, majority of fishermen go for Tawau Malaysia region; in other words, Nunukan fishermen are largely dependent on Tawau market. Such dependence, morever, is getting stronger due to commitment between fishermen and capital owners from Tawau. Avoiding Tawau as their market region, therefore, is a very difficult step to make as Nunukan economy largely depends on Tawau market. This supported by the fact that accessibility from Nunukan to other regions in Indonesia (particularly East Kalimantan) is relatively more difficult compared to the one to Tawau, resulting in higher distribution price that causes catch products are not competitive in this country. Furthermore, catch characteristic, which shows rapid

quality degradation, leads to the difficulties when distributed to other regions. In contrast, Tawau is able to absorb all the catch with a relatively higher price than the price sold in home country.

There are four conceptual models to develop capture fisheries in this area. They are conceptual for (i) production and added value in the development of capture fisheries; (ii) marketing and social relationship in capture fisheries development; (iii) management in capture fisheries; (iv) strategic environment in capture fisheries development. The first model aims to increase production and value added. This is highly dependent on the catching productivity. Factors that affect productivity are effective fishing technologies so as to exploit the fish resources in the fishing ground and the availability of supplies at sea. To give a higher value, the resource of fish caught must be an economically important fish resource (competitive commodities). More conceptual model is presented in Figure 2.

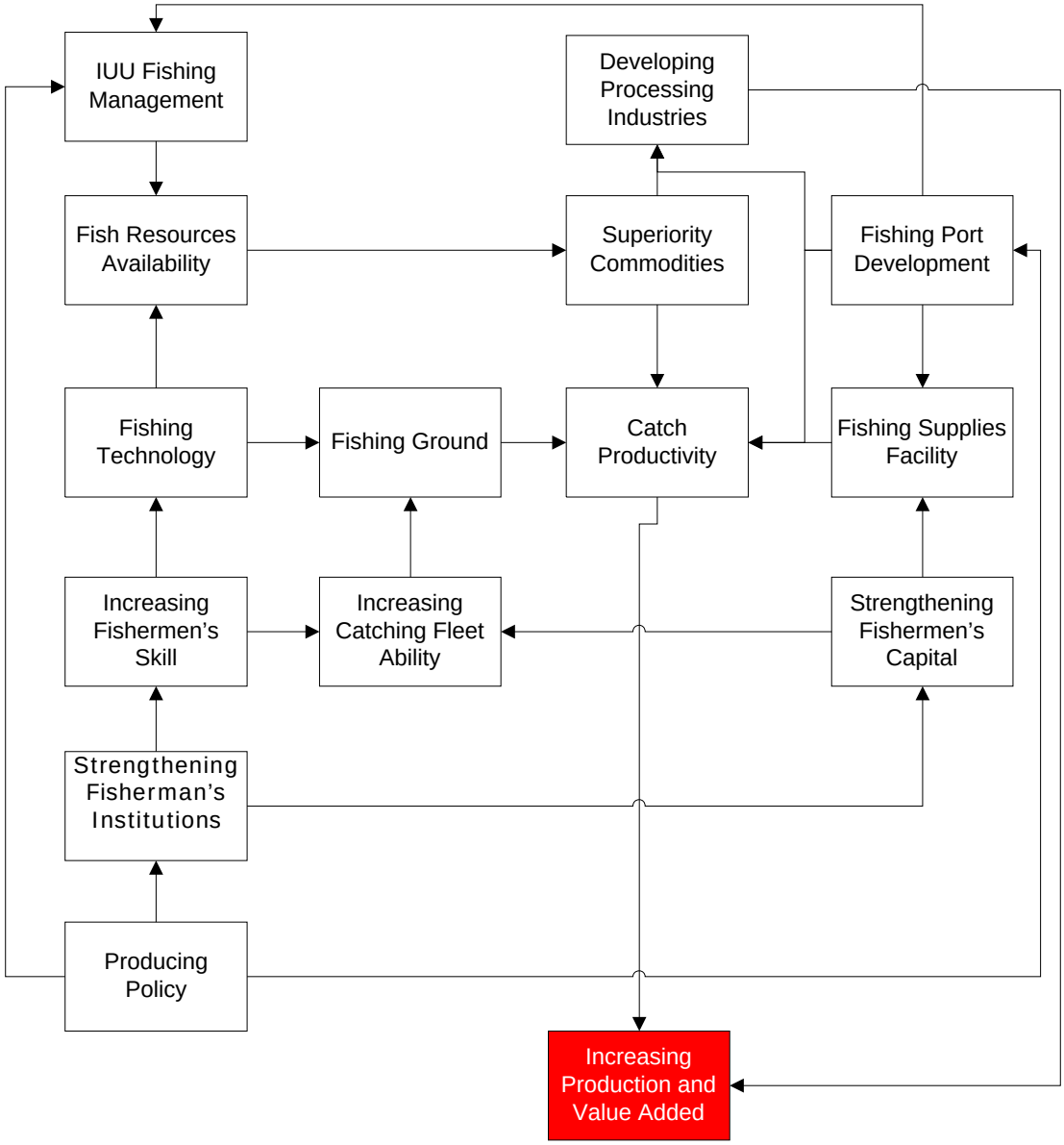


Figure 2. Conceptual model for production and added value in the development of capture fisheries in Nunukan.

Institution management is the basic rule in one community, or formally, it is a humanity tool that requires interaction among humans. Consequently, there is an intensive structure in such an interaction, not only in politic, and social, but also in economy

(Charles 2001). The discussion on institution management covers two aspects; namely, management regulation and management organisation. Regulations play an important role as they serve as a formal juridical base, becoming a stepping stone for the implementation of a management. Its study includes regulations, regulation coverage, inter-regulation contradiction, and regulation vacancy. There is no explicit rules regulating capture fisheries management in border areas in a wholistic manner. The only rule existing these days is license for operating pukat hela gear in East Kalimantan waters. In fact, capture fisheries problems, particularly in border areas, are relatively more complicated since they are not only related to inter-component interaction of capture fisheries in home country but also associated with fishery agents of adjacent countries. Within the context of management organisation, the aspect of coordination becomes the central of attention as there are relatively many institutions related to capture fisheries management in border areas.

The second conceptual model is a model for marketing and social relationship in capture fisheries development. This model aims to develop Self-Reliance and Bargaining Position Improvement. Currently the fishermen bargaining ability is very weak because of their dependence on the owners of capital and the uncertainty of the market for their catch. Therefore, efforts to improve this can be done by providing seed capital and better market access. This is done with the facilitation of cooperation between the two governments and their sales contracts. The conceptual model for marketing and social relationship in capture fisheries development in Nunukan is presented in Figure 3.

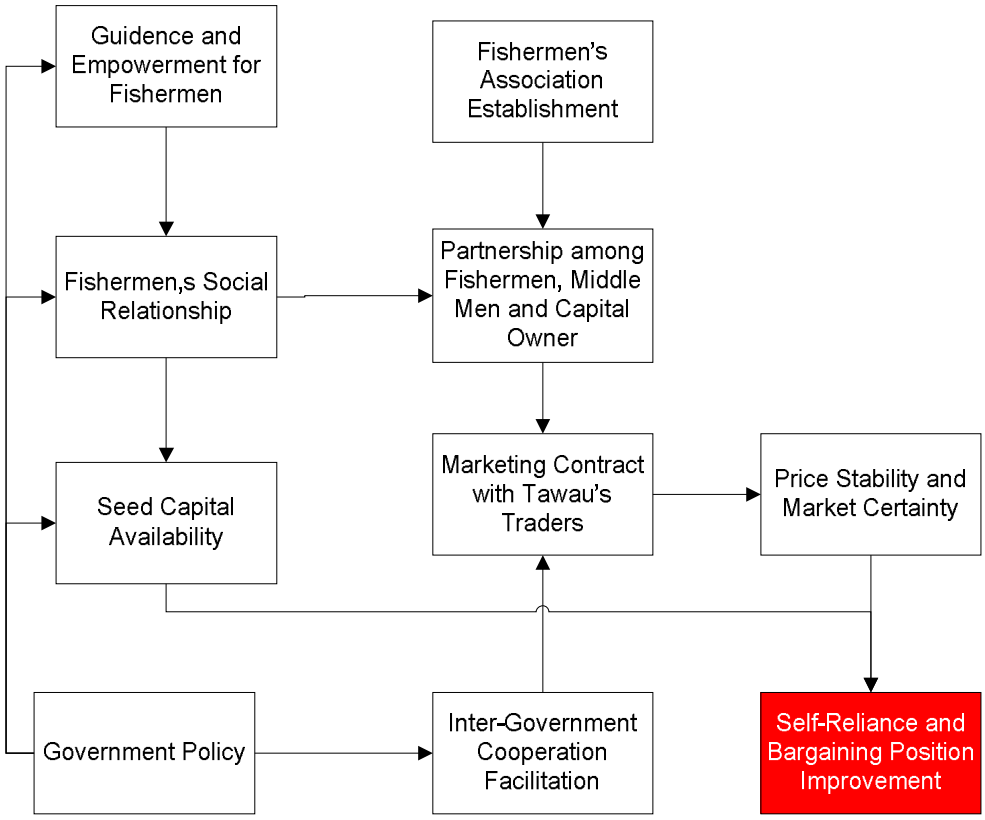


Figure 3. Conceptual model for marketing and social relationship in capture fisheries development in Nunukan.

The third conceptual model is conceptual models for management in capture fisheries. This model aims to develop a fishery management more effective. This is done by management institutional strengthening and organization effective improvement. The problem faced in the border region is the absence of a comprehensive fisheries management policy. Three actions to be taken is the preparation of management rules,

inter-institutional coordination and institutional strengthening. More model is presented in Figure 4.

The regulation of this capture fisheries management institution should lead to the achievement of overall capture fisheries development, covering development aims in economic, social, and environmental ways. Charles (2001) used the terms biological/resource conservation, social/equity, and economy/productivity in this case. Furthermore, he sharpened these goals into: (i) production of fish, which is essential for fulfilling food supply, (ii) economic efficiency which is directed to the use of a more efficient production input, (iii) employments – which are often set as the main goal in fishery development, in relation to fisheries and the development of village community and social stability, and (iv) foreign exchange/balance of payment which becomes the goal in national level; that is, bringing it to the increase of community welfare. In the broader context, moreover, the above goals support the development in economic sector; namely, industry diversification, sociopolitical stability, decreasing rural-urban drift, maintaining a regional balance of development.

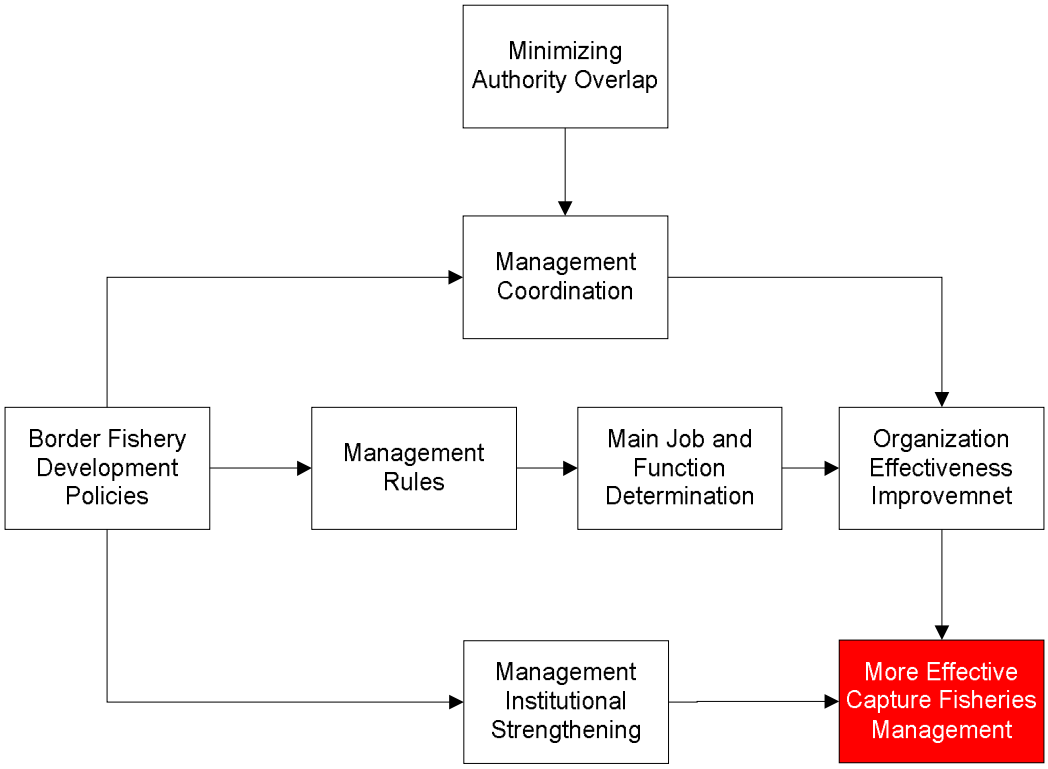


Figure 4. Conceptual model for management in capture fisheries in Nunukan.

With regard to this aspect of fisheries management the key success factors of management in the context of policy and planning are embracing complexity and integration, addressing conflicting aims, recognizing the importance of context, operating at multiple scales, ensuring institutional coherence, ensuring the viability and sustainability of ecosystem function, and adapting to external pressure and change (The Rockefeller Foundation 2013). The fundamental objective of management is expansion of the social and economical benefit derived from fisheries resources (Nazir et al 2015). Good economic policy and strong institutions for the governance of a fishery are two factors necessary for this fisheries development (Petersen 2002).

The fourth conceptual model is model for strategic environment in capture fisheries. Capture fishery is a part of the regional economic system in Nunukan Regency. Its development, therefore, is significantly affected by regional economic condition and constelation as a whole. These influencing aspects cover macro-economy in Nunukan Regency, infrastructure of the region, and regional regulation and policies. Agricultural sector is one of the fastest growth sector besides mining and excavation sector. In the

long term, however, agricultural sector will be more competitive due to the fact that this is a recovery sector compares to the other one. Sustainability and growth of agricultural sector largely depend on its proper management aspects. Agricultural sector superiority can be viewed from its proportional growth score which is the biggest and has positive value. This means that proportionally, it is relatively superior. Similarly, when viewed from Regional Segment Growth, it reveals that agricultural sector has the highest competitiveness. Meanwhile, infrastructure aspects are still facing problems regarding the low infrastructure provision in order to boost economic activities. Such a basic infrastructure is the accessibility in connecting from and Nunukan or among the places within Nunukan Regency, electricity and clean water provision. Though the availability of infrastructure will have an impact on economic activity and growth (Owolabi-Merus 2015).

Therefore, the fourth model concept emphasizes the importance of providing basic infrastructure so as to provide a conducive environment for the development of fisheries. In addition, development in the border region require investment incentives to encourage investors to invest in the fishing industry in the border region. More concept model is presented in Figure 5.

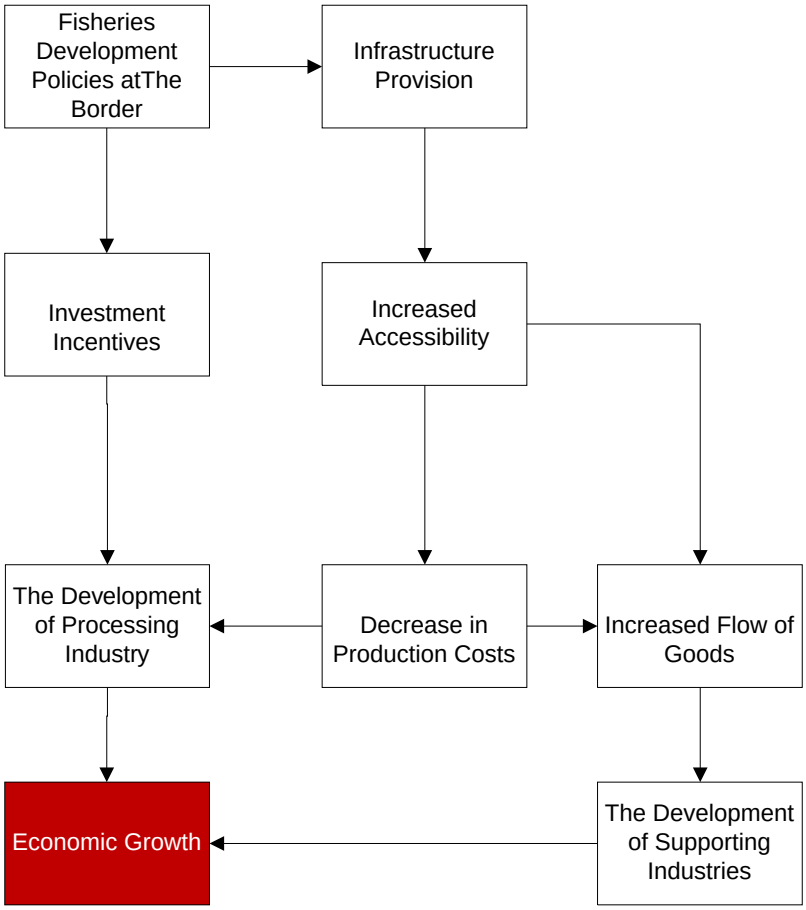


Figure 5. Conceptual model for strategic environment in capture fisheries development in Nunukan.

The interaction among development components is expected to be able to support the achievement of the goal of capture fisheries development in border areas; namely, rising fisherman's and national income through completing the system of catch trading abroad, maintaining fish resource sustainability in the border regions, handling IUU fishing practices, and improving collaboration between Indonesia and Malaysia in utilizing fishery resources.

***The comparison between conceptual model and reality***. A conceptual model is an ideal framework, an agregat of various transformation activities being performed, expected to achieve in the future. Based on the comparison between conceptual model anf current activity condition, it was found that major activities in this model have not been carried out. Nevertheless, there are activities that have been performed but have not given any effective results in succes indicator achievement (Table 2).

Table 2

Comparison between conceptual model and reality in sub-system of productivity increase and value added

| *Activities of models* | *Existence* | *How it is performed* | *Who performed it* | *The results* | *Actions required* |
|---|---|---|---|---|---|
| Making policies for comprehensive fishery management | None | - | - | - | Making management policies in the form of masterplan or blue print |
| Enhancing fisherman's institutions | Exist | Formation of KUB | DKP Nunukan | Not effective | Enhancing fisherman's institutions |
| Improving fisherman's skills | Exist | Training | DKP Nunukan | Have not reached all fisherman | Improving fisherman's skills |
| Strenghthening capital | None | - | - | - | Strenghthening capital |
| Improving catching fleet capability | Exist | Motorization | DKP | Not effective | Conducting identification on catching technology suitability |
| Facilitating fishing needs | Not institutionalized | - | - | - | Optimazing the function of fishery port |
| Building fishery port | New PP is not ready | Building | DKP | Not optimal | Accelerating building fishery port |
| Developing processing industries | - | - | - | - | Developing processing industries integrated with PP |
| Handling *IUU Fishing* | Done | patrol | DKP, AL | Not optimal | Optimizing the handling of IUU fishing |

Based on Table 2, there are only five existing activities of the nine activities necessary to achieve the purpose of the model. However, five of these activities have not run optimally. Four new activities that need to be done are making policies for comprehensive fishery management, strenghthening capital and developing processing industries. Therefore, activities that need to be prepared and implemented are making management policies in the form of masterplan or blue print, strenghthening capital and developing processing industries integrated with fishing port. Good fisheries management policy (including small-scale fishing such as Nunukan) will contribute significantly as a source of livelihoods, food security and income for millions of people around the world in both developed and developing countries (Purcell & Pomeroy 2015).

Comparison between conceptual models and reality in relationship marketing and social sub-system (Table 3) showed that most of the sub-system elemens was not running well. This means they require the introduction of activities to achieve the purpose of the model. The activities required are making management policies in the form of masterplan or blue print, forming fisherman's association, conducting initiation for cooperation in capture fisheries (marketing and processing) and initiating cooperation.

Table 3

Comparison between conceptual model and reality in marketing and social relationship sub system

| *Activities of model* | *Existence* | *How is it conducted* | *Who conducted it* | *The results* | |
|---|---|---|---|---|---|
| Making government policies | None | - | - | - | Making management policies in the form of masterplan or blue print |
| Forming fisherman's association | None | - | - | - | Forming fisherman's association |
| Empowering and guiding fisherman | Exist | Extention | Fisherman's empowering agency | none | Optimizing the role of fishery instructor |
| Facilitate cooperation | - | - | - | - | Conducting initiation for cooperation in capture fisheries (marketing and processing ) |
| Establishing partnership between fishermen and traders | Already exist | patron-client relationship | Fisherman-traders | no justice | Reformulating fisherman's partnership system |
| Establishing marketing contract with merchants of Tawau | - | - | - | - | Initiating cooperation |

Table 4 shows that the institutional management subsystem is still relatively weak. Two activities required is not executed properly, namely policies for developing capture fisheries and conducting reformulation of main jobs and functions. Two other activities have been implemented although not maximized, namely conducting coordination on management and strengthening managerial institution.

Table 4

Comparison between conceptual model and reality in management institutional sub system

| *Activities of model* | *Existence* | *How is it performed* | *Who performed it* | *The results* | *Actions required* |
|---|---|---|---|---|---|
| Policies for developing capture fisheries | - | - | - | - | Producing management policies in the form of masterplan or blue print |
| Conducting reformulation of main jobs and functions | - | - | - | - | Conducting reformulation on main jobs and functions |
| Conducting coordination on management | Done | Coordination meeting | DKP | Not effective | Conducting clear job division |
| Strengthening managerial institution | Done | Providing infrastructure, and human resources | DKP | Need to improve | Strenghtening managerial institution |

While the strategic environment sub-systems (Table 5) are relatively going well but have not optimal. Action needs to be conducted are preparing management policies in the form of masterplan or blue print, providing infrastructure, providing infrastructure and developing management industry.

Table 5

Comparison between conceptual model and reality in strategic environment sub system

| *Activities of model* | *Existence* | *How is it conducted* | *Who conducted it* | *The result* | *Actions required* |
|---|---|---|---|---|---|
| Policy capture fisheries development | - | - | - | - | Preparing management policies in the form of masterplan or blue print |
| Providing infrastructure | Being conducted | building | Related institution | Not optimal | Providing infrastructure |
| Extending investment incentive | - | - | - | - | Extending investment incentive |
| Developing management industries | Done | - | - | Not optimal | Developing management industries |
| Developing supporting industries | Done | - | - | Not optimal | Developing supporting industries |

***Actions for change and options of strategies***. Various conditions and levels of difficulties in implementing the activities in conceptual model have brought in several alternatives of priority scenario selection in implementing the activities. Such scenario selection is based on difficulty level and activity implementation. Based on this, three scenarios have been designed for selection; they are: (i) optimistic scenario in which all model activities are carried out. When all model activities are performed, it is believed that success indicators will all be achieved (+). This scenario, furthermore, requires entire inclusion of all parties, both central and regional governments including related technical institutions. Due to its reasonably vast and complex activities, this scenario requires large sacrifices, not only from attention focus, but also funding and time needed.

(ii) The next scenario is moderate scenario which prioritizes strategies which directly influence catching activities and income raise. The selected model activities, consequently, are those belonging to sub-system of production increase and value added as well as marketing system and social relationship. These two strategies are viewed as the most intentional ones to reach indicators of income rise and independency of fishermen. This scenario is chosen as it has unclear implication on an indicator achievement for effective management, accessibility improvement, and economic regional growth. Nevertheless, production increase, income raise, and selling price indicator can be achieved.

(iii) The last alternative is pesimistic scenario – the one retaining current condition with A, B, C that is uncertainly achieved and other indicators that will not be achieved (-). This scenario should be avoided as this means that there is no effort carried out to develop capture fisheries in Nunukan Regency. More are presented in Table 6.

The most rational choice of the above three scenarios is the moderate scenario in which sacrifice expelled is not as big as the one of the first scenario. As a result, the strategies need to carry out are: (i) producing management policy in the form of masterplan or blue print of capture fisheries development in border areas, (ii) strengthening fisherman's institutions, (iii) improving fisherman's skills, (iv) strengthening fisherman's capital, (v) identifying catching technology suitability, (vi) optimizing functions and accelerating establishment of both fishing port and processing industries, (vii) optimizing *IUU Fishing* management, (viii) optimizing the role of fishery extention, (ix) establishing cooperation in capture fisheries fields (marketing and processing) with businessmen and Malaysian government, and (x) reformulating fisherman partnership system.

Table 6

Scenario selection for capture fisheries development in Nunukan Regency

| *Scenario selection* | *Indicator influenced* | *Indicator condition* |
|---|---|---|
| Optimistic Scenario: conducting all conceptual model activities | A | + |
| | B | + |
| | C | + |
| | D | + |
| | E | + |
| | F | + |
| Moderate Scenario: conducting two sub conceptual model activities 1 and 2 | A | + |
| | B | + |
| | C | + |
| | D | ? |
| | E | ? |
| | F | ? |
| Pesimistic Scenario: do not carry out all conceptual model activities | A | ? |
| | B | ? |
| | C | ? |
| | D | - |
| | E | - |
| | F | - |

Note: A - production increase; B - income raise; C - better catch selling price; D - effective management; E - accessibility increase; F - economic growth; + : success will be achieved all; - : unclear achievement indicators; ? : indicators will not be achieved.

**Conclusions**. Problems regarding capture fisheries in Nunukan Regency, located in the border of Indonesia and Malaysia are relatively complicated. Such problems can be categorized into four major ones; namely, problems of catch production increase, catch marketing, capture fisheries management institutions, and strategic environment.

Strategies absolutely need to perform so as to overcome the above problems including (i) producing management policies in the form of masterplan or blue print of capture fisheries development in border areas, (ii) sthrengthening fisherman's institutions, (iii) improving fisherman's skills, (iv) stengthening fisherman's capital, (v) identifying catch technology suitability, (vi) optimizing function and accelerating the establishment of fishery port and processing industries, (vii) optimizing the handling of *IUU Fishing*, (viii) optimizing the role of fishery extention, (ix) establishing cooperation in capture fisheries field (marketing and processing) with businessmen and Malaysian government, and (x) reformulating fisherman's partnership system.

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