LIVELIHOOD DIVERSIFICATION IN COASTAL AND INLAND FISHING COMMUNITIES: MISCONCEPTIONS, EVIDENCE AND IMPLICATIONS FOR FISHERIES MANAGEMENT

(working paper)

by
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Contents

1. Introduction, paper aim, scope and plan

Diversification is a process by which households engage in multiple income generating activities. It is widely seen in the academic literature and international development arena as a strategy for spreading risk and reducing vulnerability. The formulation of policies promoting diversification is thus encouraged at national levels to alleviate poverty. However, such policies involve delicate choices and trade-offs between government objectives of development, e.g. intensification of agriculture and increase in agricultural outputs to satisfy export markets, versus increased household well-being and resilience to adversity through the promotion of small-scale, household-based, activities. In the context of fisheries, diversification is promoted as a means for reducing dependence on the resource, making restrictive management easier and less controversial for those affected by such measures.

This often interprets diversification as job-substitution (stop fishing, do something else) rather than adding other activities to an income-portfolio. With the tendency for increasing pressure on fishery resources, it becomes ever more necessary to address in a coherent way diversification and its links with both poverty reduction and responsible fisheries.

Implications of the development of alternative or complementary activities alongside a main, resource-dependent activity such as fishing, may echo those experienced by sectors such as agriculture and pastoralism. However, many characteristics of the fishing activity and of those who engage in it are particular to the sector. General poverty alleviation policies and fisheries management schemes have been found to lack the necessary differentiation and to fail to cater for the specific needs of fishing communities (Smith et al. 2005). The lack of attention – or misplaced attention through maladapted policies – that the sector and the communities it supports have received so far can be traced to a number of misconceptions stemming from "the old paradigm on poverty in small-scale fisheries" (Béné, 2003, p950). These assumptions include that (after Béné 2003, Allison and Ellis 2001):

- Fishing is an ingrained activity in fishing communities and fishermen will not leave fishing for cultural reasons.
- Fishermen are specialised and carry out fishing on a professional basis only.
- Fishing is a last resort activity and fishermen are unable to diversify into other income-generating activities.
- Fisheries development and development of fishing communities is not possible without increasing fishing effort.
- Livelihood diversification in fishing communities cannot go hand in hand with a sustainable natural resources management that encompasses both sustainable fisheries management and poverty alleviation.

It is the aim of this paper to challenge these assumptions. Because of its linkages with resource management, looking at diversification in fishing communities involves re-exploring the issue from a different perspective than its current interpretation and most widely-encountered application to agricultural (land-based)-livelihoods. Despite the potential broad remit of this task, the objective here is to remain focused on the necessity to dispel misconceptions and show the need to formulate policies that support the engagement of fisherfolk and their families in multiple activities. By doing so, the paper shall also provide a compilation and review of available information related to diversification in fishing communities and point out the complexity of the issue of diversification in these communities. The geographical scope of the paper is global, guided by the availability of case study material, though reference to the West African experiences of the Sustainable Fisheries Livelihoods Programme (SFLP) is made wherever possible. Unless expressed otherwise, the terms 'fisheries' or 'fishers' make implicit reference to artisanal fisheries and the small-scale operations and modus operandi of those relying on them.

The paper starts with a review of the concept of diversification, encompassing its associated dimensions, typology and influencing factors. Linkages between diversification and poverty are also briefly outlined in this section. The case of diversification in fishing communities is made in the third part of the paper, exploring misconceptions in greater depth, providing case study evidence to dispel them and highlighting consequences of inappropriately designed and targeted policies on fisherfolks. Implications of diversification in relation to the state of fisheries resources and their management are explored in the fourth and last part of the paper.

2. The concept of diversification

2.1 Interpretation of the concept of diversification

Definition and associated dimensions

Diversification is the process by which a household increases the diversity (i.e. number) of its income generating activities (Ellis 2000a). Often studied in association with adaptation and accumulation, it is a household risk management strategy used to secure income and consumption needs whilst minimising the risks of failing to do so. The purpose of diversification is thus to develop portfolios of income generating activities with low covariate risk among their components (Ellis 2000a, 2000b, Hazell and Norton 1986). Most studies recognise the benefits of diversification as a means to achieve increased income and livelihood security. In particular, Ellis (2000b), Carter and May (1999) and Reardon et al. (1992) emphasised the role of flexible government schemes and policies in promoting diversification, such as the removal of financial, legal and fiscal boundaries (such as market access, transportation and commodity taxes) to uptake of new activities, while taking into account regional/local specificities and households' motives for diversifying their income sources.

A distinction of relevance in the literature on diversification is that between coping and adapting. Coping is a short-term response (or *ex-post*) to decreasing income or food supply. Adapting, on the other hand, is a gradual and long-term response used to buffer the household against future potential shocks and changes, usually classified as a permanent *ex-ante* strategy (Davies 1993). Risk being the decision maker's "subjective perception of uncertainty" (Kostov and Lingard 2001: 4) and uncertainty being a large contributor to household vulnerability imply that diversification may be adopted as an *ex-ante* strategy, by choice (documented in studies by Ellis 2000b, Valdivia et al. 1996, Reardon et al. 1992), allowing households to better cope with unforeseen shocks, adverse events and trends, and seasonality (Alwang et al. 2002, Dercon 2001, Chambers 1983).

Nuances of "diversification"

- Diversification versus diversity

The outcome of a diversification process is a larger number of income generating activities for an individual, household, local or national economy. At local and national economy levels, increase of income generating activities in the rural non-farm economy raises the question as whether rural non-farm employment[1] is an accumulation strategy providing opportunities for those choosing to positively adapt, or a means by which labour displaced from traditional activities is absorbed (Ellis 1998, Reardon et al. 1992). Despite the importance of agriculture – or fisheries – in rural areas, the former involves higher capitalisation, productivity and stronger demand than the latter. As such, non-farm rural employment, when added to an existing portfolio of activities, is considered a vector of economic growth through the creation of linkages for inputs, outputs and consumption goods (Start 2001), raising incomes and efficiency.

At the household level, by relating outcomes to the "diversity versus (or) diversification" question, one may ask whether households with more than one activity outside the agricultural/fisheries sector could be considered as less poor, less vulnerable, or whether it is

[1] Non-farm rural employment is understood here to exclude fishing (and fish farming) as a primary activity. In this sense, fishing, like forestry, as a natural resource-based activity, is more closely associated with agriculture/farming than 'service' or industry-oriented, non-farm activities.

the fact that households are able to continuously change and adapt their portfolio of activities that makes them less poor and less vulnerable.

- Specialisation within diversification

Specialisation is not necessarily antagonistic to diversification in a livelihood context. A household may indeed hold a portfolio of specialised activities carried out by individual family members (Ellis 2000a), as a result of a diversification strategy. Results of a diversification strategy can be evident at the farm level through 'on-farm diversity' (when a number of more or less specialised crop and livestock production activities are carried out on the household farm land) or when farming activities are complemented by specialised non-farm activities in the rural economy. Similarly, in the case of marine fishing, 'within fishing' specialisation occurs (fishing with different gears, adapted to target species). Diversification in specialised activities 'outside fishing' such as agriculture or rural service-type enterprises alongside traditional fishing pursuits is also encountered (Coulthard 2005). In the case of inland fishing, Smith et al. (2005) contended that specialisation was relatively rare because of limits of scale such as fishing space, effective demand and labour needs, and under-investment, although it was noted that large water bodies provide scope for specialisation and that some wealthier households are more likely to invest in specialised assets (for the market). In the case of small-scale fisheries, this was supported by Salas and Gaertner (2004) who found that being "generalists" allowed small-scale fishers to switch among target species with changes in their circumstances.

- Diversification does not mean substitution

In the same way intensification does not need to follow specialisation, diversification does not always mean substitution. In Asia and Africa, it was observed that rural people do not specialise in one activity to the exclusion of all others, but rather increase their portfolio of economic pursuits to encompass a wider range of productive areas (Hussein and Nelson 1998). Consequently, the term 'alternative' livelihood activity should be used cautiously depending on whether a new household enterprise replaces an existing one, or complements it, either through integration (for example the backyard processing of a home-grown product) or through simple addition to the existing household activity portfolio.

Given the range of nuances and associated dimensions to 'diversification', how should it be understood in application to fishing communities, and what form of diversification is prevalent among them? For example, should fishing-associated activities, ranging from boat building to fish frying or ice making, be understood as part of diversification processes, or should diversification be understood as doing something completely unrelated to the original activity engaged in (for example, bicycle maintenance for a fisherman)? As explored in the next section, many factors, often context-specific, influence the process of diversification, both within and outside fishing.

Determinants of diversification

The determinants of diversification have been increasingly reported in the literature, though frequently focusing on farmers, and have shown consistency across time and space (Barrett et al. 2001)[2]. In a general context, many factors, of a 'pull' (positive) or 'push' (negative) nature, influence diversification and its outcomes. IMM et al. (2005) have proposed a useful sustainable livelihoods-based framework to classify such factors as a means to better understand the processes of livelihood diversification in coastal communities of Cambodia. The major components of this framework are reproduced in Table 1. Examples from the literature, and wherever possible from fisheries, are then used to provide deeper insights into some of these determinants.

[2] Editors of a special issue of *Food Policy* on "Income diversification and livelihoods in rural Africa: cause and consequence of change".

TABLE 1
Categorisation of determinants of livelihood diversification at the household level[3]

Livelihood strategy-related factors	
Perception of risk	
Migration	
Inter-generational investment	
Resource-related factors	
Factors related to human resources	- attitude and identity - education - technical skills - entrepreneurial skills - health
Factors related to social resources	- organisations, network and kinship
Factors related to natural resources	- agriculture and land - non-agriculture based activities, incl. fisheries
Factors related to financial resources	- diversity of financial resources - credit - wages - remittances - productivity and profitability - investment in growth
Factors related to physical resources	- household physical resources - infrastructural development

Source: IMM et al. (2005)

Although it is beyond the scope of this paper to list and review every single determinant of livelihood diversification, it is important to note that these factors are usually combined. For example, linking wealth and risk management strategies, Valdivia et al. (1996) showed that households with more liquid assets (cattle and small livestock), were in principle better endowed to survive shocks, and therefore less likely to diversify their income sources. In practice however, they were not less diversified than those with no or small livestock holdings, but had the financial capacity for self-investment allowing them to engage in higher income – higher risk activities (Dercon 1998). In the case of poor households, willingness to avoid risk stemmed from the "non-separability between current consumption and future productive capacity in the form of subsistence requirements" (Zimmerman and Carter 1999: 29). As a result, poor households adopted low risk - low return activities (Dercon 1998).

Migration and mobility are the geographical component of diversification. In the context of fishing, variations in catches and fish stocks may result in two different adaptation strategies. For migrant fishers, the response strategy to mitigate declines in catches will be to migrate to richer fishing grounds on a seasonal basis. This pattern is found amongst Ghanaian fishermen who travel much of the West Africa coast in search for fish. However, this form of migration is also conditional to the financial resources of the fishermen and their facilities (e.g. canoes, speed boats, bicycles etc.) (Fatunla 1996, example of Nigeria). For settled fishers' populations, migration can also be a solution, though instead of chasing fish, they will engage in alternative non-fishing activities on nearby land, move to urban centres, or temporarily travel to nearby villages for a few days to market fish and engage in other businesses before returning home (Fatunla 1996). This was also illustrated in research in Andhra Pradesh coastal communities which showed that migration was an integral part of fishing livelihoods, but not on a permanent basis (IMM 2003). With increased population

[3] This table does not reproduce here the 'influencing factors that can be influenced' nor those that cannot be influenced. This is addressed in a later section of the paper.

pressure, in-migration to coastal areas for fishing can also become a livelihood alternative, driven mainly by family connections (Kramer et al. 2002). In contrast, income opportunities can drive migrants to find jobs in urban coastal centres as crew members on industrial fishing fleets (*ibid*).

Inadequate knowledge and skills obstruct access to alternative employment niches, especially in the non-farm sector (Barrett et al. 2001, Dercon 1998). In the case of Nigerian fishing communities, children's school attendance is particularly challenged by the migrating patterns of fishing families, as well as high cost of education, lack of transport and facilities and high, but seasonal, profitability of the fishing activity (Fatunla 1996). Undoubtedly, unless addressed through more flexible literacy and education schemes for fishing households, this will impact on the building of human capital, with negative consequences on individuals' capacity, not only to uptake future employment opportunities within or outside of the fisheries sector, but also to engage more fully in community life as citizens (FAO 2006a, SFLP 2005).

Nawaratne et al. (in press) studied entrepreneurship amongst farmer-fishers of inland areas of Sri Lanka. They found that successful farmer-fishers were those who not only had developed a mix of activities, but also were able, through their managerial capabilities, personal attributes such as flair and attitude to work and entrepreneurship, and social networks, to perceive opportunities and capitalise on them, even in highly resource-constrained environments.

Cultural factors, such as caste, can in fact counteract the advantage and flexibility of wealthier households to engage in diverse income streams and adapt to changing circumstances. Coulthard (2005) reported the case of a South Indian fishing community where wealthier fishermen bound by their caste, specialised skills and status were unable to diversify their fishing techniques, and as a result, were less able to cope with variations in fish catches and exploit niche fish species than scheduled caste – so-called unprofessional fishers – who were freer to use a wider range of fishing gears.

Gender is another factor influencing the type of income generating activities engaged in. Studies in fishing communities of Tanzania and Kenya confirmed that whilst fishing was not an important activity for women's groups, fish trading was an important activity for them, but second to farming (MRAG 2003). Case studies in Benin and Congo (Gnimadi et al. 2006) reported a higher degree of diversification in income generating activities for women. Gnimadi et al. (2006) and Massamba et al. (2005) confirmed that men's activities stop when fishing due to low catches is halted. Women continue fish trade using imported frozen fish or are involved in often low value adding agro-processing activities and increase gathering and selling of wild fruits and vegetables and intensify their agriculture activities. In Burkina Faso on Lake Bagré, women sustain income at the household level through activities like petty trade which gives low but stable returns – un-affected by seasonality (Kabore 2006). However, in Nigeria, Fatunla (1996) showed that women engaged in similar occupations to their husbands: fishing, trading and mat weaving. This: i. shows that wives and female relatives of fishermen are not necessarily always involved in post-harvest activities, as has traditionally been assumed to be the case (Choo et al. 2006, FAO/SFLP 2006), ii. provides supplementary evidence of the range of income streams available to fishing households to which both men and women contribute, iii. reinforces the relevance of considering the household as the smallest unit when investigating diversification to capture it adequately and go beyond generalisations and stereotypes.

Lack of credit provision targeted to poor households with low assets has been identified as an important constraint to technology adoption in mixed farming systems (Paris 2002). Fishing communities are also no exception to this. An example of corrective measure was promoted by the SFLP, in collaboration with a national credit union, who developed pro-poor products such as credit for smoking ovens and drying facilities. These pro-poor credit schemes included business training, lower savings requirement and adapted grace period and repayment schedule. The collaboration of the credit union body with the national fisheries department – who guaranteed extension services to the poorest and not yet organised groups such as fish dryers and oyster collectors– was crucial to the success of the undertaking (Mattar and Mendy 2006, Mendy and Njia 2003).

By extension, dis-functioning financial markets also hamper diversification opportunities within the sector or into non-farm activities (Barrett et al. 2001). For Vietnamese fishing households for example, who lack collateral in the form of land, the problem is even more acute: banks perceive as high risk to lend for fishing gear upgrades or improvements in a context of over-exploitation of fisheries resources. Loans proposed in lieu to encourage fishers to shift occupation are nonetheless not always suited to fishers' conditions in their terms of lending. As a consequence, most loans are obtained through informal channels (Ministry of Fisheries and The World Bank 2005). This is also the case for West and Central Africa (Verstralen 2005)

The allocation of labour between farming and a non-farm activity is also a function of prices, wages, household wealth, working capacity and other characteristics such as varying returns to productive assets (e.g. labour or land) and market dis-functions (e.g. credit or land) (Barrett et al. 2001; Reardon et al. 1992). Opportunity cost of labour, associated with access to the fishery and factors indirectly 'trapping' people into fishing (e.g. specialised investment as in the example of Coulthard 2005) can also confine households to a dependence on fishing (Cunningham 1993 and Panayotou 1982, cited in Smith et al. 2005).

2.2 Diversification as a pathway out of poverty and vulnerability?

Diversification is widespread and has been occasionally shown, when households can seize opportunities, to offer them a pathway out of poverty. But this is not always the case. In rural (farming) households, those who begin poor in land and financial assets face more difficulties to overcome barriers of entry and investment to engage in non-farm activities, and remain caught in a 'poverty trap' (Barrett 2005). This situation echoes that of fisherfolks documented by IMM (2003) in the Bay of Bengal: not all members from fishing households benefited equally from diversification opportunities, in particular when a household engaged in activities associated with catching fish, such as processing and trading. Further, while better-off families benefited from diversification, disproportionate disadvantages were felt by poorer households who lacked skills, knowledge, finance, organisational ability, confidence and social linkages to effectively respond to arising diversification opportunities (IMM 2003).

When motivated by push factors, continuous switching between activities to cope, for example, with seasonal variations may only increase the transaction costs of changing from one activity to the other and bring marginal returns to the household (IMM 2003). Sievanen et al. (2005) described the rapid uptake of seaweed farming as an alternative livelihood option to destructive fishing in the Philippines and Indonesia. This was initially propelled by high international demand and high prices on export markets, but seaweed farmers tended to switch back and forth to fishing. Once commodities are established as national income earners, the constant switch of activities by producers could result in negative impacts on overall supply levels, with the risk of weakening one of the economic foundations of a country.

In addition, it is questionable whether all forms of income sources bear positive impacts. Traditional tourism, although bringing a diversity of opportunities often away from direct utilisation of natural resources, can increase sex work and alcoholism (e.g. of Sri Lanka, IMM 2003). Its multiplier effects on local economies, initially assumed to be high, have also been questioned (Brandon, 1996), and resulting distributional equality issues have been raised (Walpole and Goodwin, 2000). As a potentially important polluter, tourism also has negative impacts on the environment and some have questioned the relevance of the conservation goals of eco-friendly tourism development (Oates 1999)[4].

In relation to ecosystems, Andersson and Ngazi (1998) warned that diversification was not sufficient to enable households to spread risk if activities relied on the same ecosystem. In contexts where ecosystems are indeed a limiting factor to diversification, options to enhance or diversify existing income generating activities through adjustments in the activities

[4] Brandon 1996; Walpole and Goodwin 2000, and Oates 1999: cited in Hill, 2005.

themselves or the broader context in which they operate should not be neglected (Whittingham et al. 2003).

To overcome these limitations, Barrett et al. (2001) have recommended that four steps be taken towards pro-poor diversification enhancing policies (Box 1). Although focusing on rural non-farm diversification, they are of relevance to the fisheries sector and would ensure that poorer groups can benefit from wider policy reforms and recover from shocks.

BOX 1

What policy makers can do to enhance non-farm diversification opportunities for the rural poor in Africa (derived from Barrett et al, 2001).

1. Create clear institutional ownership over rural non-farm matters within government and research institutions.
2. Invest in sustainable rural financial systems that can reach previously excluded sub-populations.
3. Redouble efforts in education and health to stem the serious threats posed by HIV/AIDS and violence in rural areas already deficient in skills and education.
4. Increase investment in the physical and institutional infrastructure necessary to make markets accessible to all, including the need for post-crisis reconstruction.

The SFLP has furthered these initial recommendations in suggesting some ways of making diversification assistance more responsive to the needs of the fishing communities (Box 2).

BOX 2

Strategy for assisting fisherfolk in West and Central Africa to utilise diversification as a route out of poverty

- Apply a multi sectoral support approach to diversification in fisheries: this should include marketing arrangements, health, education, economic development, agriculture, livestock and forestry, infrastructure and telecommunication. Establishing strategic partnerships facilitates these actions.
- Include in change processes the relationships between post-harvest sector groups and the fishermen (with influence on the outcome of the activities). Taking these into account will contribute to the poverty reduction impact and will maximise community-level benefits within the sector (vertical integration and maximisation of efficiency of the chain).
- Apply a Sustainable Livelihoods Analysis (SLA) and gender analysis of chains to provide key information to stakeholders on how to develop gender sensitive and pro poor marketing action plans.
- Train meso-level actors and fisheries department staff on analysis of diversification within and outside fisheries
- Build capacity of meso-level actors in analysis and design of diversification activities and include these in management plans and in co management processes.
- Foster regular consultations among all stakeholders to improve communication and information flows for targeted policy actions on specific national, regional and local fisheries needs and opportunities.
- Ensure policy coherence between fisheries policy and other policies by integrating fisheries sector concerns in broader development programmes such as gender and rural employment policies. Special attention could in particular be given to:
  1. Pro-poor micro finance mechanisms and support to social cohesion and development of organisations,
  2. Creation of an enabling environment: support to infrastructure, marketing institutions, telecommunication (NICT , New Information and Communication Technology),
  3. Participation in decision making on resource management and infrastructure management,
  4. Literacy, health care and other social service issues.

Source: Holvoet 2007

3. Diversification in coastal and inland fishing communities

3.1 Some thoughts on the reasons for misconceptions regarding diversification in fishing communities

As reviewed in section 1, the case for the better recognition of the positive role of income diversification in agricultural households and its support in policy making has been argued for some time (Ellis 2000a). In fishing communities however, evidence of diversification and plural income streams remains patchy. Fishing communities are often perceived as highly specialised and dependent on a single source of food and income: water (either fresh or marine). In fact, sole reliance on marine resources is not a characteristic of coastal economies now nor in the past. Instead, there is overwhelming archaeological evidence dating back to the late stone age (Neolithic) of the contrary. Back then, coastal communities exploited marine foods in conjunction with wild and domestic plants and animals on a seasonal basis, giving rise to diverse economies supporting complex societies (Binliff 1977; Clark 1983; Deith 1988).

One of the first reasons for skewed perceptions about the status and activities of fisherfolk, as listed in the introduction, is that fisheries have been traditionally – and incorrectly – associated with poverty and marginality (Béné 2003), with fishing a last resort activity, and impeding households from engaging in 'positive' diversification processes as a means to escape poverty. In addition, numerous sources report, in a general manner, the importance of fisheries as a major contributor to livelihoods. Although this is in essence true, this generalisation hides the fact that fishers also engage in other jobs in parallel to fishing, and that these other jobs probably contribute on average equally, if not more, to the income and wellbeing of fishing households. The "lack of opportunities for alternative livelihoods in fishing communities" is often bluntly reported, yet sometimes next to evidence showing the contrary (e.g. MRAG 2003). SFLP experiences in Congo, Benin and Gabon document a wide variety of evolving diversification strategies in both inland and in marine fishing communities.

Furthermore, the literature is very elusive as to whether these 'alternative opportunities' to be promoted should be related to fisheries (for instance, a fish frying post-harvest business) or not. Notwithstanding, income from fishing can be a stepping stone for households to access services and improved education, engage and invest in different but complementary activities. Some studies have started to mention the diversity of pursuits of fishers, explained by the richness of the environment in which they live, the diversity of the natural resources at their disposal, and their social and cultural background. The physical and biological diversity of the land-water interface may however bring both opportunities and threats to those living there, in particular if they are poor and in the context of growing climate change-related uncertainties (FAO 2008).

If some specialisation is observed, it is usually more as a consequence of the social system prevalent in fishing communities (e.g. caste system in South Asia) and the weight of traditions and practices bound by it, than as a deliberate choice. Specialisation may also be temporary and market-oriented: a stepping stone for fishing households to increase the wealth needed towards diversification for accumulation (Smith et al. 2005). Specialisation is also often induced by fisheries policies that aim to 'modernise' artisanal fishing through attempts at increasing sectoral economic efficiency by 'professionalizing' fishing activities and centralizing marketing activities to benefit from economies of scale (Allison and Ellis 2001).

The strong sense of identity established through fishing (Wilson et al. 2003, cited in Hill, 2005), even as a part-time activity, can lead to erroneous conclusions from rapid rural appraisals when not substantiated by quantitative and more in-depth analyses. Hill (2005) cited the case of interviewees in a fishing community regarding themselves as "fishermen", even though they actually spent very little time and earned minimal income from this activity.

Coastal zones and communities may also be mistakenly assumed to be homogenous. Yet the range of ecosystems supporting coastal livelihoods provides coastal dwellers with varying threats but also many opportunities for extraction (e.g. reefs, mudflats, mangroves etc.). Coral reefs in particular provide a low cost entry to fisheries (minimal equipment, if any, is necessary given the proximity of the ecosystem for reef gleaning) and their access and use not as alienable as in other marine ecosystems because of the specialised skills required for its exploitation (Whittingham et al. 2003). These skills and indigenous knowledge, which are essential for the survival of communities on remote and isolated islands are likely to diverge from those developed by other fishing communities in a different environmental and economic context. If sound policies supporting fishers' diversification are to be formulated, they therefore need to rely on an in-depth understanding of site-specific livelihood/environment interactions and not assume a general homogeneity amongst all fishing groups.

Another misconception is the fact that inland fishing communities are thought to have more opportunities for diversification (because of the proximity of potentially cultivable land) than their coastal counterparts, for whom access to land has traditionally not been so important. This is however unfounded because:

1. inland fishing communities, if constituted of migrants, may not own the land on which they live (on the edge of a water body) and may have settled illegally on the edge of

water bodies (e.g. freshwater irrigation reservoirs of Sri Lanka, C. Brugere, personal observation; coastal migrant communities in Gabon, (Engone 2005);
2. it is not because one owns land that one knows how to cultivate it;
3. coastal areas are rich and varied ecosystems that can sometimes be exploited as efficiently as agricultural land (e.g. the combination of fishing, spice and coconut cultivation found in some Indonesian coastal areas, van Oostenbrugge et al. 2004);
4. coastal dwellers can make up their lack of land in skills, knowledge and familiarity with their environment; and finally v. many coastal dwellers are in actual fact found to have a plot of land, and engage in some form of agriculture, along with their fishing and other activities (c.f. reef communities described in Whittingham et al. 2003).

3.2 Reported evidence of diversification in fishing communities

Despite the lack of alternative livelihood opportunities often being highlighted in the fisheries management literature, the fisheries social science literature has long recognised fisherfolk's continual processes of diversification, captured in the concepts of 'pluri-activity' and 'occupational mobility' (e.g. Acheson 1981, Allison and Ellis 2001). To reinforce that these processes have not more recently halted and are still relevant to small-scale fishers today and in the future, we present below a number of documented examples of recent and on-going livelihood diversification among fisherfolk.

In coastal fisheries communities:

In *Tanzania and Kenya,* varying degrees of dependence on fishing and associated activities were highlighted, with a higher dependence in Tanzania than in Kenya, but no surveyed household depended solely on fishing as their mainstay. Farming, small businesses, trading, self and waged employment and fisheries-related activities all complemented households' fishing income (MRAG 2003).

In *Tanzania* (Mafia and Unguja islands), Andersson and Ngazi (1998) showed that 89% of their study respondents engaged in individual production strategies based on two or more activities, most of which relied on combined use of marine (for fishing mainly, but also seaweed farming and collection of aquatic organisms) and terrestrial (for agriculture) ecosystems.

In *Mozambique*, Hill (2005) studied the combination of fishing with farming and the development of a local ecotourism centre. His case illustrates partial economic substitution: despite the existence of a potentially attractive local source of non-fishing employment, households with a member employed in the local ecotourism industry still engaged in some fishing as a complementary activity and a source of protein.

In the *Western Indian Ocean* (Comoros, Mauritius, Mozambique and Tanzania), Ireland et al. (2004) identified over 100 different coastal livelihood income generating activities, with a large proportion relying on the use of surrounding environment or natural resources. Many of these activities were found to co-exist within the same community, highlighting their diversity and complementarity.

In *Congo* (Makotipo), under the Sustainable Fisheries Livelihoods Programme, a number of vulnerable fishing households were targeted to identify alternative income generating activities with the highest potential for decreasing vulnerability and risks of conflicts. Apart from aquaculture, ranked in 7th position among all suggested 12 activities by study respondents, all other activities were of a 'non farming' nature or outside fishing: general trade, water sale, restauration, cassava processing, duck rearing, juice and yogurt production (K. Holvoet, SFLP, personal communication).

In the *Philippines and Indonesia*, Sievanen et al. (2005) present the case where seaweed farming was introduced to reduce destructive fishing. They showed that despite widespread uptake of the activity, most fishers maintained their fishing activities alongside seaweed cultivation because the latter was carried out by wives and children. Even when seaweed

farming was carried out by fishers themselves, there was no time conflict between fishing and cultivation practices.

In *India* (Tamil Nadu), Coulthard (2005) noted that diversification occurred both within fishing and outside fishing but was limited by status and cultural background (caste). In a different State (Andhra Pradesh), IMM (2003) found that livelihood strategies of poor coastal communities reflected opportunities locally available, in particular in relation to the ecosystem in which people lived. Thus, fishing in creeks and bays, collecting molluscs, shells, mangrove wood, processing fish and rearing chickens were characteristic of semi-nomadic fishing communities of this area.

In the more general context of *reef fisheries*, Whittingham et al. (2003) reported evidence of the range of "reef livelihoods" (sea and land-based) pursued by coastal communities on isolated islands of India (Lakshadweep, Andaman, Gulf of Mannar) and on the northern coast of Mozambique.

In inland fisheries communities:

In *Burkina Faso*, farming communities prevailed, but the creation of the Lac Bagré in 1984 offered an opportunity of diversification in rice and fish farming to those engaged primarily in farming. Evidence of diversification is reported by the SFLP, which has also had a pivotal role in enhancing opportunities for alternative activities (either as coping or accumulation strategies) in its target communities (Konan 2007). The project found that while farmers and fishers categories depended on a single activity, households already engaging in a mix of farming and fishing supplemented these two activities with transformation, trade and craft production, which were dominated by women (the wives of fishers). Backward and forward linkages between fishing and these activities, including agriculture, are clear: income generating from fishing is transferred towards non-fishing activities as a means to ultimately 'safeguard' income from fishing.

In *Ghana*, some specialisation within fishing was observed through vertical integration within the fisheries sector: each family member has a specific economic role (Konan 2007). However, the SFLP showed that opportunities could be grabbed outside fisheries. Through the provision of training workshops and support through a training-of-trainers programme, activities of kente weaving (in particular targeting the youth), snail farming, batik, crafts (tie-dye and screen printing, ornaments), confection of cosmetics and pomade, pastries and baking, and bee keeping were developed in target communities[5].

Among HIV/AIDS-affected fishing households *in Congo* (Pointe Noire), diversification activities proposed under the SFLP included agriculture (groundnut, maize and cassava), fish smoking, sale of fresh and salted fish alongside the continuation of a fishing activity. Other vulnerable households were targeted with food processing activities mainly: sale of fruits and sandwiches and processing of cassava and fish (Holvoet 2007).

In *Laos*, Lorenzen et al. (2000) have reported that 90 percent of the inland fisheries catches are from households whose livelihood is not primarily dependent upon fishing.

Further information and analysis of diversification case studies are presented in Appendices 1 and 2.

Given the above, are some livelihood activities outside fishing and in associated sectors more suitable to fishers than others? If so, which ones and how many fishing households would benefit from diversification? The answer is not straightforward. All case studies, including those presented in the appendices, highlight the various limitations of each 'introduced' diversification activity. These limitations are in particular related to demand/supply-induced market fluctuations in production-oriented activities (e.g. basket and mat weaving– how many baskets can one sell locally?). In this sense, service-oriented activities may hold more potential (e.g. demand for bicycle and motorbike repairs is likely to

[5] Activities were suggested by the communities themselves. In addition to identifying appropriate directions for diversification, participatory appraisals also highlighted the prevailing lack of community organisation. Long-term financing mechanisms set up by the SFLP have taken this factor into account to ensure the success of the schemes.

be maintained over time) though they require minimal skill levels and standards. In relation to this, Pauly (2005) advocates fisheries management and coastal reconstruction (in post-tsunami context) to focus on education provision and technical skill development for diversification out of fisheries and into service provision. The development of ecotourism and pro-poor tourism is conditioned by the surrounding environment. Through the diving industry for example and the need for boat handling skills, reef areas are likely to attract more tourism than others. But how many fishers could it concern?

Despite the same resource-base, aquaculture is not an obvious alternative to fishing for fisherfolk. Uptake is often limited by input costs, knowledge, management skills and job satisfaction related to strong fishing traditions, even in contexts where alternative options are very limited (Ireland et al. 2004, World Bank 2004). Studies should therefore be carried out to cover technical as well as – if not more importantly – social, economic and market-related aspects prior to aquaculture introduction (World Bank 2004).

The suitability of each alternative income generating activity is context specific, but also needs to be assessed against existing portfolios of activities and individual aspirations. In this regard, past experiences regarding technology adoption for improved fishing efficiency can serve as lessons. They have shown that not only should promised yield increases influence adoption decisions, but so do individual fishers' values, perceived opportunity costs and risk, abilities, flexibility and social surroundings (Salas and Gaertner 2004[6]). Furthermore, Pomeroy et al. (2006) recommend that in post-disaster contexts, and by extension in any other vulnerability reduction programme formulation, four key criteria need to be taken into account to assess possible alternative livelihood options: social feasibility, technical feasibility, institutional feasibility, and supporting infrastructure and policy environment.

3.3 When fishing falls through the policy net (inadequate attention paid by policies to fisheries and fishers)

Misperceptions and the complexity of fishing households' diversification strategies have often placed them out of the reach of conventional poverty reduction strategies. Comparatively to the history of diversification in fishing communities, the need for policies to actually take into account the diverse range of activities of fishing households is relatively recent (Allison and Ellis 2001). The fact that inland fishing has often been considered by policy makers/resource managers as a last resort activity may have contributed to its relative neglect in public policy (Smith et al. 2005) and as a strategy out of poverty worth pursuing at national levels (Thorpe et al. 2004, 2005, with regard to the overall minimal place occupied by the fisheries sector in national Poverty Reduction Strategy Papers). Similarly to agriculture, especially in developed countries, fisheries can bring more to societies than generation of income and production of fish for food: by attracting tourism, maintaining coastlines and heritage, fisheries fulfils a 'multifunctional' role[7]. Yet despite some beneficial multiplier effects on the local economy, not all benefits indirectly generated are seized by fishers themselves, and this may be attributed to the lack of adequate policy framework in place to capture them.

Traditionally, fisheries management policies have included specialised schemes targeted to the specific needs of fishers, for example for buying specialised fishing gear, for up-scaling capital investment, or specific subsidies and schemes promoting the professionalisation of fishers. However, these have had the counterproductive effect of locking fishers into specific niches, depriving them of means of exit in times of hardship-linked catch declines, whilst increasing their dependence on the resource[8]. For example, when licensing is used as a policy tool to control fishing pressure, is any flexibility in-built in this system, through tradable licenses from one fisher to the other? Does such a system take into account the fact that

[6] Salas and Gaertner's example (2004) was in the context of diversification within fisheries, but similar factors can be assumed to influence diversification outside fisheries.

[7] Multifunctionality of agriculture is a concept gaining increasing recognition, in particular within the EU (van Huylenbroeck and Durand 2003).

[8] The degree to which boat owners, crews and small-scale fishers have been differently affected by such schemes remains to be established.

fishers may only require licenses on a part-time basis, for a few months of the year, or even just a few days of the week?

Inadequate education and training policies can also bind people to inefficiencies and the inclusion of technical assistance alongside capacity building into industrial fisheries management has only recently been argued for (World Bank 2004). . In Burkina Faso, inferior revenues of individuals engaging in both farming and fishing compared to those specialised in fishing (but higher than those depending only on farming) was attributed to the lack of fishing competency of farmers-turned-fishers and their limited investment capacity (Konan undated).

In contrast to farming, where land inheritance is a key issue, inheritance in fishing is, at least under most current resource tenure systems, a much less relevant concept. In small-scale communities where the shelf life of fishing assets such as boats is rarely beyond a few years, attractiveness to invest in equipment for descendants is very limited, and will lead to transfers towards other time-bound activities (e.g. purchase of infrastructure to support alternative non-fishing activities, livestock). Another form of long-term investment may be in education and training of new generation. Yet few investment and financial policies cater for these specific needs. An example of a policy that is compatible with both these needs and with emerging rights-based fisheries management, would be transferable licences or other forms of property rights, with inheritance being one possible means of transfer.

Finally, overly generic welfare policies neglecting household dynamics such as gender roles can fall short of reaching their objectives. In Burkina Faso for example, the household head often makes decision regarding who will carry out which non-fishing activity, whilst retaining his/her role as a fisher. This form of 'delegation' regarding choice of diversification strategies at the household level could influence the impact of general development policies and implementation measures targeting, often implicitly, either the household head (assumed to be male), or the household as a whole, taken as a homogeneous unit. Gender roles have been shown to deeply influence the outcome of diversification; yet few policies, especially those related to fisheries management, give them adequate attention (Kabore and Holvoet 2006)

Although policies are often decided outside the reach of fishers and overall poorer groups, these very people can have an influence on the way a number of factors and their effects on individual livelihoods and wellbeing are taken into account in development policies. Such factors are listed in Table 2 (from IMM et al. 2005).

TABLE 2
Livelihood diversification factors that can be influenced by fishers and coastal dwellers through adequate policy measures

Factors relating to wider society	
Social organisation	Culture and ethnicity
Age	Conflicts and security
Gender	Attitudes to the rule of law
Factors relating to government	
Economic organisation	Rural industrialisation support
Corruption and bureaucracy	Decentralisation
Global and regional linkages	
Factors relating to the private sector	
Barriers to entry and exit	Rural-urban linkages
Growth engines	Competition
Large firms linkages	
Factors relating to civil society	
Institutions	Formal and informal networks

Source: IMM et al. (2005)

4. Diversification in relation to the state of fisheries resources

Although some studies have investigated diversification in fishing communities, the effect this has on the management of fisheries resources remains inadequately covered. Until only recently with the development of co-management and more 'people-oriented' approaches, was fisheries management done for the conservation of the resource, and remained often de-connected from those with a primary stake in it.

4.1 How does diversification affect fisheries resources?

Despite the close link between diversification and poverty explored in the first section of the paper, this section deals strictly with diversification and its reported effects on fisheries resources. Of the many cases of diversification reported in the literature (section 3.2), few explicitly relate the uptake of alternative or complementary livelihood strategies to the state of the resource. Although new fisheries management paradigms have started to recognise the importance of incorporating people in management schemes, few deal with diversification/alternative livelihoods developed by fishers.

The paradox of interpreting cross-sectoral diversification (i.e. outside fishing-related occupations) in small-scale fisheries can be illustrated with reference to the way that the process has been incorporated in RAPFISH (Pitcher 1999, Pitcher and Preikshot 2001) a multi-dimensional method of assessing and scoring the sustainability of fisheries. RAPFISH diagnoses took diversification (or existence of part-time fishing) as an indicator that fishing on its own was providing inadequate financial returns, and its existence was therefore a good indicator and correlate of unsustainable fishing (Pitcher and Preikshot 2001, Tesfamichael and Pitcher 2006)..

Diverging interpretations of the relationship between diversification and fisheries management can also been seen in the fisheries development literature, where Allison and Ellis (2001) and Jul-Larsen et al (2003), for example, argue that diversification (occupational and geographical) can reduce pressure on resources in times of scarcity or diminishing economic return by providing alternative options while fish stocks and/or markets recover, while Pauly (2006) argues that diversification helps keep people fishing despite resource scarcity by cross-subsidising economically unviable fishing, thereby further accelerating fish stock decline. He cites the case where women in south-east Asian fishing households working as domestic labourers in cities send remittances home that allow the male members of their households to keep fishing at a financial loss. This notion that non-fishing income is used to subsidise unprofitable fishing is also prevalent in the literature on European small-scale fisheries, despite the lack of any direct evidence to sustain the argument (Allison 2003).

Sievanen et al. (2005) provide one of the rare analyses of the impact of diversification – through seaweed farming mainly – on fishing pressure exerted on coastal resources, revealing a complex answer. On the negative side, they highlighted that seaweed farming attracted in-migration, indirectly increasing pressure on the resource for fish as food, and that it would be "unlikely that subsistence fishing would decrease upon inception of seaweed farming unless alternative livelihood projects are combined with controls to present increased fishing effort and new entrants into the fishery" (p. 302). They also pointed out that the supplementary income generated through seaweed farming had been invested in houses and businesses, and that fishing equipment would be no exception unless strict fishing management measures such as control of fishing effort be put in place. Little change in overall fishing effort was observed as seaweed farming was carried alongside fishing (although a decline in seaweed farming was inversely proportional to an increase in fishing pressure). However, positive effects on fisheries included a decrease in commercial fishing

effort if commercial fishing employment was substituted for seaweed farming. In addition to seaweed farming being relatively benign in comparison to other forms of mariculture (De Silva 1992), seaweed farms can act as de facto marine protected areas where fishing is not allowed, to prevent damage to the growing plants.

Hill (2005) tested the hypothesis that the generation of employment through ecotourism would reduce dependence and pressure on marine resources in Mozambique. Contradicting findings from the previous case study, his results suggested that fishing households with members engaging in the local ecotourism enterprise may not increase the pressure on marine resources as these households were more likely to invest in alternative income generation activities than fishing gear. Conservation benefits from economic substitution were however not clear.

In southern India, Coulthard (2005) indicated that diversification was not a barrier to sustainable fisheries management because those who diversified out of fishing were actually not the prime stakeholders, managers and 'guardians' of the fishing resources.

Some fisheries management plans make provisions for night fishing. Night fishing can be a means by which fishing, especially with passive gears, is carried out along side other income generating activities, yet with minimal interferences and disturbance to day-time activities, thereby increasing overall returns to labour. However, unless it is well accounted for and an integral part of a management plan, it could easily lead to over-fishing (or depletion of specific species).

How do fisheries management plans take into account migrant fishers and influx of people to coastal areas? If with economic growth, people move out of fishing to engage in other non-fishing activities, this may open the door to incoming migrant fishing populations. A common perception is that this influx may accentuate fisheries depletion because incoming fishers can upset existing community-based fisheries management practices (e.g. Pauly 1997). The immediate answer to resource depletion and fisheries management inefficiencies may thus be to remove people from fishing through economic substitution. By contrast, for households already engaged in fishing, maintaining a stake in the activity may be a guarantee for its sustainability. The linkages between in-migration and resource extraction are however far from simple. Coulthard (2005) showed that incoming scheduled castes took advantage of under-exploited fisheries niches in a coastal area of Tamil Nadu without compromising existing allocation mechanisms of capture. A number of other studies on the impacts of migrant populations on coastal areas have shown that negative effects on marine environments depend as much on increases in population numbers as on technology, knowledge systems, social history, modes of incorporation of migrant groups with settled ones, poverty and resource valuation (Cassels et al. 2005). From these authors' case study in North Sulawesi, Indonesia, no strong relation could be established between migration and poor environmental quality through destructive fishing, but a strong relationship existed between migrant status and higher fishing effort. Grounding these findings into poverty and migrant integration theories helps clarify why the effects of population influx on ecological systems of destination areas are not as clear as initially anticipated (*ibid*).

In Burkina Faso, the reliability of women concerning loan reimbursement and their power within the household has been pointed out by the SFLP. By taking (economic) risks and initiative for alternative income generation in post-harvest activities, as well as increasing their bargaining power on fishers (Kabore and Holvoet 2006), women can influence the management of the fishery. For example, they were reported to request fishers to use larger mesh nets as undersized fish were not suitable for them, or threatening them not to purchase their catch. This illustrates the necessity to take into account the social and economic situation of those in post-harvest activities and of the fisheries beneficiaries more generally, i.e. the demand side of fisheries management, in the design and implementation of management plans (explored in greater depth in the next section).

If the primary objective of diversification programmes in fishing communities (to increase incomes and standards of living in vulnerable fishing communities) is often achieved, examples of positive impacts on the fishery through reduced fishing pressure are however less common (World Bank 2004). A word of caution is therefore needed to warn against a-

priori overestimations of the positive correlation (if not causality, even more difficult to establish) between diversification and reduced fishing pressure. Though deserving further investigations in a wider range of contexts, the case of seaweed farming introduction was eloquent. Pressure on fisheries was not reduced because seaweed farming did not change the labour composition of activities: mainly women up-took seaweed farming while men pursued capture fishing as before (Crawford 2002). The sole objective of diversification promotion should therefore not be limited to giving fishers other occupations than fishing, but should encompass broader goals related to the nature and transformation of labour in coastal and inland fishing communities.

4.2 Implications in terms of future fisheries management

The "bundle of rights" (Table 3) associated with the management modes of fisheries resources can constrain or enhance diversification opportunities for those benefiting or excluded from the resource (Ostrom and Schlager 1996). However, the sole allocation of these rights is not enough: they should also be defined on a temporal basis, allowing their beneficiaries to benefit from them when and where appropriate, without missing out on other opportunities, nor preventing others from benefiting from them.

TABLE 3
Bundles of rights associated with positions[9]

	Owner	Proprietor	Authorised claimant	Authorised user	Authorised entrant
Access	X	X	X	X	X
Withdrawal	X	X	X	X	
Management	X	X	X		
Exclusion	X	X			
Alienation	X				

Source: Ostrom and Schlager (1996)

Building on the limitations of fisheries management measures in the absence of non-fishery economic alternatives pointed out by Smith (1981), Charles and Herrera (1994) advocated a "dual focus on development and diversification" (p. 1320) to ensure that fishery development policy be compatible with fisheries sustainability. "Diversification" was meant in this case to be outside the fisheries sector, "to maintain socio-economic and community sustainability in the face of conservation-oriented management restrictions" (p.1320). As positive effects of non-fishing diversification (e.g. seaweed farming) on fishing pressure are not always obvious, Sievanen et al. (2005) recommended that the promotion of alternative activities be combined with other fisheries management tools to contribute to an integrated "seascape approach" balancing natural resources and human needs.

In the same way as the multiple functions of agriculture are being increasingly acknowledged in its development, fisheries management approaches also have to take into account the multifunctionality of fishing. This may involve a shift from their initial aim of sustainable resource management (usually comprising some degree of protection and conservation) towards recognising the varying needs of households and uses they may make of the fishery (e.g. from subsistence to recreation, Smith et al. 2005), and the range of benefits to communities brought about by fishing (apart from fish). To this end, Smith et al. (2005) proposed a framework combining an analysis of the fishery situation with one of fishers' livelihood characteristics, institutional and economic environments as a step towards a better understanding of determinants of livelihood outcomes in fisheries, and of functions of fisheries in livelihoods. Based on this understanding, they suggested that "greater differentiation of fisheries management policies" (p. 375) would be needed, though they

[9] This table is highly related to the *padu* system case study reported in Coulthard 2005.

recognised that including the complexity of livelihoods into fisheries management would require dealing with a more complex set of objectives. The table of policy priorities they proposed is based on analysed fishery and fishers' characteristics and identifies corresponding policy instruments. This could be further refined based on context-specific situations and expanded into a comprehensive 'decision-tree' elaborated to assist policy makers and fisheries managers in choosing the most adapted policy and management objectives and mix of instruments in a wide range of situations (Table 4).

TABLE 4
An example of 'decision-tree' to determine policy priorities in various livelihood and fishery scenarios (based on Smith et al. 2005)

Guiding questions	Options
What are the characteristics of fishers?	Landless; marginalized; migrants; etc.
What type of livelihood strategy?	Traditional diversified subsistence or semi subsistence; specialist full time fishing; subsistence; etc.
What are the fishery characteristics?	Open access and over exploited; open access self regulating; restricted access
What are the livelihood functions of fishing?	Food security; Buffering and coping; Accumulation; etc.
What are the main policy objectives?	Resource conservation; Poverty alleviation; local economic growth; etc.
Which instruments and fisheries management tools?	Alternative employment in the rural economy; welfare 'safety nets'; Community management; etc.

However, the timeframe for the implementation of policy instruments needs to be carefully considered if household diversification is adequately catered for: the same authors suggested that the functions of fishing vary, and with them the 'status' of diversification (from semi-subsistence to accumulation), according to changes in wealth. Such changes may be more or less rapid, but policy and management objectives should be allowed to vary accordingly. This is a challenge, but may be possible if regular monitoring and accounting is carried out (if possible, by community members themselves in collaboration with local authorities or appropriate local NGOs and other civil society organisations) and if the 'adjusting' process is transparent: although it is important for institutional arrangements to be flexible to respond to specific circumstances, the way in which this is applied has to be announced in advance and adhered to ex-post (Dixit 2003).

This approach reinforces Allison and Ellis (2001)'s suggestion that livelihood approaches should be of high concern to fisheries managers and should constitute an integral part of the fisheries management plans they devise. By looking at coral reefs through a livelihoods and poverty lens, Whittingham et al. (2003) clearly depart from the traditional environmental/conservation perspective considering reefs as threatened by human use. They list a number of principles to address poverty-related reef issues and advocate a "major shift in policy, approaches and policy instruments in relation to reefs if major equity and sustainability problems are to be avoided in the future". This would naturally lend itself to encompassing diversification as a means towards improved livelihood outcomes and environmental sustainability in reef communities.

Price fluctuations, in-migration to coastal areas and labour impacts of diversification, in particular through gender differentiation, should be taken into account in policies with the

dual goal of promoting alternative livelihoods in fishing communities and fisheries conservation (Crawford 2002).

Fishery access regimes, along with legislative and institutional conditions should be focused upon to ensure that policies promoting diversification reduce conflicts among activities at the community level, respect poor fishers' equity of access to water (Béné et al. 2003) and reduce over-capitalisation and over-exploitation of the fishery (IMM et al. 2005).

Additionally, due consideration should be given to cultural factors such as caste and tradition in fisheries management as these can constrain, to various extents, the pursuit of diversification strategies both within and outside fisheries. To ensure higher efficiency of measures to enhance diversification in culturally-sensitive environments, Coulthard (2005) suggests that those measures should target those more apt to adapt and uptake diversification opportunities in the first place.

Outside the realm of fisheries, some interesting analogies may be made and lessons drawn from ecotourism, as a diversification activity, and natural resource conservation. Carefully designed conservation incentives can positively affect both efficiency of tourism operations and local attitudes towards conservation provided they are based on local participation and capacity building (Wunder 2005). By closely linking incentives for conservation of fisheries and coastal resources (or at least their appropriate management) with diversification, either through a pull or push factor, ecotourism facilities associated with marine/inland waters protected areas could provide a means by which complementarity of income and substitution of labour time occurs, whilst enhancing awareness of resource conservation and sustainable use.

Fisheries management plans should also be broadly integrated in national development plans, associated in particular with credit, education and employment policies to ensure that the right balance between household diversification and resource conservation is reached. Fisheries management plans also need to include provisions for within fisheries diversification, recognising the fact that fishers are as dynamic as their fishery. In this regard, Salas and Gaertner (2004) question the relevance and appropriateness of explicitly stating management objectives because "it may not be possible to pursue them simultaneously or they may not be effectively applicable under different conditions" (p. 163). They suggest that "fisheries management should generate a portfolio of approaches to provide multidimensional solutions to the multifaceted problems it must address" (p. 164).

The Ecosystem Approach to Fisheries (FAO 2003), being presently broadened to encompass economic, social and institutional aspects (FAO 2006b, De Young et al. 2007), appears to provide a means to embrace the challenge of including people, their activities and relationship with the resource in the realm of fisheries management, which, up to now, has been driven by biological and environmental considerations. As a primary goal of an ecosystem approach is to "balance diverse societal objectives", the inclusion of social, economic and institutional information is necessary for policy making and fisheries management. Operationalizing the Ecosystem Approach to Fisheries on this basis reinforces the principles of other inter-sectoral and holistic approaches such as Sustainable Livelihoods and Integrated Management Approaches to create a new paradigm in fisheries management.

5. Conclusions

The broad objective of the paper was to open-up the question of diversification in relation to fishing communities. Like 'poverty', diversification is a multi-dimensional concept. Misconceptions in its application to fisherfolk are linked to the complexity and variability of the concept itself, and to our incomplete, if not biased, anthropological knowledge of fisherfolk and their communities, in particular in relation to development paradigms and efforts. These misconceptions have translated into poor policies assuming fishers trapped into dependence on their [doomed] resource or trapping them further to it, with few escape routes and opportunities for accumulation and livelihood improvement outside the sector.

The paper also raised the question related to the appropriateness of promoting diversification at any cost without taking into account social, cultural and economic parameters, as well as pre-existing relationships with the resources. In many areas of the world, coastal and inland fishing communities have, overall, not fared well in development programmes. Not only have past fisheries management schemes had limited success because of omitting human factors in their design[10], diversification programmes have also faced limited success because of the lack of understanding of who fishers are, what their livelihoods are, and what influences them. Promoting diversification is more than promoting choice from a menu of pre-determined activities (Campbell et al. 2006) and the promotion of specific activities should not be driven by economic considerations only. Diversification should not be promoted as a panacea to revert degradation of marine and freshwater fishery resources. It should not be substitutive but complementary and build on existing knowledge and uses of local fishery and aquatic resources.

Because of the influence of human and cultural values and strong linkages to the natural resources upon which fishers rely, measures such as strengthening support services allowing more freedom of movement to fishing households to build or not, when required, a diversified portfolio of activities may be more sustainable and appropriate in the longer term than direct support through the promotion of specific alternative activities to fishing.

If the review of the literature has revealed an underestimated wealth of examples of diversification in fishing communities, it has also shown that lessons learnt from the scattered evidence are few and would need to be consolidated to reach the attention of policy makers and fisheries managers. In addition, more research is needed into the correlation (and if possible causality) between uptake of diversification strategies and fishing pressure/state of the fishery and into the development of holistic programmes that combine policy measures for diversification and fishery conservation. The development of such policies and programmes should however be conditional to the thorough study and understanding of households' multi-activity strategies, cultural and economic background, and relationship with their surrounding environment (physical, natural, economic and institutional).

Furthermore, the poverty dimension should not be omitted from the nexus diversification-fishery conservation/management, but information is lacking on this intricate relationship: do people/communities who are less poor, manage their fisheries resources better? No evidence from the fisheries sector was found. Including poverty in the equation is opening the debate even wider, yet, as was seen earlier, poverty and diversification are intimately linked and omitting one from the picture could lead to erroneous decisions. Experience is however starting to emerge from the application of Sustainable Livelihoods Approaches to improving our understanding of this three-way and complex relationship and helping to identify entry points – at the activity and policy level – to improve the livelihoods of fishers

[10] Although fisheries co-management schemes have increased the participation of communities and fishers in sharing the responsibility of fisheries management, their focus is on the fishery and they do not necessarily land themselves to allowing the pursuit of activities outside fisheries by fishers, on a temporary or permanent basis.

whilst conserving their natural resource base (Allison and Horemans 2006, Campbell et al. 2006). The transient nature of fisheries resources conditions the livelihoods of those, who, in one way or another rely on it for part or their entire income, with likely repercussions on the nature of poverty faced: 'transitory' or 'chronic', and for which two different types of support policies can be devised: 'cargo net' in the former, 'safety net' in the latter (Barrett 2005). Sustainable Livelihoods Approaches developed to inform policy makers of the exact situation of fishers, and implemented hand-in-hand with new fisheries management approaches such as the Ecosystem Approach to Fisheries, may offer constructive solutions for the simultaneous promotion of diversification and fishery conservation. Supported by the right type of policies, they should ensure long-term improvements in the livelihoods of coastal and inland dwellers.

6. References

Acheson, J.M. 1981. Anthropology of fishing. *Annual Review of Anthropology*, 10: 275-316.
Allison, E.H. 2003. Potential applications of a 'sustainable livelihoods approach' to management and policy development for European inshore fisheries. In Hart, P.; Johnson, M. (Ed.) (2003). *Who owns the sea: Workshop proceedings, Tjärnö, Sweden, 24 - 27 June 2002.* pp. 53-99
Allison, E.H. & Ellis, F. 2001. The livelihoods approach and management of small-scale fisheries. *Marine Policy*, 25: 377-388.
Allison, E.H. & Horemans, B. 2006. Putting the principles of the Sustainable Livelihoods Approach into fisheries development and practice. *Marine Policy*, 30: 757-766.
Alwang, J., Siegel, P.B & Jorgense, S.L. 2002. *Vulnerability as viewed from different disciplines.* Paper presented at the International Symposium: "Sustaining Food Security and Managing Natural Resources in Southeast Asia – Challenges for the 21st Century", 8-11 January 2002, Chiang Mai, Thailand.
Andersson, J. & Ngazi, Z. 1998. Coastal communities' production choices, risk diversification, and subsistence behaviour: Responses in periods of transition. *Ambio*, 27(8): 686-693.
Barrett, C.B. 2005. Rural poverty dynamics: development policy implications. *Agricultural Economics*, 31(1) suppl: 45-60.
Barrett, C.B.; Reardon, T. & Webb, P. 2001. Nonfarm income diversification and household livelihood strategies in rural Africa: concepts, dynamics and policy implications. *Food Policy*, 26(4): 315-331.
Béné, C. 2003. When fishery rhymes with poverty: a first step beyond the old paradigm on poverty in small-scale fisheries. *World Development*, 31(6): 949-975.
Béné, C.; Mindjimba, K.; Belal, E.; Jolley, T. & Neiland, A. 2003. Inland fisheries, tenure systems and livelihood diversification in Africa: the case of Yaéré floodplains in Lake Chad Basin. *African Studies*, 62 (2): 187-212.
Bintliff, J.L. 1977. *Natural Environment and Human Settlement in Prehistoric Greece, Part i.* Oxford, UK, British Archaeological Reports Supplementary Series 28 (i).
Campbell, J.; Whittingham, E. & Townsley, P. 2006. Responding to coastal poverty: should we be doing things differently or doing different things? In C.T. Huong, T.P. Tuong, J.W. Gowing & B. Hardy (Eds) *Environment and Livelihoods in Coastal Tropical Zones: Managing Agriculture – Fishery – Aquaculture conflicts.* CGIAR Comprehensive Assessment of Water Management in Agriculture Series, 2. CAB International, Wallingford, pp: 274-292.
Carter, M.R. & May, J. 1999. Poverty, livelihood and class in rural South Africa. *World Development*, 27(1): 1-20.
Cassels, S., Curran, S.R. & Kramer, R. 2005. Do migrants degrade coastal environments? Migration, natural resource extraction and poverty in North Sulawesi, Indonesia. *Human Ecology*, 33(3): 329-363.
Chambers, R. 1983. *Rural Development: Putting the Last First.* London. Longman Publications.
Charles, A.T. & Herrera, A. 1994. Development and diversification: Sustainability strategies for a Costa Rican fishing cooperative. IN: M. Antona, J. Catanzano and J.G. Sutinen (eds.) *Proceedings of the 6th Conference of the International Institute of Fisheries Economics*. Paris, IIFET/ORSTROM. pp. 1315-1354.
Choo, P.S.; Hall, S.J. & Williams, M.J. 2006. *Global Symposium on Gender and Fisheries.* Seventh Asian Fisheries Forum, 1-2 December 2004, Penang, Malaysia. WorldFish Center, Penang.
Clark, J.G.D. 1983. Coastal settlement in European Prehistory with special reference to Fennoscandia. In E. von Z. Vogt and R.M. Leventhal (Eds) *Prehistoric Settlement Patterns:*

essays in honor of Gordon R. Willey. Albuquerque, NM, University of New Mexico Press, pp. 295–317.
Coulthard, S. 2005. *The interplay between fishing access and the ability to adapt: Insights from a South Indian fishery. Paper presented at the International Conference on "People and the Sea", 7-9 July 2005*. Amsterdam, Netherlands.
Crawford, B. 2002. *Seaweed farming: An alternative livelihood for small-scale fishers?* Working Paper. Coastal Resources Center, University of Rhode Island.
Davies, S. 1993. Are coping strategies a cop out? *IDS Bulletin*, 24(4): 60-72.
De Silva, S.S. 1992. *Tropical Mariculture*. New York, Academic Press.
Dercon, S. 1998. Wealth, risk and activity choice: cattle in Western Tanzania. *Journal of Development Studies*, 55: 1-42.
Dercon, S. 2001. *Assessing vulnerability to poverty.* Paper prepared for the UK Department for International Development, Department of Economics, University of Oxford, Oxford, UK.
Deith, M.R. 1988. A molluscan perspective on the role of foraging in Neolithic farming economies. In G.N. Bailey & J.E. Parkington (Eds.) *The Archaeology of Coastlines*. Cambridge, UK, Cambridge University Press. pp. 116-124.
De Young, C., A. Charles & A. Hjort 2007. Human Dimensions of the Ecosystem Approach to Fisheries: A Survey of Social, Economic and Institutional Considerations and Approaches. *FAO Fisheries Technical Paper*. Rome, FAO. (In progress)
Dixit, A. 2003. Some lessons from transaction-cost politics for less-developed countries. *Economics and Politics*, 15(2): 107-133.
Ellis, F. 2000a. *Rural Livelihoods and Diversity in Developing Countries*. Oxford, UK, Oxford University Press.
Ellis, F. 2000b. The determinants of rural livelihood diversification in developing countries. *Journal of Agricultural Economics*, 51(2): 289-302.
Ellis, F. 1998. Household strategies and rural livelihood diversification. *Journal of Development Studies*, 31(1): 1-38.
Engone, M-N. 2005. Gender analysis of fisheries communities in two regions: Komo-Mondah and Noya (Province de l'Estuaire) in Gabon. Rome, FAO/DFID. Sustainable Fisheries Livelihoods Programme (SFLP). (Unpublished working document)
FAO 2003. Fisheries Management: The Ecosystem Approach to Fisheries. *FAO Technical Guidelines for Responsible Fisheries*, 4, supplement 2. Rome, FAO.
FAO 2006a. *Promoting literacy to improve livelihoods in fishing communities: Policies linking education to fisheries management. New Directions in Fisheries. A series of policy briefs on development issues* No. 05. Rome, FAO.
FAO 2006b. FAO Expert Consultation on the Economic, Social and Institutional Considerations of Applying the Ecosystem Approach to Fisheries Management. Rome, 6-9 June 2006. *FAO Fisheries Report*, No. 799. Rome, FAO.
FAO 2008. *Climate change for fisheries and aquaculture.* Technical background document from the Expert Consultation held on 7-9 April 2008, Rome, FAO. (available at http://www.fao.org/foodclimate/expert/em7/outputs-em80/en/)
FAO/SFLP 2006. *Gender policies for responsible fisheries: Policies to support gender equity and livelihoods in small-scale fisheries. New Directions in Fisheries. A series of policy briefs on development issues.* No.06. Rome, FAO.
Fatunla, G.T. 1996. Socio-economic issues in the education of children of migrant fishermen in Nigeria. *Journal of Sustainable Agriculture*, 9(1): 31-61.
Gnimadi, A.G., Aniambossou N., Dossou E., Glin L., Gokou G., Koukpode B., Olowo J. & Tossou, C. 2006. *Identification et prise en compte des aspects genre dans la formulation des propositions de projets de diversification des moyens d'existence dans six villages lagunaires au Bénin.* Rome, FAO/DFID, Sustainable Fisheries Livelihoods Programme (SFLP). (Unpublished working document)
Hazell, P.B.R. & Norton, R.D. 1986. *Mathematical Programming for Economic Analysis in Agriculture*. New York, USA, Macmillan Publishing Company.
Hill, N.A.O. 2005. *Livelihoods in an artisanal fishing community and the effect of ecotourism.* MSc Thesis. Faculty of Life Sciences, Imperial College, London.

Holvoet, K. 2007. *Lessons learnt from Community and Institutional Support projects: Internal evaluation 2000-2006.* Rome, FAO/DFID, Sustainable Fisheries Livelihoods Programme (SFLP). (available at: www.sflp.org)
Hussein, K. & Nelson, J. 1998. Sustainable livelihoods and livelihood diversification. *IDS Working Paper*, 69. Brighton, UK, Institute of Development Studies.
IMM 2003. *Sustainable coastal livelihoods: Policy and coastal poverty in the Western Bay of Bengal. Sustainable Coastal Livelihoods Project Main Report.* IMM, Exeter.
IMM, CFDO & CBNRM LI. 2005. *Understanding the factors that support or inhibit livelihood diversification in coastal Cambodia. An output from DFID-funded research in Cambodia.* IMM Ltd, Exeter.
Ireland, C., Malleret, D. & baker, L. 2004. *Alternative sustainable livelihoods for coastal communities – A review of experience and guide to best practice.* The IDL Group, Somerset.
Jul-Larsen, E., Kolding, J., Overå, R., Raakjær Nielsen, J. & van Zieten, P.A.M. 2003. Management, co-management or no management? Major dilemmas in southern African freshwater fisheries. *FAO Fisheries Technical Paper,* No. 426/1. Part 1: Synthesis report. Rome, FAO.
Kabore, C. 2006. *Progress report on Institutional support: implementation of Bagré gender community action plans. Rapport de progrès : Appui institutionnel pour la mise en oeuvre des plans d'action genre de la communauté de Bagré.* Rome, FAO/DFID, Sustainable Fisheries Livelihoods Programme (SFLP). (Unpublished document)
Kabore, C. & Holvoet, K. 2006. Impact study on Institutional support to the Bagré gender community action plans, unpublished, 2006. Rapport d'étude d'impact de la mise en œuvre du plan d'action genre à Bagré Chantier. Rome, FAO/DFID, Sustainable Fisheries Livelihoods Programme (SFLP). (Unpublished working document)
Konan A. 2007. Amélioration de l'environnement politique et institutionnel pour le développement des systèmes de congestion en pêche continentale au Burkina Faso, au Mali, en Côte d'Ivoire et au Ghana. Pilot Project Terminal Report. Sustainable Fisheries Livelihoods Programme (SFLP). Rome, FAO/DFID. (available at: www.sflp.org)
Konan, A. Undated. *Evaluation de la contribution de la pêche à la réduction de la vulnérabilité des communautés de pêche en cas de crise alimentaire : cas du Burkina Faso.* Rome, FAO/DFID, Sustainable Fisheries Livelihoods Programme (SFLP). (available at: www.sflp.org)
Kostov, P. & Lingard, J. 2001. *Rural development as risk management. Working Paper* 65. Centre for Rural Economy Working Paper Series. Newcastle upon Tyne, University of Newcastle School of Agriculture, Food and Rural Development.
Kramer, R.A., Simanjuntak, S.M.H. & Liese, C. 2002. Migration and fishing in Indonesian coastal villages. *Ambio*, 31(4): 367-372.
Lorenzen, K., Nguyen Khoa, S., Garaway, C., Arthur, R., Kirkwood, G., Chamsingh, B., Litdamlong, D., Innes-Taylor, N. & Siebert, D. 2000. *Impacts of irrigation and aquaculture development on small-scale aquatic resources. Final Technical Report, DFID Project R7235.* London, Imperial College.
Massamba, H. 2005. *Profil genre dans les communautés de pêche des villages Kondi, Noumbi et Bellelo dans le département du Kouilou au Congo (Brazzaville).* Rome, FAO/DFID, Sustainable Fisheries Livelihoods Programme (SFLP). (Unpublished working document)
Mattar B. & Mendy, P. 2006. Analysis of gender impact of the NACCUG policy. Rome, FAO/DFID, Sustainable Fisheries Livelihoods Programme (SFLP). (Unpublished working document)
Mendy P. & Njia, S. 2003. Gender and micro finance study in Tanji, the Gambia. Rome, FAO/DFID, Sustainable Fisheries Livelihoods Programme (SFLP). (Unpublished working document)
Ministry of Fisheries & The World Bank 2005. *Vietnam: Fisheries and aquaculture sector study. Final report.* Washington, USA, World Bank.

MRAG 2003. *Understanding fisheries livelihoods and constraints to their development: Kenya and Tanzania. Final Technical Report.* London, Marine Resources Assessment Group (MRAG).
Nawaratne, Y.B.; Kodithuwakku, S.S.; Murray, F. & Little, D. In press. Entrepreneurial strategies adopted by rural inland fishermen in the dry zone of Sri Lanka. *Journal of Tropical Agricultural Research*, in press.
Ostrom, E. & Schlager, E. 1996. The formation of property rights. In: S. Hanna, C. Folke and K.G. Mäler (eds.) *Rights to Nature*. Washington, D.C.: Island Press: 127-156.
Paris, T.R. 2002. Crop-animal systems in Asia: socio-economic benefits and impacts on rural livelihoods. *Agricultural Systems*, 71: 147-168.
Pauly, D. 1997. Small-scale fisheries in the tropics: marginality, marginalization and some implication for fisheries management. p. 40-49. In E.K. Pikitch, D.D. Huppert & M.P. Sissenwine (Eds.) *Global trends: Fisheries Management*. Bethesda, Maryland, American Fisheries Society Symposium 20.
Pauly, D. 2005. Rebuilding fisheries will add to Asia's problems. Correspondence to Nature, *Nature*, 433: 457.
Pauly, D. 2006. Major trends in small-scale marine fisheries, with emphasis on developing countries, and some implications for the social sciences. *Maritime Studies (MAST)* 4(2): 7-22.
Pitcher, T.J. 1999. RAPFISH, a rapid appraisal technique for fisheries, and its application to the CCRF. *FAO Fisheries Circular* No. 947. Rome, FAO.
Pitcher, T.J. & Preikshot, D. (2001) RAPFISH: A rapid appraisal technique to evaluate the sustainability status of fisheries. *Fisheries Research*, 49:255- 270.
Pomeroy, R.A., Ratner, B.D, Hall, S.H., Pimoljinda, J. & Vivekanandan, V. 2006. Coping with disaster: rehabilitating coastal livelihoods and communities. *Marine Policy*, 30: 786-793.
Reardon, T., Delgado, C. & Matlon, P. 1992. Determinants and effects of income diversification amongst farm households in Burkina Faso. *Journal of International Development*, 28(2): 264-297.
Salas, S. & Gaertner, D. 2004. The behavioural dynamics of fishers: management implications. *Fish and Fisheries*, 5: 153-167.
Sievanen, L., Crawford, B., Pollnac, R. & Lowe, C. 2005. Weeding through assumptions of livelihood approaches in ICM: Seaweed farming in the Philippines and Indonesia. *Ocean and Coastal Management*, 48(3-6): 297-313.
Smith, I.R. 1981. Improving fishing incomes when resources are overfished. *Marine Policy*, 5: 17-22.
Smith, L.E.D., Nguyen Khoa, S. & Lorenzen, K. 2005. Livelihood functions of inland fisheries: policy implications in developing countries. *Water Policy*, 7: 359-383.
SFLP 2005. *Report on West African Sustainable Fisheries Livelihoods Programme. Stakeholder Forum, Burkina Faso, October 2005.* Sustainable Fisheries Livelihoods Programme (SFLP). Rome, FAO. (available at: www.sflp.org)
Start, D. (2001) *Rural diversification: what hope for the poor? ODI Meeting on Rural Development Food Security: Towards a New Agenda.* London, ODI.
Tesfamichael, D. & Pitcher, T.J. 2006. Multidisciplinary evaluation of the sustainability of Red Sea fisheries using Rapfish. *Fisheries Research*, 78: 227-235.
Thorpe, A., Reid, C., van Anrooy, R. & Brugere, C. 2004. African poverty reduction programmes and the fisheries sector: current situation and opportunities. *African Development Review*, 16(2): 328-362.
Thorpe, A., Reid, C., van Anrooy, R. & Brugere, C. 2005. When fisheries influence national policy-making: an analysis of the national development strategies of major fish-producing nations in the developing world. *Marine Policy*, 29(3): 211-222.
Valdivia, C., Dunn, E.G. & Jetté, C. 1996. Diversification as a risk management strategy in an Andean agropastoral community. *American Journal of Agricultural Economics*, 78: 1329-1334.

van Huylenbroeck, G. & Durand, G. 2003. Eds. *Multifunctional Agriculture. A New Paradigm for European Agriculture and Rural Development.* Hampshire, UK, Ashgate Publishing Limited.
Verstralen, K. 2005. *Micro-finance: How can it contribute to fisherfolk's livelihoods and responsible fisheries?* Rome, FAO/DFID, Sustainable Fisheries Livelihoods Programme (SFLP). (available at: www.sflp.org)
Whittingham, E.; Campbell, J. & Townsley, P. 2003. *Poverty and Reefs. Volume 1: A Global Overview* and *Volume 2: Case Studies.* Paris, DFID-IMM-IOC/UNESCO.
World Bank 2004. *Saving fish and fishers. Towards sustainable and equitable governance of the global fishing sector. Report No. 29090 – GLB*. Washington, USA, World Bank.
Wunder, S. 2005. Ecotourism and economic activities – an empirical approach. *Ecological Economics*, 32(3): 465-479.
Zimmerman, F. & Carter, M.R. 1999. Asset smoothing, consumption smoothing and the reproduction of inequality under risk and subsistence constraints. *Staff Paper Series* No. 402 (Revised). Madison, Department of Agricultural and Applied Economics, University of Wisconsin.

This paper was commissioned by SFLP as one of the inputs into the formulation of programme activities and policy briefings on a series of issues linking fisheries governance with wider social and economic development concerns. The purpose of these reviews was to complement SFLP field experience with review of relevant global literature and to draw on experiences from other projects and programmes around the world.

7. Appendices

APPENDIX 1
Review of fishing *and* other forms of diversification adopted by fishing communities throughout the world[11]

Country and location (inland/coastal)	Reference	Diversification within fisheries	Diversification external to fisheries (incl. fish post-harvest activities)	Support/outside agent trigger? (Y/N)	Diversification initiated as: response (ex-post), adaptation (ex-ante) or other (e.g. caste)?	Who? (carried out dominantly by men, women, household heads)
Costa Rica Gulf of Nicoya and Puerto Thiel (coastal)	Charles and Herrera, 1994	n/a*	- Supermarket, for improved distribution of seafood and other products - Bakery - Tree nursery	Y	ex-ante	- Men (fishing) - Women (non-fishing)
Mexico Yucatan (coastal)	Salas and Gaertner, 2004	Switch among species (lobster, demersal species, octopus)	n/a	N	ex-post (in the case of fishing diversification)	- Communities with less of a fishing tradition
Tanzania Mafia and Unguja Islands (coastal)	Andersson and Ngasi, 1998	n/a*	- Seaweed farming - Agriculture - Tree cultivation	N (except for seaweed farming)	ex-post (response to market integration and environmental uncertainty)	- Women (seaweed) - Men (fishing)
India Angaman Islands (coastal)	Whittingham et al. 2003	- Seasonal migration to new fishing grounds - Reef fish as	-Vegetable and paddy cultivation - Agricultural labour - Livestock	N	ex-ante ex-post (in the case of fishing diversification)	- Women (non-fishing activities, except vending) - Men (fishing, sand

[11] This table is meant to present an overview of diversification examples in fishing communities, based on case studies collected from the available literature. It does not attempt to be exhaustive, nor to provide a thorough analytical summary of the reported experiences. Factors behind the success or failure of diversification activities and the consequences of diversification on households, for example, can be multiple and their description is beyond the scope of this table. The reader may refer to the original references for further information.

		alternative to pelagic during rough weather season	- Fish vending - Private businesses - Government jobs - Sand mining			mining, some agriculture).
India Gulf of Mannar islands, Tamil Nadu (coastal)	Whittingham et al. 2003	- Boat ownership - Boat labour	- Seaweed and shell collection - Coconut farming - Small-scale agriculture - Land-based activities (goat rearing, mat weaving, construction)	N	ex-ante	- Women (seaweed and land-based activities) - Men (fishing, boat labour, agriculture)
Mozambique Cabo Delgado Province (coastal)	Whittingham et al. 2003	n/a*	- Charcoal production - Agriculture - Seaweed culture - Trading - Artisan - Firewood and shell collection - External employment Lime production (from coral)	N	ex-ante	- Women (seaweed, agriculture, mollusc collection) - Men (fishing, trade, charcoal, external employment)
Philippines Indonesia	Sievanen et al. 2005	- Subsistence fishing - Milkfish fry collection - Ornamental fish collection	- Seaweed farming - Agriculture - Construction	Y	ex-ante	- Women (seaweed) - Men (seaweed, fishing, construction. agriculture

*n/a: no diversification within fishing was observed or reported in the case study. It does not mean that there was no fishing.

APPENDIX 2

Case studies of alternative coastal livelihood projects

Ireland et al. (2004) provide a list of case study from livelihood diversification initiatives in coastal communities of Comoros, Mauritius, Mozambique and Tanzania. They are reproduced below.

Mariculture of fish

Alternative Livelihood	*Mariculture4 of fish*
Reference	www.spc.int/coastfish/News/WIF/WIF13/Howard.pdf
Country	Komodo National Park, Indonesia

Why is it an alternative livelihood?

Local communities in the Komodo area depend mostly on fishing as their main livelihood strategy. Implementation of planned no fishing zones is likely to affect a large number of the 20,000 households that live in the communities in and around this area. However the area also offers the opportunity for the culture of valuable marine organisms such as seaweed and fish. This is not a traditional livelihood strategy in this area and its introduction is being supported by development agencies.

Description

The practice of mariculture in Komodo is based on a 'full-cycle' culture: captive broodstocks of grouper and snapper will spawn in a hatchery and the fertilized eggs are then collected. Larvae are then reared and when they reach fingerling size, they are transferred to village-run sea cages to grow out. Once they are of marketable size, the fish are returned to the hatchery to be marketed to Hong Kong. A percentage of the revenue from fish sales will go to the villages and the remainder will be reinvested in the project to fund continued operation of the hatchery.

Opportunities

This mariculture enterprise offers an alternative livelihood for fishers and women in and around the park. The goal of the project is to help transform the live reef fish trade from its unsustainable and capture based structure to one that is sustainable, thereby protecting wild populations. This diversification of livelihood activities is hoped to create an incentive for people to move away from unsustainable fishing practices whilst sustainably increasing the standard of living for local villagers through the new enterprise.

Challenges

Mariculture requires a great deal of technical training and new skills. This is particularly important around the reproduction and rearing of larvae which is highly technical. The set up of mariculture activities can also be quite expensive and thereby excludes the poorest fishers from engaging in
the enterprise.

No of people reached/feasibility for scaling up

It is estimated that once the mariculture industry is fully established in the Komodo area it will employ more than 200 local people. If replicated at other sites along Indonesia's 95,000-Km coastline, the techniques developed in Komodo have the potential to provide diversification of livelihood opportunities for hundreds more households.

Who is involved

The Nature Conservancy (a US based NGO) and the SE Asia Centre for Marine Protected Areas in Indonesia have been supporting this project.

Livelihood issues
Access to assets is extremely important for the success of mariculture. It can be a highly technical process requiring skilled and trained technical knowledge (human capital), it can involve high set up costs (financial capital), it requires access to the sea (natural capital) and most importantly it requires there to be market access and demand (physical capital). However being on the coast mariculture is also vulnerable to the negative impacts from climate related disasters such as cyclones and tsunamis.

Conservation impact
By culturing fish in this way there is a potential to reduce pressure on wild populations which may lead to its sustainability. However the reality is more complex than this simple correlation. Conservation impact will depend on a certain number of people stopping the old practice but this number is not known. It also depends on no increase in people using the old practice and this can not be prevented by the introduction of an alternative. One of the challenges is that mariculture can be expensive and therefore exclude the poorest fishers. If poverty remains an issue in this area then the alternative practice is unlikely to have the conservation impact it intends.

Sustainability – ecological, economic, social, institutional

Economic	• The project aims to produce five local species that are in high demand on the international market.
Social	• High set up costs however can be a disincentive to poor households who may continue to opt to remain in their existing destructive livelihood strategy.
Institutional	• As with many alternative livelihood projects, whilst the project might encourage people to move away from destructive fishing practices in the short term, there is no guarantee that in the long term (particularly with population pressures on the coast) that the gap will not be filled by others.
Ecological	• The alternative livelihood brings with it its own pressures. Mariculture is renowned for its problems with the spread of diseases and these will have to be monitored.

Seaweed collection/culture

Alternative Livelihood *Seaweed collection/culture*
Reference http://europa.eu.int/comm/development/body/publications/fish/099936.pdf
Country and location Madagascar, East Africa

Why is it an alternative livelihood?
Traditional fishers are faced with a declining trend in their revenue due to resource depletion of their traditional fishing grounds. Seaweed farming is seen as a revenue-generating, alternative activity that can bring additional income to the household.

Description
The culture of seaweed requires a long line, fixed to a permanent structure, so that the seaweed can establish on it. Alternatively if conditions are right seaweed can be collected naturally from the wild.

Opportunities
Seaweed is relatively simple to farm. In Madagascar it has provided women with a predominant role in production and has doubled monthly incomes for those involved in it. Seaweed can be harvested regularly throughout the year providing a reliable source of income.

Challenges
Although simple to farm there are a number of risks inherent in the crop and as a result professionalizing seaweed as a farming technique has been difficult. Disease can be common and certain species grow faster than others. There has been introduction of alien species without proper environment impact assessment to determine likely effects on the coastal ecology. It is also a very time consuming activity with opportunity costs that may not fit in with the tradition of multiple activities in coastal villages. Often not used locally but needs access to an export market.

No of people reached/feasibility for scaling up
This crop initially centred on the coastal zone between Toliara and Morombe and has now elicited the interest of entrepreneurs in the North of Madagascar. At present there are 5 farms producing 1,000 tons of seaweed. Each of these farms provides employment for around 500 families, ensuring wide outreach of the benefits of this industry.

Who is involved
The seaweed industry in Madagascar has targeted traditional fishers from the North and Southern regions of Madagascar. Two multinational companies have been involved in the marketing of the seaweed and buying of the dried product.

Livelihood issues
Due to the parasites and disease that can spread amongst the seaweed it is important that the seaweed farmers are adequately trained in the skills needed to reduce these risks. The risk of disease also makes this a vulnerable livelihood strategy with the need for careful monitoring of the resource.

Conservation Impact
If the culture of seaweed is of local indigenous varieties and undertaken on a small scale then this practice is likely to contribute significantly to the conservation of the coast. However if alien species are introduced the potential for a negative impact on the environment is greatly increased as is the negative impact when large scale culture and harvesting takes place.

Sustainability – ecological, economic, social, institutional

Ecological	• Seaweed is susceptible to parasites and disease.
Economic	• Whilst there is considerable demand for this product, Madagascar is competing with the Philippines, Indonesia as well as China who has a monopoly of production and market share; • Initial set up costs require high investment with returns taking two years on this initial investment; • income generated from the seaweed can be variable due to the risk of parasites and disease.
Social	• The promotion of exchanges between technicians and seaweed farmers to share and strengthen professional experience has had a

	positive impact on social networks. Bridging the gap between social classes and gender division has been seen to have a positive impact on poverty.
Institutional	• The establishment of a seaweed farmer association: the GEAM, grouping producers and exporters of seaweed has created new social networks and norms between the different groups.

Duck farming

Alternative Livelihood	*Duck Farming*
Source/reference	www.unesco.org/csi/pub/papers/mega11.htm
Country and location	Indonesia, Seribu Islands

What makes it an alternative livelihood?
Duck farming was introduced specifically as an alternative income-generating occupation on Pari Island where livelihood opportunities for the coastal poor were perceived to be in decline.

Description
In June 1998, 290 five month old ducks that had been quarantined for a week were distributed among 55 families. Each family was expected to breed enough ducks so that they could hand on the number of the ducks they originally received for distribution to another islander. Egg production is approximately 280 eggs per duck per year so even after breeding replacement ducks, each family would be expected to have more than 1,000 eggs per year to dispose of as they wished.

Opportunities
A training course on duck farming brought new skills to the community. Training was provided in basic duck farming methods: duck housing, rearing ducklings, feeding, hatching, disease prevention and egg and meat production. The eggs that are produced provide additional protein and/or a cash crop for the household.

Challenges
Materials for building duck houses are limited and expensive in Pari Island. Bamboo, wooden blocks, and roofs were imported to make duck houses. The production of duck eggs is linked to the amount of food that the duck eats so if regular high quality feed is not provided, egg production will decrease. The experience from this project showed a high duck mortality rate. 85% of the ducklings died which was thought to be linked to insufficient care taken and the lack of high quality feed given.

No of people reached/feasibility for scaling up
The duck farming project on Pari Island has been developed as a pilot and is hoped to act as a model for other islands. The carrying capacity on Pari Island is limited to around 400 ducks therefore opportunities for scaling up this activity are fairly limited on Pari Island itself.

Who is involved
During the feasibility stage of the project, local authorities and families were involved to explore issues relevant to the project.

Livelihood issues
It was seen to be economically more efficient to import ducklings onto the island as the skills to raise ducklings from eggs proved not to be adequate enough even following the training. It's important to recognise that completely new and alternative livelihood activities bring with

them the need for effective and sustained technical training to ensure the success of the new activity.

Conservation Impact
With livelihood activities being fairly limited on the island the potential for the duck project to contribute to increased conservation is high. However limited carrying capacity of the ducks together with questionable sustainability (see below) means that it is unlikely to ease enough of the pressure to ensure conservation on the island as a whole.

Sustainability – ecological, economic, social, institutional

Ecological	• With limited food resources available for the ducks on the island the ecological sustainability of the project is extremely limited.
Economic	• While the project showed that duck farming was possible on the island, raising ducklings has been seen to have little potential due to limited food resources and technical skills to implement this type of rearing. Island capacity limited the number of ducks to around 400.
Social	• Eggs were sold through a cooperative network thereby increasing social networks.
Institutional	• By forming a cooperative, farmers could reduce their costs for purchasing food and duckling however the sharing of skills remained limited due to this being a completely new technology to the island.

Pelagic Fisheries

Alternative Livelihood *Pelagic Fisheries*
Source/reference
http://www.komodonationalpark.org/downloads/report%20pelagic%20may%202000.pdf
Country and location Indonesia, Komodo National Park

What makes it an alternative livelihood?
Whereas the coral reefs in and around Komodo National Park were being threatened by destructive fishing practices, open waters around the park were not being utilised to their full potential and were seen to still offer the potential for sustainable fishing opportunities.

Description
Six fish-aggregating devices FAD's (wooden rafts anchored to the sea floor) were deployed in the deep water (1000-2000m depth) to attract skipjacks and yellow fin tuna and other offshore pelagic fishes. A three month intensive training programme for coastal communities was provided which taught skills around fishing techniques, management of the FAD's and post harvest processing.

Opportunities
This project is providing alternative livelihood opportunities for the residents in and around Komodo National Park that will be affected by the planned implementation of no-fishing zones in the 1817km park. It has been noted that there is also considerable potential for production of various kinds of processed fish thus scaling up financial benefits and potential for adding value

Challenges
Expensive to implement, initial stages requires considerable external inputs and training plus high investment costs for the boats and rafts needed.

No of people reached/feasibility for scaling up
20,000 live around the park however some of these people will also be involved in the seaweed farming and mariculture projects that are running in conjunction with the pelagic fisheries project. It is not likely that all 20,000 people will engage in this deep sea fishing however it does have the potential to reach a large number of this population.

Who is involved
The Nature Conservancy (TNC), a US-based NGO, 20,000 people who live in communities in & around the park and Komodo National Park (KNP)

Livelihood issues
Whilst the alternative livelihood activity was developed to encourage fishers away from blast fishing it needs to demonstrate to fishers that this is a profitable alternative otherwise fishers may revert back to their previous practices. For the alternative livelihood activity to be successful efficient infrastructure for preservation, transport and post-harvest processing needs to be developed.

Conservation Impact
The conservation impact of this alternative livelihood depends predominately on people stopping old destructive practices. If the alternative activity takes of, but destructive fishing continues, the conservation impact conservation is likely to be minimal.

Sustainability – ecological, economic, social, institutional

Economic	• There is a need to ensure suitable post harvest practices are available. • Fish processing has potential to add value to the product and further diversify livelihood opportunities.
Institutional	• Marketing of pelagic fish is important to ensure sustainability
Social	• Both fishers and consumers need to be educated on the importance of maintaining product quality.
Ecological	• With open waters around the park being under utilised the ecological impact is likely to be minimal.

Concrete block making

Alternative Livelihood	*Concrete block making*
Source/reference	http://www.iczm-sa.org/maldives/hpa.htm
Country and location	Maldives, Male

What makes it an alternative livelihood?
Coral have been the main construction material in the Maldives for hundreds of years and until recently, provided the only source of stone for construction. However, concern over the environmental and ecological impact of coral and sand mining led to a government ban and encouragement of the use of hollow concrete blocks as an alternative construction material.

Description
Hollow concrete block making involves using imported concrete as a building material rather than relying on extracting natural resources through coral and sand mining.

Opportunities
If the uptake of the concrete blocks becomes widespread it has the potential to stop the illegal practice of coral and sand mining. This would bring about a positive impact in conserving the marine ecosystem, which would ultimately protect the tourist industry which is the backbone of the Maldivian economy.

Challenges
Whilst the hollow concrete blocks are now widely available for building materials they are seen as not as strong as coral. High quality cement blocks are regarded as too expensive. Incentives to move away from coral mining to the new alternatives are weak and threaten to undermine the sustainability of this new approach.

No of people reached/feasibility for scaling up
The construction industry is a large employer in the Maldives, second only to tourism and the fishing trade. The costs of the new concrete blocks have implications for wages and numbers of people engaged in the industry.

Who is involved
Fishers, NGOs, Government of the Maldives

Livelihood issues
Importing these new building materials is costly and the price is dependent on fluctuations on the international market. This could result in the exclusion of the poorest to using these materials and with the ban on using coral, options for the poor appear limited.

Conservation Impact
If the uptake of the concrete blocks becomes widespread it has the potential to contribute significantly to conservation of coral around the island. However the cost of the blocks remains a barrier to the poor, who are likely to still revert to the perceived 'free' resource of the coral and thus threaten the conservation of the resource.

Sustainability – ecological, economic, social, institutional

Ecological	• If the use of the concrete blocks takes off then it will contribute to the conservation of the coral reefs, however if the price remains high and excludes the poor from the use of these materials then this could undermine the ban and lead to increased coral harvesting.
Institutional	• Unless the ban on coral harvesting is effectively implemented it is likely that the practice may continue as economically viable alternatives remain limited for poor households.
Economic	• To encourage the shift to other building materials, the duty on imported cement was reduced to 15% to hollow cement blocks a viable alternative. Whilst a step in the right direction it is still not seen as economically competitive.
Social	• Needs to be combined with education to increase awareness of the damaging effect of exploiting coral

Vegetable and crop growing

Alternative Livelihood	*Vegetable and crop growing*
Source/reference	http://www.iucn.org/places/earo/pubs/marine/TANGAGEN.PDF
Country and location	Tanzania, Tanga Region

What makes it an alternative livelihood?
Currently the majority of the coastal population in Tanga depend predominately on the marine environment for their livelihoods. By supporting communities to diversify into agriculture and vegetable gardens it provided people with an additional livelihood strategy that lessened their dependence on the marine environment.

Description
Through training, the Tanga Coastal Zone Conservation & Development Programme supported ex-fishers, including their families, in 5 hamlets of Tongoni village to learn the skills of organic vegetable farming and crop production. Vegetables are not commonly grown in the area and demand in the market place is relatively high.

Opportunities
With few vegetables grown in the area but high demand existing, the establishment of a local vegetable supply was able to tap into this ready market. Households were able to grow enough vegetables for their own needs as well as a surplus to sell in the market. The project seems to have created a viable alternative livelihood activity that has resulted in a reduction of pressure on the marine environment by those engaged in the project.

Challenges
The income from these activities is relatively small and so is not going to result in the complete disengagement of marine livelihood activities by those engaged. The project experienced some theft of the crops, most notably the maize which has a high value in the local market. This demonstrates the vulnerability of new livelihoods as not only was their a need to protect the crops but the high chance of having capital gains stolen risked existing coping strategies.

No of people reached/feasibility for scaling up
The project covered a very small group of people (10 to 15 ex-fishers, including their families) but the potential for scale up is high.

Who is involved
Ex-fishers, including their family around the Tanga municipality, District Government, IUCN.

Livelihood issues
Through the training courses, ex-fishers and their families, have been able to gain increased knowledge of organic vegetable growing and in solving the problems that arise from such enterprises. They also received training in intercropping, controlling vermin, reducing beach pollution, preparing fuel efficient stoves and developing woodlots.

Conservation impact
The numbers involved in this alternative activity have been small and therefore pressure on the coastal environment has not been eased at this moment in time. However the potential to scale up this alternative activity is high given the demand for vegetables in the local area. If significant numbers moved away from destructive fishing into vegetable growing then this would likely see a positive conservation impact on the coastal environment.

Sustainability –• ecological, economic, social, institutional

Social	• Through participation in these training activities, it was noted that women gained increased confidence and successfully participated in management activities and decision making bodies.
Institutional	• Demand for vegetables in the local market is high.
Ecological	• Dependence on small areas of and the organic methods used meant that it was a sustainable activity.
Economic	• Whilst a market exists for the crops and vegetables at the moment only a small amount is grown and income as a result is very small.

Mat weaving

Alternative Livelihood *Mat weaving*
Source/reference http://www.worldfishcenter.org/Pubs/institutional_sea/pub_insea5.pdf
Country and location Philippines, Apo Island

What makes it an alternative livelihood?
A cottage industry, mat weaving was encouraged as an alternative livelihood activity to divert away from using the marine resources.

Description
77% of the population of Apo Island are engaged in fishing, however about 38% of the population are now engaged in hat/mat weaving as a secondary source of income.

Opportunities
Mat weaving is regarded as an additional livelihood activity that enables people to continue other activities such as looking after the family in the case of women whilst also being able to earn additional income.

Challenges
Limited opportunities for diversifying and scaling up into alternative products.

No of people reached/feasibility for scaling up
The island has approximately 250 households with an average family size of 7 and 38% of these families are said to be engaged in mat weaving. There were initially 46 members in the mat weaving
cooperative when it was initially set up, it now has 80 members and runs a retail stall.

Who is involved
Tourists, fishers, women and men.

Livelihood issues
Part of the project was the encouragement of forming a mat weaving cooperative. A women's weaving group called Apo Weaving Association has enabled women to earn extra income by selling woven mats to tourists in the island or bringing them to the weekly markets.

Conservation impact
With the resources found locally for mat making it is seen as a sustainable industry for the communities to engage in with a positive impact on the conservation of the coastal resource. However the demand for the mats is dependent on the tourist industry and if this decreases it is likely that people will revert back to marine based livelihoods.

Sustainability – ecological, economic, social, institutional

Ecological	• The materials used for making the mats are harvested sustainably from local resources
Economic	• The demand and therefore the price of the mats is highly dependent on the tourism industry.
Social	• The establishment of the cooperative to support the mat makers has created a forum for increased social networking and support.
Institutional	• The establishment of the cooperative has meant that the risk of investing in alternative activity has been shared and improved the marketing product.