1 INTRODUCTION

1.1 Background

95% of the world’s fishers are small-scale operators and more than 90% of these are found in developing countries (FAO, 2007). In Indonesia approximately 2.2 million people are employed directly as fishers, the majority of them using hook and line gear, whose average family gross income is Rp. 400,000 (US $40) per month (Nikijuluw, 2002; FAO, 2009). Governments throughout SE Asia are aware of the plight of these families and there have been concerted efforts to help them (Bailey and Pomeroy, 1996; Seilert, 2002; Satria and Matsuda, 2004). Traditionally, this help has been in the form of capital investment (i.e. motorisation, larger boats/nets) that increased catching efficiency and enabled offshore stocks to be targeted (Bailey, 1993; Dey et al., 2008). Smith (1979) observed, some 30 years previously, that this policy could only be a short term solution and one that generally benefited the wealthier commercial fishers with existing capital equipment. Bailey and Pomeroy (1996) go further, arguing that these programmes may have inadvertently increased fishing effort in coastal areas and reduced occupational diversity forcing fishers down a blind alley. Catching more fish more efficiently, may result in increased export revenue but it rarely results in employment opportunities and better welfare for the majority of small-scale fishers (Bailey and Jentoft, 1990; Kusnadi, 2002). Collier et al. (1977 cited in Smith, 1979) give a striking example of this from the north coast of Java. In 1974 a motorised boat using traditional gear and employing 22 crew members caught the same volume of fish as 41 sailboats employing 287 people. This process of mechanisation has been repeated throughout Indonesia with the newer vessels being deployed alongside increasing numbers of traditional small-scale fishers. Heazle and Butcher (2007) report that in 1960 1,500 of the 170,000 fishing boats in Indonesia had any kind of motor but by 2002, 5300 out of a total of 550,000 vessels could be described as of industrial scale. They argue that while still desirable enough to attract foreign vessels, “many Indonesian fish stocks have been severely depleted”.

Within the fisheries economy there are three ways to increase returns; 1) catch more fish, 2) lower costs or 3) achieve higher prices. Bailey and Jentoft
(1990) argue that the real hope for fishing communities lies not within the fisheries economy but in improving economic opportunities outside of the fishery. The Indonesian government also recognises this need with fisheries Law 31/2004 focused on alternative livelihoods and income generation (Christie et al., 2005). These alternative livelihoods may be marine based such as harvesting seaweed, mariculture of finfish/shellfish and eco-tourism, or one of many unrelated opportunities such as chicken and duck breeding (Anon, 2005). In response to the 2004 Asian tsunami, Pauly (2005) argues that fishing boats should not be rebuilt but fishers taught to “repair bikes, sewing machines and water pumps”. The primary aim of these alternative livelihoods is to provide a means of income outside of the fishery but they are also typically intended to take pressure off fishing stocks, move fishers away from destructive fishing practices and reduce the vulnerability of coastal communities by increasing economic diversity (Sievanen et al., 2005).

As an archipelago nation Indonesia has enormous aquatic resources and the Ministry of Marine Affairs and Fisheries’ (KKP) vision is for Indonesian fisheries and aquaculture to be competitive and sustainable, for the welfare of society KKP (2014). While revenue increases can be made through increased capture efficiency as well as post-capture technology and processing, the KKP clearly sees an increase in productivity through aquaculture as driving the mission statement of “improving the welfare of marine and fisheries societies” (Anon, 2009). Indeed, with an expansive coastal zone Indonesia has tremendous potential for marine and freshwater based aquaculture but one crucial aspect of realising this potential is marine spatial planning (MSP). Following pilot projects in North Malawesi and Kalimantan there is currently a process of mandatory MSP

Generally “alternative livelihoods” implies a switch from one full-time occupation such as fishing to another, such as farming. “Supplementary livelihoods” implies that a person will continue in their normal occupation but will add another string to their bow such as a fisher adding seaweed farming to his normal activities. Occupational diversity is a reality of many coastal communities and references to alternative livelihoods in this thesis include supplementary livelihoods or side jobs (Indonesian - usaha sampingan).
application throughout Indonesia in response to UU 2007\(^2\). The aim is for each region (Kabupaten) to produce a geographic information system (GIS) map showing which activities are permissible and suitable in different parts of their jurisdiction. For a number of possible activities, including different forms of aquaculture and tourism, matrices of suitability have been developed (D. Bengen, pers. comm., 2010.) which can be used by marine spatial planners to identify the plausibility of these activities. These maps will clarify and streamline the MSP process and reduce conflict from competing activities. However the maps are only the first step in unlocking the potential of these regions. They will indicate which activities are possible and permissible but further work is necessary to ascertain firstly, how physically and technically this potential can be realised and secondly, how to ensure that the benefits accrue to entire communities and not a selected elite that already possess access to knowledge, financial capital and markets.

In reality, most regional fisheries managers as well as the fishers themselves already know which alternative livelihoods could be developed in particular locations. Many of the ideal locations for aquaculture and tourism have previously been snapped up by private investors but many more exist that with targeted investment and empowerment of local communities have the potential to improve the welfare of these communities. Such an example exists in Bali where the Gondol Research Institute for Mariculture was the catalyst for a burgeoning industry of backyard hatcheries (see literature review below and Siar et al., 2002).

In West Sumatra (West Sumatra) many fishers still live below the poverty line (Zen et al., 2002) and the traditional priority in West Sumatra for small-scale fishers has been to increase productivity from capture fisheries by the provision of boats, nets and machines. In personal communication with the author a number of small-scale fishers in West Sumatra have expressed gratitude for the grants they received to purchase machines for their boats but grave concerns about the future of capture fisheries in the face of competition from larger vessels and declining stocks. Desniarti’s (2007) analysis of pelagic fisheries in West Sumatra adds

\(^{2}\text{UU refers to Undang-Undang an Indonesian law.}\)
weight to their concerns by demonstrating the overcapacity that already exists in the fishery. In response to this, there have been livelihood diversification initiatives originating from private investors and the government including mangrove crab ranching, shrimp, grouper and seaweed farming. At the time of writing small-scale catfish farming using tarpaulin constructed ponds is being implemented in some coastal communities and milkfish aquaculture as a source of bait for the tuna fishery has started within the last year.

1.2 Research Problem

Small-scale fisheries have the potential to generate significant profits, prove resilient to shocks and crises, provide employment, alleviate poverty and meaningfully contribute to food security for millions of people (Allison and Ellis, 2001; Andrew et al., 2007; FAO, 2003; Kent, 1997; Thorpe et al., 2006). Yet, they are often referred to in tandem with poverty (Cunningham, 1993; Macfadyen and Corcoran, 2002). The factors contributing to a low standard of living amongst communities dependent on small-scale fisheries, were clarified by Smith (1979), and are summarised in Figure 1.1A and described below.

Limited fisheries resources is comprised of two components. The first is simply “too many fishers chasing too few fish make too little income” (Sumaila, 2008). Typically this is a function of overcapacity and results in overfishing. Small-scale fisheries can be a safety valve or last resort for the poor and the combination of large numbers of small-scale fisheries coupled with efficient larger vessels concentrated in a narrow coastline leads to depletion of stocks (e.g. Collier et al., 1977; Kurien, 1993). Besides overfishing, degradation of the marine and coastal environment through destructive fishing methods, loss of mangroves and pollution of nursery grounds can lead to a reduction in the ecosystem health and capacity for the production of exploitable resources (Copes, 1989). The second reason resources are limited relates to governance, equity and technological capacity. Biologically, the stocks can be exploited below the maximum sustainable yield (MSY) but be unavailable to small-scale fishers because they do not have the necessary rights or technological capacity to access them (e.g. Islam, 2003).
Lack of market power also incorporates two aspects. Firstly, small-scale fishers, unlike farmers, are unable to store their harvest and wait until the price is good. In tropical climates where the catch is often landed at many different points along the beach fishers are racing against the clock to sell the catch before it starts to rot. Depending on the location this can provide conditions for middlemen to prosper. It is important to emphasise that these middlemen have a valuable role in providing loans, financial security for the families of fishers while they are at sea and a guarantee that they will buy the fish. They may even own the boat and fishing gear and have provided the fuel to enable the fisherman to go to sea. However, as Smith (1979) points out “traditional fishers are poor; middlemen, on the other hand, generally are not”. The kind of relationship between fishers and middlemen can be exploitative and serve to preserve the status quo for poor fishing families (Elfindri, 2002). This is especially the case where cultural norms and the lack of education and information about the price and market alternatives leave fishers with few options besides the middleman.

The second aspect which has been touched on above is the handling and processing of fish in order to maximize revenue. Fishers used to selling it on the beach may not know that certain handling practices, especially with high value catches such as tuna, can increase the sale price. The absence of cold storage facilities combined with poor road access limits the capacity of fishers to access more lucrative markets. Finally, while drying and salting are frequently used to process and preserve the catch, adding value through smoking or processing fish waste into food for human or animal consumption are uncommon.
Figure 1.1: The problem facing small-scale fishing communities (panel A) and the possible solutions (panel B). Modified from Smith (1979).
Inflation and wider economic changes do not only affect fishing communities but all rural communities. They need not necessary be negative changes with the possibility that an increasingly wealthy proportion of the wider population combined with a shortage of wild stocks increases the price of the catch and the revenue obtained by fishers. However, the geographical isolation of fishing communities can mean that consumer goods originating from the larger urban centres are more costly in the fishing communities and that the price of fish has not kept pace with the wider retail price index. Furthermore, increasing fuel costs can swiftly cripple the fishing industry.

Related to the wider economy above is the lack of viable alternatives. Because of its low capital investment costs fishing is an attractive proposition for the landless poor. Consequently it has had an important role in absorbing the surplus labour of the landless poor and unemployed (Béné et al., 2010). Pursuing a strategy of maximizing economic rent, that is of having fewer, highly efficient fishing vessels, is possible in tropical fisheries but is working against the ‘natural’ trend, that is, of the jobless seeking employment in the fishery. In order for this policy to be successful the wider economy needs to be strong enough to absorb the surplus labour that would be generated. Although coastal communities vary in their dependence on fishing typically a great deal of occupational multiplicity already exists. Fishers may own some chickens or goats, plant rice or have a member of the family working in another business locally or further afield (Bailey, 1993). These simple alternatives have low capital costs and are complementary to the fishers’ way of life. However, many alternatives such as fish farming require capital costs beyond the reach of small-scale fishers who are not willing to risk their already vulnerable income from capture in a potentially risky aquaculture venture.

These five problems identified by Smith (1979) are not independent of each other but closely interrelated. For example, the lack of viable alternatives may be connected to an absence of financial capital which could stem from the fishers’ dependence on the middleman. This dependence on fishing as the primary source of income only serves to accentuate the depletion of limited natural resources.
Coastal communities are wider than the fisheries sector alone and the degree of fisheries dependence is highly context specific. In places where small-scale fishing contributes a small proportion of individual or community income, Smith’s (1979) analysis will need to be broadened to incorporate other aspects of the rural economy.

These five problems do not account for every possible reason why small-scale fishers continue to be poor. Smith’s (1979) review takes one slice of the economy, that of small-scale fishing, and focuses on the main reasons that this economic sector does not enable fishers to escape poverty. Underpinning these five factors are aspects of governance, equity, education, cultural values such as attitudes to work, social relations, cooperation, natural disasters, vulnerability and exclusion amongst others (Béné, 2003, Islam, 2003, Jentoft et al., 2010). This is crucial because Smith’s (1979) solutions (explained below and shown in Figure 1.1B) focus on the income generating aspects of poverty alleviation. Clearly increasing revenue for poor fishing-dependent households may be an important aspect of a development program but these underlying factors may hamper the increase in standard of living even though household incomes have increased. The obvious example of this is where the additional income is spent on gambling or alcohol consumption rather than benefiting the wider family. Finally, Smith’s (1979) work reflected the prevailing perception at the time that poverty is lack of income and low consumption. An understanding of poverty has since evolved that incorporates human rights and qualitative aspects such as feelings of powerlessness, humility and insecurity (Allison and Horemans, 2006).

In spite of these limitations, Smith (1979) made a convincing case for alternative livelihoods even while policy makers continued to target efficiency solutions that served to magnify overcapacity in the industry. The arguments that Smith (1979) made in response to the problems and solutions available to small-scale fisheries are still valid today. He argued that for fishermen to increase revenue means catching more fish, achieving a higher price or lowering costs through the following three ways (Figure 1.1B):

(1) Vessel and gear upgrading. This is a highly popular approach with instant, tangible results. Catches in the short term increase but unless the current stock is not fully exploited or new stocks can be targeted this strategy can lead to
social conflict between the have and have-nots as well as overcapacity and decreasing revenue in the long term.

(2) Restricting effort or subsidizing the fishing industry. Restriction of effort through traditional fisheries management measures such as closed areas/seasons and mesh size restrictions are effective in theory but often difficult to enforce in the widely dispersed small-scale sector. Subsidizing the industry through fuel subsidies or loans below market rates distorts the market and can lead to overcapacity.

(3) Improving marketing and post-harvest technology. This can include reduction of waste or the provision of marketing infrastructures, such as transport, ice and cold storage, or landing areas. Unless effort is capped any gains can be lost in the long term by new entrants being attracted to the fishery resulting in overcapacity. Post-harvest processing can enable the fishers to gain a higher price.

Cunningham’s (1993) simple economic model reinforces Smith’s (1979) argument by demonstrating that a short-term surplus in the fishery leads to overcapacity if labour is sufficiently mobile and returns from fishing are higher than other jobs. Smith (1979) reasoned that the only method that increases revenue over the long term is the development of alternative livelihoods (Figure 1.1B). Small-scale fisheries are stuck between a rock (limited stocks) and a hard place (high numbers of inefficient fishers). He argued that there is no solution within the fisheries sector that can reduce effort while simultaneously offering employment to fishers. This is the theoretical basis for the development of alternative livelihoods as a means to increase the standard of living of fishing dependent communities.

Globally, more recent authors agree with Smith (1979) that the solutions are wider than the fisheries sector alone. They argue for policies that move away from increasing production in the catching sector (Bailey 1993), and that move towards developing strong institutions that target broader livelihood strategies and the strengthening of the wider economy (Bailey and Pomeroy, 1996, Allison and
In Indonesia the fisheries sector is not fulfilling its pro-poor potential and livelihood diversification is recognised as a resilient long term strategy to combat poverty in small scale fisheries (Yafiz et al., 2009) with Suyanto (2004) arguing, “fishing households that develop diverse livelihoods are always stronger and can overcome economic pressures.”

While there is a strong justification for livelihood diversification as a means of improving fishers’ livelihoods, it is important to note that small-scale fisheries need more than just the development of alternative livelihoods. Attempts to limit effort through marine protected areas and gear restrictions are important steps to ensure that the ecosystem base is maintained and able to support a profitable and thriving fishing industry (Pomeroy et al., 2009). Similarly, efforts to increase revenue through processing are needed to enable remaining fishers to be as profitable as possible. Moreover, simply opening up new sources of income does not mean that the standard of living for the poor automatically improve. Diversifying income sources is one aspect of poverty alleviation that must examine the processes and institutions that made people poor in the first place (Béné, 2003).

The theoretical need for alternative livelihood development is strongly established with Crawford (2007) writing, “livelihood initiatives are an important element of almost all Integrated Coastal Management (ICM) Programs implemented in developing countries around the world.” However, in Indonesia, the theoretical need has not always translated into practice. Despite the number of programs and initiatives that have been implemented, differences in policy and implementation between government agencies have meant that poverty alleviation efforts have lacked coherence. One reason is that policies and programs are not always in line with the needs of the most needy. Purwanto (2007) identifies nine programs, including Inpres Desa Tertinggal (IDT), Kredit Usaha (KUK), and Kredit Usaha Kecil (KUK) that are specifically aimed at empowering households and communities to overcome poverty and asks the question, “despite all this effort, why have these programs not worked?”

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See Section 2.1 of the Literature Review (below) for a further discussion of this point.
(World Bank, 2012a) and because of the multi-dimensional nature of poverty, uncoordinated efforts tend not to bring long-term solutions. Sallatang (1998) argued that fishers were not participating in the management process, rather being passive receivers and had weak institutions. Purwanto (2007) agreed that communities are receiving aid but are not being empowered to manage that aid. Others argue that the structural and cultural aspects of poverty need to be tackled to ensure poor fishers experience justice and are motivated to seek a better future (Elfindri, 2002; Syahrizal et al., 2011; Tain, 2011). Some programs have been broadly successful with the ongoing National Community Empowerment Program (PNPM) being cited as one of those that harnesses social capital well (World Bank, 2012a). Others are publicised as successful but on closer inspection have not produced the kind of transformation that was hoped for. One example of this is in the village of Sungai Pisang, Padang. A Marine and Coastal Resources Management Project (MCRMP) set up 20 small self-help groups (Kelompok Usaha Bersama – KUB) in 2007 and amongst other activities such as coral farming started a revolving fund for Tilapia and mud crab farming. A year later a report was written documenting how successful the project was (Agussalam, 2008). Yet when the author discussed this program with a local scholar (Arlius, pers. comm.) and made a field visit in 2010 it transpired that the mud crab component had completely failed to work because of a poor design, the Tilapia had been partially successful but the fund had ceased to revolve and because there was no market for the coral farming that had ceased to function. This program had worked successfully enough to write a report in 2008 yet had further monitoring and evaluation happened two years later it would have demonstrated a degree of failure and the authors would have the opportunity to examine the root causes of that failure. It is this examination of what is causing these initiatives to fail to improve livelihoods for the long term that is sorely needed and is the motivation of this current research. Indeed, the failure of previous programs to tackle poverty in coastal communities in West Sumatra was confirmed when in 2012 the provincial governor inaugurated the new program GPEMP (Gerakan Pensejahteraan Ekonomi Masyarakat Pesisir). This is a cross-agency program incorporating 14 government agencies with the following aims.
1. Strengthen existing technology and human capacity of coastal residents.
2. Develop supplementary fisheries and aquaculture based livelihoods.
3. Develop the processing and ‘down-stream’ aspects of fisheries.
4. Develop supplementary livelihoods outside of fisheries and aquaculture.

These aims are essentially the same routes that Smith (1979) identified (Figure 1.1B). However, there is still a concern that a ‘gap’ exists between program design and program implementation. The author has spoken with a number of representatives from provincial and local government agencies, including the Fisheries and Oceans Agency (DKP) and the Planning and Development Agency (BAPPEDA) who have suggested a variety of reasons why initiatives have succeeded or failed, including technical inadequacies in the design of equipment, cultural resistance to adopting new methods, laziness, lack of ongoing extension and support, absence of a market for the alternative products produced and poor infrastructure. Yet to date, there has been no rigorous scientific analysis of whether interventions are doing the right things in the right way and this research is a response to that question.

1.3 Research Aim and Objectives

Based on the background and problem outlined above the aim of this research is:

To analyse whether livelihood improvement initiatives address the needs and constraints of poor fisher households in selected coastal communities in West Sumatra.

This aim was achieved through the following objectives:

Objective 1: Provincial-wide review of fisheries dependence and poverty. To develop indices of fishing dependency and poverty that isolate the most highly fisheries dependent/poor communities in mainland West Sumatra and
to examine the relationships between poverty in fisheries and poverty in other economic sectors.

**Objective 2: Livelihoods and poverty analysis.** To determine the household livelihood context of selected representative coastal communities in West Sumatra and to quantify the key enabling and constraining factors in livelihood development and poverty alleviation in fishing communities.

**Objective 3: Evaluation of existing livelihood interventions.** To evaluate the suitability of previous livelihood projects in West Sumatra with the needs and constraints of the poor. Livelihood diversification initiatives are costly in time, finances and in confidence. A failing project may leave coastal communities without a second chance to source financial capital or the motivation to try again. Hence there needs to be good justification for choosing one type of project over another and ensuring that the process of implementation leads to successful uptake by the community. Objective 3 seeks to learn lessons from the implementation of previous projects and analyse whether they are what the poorest households dependent on fisheries really needed.

**1.4 Research framework**

At the simplest level the fisheries system is about people in boats catching fish in the sea (Charles, 2001). However, as Charles (2001) recognises, the system in reality is a complex combination of human and ecological sub-systems in interconnecting relationships. While including relevant elements of the ecosystem, this research is particularly concerned with the human system of livelihood strategies and within this, the interface between interventions and existing livelihood strategies. The basic framework of Figure 1.2 is the Sustainable Livelihoods Approach which is explained at length in the literature review. In essence, household livelihood strategies are determined by the access they have to the five asset categories. Some of the factors that determine access to those assets are way outside the control of stakeholders but others of them can be influenced. It is these aspects that can be influenced that the interventions are trying to achieve. As a concrete example of this, a fisher may work seasonally catching fish
and also work part time on a rubber plantation. The global price of rubber is outside of the control of any local intervention, however projects could be developed that lower transportation costs and keep the rubber competitively priced. Similarly, in the absence of subsidies changes in the global oil price can be passed on to small scale fishers making going out to sea uneconomical. However, a project can be implemented to look at the feasibility for fishers who own land to grow their own biofuels and become self-sufficient. The successful outcome of such a project would decrease their vulnerability to global price hikes.

Figure 1.2: The SLA research framework. Emphasising the interface between the intervention (blue box) and the components of the livelihood strategy (based on modified form of SLA as shown in ADB 2005)
The aim of this research is to understand the links between the different components of the livelihood strategy and to identify those links that particularly prevent poor fisher households emerging from a state of poverty. Having identified the crucial links in the chain, the next stage is to examine whether livelihood interventions are addressing those key links in the chain. The hypothesis for this research is; livelihood improvement initiatives in at least some coastal communities in West Sumatra do not meet the needs and constraints of poor fisher households.

1.5 Research Contribution

The novelty of this research is in the methodological and practical applications that it brings. It is firmly established in the literature that fisheries and poverty relate to wider systems economically, ecologically and socially (see for example Charles, 2001; Berkes et al., 2001; Béné, 2003, Kusnadi, 2004). In both disciplines, authors are calling for a move away from individual measures, such as species specific stock assessments or infant mortality, towards tools that capture and quantify the complexity in these systems. Doing so presents many conceptual and methodological challenges, not least in a huge, developing country such as Indonesia where the research budget is stretched. The research tools described and developed in this dissertation are a response to these challenges and enable policy makers and practitioners to:

- Incorporate social and economic data into the Marine Spatial Planning (MSP) process using readily available statistics and by including poverty statistics in MSP to ensure the process involves the needs of the poor.
- Conceptually understand that poverty alleviation is multi-faceted and to have 1) a checklist of the key factors that inhibit and enable livelihoods and 2) a quantitative methodology for measuring those factors. This method, while tuned to West Sumatra will be highly applicable to examine livelihood resilience in other coastal communities.
- An approach to evaluating livelihood improvement initiatives through the lens of the SLA that can help policy makers assess if their programs are being designed effectively.
Despite the good intentions behind many livelihood diversification and fisher empowerment projects, there has been a low rate of success and sustainability. This research brings robust methodology to examine why programs are unsustainable and directs policy makers towards improving initiatives. Key findings from this research will be disseminated to government agencies, research institutions and NGOs. Although it is hoped that the published papers can have a role in shaping national policy, the tangible output of this research is that future projects are implemented in West Sumatra that will incorporate the recommendations from this research and benefit the poor for the long term.