

**UNDERSTANDING LIVELIHOODS
DEPENDENT ON INLAND FISHERIES
IN BANGLADESH AND
SOUTHEAST ASIA**
(DFID/FMSP Project R8118)

**SYNTHESIS
REPORT**

Prepared by

P.-J. Dixon
(Durham University, UK)

Parvin Sultana
Paul Thompson
Mahfuzuddin Ahmed

(WorldFish Center)

A.S. Halls
(MRAG, UK)

Kai Lorenzen
(Imperial College, UK)



Imperial College
OF SCIENCE, TECHNOLOGY AND MEDICINE



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Executive Summary

Purpose of the report

Information on fisheries resources in Bangladesh and S.E. Asia is fragmented and has not taken account of poor people and their livelihoods. Systems approaches have considered impacts at the ecosystems and production system level, rather than the household level. The Sustainable Livelihoods Framework is the most obvious manifestation of this systems approach at the household level, and has been used as far as possible to integrate the data.

The role of aquatic resources in rural livelihoods is characterised by diversity in the resource, habitat and environment, and in the resource users and the ways in which they exploit these resources. Understanding this diversity and the inter-relationship between different parts of what are wider socio-agroecological systems is critical to understanding threats to resources and livelihoods and to achieving their sustainability. Thus while the report primarily deals with the livelihoods of those who have some dependence on the fisheries, it also seeks to place these in the context of rural livelihoods in general and the pressures and trends that are taking place in relation to them.

The project has reviewed relevant secondary data in the four study countries, and consulted with intermediate and secondary stakeholders. It has also carried out field research with primary stakeholders to prioritise constraints and identify possible research priorities. That data is contained in four Country Status Reports and four Country PRA Reports.

This synthesis report is based primarily on information contained in the above reports together with some additional material available to the author. The country status reports are syntheses of secondary information while the PRA reports contain information derived from fieldwork with primary stakeholder groups at different fisheries-related locations in-country.

Poverty

The four study countries have different poverty characteristics. These are most easily and quickly grasped through comparison with the World Bank's Lower-middle-income group of countries (see Appendix 2), based on the World Bank's 'development diamonds'. In broad terms all countries' life expectancy meets the average, primary school enrolment is above the average in all cases, access to an improved water source is mixed, while GNI per capita is below the average.

The four countries vary considerably in population size and population density. Bangladesh has by far the highest population density (981 per Km²), followed by Vietnam (238 per Km²) and then Cambodia (67 per Km²) and lastly by Laos where the population density remains one of the lowest in the region at 22 persons per square kilometre. However, average population densities mask considerable regional differences within countries. Upland regions in SE Asia have much lower population densities than the floodplains of the Mekong and Red rivers. On the floodplains population densities are on a par with those in Bangladesh. Some regions of Cambodia have high population densities, but unlike the other study countries, much lowland still has relatively low population densities.

Countries are more similar in the distribution of poor between rural and urban sectors. Poverty is primarily a rural phenomenon in all four countries. There can be differences within rural areas, most usually as a result of landlessness. Landlessness is less of a problem in upland areas where there is still forest to clear, but sedentarisation of people who were swiddenists can lead to land degradation and impoverishment of cultivators. The spatial incidence of poverty also has ethnic dimensions, with the population of upland areas in Laos and Vietnam primarily comprised of ethnic minority groups. The position of women and of female-headed households appears to be less disadvantaged in SE Asia than in Bangladesh.

Poverty reduction through economic growth

The opportunities associated with urban centres and diversification of economies are predicted to lead to increasing urbanisation of populations. As countries have reformed their economies, so too has the opportunity for non-farm employment. This has probably gone furthest in Bangladesh, which is also further ahead of the three SE Asian study countries in its improvement of rural infrastructure.

All countries have established stable central government after periods of civil strife - most recent in Cambodia's case - and all have put in progress major economic reform intended to achieve pro-poor economic growth. However, implementation is still lagging policy-making.

Historically, all four countries' economies have been agro-based. In the last two decades, however, there has been a shift to economies involving a mix of agrarian, industrial and service sectors. However, the agricultural sector is still very important in the livelihoods of rural households, though the proportion dependent on agriculture is declining in all four countries. The process has gone furthest in Bangladesh. However, non-agrarian opportunities are increasing only slowly, and the best hope for lifting the greatest number out of poverty in the immediate future are likely to lie in the rural sector.

Some commentators have seen the route to achieving poverty reduction as being through export-oriented agricultural production, but this can be risky for small producers. There is possibly a 'halfway house' in the growing urban sector's demand for rural good and services. The ability of the rural sector to take up this opportunity depends on a range of factors including proximity and access to urban markets and access to the necessary factors of production. These factors vary by country according to their stage of development, size of economy, geographical location, and so on.

Urbanisation can impact in different and unexpected ways on rural production and thus rural livelihoods. These concerns, taken together with the vulnerability of the world market for rice, reinforce the need for appropriate forms of agricultural diversification.

As urban populations' incomes rise so too will their demand for food (including protein-rich fish). This may lead to further pressure on wild stocks, but also may stimulate aquacultural production. This may lead to income gains for the rural poor with access to ponds. These, however, are unlikely to include the landless poor unless a market in leasing/sharecropping ponds develops.

One cloud on the horizon of growth-led poverty reduction is the danger of rent-seeking by powerful elites, exacerbated by the ‘fragile’ property regime status of much of the inland capture fisheries (as CPRs) in all countries.

The fisheries in national economies

The fisheries sector is important to national economies, yet there is continuing debate about the significance of production figures, and in particular as to whether the upward production trend is true, sustainable, or masks significant changes in the composition of species in the fisheries. In contrast to governments' figures, PRAs and stakeholder discussions suggests the resource is declining and that some important species are close to extinction.

Overall production is dominated by temporarily flooded habitats, in particular rice paddies, followed by large rivers and perennial wetlands.

Production figures are still rising in all four study countries. However, there are some issues regarding the veracity of these and how they should be interpreted. Most national level figures are estimates and quite wide margins of error may be involved. A difficulty with national production figures are that they do not record the value of fish, LARs and other items like wild water vegetables which are consumed by households as an expenditure-saving strategy. The focus of governments on high value fisheries production masks this ‘hidden harvest’.

Again production figures only record a number of the more important high value species, while in fact fishing effort is devoted to almost all species. Rising production figures may be comforting to governments concerned with national economic growth, but they may well mask changes in species composition of the fisheries, while also failing to capture the situation concerning the many LARs that rural poor people exploit besides fish.

Most research on SE Asian fisheries has focused on the floodplains of the great rivers of the region – in particular the Ganges-Padma, Meghna and Jamuna-Brahmaputra rivers and their tributaries which form the floodplains of Bangladesh and the Mekong and Red river floodplains of SE Asia. Of these rich and varied aquatic resources, those of most interest to the national economy and captured in national-level statistics are fish and prawn. However, as far as the livelihoods of the poor are concerned other living aquatic resources such as prawn/shrimp, snails, frogs, shellfish and water plants are important both for subsistence consumption and for income-generation.

Fish ecology

Published research on fisheries biology in the study countries is not extensive. However, it is important to emphasise the variety in fish species, the complexity of their interactions and complexity of different species habitat requirements. The relative importance of different fish species to the fisheries is difficult to assess from national statistics which aggregate catches into broad categories for the main sectors.

In Bangladesh total instantaneous mortality rates in the floodplain fisheries are high (1.6–5.2 year⁻¹), equivalent to survival rates of 20–0.5 % per year. Due to the rates of exploitation, many stocks are therefore believed to be virtually annual, comprising a single cohort for most of the year (Craig et al 2000). A similar situation is likely to hold on the floodplains of other study countries.

Dry season waterbodies, replenished with water from the flood pulse, provide important dry season refugia for floodplain fish species. By contrast, conditions in the main channel are less favourable for primary and secondary production. Most species of fish that permanently occupy the main channel tend to be predators of fish and aquatic invertebrates which depend to a great extent directly or indirectly on the primary production of the floodplains. The main channel is used mainly as a migration route for gaining access to feeding and spawning grounds upon the floodplain or as a refuge during the dry season.

The important points to note with regards fish ecology are that there are a great variety of species which primarily seek refuge in perennial water bodies (such as rivers and lakes) during the dry season, but move out onto the floodplains and rice fields during the flood season in order to breed and exploit their high nutrient value. Additionally others may breed in rivers and perennial water-bodies prior to the flood so that their spawn, fry and/or fingerlings may be carried onto the plains by the flood. At the end of the wet season, as floodwaters flow off the land, the majority of fish attempt to make their way back to perennial water bodies. However, even without human fishing effort, the greater proportion of these, as Halls et al (1999) and Hoggarth et al's (1999) research indicates, are likely to be unsuccessful and die.

Livelihoods

Understanding the seasonal dynamic of the fisheries is critical to understanding livelihoods in the study countries. Seasonal opportunities and constraints necessitate flexibility in livelihood strategies. There is a huge efflorescence of fisheries-related biomass on the floodplains during the flood season, which is matched by a reduction in agricultural opportunities for people living on the floodplains. In consequence a considerable number of floodplain dwellers need to find alternative employment. A prime strategy for supplementing the income and food gap during the 'lean' period is to turn to 'gathering' activities from CPRs – in upland areas of SE Asia from the forest, in lowland areas of Bangladesh and SE Asia from the floodplains and flooded rice-fields.

In all four countries estimates are that a high proportion of rural populations are involved in floodplain fisheries, though this masks the diversity of who fishes, when, for how long, with what intensity and gear, and how these factors relate to households' other livelihood strategies.

There are essentially three types of participant in the fisheries: subsistence, seasonal and professional fishers. The division between these categories is of course not immutable, and individuals may move between them in response to opportunity and the cost of fishing gear required.

There can be considerable internal migration of fishers (both fulltime, but especially part-time) from place to place in order to take advantage of seasonal availability of fish associated with the rise and draw-down of the annual flood. The monsoon is the peak fishing season. Only a few professional fishermen continue fishing throughout the year. During the dry season professional fishers make their livelihood from other activities such as agriculture on their household owned or share cropped land or as agriculture labourers.

The majority of full time fishers categorise themselves as very poor, and their educational and health status does tend to be low, as does their housing. Needing to be highly capitalised due to the variety of gears that they require, they are also highly dependent on others for finance. If their vulnerability context is taken into account, then full-time fishers may not be the most vulnerable. Unlike agriculturally-based poor who consistently report having a seasonal 'lean period' when food and income are scarce, fishers do not.

Part-time (seasonal) fishers fish on the floodplains in the monsoon period when there is, at least theoretically, open access to the fishery. The majority of part time fishers categorise themselves as poor or very poor – Most poor and very poor part-time fishers have no agricultural land.

Subsistence fishers are opportunistic according to floodplain conditions, and catch mainly for home consumption using relatively inexpensive, simple gears. This group includes landless labourers, small farmers and women and children. As might be expected this group ranges from very poor to rich. Since this large and occupationally diverse group is not dependant for income-generation or subsistence upon the fisheries, they are unlikely to be negatively impacted by any degradation of the wild resource.

There are various other groups which are dependent to an extent on the fisheries, for example women and those in fisheries-related pre- and post-harvest trades

Fishers use all conceivable types of fish capture from bare hands to seines and gillnets. Access to different types of gear is determined by their cost. Peak catches are normally obtained during the periods of up-migration of fish from perennial waterbodies to seasonal wetlands including paddies, and during down-migration. Hydromorphological conditions change throughout the year, so full-time fishers in all the study countries require a wide range of different gears to be successful. Some of these can be expensive and require fishers to be highly capitalised. Those that fish on a part-time basis, usually in seasons when their other livelihood strategies are 'slack', may be able to reduce costs by focusing fishing effort on peak fishing periods and limiting the types of gear that they need.

There has been a significant change in fishing technology during the last ten years in the study countries, with many fishers now using nylon mono-filament gill-nets, and in SE Asia resorting to electrocution fishing. The number of fishers (both full-time and part-time) appears to be increasing in all countries, as does the volume of fishing gear which each fisher uses. Lastly the development of aquaculture in Vietnam has led to a growing demand for fish feed. This can threatens recruitment to the adult stock.

Threats to the fisheries: land use change

The pressure for food security is a major driver of land use change and may be a major cause of fish habitat loss. In Bangladesh this has led to the conversion of most available wetland to wet-rice production, to huge investment in irrigation infrastructure and continuing investment in FCD/I infrastructure. In SE Asia it has led to a continuing loss of upland forest cover. Cambodia's flooded forest which plays an important role in household food production, may be under especial threat.

The process of forest loss in SE Asia is more complicated than the loss of indigenous floodplain vegetation in Bangladesh. In Bangladesh wetlands have been converted to highly productive farmland, most deforested upland areas in SE Asia have been degraded.

The impact of forest removal has been blamed for a number of negative downstream impacts on fish habitat, including increased run-off from upper catchments, and increased siltation and flood risk in lower catchments. Reforestation, usually with quick-growing conifer or eucalyptus may also have a chemical impact on the quality of water, and this may well impact on the volume and species diversity of fish. In those parts where there is a pronounced dry season, such tree species may also reduce low-flow volumes to lower catchments. Such potential impacts have not been researched in the SE Asian context.

Agricultural intensification

There is more evidence of the impact of agricultural intensification on inland capture fisheries.

There are two issues here: the impact on water quality of agricultural practices, and competition over water use. Given the low industrial base and extent of sheet flooding, surface-water pollution is not a serious problem within the floodplains. However, there can be quite dramatic localised downstream impacts by, for example, effluent from fertiliser plants, paper mills and the like.

Infrastructural disturbance of the floodplains in order to increase agricultural, and particularly wet-rice, production have received adverse comment. Agriculture is the major use of the floodplain area, and floodplain development has favoured this use.

The main contention is that where polders have been built to protect low-lying crop lands from flooding and there is poor maintenance and operation of sluice gates, not only are crops at risk of damage through water-logging, but migratory fish species are prevented from entering the seasonally flooded lowlands from perennial rivers in order to breed.

The extent of the problem is, however, contentious. Flood control, drainage and irrigation (FCD/I) engineering projects have provided a means of partially controlling floodplain inundation and preventing extreme flooding, and are said to have contributed to enhanced agricultural yields (Hoggarth et al., 1999a). Such gains may more than offset the loss to the fisheries. However, which households this benefits and which may lose out is unclear.

However, in contradistinction to the pessimists, Craig et al (2000) suggest that FCD/I schemes may obstruct the lateral migrations of rheophilic whitefish species and the passive drift of larvae from rivers to modified floodplains. However, they also suggest that existing

modifications to hydrological regimes probably have an insignificant effect on floodplain fish production although they may cause reductions in catch per unit area and fish biodiversity. They conclude that 'Hydraulic engineering structures are increasingly forming an integral part of the Bangladesh floodplain environment and economy. Although hydrological modifications within these schemes appear to have little impact on the production potential of individual fish, their levées and embankments can significantly diminish the recruitment to modified floodplains of prized rheophilic whitefish species. The effects are manifest in lower catch per unit area and local species diversity, as well as potentially more extreme-flood-prone main river channels. More subtle effects may have been, and may remain, undetected.'

The impact on different livelihoods of this change in species composition and volume of fish on modified floodplains remains unclear. Full-time fishers are primarily fishing to generate income, and a reduction in the number of prized species inside FCD/I schemes is likely to reduce this opportunity. Part-time and subsistence fishers may be less affected since they may not have the appropriate gear for catching the higher valued fish species, but are exploiting the lower value species which Craig et al (2000) suggest are relatively unaffected by compartmentalisation schemes.

There are also concerns in SE Asia about the impact of dams and large hydraulic structures. The high productivity of the Mekong River System relies on the seasonal inundation of forest and floodplains. Since the early 1950s nearly 6,000 large and small dams have been built in the lower Mekong basin. The main concerns regarding fish are that the migrations and complex biology of riverine fish associated with flood pulses will be disrupted.

With agricultural intensification, the agricultural production pattern has shifted towards irrigation-dependent cropping in the dry season. Shallow and deep tube-wells draw on groundwater for the irrigation water required to support production, while mechanised or manual low-lift pumps draw on surface water in dry season water bodies. Upper groundwater aquifers, however, are hydraulically connected to streams, rivers and water bodies, thus groundwater development affects surface water resources.

Lorenzen et al (2000) have investigated the impact of irrigation development on the fisheries in Laos. Irrigation development is proceeding rapidly, based mostly on small to medium scale schemes. Overall findings were that none of the irrigation schemes had significant effects on fish species diversity. The development of individual, small-to-medium scale irrigation schemes is associated with moderate, but significant negative impacts on local aquatic resources.

A variety of technical solutions, including simple sluice gate management practices, have been proposed for mitigating the impact of infrastructure on floodplain fisheries. Importantly, Halls (1998), has suggested that floodplain fish production is most strongly dependent upon recruitment and therefore on the (density-dependent) survival of the spawning stock, and that this is most sensitive to hydrological conditions during the draw down and dry season period when fish densities are at their highest, although flood season hydrological conditions become increasingly important with increasing dry season water heights.

Exotic species

Cultured fish production has been identified as having potential for maintaining growth in national production and for adding value to rural livelihoods. Two studies, by Lorenzen et al (1998) and Arthur (unpublished), found no evidence of any negative effects of the stocked exotics on native species assemblages, suggesting that the exotic species currently used in Lao aquaculture pose at best moderate risks to biodiversity.

Of potentially greater concern to the livelihoods of the poor in general must be the concern that aquaculture expansion on the floodplains will erode their access to the CPR. Where rice-fish is being adopted, the pressure on wild fish in rice-fields is likely to increase, since farmers are likely to erect perimeter netting to protect their investment by excluding wild piscivorous fish which predate on stocked fish.

Aquaculture has also become an importance sector in Vietnam and the Government has taken a number of measures to support aquaculture development. However, it has tended to ignore inland capture fisheries. Aquaculture has potential to provide high returns to those who engage in it, but there are concerns as to whether the poor have access to waterbodies and can afford to invest in this technology. Presently the wild fishery, both inland and coastal, is of greater importance than aquaculture to the poor.

Fishing effort

Overfishing is frequently identified as depleting the resource. But there is uncertainty about this, due to difficulties/inadequacies in data on catch and the monitoring mechanisms used. There are many anecdotal references in the literature to overfishing and worries are expressed at local level and by environmentalists to the effect that floodplain fisheries are being depleted.

However, as Halls and other have indicated for Bangladesh, - and which may be true for SE Asian floodplains too - due to the dramatic seasonal shifts in fish habitat, the high growth rate of floodplain fish and their high annual mortality rate are natural features of most floodplain fish species, though not necessarily all. Thus fishing effort may have little impact on the long term viability of the stock, so long as sufficient survive to breed the following season and repopulate the floodplains. As Craig et al (2000) and others have indicated, other factors which interfere with this part of the lifecycle of floodplain fish species, for example infrastructure which interferes with fish migration, may have a greater impact on long term sustainability of the resource than fishing effort.

Certainly Craig et al (2000) conclude that 'Whilst catch trends alone cannot always be relied upon to determine the exploitation status of fish stocks, the national catch statistics appear to offer little support to the widespread notion that Bangladesh fisheries are overexploited. With the exception of the main rivers, catches from other sectors (including total inland catches) are, based on the statistics, increasing or remaining relatively stable.

Two implications may be drawn from the above:

- a) Restrictions on catch effort may make little difference to the long term viability of the resource, but will have a negative impact on livelihoods of both f/t and p/t fishers, while reducing the total catch available for consumption by the population as a whole;
- b) there is a need for more research to understand the nature of the resources (fish ecology), and the complex interactions of the different fish species with the environment and with each other, a need for better mechanisms for monitoring the status of the resource, and a need for further investigation as to which interventions are best likely to conserve the resource with minimum negative impact on livelihoods of the poor.

In the SE Asian countries, PRAs suggest that the fisheries are being degraded. Pressures bearing on the fisheries have changed. Traditionally, Fishing was conducted almost entirely for subsistence purposes, with the exception of a small amount of barter trade. However, reform programmes, the increased availability of new technology, and particularly the opening up of regional market-links have led to a shift from subsistence to commercial fishing.

A significant number of Lao aggregate natural fish stocks may be declining due to a range of unfavourable human-induced disturbances including deforestation in the upland, water pollution and dam construction, as well as commercialisation of the industry due to regional demand for fish. However, there are no convincing data to support the widespread assumption of an overall decline (see Lorenzen et al 2002). Catch per fisher may have declined as the result of increased numbers of fishers exploiting the resource, but overall catch has been maintained or has increased (which may suggest that optimum off-take levels have not yet been reached). However, since fishery statistics do not record the catch landed by species, it is not possible to say whether fishing effort is changing the composition of species in the fishery.

In the absence of detailed research into the impact of fishing effort on the inland capture fisheries in study countries, the best guide to their status is currently likely to be catch statistics. However, where there is a decline in annual catch (as in Vietnam), it is necessary to separate out whether the decline can correctly be attributed to fishing effort (i.e. overfishing) or to other causes.

In the case of other LARs, there does appear to be clearer cases of over-exploitation, although attribution to human collecting effort rather than other causal factors may still be uncertain.

Whether or not fishing effort is currently a threat to the sustainability of the resource, all study country governments have sought to mitigate its impact. Regulations have historically been geared to national production and government revenue needs and have sought to restrain the amount of fishing in order to improve the types of fish caught and the overall value of the catch. However, present policy goals are directed to providing greater opportunity for poor people's livelihoods. Given that heavy fishing of floodplain stocks does not presently affect overall production but may reduce the catch of more valuable species (since these are usually the first to decline), there is no reason for regulations to be continued in their present form. There could be greater flexibility in the setting and enforcement of regulations so as to match them to local context and need.

However, there are specific aspects of fishing effort which can threaten the sustainability of the resource by threatening recruitment. These mainly relate to specific types of gear in specific

locations at specific seasons. In particular ‘barrier’ gears set to catch fish as they migrate onto the floodplain at the beginning of the wet season and migrate off it as the water level drops again, and ‘hoovering’ gears used to take all fish stranded in dry season waterbodies. The threat of these is clearly laid out in Hoggarth et al (1999), and as the latter say ‘Managers must ensure that barrier gears do not prevent the upstream spawning migration of whitefish, and that hoovering gears do not catch *all* the blackfish during the dry season.’ However, given the high natural mortality rate of most species exploiting the floodplains, there should be opportunities for developing fisheries management which exploits the high productivity of the fisheries while ensuring the survival of a proportion of adult stock to secure high annual recruitment levels.

Competition and conflict management

Competition for use of the floodplain centres on two main areas of water management: the use of surface water for irrigation of crops in the dry season, and the control of flooding in the monsoon season. Where the resource is scarce, as in the dry season, competing demands for water can result in conflict, denial of traditional access rights, diversion of water and control of the resource by powerful elites.

The study countries are similar in pursuing decentralisation reforms. The current trend is to move away from central management of the resource with gains for national production and revenue, to more devolved management (including CBFM) with gains for poverty alleviation.

In the absence of strong central management, a variety of informal management arrangements have tended to emerge at local level which have allowed states to extract benefit from the fishery for revenue purposes, have allowed different user groups to exploit the fishery, but have also allowed rent-seeking by powerful interests. This has been, and continues to be, a threat to the livelihoods of the poor dependent on the fisheries.

ICLARM (2000) has demonstrated that constraints to successful fisheries resource management lie as much in the socio-political realm as in the technical. Research suggests that local communities can better manage inland fisheries resources when management is devolved to them and where rights to their use are clarified.

If CBFM is going to be effective in resolving some of the difficulties associated with multiple users exploiting multifunctional resources, there will be a need for the pre-existence of communal social capital or its development, together with platforms enabling the different stakeholders to represent their interests and agree on the way forward. In the SE Asian countries community social capital is generally high due to a history of cadres under the now defunct commune system, while the isolated subsistence nature of communities has kept social differentiation in check and has led to a dependence of households on kin, neighbours and community for support in times of need. Social capital would seem to be less well developed in Bangladesh, but since most have an interest in the well-being of the fishery, opportunities for CBFM are probably good here too.

A number of recent initiatives in Bangladesh have explored how conflicts between different natural resource user groups might be best resolved, and consensus built for integrated floodplain

management (IFM). These methodologies are being developed further by local partners, and are being disseminated more widely through ICLARM.

Conclusion: vulnerabilities, access and livelihood constraints, data gaps

Shocks can be of many kind, while **Seasonality**, as indicated in previous sections, forces large numbers of poor households to build portfolios of livelihood strategies. Diversifying livelihood strategies here is not only sound business sense, it is a necessity.

The key trend in Bangladesh and Vietnam is for intensification of agriculture, and it is likely that the same will occur in the other two countries. This will involve the conversion of land, such as forest, swamp, and mangrove, to agricultural use. It will also involve the intensification of agricultural production through HYVs, HEIs and provision of FCD/I infrastructure. However, in Bangladesh this has been achieved at a price. Firstly, HYV species require High External Inputs (HEI) such as inorganic fertilisers and technical support, while their widespread uptake has led to a dramatic reduction in indigenous foodgrain species. This has made Bangladesh more vulnerable to sudden shocks (such as the 1987, 1988 and 1998 floods), and input supply constraints.

Trends can be in the political, social, economic and natural resource sectors. With the study countries now opening their economies to global financial flows and demand for their products, the proportions of their populations who are poor are falling. This trend is set to continue. Trends associated with this include increasing urbanisation, non-farm employment in rural areas and diversification of national and rural economies. These, and the positive trend in human capital gains, are helping to reduce the proportions of those in poverty. However, the gains are more rapid in urban than in rural areas.

Governments are now more conscious that their rural areas have missed out on the benefits of growth over the past few years. All are now beginning to address the issue, particularly through the development of infrastructure and through devolution. All four countries are at an early stage in this process.

Research in Bangladesh and Laos suggest that the impact of floodplain infrastructure on the inland capture fisheries may not be of the order that some have feared. Demand for fish and fish products is likely to grow due to growing country populations, wealthier urban populations, and demand from overseas. This is likely to increase fishing pressure, though it may also lead to greater intensification of aquaculture.

With the trend to devolve management of natural resources to the local level, governments are increasingly interested in CBFM. There will be many issues to resolve, not least as to who should have a voice, and how costs and benefits should be apportioned. The management regime is likely to differ from fish habitat to fish habitat, and from season to season, and will need to take into account the impact of fishing effort on stocks as well as impact on different livelihoods. However, research suggests that those areas where fish 'overwinter' (in dry season refugia) will require better management than at present, while fishing in rice fields and seasonal floodplains can continue at a high level of effort, so long as measures are put in place to allow a proportion of juveniles to escape to their dry season refugia.

CPRs: food security and safety nets

Given the importance of fisheries in poor people's livelihoods, particularly subsistence farmers, it is important to ensure access to the them. However, there is the threat of privatisation of the resource. There are two natural resource sectors – fisheries and forests - in the four study countries which are exploited not only for income generation, but for the wide range of goods and services (NTFPs) they can provide households. These goods and services frequently make up the shortfall in poor households' needs. As such exploitation of these resources functions as an expenditure-saving device, contributing to household food security, and enabling scarce money from income-generating strategies to be allocated to other activities. CPR such as the fisheries (and forests) are also a safety net on which the poor and those retrenched from their primary occupations can fall back in times of economic shock.

The main mechanism for allocating fishing rights to specific individuals and groups has historically been through the auction of rights to the highest bidder. This policy has been a constraint to access to opportunity by the poor. More recently, study country governments have sought to allocate fishing rights to poorer groups -in particular fisher groups. More recently they have begun to devolve fisheries management to the community-level. In both cases the issue of excludability still exists – who should be excluded from the fisheries, and who should bear the costs of enforcement? The danger still exists that elites will continue to rent-seek, and that poor people will be excluded from the fisheries.

Livelihood constraints faced by fishers

Access to the fisheries does not appear to be the most pressing issue for fishers in any of the study countries. However, fishers do face a variety of other problems in their livelihoods. The majority of these have to do with their personal and communal poverty, but also with perceived threats to fisheries resources, with the former frequently being seen as a greater constraint to livelihoods than the latter. Problems include lack of rural infrastructure (roads, clean water source and sanitation facilities, schools), lack of land for farming rice, crop pests, and population increase, as well as decline in the fisheries and increasing use of illegal fishing gear. Flooding of homes was not normally a problem.

Data gaps

Townsley (1998) has emphasised the fact that 'Data which indicates the relative importance of aquatic resources in rural livelihoods are rarely available' and therefore 'more qualitative indicators become particularly important.' While this is so, there is also a need to treat qualitative information with some caution. As the authors of the Bangladesh Country Status Report note

'From the review of existing literature and secondary stakeholders discussion, it would seem that the inland fisheries (capture) are declining, though according to DoF's estimates they are increasing since 1990. The reasons for this contradiction are unclear. However, it may be that total catch is increasing due to increased fishing effort although the catch per unit effort or per fisher is decreasing, or may be that the recorded increase in

catch is due to weak and old data base and a faulty data collection system. This is a weak area in inland fisheries management which needs to be addressed properly.'

It is hoped that the output from the current project gives some insight into the livelihoods of the groups which have some dependence on the inland capture fisheries, and into the opportunities and threats which they face. There remains a need for further work on a number of fronts including:

- ❖ further work from a livelihoods perspective (particularly in the SE Asian countries)
- ❖ further work from an institutional and governance perspective (as governments reform their fisheries policy and move towards CBFM)
- ❖ further work on appropriate fisheries data systems (to ensure their relevance in the context of CBFM and poverty alleviation).

Introduction

1.1. Purpose of the report

- 1.1.1. Information on fisheries resources in Bangladesh and S.E. Asia is fragmented and has not taken account of poor people and their livelihoods. In particular research has been supply-led and had focused on the identification and relaxation of constraints to optimisation of production from the resources rather than on the problems and needs of poor people who may be dependent upon those resources. As a result there has been limited uptake of the technologies developed, while the main gains achieved have been by the non-poor. Historically, decisions have been based on national level priorities while overlooking the needs of local people, especially the poor, and thus rather than enabling livelihoods have frequently contributed to threats to assets they are based on and including fisheries.
- 1.1.2. Many of the development issues in the two regions are similar, and fisheries are a vital source of food and income for poor people. Comparative analysis offers the opportunity to learn from differences in institutional arrangements at local and regional levels, and from differences in dependence on fisheries as a source of livelihood, to help guide future development and research.
- 1.1.3. The project has reviewed relevant secondary data in the four study countries, and consulted with intermediate and secondary stakeholders. It has also carried out field research with primary stakeholders to prioritise constraints and identify possible research priorities. That data is contained in a four Country Status Reports and four Country PRA Reports.
- 1.1.4. This synthesis report is based primarily on information contained in the above reports together with some additional material available to the author. The country status reports are syntheses of secondary information (published literature, consultation with fisheries officers and others), while the PRA reports contain information derived from fieldwork with primary stakeholder groups at different fisheries-related locations in-country.
- 1.1.5. As such this report seeks to synthesise the above reports into a comparative assessment of the linkages between resource bases and livelihood strategies of the poor using and dependent on wetland/capture fishery systems. It strives to identify levels of dependence, impacting factors, key constraints and opportunities for improving livelihoods, relevant research, and critical researchable problems. This is linked with poverty profiles for these wetland systems and the institutions and property rights that govern access to aquatic resources.
- 1.1.6. The format has been to take themes (and issues) and arrange and discuss data by country in relation to these topics. Since issues are inter-related there has to be a fair amount of cross-references between issues, though in order not to confuse readers, there is only a limited amount of cross-referencing between countries. The chief broad lessons which apply across the four countries and emerging from the synthesis are pulled together in the conclusion

- 1.1.7. There are inevitably gaps. This is partly due to breadth of the topic and to the different availability of data in the four countries. For example, in Bangladesh there is a great deal of information relating to the fisheries and to the challenges which they face. There is also an increasing amount of information relating to livelihoods either partly or wholly based on fishing and other Living Aquatic Resources (LARs) – though this has not always been assembled in the coherent form suggested by DFID’s Sustainable Livelihoods Framework. Bangladesh of course has been open to global influences (and external financial flows donor support influence) for longer than the other study countries. It is, therefore, perhaps not surprising that it has been on the ‘development path’ for longer than the other three countries – though whether it has, as a consequence, taken the right path is a matter of debate.
- 1.1.8. At the other end of the spectrum, Vietnam, there is information relating to the fisheries and to production from those fisheries, but there appears to be a limited amount of information about the pressures impacting on those resources or about livelihoods which are built on them and the constraints which people face in making a living. Cambodia and Laos are similar in some respects to Vietnam, but here at least there is an appreciation that the inland capture fisheries are important to rural people as well as to GNP, whereas staff in government line ministries in Vietnam are only beginning to realise this and take it on board.

1.2. Managerial versus livelihoods governance

- 1.2.1. Historically all four countries (and donor bodies and researchers) have viewed the fisheries sector from a ‘managerial’ (commodity) production and revenue generating perspective – i.e. the contribution the sector makes to the national economy. Thus strategies to improve management of the fisheries sector have focused on the resources and on supply-side solutions. Interventions in the industry have been made to increase productivity, and decisions regarding how to do this, including extension support, have been made by top ‘management’. The approach has led to a focus on larger-scale fishing operations, or to operations that show most promise for generating most ‘volume and value’ returns (e.g. marine fisheries, aquaculture), while poor and marginal producers have been ignored. The approach has also led government to allocate resources, and thus to intervene, in those sectors of the economy which it determines show most promise of growth and of job creation in the future.
- 1.2.2. There is nothing wrong *per se* with identifying where emerging opportunities lie and of allocating resources accordingly. Indeed, livelihoods as well as national economies would be in difficulties if an eye were not kept open to the future – particularly in a globalising world economy. But the ‘Fordian’ managerial approach fails to sufficiently take into account the fact that there are other sectors which are currently making a contribution to the national economy and to livelihoods based upon them.
- 1.2.3. There is a tendency, therefore, for line ministries to compete with each other for centrally-allocated resources rather than to collaborate with each other to achieve results, while also looking towards the centre either for instructions or in order to seek to influence it. In such an approach, little thought or attention has been given to those without influence (or ‘voice’) – poor producers – or to the technologies they need and have the capacity to apply.

1.2.4. However, this top-down approach, as in so many other sectors, has met with difficulties. These have included variable uptake of the technologies developed for target beneficiaries (understanding these natural resources is well advanced, but opportunities and constraints have largely been identified by fisheries experts), while there has also been capture of benefits by non-poor with the resources to invest in new technologies, and leading to an increasing gap between rich and poor. It has also led to a gap between those that govern and the governed - not least because of lack of management capacity to implement directives and enforce compliance by small-scale artisanal 'producers' struggling to make a living with - or in spite of - the support of government.

1.2.5. With international agencies and governments now focused on pro-poor growth and on the contribution that the fisheries sector can make to overall poverty reduction, there is a need to ensure that management solutions clearly address the needs of the poor. Recent World Bank PPAs (e.g. 'Vietnam: Voices of the Poor') have highlighted the livelihood problems, and their causes, that the poor face. However, the poor are not a homogeneous group, they follow diverse and varied strategies, so there is a need to more clearly identify stakeholders involved in the fisheries sector, to understand their needs and the socio-economic context in which they make a living, and to design solutions accordingly.

1.2.6. Now that governments and donor bodies have become much more oriented towards poverty elimination and, perhaps as importantly are becoming 'client' oriented', there is the opportunity for instituting pro-poor growth policies which support livelihoods of the poor and the national economy. This post-Fordean approach requires governments to actively seek not only to understand who and where the poor are in their countries, but also what their livelihoods are based on and what opportunities and constraints they see for improvements in their livelihoods.

1.2.7. In terms of research, most earlier projects have modeled the management of aquatic resources from the perspective of system's managers – that is from the perspective of secondary stakeholders – those who are situated at the macro- and meso-level and are particularly concerned with the making of policy and the regulation of fishing effort in order to ensure sustainability of the resources while achieving optimum economic value from them. In order to do this, there has been considerable investment in research to better understand the dynamics of what are complex biophysical and multi-species systems, and on developing management information systems, protocols and support to fisheries extension agencies for governing the exploitation of these resources. There has been little work so far in relation to inland fisheries that directly addresses the livelihood needs of identified groups of poor fishers.

1.2.8. Thus the emphasis under the earlier FMSP has been on the impact of fishing effort and the management (or not) of this impact on fish stocks and on species diversity, rather than on the place of aquatic resources in the livelihoods of population groups with 'different portfolios of livelihood strategies' (to use Ellis' phrase, 1998). Two recent projects (R6756 and R7562) under the LWI production system of the NRSP with which some members of the current research team have been associated, have taken greater account of the differences in

livelihoods of groups exploiting a range of natural resources on the Bangladesh floodplains. Taking a systems approach, both projects characterise different livelihood portfolios, the interdependencies between livelihoods, and present the prioritised problems which representatives of different groups face in their livelihoods.

1.2.9. While earlier ‘commodity-based’ research has not being placed in the context of poor people’s livelihoods, it nevertheless remains of great value for the strategic management of natural resources. However, it needs to be understood within the context of a dominant discourse on natural resource conservation. Since the 1980’s and especially since the 1992 Earth Summit in Rio, government agencies have primarily focused on environmental conservation and sustainable natural resource use due to worries about their depletion through over-exploitation.

1.2.10. This focus on the environment has predominated despite the fact that the Agenda 21 section of the UNCED document stated that sustainable livelihoods could serve as an integrating factor that allows policies to address development, sustainable resource management and poverty eradication simultaneously. The concern with sustainability is laudable, but until recently this has meant that initiatives targeting the poorest countries have been overshadowed by initiatives to protect the environment. Only since the World Summit for Social Development at Copenhagen (1995), has there been a global consensus on the need to address poverty, and an acceptance that the depletion of natural resources can also be due to poverty and the lack of alternatives for poor people as well as to failures in the governance of natural resource use.

1.2.11. There is thus a need to understand the nature of poverty in the target geographical countries, and the socio-economic systems in which natural resource use is set. This requires the generation of new knowledge on where and to what extent people are dependant upon natural resources such as fisheries, their economic status, the important factors which impact upon their livelihoods, their vulnerability in relation to loss or mismanagement of these resources, and also information about their needs and goals as expressed by themselves.

1.2.12. Generally systems approaches have considered impacts at the ecosystems and production system level, rather than the household level. Consideration of poverty elimination as well as sustainability forces us to consider this at the household and intra-household level. (The Sustainable Livelihoods Framework is the most obvious manifestation of this systems approach at the household level).

1.3. The Sustainable Livelihoods approach

1.3.1. The Sustainable Livelihoods approach can make a contribution here. Drawing on a number of influences this approach takes peoples’ own interpretations of and priorities for their livelihoods as its starting point, while the mapping of the different capital assets on which people draw to build their livelihoods, and investigation of how transforming structures, institutions and processes influence how endowments are (or are not) turned into entitlements, forces researchers ‘to think holistically rather than sectorally about the basis of livelihoods’ (Carney 1998:7).

1.3.2. Thus the Sustainable Livelihoods approach offers considerable potential for developing:

- Appropriate understandings of poverty, and for identifying the importance of aquatic resources in poor people's livelihoods. A means for bringing the poverty alleviation and aquatic resource sectors closer together in order to:
- Develop effective targeting,
- Devise appropriate interventions whether based on aquaculture or on wild fisheries management,
- Monitor impact,
- And on a broader scale for creating more responsive delivery institutions.

1.3.3. The SL Framework (Figure 1) can assist in helping researchers and policy-makers to think about the important facets to livelihoods and to consider – in partnership with identified livelihood groups (groups of poor with particular portfolios of livelihood strategies) – what can be done to improve them. Thus while previously sectorally-oriented line-ministries might only think in terms of the natural resource – in this case the inland capture fisheries - and in terms of the capacity to exploit these (the other capitals), the SF Framework draws attention to those other factors (the Vulnerability context and Policies, Institutions and Processes - the PIPs box) which also impinge on capacity.

1.3.4. It will also be important to grasp that livelihoods impinge on each other. That is that there can be 'externalities' produced by one type of livelihood which can, like the PIPs, prevent or limit access by others to the opportunity which a resource may present. Earlier projects have paid insufficient attention to the complexity of the social – to the socio-economic characteristics of the human populations exploiting aquatic resources, and in particular to the different needs, perspectives and objectives of different population groups upon whom policy for the governance of resource exploitation impacts differentially.

1.3.5. Historically, formal economic definitions of absolute poverty have led to whole populations being classified as poor or vulnerable, with development policy and interventions treating them as a homogeneous target group. But this can lead to biases in the development of policy instruments/ technology which, while they may suite the better-off, may be inappropriate to the needs of the resource-poor. Consequently, until quite recently, there has been a tendency to design and evaluate development interventions on the basis of net returns, many of which have been preferentially captured by, or accrued to, the wealthier members of communities.

1.3.6. Again it is important to note that international definitions of poverty have changed. Historically, under the definition of poverty as an income deficit, interventions were focused on job-creation as the route to income generation. However, the definition of poverty has broadened; poverty is now recognised as multifaceted, with the different dimensions of poverty interacting in important ways. So do interventions to improve the well-being of poor people. As the World Bank (2000/2001) says 'The report accepts the now established view of poverty as encompassing not only low income and consumption but also low achievement in education, health, nutrition, and other areas of human development. And based on what

people say poverty means to them, it expands this definition to include powerlessness and voicelessness, and vulnerability and fear.’

- 1.3.7. This definition of poverty is important for understanding the livelihoods of poor people and the opportunities that natural resources may offer them. It means agencies having to think beyond interventions to generate jobs and income (though these may still be desired by the poor), to interventions which can reduce vulnerability, improve quality of life, improve the poor contribution to decision-making processes which affect their livelihoods.
- 1.3.8. The role of aquatic resources in rural livelihoods is characterised by diversity in the resource, habitat and environment, and in the resource users and the ways in which they exploit these resources (Townsend in Carney 1998). Understanding this diversity and the inter-relationship between different parts of what are wider socio-agroecological systems is critical to understanding threats to resources and livelihoods and to achieving their sustainability.
- 1.3.9. Thus while the report primarily deals with the livelihoods of those who have some dependence on the fisheries as either a small or significant part of their overall livelihood strategies, it also seeks to place these in the context of rural livelihoods in general and the pressures and trends that are taking place in relation to them. In brief it addresses the question ‘What are the routes out of poverty for the poor?’ and in relation to those with some dependence on the resource, ‘How dependent are they on the resource, what are the pressure bearing upon them, and what can be done to reduce their vulnerability to this dependence?’
- 1.3.10. The current project is a first step to addressing the need for fisheries research and development that takes into account the livelihoods and needs of poor people in two similar yet contrasting regions. The project characterises fisheries and highlights the dependence of different stakeholders on them and the trends, pressures and vulnerabilities associated with them.

1.4. Geography of the study countries

1.4. Climate

- 1.4.1. All countries lie in the tropical or subtropical zone, and have a marked seasonality of climate with pronounced wet and dry seasons. For example **Bangladesh** is influenced by the southwest monsoon which causes heavy rainfall (up to 400 mm) between July and September, leading to inundation of more than one third of the country every year. For the rest of the year there is little or no rain. **Laos** and **Vietnam** span the zones. For example in the southern part of the Vietnam the weather is tropical. It is monsoonal in the north, bringing a hot, rainy season from mid-May to mid-September and a warm, dry season from mid-October to mid-March. Occasional typhoons from May to January bring extensive flooding to the middle regions of Vietnam. **Cambodia** lies in the tropical zone. The temperature is fairly uniform throughout the year and averages 25 degree centigrade (77 degree Fahrenheit) with a wet season from May to October).

1.5. Topography

- 1.5.1. **Bangladesh** is essentially a vast alluvial floodplain with low ranges of hills on the eastern and north-eastern margins. The country is criss-crossed by a network of rivers, the major ones of which rise in neighbouring countries and exit into the Bay of Bengal. The major river systems are the Ganges, Brahmaputra and the Meghna.
- 1.5.2. **The SE Asian Countries** are rather different in that while they have extensive floodplains – particularly associated with the major river system of the Mekong and Tonle Sap/Great Lake, but also including the Red river in northern Vietnam – they also have extensive upland and highland areas. with different livelihood strategies being stratified by land type and altitude. The upland areas were originally covered with tropical and subtropical montane forest which over the past 50 years or so is gradually been cleared by commercial logging and the encroachment of growing populations hungry for land. There are still significant stands of forest in all three countries, but with their reintegration into the world economy and a growing demand for timber, these stands are under threat.
- 1.5.3. **Cambodia** consists of a large inland alluvial floodplain extending into the delta region of southern Vietnam which is formed by the Mekong-Bassac and its tributaries (particularly the Tonle Sap). The floodplain is surrounded by a rim of higher land.
- 1.5.4. In **Laos** there is considerable topographic variation throughout the country, from floodplain to high mountain, with about 80% of the country being mountainous and around only about 3% being cultivated. The majority of the population is to be found on the floodplains of the Mekong and its tributaries.
- 1.5.5. **Vietnam** The total area of Vietnam is 331,689 km². Almost all the country consists of hills and mountains that divide into many sub-ecosystems, such as the mountains and midlands (middle elevation hills and plateau) of the north and centre, coastal central area, the western midlands, and southern delta and coastal wetlands. There are two main floodplain areas, that of the Red River in the north, and the floodplain and delta of the Mekong River in the south. Another water body type is lakes, situated in many parts of Vietnam such as Tay Lake in the north, and the lakes in the midlands.
- 1.5.6. The major river fisheries are centred on the Red River and its delta in the north, which is now highly degraded, and more importantly the Mekong delta in the south. FAO studies from remote sensing show that up to 40 percent of the area of the Mekong delta in Vietnam is still flooded seasonally, mainly in the upper section. This is essentially an extension of the highly productive Tonle Sap floodplain system of the lower Mekong in Cambodia. Coastal regions are now largely under flood “protection”.

1.6. Uplands and floodplains

- 1.6.1. While the inland capture fisheries are primarily associated with the lowland rivers and floodplains in all four countries it is necessary to say something about the upland areas of countries not only because there are upper catchment processes which impact on downstream

resource use, but also because the uplands are home to some of the poorest segments of country populations.

1.6.2.Floodplains

In all four countries the floodplains have been converted to agricultural use through farming systems based on wet rice cultivation together with a range of other dry season crops and with fruit and other commercially important trees being planted around homesteads. The latter are located on slightly higher ground above the annual flood level. Intensification of wet rice production has been achieved by extending the growing season through irrigation during the dry season. This has entailed significant investment in irrigation and drainage infrastructure.

1.6.3. During and following the annual monsoon the floodplains are inundated to varying degrees by *in situ* rainfall and by the floodwaters from the upper catchments of the river systems. The timing, level and extent of the annual flood of course varied from year to year in response to the rainfall regime and run-off from the upper catchments. Historically the annual flood was not a great problem to those exploiting the floodplains since most homesteads were located above flood level, farmers used long-stemmed flood-tolerant varieties of rice and did not cultivate dryland crops until the flood subsided, while fishing became a major seasonal livelihood strategy for the majority of households. There could of course be unexpectedly severe and destructive floods.

1.6.4. Today floods, even those which are less destructive, have become more of a problem due to the shift by farmers to short-stemmed but high yielding varieties (HYV) of rice which are not flood-tolerant, and to the shift towards intensification. Cropping patterns may now include a succession of two, three and sometime more crops - two of them rice - and there is pressure on farmers to get onto farmland as soon as the annual flood subsides and to cultivate their land for as long as possible until the next flood. Any shift in the timing, level and extent of flood may therefore cause significant damage to crops and threaten livelihoods. Shortage of homestead land due to population growth and poverty has also led to significant numbers of landless poor building on lowland which are liable to periodic flooding.

1.6.5. The threat of flooding to livelihoods and to national economies as a result of crop loss and other damage has led to flood mitigation measures in the study countries (particularly Bangladesh and Vietnam). In Bangladesh, which primarily consists of floodplain, there has been an ongoing programme of embankment and associated drainage infrastructural construction. In the SE Asian countries there has been some embankment construction on the floodplains of the Mekong and Red rivers, but the major mitigation effort has been to try and reduce run-off from upper catchments by stemming the loss of forest and through replanting.

1.6.6. The success of these mitigation measures has been mixed. In Bangladesh Flood Control Drainage and Irrigation (FCD/I) schemes have undoubtedly provided protection to some high value urban centres, and to many agricultural households. However, their operation and maintenance has often not been of the highest standard, leading to the impoundment of flood waters behind embankments with associated damage and crop loss, the displacement of flood waters to unprotected areas downstream, and interference with the migration of fish onto the

floodplains. Importantly as far as this study is concerned, the costs associated with FCD/Is impact floodplain user groups differentially – with the poor, who are more dependent on fisheries during the flood season, losing out (see below).

1.6.7. In SE Asia attempts to mitigate flooding in lower catchments have focused on embankment and drainage to increase throughput in river systems. This has also not been without problems for downstream areas, both in terms of surge flooding, and erosion. However, the main thrust to mitigate flooding has been to stem the removal of, or to replace, forest cover.

1.6.8. The causes of forest removal are complex. Many writers suggest that forest removal has primarily been a consequence of, or at least initiated by, commercial logging stimulated by regional and global demand for the high value hardwood timber species which grow here. Other writers point to the impact of immigrant farmers who, due to land shortage in the lowlands, move to the uplands in search of land, and clear the forest or settle on logged-over land. These farmers tend to practice inappropriate natural resource management due to their unfamiliarity with upland farming systems.

1.6.9. Uplands

The upland areas of SE Asia (and the Chittagong Hill Tracts in Bangladesh) have farming systems which traditionally were based on dry rice cultivation on forest swiddens supplemented by the collection and harvesting of non timber forest products (NTFPs) including game and fish. Official rhetoric in all three SE Asian countries is that it is the swidden farming systems of peoples indigenous to the uplands which is the major cause of most deforestation.

1.6.10. This is a complex issue, with different indigenous groups practicing different types of swidden with different rotational fallows, and in response to their population numbers, opportunities available for cash crop cultivation and so on. Suffice it to say that country governments have tried to sedentarise indigenous upland populations and discourage swiddening (even when they have been unable to fully control it), yet at the same time have allocated upland land to landless lowland households with inappropriate and usually unsustainable land-use practices (see below). Additionally, reforestation has often been with alien tree species (particularly softwood and pulpwood species) with consequences for floral and faunal biodiversity.

1.6.11. The social impact of these measures has (theoretically) been to deny access by upland households (who are among the poorest in the region) to indigenous regenerated forest for widening and NNTP's on which their farming systems are based. In the absence of sufficient fertiliser input and of a forest regeneration following cycle, soils become depleted, crop yield fall, and users have to turn to other livelihood strategies (illegal widening in the forest, the cultivation of opium poppies) – some of which may be financially risky (e.g. coffee production for export) – or have to migrate elsewhere in search of work. Meanwhile, immigrants to the uplands have frequently found that opportunities for wet-rice cultivation are constrained, and have to adopt the land use practices of indigenous sidedness or migrate.

- 1.6.12. While capture fisheries are of lesser importance to upland peoples than to those that live on the floodplains, and while a greater proportion of animal protein in diets is provided by livestock and cultured fish than by captured fish, the fisheries can still be of importance to upland peoples. Haylor et al (1997), for example, found that where Lowland Lao had moved into the uplands and had begun to cultivate wet rice, the rice fields became habitat for wild fish which were exploited by the poor. A recent fisheries survey in Luang Prabang Province carried out by the Living Aquatic Resources Research Center (LARReC) concluded that although a mountainous region, Luang Prabang Province is rich in aquatic resources. There are few floodplain areas but rice fields are habitats for fish and aquatic animals that are extensively exploited. The survey also confirmed the findings of the recent Agricultural Census, 1998/99 and the Lao Expenditure and Consumption Survey, (1997/98) that fishing and collection of aquatic animals is very important for subsistence and is integrated with all aspects of people's livelihood strategies.
- 1.6.13. I will return to the issues raised in relation to the linkages between upland and lowland natural resource management practices, but I turn now to say more about the distribution of poverty in the study countries.

2. The nature of 'poverty' at the national level

2.1.1. Except for Vietnam (which is at the lower end of the band for countries of 'Medium human development'), on the UNDP's Human Development Index (1999) the study countries appear amongst those with 'Low human development.'

2.1.2. Out of a total of 175 countries:

Bangladesh with a population of 128m growing at 2.4% pa, is ranked 144,

Cambodia with a population of 12m growing at 2.9% pa is ranked 153 - the lowest in South East Asia – and is one of the poorest countries in the region. The average per capita income in 2002 was \$286 per annum,. While almost 40% of households were below the poverty line.

Laos ranked 136, with a population of 5.1m, growing at a rate of 2.3% pa, 76% of whom are rural, and has about 52% of its population in poverty. Laos has a large land area, with a sparse population, and is landlocked.

Vietnam with a population of 78m, growing at 2.1% but having 59% of its population below the poverty line, is ranked 121.

(For national poverty statistics see World Bank (Appendix 2, Table4.). For countries 'at a glance' see Appendix 1).

2.1.3. Proportions of poor

In terms of national poverty lines (Appendix 2. Table 4.) the proportions of their populations below the poverty line, also vary (varying from 50.9% for Vietnam to 39% for Cambodia). In terms of absolute numbers below the poverty line, however, Bangladesh far outstrips the others on account of its large population, with Vietnam being next. Laos and Cambodia have smaller, but rapidly growing, populations, also have smaller absolute numbers in poverty.

2.1.4. General data

Bangladesh: With a population estimated at 125 million (and growth rate of around 2.17%), Bangladesh is one of the world's poorest countries on international measures. Over 50% of the population, 90% of which live in rural areas, is classified as poor, while BBS estimates 36% of all Bangladeshis are 'extremely poor' (including 40% of the rural population). Some 90 million people make a living on the floodplains, the majority from exploiting the NR base, while more than 50% are classed as functionally landless (owning less than 0.2 ha of land for cultivation.)

2.1.5. Bangladesh faces serious problems of natural resources management (NRM). There is relentless pressure on land from a growing population, while the stock of agricultural land is close to its natural limits. The extensive margin of cultivation was probably reached by the late 1950's, so increased agricultural output has to come from intensification. Current population density (averaging $900/\text{km}^2$ in rural areas) is the highest in the world among countries of significant area, Resource use patterns are adapted to the temporally and spatially dynamic interface between terrestrial and aquatic natural resources. In consequence the rural population is extremely vulnerable to seasonality and to natural shocks and trends,

while HHs build ‘portfolios’ of livelihood strategies to reduce vulnerability.¹ Unable to be self-sufficient in food, the livelihoods of marginal rural families depend increasingly on a mixed portfolio of share-cropping, agricultural and non-agricultural wage labouring, fishing, migration to work elsewhere, and remittances from relatives abroad. Meanwhile for the whole population, land subdivision due to inheritance laws and crisis sales results in increasing landlessness and increasing pressure on Common Pool Resources (CPRs) (see Dixon 2000).

2.1.6. There are conflicting opinions as to whether Bangladesh is succeeding in reducing the proportion of its population in poverty. Recent studies (World Bank 1998b; Greeley 2000), based on BBS data, suggest Bangladesh has made outstanding progress over the last 20 years – the proportion of households below the poverty line falling from 80% to 37% in 1996 due to agriculturally-led growth, cheap food, strengthening domestic demand, and keeping labour in the countryside, while good management and reform at government level have also contributed. The World Bank (1998b) – using BBS data - notes that the incidence of the ‘very poor’ declined from 43% of the population in 1991-92 to 36% in 1995-96 while the incidence of the ‘poor’ declined from 59% to 53%. Other authors (see Rahman and Hossain 1995), however, suggest the poverty reduction trend is downwards, despite some upward mobility and evidence of ‘churning’ between groups. BIDS figures indicate that while in 1994 the ‘moderately poor’ made up 29% of all households, between 1987 and 1994 30% of these fell into ‘extreme poverty’, while of ‘tomorrow’s poor’ (21% of all households in 1994), 40% fell into poverty (24% into ‘moderate poverty’ and 16% into ‘extreme poverty’) by 1994.

2.1.7. Until the policy shift in 1996, the main driver of Bangladesh government policy in the natural resource sector since the 1950’s had been the goal of national food security. Policy measures to achieve this goal primarily involved extensification (converting wetlands to agricultural production), and intensification of food-grain production through the introduction of High Yield Varieties (HYV) of rice, and investment in flood control and drainage and irrigation infrastructure (FCD/I) measures to support these (see Palmer-Jones 1999).

2.1.8. While agricultural production has kept abreast of the needs of a growing population, the trend has been for a reduction in the size of landholdings (see Appendix 1 WB Table 8) and increasing landlessness. In consequence poorer households are unable to meet their food security needs from their own or share-cropped land and have to diversify out of agriculture. While members of poor rural households may pursue a variety of livelihood strategies, including agricultural and migrant labouring, transportation, and petty trading, a very significant number turn to fishing as a part or even full-time occupation because of the low entry costs involved. This occupational trend, plus the trend in increased subsistence fishing is increasing pressure on the fisheries and leading to conflict between groups (see Barr et al 2000b, Dixon 2000).

¹ For the impact of seasonality and migration on rural livelihoods see Gill (1991). For the impact of seasonality more generally on livelihoods and the health of the poor see Chambers (1979), Chambers et al (1979), and Longhurst and Payne (1979). On livelihood ‘portfolios’ see Ellis (1998).

2.1.9. The World Bank sees the key to accelerating growth and reducing poverty in Bangladesh as being reform of the public sector. As the Bank says (1999a) 'development entails the need for an institutional transformation that improves information and creates incentives for effort...' . In particular agrarian and institutional structures are constraints to achieving greater poverty reduction, while there is a need to address public sector inefficiencies and also institutional/ 'transforming' structures and processes at the local level.

2.1.10. **Cambodia** with a population of 12m has almost 40 % of its population below the national poverty line, and has the worst human development indicators in Asia. It has, of course only recently emerged from some decades of civil strife, but while there has been reasonable economic growth over the last couple of years or so, there has been little reduction in levels of poverty. With the greater proportion of its population living in the rural areas, rural poverty remains stubbornly high at 40%, though urban poverty has come down to just over 20%. Agricultural productivity remains very poor, while landlessness and indebtedness are increasing.

2.1.11. A Poverty Reduction Strategy agreed with donors is now in place. However, government is making only slow progress with reform of the public sector despite pressure from donors, and suffers from a lack of capacity and from institutionalised rent-seeking by officials. According to DFID (2001) 'Basic mechanisms that would enable the rural majority to improve their lives are not yet in place.' However, there are hopes that a multi-donor government programme (Seila) will strengthen local governance, and will provide a conduit for investment in rural infrastructure and increased access to health and education, and that this will increase the process of decentralisation reform - particularly to the poorest provinces. Seila is already having an impact at the local level with increased access to social services, improved access to safe water supplies, and increased agricultural productivity. However, for there to be a dramatic increase in the latter there needs to be greater incentives for farmers to shift out of subsistence agriculture and invest in their land, and that means improving their access to market and to market information. At present rural infrastructure remains in a parlous state after decades of civil conflict and neglect, and this dramatically restricts rural economic growth.

2.1.12. Presently, with the greater proportion of the population dependent on natural resources for their livelihood, there is a need to ensure that their access to these is secure. However, the indications are that access to land and to CPRs is diminishing, while policies currently work against the interest of the poor. Reform of the forest concession management system is particularly needed, since most poor people are unable to make a living, or to subsist, from the produce of their land, and have to make up the shortfall from foraging in the forest and exploiting common fisheries resources.

2.1.13. **Laos** According to IFAD (2002), major determinant of poverty is the degree of self-sufficiency in rice production and the primary indicator of wealth is livestock ownership. Lack of land and a shortage of cash for investing in land improvements are major causes of rural poverty. Other constraints to improved agricultural productivity include a limited home market due a small and widely dispersed population and small urban base, and poor rural infrastructure making the costs of accessing markets prohibitive. According to Ireson (1995) 'rural society is characterised by semi-independent villages engaged in semi-subsistence agricultural production.'

There is a commonality across the country of 'village self-reliance, limited regional trade and communication, and identification with one's village...'

Datt and Wang (2001) categorise the poor into the 'very poor' (or ultra poor) whose per capita consumption is below the food poverty line, and the 'moderately poor' whose per capita consumption falls between the food and the total poverty lines. On this definition, the very poor make up about 17% of the total population, while the moderately poor account for about 20%. Poor households are more likely to have an illiterate head, and tend to be larger and to have a higher dependency ratio than nonpoor households.

2.1.14. **Vietnam** Under the current research a wealth ranking exercise in communities in the Mekong delta region identified three main groups, the wealthy, the average and the poor:

- (a) Rich households had well-built brick houses with good facilities, good educational attainment and job opportunities (most children going to high school), a high income level and a variety of assets (such as boat with outboard and fishing gear, Japanese motorcycle, colour TV). Most people in this category were farmers or 'elite', having up to 10ha of land primarily for rice (and other cash crops such as sugar cane, fruit trees), together with a few pigs, poultry and often a fish pond.
- (b) Average households had a brick house but less well appointed than the rich, reasonable educational attainment (about half going on to secondary school), and a number of assets (such as a boat, a Chinese motorcycle, colour TV). Most were farmers and/or small businessmen, having 1 – 2ha land, together with a pig, poultry and perhaps a fish pond.
- (c) Poor households had wooden/bamboo walled houses, poor educational attainment, and had few and inferior assets (such as bicycle, and black and white TV, and perhaps a poorly-made boat and simple fishing gear). These were landless or near landless (0.1- 0.3ha land) surviving primarily through agricultural labouring, fish trading, and fishing.

2.1.15. An indication of groups income status is provided by the following:

Very wealthy households' income is more than 30m dong pa, rather wealthy households' is between 20-30m dong, Average households' is between 10-20m dong, Poores' is between 5-10, and Hungry's (the poorest) is < 5m dong pa (Country PRA Report: Vietnam 2003).

2.1.16. The research also found that there is a group of people, the "static poor", who have become trapped in poverty which is difficult to reverse. These poor are landless, and it appears that returns to selling wage labour (the only viable income generating activity available beside fish capture) are so low that it is impossible to save enough to purchase assets, such as land. Most of these poor are in debt to both government lending programs and/or private moneylenders. If (and when) they default on government loans, they become ineligible for new loans, while if they borrow from private moneylenders, the interest rate is so high that they end up paying much more cumulative interest than they originally borrowed in loan principal. This group is also not showing any improvements in education, health, or income levels (Country PRA Report: Vietnam 2003).

2.2. Capitals (formal indicators) at the national level

2.2.1. While poverty measures normally take the individual as the unit of measurement, the targets of poverty elimination interventions may be at the individual, household, community or higher level. The Sustainable Livelihoods framework can serve as a guide to thinking about issues at these different levels. That is, ‘capital’ assets and livelihood strategies, the vulnerability context, and the impact of policies, institutions and processes can be considered at each of these levels. However, while for many purposes the targets of intervention are most properly individuals (e.g. the educational and health status of individuals), for other purposes it is preferable to think in terms of the household, and in terms of the household economy. In what follows there will be a mix of both approaches.

2.2.2. I deal with only two ‘capitals’ here, human and financial. The other ‘capitals’ of the Sustainable Livelihood framework will be considered as and when appropriate. A brief consideration of human capital, and specifically education and health, is useful for indicating the extent of some characteristics of poverty among study country populations. High proportions of educated and healthy persons (as indicated by low child mortality rates, greater number of years of life expectancy, and higher proportions of the population with access to clean water) are taken not only as an indicator of the general well-being of a population, but also as indicating the potential for a country to achieve sustainable development through economic growth. Financial indicators similarly indicate well-being or not, and the potential vulnerability of a population to seasonality, shocks and trends. This is ‘potential vulnerability’ since there may be sections of a population who do not rely on savings as a buffer against untoward livelihood events, but are able to call on a range of other non-financial coping strategies. Nevertheless, savings not only reduce vulnerability at household and country level, but also provide access to investment in emerging opportunities.

2.2.3. As will be seen the four study countries have different poverty characteristics. These are most easily and quickly grasped through comparison with the World Bank’s Lower-middle-income group of countries (see Appendix 2), based on the World Bank’s ‘development diamonds’. (Thailand is also included here for comparative purposes since it is frequently cited as a country which, unlike the three SE Asian study countries, has not suffered a recent period of conflict and instability and whose economic growth is lifting the majority of its population out of poverty. While this may be so, it can be seen that on some key social development indicators Thailand does not perform well in comparison with the average for Lower-middle-income-countries.)

Table 1 Comparison of countries in relation to World Bank ‘at a glance’ diamonds

WB rank	Country	Life expectancy	Primary school enrolment	Access to improved water source	GNI per capita
144	Bangladesh	0	√	√	X
153	Cambodia	0	√	X	X
136	Laos	0	√	√	X
121	Vietnam	√	√	X	0

59	Thailand	0	√	X	X
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√ = outperforming the average, 0 = meeting the average, X = under-performing.

2.2.4. Perhaps the main points to take from this very rough comparison is that for all countries life expectancy meets the average, primary school enrolment is above the average in all cases (which bodes well for future economic development and poverty elimination), access to an improved water source is mixed (which may prove a constraint to health and thus economic growth), while GNI per capita is below the average (suggesting that all countries have some way to go to improve economic efficiency and the growth-led output which will lift their populations out of poverty).

2.2.5. Of course the above key indicators are only a comparison with other Lower-middle-income countries, all of which have considerable proportions of their populations in poverty, and which need to do better if extreme poverty is to be eradicated. A different kind of comparison would be to consider individual countries' ranking according to World Bank's HDIs. These ranks are shown on the left of Table 1, and are perhaps more sobering.

2.2.6. Again this rough comparison only indicates proportions, it cannot indicate the actual numbers that fail to meet any of the key indicators. The depth and extent of poverty in the study countries has been indicated early. The next section gives a brief national country perspective on their human and financial capitals.

2.3. Human Capital: Education, health and other social indicators

2.3.1. **Bangladesh:** The large and growing population of Bangladesh is seen as a problem rather than a blessing because of deficiencies in respect of literacy, skill and sound health. However, at the national level, human resource quality is gradually improving. The overall literacy rate has increased to 53% in 2001 as against 32.4% in 1991 and 18% in 1979 (see Fig.-4). However, the literacy rate in female population has lagged that for men (BBS 2002).

2.3.2. In Bangladesh access to clean drinking water, sanitary latrine, electricity, improved communication etc. has improved over the past few decades. According to BBS (2001), 6.79% people drink tap water, 89.91% people drink tube-well water, which according to 1991 census were 4.3% and 75.3% respectively. These gains are reflected in improvements in other indicators: Child mortality has decreased to 51‰ in 2000 from 75‰ in 1973. The life expectancy increased from 56.6 years in 1997 to 61.0 years in 2001 indicating gains in health.

2.3.3. In Bangladesh, the incidence of poverty in households with agriculture, forestry, and fishing as major occupations is much higher than the overall national average (BBS 2001). About 40% of these households are below the poverty line (taking the lower poverty line). The highest percentage (49.5%) of households which are below the poverty line (using lower poverty line) is that of landless households. According to the 1995-96 HES (BBS 1998) 74.8% of landless agricultural-workers and 45.4% of fishermen were below the lower poverty line as against the national rural average of 39.8%. Professional fishermen are usually poor, landless and illiterate. BRAC, (2001) reported literacy rate to be 36% in eight

open water fisheries area under the Fourth Fisheries Project. People have access to tubewells for drinking water, but the majority lack a safe latrine.

- 2.3.4. **Cambodia:** Poverty incidences are higher in households headed by someone with no schooling (47.1%) as compared to households headed by someone with secondary education (30.1%) and for those with a college/university degree (0%). In general, male literacy rates are higher than those for females, while males have more chance to go to school than women. Twice as many women as men over 15 years of age have never attended school. Literacy rates are higher in urban than rural areas. A majority of the population aged 25 years and over have not completed primary level education: 70.5% of the rural population and 39.5% of the urban population. Only a tiny number have gone beyond secondary level. Cambodia also performs poorly as regards the proportion of children completing even primary education. While there is educational provision, three-quarters of the cost of primary education is met by households and communities. Education is thus too expensive for many families; girls and older children especially working rather than going to school or being withdrawn from school when the family falls into debt (DFID 2000).
- 2.3.5. Cambodia also does poorly on other social indicators. For example, half the children under five are malnourished, while for every 1000 live births 115 children die before the age of five. 42% of the population are under the age of 15. Average life expectancy is 54 years (DFID 2000).
- 2.3.6. Additionally 82% of rural households have no toilet, 96% cook with firewood, and less than 1% had access to electricity. The provision of safe drinking water, medical staff and health clinics in rural areas is poor, while most medicines have to be purchased in the local market. Yet the poorest quarter of the population spend on average 28% of their income on healthcare which may be inappropriate and ineffective (DFID 2000).
- 2.3.7. As in Bangladesh, individuals or household in Cambodia cannot look to their own human capital for salvation from shocks. As noted above, Cambodia performs extremely poorly in terms of the UNDP's HDIs, while the provision of safe drinking water, medical staff and health clinics in rural areas is poor, while most medicines have to be purchased in the local market.
- 2.3.8. **Laos** On a number of social indicators Lao PDR performs better than Cambodia, but does more poorly than the World Bank's indices for other Low-income countries, and significantly worse than the Bank's indices for East Asia and Pacific countries. Gross primary education enrolment compares well (at 112% of school age population) with that of Low-income countries (96%) and East Asia and Pacific (at 119%). However, there is still a primary education enrolment gap between males (123%) and females (101%), and an illiteracy rate of 53% among the population aged 15+ as compared with 39% for Low-income countries and 15% for East Asia and Pacific. Datt and Wang (2001) note that households with an illiterate head are disproportionately poorer than those who can read and write in Lao. The severity of poverty for the illiterate group is more than double that for the literate group.

2.3.9. Life expectancy at birth (at 54 years) and infant mortality (at 96 deaths per 1000 live births) are worse than that for Low-income countries (at 60 years and 77 per 1000), and markedly worse than that for East Asia and Pacific (at 60 years and 35 per 1000). Similarly the proportion of the population with access to a safe water source (39%) is also poorer than for Low-income countries (64%) and Asia and Pacific (84%) (World Bank 2000). There are considerable regional differences in all social indicators within the country, with the rural and particular mid- and upland areas performing more poorly. For example in 1989 the infant mortality rate in the capital, Vientiane, was 50 per 1000 live births, but in some mountain districts was as high as 299 per 1000 (WHO 1989:4).

2.3.10. **Vietnam** A survey in 1993 showed that the population under the “overall poverty line” (annual per capita expenditure of VND 1,160,000), was as high as 58%, while as many as 25% were below the “food poverty line” of VND 750,000. Another key social indicator, that of child malnutrition, showed that 51% of children under the age of 5 were malnourished. Enrolment at lower secondary school level had fallen to 29% of eligible female children and 30% of male children by 1993 following economic restructuring during the 1980s.

2.3.11. By 1998, the situation had improved dramatically. A significant but much decreased 37% of population were then classified as poor in relation to the adjusted overall poverty line (US\$ 92). The incidence of child malnutrition had fallen to 34% and lower secondary school enrolment had rebounded to around 61%. However, 32% of the total population is still below the national poverty level (World Bank, 2002).

2.3.12. There are also regional disparities. In general educational level in the Mekong delta is low. Near the Cambodian border Khmer groups (refugees from the Pol Pot regime) have low education, lack of technical knowledge and live in poor conditions. Migrants (official and unofficial) lack knowledge of how to manage problem soils of the delta (which are severely acidic and old alluvial soils).

2.3.13. Life expectancy at birth is 69 years, and infant mortality is 37 per 1000 live births. Although many are living close to water resources, only 56% of the total population have access to an improved domestic water system. The percentages of rural population with access to clean water and electricity are as low as 17% and 48% respectively. The illiteracy rate is 6% (World Bank, 2002). On these figures Vietnam is performing very credibly in key social development sectors, while the economic sector has lagged behind.

2.4. Financial Capital

2.4.1. **Bangladesh:** About 70% of rural Bangladeshi households are dependent on some sort of credit, either institutional or private (BBS 1998). Collateral is the determining factor for access to institutional credit. The poor and those who have no resource for collateral are heavily depend on private sources of credit (moneylender, *Dadondar*, *Mohajan*) with a high rate of interest (8 % to 15 % per month). Fishermen, who are poor and virtually landless, in particular have to depend on private loan from *Dadondar* and *Mohajan* and *Aratdar* (fish trader).

2.4.2. Cambodia: Rural households rarely have many cash savings, while there are few formal options for obtaining credit. Most frequently rural people meet their medium-term need for finance by borrowing against their next rice harvest. According to UNDP (1999) ‘40% of rural households engaged in small-scale rice farming activities are using the harvest to pay back loans.’ When faced with an urgent need, people try to borrow from relatives or neighbours, but when that is not possible they borrow from money-lenders at high interest rates.

2.4.3. Laos As in Cambodia, rural households rarely have access to cash savings.

Vietnam In Long An, 60% of households are on low incomes (22 million VND per household - 5.7 persons on average), or 321,637 VND per person per month.

2.5. Natural Capital: food security and land

2.5.1. International bodies and country governments have been concerned for the food security of their populations. With the dismantling of the collective system of production in the SE Asian study countries, a prime strategy for achieving this has been through the promotion of enhanced cereal production by households. Given the overall agrarian nature of livelihoods, ‘food security’ has generally been translated into policies for ensuring that households have the basic prerequisites (in particular land, but also agricultural inputs such as seed) to ensure their own food security through cereal production for household consumption. While the same interventions have not occurred in all study countries, this policy driver has underlain the historical emphasis on land redistribution, the introduction of HYVs of cereals (particularly rice) and technologies such as HEIs and FCD/I infrastructure, together with agricultural extension approaches such as T&V.

2.5.2. However, while the strategy has been effective in ensuring that, at the national level, populations are food secure, while the strategy has also generated surpluses for export, it has not made all households food secure. Interventions to ensure national food security may impact differentially on livelihood groups, benefiting some and negatively affecting others. This is a theme which will be picked up later when considering livelihoods in the context of the fisheries (see Section xxx). Meanwhile, due to growing populations, inheritance laws, shocks and the natural vagaries of markets, land is not necessarily the only ‘capital’ on which poor people should rely to meet their household food security and other needs.

2.5.3. Bangladesh

The overriding objective of GoB agricultural policy has been to achieve self-sufficiency in food grains (primarily rice) There have been large gains in output over the past 40 years and the country is approaching self-sufficiency in food grain production. Expansion in irrigation and the adoption of ‘green revolution’ technologies are the main factors behind this increase. There are worries as to whether this rate of growth in rice production can be maintained (see contributors to Rogaly *et al* 1999).

2.5.4. The World Bank and other donors are also not so sanguine about the contribution of cereal production increases to poverty reduction. Data indicate that cereal yields in Asia have

tripled since 1955 to over 3 metric tons per ha as a result of Green Revolution technologies while, despite initial controversy over the impact of the latter on livelihoods of the poor, 'it is clear that poor people have benefited significantly through higher incomes, cheaper food, and increased demand for their labour' (World Bank 1999b).² However, there have been social costs – in particular indebtedness and landless - within the traditional smallholder farming community, while there have also been negative environmental impacts.(Dixon 2000).

2.5.5. Because of the rapid increase in human population, the per capita availability of land has also dropped to 0.06 ha. (1995-97 figure) as against 0.10 ha in 1979-81 (World Development Indicators 2000 - World Bank). Indeed about 8.7% of households have no land, 19.6% of households only have homestead land, 28.2% of households only have homestead land with cultivable land up to 0.5 acre, while 12.3% of households own cultivable land measuring 0.5 to 1.00 acre (MOF 2002).

2.5.6. Indeed, given increases in productivity through HYVs of rice, double and often triple cropping through irrigation, and the production of cash crops to meet regional demand, size of landholding is perhaps not the constraint it is sometimes thought to be. Access, rather than ownership may be key here, and there are considerable opportunities to share-crop land in order to meet household need for a variety of land types for different crops. Certainly, landed households, and indeed entrepreneurial landless households, engage in complex in- and out-transfers of land under share-cropping and other leasing arrangements in order meet household food security needs and take advantage of market opportunities. Additionally, landlessness and near-landlessness may now be less of a constraint to household food security than they once were, given that there is a wide range of alternative, though often agriculturally-related, employment opportunities (such as transport, petty trade, food processing and migrant agricultural labouring).

2.5.7. However, a major issue as far as the majority of landless and near-landless rural households are concerned, is what livelihood strategies to follow during the flood season when agricultural labouring jobs are at a premium. Of course many of the above jobs in transport, petty trade, food processing and migration to agricultural jobs in areas which have not been inundated are still available to the landless (see Herbon 1994), but significantly a considerable number of men and other members of their households (both women and children) turn to fishing both as a part-time occupation and for subsistence needs (see Section 7).

SE Asia

2.5.8. **Cambodia:** The availability of arable land is reasonable, at 0.34 hectares per capita (1995-97 figure; World Development indicators 2000 - World Bank), and most families own land. However, only 7.1% of crop land is irrigated (unlike Bangladesh's 43.4%), precluding multiple cropping. Land pressure is more acute in more fertile areas, while there are indications that landlessness is growing. Most households do not produce enough to meet

² For example, a survey in India concluded that between 1973 and 1994 the average real income of small farmers increased by 90%, and that of the landless – among the poorest – by 125%, while calorie intake for small farmers and the landless rose 58% to 81% and protein intake rose 103% to 115% (World Bank 1999).

their needs, with the difference being made up by fishing and foraging. Many households, both rich and poor, depend on *prei* (forests/wildland) for basic household goods, foodstuff, and grazing land. However, one reason for food insecurity is that farm enterprises are under-capitalised and agricultural productivity is low. DFID's Country Strategy Paper (DFID 2000) suggests that 'increased investment in land productivity would make a big difference in increasing the rural poor's wealth and assets.' The Paper also suggests that 'the weakness of property rights (as well as lack of access to better inputs) has led many farmers to keep their investment in land very low,' with the consequence that national rice production has stagnated – in stark contrast to Bangladesh where growth in rice production has kept pace with population growth (see Palmer-Jones 1999), and to Vietnam which, like Thailand, has become a major rice exporting country.

2.5.9. Meanwhile, as in the other study countries, there is a shift in livelihood strategies by large numbers of the rural population during the wet season (when much farm land is inundated) to take advantage of the opportunities that fishing represents.

2.5.10. On the floodplains of **Laos** and **Vietnam** where land is at a premium, most rural households with access to land are primarily dependent on their land-holding for food security. Besides rice production, their farming system may include small livestock (pigs), and pond aquaculture, while individual households may also fish for subsistence needs where the opportunity presents itself. In lowland Laos arable land availability is reasonable at 0.17 hectare per capita, but whereas Laos has a greater proportion of irrigated land (at 18.6%) than Cambodia (7.1%), and is seeking to extend this considerably, it is still low in comparison with Bangladesh.

2.5.11. A general conclusion concerning natural resource-based livelihoods in **Laos** is that the majority of farming systems are based on a combination of rice farming, animal husbandry and fishing. However, there are significant differences between the well-being of households. On the floodplain most richer households have >1 ha land, >5 cattle, a tractor, own a modest house, and have a rice mill, and/or plantation. They fish on a part-time basis and are self sufficient in food. 'Middle-income' households own two or three buffaloes, two cattle, have simple houses made of wood, some household garden, some fishing gears and boat and they are also self sufficient in food. By contrast a substantial proportion of poorer people also live there but do not have land or other productive assets; they are either agricultural labourers or petty traders and also fish part time for subsistence needs. Poor people may possess a small house and some fishing gear. In order to secure household rice security they have to lease land and draft animals from others. The very poor categories on the floodplain are landless seasonal labour lacking professional skills (Country PRA Report: Laos, 2003).

2.5.12. Fishing as a full time occupation is rare, and limited to locations near major rivers or reservoirs. Even in those locations, full time fishers rarely account for more than a few percent of the population. Nevertheless the Fisheries do play an important role in rural livelihoods in virtually all regions of Laos, but fishing is typically ranked as the second or third most important activity (after rice farming and animal husbandry) and contributing on average about 20% to rural household income. The bulk of fish catch is consumed within the household, but surpluses may be sold and this accounts for about a quarter of total catches.

- 2.5.13. The Country PRA: Laos Report (2003: Table 2) indicates that there can be variations around this 20% mean in different agro-ecological zones on the floodplain as a consequence of the composition of livelihood portfolios, (from 5% of household income in rice-field agro-ecosystems to 20% in Mekong mainstream agro-ecosystems). (Interestingly the rice-field zone also has the highest number of poor and very poor people, while the Mekong mainstream zone livelihood strategies are focused on weaving (50%), farming (20%) and fishing (20%) – with fishing and weaving probably substituting for income generation from farming (which contributes between 40-63% elsewhere). (In the Mekong mainstream zone, there may be less farming opportunities, while it is probable that the wealth of the zone has been built through the other strategies subsidising each other, while the surveyed communities probably also have good market access.³
- 2.5.14. The Country PRA Report also suggests that the relative importance of the fishery and agriculture has changed over the past 20 years or so. Thus as fish species, and particularly high value species have declined (Country PRA Report Table 12), so the yield (and probable value) from agriculture has increased due to the introduction of HYVs of rice and irrigation infrastructure allowing a second rice crop during the dry season (Country PRA Report Table 13). This trend is probably set to continue with a decreasing significance of the fisheries to rural dwellers livelihoods, particularly the wealthier, although an overall reduction in fishing pressure may lead to a recovery in the resource with benefits for the poorest who are likely to continue to exploit this CPR.
- 2.5.15. Meanwhile, farm households in upland **Laos** and **Vietnam** also tend not to have enough land to achieve food security and are similarly dependent on hunting and gathering in the forest to make up the shortfall. Here the cause is low productivity, but this time due to poor soils, labour and other constraints.
- 2.5.16. **Vietnam** Historically good land on the Vietnam floodplains (particularly on the Red river floodplain) has been regarded as scarce, with the government being prompted to resettle landless households in the northern uplands. However, there have been periods when this has not been the case (e.g. when commodity and therefore land values have been low, and farmers have abandoned their land holdings). Again, under the stimulus of the *doi moi* reform policy, agricultural productivity has increased so dramatically that farmers' landholding, though small, have not only generated sufficient income to achieve household food security but have also generated a surplus for export. Average per capita arable landholding at 0.08 hectare is almost as small as in Bangladesh, but as in Bangladesh the proportion of irrigated crop land is considerable at 31% and enables multiple cropping through the year.
- 2.5.17. The poor tend to have less/no land and are most dependent on aquatic resources and have been impacted by agricultural intensification. In the Mekong delta region the key natural capitals are land, water and aquatic resources. The key issues are their quality and quantity. 28% of land is alluvial soils suitable for rice, 40% is acid sulphate (some are heavily acidic

³ N.B. The low figure for the rice-field agro-ecosystem, as an income measure, may mask the importance of living aquatic resources to the population of this zone, since evidence elsewhere suggests much of the production from rice fields is not sold but is consumed by households – particularly poor households (which constitute 52% of households of the survey sample).

with dry season water pH value of as low as 1.5), 21% is saline, the rest is upland. Landlessness is increasing as a result of high provincial population and small land area. In the Ca Mau peninsula agriculture centres on a single, extensive, wet season crop of rice. As a result Eighty-three percent of low-income families fish in rice fields, canals and rivers, catching on average 531 kg of fish per household per year, of which half is sold providing 14% of income, they eat on average 60kg of fish per person per year.

2.5.18. In all regions, but particularly in the Northern Uplands and Central Highlands, poor people living in or near wetland areas fish for income because they have no access to land and other productive resources. Moving into fishing is often a last resort for landless and displaced people. In inundated areas, areas prone to flooding and in flooded forest areas on the Mekong, people are often landless or land short, and lack capital and access to productive resources. These environments are vulnerable to storms and extreme floods. There are capture fisheries during flood/inundated periods and aquaculture in ponds. The Midlands and some coastal areas have poor soils as a result of deforestation, with high erosion, and poor access to fresh water. There are few opportunities for alternative livelihoods, and limited extension services. Wild (capture) fisheries have declined. This is partly attributable to the use of fertilisers and pesticides for rice cultivation due to government efforts to increase rice production. But there has also been a loss of dry season wild fish refuges in areas prone to saline intrusion.

2.5.19. Conclusion

Growing populations and the perceived need for food-grain security have historically led to the conversion of most suitable land to arable production in Bangladesh and Vietnam. While the process has lagged behind in Laos and Cambodia, it is continuing stimulated by government policy. The impact of land conversion and of the associated technologies and processes associated with arable production will be discussed later, together with the drivers behind these (see Section 8).

2.5.20. With most suitable agricultural land having been converted to arable production, but with populations still rising, there has been a falling per capita availability of land on the floodplains. With this, and marked seasonality of agricultural production on the floodplain, and despite intensification and mitigation of seasonality through irrigation, flood control and other technologies, poorer households in the study countries have increasingly had to build portfolios of livelihood strategies beyond those based on land. These may be based on agricultural and other labouring, the seasonal exploitation of agricultural by-products, fisheries and forest NTFPs (in CPRs), and a variety of other strategies ranging from transport, petty trade, post-harvest industries, and migration. However, as will be shown, an important component of the livelihoods of poorer, and particularly land-less or near-landless, households is exploitation of the fisheries in one form or another (see Section 7).

3. Poverty: in-country differences and uneven development

3. The four countries vary considerably in population size and population density (see Annex 2 Table 3). Bangladesh has by far the highest population density (981 per Km²), followed by Vietnam (238 per Km²) and then Cambodia (67 per Km²) and lastly by Laos where the population density remains one of the lowest in the region at 22 persons per square kilometre.

3.1. Topographic differences: uplands versus lowlands

3.1.1. However, these average population densities mask considerable differences in population densities in different regions of countries. Thus a major proportion of the land area of Vietnam is highland with much lower population densities than the floodplains of the Mekong and Red rivers. On the floodplains population densities are on a par with those in Bangladesh. A considerable portion of Laos similarly consists of highland with lower population densities than are found on the Mekong floodplain. Some regions of Cambodia have high population densities, but unlike the other study countries, much lowland still has relatively low population densities.

3.1.2. Some regions within countries suffer higher incidences of poverty than others. Thus national poverty data show some areas in Bangladesh (e.g. the North West, riverine and *charlands*) as structurally poorer than others (see World Bank 1998b). People living in the *charlands* are at risk of floods, but when it is not of the fast-flowing destructive kind, the flood is an annual event which *charland* dwellers have learned to cope with. Perhaps a bigger risk is land erosion as rivers change their course, since this can reduce households which are emerging from poverty to landlessness and destitution at a stroke.

3.1.3. In SE Asia (except Cambodia) those areas which have higher incidences of poverty tend to be the upland areas. Cambodia is the exception. In Cambodia by contrast the coastal and upland regions have the lowest incidence of poverty (22%), the Tonle Sap Great Lake region has the highest incidence (38%), while the plains region has 29% of the population below the poverty line (UNDP, 1999). Upland regions elsewhere in SE Asia have much lower population densities than lowland regions, but given the historically agrarian nature of national economies and with more limited natural resource opportunities, populations tend to be poorer. For example in Laos, Datt and Wang (2001) note that living standards are highest in the Central region (containing the capital Vientiane), is predominantly low-lying, with reasonable infrastructure and opportunities, and has benefited from the NEM reform programme. The South and the North by contrast have significantly lower living standards. The North has about 38% of the poor but 32% of the population, the South has about 22% of the poor and about the same proportion of the population, while the Central region has 38% of the poor but 45% of the population. Within the three regions there are also significant differences between provinces in their level of poverty (see Datt and Wang 2001).

3.1.4. Again in Vietnam the incidence of poverty is higher and deeper in the northern mountain and central highlands regions, where 59% and 52% remained in poverty in 1998, and where the poverty gap index was 16.8 and 19.1 respectively. In coastal areas, 48% of the population along the north central coast remain below the poverty line, but the depth of poverty was

rather lower with an index 11.8. These differences between regions also tend to be reflected in differences in food security. For example, while Laos is self-sufficient in rice, the North has a rice deficit, while the South has a surplus (Lao PDR 1996b). The same is true for Vietnam, where the lowlands produce a rice surplus, but the highlands have a rice deficit.

- 3.1.5. One reason for the differences between lowland and upland regions is the poorer agricultural opportunities available in the uplands. Household livelihoods in upland regions tend to be based on linked strategies of subsistence agriculture and exploitation of wild resources. The Vietnam upland farm type of rice plot and forest swidden plot together with hunting and gathering in the forest is archetypical of non-market oriented survivalist livelihoods in the region. Reasons for greater poverty in these regions have been given as a poorer natural resource base, less developed human capital, isolation, and lack of other opportunities. Populations here are heavily dependent on natural and particularly wild resources (including fisheries) with agricultural (primarily dry rice) production being unable to meet household needs.
- 3.1.6. IFAD sees households in remote uplands areas as being most vulnerable to food shortages, particularly those practicing short-cycle shifting rotations and with marginal lowland paddy holdings. IFAD sees increasing household rice production as the most effective way of achieving food security (IFAD 2002). The NEM reform programme has so far produced only moderate benefits for Lao Theung, and insignificant benefits for Lao Sun (see Rigg 1997).
- 3.1.7. SE Asian countries have seen their uneven distribution of population as a drawback to national development. Like other SE Asian countries (e.g. Indonesia, Thailand), study country governments have at one time or another pursued policies encouraging internal migration from what they regard as the 'overpopulated' lowlands where there is increasing landlessness to the 'under populated' highlands where land appears to officials to be abundant. Besides concern for national security, the justification has been that national economic development could be driven through extending the total cropping area and giving landless HHs access to land. There are, however, social and environmental difficulties with this approach, including the loss of forest cover to agricultural land, and conflict between different population groups.

3.2. Urban-rural differences: uneven development

- 3.2.1. While there are regional differences in poverty incidences (and associated vulnerability) in the study countries which are primarily associated with different natural resource opportunities associated with floodplain as opposed to upland livelihood strategies, countries are much more similar in the distribution of poor between rural and urban sectors.
- 3.2.2. Infrastructural and other constraints can lead to uneven development (both spatially and socially) with different groups 'winning' or 'losing' in the development process. Since it is far easier to reach consolidated urban populations than dispersed rural ones, the former populations are usually the first to benefit from any new development initiatives. Thus as study countries have undertaken reform over the past decade or so and as politico-economic reform processes have kicked in, urban populations have benefited. In consequence, and

given that these countries are primarily agrarian, higher numbers and proportions of their poor to be found in rural than urban areas, while the rate of poverty reduction is higher in urban than in rural areas (Appendix 2 Table 4).

3.2.3. In **Cambodia** most of the poor (90%) live outside the cities in rural areas where they have an average income of less than one-third that of urban incomes. 40% of Cambodia's rural population and 24.8% of its urban population are below the national poverty line. Between 1993-4 and 1997 the poverty incidence in urban areas fell in Cambodia from 37 percent to just under 30 percent, while they fell only slightly in rural areas from 43% to 40%.

3.2.4. In **Laos**, poverty is overwhelmingly rural. 77% of its population live in rural areas, 40% of whom live below the World Bank poverty line, while the rural poor accounting for more than 90% of all poor (World Bank 2000). Per capita income in rural areas of Lao PDR is believed to be considerably lower than the national average US\$ 280 at US\$ 150 – 200 (in 1999). A World Bank study using data from the Lao Expenditure and Consumption Surveys (LECS) conducted in 1992-3 and 1997-8 notes that rural poverty rates are 2-3 times higher than urban poverty rates and that the depth and severity of poverty are highest among farm households, while poverty levels are below average for non-farm self-employed households, lower still for paid employees and lowest of all for the employer group. A major determinant of poverty is the degree of self-sufficiency in rice production and a primary indicator of wealth is livestock ownership. Lack of land and a shortage of cash for investing in land improvements are major causes of rural poverty (Datt and Wang 2001).

3.2.5. 57% of **Vietnam**'s rural population is below the national poverty line, while only 25.9% of its urban population are. As the development gap between urban and rural areas has increased during the transition towards a market economy, rural development has been given first priority in the Government's current development strategy which is targeting 1,715 communes facing extreme difficulties in remote and mountainous regions.

3.2.6. Since countries construct their own poverty lines according to their own criteria, and there are other difficulties with the data (see World Bank 2000 Technical Notes), comparison between countries can only be rough, and firm conclusions cannot be drawn. However, on the data that the World Bank gives, it is noticeable that all countries' proportions of urban dwellers who are poor are within one or two percentage points of one another, while their proportions of rural poor vary between 43% (for Cambodia) and 57% for Vietnam.

3.2.7. This suggests at least, that at the time of survey, poverty is primarily a rural phenomenon in all four countries. To confirm whether this is so over the longer term, it would of course be necessary to look at the trends regarding poverty levels in the two sectors over time. Unfortunately the World Bank does not give any tables for such. However, other data (both qualitative and quantitative) suggests that a shift in the structure of the economy over time has been responsible for lower rates of poverty among urban populations in all countries, while reductions in rural poverty rates have lagged behind. Thus recent economic growth has benefited those living in urban areas far more than those living in the countryside. This is reflected in trends in consumption patterns. For example, in Cambodia the consumption of the richest population quintile has increased ten times faster than the poorest quintile over the last five years.

3.2.8.Trend

While country governments are increasingly targeting rural populations for poverty elimination interventions, the opportunities associated with urban centres and diversification of economies are predicted to lead to increasing urbanisation of populations. The potential impact of this trend is discussed below.

3.3. Differences within rural areas

3.3.1. There can also be differences within rural areas, most usually as a result of landlessness. A major determinant of poverty in all study countries is the degree of self-sufficiency in rice production, while in SE Asia a primary indicator of wealth is rice self-sufficiency and livestock ownership. Lack of land and a shortage of cash for investing in land improvements are major causes of rural poverty in floodplain regions of all countries.

3.3.2. Landlessness is not such a problem in upland areas where there is still forest to clear, but sedentarisation of people who were swiddenists can lead to land degradation and impoverishment of cultivators. In addition, location and infrastructural links affect access to markets and imported products. As Haylor et al (1997) note, villages close to forested areas have access to a wide range of local foods, production-enhancing inputs and grazing, which villages in dry or deforested areas do not have. Additionally, long-established villages with developed land-water and institutional infrastructure contrast with newer ones reclaiming dry forest areas and bunding rice fields, or moving close to main traffic routes

3.3.3. On external measures, wealth differences between families are not pronounced and most rural people would be formally classified as poor. However, Haylor et al (1997) did find in their Savannakhet study that when using local wealth ranking indices - which classified families into poor, middle and rich - there were differences between families and between villages. In some villages, 'poor people' - those with very little land and who regularly produce less than they need to eat - made up between 50% and 60% of the total village population. In other villages they constituted a minority. In Haylor et al's sample villages, 'middle people' - those who usually have enough to eat but who may have difficult years, who have some but not extensive land holdings, some livestock, but no business - constituted between 30% and 64% of the population. Villages with higher proportions of middle and 'rich families' - the latter being those that are never hungry, who have plenty of land and significantly some kind of business - were those with proximity to main roads and markets (Haylor et al 1997).

3.3.4. The Country PRA Report: Lao (2003) also indicates that there can be significant differences in the social composition of villages on the floodplain which are associated with different agro-ecological zones. I reproduce a table (Table 2) from that report which indicates these differences, but say nothing about the causes of the different population compositions in the surveyed communities. More work would have to be done to ascertain whether those with a broader mix of wealth strata had this because of greater opportunities, whether those with few wealthier people were isolated and lacking in resources, and so on (see Section 3).

3.3.5. However, as regards natural resources, communities in the Back swamps appear to have a wider range of natural resources than elsewhere; the report mentioning that community agricultural land for rice and livestock takes up about 50% of land available, while they also have access to forest land (48% of their land area) which, although not public property, community members have access rights to. The report suggests that this is a significant community resource, under the control of a village committee, the income of which is used for village welfare (such as road repair, festivals etc.) and for loans to needy villagers. The report does not say what the value of NTFPs are to livelihoods, though respondents said some were of considerable value but were becoming scarce, while Table 11 of the report indicates that respondents still felt that forest resources were highly important to them.

Table 2. Wealth Categories (% of population)

	Very Poor	Poor	Average	Rich
Mekong tributary	0	28	58	14
Back swamp	3	5	16	76
Mekong mainstream	0	25	25	50
Rice field	12	40	44	4

(Country PRA Report Lao, 2003, Table 1)

3.3.6. The different wealth compositions are partially mirrored in educational attainment (Table 3), those living in Back swamp communities having the highest proportion of rich people (76%), whose income generation comes from farming/livestock strategies (72%), with a high proportion completing secondary school (95%) and (60%) actually completing high school. Rice field communities by contrast have the highest proportion of poor and very poor (52%), with 70% of their income similarly coming from farming/livestock strategies (but clearly at a lower level than the rich), but with only 30% completing secondary school, and only 10% completing high school. Mekong mainstream communities, with 90% of their income from weaving, farming and fishing strategies, have a reasonable proportion (25%) completing high school and 75% completing secondary level education.

Table 3: Educational level completed

Environments	Primary	Secondary	High school	University
Mekong tributary	60	20	15	5
Back swamp	30	10	55	5
Mekong mainstream	40	35	20	5
Rice field	70	20	10	0

(Country PRA Report Lao, 2003, Table 5)

3.4. Occupational differences in poverty incidences: Farm households

3.4.1. As might be expected. The different poverty incidences for rural and urban populations are also reflected in occupational differences. In **Bangladesh**, the incidence of poverty in households with agriculture, forestry, and fishing as major occupations is much higher (at 40%, taking the lower poverty line) than the overall national average (BBS 2000). The highest percentage (49.5%) of households which are below the poverty line (using the lower poverty line) is that of landless households. According to the 1995-96 Household Expenditure Survey (HES) 74.8% of landless agricultural workers and 45.4% of fishers were

below the lower poverty line as against the national rural average of 39.8% (BBS 1998).

3.4.2. In **Cambodia** about 90% of rural households depend on agriculture as their primary source of income. Here households headed by someone working in agriculture and fishing manifest the highest incidences of poverty (46%), followed by construction and mining (37%), transport (31%), and government workers (20%) (UNDP, 1997). Nearly 75% of all poor people are in fishing and farming occupations.

3.4.3. The **Lao** economy is similarly predominantly farm-based, with the largest part of the labour force consisting of farmers (60% of the 90% of the population in households with economically active heads), while the depth and severity of poverty are highest among farm households. Other self-employed account for about 13% of the labour force, paid employees for another 13%, while employers account for less than 1%. Poverty levels are below average for non-farm self-employed households, lower still for paid employees and lowest of all for the employer group (Datt and Wang: 2001). Given this data, and as will be discussed below, it is clear that natural resources are of considerable importance to a major proportion of the population, and including the poor, but the data also indicate that as natural resources are currently utilised they are unlikely on their own to be the basis for lifting poor people out of poverty.

3.5. Non-farm rural employment opportunities, and rural infrastructure

3.5.1. One reason for the low proportion of rural non-farm households, is that historically rural economies have been subsistence-based due to an absence of markets for rural produce, which in turn has been due to poor infrastructural linkages between rural and urban areas (see below). This has limited the opportunity for non-farm rural employment. In Cambodia for example DFID (2000) notes that opportunities for non-farm employment in rural areas is extremely limited (DFID 2000).

3.5.2. Improving rural infrastructure can provide an opportunity for rural poor to commoditise and to diversify their livelihood strategies. Access to community-level infrastructure (roads, irrigation, transport, markets) and services (health and education) are important complements to household-level assets in generating incomes and enhancing livelihoods (see Datt and Wang 2001). Poor infrastructure restricts rural economic growth – particularly by denying farmers access to sources of input supplies, local urban markets and wider market information. Access by rural households to urban, regional and global markets for their commodities and labour is considerably eased through good infrastructure (road, rail, river, telecommunications). This can assist poverty elimination through enabling diversification of rural households into non-farm livelihood strategies and their incorporation into the formal economy. Thus, for example, the World Food Programme (1999) sees access to food security in Laos as ‘constrained by scarce off-farm opportunities, lack of access to services and markets and limited irrigation schemes.’

3.5.3. However, as countries have reformed their economies, and demand for rural products has grown, so too has the opportunity for non-farm employment. This has probably gone furthest in Bangladesh where there is a sizable, and landless, segment of the rural population which is

engaged in servicing the farming and fishing sector (e.g. rural transport) and/or is engaged in post-harvest activities (e.g. food preparation). In the three SE Asian countries economic reform and infrastructural development has occurred later, so that diversification of rural economies is at an earlier stage and rural livelihoods are still primarily based on farming.

- 3.5.4. Development of non-farm employment opportunities are important not just in offering landless poor access to opportunity, but also in enabling poor farming households to diversify their livelihood strategies – which can reduce the vulnerability caused by the seasonality of farming practice and can offer a route out of poverty. For example, in Laos Datt and Wang (2001) note that poor and nonpoor differ notably in their economic activity status over the year. Thus in general poor households depend on farming as their main source of livelihood and have fewer non-farm opportunities as compared with non-poor households.
- 3.5.5. While Datt and Wang (2001) do not say so, the data indicate that the diversification of household livelihood strategies beyond the farm are likely to be of most significance in lifting Lao households out of poverty – particularly as the differences between poor and nonpoor in access to dry and irrigated land is not very large (reflecting the preponderance of small farm holdings and limited levels of irrigation in the country. However, increased investment in, and commercialisation of, the farming sector (and including enhanced rice-field fish production where it is suitable, see Haylor et al 1997, and discussion below) would make a significant difference to the living standards of a majority of the rural poor.
- 3.5.6. However, investment in rural infrastructure can also represent a threat poor rural livelihoods. The opening up of rural areas enables the exploitation of previously inaccessible natural resources by rent seeking external agents (including governments). As will be discussed below, while the process can lead to increased investment in agricultural production by households in response to market demand, in the absence of regulations and incentives it can also lead to the unsustainable exploitation of resources (for example, CPRs such as fisheries and forests). Indeed it can be argued that the demand by Thailand for timber from Laos and Cambodia preceded rural infrastructural improvements, and indeed led to their development. Only then did farmers take advantage of logging roads to access new land for the growing of commercial crops (see Rigg 1997).

Infrastructural status

- 3.5.7. **Bangladesh** is further ahead of the three SE Asian study countries in its improvement of rural infrastructure. There has been considerable investment in upgrading the road system and in improving road and rail links to its main ports and to India. This stimulating within and between country commodity flows.
- 3.5.8. In **Cambodia** much of the rural road infrastructure was destroyed through three decades of open conflict and neglect. An indication of the importance of rural infrastructure to poor people is the high priority it is given through local planning processes developed under the Seila programme (DFID 2001). However, despite considerable donor assistance the road network - and capacity to undertake basic maintenance - is very limited.

3.5.9.I provide an example from the Problem Census included in the Country PRA Report: Cambodia (2003) which brings home the importance of infrastructure to rural households.

‘Road infrastructure is very important for villagers to travel and transport the product to exchange with outsiders. Without roads, the village could not be developed and the livelihoods of the villagers could not be upgraded because the product being produced in the village is cheap, or if they need to transport to other places they need to spend a lot of money, while imported commodities from outside is expensive....There are two main routes of the problem which can be described; firstly the villagers have no ability to build roads themselves and secondly they lack communication and contact with outsiders such as government institution and NGOs.

The respondents also stressed that they lacked other services such as electricity, a safe water supply and decent sanitation.

3.5.10. Infrastructure in **Laos** is underdeveloped, particularly in the upland and highland areas, with about half the population living in areas unreachable during the rainy season, while more than two-third are not linked to an electricity network and about half do not have access to a safe water supply. Additionally poor households are concentrated in areas where infrastructure is more underdeveloped. Anecdotal evidence from Haylor et al’s (1997) wealth ranking exercises suggest that Lao themselves rank as rich those who have proximity to an urban centre and have the opportunity for salaried work there. Yet, as Haylor et al (1997) note, in Laos rural communities may move closer to improved roads in order to take advantage of the new opportunities.

3.5.11. In **Vietnam**, the causes of poverty are diverse depending on geographical location. For example, the northern mountain population has a high poverty incidence as a result of geographical isolation, limitations in land area for rice cultivation, poor communications and transport infrastructure, poor public and extension services (including health and education), and difficult access to markets and credit services.

3.6. Poverty: minority group incidence of poverty

3.6.1. While poverty is differentially distributed according to region, location, and occupation, it is also differentially distributed according to social group, for example by ethnic group, gender and by household type.

3.6.2. Ethnicity

The spatial incidence of poverty has ethnic, and land use connections. Certain social groups tend to have higher incidence of poverty than others. Minority ethnic groups within countries can have higher incidences of poverty than majority populations (though figures can be difficult to derive from national statistics). As previously noted upland regions Laos and Vietnam (but not Cambodia) have higher incidences of poverty than lowland areas. The population of upland areas in Laos and Vietnam also primarily comprise ethnic minority groups, though over the last few decades households from dominant national groups have been moving into upland areas due to land shortage in lowland areas and encouraged by national land redistribution policies.

3.6.3. **Bangladesh** Minority ethnic groups are not distinguished in poverty statistics, but there are number of ethnic minorities on the floodplains as well as in the Chittagong Hill Tracts.

3.6.4. **Cambodia** is 90% Khmer, but has up to 10% ethnic minorities of Cham, Chinese, Vietnamese and Khmer Loeu. Figures for poverty incidence among these groups are not available.

3.6.5. **Laos** is ethnically diverse with up to 68 different ethnic groups identified as inhabiting the country. However, while it is rather simplistic to put it so, they are normally classified into three groups: The Lao Lum (or Lowland Lao), who occupy the lowlands plains and the Mekong River valley, and constitute about 56% of the total population; the Lao Thung (or Upland Lao), who occupy the mountain slopes, and comprise about 34% of the population, and the Lao Sun (or Mountain Lao) constituting about 9% of the total population. The latter two groupings (which contain a number of different tribal groups such as Hmong, Akha, Lahu and others) being referred to in government literature as 'ethnic minorities'. Government is dominated by Lao Lum. The latter two groupings are in general poorer than Lowland Lao, have fewer material possessions, have less access to good farm-land and most commonly practice swidden agriculture rather than wet-rice cultivation coupled with hunting and gathering in the forest (Meusch 1996, Haylor et al 1997).

3.6.6. Laos' Central region's population is predominantly Lao Lum. The North and South with significantly lower living standards, infrastructure and services, consists primarily of uplands and highland, with a population comprised primarily of Lao Theung and Lao Sun 'tribal' groups together with poorer Lao Lum who have moved into the uplands in search of land.

3.6.7. **Vietnam** is predominantly 85-90% Vietnamese (Khin) but 3% are Chinese, while ethnic minorities include Muong, Thai, Meo, Khmer, Man, Cham, and other mountain tribes. There are Khmer near the Cambodian border. The key issues for ethnic minorities are limited land, isolated areas, and prohibition on their cultivating land with more than 15° slope. The Khmer often live on saline and acid sulphate soils in the Mekong delta, with poor agricultural opportunities. Minorities usually have poor access to extension services, are often geographically isolated with limited infrastructure (including access to markets), and are culturally isolated (see van de Walle and Gundewardena, 2000).

3.6.8. **Female-headed households**

In **Bangladesh**, despite improvements in recent years, women and female-headed households (where 95% are in poverty) remain particularly disadvantaged (see World Bank 1998, Ashley et al 2000), while the literacy rate in female population has lagged that for men (BBS 2002).

3.6.9. In **Cambodia** s socio-economic survey done by the project for the management of the freshwater capture fisheries of Cambodia revealed that 19% of households in the fishing commune are headed by women, while national statistics indicate that 26% of households in the whole nation are headed by women. However, information is not available on their poverty status.

3.6.10. In **Laos** female-headed households, which make up only about 5% of the total population, are less poor than their male counterparts – the incidence of poverty amongst the two groups being 30% and 37% respectively. However, Haylor et al (1997) suggest that families headed by single women are the most vulnerable in such a labour-constrained farming system. Meanwhile poverty levels tend to decline with the age of the household head, but the differences are not large (Datt and Wang 2001).

3.6.11. Comment

The position of women and of female-headed households does appear to be less disadvantaged in SE Asia than in Bangladesh. This may be due to religious differences with Islamic practice restricting the number of opportunities available to Muslim women in Bangladesh. Thus in Laos, for example, while there is a gender division of labour, this is not absolutely fixed. Certainly both sexes are involved in the agricultural sector (where women composed 60% of the labour force in the agricultural sector in 1989 (UNESCO 1989), and both sexes fish and gather aquatic resources (see Thompson and Baden 1993:5-6). However, women face a number of constraints which deny them access to the means to optimise their labour productivity (e.g. the burden of housework, insufficient agricultural skills-training by extension services, lack of access to credit, lack of research and technology development appropriate to their activities), even though these have increased since the introduction of NEM reform in 1986 (see Ireson 1989).

4. The national institutional and governance context in which livelihoods are set

4. From civil conflict to peace and stability ('the peace dividend')

Bangladesh has experienced many political changes and turmoils during the last few decades –independence from British rule in 1947 as a part (as East Pakistan) of Pakistan, cessation from Pakistan in 1971, then veering between democracy and autocracy until democratic was established in 1991. Meanwhile mainland **Southeast Asia** region has, during the last decade, enjoyed a period of relative peace and growth that contrasts with the civil wars, international conflicts, mass migrations, and emigrations that characterized the 1950s, 1960s and 1970s.

4.1. Routes out of poverty: economic reform and growth

4.1.1. More recently all countries have put in progress major economic reform which is intended to achieve growth in national economies and reduce poverty.

4.1.2. Bangladesh

A major economic policy reform in Bangladesh has been the adoption of a free market economy. However, the impact of this and of globalization has been mixed. Decentralization of power and authority to local level, together with peoples' participation at all levels are the policy strategies of the Government. However, the reform process has still not gone as far or as quickly as the World Bank and other donors would like, and there is a worry that implementation is lagging policy-making.

4.1.3. The fourth Five-Year Plan (1990-95) was revised in 1993 to reduce public expenditure as a result of lower than expected GDP growth. In its place, GoB presented a New Development Perspective which emphasises employment generation against traditional growth-based planning. Although official GoB policies support a reduced role for central government, in practice devolution and privatisation have been too slow for the World Bank's liking (Dixon 2000). The Bank sees the key to accelerating growth and reducing poverty as being reform of the public sector. As elsewhere in the world, the 'drivers' behind the strategy are 'good governance'/ participation, and subsidiarity/ local management as mechanisms for achieving efficiency throughout the economy.⁴

4.1.4. Cambodia: economic reform

Cambodia is emerging from more than 30 years of civil war and turmoil which has left the population desperately poor. In terms of governance structures, DFID (2000) notes that macroeconomic management has generally been good since the elections of 1993. Cambodia's overall economic policy has been to promote an open liberal economy integrated

⁴In 1999 the Paris meeting of the Bangladesh Development Forum (a forum of GoB and Bangladesh's development partners) noted that GoB was making important gains in human development, but also expressed concern about the slowing momentum of institutional reform, and stressed that improvements in governance were the key to further progress in reducing poverty (World Bank news release No. 2000/042/SAS)

into the world trade system, and the economic reform programme has liberalised the economy substantially. Certainly the government seems committed to a pro-poor growth policy, and has reoriented its spending priorities away from defence and security towards the social sector— notably education, health, agriculture and rural development. Such policies should if implemented effectively, start to make a difference to the livelihoods of the poor.

- 4.1.5. Post-conflict reform in Cambodia, as stated in the Policy Framework Paper (PFP) prepared in 1999, is geared to ensuring macroeconomic stability, strengthening the banking and financial system, undertaking fiscal reform measures, establishing a sound management of public property and increasing public investment in the area of physical and social infrastructure, promoting private sector development, and developing human resources. The government's economic objectives are centered on poverty alleviation and sustainable economic growth.
- 4.1.6. Key elements include: strengthening revenue collections and enhancing the transparency of fiscal operations, reform of the civil service and military; increasing public investment with a view to rehabilitating the country's poor social and physical infrastructure, and shifting spending priorities to health, education, agriculture and rural development; and strengthening legal frameworks and economic institutions.
- 4.1.7. However, implementation is key, and implementation of policy has not measured up to policy-making. For example a review of the First Social-Economic Development Plan for 1996-2000 noted that while the development plan had allocated 65% of its investment to rural areas and 35% to urban ones, on the basis that investments in rural areas were more likely to have greater poverty-elimination impact, the reverse had occurred in practice.
- 4.1.8. DFID (2000) also suggests that the government's effectiveness is hampered by lack of capacity and by the web of vested individual and group interests that share power and wealth. The public services are weak at all levels, while corruption in government and the civil service is also perceived as high. Social sector expenditure is increasing, but widespread failure to disburse, skills shortages, institutional blockages and corruption at all levels mean that very little reaches service users. DFID (2000) suggests that it is the lack of implementation capacity, rather than an adverse or disempowering influence of government policies, that characterises Cambodia, though a multi-donor funded project (Seila) is working with government to address the above constraints to linkages between governmental structures and communes (DFID, NARSIS database 2002).
- 4.1.9. A bleaker picture than this is painted by some. For example Chaumeau, (2001 in WRI 2002) suggests that even after the signing of the Peace Accords in 1992, the central government and its branches at the province, district, and commune levels have been weak, rife with corruption, and crippled by limited human resource capacity. Indeed Cambodia's rural areas have had little effective government, or governance, *per se*. Instead, elements of the government, military, and private corporations have engaged in asset-stripping the country's richest resources.

4.1.10. Laos: modernisation

Laos is similarly emerging from a protracted period of political turbulence. The armed struggle against French and later American forces for three decades after World War II left Lao PDR as one of the poorest countries in the world. However, after the accession of the Lao People's Revolutionary Party in 1975 and particularly after 1986 there has been a gradual social and economic improvement and an increasing opening up of the country to the world.

4.1.11. 1986 saw the Lao government enact the New Economic Mechanism (NEM) which began a process of decentralising decision-making to the provinces, decontrolling prices, eliminating state subsidies, unifying the exchange rate, began a process of privatisation of state enterprises and introduced a number of other macro-economic and institutional reforms. As Rigg (1997) notes, after decades of being an economic backwater, Laos is seeking to make up lost time and join other East Asian 'miracle' economies.

4.1.12. Having been a landlocked, isolated, 'timeless' corner of Asia, Laos is undergoing rapid and deep economic reform and is being incorporated into regional and international economies. In particular Laos has significant natural resources, such as forestry, which have for the most part been exhausted elsewhere, an abundant supply of cheap labour, and opportunities for the production of hydro-power for export to its industrialising neighbours Thailand and Vietnam. The NEM reform programme has led to significant investment in the country by Thai (and Chinese) entrepreneurs which is helping to grow the economy, though it is also increasing strains in the Laotian social and economic fabric. A key challenge for the government, as Datt and Wang (2001) recognise, is promoting economic growth while keeping inequality in check.

4.1.13. The result of the reform process has been that between 1979 and 1989 average annual growth of GDP was 2.9%. However from 1989 to 1999 growth has been 6.3% annually on average, while agriculture grew at an average annual rate of about 3.8% during the 1980s, almost double its growth rate in the preceding decade. The private sector is expanding but slowly, due to a host of constraints including a small domestic market, few domestic suppliers, occasional restrictions on the imports of inputs, bureaucratic red tape, a poor tradition of manufacturing, credit unavailability, and poor infrastructure.

4.1.14. However, after steady GDP growth during the early 1990's, the Lao PDR's economy faltered in the wake of the East Asian financial crisis which led to increased levels of poverty. Annual per capita GDP was estimated at US\$ 400 in 1997 but as US\$ 280 in 1999, which is considerably below the World Bank's average for Low-income countries of US\$ 410 (1999 figure), and considerably worse than the Bank's figure of US\$ 1,000 for East Asia and the Pacific.

4.1.15. As Rigg (1997) notes the reform process has proceeded rapidly because 'the constraints on the reform programme have...not been so much those linked to the tensions of transition from a command to a market-based system, but rather those connected with underdevelopment, pure and simple.' Rigg (1997) argues that poverty and its multiple facets in Laos are primarily the result of underdevelopment. To this can be added its isolation as a

landlocked country where poor rural infrastructure, poor access to markets and the limited network of all-weather feeder roads remain major constraints to rural diversification and development. The government's policies under the NEM reform programme are designed to address these constraints.

4.1.16. However, in the shift from an overwhelmingly subsistence economy to one integrated into regional and global economies, the government runs the risk of promoting uneven development and increasing the vulnerability of many of its poorest citizens. Thus it can be argued that the government's drive to modernise the economy through granting concessions to large-scale commercial logging enterprises and developing large-scale hydro-power infrastructure, together with its antithetical approach to traditional swidden agriculture, has contributed to a reduction in livelihood opportunities for the poorer sections of Lao society rather than to an increase in them (see below). That is poverty is – at least partially – 'policy induced'.

4.1.17. Similarly in **Vietnam**, the government's growth strategy has been broad-based, with moves to diversify the economy through greater industrialisation, but also through agricultural development in order to address the prime seat of poverty – which is in the rural areas. Indeed Vietnam has made remarkable progress in economic growth and development since the beginning of economic reforms in the early 1980s. Since 1988, aggregate GDP has increased on an annual basis by an impressive 8-10% in real terms putting Vietnam among the 10 fastest growing economies. Industrial sector growth has been even more rapid – though starting from a low base – at 13% per annum.

4.1.18. An issue in all countries is the gap between policy-making and legislation and implementation and enforcement. Policy-making is improving in all countries, but implementation is lagging behind. The main reasons for this are a lack of capacity in all countries, a general failure for line ministries to think in an holistic way as regards poverty alleviation and development, together with a failure to seek partnerships with other government and civil society bodies to address problems, and a tendency for rent-seeking and corruption by officials.

4.2. Rural economies: The continuing importance of agriculture and fisheries to rural livelihoods

4.2.1. While the contribution of agriculture (including fisheries) to national GDP has been declining in all four countries, it is still very important in the livelihoods of rural people.

4.2.2. For example, raw and processed agricultural products generate the bulk of **Bangladesh's** foreign exchange earnings, while the agricultural sector is the main source of employment. Crop cultivation makes up 46% of the income of farm HHs, while the agricultural wage makes up 15% of the income of non-farm HHs (Rahman and Hossain 1995). Agro-processing and agricultural input supply provide the core of industrial activity. Non-agricultural employment makes up 27% of farm HH income and about 50% of rural non-farm HH incomes (Rahman and Hossain 1995).

- 4.2.3. A major reform undertaken by the Bangladesh government in the past was the East Bengal Tenancy Act 1950 by which the landlord (*Zamindar*) system was abolished and ownership to land was vested in the government. Subsequent reform (to the benefit of poor marginal farmers) included the waving of land tax on up to 3 hectares of cultivable land in 1973. While private ownership of land was abolished, this has not stopped wealthier households from accumulating land, since they may arrange for different plots to be held under the names of different relatives. Nor has this practice prevented the access of others to land, since an informal land leasing (share-cropping) system has developed to meet demand. Finally, land ownership has more or less become *de facto*, since the state does not try to enforce the law limiting the size of landholding for use by households.
- 4.2.4. In **Laos** agriculture remains the major sector of the economy, contributing 53 percent of GDP and employing over 80 percent of the labour force. Rice accounted for about 84 percent of the total cultivated area of approximately 820,000 hectares in 2000, while about 16% of the rice area was an irrigated dry season crop. In addition to land under cultivation, about 800,000 hectares are used for pastureland or contain ponds for raising fish. Usually characterised as an extensive but low productivity system, the agriculture sector has been unable to meet the needs of the growing population and to provide a reliable surplus for export and the food and feed processing industries. Generally, the low output character of Lao agriculture, and the low rural incomes that are its result, stem from both supply and demand side factors.
- 4.2.5. Growth in the Laotian economy faltered in the wake of the Asian financial crisis, but appeared to recover in 1999 given continued strong agricultural growth and measures to stem the macroeconomic instability. The agricultural/rural sector continues to be the most important to the national economy, but poor rural infrastructure, and the limited network of all-weather feeder roads remain major constraints to the rural economy given the rather isolated and semi-subsistence character of livelihoods in rural Laos.
- 4.2.6. Again in Vietnam, while agriculture's contribution has been shrinking over recent years, it still comprised 23.6% of total national GDP (US\$ 32.7 billions) in 2001, with an average annual growth of 2.8%. As a result of the reform programme after 1986 which assigned land use rights to farm households and liberalised marketing arrangements, Vietnam is now the world's second largest exporter of rice after Thailand achieving an export volume of 3.8 million tons in 1998.
- 4.2.7. The performance of the agricultural sector has led to a dramatic improvement in the incomes of rural households in Vietnam, which have risen by 61% over the five years between 1993-1998 increasing the share of agriculture in the rural income to 47%. However, there is concern that the limit to increase rice production based on further expansion of the area under cultivation has been reached. Apart from the central highlands, most land suitable for agriculture is already cultivated and new settlers have to do with less fertile land.

4.2.8. Cambodia: agriculture reform: from state to market

Cambodia's agricultural development strategy features a two-pronged framework – rapid, sustained and equitable agricultural growth as well as empowerment of the poor. The first prong is to invigorate and modernize the agricultural sector, generate employment, enhance household incomes and improve the access of the less privileged to food. Modernization, in the context of Cambodian agriculture, means a small-holder and dynamic agriculture (making use of appropriate technological innovations) where farmers have control over their production environment. The second prong is the entitlement-mediated approach which empowers farmers, rural poor and other vulnerable groups to enhance their ability to participate in the growth process. It focuses on improving these groups' access to land, water and other production inputs for sustainable livelihood, food security and overall socio-economic development.

4.2.9. The strategic framework centers on the development of an export market for rice and other agricultural products, improving management and introducing appropriate technologies for rice-fish farming and aquaculture, strengthening agricultural support services, and strengthening the capacities of the Ministry of Agriculture, Forests and Fisheries (MAFF) at all levels.

4.2.10. However, whether a strategy which appears to be primarily concerned with national financial needs realistically targets the poorest in Cambodia is a moot point. As will be discussed later (see Section 9), the strategy appears to be similar to that of Vietnam in identifying the main route out of poverty as being primarily through the export of a staple food crop – rice. This may prove successful in the short term, as it has in Vietnam, but this strategy will require substantial investment in rice technology and irrigation infrastructure. (Cambodia currently has a very low proportion of its cropland under irrigation (7.1%) compared with other Asian countries where proportions have increased rapidly since 1980 (see Appendix 2 Table 5). However, the poorest may not have access to land or the finance to take up the technologies which are required for this strategy. The same may be true of rice-fish and aquaculture.

4.2.11. Vietnam: agricultural reform: from state to market

Vietnam has followed a similar political trajectory to Laos with a protracted period of conflict with colonial powers followed by a period of some 20 years when it was largely excluded from participation in the world economy due to its socialist governance structure. To understand many of the political events in Vietnam's history it is necessary to understand the role of natural resources in people's livelihoods, and in particular the struggle for land to ensure household food security. Thus the transformation of the agricultural economy of Vietnam has been influenced primarily by land reform policies over the last few decades.

4.2.12. In the early 1960s, land reform was the central issue of peasant politics. The struggle for land was the engine of the Vietnam revolution during the American occupation. After the war with America, collectivised production was introduced into the south from the north but disregarded producer incentives and disrupted market mechanisms for the flow of inputs and outputs. In 1970, the "land for tiller" programme was launched with large land-holdings

being broken up and distributed among peasants with landlords being compensated for their land and allowed to retain up to 15 hectares each. Vietnam's agricultural policy was then directed primarily towards making the country self sufficient in food through a system based on collectivisation.

4.2.13. By 1981, inherent problems with the system had become apparent, (e.g. a decline in investment in land and production technologies served as a disincentive to increase production.) In 1986, Vietnam's Party Congress adopted its *doi moi*, or renovation, policy that ushered in a set of reforms aimed at liberalizing the economy and attracting foreign investment. *Doi moi* ushered in a change from the post-war collectivised production system towards a household oriented contract system, which led to self sufficiency in rice in the mid 1980s. Further reforms initiated in 1988 included long-term inheritable land leases, the replacement of the contract system and of fixed prices for the sale of produce to the state, privatisation of output markets, the decentralisation of input supplies and the removal of grain subsidies. These initiatives strengthened producer incentives and led to further productivity increases.

4.2.14. Vietnam is now the largest rice producer and the second to third largest exporter of rice (depending on year) after Thailand and USA. Traditional rice production systems in the Mekong delta in the mid 1970s produced 4 million tons, by the late 1980s 6 million tons, and now around 13 million tons, just under half of national output.

4.2.15. Vietnamese society has opened significantly since the 1980s, signaling a move away from Soviet-style socialism and toward market socialism. As a consequence of *doi moi*, new markets are becoming available to farmers for their products. Whereas subsidiary government agencies and state enterprises controlled all natural resources previously—and the government took responsibility for every aspect of people's lives including employment and welfare—households are now permitted to lease agriculture and forest land for up to 50 years.

4.2.16. In spite of land reform and the partial embrace of market reforms, Vietnam retains strong central planning of its economy setting targets and quotas. Virtually all significant policy debate is still conducted within the confines of government and party, while there is still a tendency towards central policy-making and legislation (though informed through party contacts at the grassroots) but without necessarily implementation and enforcement. (see Kerkvleit and Porter 1995). Political or democratic decentralization with accountable local government with decision-making powers, remains largely unrealized.

4.2.17. However, while central planning was accepted in the North where there was a longer tradition of it, it was never fully imposed in the South of the country where farmers expressed considerable opposition and sought to manage their own affairs. Again, in the highland regions today, local farmers pay lip service to the many central edicts regulating natural resource use, while seeking to subvert them to meet their food security needs.

4.2.18. Indeed as in Laos, the failure to fully implement decentralisation policy, and the preference to central control by edict still represent policy constraints to poor people's livelihoods. An example of this is the attempt to ban swidden agriculture in the highlands on

the grounds that it is unsustainable and leads to environmental damage –in particular the removal of forest cover.. However, there are different types of swidden, some of which are sustainable, and there are other pressures which are leading to the removal of forest cover, while policy is not geared to incentivising local sustainable initiatives or drawing on indigenous knowledge to achieve this.

4.2.19. In 2002 with World Bank and donor support, the Vietnam government tabled a Comprehensive Poverty Reduction and Growth Strategy (CPRGS). The CPRGS recognizes that despite the gains of the last decade, poverty remains widespread and deep. The Strategy also articulates clear targets through the Vietnam Development Goals. However, whether these will be met will depend on how three main challenges are addressed. Firstly how the structural reform agenda proceeds, since it is likely that the fast progress made in liberalising trade will soon conflict with the slow restructuring of state-owned enterprises and state-owned commercial banks. Secondly whether growth can be kept pro-poor. Integration with the world economy may widen the gap between urban and rural, and skilled and unskilled which the government would wish to avoid. Thirdly, despite upbeat growth prospects it may be difficult to become a market economy with a socialist orientation. There is a danger that vested interests capture government transfers, and that an unhealthy relationship develop between enterprise and government officials with all its attendant inefficiencies and social equity failings. Such rent-seeking would be a constraint to the economic growth that could lift more poor people out of poverty.

4.3. Routes out of poverty: Globalisation and Urbanisation

Industrialisation

4.3.1. One of the messages coming out of national poverty statistics is that income poverty is closely correlated with low educational achievement. Those who only complete a low education level are more likely to be recruited into occupations (such as agriculture) where pay is low, where opportunities are limited, and to belong to households which are also typified as poor according to other social indices. Breaking out of the cycle of poverty is likely to require interventions on a number of fronts. Improving education and health levels for the population as a whole can give beneficiaries greater access to opportunities beyond their immediate rural and agrarian environment.

4.3.2. However, without an expansion in non-local opportunities, even healthier and better educated beneficiaries will be forced to fall back on local rural opportunities and, if they have access to land, on agrarian opportunities. Industrialisation can be a help in providing wider opportunity and in soaking up surplus – and usually landless poor – labour from the rural areas. With these issues in mind, and in order to diversify their economies, the development of manufacturing and service industries is proceeding in all four study countries.

4.3.3. With the opening up of country economies, world investment flows have been keen to take advantage of low production costs and compliant labour in the study countries. In particular a major proportion of foreign investment in the last 20 years has been directed to urban areas for the development of industry focused on manufacturing for export (see World Bank figures on growth in this sector in Appendix 2). This has stimulated a demand for labour in

the urban areas with a considerable amount of their population growth being the result of migration from rural areas rather than natural growth. Industrial wages have also been one of the reasons for the much lower proportions of poor in the urban sector in all four countries.

4.3.4. For example, the establishment of free trade zone has led since the 1980s to a highly labour-intensive export-oriented garment industry in **Bangladesh**. This is the highest foreign exchange earning industry and provides employment for many thousands of poor young men and women. Presently 0.8 m people are engaged in this industry. However, the industry is primarily located in Dhaka and its relevance to the rural population is perhaps negligible. Meanwhile heavy investment in 'green revolution' technologies and the FCD/I infrastructure to support them has led to year on year food grain production (primarily rice) which has made a significant contribution to the income of poor landed households, to agricultural labourers and to rural service sector workers as the rural economy has grown.

4.3.5. From agro-based to diversified national economies?

Historically, all four countries' economies have been agro-based, and indeed still are. In the last two decades, however, there has been a shift in all countries from rural agrarian economies to ones which involve a mix of agrarian, industrial and service sectors. In all four countries the industrial sector shows growth in the proportion of its contribution to national GDP, while the service sector's contribution has been generally static, and the agricultural sector's share has fallen. Industry's average annual rate of growth has also generally been higher than the agricultural sector (though obviously starting from a low base).

4.3.6. Stimulated by changes in the macroeconomy, particularly due to the opening up of countries to foreign investment etc. (globalisation), the trend in industrialisation and urbanisation is set to continue. The development of the three SE Asian countries studied here has lagged behind other parts of the region due to their embracement (to a varying extent) of principles of command economies, extended periods of civil conflict, and thus to their isolation from international financial flows. However, with the shift away from a command economy in Vietnam and Laos, and the greater stability of Cambodia after a protracted period of civil conflict, these countries have rejoined the mainstream, have based their development on market principles and free enterprise, have reduced the state's role in micro-management of the economy, and have based poverty reduction firstly on growth in the national economy.

4.3.7. It should be noted that even in the rural areas, the proportion of households which are dependent on agriculture is declining in all four countries. The process has gone furthest in Bangladesh where, for example, the proportion of rural households who are dependent on non-farm occupations is close to 50%. However, the development of the rural non-farm sector is also proceeding in the SE Asian countries, though they lag Bangladesh in this respect. This attests to the growing diversification of rural economies away from agriculture, though this has been patchy in all three countries, and is associated with good infrastructural links to urban centres. Regions that have poorer infrastructure and remain relatively isolated have a much higher dependence on agriculture and higher levels of poverty.

4.3.8. However, since these countries are still remain predominantly agrarian and non-agrarian opportunities are only increasing slowly, the best hope for lifting the greatest numbers out of poverty in the immediate future are likely to lie in the rural sector through improving agricultural returns to labour, which in turn can stimulate rural non-farm enterprises servicing the agricultural sector (see IFAD 2000).

4.3.9. Some commentators have seen the route to achieving this as being through stimulating export-oriented agricultural production. This can and has been achieved in certain industries (e.g shrimp and prawn production). However, experience elsewhere suggests that the opportunities are likely to be in niche markets, to be capital rather than labour intensive, and therefore to favour richer rather than poorer people. Such product opportunities also require entrepreneurs with capital and skills to bundle sufficient disparate small-holder agricultural commodities together to achieve the critical mass required to build an export industry. Again, given the poverty of the majority of rural households, their risk averseness, and their need to diversify livelihood strategies to achieve food security, most will be unable to participate in export-oriented activities in other than a small way, while the greater proportion of benefits will naturally accrue to those who have the capacities to bundle together specific commodities from a number of producers.

4.3.10. Orienting production to export markets is risky for small producers. There have been instances (for example coffee and sugar cane growers in Vietnam) where agricultural extension officers have been too enthusiastic in pushing the benefits of export markets to poor producers who have had to practice monocultural production on their small plots and have later been caught when global markets have slumped. The lesson is that production from rural areas needs to develop organically in response to markets, market access and mechanisms and entrepreneurs which have the capacity to take on transaction costs and risk.

4.3.11. **The urban market**

However, there is possibly a ‘halfway house’ between the local area and export markets, that is the market present in urban areas or other rural areas of the same country or region in which it lies. Differences between agro-ecological zones at the regional level, and the development of infrastructural links between them have usually been a stimulus to trade and production for these markets.

4.3.12. Examples in the four study countries include agricultural commodities such as fish, rice, bananas, onions, peppers, pulses, fruits and the like which are traded over considerable distances in Bangladesh, the development of agricultural labour markets in Bangladesh to take advantage of the differing seasonal demand for labour in different regions of the country; the processing of a wide variety of fish products for regional export in Cambodia; and the regional export of commercial timber resources by producers in Laos and Cambodia to Thailand. In Bangladesh, the free market economy has promoted the export and import of fish with fresh water fish like *hilsa*, cat fish etc. being exported to India, while cultured carp are imported from there.

4.3.13. The growth of the urban sector in all countries has led to a demand by urban populations for goods and services from the rural sector – and in particular for food items. The ability of

the rural sector to take up this opportunity of course depends on a range of factors including in particular proximity and access to urban markets (which includes infrastructure, transport and mechanisms such as ‘middle-men’), access to the necessary factors of production (such as land, labour or labour-saving devices, and finance).

- 4.3.14. These factors vary from country to country due to their stage of development, size of economy, geographical location, and so on. Bangladesh, for example, has been set on the course of export-led industrialisation and urbanisation for longer than the three SE Asian countries in this study. In consequence the main themes of what is highly likely to emerge in these latter countries are more evident here. Thus, in order to feed its growing and increasingly urbanised (and non-food producing) population, Bangladesh has for some years pursued an agricultural intensification programme involving high investment in Flood Control Irrigation and Drainage (FCD/I) infrastructure, HYV rice requiring High External Inputs (HEIs) since the limit to increase rice production based on further expansion of the area under cultivation has been reached.
- 4.3.15. The same trajectory is occurring (if at a later stage) in the three SE Asian countries. As their economies are opened up to world financial flows, urban centres based on export-oriented industries grow. Non-poor urban populations require food items and this demand stimulates and is met by the rural economy. These market forces and the opportunities they offer are a strong driver for rural development. Urbanization is seen by many policy-makers as offering opportunities to rural dwellers to supply urban population’s needs and thus to become more market oriented.
- 4.3.16. Urbanisation can impact in different and unexpected ways on rural production and thus rural livelihoods. For example in Vietnam there is similar concern to Bangladesh that the limit to increase rice production based on further expansion of the area under cultivation has been reached. Apart from the central highland, most land suitable for agriculture is already cultivated and new settlers have to do with less fertile land.
- 4.3.17. These concerns taken together with the vulnerability of the world market for rice, reinforce the need for appropriate forms of agricultural diversification. A breakdown of the contribution of different categories of agricultural activities demonstrates that, particularly in the Mekong delta region close to Ho Chi Minh city, there has been a tremendous diversification away from rice. Though real revenues from rice cultivation have increased by 21% over this period, there have been increases of 53% in real revenues from livestock and aquaculture, 55% from other food crops, 66% from industrial annual crops, and 27% from perennial crops. A similar diversification away from rice to wheat, potatoes and a wide range of vegetable crops, in order to take advantage of higher prices for these, is taking place in Bangladesh.
- 4.3.18. However, who it benefits, how and why, and whether the rural poor have access to the opportunities the process presents, and if not why not, is for further discussion. There is evidence that, while the rural, and landless, poor do benefit from the labour and service opportunities that agricultural intensification and diversification in response to market forces offers, those who benefit most are landed non-poor and middle men. Certainly the ability to

access the opportunity that urban, regional and global markets represent for the rural poor is not only dependent on their capacities for doing so, but also on location and on infrastructure. (see Section 2), and on social equity.

4.4. Urbanisation and the impact on the fisheries and on livelihoods

4.4.1. Growing urbanization of country populations may also be a factor that may impact in the future on the fisheries and the on livelihoods of those who depend on them. As the proportion of the population which is urbanized grows and the rural economy diversifies into non-farm strategies, there are likely to be different demands on the fisheries sector. As urban populations' incomes rise so too will their demand for food (including protein-rice fish). Such demand-led development may lead to further pressure on wild stocks, but also will stimulate aquacultural production, which in turn should lead to income gains for the rural poor with access to ponds. These, however, are unlikely to include the landless poor unless a market in leasing/sharecropping ponds develops.

4.4.2. As with other natural resource commodities, aquatic resource production in Bangladesh, for example, has been stimulated by demand from urban centres and from overseas. However, where this has been based on the exploitation of wild resources (fish, frogs, fish and shrimp fry), there has been the attendant danger of over-fishing and over-gathering with negative impacts on species. However, the banning of these practices has had adverse impacts on poorer people who are involved in their collection. Impacts on the wild resource and on the livelihoods of the poor has only been partially mitigated (for some species) by the development of fish breeding centres (see Section 7).

4.5. Threats to growth-led poverty reduction

4.5.1. One cloud on the horizon of growth-led poverty reduction is the danger of rent-seeking by powerful elites. As the World Bank (1999a) has noted rising inequality has reduced the rate of poverty reduction and, 'depending on which poverty measure is used, one-fifth to one-third of the potential poverty reduction from growth may have been lost.' That GDP growth has not commensurately benefited the poorest is indicated by Bangladesh's 144th place on the UNDP's Human Development Index (HDI) ranking.

4.5.2. The same point is made in a recent *ODI Poverty Briefing* (ODI: 2000) which, on a survey of a number of countries, suggests that

‘high levels of income-inequality limit the poverty reducing effects of growth. Higher growth and pro-poor policies will improve poverty reduction prospects in both high and low-income countries but high-inequality countries will need to grow twice as fast as low-inequality countries to halve poverty by 2015.’

The *Briefing* suggests that this is not feasible, which in turn suggests that if the study countries are to meet world development targets they will need to do more to limit corruption, rent-seeking and improve the rule of law.

4.5.3. This analysis also suggests why countries have sought to increase production from the fisheries sector, whether from inland capture fisheries, coastal and marine fisheries or aquaculture. Not only is fish a major source of protein in the diet of populations in all four study countries, but the resource is an important income generator for poor people. Taking part in the inland capture fishery is also of course important to the poor for subsistence reasons, as an expenditure-saving strategy, and as an ecological reserve (or safety-net) when other livelihood strategies have failed (see Section 8). However, as with other sectors, such as food grain production, high levels of income inequality limit the poverty-reducing effects of growth. There is the danger, exacerbated by the ‘fragile’ property regime status of much of the inland capture fisheries (as CPRs) in all countries, that rent-seeking by powerful elites will increase social inequality and will limit the poverty reducing impact of growth, while a variety of threats to the sustainability of the resource may ‘kill the golden goose’ (see Sections 9, 10, 11).

5. Importance of the fisheries sector to national economies

5.1. National production and yields from the inland fisheries⁵

5.1.1. The fisheries sector of **Bangladesh** plays an important role in the national economy, in employment generation and in the supply of animal protein in the diet of people. Inland capture fisheries in the rivers, canals, depression (*beels* and *haors*), oxbow lakes, reservoir, flooded land etc. are one of the richest in the world after China and India.

5.1.2. In the past the major source of fish production of the country was from the inland capture fisheries. Even during the 1960's more than 90% of the country's fish production came from inland capture fisheries, with the rest coming from marine fisheries and aquaculture. However, during the last 3-4 decades the contribution of the inland capture fisheries to total national production has declined, partly due to increased production from marine fisheries and aquaculture, but also due to over-exploitation, and other human impacts and natural processes on the resources and their environment (such as FCD/I).

5.1.3. The fisheries sector as a whole currently contributes 5.9% to the national GDP (BBS, 2001), and 6% to the country's export earnings. In the year 2000-2001 a total weight of 38,988 metric tonnes of fish and fish products were exported and Taka 20,327.5 million was earned. (41,686 metric tonnes in 1994/5 worth Tk 13069 38,988 metric tonnes in 2000/1 worth Tk 20327). Real annual growth in the fisheries sector has been rising steadily since the late 1980s registering 8.7% in 1993/94.

5.1.4. Inland capture and enhanced fishery presently (2000-2001) contribute 38.7% of the country's fish production. This sector provides employment to full time and part time fishermen, fish farmers, fish traders and others involved in fisheries-related and auxiliary activities. About 10% of the population have some dependence on the fisheries sector for their livelihood and more than 73% engage in part-time fishing. According to DOF some 0.77 million full time fishers are directly dependant on inland capture fisheries for their livelihood. In addition it provides opportunities for about 70% of rural population in subsistence fishing for their own consumption. A significant number of people are engaged in other related activities such as fish fry production, aquaculture and enhanced fisheries, fish trading, fish processing, net/ trap & boat making, fisheries labour, etc.

5.1.5. Estimates of the total annual yield of fish in Bangladesh including the marine fisheries range from 750,000 - 1,500,000 t (FAP 17, 1994b). Inland capture fisheries have increased in recent years to 536,055 t in 1996-97. Within the open water fisheries, floodplains account for 63% of the total inland production.

5.1.6. In 1996-97, the estimated total annual catch of fishes and shrimp from all inland waters of Bangladesh was c. 600,000 t. This represents an increase of c. 190,000 t since 1989-90, mainly from the floodplain sector. This increase is believed by some to be erroneous since only 20,000-33,000 t can be attributed to increases in carp catches in response to the Third

⁵ This sub-section draws primarily on Craig et al (2000).

Fisheries Project between 1991-1996. Other groups with significant ($P < 0.01$) increases in catch from the floodplains since 1983-84 include snakeheads (*Channidae*) (c. 3,500 t year⁻¹), 'livefish' (fishes sold live which includes catfish, snakeheads and a few other types) (c. 4,000 t year⁻¹) and others (c. 11,000 t year⁻¹).

5.1.7. Total fish production of the country in 2000 - 2001 was 1.78 million m. ton of which inland open water contributed 0.69 million metric ton (38.7%), aquaculture 0.713 m. metric tons (40%) and marine water 0.380 million metric ton (21.3%) (*DOF Fishery Statistical Year Book of Bangladesh. 2000-2001*).

5.1.8. Catches from riverine habitats have declined significantly ($P = 0.03$), by c. 3600 t year⁻¹ from 1983-84 to 1996-97. The last 5 years for which data are available indicate some recovery. Other than large shrimp catches, which have declined significantly ($P < 0.01$) by c. 240 t year⁻¹, the overall decline in catches from rivers cannot be attributed to any one species or species group. Catches from *beels* have shown a steady but modest (c. 2000 t year⁻¹) improvement since 1986-87 arising from significant ($P < 0.01$) increases in the catches of *W. attu* (c. 1,000 t year⁻¹), *L. rohita* (c. 850 t year⁻¹), *C. catla* (c. 700 t year⁻¹), *Channa striatus* (c. 475 t year⁻¹), *C. mrigala* (c. 350 t year⁻¹), *N. chitala* (c. 2,700 t year⁻¹), *Heteropneutes fossilis* (c. 220 t year⁻¹) and *Anabas testudineus* (c. 200 t year⁻¹).

5.1.9. Based upon an estimated total floodplain area for the country of 2.8m ha, the national catch statistics indicate a catch per unit area (CPUA) for Bangladesh floodplains of 60 –130 kg ha⁻¹ year⁻¹. Other estimates range from c. 50 to 400 kg ha⁻¹ year⁻¹. There is some evidence to suggest that catches of *T. ilsha* and prawn species may be correlated with rainfall in the catchments of the Padma and Jamuna rivers.

5.1.10. Major sources-wise (inland capture, culture & marine), it appears from that overall production increased at an average rate of 7% during last 16 years, but the production in inland open water gradually declined at a very low rate with a slow upward trend since 1991-92. The reason for which has been attributed by the Government (DOF) to public sector intervention like flood-plain stocking with carp fingerlings, and the strengthening of conservation measures and the like.

5.1.11. There is continuing debate about the significance of production figures for the inland capture fisheries and as to whether the upward production trend is true, sustainable, or masks significant changes in the composition of species in the fisheries. In contrast to DOF's figures, PRAs and stakeholder discussions suggests that the resource is declining and that some important species like major carp are close to extinction. (See for example the species composition of inland catch for 16 year 1985-2000 in Country Status Report: Bangladesh, Annexure-IX 2003). According to IUCN (1990) some 54 species of fish are endangered and 12 species of them are critically endangered or extinct. This issue regarding the reliability of the different data sources needs to be resolved through further study if the fisheries are to continue to make a sustainable contribution to the national economy and to livelihoods.

5.1.12. In **Cambodia** fisheries contribute some 10% of the agricultural sector's total output. The annual freshwater fish catch is in the order of 295,000-420,000 tons, and fisheries contribute

8.8%-10.3% of GDP. According to DOF (2000), the total inland fish production for the whole country ranges from 279,000 to 441,000 tonnes of which 115,000-140,000 tonnes is landed by small-scale fisheries, 45,000-110,000 tonnes from rice field fisheries, 34,000-91,000 tonnes from large scale fisheries and 85,000-100,000 tonnes is landed by middle scale fisheries. In addition, marine fisheries production contributes 36,000 tonnes and aquaculture contributes 15,000 tonnes to the total production (See Country Status Report: Cambodia 2003, Table 2.3).

5.1.13. **Laos**⁶ is arguably the last country in South-East Asia which can be said to be truly 'agrarian'. The largest part of the labour force consists of own-account farmers (60% of the 90% of the population in households with economically active heads) (Datt and Wang, 2001). In 1992 agriculture and forestry accounted for about 60% of GDP, and employed over 85% of the labour force (Rigg and Jerndal 1996). Presently agriculture (within which the fisheries sector is subsumed) contributes more than half of GDP (52.6% in 1998), but its overall importance has declined (from 60.6% in 1989%), while its average annual growth rate of 4.6% between 1989 and 1998 compares unfavourably with industry's 12.2% annual growth rate over the same period. Industry has expanded since 1986 and accounted for 17.5 percent of the GDP in 1995 (22% in 1998). Growing exports are the driving force behind economic growth with wood products contributing US\$ 115m and manufactures US\$ 80m to total exports of US\$ 337m in 1998. The agricultural sector by contrast contributed only US\$ 8m (World Bank 2000). For the future, the export of hydro-power is expected to be a major source of foreign exchange earnings.

5.1.14. While the agricultural sector is gradually declining in importance to the national economy, it still contributes over half of total GDP value (US\$ 25b in 1998). However, the economy of Lao PDR is one of the least developed in the world; with production primarily oriented to the subsistence needs of the rural population (still 77% of the population in 1999, although down from 90% in 1989) – the majority of whom are dependent on the exploitation of natural resources (World Bank 2000).

5.1.15. While no separate fisheries statistics are available, the gross value of fisheries output is put at around US\$ 48m with a contribution to GDP of about 4% by commercial fisheries and another 2% by subsistence fisheries. Current fish production is estimated at 73,135 tons per annum, of which capture fisheries supplies 30,035 tonnes per annum and aquaculture is estimated to total 43,100 tons pa (Phonvisay, 2002).

5.1.16. However, due to a lack of comprehensive data on fish catch and consumption this is more of a guesstimate, which may not reflect the size and importance of this resource. It has been shown that there is a significant correlation between catches and consumption at the household level but that reported catch figures are consistently lower than figures for consumption of fresh fish. This indicates that the yearly catch figures for the households are probably systematically under reported. Actual catch could be substantially higher. Lorenzen (2000) suggests that DLF's estimate of 30 kg/ha/ pa for Swamps and wetlands may be a substantial underestimate. In particular, unregistered catches from rice fields and wetlands

⁶ This section draws heavily on Lorenzen (2000)

for subsistence needs may be of a considerable size. There is no data at all on the catch and consumption of other aquatic animals (frogs, snails, snakes, and turtles) which is believed to be of substantial magnitude (Phonvisay 2002).

5.1.17. A survey in the lowland areas of Savannakhet province (Lorenzen 2000) found that participation in natural aquatic resource use was near universal, with 82% of households fishing during the survey period. On average, households caught 60 kg of fish per year. The relative importance of aquatic resource use to households can be assessed by comparing the value of the fish catch to other household income (in cash and in kind). The value of fish in local markets ranges from 0.5 US\$/kg for small “trash” fish to 1.5-2.5 US\$/kg for larger fish. Household catches consist of about one third of “small” and two thirds of “large” fish, and the average value can therefore be estimated to be about 1.5 US\$/kg. Baird *et al.*, (1998b) note that in their study area – the Kong district of southern Laos where the overwhelming majority of the population practice subsistence or semi-subsistence paddy rice agriculture as their primary occupation but who have also traditionally relied heavily on the aquatic wealth of the Mekong River and its tributaries. The average annual catch for a family was about 355 kg, of which 249 kg was consumed (Baird *et al.*, 1998a). Fishing was not only the main source of animal protein in Khong, but was also the largest source of cash income (Baird *et al.*, 1998a).

5.1.18. Haylor et al (1997) note that the rice field wild fishery is open and unregulated and neither catch nor the fish taken by the farming family are normally quantified and, since some farmers use aggregating techniques and fish density is far from uniform, harvest rates for wild fish per unit area can be misleading. However, they suggest that production may be around 10kg/ha. While this does not compare with the production from ‘extensive’, ‘semi-intensive’, and ‘intensive’ fish culture in rice fields (from 30kg/ha for ‘extensive’ up to 500kg/ha for intensive)(Haylor et al 1997:Table 4.8), it does not require any labour input beyond harvesting, nor any further input costs. It is also far less risky, which is an important consideration for cash-strapped poor farmers.

5.1.19. Almost the entirety of aquatic resource production is consumed in-country, with little or no fish exports, although a considerable amount of catch from the Mekong river may be landed in Thailand where market prices are higher (FAO 1999).

5.1.20. Contributions by habitat and production system

Approximate contributions of different aquatic habitats to total aquatic habitat and capture fisheries production are given in Table 4.

5.1.21. Overall production is dominated by temporarily flooded habitats, in particular rice paddies, followed by large rivers and perennial wetlands. The breakdown into habitats is indicative only, and it should be remembered that aquatic resource productivity in all habitats is closely linked. Thus production in rice paddies and other seasonally flooded habitats is dependent on recruitment from perennial water bodies. On the other hand, production in seasonal habitats “subsidizes” stocks and yields in perennial habitats. Perhaps the most important general pattern apparent from the distribution of production between habitats is that habitats other than large rivers account for over 70% of the total.

Table 4. Estimates of capture fisheries and aquaculture production in Laos based on DLF (2001). Aquaculture and culture-based fisheries estimates given in brackets are based on fisheries survey estimates (Lorenzen et al 2000).⁷

Description of the fisheries	Type of water resources	Area in (ha)	Productivity (kg/ha/year)	Total production (tons/year)	% of total capture	% of total production
Capture fisheries	Large rivers	254 150	70	17 790	28	78 (95)
	Large reservoirs	57 025	60	3 421	5	
	Small reservoirs	34 460	150	5 169	8	
	Perennial wetlands	95 686	150	14 352	22	
	Rice paddies and floodplain	477 176	50	23 858	37	
	Total:			64 593	100	
Aquaculture and culture-based fisheries	Aquaculture (pond)	10500	1000	10500		22 (5)
		(2400)	(650)	(1560)		
	Culture-based fisheries	12 934	570	7411		
		(5000)	(250)	(1250)		
	Total:			17911		
				(2810)		
Grand Total				82504		100
				(67403)		

5.1.22. Vietnam

During the last few years (1994-1997) the contribution of the fisheries sector to national GDP has been about 3%. The sector has attained a rapid growth in production from 890,590 tons in 1990 to 1,969,100 tons in 2000 (MOF, 2000). However, the potential for capture fisheries is estimated to be limited, while the contribution of aquaculture to total production continues to increase, reaching 727,140 tons in the year 2000 (Fig.2.).⁸

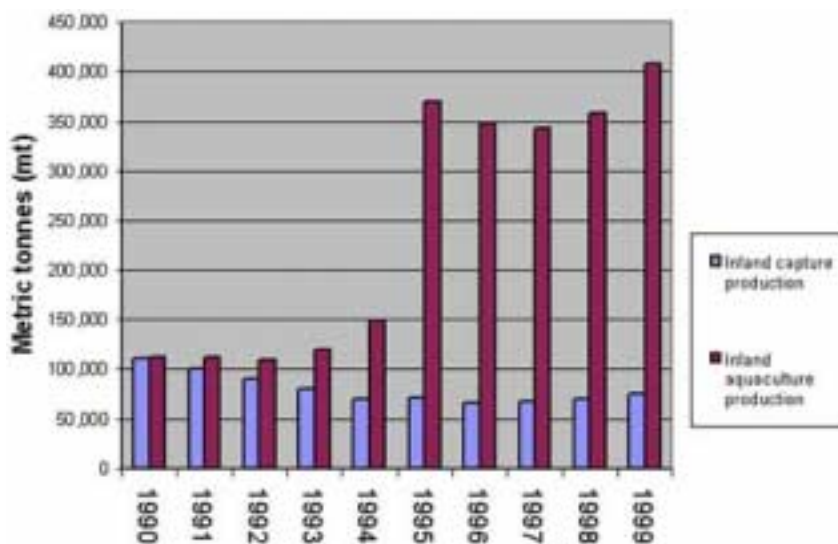


Figure 2. VietNam - Inland capture fisheries and aquaculture production (national totals). Source: RIA I, 2001

⁷ These estimates cover mostly the harvest of exclusively aquatic animals, in particular fish and shrimps. In addition to this, there is a significant harvest of amphibious animals such as frogs, snails and crabs.

⁸ DFID (2000c) notes that ‘Secondary data on aquatic resource use by poor people is limited... Their significance

5.1.23. *North Vietnam*

The Red River delta in northern Vietnam, with an average population density of over 1,000 persons per km² is, in common with Bangladesh, one of the most densely populated rural areas of the world. Although the delta comprises only about 5% of Vietnam's total landmass, its population is over 20% of country's total. Thus, the delta has minute agricultural holdings of only 0.3-0.5 ha per household. Although 80% of the population of the Red River delta makes a living from agricultural activities, limitation of arable land is a major constraint to improve the livelihoods of its rapidly growing population.

5.1.24. In these intensively cultivated rice-fields, the fish productivity is less than in rivers, but the area is much greater so that they supply in total a large catch. The reported fish production has fallen gradually, for example in the Red River 1,200 ton and 500 ton in 1985 and 1990 respectively; Chau Giang 200 ton in 1978 and 50 ton in 1982; and Chau Truc catch of 650 ton in 1966, 101 ton in 1976, and 70 ton in 1995.

5.1.25. *Central Vietnam (Lac lake)* Average fish production reaches about 3,900 kg/month (45 ton/year), which amounts to about 69 kg/ha.

5.1.26. Mekong Delta The Mekong Delta covers 369 million ha, which is about 12% of the whole country. Total agricultural land is 2.46 million ha including 1.97 million ha used for rice cultivation. The total water surface is about 954,350 ha (excluding rivers). Average household income is about 6 million VN dong per year (1992), of which 60% was from cultivation and planting activities, 10% from animal raising (including aquaculture), 5% from service and 4% from processing. Dependence on agricultural production makes agriculture development of primary importance in the region to help the people out of poverty. Annually, 50,000 tons of fish are produced and billions of fry and post-larva are harvest. Fish production in this region has fallen by 10-15% in comparison to 20 years ago (Sinh, 1995; and 2000).

5.2. Non-fish LARs

5.2.1. A difficulty with national production figures are that they do not record the value of fish, LARs and other items like wild water vegetables which are consumed by households as an expenditure-saving strategy. It is likely that these may make up a significant portion of poor rural households' food budget. The focus of governments on high value fisheries production masks this 'hidden harvest'. Yet valuations in other sectors in other regions (for example of NTFPs and of bush vegetables) is revealing the true value of these products, especially for landless poor people, and the true cost of their loss when their habitat is, for example, converted to rice production. These costs are not taken into account by policy-makers considering agricultural intensification.

5.2.2. An example is provided in **Vietnam**. The Country PRA Report: Vietnam (2003) notes that

is often overlooked in official data; both within the fisheries sector (as evidenced by the scarcity of data relating to poverty and aquatic resources) and also within poverty alleviation strategies. For example, production data in the Vietnam Living Standards Survey (VLSS) combines livestock and aquaculture but does not include capture fisheries...

‘Wild vegetables have an important role in fisherman’s meal. They are not only delicious but also healthy (no residue of agricultural chemicals) and free of charge. However, this practice becomes rarer and rarer, because of over population, over application of agricultural chemicals to kill mass of wild vegetables on rice field. Landless group can also pick wild vegetables from field to get income in addition to eat when having free time. Some households consider selling *Sesbania javanica* as an important income in their livelihood in flood season. They can earn 2 500 000 VND per flood season just by picking wild vegetable from field to make fermented sour vegetable (Vietnamese traditional vegetable pickle).’

This is a significant amount to add to the income of poor fishers and landless whose average annual income is not much more than 5m for a whole year.

5.2.3. Comment

Production figures are still rising in all four study countries. However, there are some issues regarding the veracity of these and how they should be interpreted. Most national level figures are estimates and quite wide margins of error may be involved. If figures can be accepted, they are likely to be a considerable under-estimate of total production (both in weight and value) from the inland capture fisheries (particularly if other LARs besides fish are included). One reason for this is that the significant catch by fishers of all types which is consumed in the home is rarely recorded. Again production figures only record a number of the more important high value species, while in fact fishing effort is devoted to almost all species.

5.2.4. Thus, while rising production figures may be comforting to governments concerned with national economic growth, they may well mask changes in species composition of the fisheries, while also failing to capture the situation concerning the many LARs that rural poor people exploit besides fish. Yet with governments now focused on poverty alleviation and the sustainability of natural resources as well as overall economic growth, it is important to know the status of the different resources. It is also important to know which resources are particularly being exploited by the poor, to what extent, and what influences are impacting on the sustainability of these resources and the access of the poor to them. These issues will be addressed in section 6.

5.3. Fish in livelihoods: Consumption of fish

5.3.1. When considering fisheries as an entry point for interventions to alleviate poverty, the main concerns from a livelihoods perspective lie in food security and income generation for the poor from exploiting the resource, and ensuring the sustainability of the resource. A previous Section (Section 3), has shown the importance of study country governments’ policies concerning land to achieving cereal grain self-sufficiency and household food security, while Section 4 has indicated the importance of the sector to national economies. However, besides calories there is also a need for protein in people’s diets, and this is most readily provided by meat and fish.

5.3.2. Production figures give an indication of the importance of the inland capture fisheries to national economies and, when figures for the numbers employed in

the industry accompany these, can give an indication of the importance of the fisheries to some livelihoods. However, such employment figures frequently only record those who state that their only or principal occupation is fisheries related. They infrequently capture those who state that they fish as a secondary occupation or on a part-time basis. Yet given the dynamic context of seasonal floodplain fisheries, the number of part-time and seasonal fishers and related trades is likely to be far higher than those who are occupied full-time in the fisheries. Additionally figures almost never record the numbers who are fishing on a subsistence basis, but for whom the fisheries are a critical component of their livelihoods both for subsistence and for expenditure-saving.

5.3.3. National production figures also only record catch that is declared. It is likely that there is a substantial under-reporting of catch, primarily because a proportion of the catch in countries with large numbers of subsistence households is for home consumption and is not recorded.

5.3.4. Yet fisheries are of considerable importance in rural people's livelihoods not only in terms of the income generated from production but also in terms of household food security – particularly for subsistence fishers and where they are unable to participate in markets. National food poverty indices give some indication of the importance of the resource in the diets of the study countries' populations (see Table 5.), while their importance can also be gleaned from consumption rather than production figures.

5.3.5. **Bangladesh** Bangladeshi say 'Mache, Bhate, Bangali' meaning 'Rice and fish, that is the Bengali person'. While fruit and vegetables are also of considerable importance in the diet of Bangladeshis, the cereal staple is rice, while fish is the predominant protein staple. The majority of carbohydrate calories are derived from rice, while the majority of animal protein is derived from fish, cattle and fowl. While wealthier households may keep cattle and are able to afford to buy such meat in the marketplace, fish is highest on the preference list of most Bangladeshis. However, due to financial constraints, poorer people cannot afford to buy most fish that are marketed and have to make do with 'trash fish' and other small fish which their simple gear allow them to catch.

5.3.6. Although agriculture dominates the economy, the population relies upon the country's fisheries resources for protein, fish supplying c. 80% of the daily animal protein intake. Fish contribute 4.53% to daily food intake, 14.15% to total protein intake, and 63% to the animal protein intake in the diet of the people of the country.

5.3.7. The majority of consumers prefer fresh fish; the least preferred forms are those which have been salted, sun-dried or smoked. Only 15% of the catch is processed in this manner and, although a limited market exists, it is declining. However *T. ilsha (hilsha)* is frequently smoked and highly regarded in this form. Historically major carps were sun dried at the seasonal fish assembly centres located beside *beels* in the Mymensingh-Sylhet region. Improved road transportation and infrastructure now allows much of the catch to be

transported fresh to urban markets. Sun drying of smaller fishes, such as the barbs, *Puntius* sp., however, is still common.

- 5.3.8. Nearly 97% of the fish captured and cultured in Bangladesh are consumed domestically (Rahman, 1997). The domestic market is extensive and complex in nature. In Bangladesh it handles $>10^6$ t of fishes annually. Despite their economic importance, infrastructure facilities for the marketing of fisheries products are poorly developed (Rahman, 1997). Fishers rarely go to the market themselves, rather agents visit the fishing grounds and transports the catch to a nearby wholesale market for sale to local wholesalers, retailers or distributors through a commissioning agent. The commissioning agent holds a public auction to sell the fish (Rahman, 1997). (Craig et al 2000). Thus there are many livelihoods beyond those actually based on fishing which are dependent upon the resource and which could be negatively impacted by any decline in this or potentially by any change in the composition of the catch.
- 5.3.9. In **Cambodia** more than two-third (69%) of calories consumed by households are obtained from cereals, especially rice. Meat consumption (which includes fish) is the largest expenditure category for Cambodian households, yet per capita consumption of fish is considerably higher than in Laos and Bangladesh. (N.B. The Country Status Reports for the other countries do not record what proportion of HH expenditure is spent on meat (including fish).) In Cambodia a considerable number of families keep small ruminants (especially pigs) and fowl and these form an important part of people's diet as well as fish.
- 5.3.10. Fish consumption rates vary around the country. The national average is estimated to be 25-30 kg per capita per year. The highest consumption rates are found in or near fishing villages, particularly near the Great Lake and the Tonle Sap where rates may exceed 80 kg per capita per annum. In southeastern Cambodia annual fish consumption per capita is much lower (at 13.5 kg).
- 5.3.11. Studies on freshwater fish consumption described by Ahmed *et al.*, (1998) reveal that fish is eaten in three main forms:
- *Fresh fish* (43.5 kg per capita per year of fresh fish, is consumed by fishing households who live in or around fishing districts and 39.9 kg per capita per year for non-fishing households);
 - *Processed fish* (14 kg per capita per year of fish paste, fermented fish, salt dried fish, dried fish and smoked-fish are consumed by the average household. Based on available conversion rates, this is equivalent to nearly 27.5 kg of fresh fish);
 - *Fish sauce*: Fish sauce consumption per capita ranged from as low as 3 litres/year for non-fishing households in Siem Reap to as high as 10 litres/year for fishing households in Kampong Chhnang. The fresh weight equivalent for average annual consumption rates is approximately 4.5 kg).

- 5.3.12. The fact that a significant proportion of the catch is processed in one form or another re-emphasises the importance of fisheries to rural Cambodians, as well the subsistence nature of many livelihoods. In the absence of developed markets and alternative livelihood opportunities, households have to harvest fish and store up sufficient (in processed form) during the flood season for consumption during the dry season. There are accounts of large seasonal movements of population from the uplands to the floodplains (particularly of the Great Lake and Tonle Sap) in order to participate in the seasonal fishery.
- 5.3.13. **Laos** While the fisheries do not appear to make a large contribution to GDP, aquatic resources are nevertheless of great importance in the livelihoods and diets of the majority of Lao – both in the lowlands and uplands (see later). Fish play an important role in the economy and diet of the people, particularly those living in the rural areas. For these people, fish and other aquatic animals such as frogs, snails, snakes and turtles are an easily accessible and inexpensive source of food. Freshwater fish are the principal source of protein for the rural population. Fermented fish (*pa daek*) is also a significant staple in all villages, particularly during periods in the year when catches are poor or peak agricultural labour requirements reduce the time available for fishing. On average seventy percent of household fish supply is caught by households themselves, less than twenty percent purchased, and the remainder received as gifts, reciprocal exchange, or payment in kind for labour.
- 5.3.14. According to sample surveys in 1995 the annual per capita fish consumption of rural and urban dwellers was 10 and 8 kg respectively. These figures indicate that a minimum of 30 percent of the total animal protein intake comes from aquatic resources. FAO (1999) notes that:
- ‘proper estimates of per caput consumption cannot be established; fish consumption as a percentage of total animal protein consumption can vary from only 10% among hill tribes to 90% among the population in Lower Lao. The average estimate for 1997 was 8.5kg of fish consumption per caput, out of a total of 20kg of animal protein. These figures certainly ignore the contribution of non-fish aquatic products which are gathered and consumed in large quantities during the monsoon season and can form a significant part of rural diets.’⁹
- 5.3.15. However, a recent fisheries survey in Luang Prabang Province carried out by the Living Aquatic Resources Research Center (LARReC), concluded that the average yearly per capita consumption of all fish and aquatic products is estimated to be 29 kg per person per year, with fresh fish accounting for between 16 and 22 kg. 5.3.16. Fish and aquatic animals account for 43 % of the total animal product consumption, but for between 55% and 59% of the total animal intake if standard conversion is applied. Similarly for the southern lowlands Baird (pers comm.) estimates fish consumption is more likely to be 60kg/person/year. Baird et al (1998a) note that in their study area (Khong province) approximately 78% of the animal protein consumed annually consists of fish products.
- 5.3.17. **Vietnam** Household freshwater fish catches are mostly used fresh, but processing and trading are also livelihood options. When fish are caught by fishers the best will be sold to

⁹ All species are taken and utilised by Lao – including crabs, shrimp, fish, snails, frogs and insects. This can confuse fisheries statistics where data collection often emphasises fish while ignoring the significant contribution of other species.

fish traders, young fish may be sold to those who practice cage culturing, trash and dead fish will be consumed by the fisher household, while some may also be sold as feed for cultured fish.

5.3.18. Since Vietnamese households not infrequently keep pigs and fowl, fish is not the only supplier of animal protein in the diet. In fact wild and cultured fish contribute about 40% of the total animal protein intake of the population. However the per capita availability of fish has increased from 11.8kg in 1993 to 13.5kg in 1995 and is expected to reach a level of 15.0 kg by year 2000, which probably reflects increasing incomes and levels of well-being as well as growing production from aquaculture. While there is limited data, the Vietnam Living Standards Survey (VLSS) clearly indicates that aquatic resources are of great nutritional significance in Vietnam, and more so for poor people.

5.3.19. The Country PRA Report: Vietnam (2003) notes that for ensuring food security, respondents at the study site in the Mekong floodplain considered rice farming to be the most important activity for most households, with fishing and the collection of other LARs as second in importance. However, fishing was ranked first by 29% of households and second by 32% of households. Compared to livestock rearing, the nearest ranked activity, fishing and collection is assigned a higher overall importance. In terms of income generation, rice farming is ranked highest by most households, but capture fisheries are ranked clearly in second place for income. However, about 29% of households ranked it first for income generation, and 39% ranked it second. On the strength of this data the capture fisheries sector is clearly very important for food security and income generation for the majority of the population, and of critical importance to almost a third of households.

5.3.20. Comment

Interestingly the per capita food supply from fish and seafood differs considerably between the four countries, though they say nothing about the reasons for this (see Table 6.).

Table 6 Comparison of Food production and consumption by country

	HDI rank	Food Production per capita index (1979-80 = 100) 1993	Agricultural production (as % of GDP) 1994	Food consumption (as % of total HH consumption 1980-85	Daily calorie supply per capita 1992	Per Capita food supply from fish/seafood (kg) 1990-92
Vietnam	121	133	28	--	2,250	14
Lao PDR	136	--	51	--	2,259	7
Bangladesh	144	97	30	59	2,019	7
Cambodia	153	141	--	--	2,021	12

(UNDP 1997).

5.3.21. However, consumption figures do not indicate the wider importance of fish in the household economy of different occupational groups. As noted elsewhere a number of studies give much higher figures for the consumption of fish by fishing households, where it functions as an expenditure-saving strategy.

6. Natural Capital: Inland Capture Fisheries and Living Aquatic Resources

6.1. Habitat

6.1.1. Most research on SE Asian fisheries has focused on the floodplains of the great rivers of the region – in particular the Ganges-Padma, Meghna and Jamuna-Brahmaputra rivers and their tributaries which form the floodplains of Bangladesh and the Mekong and Red river floodplains of SE Asia. However, the floodplain is a distinct, complex sub-system of the river ecosystem and should be perceived within a holistic spatial-temporal framework encompassing the entire river valley or catchment area. Historically fish and other living aquatic resources (LARs) are found wherever they have access to water, though the species that are to be found in any locality are dependent on the range of physical factors (e.g. water quality, volume, nutrient availability) to which they are adapted.

6.1.2. As Craig et al (2000) point out, river systems have developed in response to patterns and processes occurring along four dimensions, longitudinally from headwaters to the sea, laterally beyond the channel boundaries, vertically with the ground water and temporally for each of the three previous dimensions. However, it is the ecological interactions in the lateral dimension over time that are most developed in floodplain river systems.

6.1.3. **Bangladesh** According to the FAO Agro-Ecological Zones (AEZ) scheme for Bangladesh, floodplain agro-eco zones occupy *c.* 80% of Bangladesh (FAO/UNDP, 1988). Bangladesh is one of the richest country in the world in fisheries resources, particularly in inland open water fisheries. (In third place after China and India in terms of World production.) Bangladesh has vast inland open waters in the forms of rivers, canals, depression (*beels/haors*), flood plain (seasonal flood lands) and closed- water ox-bow lakes (abandoned courses of rivers) reservoirs, etc. and innumerable closed water bodies such as man-made ponds and impoundments. The 1 million ha of perennial inland water-bodies (15% of Bangladesh's territorial area) and the over 3 million ha of floodplains provide an extensive opportunity for inland fisheries.

6.1.4. Various types of seasonal and perennial water bodies exist on the Bangladesh floodplain, and include side arms, oxbow lakes, marshes, swamps, pools and tributary streams. During the flood period these water bodies merge with each other and with the main river channels. Many become isolated from one another or dry out during the dry season.

6.1.5. In an average year *c.* 26,000 km² of the floodplain is submerged on a seasonal basis (June to October) in response to monsoon rains (March to September) and snow melt. The upper limit in recent years has been 82,000 km², *c.* 57% of the whole country, although the unofficial value for 1998 was 95,000 km² (66% of the country). Inundation depth and duration varies spatially according to relief and soil type. Temporal variations in water heights about the mean are more pronounced (*c.* ± 1.5 m) during the flood season compared to the drawdown period and dry season (*c.* ± 0.5 m) (see Craig et al 2000).

6.1.6. Of these rich and varied aquatic resources, those of most interest to the national economy and captured in national-level statistics are fish and prawn. However, as far as the livelihoods of the poor are concerned other living aquatic resources such as prawn/shrimp, snails, frogs, shellfish and water plants are important both for subsistence consumption and for income-generation. Additionally in Bangladesh the role of CPRs, and particularly open-access fisheries, feature prominently as expenditure-saving strategies in the livelihood portfolios of the poor.

6.1.7. **Cambodia** Inland fisheries occupy two major ecosystems: the Tonle Sap region consisting of the Great Lake and Tonle Sap River, (which accounts for approximately 60% of annual commercial fisheries production), and the Mekong-Bassac inundated region. In the dry season, the Great Lake occupies an area of 3,000 km² with an average water depth of around 0.8 -1m. During the rainy season, it expands to more than 10,000 km² covering the flooded forest to depth varying from 10-12 m. The Mekong-Bassac River system creates a vast inland water system, comprising numerous rivers and lakes, flooded forest, grassland, rice fields and swamps which is inundated during the wet season.

6.1.8. **Laos** Up to 80% of Laos consists of upland and highland, with only a small amount of lowland along the Mekong river and its tributaries. Most lowland – and the floodplain – is to be found around the capital Vientiane. There are numerous smaller rivers and streams which flow into the Mekong from the northern highlands.

6.1.9. **Vietnam** Much of Vietnam also consists of uplands and highlands, with only a narrow coastal plain for most of its length, except where it broadens out in the north with the Red river delta and in the south with the Mekong river delta. Both the Red river and the Mekong river and their deltas have extensive areas of floodplain which have almost entirely been converted to agricultural use.

6.2. Fish species

6.2.1. A common saying in the study countries is that ‘Where there is water, there is fish;’ a saying which emphasises not only the significance of the resource to local people, but also the fact that fish will opportunistically exploit any water bodies – even the smallest – that they have access to, and providing water quality and other conditions are suitable for them. At sites where natural levées are breached, fish migrations occur between the main river and the floodplain during the periods of rising or receding water. They also migrate through permanent channels. As water spreads across the floodplain nutrients dissolve and, combined with silt borne by the river, increase the productivity of the system. This productivity is passed through the food chain to enhance fish feeding, growth and reproduction. Nutrient cycling and transfer of energy is complex and poorly understood but involves interactions between the aquatic and terrestrial systems (Craig et al 2000).

6.2.2. Published research on Bangladesh fisheries biology is not extensive. However, it is important to emphasise the variety in fish species, the complexity of their interactions and complexity of different species habitat requirements. Species assemblages in Bangladesh

have been shown to vary significantly according to both habitat type and geographical region (Halls et al. 1998). Attempts have been made (Halls, 1998) to categorise many of these species into the two distinct behavioural and morphological whitefish and blackfish groups (Welcomme, 1985). Blackfish have a high tolerance to anoxia and may remain in the ephemeral standing water areas during the dry season. They exhibit only localised migration patterns, moving between the flooded areas and the slow moving vegetated fringes of the main river channel. In comparison, whitefish species, for example species of the clupeid *Tenuulosa*, have little or no tolerance of deoxygenated conditions and undertake extensive longitudinal, upstream or downstream migrations.

6.2.3. In Bangladesh. A conservative estimate of the number of freshwater bony fish species inhabiting the inland waters of Bangladesh is 273, of which 13 are exotics. There are also 62 species of prawn. Cyprinids, catfishes and *Tenuulosa ilisha* predominate as does the prawn, *Macrobrachium rosenbergi*. Additionally there are other aquatic resources like crab, turtle and tortoise (25 species), mussels (10 species) & snails (molluscs), amphibians (frogs, crocodiles, etc.), dolphin and sea weeds etc. with commercial, environmental and nutritional values (see Chowdhury, 1994; and Craig et al 2000).

6.2.4. The paucity of fish community data from isolated areas, for example forest rivers of the Chittagong Hills, means that many freshwater species may remain unrecorded. The occurrence of ecological polymorphism is also possible within species which occupy complex aquatic habitats. Attempts have been made (Halls, 1998) to categorise many of these species into the two distinct behavioural and morphological whitefish and blackfish groups (Welcomme, 1985).

6.2.5. Cambodia Around 280 fish species utilize the inundated forest for at least 6 months for breeding and feeding during the monsoon (Thouk and Sina, 1997). Data for the number and type of fish and other aquatic resources has not been provided in the Country Status Report, but some indication of the number may be indicated by that for Laos (see below).

6.2.6. Laos Fish species diversity in the Mekong basin is currently estimated at 1,200 species. In addition, the Mekong fish fauna, as in other large rivers, is probably characterized by a high degree of within-species diversity, brought about, in part, by the zoogeographic history of the region, whereby different sections of the basin have been isolated and re-united over time. The dynamic nature of floodplain ecosystems also drives fish to migrate over short and long distances, contributing to both genetic mixing and isolation of populations. Although only a fraction of migratory species have been studied, in only modest detail to date, a high proportion of these are thought to have distinct populations within the Mekong basin (Coates et al. 2001).

6.2.7. Vietnam There are 145 species of fish and 14 species of shrimp distributed in the freshwater areas of the Mekong delta alone. They include 13 taxa of high value fish and 3 taxa of high value shrimp (Xuan et al. 1995). However, while these are the species that are of most importance for national production, it is highly likely that a wide range of other species, together with other living aquatic resources are exploited by poor people.

6.3. Fish ecology

- 6.3.1. **Bangladesh** The relative importance of different fish species to the fisheries is difficult to assess from national statistics which aggregate catches into broad categories for the main sectors. However, about 20-30 fish species, mostly blackfish, which are resident in the floodplain and tolerant to low levels of oxygen, provide the majority of the national freshwater fish production. Cyprinidae, carps and minnows, and a large variety of catfishes predominate in the rivers and floodplains (a list of important species is provided in Craig et al 2000). The *Tenuulosa ilisha* (hilsa) fishery is the largest single fishery in inland waters. Many small species which form the majority of finfishes in the floodplains, ranging from *Danio rerio* (2 cm) to *Gudusia chapra* (16 cm), are eaten by rural people (Hossain and Afroze, 1991).
- 6.3.2. Total instantaneous mortality rates in the floodplain fisheries are high (1.6–5.2 year⁻¹), equivalent to survival rates of 20–0.5 % per year. Due to the rates of exploitation, many stocks in Bangladesh are therefore believed to be virtually annual, comprising a single cohort for most of the year (Craig et al 2000). Hoggarth et al (1999a) found similar mortality rates in dry season waterbodies.
- 6.3.3. With the exception of *T. ilisha*, which has a main spawning season between September and November corresponding to the falling water period, most species spawn during the rising water period between April and July, with most species spawning at the end of their first year (Halls et al 1999). However, some species (e.g. some of the Indian major carps, for example *C. catla*) may not reach maturity until at least their second year.
- 6.3.4. **Laos** Fisheries ecology of the Mekong River Basin is intimately linked to, and influenced by, the morphological and hydrological characteristics of the basin. The main driving force responsible for the fisheries productivity of the Mekong and other floodplain river systems is the pulsing of the river flow, which produces periodic inundations of the floodplain.
- 6.3.5. The bulk of fish production is derived directly or indirectly from the floodplain, which is periodically replenished with inorganic nutrients derived from water and sediments transported from the main channel. These promote primary production from phytoplankton, grasses and higher plants. The ephemeral conditions also produce ‘dynamic edge effects’ or moving littoral zones where decomposition of organic material is promoted, thereby releasing nutrients back into the floodplain (Junk et al, 1989). This rapid increase in primary production and area available for colonization by aquatic organisms, supports a diverse community of highly productive fauna. Fish exploit this surge in production to grow rapidly. The floodplain also provides sheltered spawning grounds and refugia amongst submerged vegetation for the young and juvenile stages.
- 6.3.6. Various dry season waterbodies, replenished with water from the flood pulse, also provide important dry season refugia for floodplain resident fish species (Welcomme, 1985). By contrast, conditions in the main channel are less favourable for primary and secondary production. Most species of fish that permanently occupy the main channel tend to be

predators of fish and aquatic invertebrates which depend to a great extent directly or indirectly on the primary production of the floodplains. The main channel is used mainly as a migration route for gaining access to feeding and spawning grounds upon the floodplain or as a refuge during the dry season.

6.3.7. What Lorenzen (2003) says with regard to Laotian fisheries' ecology neatly describes a process which is characteristic of other floodplains in the four study countries. The important points to note with regards fish ecology are that there are a great variety of species which primarily seek refuge in perennial water bodies (such as rivers and lakes) during the dry season, but move out onto the floodplains and rice fields during the flood season in order to breed and exploit their high nutrient value. Additionally others may breed in rivers and perennial water-bodies prior to the flood so that their spawn, fry and/or fingerlings may be carried onto the plains by the flood. At the end of the wet season, as floodwaters flow off the land, the majority of fish attempt to make their way back to perennial water bodies. However, even without human fishing effort, the greater proportion of these, as Halls et al (1999) and Hoggarth et al's (1999) research indicates, are likely to be unsuccessful and die.

6.3.8. There are fisheries in the upland regions of the four study countries which do not display the same ecology as that for the floodplains which has been described above but which are exploited by some of the poorest rural households. Nevertheless, the vast bulk of production from the inland capture fisheries of Bangladesh and SE Asia comes from the floodplains of the Gange-Brahmaputra-Meghna and Mekong river systems. These fisheries are extremely important not just to national economies (see Section 5), to the food security, health and well-being of consumers (see Section 5), but are also extremely important to the livelihoods of a large proportion of poor people who depend upon them for employment and income, for subsistence, and as an ecological reserve to reduce vulnerability (see Section 11). The current and future sustainability of the resource is therefore of considerable importance to them.

6.3.9. Questions which therefore arise, given this natural ecology described above are:

- what is the impact of human disturbance on this ecology, and in particular do infrastructures such as dams, bunds, sluice gates, and FCD/I structures seriously impede fish and fry ingress onto and egress from the floodplains at the beginning and end of the flood and thus threaten the sustainability of the resource;
- what is the impact of human disturbance (particularly in relation to water quality and the like) on floodplain flora and on fish species on the floodplain during the flood season;
- what is the impact of human disturbance (particularly fishing effort on the floodplains) on recruitment and thus on the sustainability of the resource, given the high seasonal natural mortality rates that Craig et al (2000) and Hoggarth et al (1999a) identify;
- what is the impact of human disturbance (particularly fishing effort in perennial water-body refugia during the dry season) on annual recruitment and thus on the sustainability of the resource;

- what is the impact of introduced exotic species on the biodiversity of the inland capture fisheries (and are these likely to threaten the sustainability of the resource);
- if any of the above are having negative impacts on the resource, how are these being addressed and mitigated?

Section 8 and 9 will seek to pull together some of the data seeking to answer these questions.

7. Fishing livelihoods and fisheries related livelihoods

7.1. Numbers involved in the fisheries

7.1.1. Another way to capture the importance of the fisheries to livelihoods is to look at the numbers that are involved in the fisheries in some way or other.

7.1.2. **Bangladesh** It is estimated that 73% of all HH are involved in floodplain fisheries (DOF, 1990), though this masks the diversity of who fishes, when, for how long, with what intensity and gear, and how these factors relate to households' other livelihood strategies. There are essentially three types of participant in the fisheries: subsistence, seasonal and professional (FAP 17, 1994). Subsistence fishers are opportunistic. Seasonal fishers are a group which has expanded recently in response to crises and shortage of agricultural land. They are primarily landless and marginal farmers, and fishing has become an important component of their livelihoods. Professional fishers were traditionally Hindus. This group has declined due to competition and out-migration, and Muslim agriculturalists have increasingly entered this part of the fishery. Their occupation is primarily fishing. However, they may also have other livelihood strategies and if they are able to save may invest in agriculture (either owning or share-cropping land) as a dry season activity.

7.1.3. FAP 17 (1994) found the participation in fishing in agricultural villages (as distinct from fishing villages) to range from 47% in the north-west to 73% in the north-central region. According to the Household Expenditure Survey (HES) (BBS, 1997) the main occupation of 2.5% of households is fishing. However, the number involved can vary considerably between different regions. In the riparian *charland* area (Jamuna, upper Padma, lower Padma, upper Meghna, lower Meghna), ISPAN (1995) reports that 8% of households are professional fishers whose main occupation is fishing. Most other households are involved in fishing as a secondary source of livelihood with their main occupation (agriculture), but fishing is also equally important for their livelihood. ISPAN (1995) found that in upper Meghna 49% households were involved in fishing and 34% of them were professional fishermen with their own boats and nets. In the Surma-Kusiarra river area 6% of households were involved in fishing as their principal occupation. (ISPAN, 1995). Only around *Haors*, *Baors* and along the major rivers with year round water (and therefore fish) are fishers found fishing throughout the year. Elsewhere, f/t fishers shade into the p/t category in having to find alternative employment during the dry season when fishing is not an option.

7.1.4. A reciprocal study of the involvement of households in fishing communities in agriculture revealed that farming and agricultural-labouring were the most important non-fishing activities in a village well-endowed with land, but that trade was more important in more perennially flooded areas (Huq and Huq, 1985). Income from these activities reflected the level of effort, except in the most agriculturally orientated village where returns from farming were better than from fishing effort. de Graaf and Martin (2000) found 68% of households fished for subsistence, catching about a third of the annual catch, while only 1% of households were full-time fishers. In the Bangladesh Water Development Board's Systems Rehabilitation Project areas (FCD/I schemes), 53.7% of households were involved in fishing (range 38–72%), and of those households 77% fished for subsistence, 6% for sale and 17%

for both purposes (Soussan et al., 1998). Therefore, in summary *c.* 67 – 75% of households fish at some time of the year. These proportions equate well with those households which have marginal amounts of land to subsist from agriculture alone. In rural areas, 46.3% of households are landless (owning <0.2 ha) and a further 33.6% are marginal and small (owning between 0.2 and 1.0 ha) (BBS, 1998). Only a small proportion, <5%, of households are professional fishers (see Barr et al., 2000).

7.1.5. Additionally, besides those involved in the harvest sector, the fisheries of Bangladesh provide employment for *c.* 2 million people, including fish traders, transporters, packers and other related occupations. The sector also supports *jalmahal* lease holders and the water-bailiffs they employ to enforce their property rights.

7.1.6. **Cambodia** There are 14 fishing provinces in Cambodia with a total human population of more than 9 million. Of these, about 35% are living in fishing dependent communes. The Tonle Sap and its floodplain alone are home to an estimated 1.2 million people of whom 25% live in floating villages or raised houses with little or no access to farmland (FACT, 2002). However, there is also a largely unrecorded number of people who seasonally migrate from upland areas into the floodplain fisheries areas in order to take advantage of the opportunity provided.

7.1.7. **Laos** An estimated 225,000 people are formally employed in an industry producing 40,000 ton live weight p.a. for direct human consumption within the country (FAO 1999). Again the recent Agricultural Census of 1998/99, and the Lao Expenditure and Consumption Survey (LECS) of 1997/98, indicated that fishing and collection of aquatic animals is very important for subsistence and is integrated with all aspects of people's livelihood strategies (Lao PDR 1999).

7.1.8. According to the Agricultural Census more than half the population is engaged in capture fisheries in one way or another. A survey in the lowland areas of Savannakhet province (Lorenzen 2000) found that participation in natural aquatic resource use was near universal, with 82% of households fishing during the survey period. Baird *et al.*, (1998) noted that in their study area – the Kong district of southern Laos - approximately 94% of families participated in wild-capture fisheries for food in 1996, and 56% generated income from selling wild caught fish.

7.1.9. A recent survey in Luang Prabang Province by (LARReC) discovered that 72 % of all the households in all the surveyed villages were engaged in fishing and the collection of aquatic animals, while fishing was the third most important economic activity after rice farming and livestock rearing. Most of the fish and aquatic animals caught are consumed in the household of the fisher. However, a sizeable amount is given away to other households or villages, sold or used in barter-trade. According to the Agricultural Census 35,100 households, or 56%, of the total 62,546 households in the province are engaged in capture fisheries. Other aquatic resources (frogs, crabs, mussels, water lily etc.) resources were not so important for fishers

livelihoods before, but today they can sell these resources for a high price (Lao Country PRA Report 2003).

7.1.10. **Vietnam** Although there is no data available on inland capture fishery characteristics separately (i.e. statistics are for wild and cultured fisheries together), Vietnam has approximately 14% of families working in the fishery sector (Dollar et al., 1998). These work on average 18.3 days per month and 5.9 months per year. Only 15.5% capture fish all year round, and 17.6% capture fish in a fixed location. However, in rural areas 93% of households are involved at some time in the fisheries. The annual hours of family labour are 1,800 hours, distributed among 2.09 workers employed per household.

7.1.11. **According to the figures in Table 7, the highest numbers of fishers are found in the Mekong Delta, the North Central Coast, South Central Coast and North East South. It is somewhat surprising that figures are so low for other areas, in particular the North West and Central Highlands. However this is perhaps symptomatic of inland fisheries, in which there may be a significant proportion of people who fish, but only a small proportion who regard themselves as ‘fishers’. Nevertheless, the increase in numbers of fisher households from 228,650 in 1990 to >1.5m in 1998 is dramatic and attests either to the previous under-reporting in government statistics or to a growing dependence by a proportion of households on the resource.**

Table 7 Fisher households by region in 1990 and 1998. Inland and coastal fisheries

Region	Number of Fisher Households 1990	No of Fisher Households 1998	Number of Fishers 1990	Number of Fishers 1998
Red River Delta	12 415	16 745	55 326	77 630
North East	5 621	7 635	26 804	37 270
North West*	147	174	648	1 068
North Central Coast	62 610	72 967	309 843	370 798
South Central Coast	49 213	63 783	260 947	335 099
Central Highlands **	247	409	1 336	2 260
North East South	37 720	52 594	201 424	285 232
Mekong Delta	60 677	87 645	314 802	448 564
Whole Country	228 650	301 952	1 171 130	1 557 921

Source: Government Statistics Office (1999)

Meanwhile, based on a survey of three regions (the Northern Region, the Central Region, and the Southern Region), Carl Bro (1996) concluded that the majority of surveyed households are involved in some form or other of fisheries or aquaculture activity.

7.1.12. Capture fisheries remain of considerable importance for rural people, from poor to rich, in many parts of Vietnam, not only for full-time fishers, but significantly for households who combine fishing as a component of wider livelihood strategies. Preliminary evidence from the main research initiative concerning wild fisheries in the region (the Assessment of Mekong Fisheries Project of the Mekong River Commission) suggests that inland capture fisheries remain of considerable importance in rural livelihoods in the Mekong Delta.

7.1.13. **The role of inland capture fisheries is more clearly illustrated by case studies. In two studies of capture fishing and aquaculture in two provinces in Southern Vietnam (Tay Ninh province and Long An province) Nho and Guttman (1999a and 1999b) discuss the role of aquatic resources in livelihoods according to economic status. The study of Tay**

Ninh province (1999a) indicates that most households are involved in some form or activities of capture fisheries but that this is of even greater importance for poorer households Table 8.

Table 8. Proportion of households fishing by different income groups

Income group	Proportion of households fishing
Very low income	88%
Low income	84%
Medium income	58%
High income	44%

Source: Nho and Guttman (1999a)

7.2. Exploitation of the resource: the impact of seasonality on livelihoods

7.2.1. Understanding the seasonal dynamic of the fisheries is critical to understanding livelihoods in the study countries. Seasonal opportunities and constraints necessitate flexibility in livelihood strategies. As previously noted there is a huge efflorescence of fisheries-related biomass on the floodplains during the flood season, which is matched by a reduction in agricultural opportunities for people living on the floodplains. Wealthier people may have sufficient grain and income reserves built up during the agricultural season to see them through until the next harvest. However, a considerable number of floodplain dwellers, and particularly the landless and near-landless, who live ‘hand to mouth’ often need to find alternative employment or at the very least need to be able to put food on the table. Even many landed households report a ‘lean’ period when the next rice crop is growing but household grain stores are running low. The prime strategy for supplementing this income and food gap is to turn to ‘gathering’ activities from CPRs – in upland areas of SE Asia from the forest, in lowland areas of Bangladesh and SE Asia from the floodplains and flooded rice-fields. In the latter case that is to turn to the inland capture fisheries.

7.2.2. There are inland waters (lakes, reservoirs, flowing rivers) in all study countries where fishing is practiced the whole year round, and where there is consequently an occupational category of ‘full-time fisher’. However, in all countries the majority of those who fish do so on a part-time seasonal basis when return to effort is most productive and/or when other livelihood opportunities (particularly in agriculture) are limited. This latter seasonal category of fisher can be broken down into two main sub-groups: part-time fishers who have fishing as a seasonal occupation, and subsistence fishers fishing for the pot.

7.2.3. The division between these categories is of course not immutable, and individuals may move between them in response to opportunity and the cost of fishing gear required. Those who fish ‘for the pot’ require cheap and simple gear (such as hook and line or push net), and may not devote much time to fishing; those who fish on a more time intensive, if seasonal basis, will invest in gear which gives a greater return to effort, is still affordable and may be operated by the individual; while full-time fishers are most likely to invest in gear which gives high returns to effort, but which is more expensive (e.g. seine nets) and may usually require team effort to purchase and/or operate. By contrast large ‘barrier’ type gears are expensive and are likely to be owned by wealthy non-fisher individuals who have seen an opportunity to invest in a limited operation with high returns.

7.2.4. There are some differences between countries as regards the impact of physical features on the fisheries. In Bangladesh, Laos and Vietnam, part-time seasonal and subsistence fishers usually exploit those waters that lie close to their homesteads and particularly the floodplain rice-field fisheries. By contrast full-time fishers tend to locate close to where there are year round waters (lakes, reservoirs, flowing rivers) which they can exploit, while also moving out onto the floodplains to exploit fish in the deeper parts that subsistence fishers have less access to. In Cambodia, however, a large migration of people takes place every year to the Tonle Sap to trade rice for Treyl Riel (*Henicorhynchus sp.-a small cyprinid*) and other small fish species to make *Prahoc* (fish paste), a key component of seasonal food security for poor rice farmers.

7.2.5. *It is also important to note that where there are full-time fishers, 'full-time' usually refers to their main occupation or livelihood strategy. In reality, the majority of full-time fishers and their households are likely to pursue other livelihood strategies as well both by reason of the seasonality of production on ephemeral floodplains, closed seasons in perennial water bodies, and the need to spread risk and reduce vulnerability through diversification. Indeed some full-time fishers may devote more time to non-fishing strategies than fishing, but may or may not derive a higher proportion of their income from these sources. Even where a higher income is derived from non-fishing strategies, this may not represent the true 'value' of the fisheries to households since a proportion of the fish caught may be for household consumption rather than sale.*¹⁰

7.2.6. The seasonality of peak fishing times varies greatly between environments and, just as agricultural labour migrates seasonally to take advantage of the different agricultural seasons in different parts of Bangladesh (see Herbon 1994), so in some cases traditional fishers make seasonal migrations to take advantage of the rise and draw-down of the flood in different regions.

Bangladesh

Barr, J.J.F., Dixon, P-J., and Rose, D., (2000) *Mache, Bhate, Bangali: understanding rural livelihoods on Bangladesh floodplains*. Documentary Video for DFID, London.

Also see Consensus building report (notes from R7562 Crafting futures)

Cambodia For example this is certainly the case in Cambodia, where Ahmed et al (1998) for example, report that households in the fishing community surveyed by them are involved in a variety of occupations. Taking account of the responses of all household members, farming activities (76.71%) predominated over fishing (38%), although the households are in the fishing dependent community. In fact household income in the fishing dependent commune is derived from various economic activities such as agriculture, non-agriculture

¹⁰ As with NTFPs (see Sarch, for Africa, Cambell and Luckert, 'Discovering the Hidden harvest' etc.) the true value of goods and services derived from fisheries, forests and rangelands and consumed in the household is poorly captured in national statistics which focus on income measures.

activities, and also from business and remittances.

According to Ahmed et al (1998) non-fishing households obtain an average annual gross income per household of almost double that which fishing households obtain, which may indicate the severity of their poverty although (as explained elsewhere) a proportion of their catch may be for home consumption and therefore is unrecorded by income measures.¹¹

It is important to note that there is a considerable amount of internal migration of fishers (both fulltime, but especially part-time) from place to place in order to take advantage of seasonal availability of fish associated with the rise and draw-down of the annual flood. One of the most marked seasonal migrations is from other parts of the Mekong floodplain to the Tonle Sap and especially the Great Lake. It is important to keep such movements of segments of the population in mind when considering the allocation of rights of access to water-bodies for fishing purposes.

Laos There is considerable seasonal variation in aquatic resource use patterns. Noraseng et al (1999) show changes in resource use in terms of both income and nutrition. Fish are consumed more in October and May while the least amount of fish is consumed in February and September. Income from aquatic products is greatest during the months of July and December-January. This closely follows the annual flooding cycle with most fish available on the rising and the falling flood in July and October respectively. The large amount of fish consumed in May and October is probably associated with the harvesting of rice-field fisheries and dry season back-swamps.

Even though there is a marked seasonality in catches, fishing activities are carried out at a high level of effort throughout the year. During the dry season when agricultural labour demand is low and food security most at risk, perennial waterbodies are subject to extreme fishing pressure. It is not unusual for rural people (particularly men) to travel up to 10-20 km to fish in perennial water bodies.

Vietnam There is a similar marked seasonality to the inland capture fisheries in Vietnam. The rainy season begins in April and ends on November, the dry season runs from November to March. The flood season on the Mekong floodplain starts when water begins to run into the fields about July (the highest flood occurs from September to October) and withdraws in November. The main fishing season is from February to May/June, followed by a secondary season from September to November. The size of fish at the beginning of the fishing season (about June-July) are small, but become bigger towards the end (September to November). The largest production is usually concentrated in this period of year.

¹¹ Ahmed et al's figures may also disguise differences between types of 'full-time fisher'. Oxfam (2000) for example distinguish between 3 types of fisher household: land-based households with animals, land-based households without animals, and landless households (though it is not clear whether Oxfam's 'fishers' are self defined 'full-time fishers' or 'all those who fish' as identified by Oxfam – i.e. full-time and part-time fishers). The landless group may or may not define themselves as 'full-time fishers' or merely as 'landless who fish' (which it is uncertain from the data), but their average income per day from fishing is less than the other two groups, which suggests that they have less effective fishing gear than the others on account of their poverty.

The PRAs carried out under the present project noted that the best season for fishers livelihoods is the dry season when fish prices are high and non-fishers are busy cultivating and have no time to fish. January-February is the best period for catching fish from the river as the water recedes, but they consume most fish at the onset of the monsoon when they catch them in the flooding rice fields. The wet season, especially July-August when they are able to catch plenty of fish, is the poorest time for fishers income generation because there is a surplus of fish and ‘everybody fishes,’ though fishers are of course also fishing for home consumption and for inputs to fish processing (Country PRA Report: 2003).

Full-time fishers participating in the PRA exercises under the current project said that they were short of money for up to 8 or 9 months (between December and August) but were particularly hard up (between December and February) prior to the start of the fishing season. Most of them depend on credit from middlemen at this time of year. Part-time fishers had shorter periods of seasonal hardship (usually from November through till February), since they pursued other income-generating strategies.

As in other countries there are a number of migratory, and often landless, fishers taking advantage of seasonal opportunities whose needs must be considered when allocating access rights to the fisheries. The issue is whether these should have access to the fisheries (which may support their livelihoods – particularly during periods of shock) or whether they should be excluded on the grounds of reducing fishing pressure. Mechanisms for managing these issues are likely to be most effective if they are developed at local level taking into account different stakeholders’ needs and the status of the resource.

7.3.Fishing livelihoods

7.3.1.Bangladesh: livelihoods

There are three categories of participant in floodplain fishing: professional, seasonal and subsistence, although there is considerable overlap (FAP 17, 1994a). Fishing is traditionally considered a lowly profession, with an associated social stigma (Pokrant and Rashid, 1997). Professional fishers were traditionally Hindus using larger, costly gears in *beels* and rivers. This group has declined and Muslim agriculturists have increasingly become professional fishers (FAP 17, 1994a). However, driven by poverty and increasing landlessness due to rapid population growth, and the low entry costs to what are a common pool resource (CPR), poor Muslims have increasingly adopted fishing as their profession for survival. Now the majority of the fishing community is constituted of Muslims.

7.3.2. In addition to these three categories, there is a wide range of other categories of person who are involved in the fisheries in some form or another, either in harvest or post-harvest activities. The Country PRA Report: Bangladesh (2003) lists these as: Ditch (*kua*) owners, Fish/shrimp fry collectors, Fish fry producer, Fish traders (*aratdars* and retailers), Fishery workers, Poor women, Fishing gear maker. In what follows most attention will be paid to the three ‘fishing’ categories, with some lumping of observations as regards the remainder.

7.3.3.Full-time fishers livelihoods (Bangladesh)

The majority of full time fishers categorise themselves as very poor – typically being landless, and in many cases neither owning the homestead land they live

on nor the fishing gear that they use. According to the 1995-96 HES (BBS 1997) 45.4% of fishermen were below the lower poverty line as against the national rural average of 39.8%. This can be contrasted with landless agricultural -workers 74.8% of whom are below the lower poverty line. The Country PRA Report: Bangladesh (2003 Table a Exec. Sum.) gives the proportions of full-time fishers in different wealth classes as follows:

Table 9 Wealth category of full-time fishers

Full time Fishers	1. Very poor;	>50%	Landless, some have no homestead land or house. Some have small gear, some catch fish on share basis or as labours. Live hand to mouth, in debt
	2. Poor;	20%	Have homestead land, but no agricultural land. Have gear but no boat. No savings
	3. Average	20%	Have some agricultural land, own gear, break even
	4. Better off;	<10%	Have agricultural land, food surplus. Have fishing gear and boats. Have savings.

However, the proportion of those belonging to the different classes actually differs considerably from location to location, from 95% being poor or very poor at Sundarbans survey site to 60% at the floodplain site (see Country PRA Report: Bangladesh (2003 Table 2.1.1)

- 7.3.5. The Country Status Report: Bangladesh 2003 states that ‘the socio-economic condition of full-time fishers has always been deplorable. They are usually poor, illiterate, unorganised and neglected. The majority live below the poverty line. Their access to the resources is frequently limited. Many do not have fishing equipment (gear and boat) of their own. Most are landless, and many of them do not even have homestead land but build their houses on river banks (Government *khas* land) subject to flooding. They rarely have access to bank credit because of a lack of collateral. Consequently they are highly dependant on private money lenders who usually charge a very high rate of interest. Most of them undertake fishing on a share basis with the boat-gear owner or money lender, or as daily labourer or on a monthly salary basis.’
- 7.3.6. *Fishers’ educational and health status tends to be low, as does their housing (consisting of reed or kutcha). Most fishers own their own fishing gear (of the smaller and cheaper variety), but poor and very poor fishers would not own the more expensive gear. Being poor but needing to be highly capitalised due to the variety of gears that they need, they are also highly dependent on others (such as leaseholders, moneylenders, and large traders) for finance, or work on a share or labouring basis for these. Most fishers do not have savings.*
- 7.3.7. *Fishers share physical infrastructure in common with other members of the community and this can vary from location to location, but since fisher communities can be in poorer locations (e.g. on the edge of larger agricultural communities) they can be more isolated and lack the facilities found there..*
- 7.3.8. Social capital varies according to the fisher community, but in most cases fishers report good cooperation within their communities and usually resolve conflicts internally through

traditional means. There are few formal organizations, and in the floodplain case study low trust among a range of villages with people who farm and fish.

7.3.9. It is also important to note that, despite government attempts to favour full-time fishers in the fishery auction system, these frequently do not have sufficient savings and access to credit and/or the political connections needed to compete with wealthy non-fisher elites. Professional fishers can rarely afford to pay for the lease of fishing rights in a water body, and so are usually dependent on credit. Often this results in their renting fishing gear or sub-leasing the right to fish a water-body from richer leaseholders or middlemen, who may not be fishers themselves (Hoggarth et al., 1999b).

7.3.10. The monsoon is the peak fishing season. Only a few professional fishermen continue fishing throughout the year. During the dry season professional fishers make their livelihood from other activities such as agriculture on their household owned or share cropped land or as agriculture labourers. ISPAN (1995) found that the peak fishing season for riverine fisheries was from July to October and the lean fishing months between November and June. In the case of floodplain fishing peak period was usually between July and October. Peak fishing season in *haor* was from December to February

7.3.11. ISPAN's (1995) study reported that the average income of a fisherman per day was Tk. 135 during the peak period (mid April to mid July and mid September to mid October), while their average income per day was Tk. 45 in lean period. Professional fishers get less income from fishing during October to June and may suffer hardship during this vulnerable period, although this depends on whether they are fishing in flowing rivers and permanent water-bodies or not. Where water bodies dry up, they are naturally forced to stop fishing and must pursue other livelihood strategies. Most of them do not have cultivable land to cope during these hard days, though poor fishermen sometimes migrate to distance places to work as fishing labour.

7.3.12. On the other hand wage-labour fishermen may earn Tk. 800 to 1200 per month in lean season. CNRS (2000) reported that in the Tangail CPP area a full time fisherman earns on an average Tk. 50 to 60 per person per day during peak season and Tk. 30 to 50 per day during the lean season.

7.3.13. There is some uncertainty as regards the impact of a declining resource base on fishers' vulnerability context. There is some evidence that full-time fisher households, while poor, may not be the poorest of the poor, do diversify into other activities (such as share-cropping) when circumstances allow, and are not as seasonally vulnerable as those poor with agriculturally-based livelihoods (see below).

7.3.14. The worst case scenario would be a catastrophic collapse of the resource base and a necessary shift of all fishers to agricultural strategies where – as most do not own land – they would join the ranks of landless labourers and share-croppers. Given the current (healthy) status of the inland capture fisheries (see Section 6), the development of aquaculture on the floodplains (enhancement fishery), its growing contribution to inland fisheries production,

and the opportunities for f/t and p/t fishers in this sector, such a scenario does not seem likely.

7.3.15. Part-time fishers' livelihoods (Bangladesh)

Part-time (seasonal) fishers fish on the floodplains in the monsoon period when there is, at least theoretically, open access to the fishery. The poorer members of this diverse group supplement their fishing income with agricultural work and other non-fishing activities during the dry season. Their numbers have recently increased in response to pressures for land and because fishing in the monsoon season fits well with agricultural production, which requires most labour in the dry season. This group may be landless and marginal farmers or, in the case of more profitable fisheries, small and medium landowners who intensively exploit the seasonal floodplain fishery. For this group, fishing has become an important component of their livelihoods.

7.3.16. The majority of part time fishers categorise themselves as poor or very poor – those in areas near the coast have higher proportions of these poor than elsewhere. The Country PRA Report: Bangladesh (2003: Table a Exec. Sum.) gives the proportions of part-time fishers in different wealth classes as follows:

Table 10 Wealth category of part-time fishers

Part time Fishers	1. Very Poor; 20–60%	Some have no homestead or agricultural land (live on others' /khas land). Have gear, some fish on share basis as labourers
	2. Poor; 25 – 70%	Have some agricultural land, homestead, house Have poultry and livestock, have gear but no boat. Have diversified source of income
	3. Average, 20-25%	Have some agricultural land, homestead land, fishing gear
	4. Better of; 10 - 25%	Have agricultural land, boats & nets

7.3.17. However, the proportion of those belonging to the different classes actually differs considerably from location to location, from 90% being poor or very poor at the Estuary and Sundarbans survey sites to 70% at the floodplain site (see Country PRA Report: Bangladesh (2003 Table 2.2.1).

7.3.18. Most poor and very poor part-time fishers have no agricultural land. Many have homestead land but their houses are usual poor (reed or *kutchha*), while fishing gear ownership is limited and of the simple variety. They usually work as fishing wage labourers, while depending on agricultural labouring as their other source of income. Part time fishers vary in their fishing skills – some have inherited the occupation and are very knowledgeable. Most are illiterate and have a poor health status.

7.3.19. Average part-time fishers normally have some agricultural land as well as homestead land with some farming. While the 10% of better off have reasonable amounts of agricultural land, own boats and nets, may be involved in business and may finance poorer fishers or employ them to operate their gear.

7.3.20. Degradation of fisheries resources would limit this disparate group's opportunities for local seasonal livelihood diversification. In order to make up the short-fall in household

needs, these (male) stakeholders would either have to seek employment in petty trade or off-farm employment, or to join the large number of seasonally migrant agricultural labourers. For this latter group, degradation of fisheries resources would also remove a seasonal safety-net upon which their households are dependant during migrant husbands' absence. These households' vulnerability is also likely to increase, since any 'shock' which removed their wage-earner (such as death or abandonment) would leave them with no safety-net at all.

7.3.21. Subsistence fishers' livelihoods (Bangladesh)

Subsistence fishers are opportunistic according to floodplain conditions, and catch mainly for home consumption using relatively inexpensive, simple gears. This group includes landless labourers, small farmers and women and children. Although they evidently do fish and some of the catch may be sold, this group do not class themselves as 'fishers' (*jele*).

7.3.22. Where there is scope for fishing, people of almost all categories catch fish for their own consumption. According to DOF (2002) about 70% of rural population undertake some sort of fishing for their own consumption. Occasionally individuals may sell part of their catch. As might be expected this group ranges from very poor to rich. The Country PRA Report: Bangladesh (2003 Table a Exec. Sum.) gives the proportions of the different wealth classes as follows:

Table 11 Wealth Category of part-time fishers

Subsistence Fishers	1. Very Poor; 15 – 50%	Landless, most of them have no homestead land Most depend also on labour, rickshaw, poultry, share cropping
	2. Poor; 25 – 50%	They do not have agricultural land, Mostly labour
	3. Moderately poor; 15-20%	Have some agricultural land but income is insufficient, no savings
	4. Better off 10 – 15%	Have agricultural land and business, some have government job

7.3.23. The very poor and poor, like other poor in the community at large, are landless households, most of which will not have homestead land. Their livelihoods are based on agricultural labouring, transport, and share cropping. Their assets reflect those of the community at large (Country PRA Report: Bangladesh, 2003).

7.3.24. Since this large and occupationally diverse group is not dependant for income-generation or subsistence upon the fisheries, they are unlikely to be negatively impacted by any degradation of the wild resource. However, their nutritional status could be affected since a reduction in the resource and a likely increase in price is likely to lead to reduced household consumption. However, the short-fall may be met from the growing output from aquaculture, which may keep volumes and prices down.

7.3.25. Cambodia: livelihoods

Whether households are 'fishers', 'part-time fishers', 'fishers-who-farm', 'farmer-fishers' or 'farmers-who-fish' is partly dependent on their livelihood portfolio as well as on self- (or external- definition. Suffice it to say here that the greater proportion of rural households in Cambodia both farm and fish as a direct result of the different seasonal opportunities, while the direction in which their livelihoods are evolving is the consequence of a whole range of factors.

7.3.26. The Country Summary Paper: Cambodia (2003) reports that, based on PRAs in three fishing villages in different ecosystems, (upstream Mekong, Great Lake, and downstream Mekong) livelihood strategies only differ slightly. Around the Great Lake there are more fisheries-related stakeholders, including full-time and part-time fishers, fish traders and fish processors, whereas near the down-stream and main-stream river (Tonle Sap, Mekong-Bassac) most were full time or part time fishers, with only a few households involved in fish trading and processing. At the downstream Mekong site, only 5% were full-time fishers, while 70% were part-time fishers who also cultivated rice cultivation for household consumption.

7.3.27. The poorest are full-time fishers around the Great Lake, who live in on floating houses or stilted villages above the flood water, and have poor human capital (due to the inaccessibility of schools to them). Most, being landless, have only the one livelihood strategy (fishing), and use only small scale fishing gear – which means that they obtain a poor catch return to effort). The Report does not indicate the number of poor fishers that are to be found around the Great Lake. However, the fact that they are poor, landless and only fish indicates the importance of the Great Lake fishery as a ‘safety net’ for the poorest Cambodians. It is likely that the recent civil conflict in Cambodia led to considerable numbers of Cambodians becoming impoverished and, given entry costs to fishing are lower than to agricultural livelihoods, turning to this (On CPRs as ‘safety nets’ see [section xxx](#)).

7.3.28. The PRA exercises classified the population in the fishing community along the Tonle Sap into 3 classes: medium, poor and very poor, with medium being preponderantly full-time fishers, and the other two groups being preponderantly part-time fishers. Full time fishers along the Tonle Sap are better off because they are more highly capitalised (using larger scale fishing gear and have enough fishing equipment for the year round), whereas part time fishers are undercapitalised (operating small scale fishing activities and having inappropriate fishing gears for the different fish and fishing seasons). Moreover most medium households have land and other income generating strategies, while there are greater livelihood opportunities here. This is despite the fact that, in terms of capital assets, the fisheries resource is much richer in the Great Lake than in the Tonle Sap and Mekong-Bassac. A high proportion of households (around 65%) also keep one or two head of livestock. (Country PRA: Cambodia, 2003 Fig 1, 2).

7.3.29. The groups participating in PRA exercises were:

- (a) Medium households, which comprise about 20% of the population, usually operate middle-scale fishing operations and have private fishing areas that they lease from fishing lot owners. They also have dry-rice land of up to 2 hectares, producing about 4 tonnes of rice crop annually that can meet household need for between 10 and 12 months. Apart from rice farming, some households rely on fishing, some on small business, fish trading and raising one or two head of livestock.
- (b) Poor households, which comprise about 50% of the population possess little or no agricultural land (maximum 300 m²), producing 600 kg of rice per year which can supply households for 2-3 months only. Apart from farming, this group depends

mainly on fishing, and may keep the odd pig or two. However, both fishing and farming are not enough for the household to survive. They have to work as agricultural and fisheries labourers.

- (c) Very poor households, which comprise about 30% of the population, are the most vulnerable (widows, old people) They are defined as those with neither farmland nor education. They usually work as wage labourers in farming and fishing. Some households in this group had owned dry season rice land, but this group is identified by being landless. They are surviving from day to day.

7.3.30. Almost every household has a boat, with some households having more than one boat. Even very poor or poor households need a boat. Most of the middle households or FT fishers possess boats with an engine. Households consider boats as a very important means for transportation, fishing and collecting firewood. Almost every household has some form of fishing gear, but richer households have more and a greater variety than poorer ones. The peak period for fishing starts from the end of October and ends at the end of January, though fishing continues throughout the year in rivers and perennial waterbodies.

7.3.31. Local communal resources also include flooded forest which is widely exploited for firewood and for NTFPs, but is under threat from conversion to rice fields.

7.3.32. The PRA exercises classified the population in the fishing community near the Great Lake into two classes only, poor and very poor households. In the survey location poor comprised 34% of the population, while very poor comprised 66%. The area has poor infrastructure and households also have poor services (no safe water sources or toilets). Contacts with the outside world through NGO and other agencies is poor.

7.3.33. The majority of the full-time fishers were very poor, the majority of part-time fishers, fish traders and fish processors were poor. The reason given for full-time fishers being poor is because they operate small-scale fishing operations, so they catch insufficient fish to make a decent living, and the reason they operate small scale fishing is because they are too poor to buy or operate large-scale fishing gears. Full-time fishers are usually landless.

7.3.34. By contrast most part-time fishers, while poor, are nevertheless better off because they have more than one livelihood strategy. Most of them undertake rice cultivation (but each normally does not have more than 1ha of land for this), and fish cage culture etc. Fish culture production provides higher returns compared to daily income from fishing, though of course it requires more investment capital. Meanwhile fish traders are slightly better off than fishers because they get a higher daily income from trading. All households undertook fish processing (smoked fish, fermented fish paste (*Prohok*) making) throughout the year though this along with resource, is declining.

7.3.35. The development of cage culture is offering an opportunity, but it requires considerable capital investment. Indeed most cage culturing in this area belongs to migrant fishers. Cage culture has started in 2000 with 50 cages and has already increased to 86 but a shortage and high price of fingerlings is limiting development.

7.3.36.Laos: livelihoods

Haylor et al (1997) state that at a general level, rural livelihoods in Laos are based on four components: food production systems, the collection of wild food resources, other income generating activities, and other essential activities.

7.3.37.Rice production dominates Laotian agriculture, although many other components of the rain-fed rice field ecosystem are harvested (e.g. many species of fish, frog, insect, vegetables etc.). Rice production is central to most farming systems in Laos, and accounts for more than 80% of crop land. It is important to note that 97% of rice production is rain-fed (of which about 25% is upland rice), with the remaining 3% being irrigated lowland rice. However, national policy has focused on rain-fed lowland rice production and the expansion of irrigation in order to achieve national food security (Lao PDR 1996a, 1996b). By contrast there has been a policy for long term reduced rice production - including swidden rice cropping - in the highlands in order to improve environmental and hill-slope stability.

7.3.38.The household is an important decision-making body since land is managed by the family and not by the community. Both Ireson (1992) and Haylor et al (1997) note that women's status in Laos is relatively high and that husbands and wives shared the decision -making for the household, though women and men tend to have different sources of income. Both men and women work on the household farm and make decisions regarding it jointly, but men are primarily responsible for rice field preparation and for hunting for larger wild animals, while women are responsible for family care, garden crops, the raising of small stock, the transplanting, weeding, harvesting and threshing of rice, and for foraging in the forest (Ireson 1992, Schenk-Sandbergen and Choulamany-Khamphoui 1995). Women are the principle foragers for plants, animals and other wild foods for supplementing the households' staple rice and farm animal production. Wild food dependence decreases with greater population density and proximity to urban centres which offer alternative sources of food and income generating opportunities. A great diversity of plants and animals, including aquatic resources, are collected, but Haylor et al (1997) suggest that such resources are declining.

7.3.39.Forest and wild resource use is also related to ethnic group, with Upland Lao being more dependent on wild food resources, since upland households usually have an annual rice deficit and are forced to supplement their food requirements through forest gathering or food purchases (Meusch 1996; Ireson 1992, Schenk-Sandbergen and Choulamany-Khamphoui 1996). Ireson's (1992) study showed that an indicator of poverty is dependence upon wild resources, respondents noting that 'only the poor are always dependent.' As Thompson and Baden (1993) note 'This loss of forest has serious consequences for women as it forces them to travel greater distances to collect wood and other essential forest products. Deforestation has particularly adverse effects on women in the Highland areas where household survival depends almost solely upon forest food and medicinal plants (Ireson 1991: 23).'

7.3.40.As Lorenzen (2000) emphasises, the importance of capture fisheries to Laotian livelihoods has historically been underestimated not only for Lowland Lao but also for Upland Lao. The diversity of the environment, of the fishery resource, and its accessibility, promote a high degree of diversity in exploitation. Participation in fishing is almost

ubiquitous among rural households (over 80% in southern Laos, Lorenzen et al. 2000). However, most fishing is carried out as part of a diverse rural livelihood strategy, typically ranked as the second or third most important activity after rice farming and animal husbandry.

7.3.41. Full-time fishers' livelihoods (Laos)

Fishing as a full time occupation is rare in **Laos**, and limited to locations near major rivers or reservoirs. Even in those locations, full time fishers rarely account for more than a few percent of the population. PRAs, carried out under the current project indicate that in the study area, 90% of full-time fishers derive most of their livelihood only from fishing (and are landless), though a fraction derive income from weaving (5%) and rice cultivation (5%). These normally grow wet season rice since they cannot afford irrigation costs, but some are now beginning to venture into dry season rice cultivation on leased land. The majority of full-time fishers (62%) earn between 3m and 7m Kip per annum, with 13% earning more than 7m pa and 25% earning less than 3m pa. The majority (75%) have attended primary school, but only about 25% have attended secondary school. Reasons given for poor educational attainment include the lack of the need for education in a fishing occupation, and the high cost of schooling.

7.3.42. Physical capital and infrastructure is poor. There is a primary school, but no medical centre, no safe water supply, no road access and no electricity. Health was said to be poor due to water-borne disease, open latrines and malaria. Social capital is high, and there is considerable community solidarity, with those resident in the village assisting their families when fishers are absent.

7.3.43. Until recently almost all fish were caught in the wild both in rivers but most frequently in rice fields (Meusch 1996). Virtually all aquatic habitats are heavily fished, from large rivers including the Mekong mainstream to paddies and roadside ditches. The important waters for capture fisheries as far as commercial production is concerned are the Mekong River and its tributaries, reservoirs, lakes and wetlands, the majority of which are located on the floodplains of Lowland Lao. Thus much fisheries research and management attention has focused on the Mekong mainstream, but it is important to remember that nationally, the bulk of the fish catch is obtained from smaller water bodies. Rice fields are also important for capture fisheries – particularly for the many non-fish aquatic species exploited by Lao. A considerable proportion of this production is not marketed but is consumed within households, and may not be included in national production figures.

7.3.44. The survey in Luang Prabang also reported that a large number of households living in mountainous areas of Lao PDR are dependent on fishing and the collection of aquatic species for subsistence needs. Fishing and collection is ranked overall as the third most important activity after rice farming and livestock rearing. In general, in rural Lao the economy is largely subsistence-based and fishing, in common with many other activities, does not appear to be of primary importance for income generation.

7.3.45. There is some economic differentiation, even though low, between households in Laos, and this does correlate with difference in reliance on the fishery. Lorenzen (2000) notes that

poor individuals, having fewer economic opportunities, tend to catch more, and fish more often, than individuals from other socio-economic groups. The poorest groups that catch most are also selling the most, and therefore using the local fishery for income generation as well as household subsistence to a greater extent.

7.3.46. Part-time fishers' livelihoods (Laos)

As elsewhere in the study countries there are part-time fishers – those who combine fishing with other activities. The Country PRA Report: Laos (2003), presents the data from the perspectives of part-time fishing livelihoods, but it is perhaps as useful to think of these people as farming and agricultural labouring households who fish part-time. Except for a small number of full-time fishers, most people appear to rank fishing as a third strategy in terms of importance to household well-being. As in Bangladesh there are no doubt gradations between full-time farming and fishing, though the majority of households fish at some point in the year and farm or labour on farms for the remainder of the year.

7.3.47. There are also gradations between these farmer/fishers and subsistence /farmer fishers. The latter group includes the poorest, who may have some land or be landless, engage in agricultural labouring, and fish for subsistence needs for part of the year. It also including households whose well-being may be reasonable but who have not yet moved out of a subsistence lifestyle into the more formal economy.

7.3.48. Vietnam: Livelihoods

The Country PRA Report: Vietnam (2003) indicates that, in the study area of the Mekong delta, full-time fishers fall into two groups, both of whom are poor and landless or near-landless. The first relies almost entirely on fishing, the second (perhaps becoming part-time fishers) relies on fishing and agricultural labouring. In 2000 almost 75% of full-time fishers' income was generated from fishing, with the other 25% generated by wage labouring. However, this group has seen average annual income drop from around 11m dong pa to between 6.5m – 8.5m dong pa today as a result of the decline in the fisheries.

7.3.49. The second (part-time farmer-fisher) group has managed to stabilise its income generation at roughly the same level as 1995 (at about 5m dong pa) by diversifying into other strategies besides fishing. Thus while fishing brings in around 20% of household income today (as opposed to 25% in 1995), wage labouring brings in about 80% of the total (as opposed to 75% in 1995). Given the erosion of those with fishing as sole occupation, it is likely that this group too will have to diversify their livelihood strategies.

7.3.50. As in other SE Asian countries, due to the impact of seasonality and the need to diversify to reduce risk, the majority of rural Vietnamese households have portfolios of livelihood strategies. These portfolios differ according to the opportunities offered by different agro-ecosystems, but comprise two main types, those of lowland floodplain ecosystems and those of upland/highland ecosystems. In brief, rural lowland livelihood farming strategies have components which include wet-rice farming, livestock rearing, pond aquaculture, and fishing and the gathering of LARs and other resources in 'waste' areas. Upland livelihood strategies

include some wet-rice (or other food staple) production where feasible, a ‘forest garden’, and the gathering of NTFP (see Section 2).

7.3.51. DFID (2000c) notes that:

Aquatic resource use may only be a seemingly minor component of poor people’s livelihood strategies, particularly in a country such as Vietnam in which most rural people identify themselves as farmers, and predominantly as rice farmers. However, aquatic resources, including non-fish resources, often provide an important source of animal protein (particularly in times of hardship), and an important economic activity, if only seasonally. Historical evidence indicates that those most dependent on aquatic resources are those that have been displaced from land-based agricultural activities; this is especially true in coastal areas. Aquatic resources including wild fisheries, both inland and marine, provide a valuable source of income and nutrition for many poor people, and constitute an important component of diverse and dynamic livelihood strategies in a variety of agro-ecological settings throughout Vietnam. Small-scale artisanal fisheries are identified as particularly poor and vulnerable groups; though an even larger but significantly less visible number of poor people depends on inland capture fisheries as a component of wider livelihood strategies.’

7.3.52. Full-time fishers’ livelihoods (Vietnam)

According to the Country PRA Report: Vietnam (2003), the poverty of full-time fishers is indicated by the fact that they have few assets. They are landless, live in simple thatched-roof houses, have bicycles rather than motor-bikes, black and white rather than colour TVs, but may possess a boat and fishing gear. Their educational attainment is also low, grade 3 on average. Access to education is not a problem on the Mekong floodplains, despite there being no high school in the surveyed area. However, fishing households tend not to see the benefits which education might bring them. They do not see education as cost, needing all household members to be earning money.

7.3.53. Part-time fishers’ livelihoods (Vietnam)

In the PRA exercise under the current research, poor part time fishers households (which perhaps are better described as farmer-fishers) on the Mekong floodplain fished for a part of the year, were often landless but might have some land for rice cultivation. During the flood season after finishing harvesting the summer-autumn rice crop, they go fishing for income generation and subsistence needs. The landless fisher group also consists of households which fish part-time on a seasonal basis. Their livelihood strategies depend on working as daily wage labour, most normally in agriculture, followed by fishing during the flood season when agricultural activities are stop.

7.3.54. Poor part-time farmer-fishers may follow a variety of livelihood strategies. The Country PRA Report: Vietnam (2003) identifies three main portfolio types:

- (a) fishing (which is declining), agricultural labouring and aquaculture, (with the latter becoming most important for income generation and replacing fishing as a strategy). This landless group is probably the poorest with earnings around 5m dong pa;

- (b) farming, aquaculture, and fishing for feed for cultured fish. While the proportion of household income generated by farming has declined to around 70% of total income, in reality aquaculture and fishing have been added to farming with overall income gains. This group earns around 8m dong pa;
- (c) farming, to which fishing has been added.

The income levels of all three groups have improved since 1995 and appear to have stabilised at around 5m dong pa for poor groups.

7.3.55. For poor farmer-fishers the busiest time of year is from December to March and again from April to July when they are busy with the two rice crops. Those with land need capital between November and February since they need money to prepare for the winter-spring rice crop and for school fees, while savings from the previous rice crop are exhausted. One way to raise this, other than through a loan, is to through fishing. Thus during the wet season, farmers often fish between August and November – a time when they are in competition with full-time fishers who are also fishing (Country PRA Report: Vietnam, 2003).

6.3.56. Households belonging to the poor part time farmer-fisher group, like other poor groups (Fish Traders and Full-time Fishers) have few assets, with bamboo-walled and leaf-roofed houses, bicycles rather than motor bikes, and black and white rather than colour TVs. However, they tend to have a small amount of land (about 0.2ha), and their educational level tends to be slightly higher than full-time fishers, about grade 6 on average. Unlike full-time fishers, they are also keen for their children to attend school and recognise that education can give their children opportunities (Country PRA Report: Vietnam, 2003).

7.3.57. By contrast with full-time fishers, part-time farmer-fishers do not rank their fellows or their community highest as regards support, though they also do not regard them as constraints to their livelihoods. Those that are most important to them include government agricultural departments, and the Bank and private lenders, with fishers from elsewhere as the biggest threat to their livelihoods. Additionally, when doing the ‘problem cause-effect’ exercise this group considered some problems from the household perspective, and identified effects (impacts) on the household rather than on other groups and others as impacting on the community (Country PRA Report: Vietnam 2003 Table 15). This suggests that households belonging to this group are beginning to become much more self contained, with community solidarity weakening, though still important.

7.4. Are full-time fishers the poorest and most vulnerable?

- 7.4.1. There is a natural sympathy among many observers for full-time fishers, particularly in **Bangladesh** where historically they belonged to the minority, and often discriminated against, Hindu population. Whether fishers are poorer than for example landless poor is a moot point (though in Bangladesh most certainly belong to the category of the poor on a number of indicators). This partly depends on the definition of poverty used. In terms of income poverty, surveys in the four countries suggest fishers may indeed be poorer, while they normally have less assets and a poorer educational attainment than other groups.
- 7.4.2. However, income surveys usually leave out the value of own-produce consumed by households. While the size of home gardens, and therefore the amount of produce from them, varies according to the wealth strata households belong to, the landless have little or no household land to allocate to this expenditure-saving activity. In the case of fishing, the benefit which a household can gain is dependent on access, effort and gear. Full-time fishers tend to have advantages in all three areas over part-time fishers, and the latter over subsistence fishers (usually the landless poor) – as catch to effort studies indicate.
- 7.4.3. Additionally, there is a direct relationship between the type of fisher and the amount of fish which is consumed by the household. As one might expect, fishing households consume more fish than households defined as non-fishing or as subsistence fishers. (see Section 5) What the value of expenditure-saving fishing might be is uncertain, but if expenditure-saving and income-generating strategies are both taken into account, it is likely that full-time fishers, and perhaps a proportion of part-time fishers as well, will not appear to be the poorest of the poor.¹²
- 7.4.4. One additional point here in considering the relative ‘poverty’ of user groups is that, if their vulnerability contexts are taken into account, then full-time fishers may not be the most vulnerable. Thus, while agriculturally-based poor consistently report having a seasonal ‘lean period’ when food and income are scarce, Bangladeshi fishers do not. (see Barr et al 2000a). Certainly, unless living by permanent water-bodies, their fishing effort has to be seasonal. However, the seasons when fishing is not possible are the times when agricultural and other land-based work is available.
- 7.4.5. The situation may or may not be different in the SE Asian countries. Certainly fishers are usually landless and where the capture fisheries are declining (as they appear to be in Vietnam) are locked into a declining industry. Full-time fishers may be particularly at risk since most are landless, the fishing season is not that long, and they have an extended period (up to 8 months) when money is short, but they need capital (between May and August to buy fishing gears for the next season, but illness and other potential costs increase. However, other opportunities, particularly in agricultural labouring, are increasing, though labouring jobs are scarce in May and June when farmers also get into similar difficulties (Country PRA Report: Vietnam, 2003). However, it would appear that more fishers are switching from

¹² Participatory wealth ranking could be of assistance here in helping to ‘triangulate’ with income and expenditure surveys to identify where fishers are located on a poverty and vulnerability index.

being solely dependent on fishing to building portfolios of fishing, agricultural labouring and other strategies.

7.5. Other groups dependent on the fisheries

Women

7.5.1. **Bangladesh** The majority of those who fish as an occupation are men, with women and children fishing on a subsistence basis, and being involved in post-harvest activities such as fish trading, and fish product preparation. The contribution of children to the floodplain fishery is often overlooked, though their fishing, using cheap simple gears such as push and scoop nets, can account for > 50% of effort in subsistence fisheries (FAP 17, 1994).

7.5.2. The involvement of women in fishing is less than that of children mainly because Muslim women are expected to adhere to *purdah*. Hindu women, widows, very poor women and female heads of households, however, do fish in open-waters, ponds and ditches (FAP 17, 1994), but there are associated costs, economic by not fishing, social by fishing (Kabeer, 1998). The division of labour between the sexes differs geographically and is dependent on whether the fishery is estuarine, floodplain or pond-based. In floodplain or pond-based fisheries, women take a very minor role in fish marketing, but take a larger involvement in net and trap manufacture and other home-based fishing activities.

SE Asia

7.5.3. In general in non-Muslim SE Asia women are not excluded from the fisheries. In general it is men who fish, with women participating in post-harvest activities such as fish trading and fish processing.

7.5.4. **Cambodia** 19% of households in the fishing commune are headed by women, while national statistics indicate that 26% of households in the whole nation are headed by women (Country Status Report: Cambodia 2003).

7.5.5. **Laos** Fishing as an activity is not gender specific though the choice of gear used tends to be. The selling of fish and immediate control of the cash income also tends to be in the hands of women. Children also play quite a significant role in fisheries, particularly in the smaller scale stream, rice-field and pond fishing (Lorenzen 2000).

7.5.6. **Vietnam** There are differences between the genders in their involvement in the fisheries, with commercial fishing and fisheries related wage-labour being dominated by men. Women are more involved with smaller-scale household food production activities and with fish trading (Country Status Report: Vietnam 2003).

7.6. Other poor stakeholders

7.6.1. While this study has primarily been concerned with those who fish, there is also a need to make some short comment on other fisheries-related livelihood strategies, of which there are a number. Not all the categories addressed below have been covered by all country studies, and it should not be assumed that what is recorded for one country applies to the others. However, there is probably a fair degree of similarity in these livelihoods across countries.

Preharvest trades

7.6.2. Fish and shrimp fry collectors:

Bangladesh Freshwater aquaculture used to be almost entirely dependant on fish fry collected from the wild (i.e. natural water in rivers). Many people (including fishers and women and children) included fry collection among their opportunistic seasonal activities. However, with the development of induced spawning technology for major carp, dependence on wild sources has been greatly reduced. This has reduced pressure on wild fry stocks, but has also reduced income-earning opportunities for fish fry collectors. An indication of impact is that in 1985 an estimated number of 8,407 people were engaged in fish fry collection from different rivers systems and 19,362 kg of fry (3-4 days old) were collected (1 kg = about 400,000 fry). In 2000, the number of fry collectors has come down to 1441 who caught 1872 kg of fry (DOF 2001). However, this is partially compensated for by the growth of the cultured fish fry transportation trade.

7.6.3. Fish hatchery and nursery operators

Bangladesh With the introduction of enhancement fisheries in Ox-bow lakes, *beels* and flood-plains, hatchery and nursery activities have become part of the activities of open water inland fisheries. As such hatchery and nursery operators including fry traders, have to some extent become dependant on the inland fisheries. However, with the development of enhanced flood-plain fisheries and their growing importance to production from the inland fisheries, opportunities for this group of stakeholders should expand.

7.6.4. Fishing equipment makers

Bangladesh Many people, both men and women, are engaged in making fishing nets of small size (cast net, push net, lift nets) and traps as a 'cottage industry' as a source of supplementary income. In fishing families, women are engaged in making net/traps and mending nets. The building of fishing boats also offer a means of livelihoods for many people, usually as part of carpentry businesses.

7.6.5. **Vietnam** The production of nets, traps and other gears tend to be small-scale household level operations.

Post harvest trades

7.6.6. Fishery Workers

Bangladesh Many poor and landless people work as labourers in fish landing centres, at wholesale markets for carrying, handling, icing, packaging fish, and also in large scale indigenous fish processing and export-oriented fish processing plants, fish hatcheries and nurseries.

7.6.7. Fish Traders

Bangladesh As with most employment outside the home, most traders are men, though poorer women and widows may also participate. Traditionally people from the fishing community were involved in fish marketing and trading. Overall fish traders are better off than the other three common categories of inland fishery stakeholders and even some of the poorest have more assets than the poorest of fishers. Fish trading requires access to funds and credit, with many traders dependent on larger traders/wholesalers/assemblers (*aratdars*) for this. However, most have some savings. In the *haor* and to some extent estuary area the traders are better off than elsewhere, having homestead and agricultural land and their own working capital.

7.6.8. Unlike fishers, fish traders reported seasonal vulnerability and that their incomes are low during times when there are less fish available. All would be affected if less of the resource were available for trading. The likely increase in value of the remaining fish might compensate for the loss of volume of the product, but it is likely that lower volumes would lead to consolidation in the industry and the withdrawal of the more vulnerable (Country PRA Report: Bangladesh 2003).

7.6.9. **Vietnam** According to the Country PRA Report: Vietnam (2003), there is a high level of employment in the capture fisheries sector, including employed and self-employed fish traders. Of the four stakeholders considered, fish traders are the best off. According to the survey, fish traders earn more (at 9.4m dong pa) than either full-time or part-time farmer-fishers (around 5-6m dong pa).

7.6.10. Most fish trader households have a number of income sources. The research found three main ones: fish trading, fish capture and agricultural labouring. Income from each source was about the same in 1995, but today the largest earner is agricultural labouring (bringing in 43% of the total (due to the opportunities generated by agricultural intensification), with fish trading declining (to 22%), and fishing remaining static. Additionally, when doing the 'cause-effect' exercise this group considered problems from the household perspective, and identified effects (impacts) on the household rather than on other groups or the community (in contrast to full-time fishers).

7.6.11. Fish Processors

Bangladesh Processing is done both on a small scale by poor people - mainly women - as a secondary occupation, and on a larger scale by richer people as a major profession. These processing activities are seasonal. In sun-drying the women are involved mainly during the winter months when bulk of catch is derived from *beels* and *haors*.

7.6.12. **Vietnam** Self-employment is also common in fish paste and fermentation home industries but there are also bigger industrialised operations with hired labour. Most of those employed in this sector of the industry are women.

Those who finance the industry

7.6.13. Leaseholder/ *Mohajan*/ Money Lenders

Bangladesh The leaseholder/Money lender/ *Mohajan*, boat and net owners belong to the wealthy and influential group of people. They are private investors in this sector. Money lender/*Mohajan* lend money to the fisher at higher rate of interest as operating cost of fishing or for purchasing net/boat. Some possess nets and boats which they provide to fisher groups on a catch-sharing or hire basis.

7.6.14. Given that fishers are generally unable to obtain working capital from formal sources to finance their fishing effort, this group is important to the productivity of the fisheries despite their rent-seeking (as represented in the high loan rates that they charge fishers). In the absence of formal sources of working capital, the fishing effort of f/t fishers and thus productivity of the fisheries, could be adversely affected were there to be a trend for this financing group to abandon the fisheries for more profitable investment opportunities elsewhere. P/t fishers, using inexpensive gears and fishing primarily for subsistence, would be unlikely to be effected by such a scenario. However, despite their present importance to the fishery, there are negative aspects to the involvement of this financing group, not least because of the incentive to both fishers and their investment backers for short-termism, and for maximisation of off-take at the expense of the sustainability of fishery resources (Dixon 2000; Barr and Dixon 2001).

7.7. Fishing methods

7.7.1. **Bangladesh** Fishers in Bangladesh use all conceivable types of fish capture from bare hands to seines and gillnets. In a study of three *beels* in western Bangladesh an extensive array of gears was noted (Alam et al., 1997). This included eight types of seine, four types of push net, two types of trawls, seven types of gillnet, a cast net, a large lift net, four types of block net, 11 types of trap, six types of hook and line and four types of spear. More than 70 different gears belonging to the four main gear categories have been identified (Hoggarth et al., 1999b). Gears used vary according to the local hydro-morphological conditions, habitat type and tradition (Alam et al., 1997).

7.7.2. Set-and-wait and chasing gears catch fish at any time, but are labour intensive and relatively inefficient. Barrier and ‘hoovering’ gears, in contrast, are more efficient as they catch fishes when they are highly concentrated in specific habitats, e.g. barriers in channels and ‘hoovers’ in dry season water bodies. The high efficiency of barrier and ‘hoovering’ gears makes them particularly threatening for long-term sustainability unless provision is made for fish passes and/or alternative dry season refugia (Hoggarth et al., 1999b). In addition to fishing gears, Bengali fishers also employ other strategies such as fishing in ditches and the draining of ponds, canals and sections of small river channels.

7.7.3. Access to different types of gear is determined by their cost. Barrier gears are more expensive than hooks, spears, cast nets or fish traps, and therefore often used only by wealthier fishers (Hoggarth et al., 1999b). Full-time and traditional fishers commonly use gear of a higher value and efficiency, requiring greater operation skills. According to

Thompson and Hossain (1998), fishers using high value gear are likely to only own a share of it, or not to own it at all, thus effectively acting as labourers earning a share of the catch. Subsistence fishers commonly use gears such as traps and push nets, which target small fishes and their share of the profit from the fishery is therefore normally low. The 1950 Fish Conservation Act restricts the use of certain gears and fishing for juvenile fishes. Both leaseholders and fishers are subject to the act, but its enforcement has been very weak and compliance poor, mainly due to resistance to the Act from leaseholders and fishers.

7.7.4. In the upper Meghna *char* area ISPAN (1995) found that 34% of professional fishers possessed boats and nets, and those having no boats and nets catch fish on share basis with others or as labourers. CIDA (1998) reported that all fishermen have fishing gear individually or jointly. About 73% full time fishers have gears individually and 27% jointly owned large mesh-size nets, while 39% full time fishers have individually owned a boat in the Sylhet-Moulvibazar *Haor* basin area.

SE Asia

7.7.5. Similar gears are to be found in **Cambodia** and **Vietnam** and the same general principles concerning their cost and use apply here as in Bangladesh. The PRA reports in **Cambodia** and **Laos** under the current project reports that most fishers possess boats and low cost fishing gears. However, they usually have to rent-in big seine nets for river fishing. However, use of fishing gears has changed in last 20 years. Fishing was mostly done individually 20 years ago when traditional gear use was common. Nowadays fishers use nets made of fine mesh nylon thread, and larger nets are used. In consequence they can catch more fish, but may have to work in fishing gangs to do so.

7.7.6. Laos Peak catches are obtained during the periods of up-migration of fish from perennial waterbodies to seasonal wetlands including paddies, and during down-migration. Harvesting during these periods involves mostly traps and other passive ‘barrier’ gear set across migration paths. This method of harvesting is highly efficient, bringing in a substantial share of the annual household catch while interfering little with concurrent agricultural activities (paddy land preparation and transplanting).

7.7.7. In **Vietnam** the fishing gears used are very diverse and depend mainly on the habitats exploited, the target species and the purpose of exploitation. The most common small-scale fishing gears used in An Giang in the Mekong delta are lift-net, draw-net gill nets, cast-nets, hooks and small traps, though other (illegal gear) such as electric shock, are also used. A previous study on 1002 households in An Giang province confirmed that about 55% of all fishing households use gill nets (average 6.8 gill nets/household), 34% of households use hooks (average 44.8 active hooks/household) and 39.18% of households catch fish by hand (scooping with the hands). Only 25% of ‘professional fishing’ households operate large-scale fishing gears (bag nets, and large traps/barrages).

Comment

7.7.8. Hydromorphological conditions change throughout the year, so full-time fishers in all the study countries need a wide range of different gears if they are to be successful. Some of these gears can be expensive and require fishers to be highly capitalised. This can be a

problem and fishers frequently have to seek a loan in order to participate in the next fishing season when they will pay the loan back. Where fish stocks and/or catch revenue is falling, fishers are in danger of having to shift to cheaper less efficient gears, with a concomitant drop in living standard. Those that fish on a part-time basis, usually in seasons when their other livelihood strategies are 'slack' may be able to reduce costs by focusing fishing effort on peak fishing periods and limiting the types of gear that they need.

7.8. Changes in fishing technology

7.8.1. There has been a significant change in fishing technology during the last ten years in the study countries, with many fishers now using nylon monofilament gill-nets to replace bamboo frames and other bamboo materials. Furthermore, the use of small mesh netting to catch smaller and smaller fish has spread as larger fish have declined.

7.8.2. This technology is seen as a threat to the sustainability of the resource, since juvenile fish are caught as well as mature fish. However, the exact impact of this technology on fish stock does not appear to have been well researched. If Hoggarth and Kirkwood's (1996) findings that restricting one fishing gear merely re-allocates the catch to other gears are accepted, then banning monofilament gill-nets (which are inexpensive) may only penalise poorer p/t fishers while potentially re-allocating the catch to full-time fishers and wealthier people with barrier-type nets. It may be that there needs to be a ban on all gears during a longer close season in the early part of the flood season when fish are spawning and juveniles are growing.

7.8.3. The number of fishers (both full-time and part-time) appears to be increasing in all countries primarily due to population growth, as does the volume of fishing gear which each fisher uses. One reason for the increase in fishing gear in some countries is said to be due to decline in the resource (with more gear needed to catch the same weight of fish). For example participants in the PRA exercises in Cambodia noted that gillnets have been used for the past 50 years. However, in 1979 on average, one household would have 5 sets of gillnets (that is about 300m long). But the number of gillnets increase rapidly after 1995 due to declining fish production, while the cost of the gear is also cheaper than before. Now one household has an average of 25 sets of gillnet (which is about 1500m long) (Country PRA: Cambodia, 2003).

7.8.4. Other changes include changes in post-harvest handling practices in the Great Lake region of Cambodia from storing fish in pens and cages through the dry season for live distribution, to chilling for year-round distribution to local and export markets. However, the quality of most fish now arriving at the markets is low, due to shortage of expensive crushed ice at the fishing areas. The only likely impact on livelihoods is to reduce the number of fishers needed to tend the fish cages through the dry season, and thus make their fishing strategy even more seasonal. However, there is evidence that fishers on the Mekong in Laos, Cambodia and Vietnam may be substituting cage aquaculture for their previous dry season management of wild fish. Their livelihoods may therefore be benefiting through two high value and complementary strategies – participating in the inland capture fisheries during the peak season for that strategy, and then switching to cage aquaculture during the off-season. .

- 7.8.5. Some authors suggest that the use of electrocution fishing, focusing on snakehead, is widespread throughout the remote wetland region in Cambodia and southern Vietnam, and is being practiced at all scales of fishing, especially small-scale. 'This situation is rampant, due to widespread poverty, fish stock decline, inequitable right of access to fishing grounds by small-scale fishers, and the surge in snakehead demand by the Thai market' (Country Status Report: Cambodia 2003). Hoggarth et al (1999) suggest that this form of fishing is extremely threatening to the sustainability of the resource.
- 7.8.6. Lastly the development of aquaculture in Vietnam has led to a growing demand for fish feed. Very frequently this is provided by fishers collecting 'trash fish' (sweeping fingerlings and juveniles of all aquatic species up together), but also by others fishing opportunistically. This threatens recruitment to the adult stock, and is potentially more damaging than the banned practice of fry collection.

8. Threats to the fisheries: habitat disturbance

- 8.1.1. While potential threats to the fisheries can and are easily identified, there is considerable difficulty in determining the individual effects of different kinds of human activity on the fisheries in the study countries. As in any complex co-evolving socio-ecological system, causal factors keep changing in response to a wide variety of other factors in the system. Attribution is particularly difficult where there are natural fluctuations in the resource and in species composition both seasonally and in the medium to longer term in response to climate-induced habitat change, to disease, and other natural factors, as well as fluctuations in human activity systems impinging on the resources and their habitats. All this makes attribution to human-induced factors extremely difficult.
- 8.1.2. Science is about identifying causal factors and correctly attributing their impact on the matter under investigation. Real world systems (unlike scientific experiments in the laboratory where variables can be held steady) are complex dynamic and evolving. In real world contexts then the problem of attribution is underpinned by the problem of measuring effects over time. Are the same things being measured and are the same causal factors still impacting?
- 8.1.3. When it comes to the management of natural resources and their exploitation by man. The problem of attribution takes on a real concern. Clearly, in the interest of ensuring the availability of natural resources for current and future generations, exploitation of the resource has to be sustainable. However, in the interest of ensuring maximum benefit to users (with least cost to society), and particularly poor people who are highly dependent on natural resources, the optimum exploitation level needs to be sought. Further, given that there are different user groups exploiting what are multifunctional resource systems, and given that socio-ecological systems are complex and dynamic, the necessary flexibility in management is extremely difficult to achieve. Identifying the major causal factors underlying change in systems therefore becomes something of an imperative for natural resource management, but one which is extremely difficult to achieve.
- 8.1.4. Conservationists are keen to emphasise the negative impacts of human activity, and in particular fishing effort on stocks, while local people tend to suggest that productivity from the fisheries was better in the past. However, great caution needs to be exercised in accepting either of these perceptions, even accepting the need for the 'precautionary principle' when exploiting natural resources. As regards local perceptions while there is undoubtedly a place for (Indigenous Knowledge (IK) in evaluating and monitoring the state of resources, cross-checking through other methods (and particularly quantitative ones) is needed. As regards conservationists' perceptions (Scientific knowledge (SK)), these also need to be treated with caution. There are many instances of science which are accepted as 'correct', and over which there is 'consensus', which later turn out to be wrong or only partially correct. That is the nature of much science with its reductive experimental 'steady-state' approach to causality, which, by reason of human capacity and resourcing, is only partially suited to elucidating the causalities in complex dynamic systems. In this sense both IK and SK only partially capture real systems.

8.1.5. Having made these cautionary comments, I now turn to what others have said about threats to the fisheries in the study countries and to consideration of the robustness of the evidence for them.

8.1.6. Summary of threats

Threats can be classified into two broad categories:

- those that threaten the quantity, quality or sustainability of the resource (i.e. that threaten the status of the resource);
which can be broken down into two subcategories
 - a) those that impact on the habitat of the resource, and
 - b) those that reduce or threaten the resource directly (e.g. overfishing),
and
- those which threaten access to the resource by users

8.1.7. Land conversion for agricultural production is a major cause of habitat loss which may have implications for the fisheries. Additionally the infrastructures associated with them may interfere with fish ecology and threaten the viability of the fishery. To date, Lao and Cambodian aquatic ecosystems are less modified than those in most other countries of SE Asia. In Bangladesh and the delta regions of the Mekong and Red rivers in Vietnam there are FCD/I structures which have modified hydrological systems. The actual impact of these structures on aquatic ecosystems will be discussed below.

8.1.8. In SE Asia there is also a range of regional and national development issues which pose a number of challenges for the fisheries and for farming. These include a series of hydroelectricity generation dams on tributaries of the Mekong which would change the character of the river's flood pulse, and could have negative impacts on fish which leave the river to spawn on the submerged floodplain (and rice fields) during and after the monsoon rains.

8.1.9. Water extraction for irrigation purposes (by both countries, but also by Thailand) could also impact on river flow regimes with implications for downstream users. Considerable deforestation in the highland areas of SE Asia also has implications for flooding patterns, erosion, water pollution and siltation, which in turn may negatively impact the fisheries (see Phonvisay 1994).

8.1.10. Other threats include agricultural and industrial water pollution, siltation etc.

Deforestation of the uplands. As noted earlier (Section 3), the livelihood strategies of poor and landless and near-landless people in the SE Asian study countries, and particularly those who live in the upland regions, include a significant element of hunting and gathering in the forest. However, these CPRs and the NTFPs they contain are under threat.

8.2. The pressure for food security: a major driver of land use change

8.2.1. Food security through food-grain production

As previously noted, over the longer term, with growing populations -and growing urban non-food producing populations - all four countries have been concerned with ensuring national

food security. Thus, supported by international organisations such as the FAO and IFAD, there has been considerable investment by all study country governments in the agricultural sector. Food security has in particular meant self-sufficiency in cereal production and particularly in rice production. While there is rain fed (dry-rice) production in the upland areas of SE Asia, the major effort has been in developing wet-rice production, both extending the area devoted to wet rice through converting land from other usage to crop land (e.g. flooded forest and swamp), through multiple cropping (by means of irrigation), and by lifting yields through introducing new cultivars (HYVs) and technology (HEIs).

8.2.2. In Bangladesh this has led to the conversion of most available wetland to wet-rice production, to huge investment in irrigation infrastructure (including deep tube-wells for dry season agricultural water supply) and continuing investment in FCD/I infrastructure (see Dixon 2000). Similarly in Vietnam most land suitable for wet-rice cultivation (most of which is to be found in the Red river and Mekong delta regions) has already been converted, irrigation infrastructure is quite extensive, and there is growing investment in FCD/I infrastructure. As a consequence of these developments, together with ‘*doi moi*’ socio-economic reform, Vietnam now a major rice exporting country, second only to Thailand in the region. Similar trends in the conversion of ‘waste-lands’ suitable for wet-rice production to arable land are proceeding in Laos and Cambodia. For example Lao has ambitions to boost economic growth by becoming a major rice exporting country like its neighbours Vietnam and Thailand.

8.2.3. The Lao Country Summary Report suggests the following rather bleak impact of agricultural intensification on livelihoods based on the fisheries:

‘In the short term, increasing population density combined with limited opportunities for off-farm employment are likely to increase pressure on fisheries resources. Water resources development for irrigation and hydropower will lead to widespread hydrological alterations and loss of habitat connectivity. Initially increasing, but eventually reduced use of marginal land. Land use change due to agricultural intensification may be more critical than irrigation development, given the key role of rain fed paddies in fisheries production. Agricultural intensification is likely to lead to concentration of land ownership and the emergence of marginalized landless group. A small and relatively poor group of full-time fishers is likely to emerge in the vicinity of major rivers or reservoirs.’

8.2.4. There are, however, a number of reasons for being more cautious about such a prognosis. Firstly water resources development for irrigation (and the drive for increased agricultural output through this, improved infrastructure, extension services and the like) should lift rural incomes and may provide opportunities for investment in aquaculture and generate a demand for agricultural labour as has happened in Vietnam). Irrigated paddy may be as or more productive of fish than rain-fed paddy, though the Bangladesh experience is that water bodies may be drawn down for dry season irrigation with impacts on the fisheries, while intensification may involve greater water pollution from HEIs. The concentration of land ownership is likely to be a medium to longer term affair rather than short term, by which time there should not only be the development of demand for agricultural labour, but also for other rural no-farm services, both of which are likely to be met by marginal farmers withdrawing from agricultural production (and perhaps land ownership)- while some may leave to the

growing opportunities in urban areas. Increasing rural wealth may produce a greater local demand for fish which, together with urban- and export-led growth in demand, may lead to growth in the fishing community as trade specialisation develops, and may also lead to greater production from a variety of sources (both wild and cultured).

8.2.5. Access to land to ensure household food security

While governments are very conscious to ensure that there is national food security in cereal grain production, there has been a shift in the means by which that security is to be achieved. Historically, governments (as elsewhere in SE Asia region) have sought national food security through ensuring household access to land. Thus there have been land redistribution programmes taking back land from large land-owners and subdividing it among the poor, and resettlement programmes with landless poor from areas of high population density and a land shortage being resettled in areas of low population density and (supposed) land availability (e.g. from the Red river delta to forest areas in the north of Vietnam).

8.2.6. The fact that these areas were usually isolated, provided few non-farm opportunities, and indeed offered limited opportunity for wet-rice cultivation, while the émigrés lacked knowledge of appropriate farming systems for these areas, was not taken into account. Thus poor wet-rice farmers tended to join the ranks of impoverished swidden agriculturalists. Some land redistribution programmes still continue, though now from the state to the private sector (e.g. the distribution of *Kash* land in Bangladesh to poor people). In the command economies (particularly Vietnam), the state experimented with collectivisation as the major means of production of foodstuffs, but under the *doi moi* reform programme has returned this responsibility to households.

8.2.7. Internal migration in order to access land has also taken place without government sponsorship from areas of high population density to those with low (e.g. from plain to forest in Vietnam, Laos and Cambodia) and still continues. However, the opportunity for wet-rice cultivation in the upland areas of SE Asia is limited by reasons of hydrology, soil and terrain, while a dry-rice and swidden cultivation system, which is primarily devoted to household subsistence needs, cannot in itself secure households' food security.

8.2.8. Implications of achieving food security through non-agricultural income-generating activities

Increasingly, governments are seeing the way for ensuring national food security as being through the development of other non-agricultural income-generating sectors (both rural non-farm and urban) and particularly through the development of export-led industry. Policies encouraging this strategy have led to a growth in urban populations and this in turn has led to a demand by those populations for rural food products – particularly rice. This process has gone furthest in Bangladesh and Vietnam, with Cambodia and Laos lagging behind due to their more recent history of civil conflict and isolation from wider market forces. Additionally as incomes rise, this has meant a demand for a much wider range of food commodities beyond rice and including wheat for bread, onion, pepper, and vegetables, banana and other fruits, and fish.

- 8.2.9. One impact in the rural areas of this growing urban demand for a variety of foodstuffs, and also in rural areas of the former command economies as collectivisation has been abandoned and responsibility for natural resource management has been handed back to households, has been the commoditisation of the agricultural process. Thus in Bangladesh and Vietnam, for example, many farmers are investing in their land and in input technologies to take advantage of developing markets in different agricultural commodities. Meanwhile, in Bangladesh there is a growing number of agricultural entrepreneurs who are renting or sharecropping land with a view to producing for the market rather than for household consumption, while in Vietnam land markets are developing.
- 8.2.10. Other entrepreneurs are developing transport businesses and networks and developing wholesale operations between rural and urban markets. While such ‘middle-men’ receive opprobrium from producers who feel that they are exploiting them, these people nevertheless provide a critical service linking local, regional and national economies, and enabling rural producers to access wider markets. Meanwhile agricultural labour (drawn primarily from landless households) has become much more flexible, shifting between different farming, fishing, transport, and petty trade sectors as opportunity and seasonal necessity demands, and being prepared to migrate between geographical regions as seasonal opportunities become available. (For more on the potential impacts of urbanisation and globalisation see Section 5).

8.3. Loss of habitat: land conversion and degradation of water bodies

- 8.3.1. **Bangladesh** During the last 50 years there has been a considerable loss and degradation of inland water bodies in Bangladesh due to man-made factors such as siltation, water pollution, caused by the impact of FCD/I projects, unplanned construction of embankments, dams and roads, and the diversion of water flow in major rivers in the neighbouring countries.
- 8.3.2. Since population pressure on land is intense, and all available land that can be tends to be converted to cropland, there are declining water bodies which can act as natural refugia in which non-migratory wild fish can shelter though the dry season. This problem is compounded by the fact that the number of perennial waterbodies may also be being reduced by natural siltation, by improved drainage designed to convert these wetlands. The problems for some species of fish are also compounded by the common practice of dewatering natural and man-made depressions in order to capture the fish concentrated there as flood waters recede.
- 8.3.3. Natural processes such as siltation, and man-made FCD/I infrastructure are reducing the overall area of water bodies on the Bangladesh floodplains, while the pressure of an increasing population and increased landlessness is swelling the numbers of those exploiting the inland fisheries. It is uncertain what the impact of this on livelihoods is likely to be. However, the overall impact may be to lead to a reduction in catch per unit effort for all fishers, and the withdrawal of some from the industry, or at least diversification into other activities by those who were previously primarily dependent on the resource. That is, in order to meet household needs, the majority of poorer floodplain households may need to diversify

from necessity, flexibly exploiting resources as they become seasonally available, with only a limited number of richer households using capital investment to specialise.

8.3.4. Cambodia: The flooded forest; under especial threat?

The flooded forest plays an important role in household food production and income generation through the different goods and services which it provides. This is exploited for food, trade and other products and provides charcoal, firewood, land for agriculture, materials for constructing shelters and fishing gear, food and medicine. Flooded forest wildlife includes crocodiles, snakes, turtles, frogs and waterfowl. However, a large proportion of Cambodia's flooded forests and wetlands have already been converted to agricultural land and the remainder is under threat. Flooded forest areas decreased from 937,900 ha in 1973 to about 370,000 ha in 1997. This forest would seem to be under especial threat because it allows for the possibility of two/three livelihood strategies (fishing, farming and hunter-gathering in the forest). There is a population of very poor people around the Great Lake whose sole occupation is fishing but who, given the forest's *de facto* CPR status, would seek to clear some for rice cultivation when opportunity arises and thus secure greater livelihood security.

8.3.5. Vietnam In the Mekong delta the wild fishery on which the livelihoods of many of the delta's poor depend is said to be declining. As in Cambodia, Vietnam's flooded Melaleuca forest and the Plain of Reeds which previously was a good environment for fish, is now being converted to rice paddies (50% has been lost in Long An).

8.3.6. The Country PRA Report: Vietnam (2003) notes that at the Thoi Giang study site, in 2002, most of the area was protected by dyke. There are two types of dyke in the area. The first protects the summer - autumn rice crop (which is harvested in August). The total flood protected area is about 4,537ha, where farmers can grow two crops of rice per year. After the harvest, the waters overtop the dyke and the rice fields are flooded. The second dyke system, which will eventually cover about 2,825ha, will fully protect the land inside the dyke and enable triple cropping per annum. Since the whole area will be dyked completely, the water surface area and natural fish will disappear in the future due to loss of habitat.

8.3.7. Additionally LARs are also disappearing due to loss of habitat. Before 1983 when farmers grew a single crop of traditional rice, wild vegetables such as water spinach, bông diên điển (*Ammannia* spp.), lotus, water-lily and so on, which are commonly utilised for food and income generation by local people during the flood season, were common. After 1983, with the introduction of HYV rice and high application of herbicides, wild vegetables have gradually disappeared. This decline is even more dramatic where triple rice cropping has been introduced. However, in compensation, three rice crops per year should help poor people to earn money from wage labouring.

8.3.8. However, participants in the PRA exercises suggested that intensive farming was unsustainable because soil fertility depended on the annual flood providing nutrients and flushing toxins and pests out of the soil. This meant farmers had to use more fertiliser and pesticide year on year, which in turn increased production costs and also was harmful to fish.

8.3.9. Impact of change in the rural sector on natural resources management: forests

The impact of changes in the structure of the rural economy has not been overwhelmingly positive. It is clear that on a general level rural livelihoods have benefited from the development of linkages between urban and rural economies. Rates of poverty in rural areas have been reducing through access to wider markets.

8.3.10. However, not everyone has benefited. Location, and access to markets are critical in enabling people to lift themselves out of poverty. Where communities have remained isolated, so they have generally remained poor (e.g. isolated communities in the uplands of Vietnam, Cambodia and Laos, and the *char lands* in Bangladesh). Additionally, the stimulus of demand from the wider economy for rural products (overwhelmingly in the natural resource sector), raises questions as to the sustainability of these livelihood strategies.

8.3.11. The pressure of growing populations, of growing opportunities for diverse commercial agricultural production, and the limited availability of land in those areas best suited to wet-rice cultivation has meant that there is a continuing pressure on natural resources and a continuing conversion of land from other uses to agricultural use. Of the four countries, this process has gone furthest in Bangladesh, where almost the entirety of the floodplains has been converted to agricultural use over the past 100 years. In SE Asia, the same process is continuing and is most graphically illustrated by the loss of forest cover from the three countries (Appendix 2 Table 6). In SE Asia it has gone furthest in Thailand which has been incorporated into the regional and global economy for longest (but which not included in this study).

8.3.12. In some respects the process of forest loss in SE Asia is more complicated than the loss of indigenous floodplain vegetation in Bangladesh. In Bangladesh wetlands have been converted to highly productive farmland, while (slightly) higher land is most usually planted with fruit and commercially valuable trees around homesteads. Except for small areas of forest in the Chittagong Hill Tracts, the bulk of Bangladesh's timber production comes from these homestead areas. In the SE Asian countries the same process has taken and is still taking place in those regions suitable for wet-rice cultivation and agricultural intensification through irrigation (e.g. Mekong delta in Vietnam and Cambodia and on the Lower Mekong plains in Laos). However, forest clearance in these three countries has also been due to a number of other factors, since forest land has primarily been on sloping land in the upland regions which is unsuitable for wet-rice cultivation.

8.3.13. SE Asian governments have primarily blamed swidden agriculturalists for the removal of forest cover, and have historically taken a number of measures to discourage continuation of the practice. There has been considerable pressure on tribal peoples to change traditional land use practices (see Rigg and Jerndal 1996). The role of swidden agriculture in forest destruction is a highly sensitive issue with governments maintaining that shifting cultivators are the main source of forest loss and outstrip commercial logging, though others suggest that different upland peoples manage the forest resource in different ways and their impacts vary accordingly (Rigg and Jerndal 1996).

8.3.14. There is, however, considerable complexity in livelihoods to be found in these regions and in the types of farming system practiced. Most are diversified and have at heart wet- or dry-rice cultivation. To this is usually added a swidden (or forest-garden) on which dry-rice, maize, cassava, and vegetables are grown, together with hunting and gathering of non-timber forest products. There are different swidden systems, some of which appear to be more destructive of the forest than others, while there also appears to be change between longer to shorter rotational systems of fallow as population grows, and eventually to complete clearance. Increasingly, as forest areas have been incorporated into national economies under government economic reform processes, forest swiddens have also become permanent orchards. Differences in hydrology, soil, the ability and motivation of cultivators to maintain soil fertility, and exogenous factors (particularly in demand for forest and swidden products) affect whether these areas remain under swidden, become degraded bare hills, or revert to forest See Kerkvleit and Porter 1995; Adger et al 2001).

8.3.15. However, a major factor in the removal of forest cover in these SE Asian countries (as in others) is their exploitation for commercial timber products. Authors suggest that the main driver for this is the incorporation of these countries into the wider regional and global economies. Thus it is suggested that both Laos and Cambodia's forest loss is due to Thailand's demand for high value timber, a situation which has been brought about through that country's exhaustion of its own forests over the past few decades (Rigg and Jerndal 1996).

8.3.16. Impacts of land use conversion from forest on inland capture fisheries

The impact of forest removal has been blamed for a number of negative downstream impacts on fish habitat. In particular a commonly voiced view is that removal of forest cover increases run-off from upper catchments, and increases siltation and flood risk in lower catchments. For example in **Cambodia** it has been reported that siltation of the Tonle Sap is a serious problem as deforestation in the basin is believed to have caused accelerating soil erosion. However, the lack of reliable long-term data prevents the development of firm conclusions. A planned study forming part of the Mekong River Commission's Water Utilization Program should aim to investigate this further (Country status report: Cambodia, 2003). DFID's Country Strategy Paper (DFID 2000) also notes that many forests have been logged illegally and are seriously degraded.

8.3.17. In **Laos** with deforestation proceeding at a quite alarming rate there is soil loss and siltation according to Rigg and Jerndal (1996). Again Mattin and Hussain, (1989), Ahmad (1989) and Pramanik (1994) have blamed deforestation as a contributory factor to extreme flooding in Bangladesh, arguing that increasing discharge rates and silt loading leads to shallower rivers which combine to make the rivers more prone to flooding.

8.3.18. While the latter part of this statement is true, and is a natural function of floodplain development, evidence from elsewhere suggests that deforestation in itself is but a minor contributory factor in extreme flooding. Indeed some hydrological scientists suggest that the difference in run-off and sediment volume between forested and non-forested (grassland) catchments is small, and that there are other factors which contribute far more to flood risk in lower catchments than the type of vegetation cover in upper ones.

8.3.19. That siltation as a natural process is occurring is not in doubt. **Bangladesh** water bodies on the floodplains (*beels*, *haor* and river) are gradually being silted up due to increased soil erosion, by intensification of agriculture activities and deforestation both in the country and outside of the country. According to Millman & Heade (1983) some 2.00 to 2.4 billion metric tons of sediment are carried out by the three major river systems with their tributaries and distributaries every year. About 5% of this is deposited in the river bed, flood plain and *beels*, and the rest is discharged into the Bay of Bengal (Hossain 1992). Soil erosion due to agricultural intensification and deforestation is pronounced on the hills in the northeast region of Bangladesh, with huge amounts of sediment being deposited every year in the *beels*, *baor* and other low lying areas gradually reducing their water holding capacity. These perennial water bodies are rapidly being converted into seasonal ones or the water area is gradually being reduced. ISPAN (1992) reported a reduction of about 70% water area in a *beel* (Jugnidaha *beel*) in the district of Tangail in 15 years (1977 to 1992) as measured by satellite imaging. According to MACH (2000) about 7.6 cm of sediments have been deposited in Hail *Haor* with maximum of 15 cm/yr during last 12 years. FAP-6 (1994) reported that the piedmont rivers rising in the Indian catchment area carry large quantity of sediment, most of which are deposited in the *beels*, floodplains and rivers. As a result many of the perennial water bodies are converted into seasonal water bodies, while reduction in surface area and depth of water bodies are negatively impacting fish production.

8.3.20. Similar concerns about deforestation, soil loss from the uplands, and potential negative impacts on downstream resource users are voiced by observers of Vietnam (see Adger et al 2001).

8.3.21. **Impact on water quality due to reforestation and implications for inland capture fisheries**

While it may not be entirely correct to blame siltation of rivers and water courses in lower catchments on forest removal in upper ones, one can ask whether other characteristics of water quantity and quality might be affected by forest removal, and perhaps more importantly reforestation, which may in turn impact on inland fisheries.

8.3.22. Indigenous forest in Cambodia, southern Laos and southern Vietnam consists primarily of *Dipterocarpus* species, while those in northern Laos and northern Vietnam consist of a mixture of species. These produce leaf litter which contribute to the formation of alkaline soils and to a high alkaline content of water. The wild fish species found in South East Asia are adapted to this chemical content in water. A change of land use to grassland or agricultural land is unlikely to change the chemical constitution of water. However, reforestation, which is most usually done with quick-growing conifer or eucalyptus may have both a chemical impact on the quality of water since leaf litter from these is acidic, and this may well impact on the volume and species diversity of fish.¹³ Additionally conifer and eucalyptus evapo-transpire throughout the year and may, as a consequence, reduce the volume of water available to lower catchments. In those parts of SE Asia (northern Laos and Vietnam) with a pronounced dry season, any reduction in water volume may put lowland wet-rice cultivation and developing rice-fish enterprises at risk. A study by Haylor et al (1997) in Savannakhet province in Laos noted that rice fields are an important source of wild

¹³ On water quality issues (in particular acidic discharge) in the Mekong delta region see Hashimoto (2001).

fish. The study also identified 8 agro-ecological systems, that could incorporate fish based on the seasonal availability of water. The systems range from those with water availability throughout the year to those with decreasing periods of water availability, increasing aridity and dependence upon rainwater. With the shift from one to the other across the range, fish production becomes more marginal and risky. Again this is an area which does not appear to have researched in the SE Asian context, but evidence from elsewhere suggests that the water volume lost to lower catchments can be substantial.

8.4. Impact of agricultural intensification on the inland capture fisheries

8.4.1. While the impact of changes in forest type on water quality has not been researched in the SE Asian context, there is more evidence from the country studies of the impact of agricultural intensification on inland capture fisheries. There are two issues here: the impact on water quality of agricultural practices, and competition over the use of what is a multifunctional resource – water. I deal with the first here, and will deal with the second when dealing with constraints to access by users of the resource.

8.4.2. Impacts on water quality due to agricultural intensification

Bangladesh Based on the concept of the conservation of fish habitat different government ministries (such as MOEF, MOWR, MOL, MOFL) have adopted environmental policies stressing the need to conserve environments congenial for fish, to control the discharge of industrial & domestic untreated effluent/waste into water courses, to prohibit the use of harmful insecticides and pesticides in agriculture, and to prohibit the dewatering of water bodies to harvesting fish. However, the enforcement and implementation of these prohibitions is proving to be extremely difficult due to institutional weaknesses and the influence of the industrialists.

8.4.3. Part of the problem has to do with perceptions which are general in the population. The surface water of the Bangladesh floodplains serves many functions apart from fishing. It is used for ablutions, livestock, jute retting, the disposal of domestic, agricultural and domestic waste, and irrigation. (Toufique, 1997). While these uses may be considered to conflict with the fishery, there is a belief that all contaminants will be washed away during the annual flooding season (Ahmad and Reazuddin, 1990).

8.4.4. Craig et al (2000) report that the shift to the use of HEI technologies (chemical fertilisers and pesticides), accompanying the adoption of HYV rice, has been identified as a potential problem for water quality and as leading to unacceptable levels of harmful contaminants in fish caught for human consumption. There is widespread, popular belief that rice cultivation, especially intensive production of modern varieties of *boro* rice is the cause of much wetland pollution due to run-off of agro-chemicals that adversely affect fish and fish habitats (Sadeque and Islam, 1993). For example ISPAN (1992) reported that pollution due to use of chemical fertilizers and pesticides / insecticides in agriculture for production of HYV rice and other crops have affected fish and its production. BCAS and NCM (1994) reported that the commonly-used fertilizer, urea, which is soluble in water, is washed into water bodies under irrigated conditions and flood and causes luxuriant growth of hydrophytes which after

death and decomposition give rise to anoxia conditions which result in fish mortality. Ali (1994) reported the occurrence of pesticides in the *khals* and ponds within the Meghna-Dhonagoda Irrigation Project area and resultant mortality of fish there.

8.4.5. About 70% of all pesticide use is on rice, most of which are insecticides and >50% of which are used in the dry season on the *boro* rice crop (Pagiola, 1995). Usage per unit area is, however, low, and the three main insecticides (carbofuran, diazinon and phosphamidon) are relatively short lived, though moderately to highly hazardous. A limited study by FAP 17 (1994b) found no organo-phosphate residues although low levels of organo-chlorine residues were detected in fish collected near Tangail. In the north-east region the annual application of chemical fertilisers was conservatively estimated at 95 kg ha⁻¹ in 1987-1988; case studies have shown that fertiliser runoff from these areas is capable of causing eutrophication, especially in areas where FCD/I projects result in stagnant waters. Also, there are occasional fish kills which have been attributed to the 4-5000 t of pesticides used annually in Bangladesh (Craig et al 2000).

8.4.6. Similarly, given the low industrial base and the extent of sheet flooding, it might be thought that surface-water pollution is not a serious problem within the Bangladesh floodplains. However, there can be quite dramatic localised downstream impacts by, for example, effluent from fertiliser plants, paper mills and the like (FAP 6, 1993; Ahmad and Reazuddin, 1990). The World Resources Institute reported that 'the direct contamination of aquatic systems by industry in Bangladesh is widespread and of concern' (WRI, 1990). Aside from water-borne pollution reducing the productivity of floodplain fisheries, there are also concerns over the deleterious impacts to human health of consuming contaminated fish (Ali, 1997) (Craig et al 2000)

8.4.7. This is as yet probably not a problem in the upland regions of SE Asia where agricultural intensification is at an early stage and where households are perhaps unlikely, still being poor, to invest in HEI technologies. It is, however, a problem in lowland wet-rice systems where there has been considerable adoption of these technologies as wet-rice production and the production of other commodity crops has intensified. The problem has been identified and is being addressed through a variety of strategies designed to produce HYV rice which are less dependent on HEIs to generate high yields and IPM technologies to reduce dependence on chemical pesticides.

8.4.8. **In Cambodia** it is reported that agricultural chemical run-off may affect nearby fisheries and directly impact rice paddy fish productivity (Thuok and Sina 1997). Due to a lack of research on this subject in Cambodia, it is impossible to determine whether the levels of agricultural chemical run-off have significant impact on the health of fisheries. However, anecdotal evidence suggests that high pesticide use in some areas affects fish productivity in rice paddies and nearby ponds (Gregory 1997, Shams and Try 1998, Gum 2000).

8.4.9. Reliable data on water pollution is very scarce, but local researchers have found that pesticide use in the Tonle Sap catchment is widespread and increasing every year. The impacts of pesticide use on ecological security have yet to be assessed but are potentially acute. Fish samples taken from the lower Mekong basin have indicated that pesticide residues

are ubiquitous with the highest concentrations in catfish species, one of the most commercially valuable taxa. The widespread use of fertilizers in the dry season could also affect the ecology of the lake, causing localized temporary eutrophication and even fish kill (UNDP, 2001).

8.4.10. **Vietnam** also has very extensive rice cultivation and has recently challenged Thailand as the world's top exporter. However, production is intensive with very high pesticide use and rice fish, rice-shrimp production has no doubt suffered as a result. Other factors are pesticide use for HYV rice production, and low pH in canals during the early rainy season. Along the coast (Long An Tien Giang, Ben Tre, Tra Vinh, Soc Trang, Kiengiang, Bac Lieu and Ca Mau) saline intrusion (in part due to shrimp culture) has reduced rice yields and reduced the catch of wild freshwater fish. Salinity protection interventions are increasing acidification of acid sulphate soils in the dry season, and consequent canal pollution. The less saline, more acidic canal waters affect aquatic resource production and biodiversity, while the reduction in flood due to infrastructural developments has led to increased acidification of soils (see Hashimoto 2001, Minh 2002). This in turn appears to have adversely affected landless labourers and small farm holders who have relied on capture of aquatic resources to supplement their income and food intake.

8.4.11. The full- and part-time fisher groups taking part in the PRAs under the current project identified pesticide use in intensified rice production as one of the culprits for the gradual decline in fish and fish species on the Mekong floodplains over the past 20 years (Country PRA Report: Vietnam, 2003).

8.5. Impact of infrastructural developments on the inland fisheries

8.5.1. The most commented-upon impact by agricultural land use on inland capture fisheries has been on the likely impact of the whole system of human infrastructural disturbance of the floodplains in order to increase agricultural, and particularly wet-rice, production. Agriculture is the major use of the floodplain area, and floodplain development has favoured this use (see Dixon 2000). Due to FCD/I projects for increased agriculture production, some 0.814 million ha of floodplain water area had already been lost up to 1985, and by 2005 a total of 2.00 million ha of flooded area is expected to be lost (MPO 1988) with potential adverse consequence for fisheries.

8.5.2. In the post-liberation period the issue was taken into consideration and a Master Plan Organization (MPO) was established during early 1980s to assess the impact of FCD/I projects and other water management activities on fisheries, navigation, the environment etc. and develop a policy and action plan. Subsequently in 1990 a national water resource policy was formulated and adopted by the Government. Key points relating to the fisheries included:-

- 1) giving due emphasis to fisheries and wildlife in water resource planning in areas where their social impact is high,
- 2) minimizing disruption to the natural aquatic habitat and water channels,
- 3) ensuring drainage schemes avoid, wherever possible, state-owned swamps and marshes that have primary value for waterfowl or other wildlife,
- 4) reserving water bodies *like baors, haors, beels*, roadside borrow pits etc. as far as possible for fish production and development, while maintaining links of the water bodies to the rivers,
- 5) ensuring water development plans will not interrupt fish movement and will make adequate provision in control structures to allow fish migration and breeding,
- 6) discouraging the conversion of water land to agriculture land.

8.5.3. Despite this policy it has proved difficult to enforce. Thus it is suggested that the extent of floodplain fisheries is being reduced due to hydraulic engineering, the reclamation and cultivation of wetlands, drying up of water bodies and use of surface water for irrigation of crops (Hossain et al., 1998a).

8.5.4. Impact of hydraulic structures on inland capture fisheries

Despite the fact that the extent of water bodies acting as fish refugia through the dry season may be reducing due to their draw-down for irrigation purposes, most observer comment has been reserved for the potential negative impacts on the fisheries of hydraulic engineering. The main contention is that where polders have been built to protect low-lying crop lands from flooding and there is poor maintenance and operation of sluice gates, not only are crops at risk of damage through water-logging but migratory fish species are prevented from entering the seasonally flooded lowlands from perennial rivers in order to breed. The extent of the problem is, however, contentious, while the gains to agriculture and other sectors may more than offset the loss to the fisheries. However, which households this is likely to benefit and which may lose out is unclear.

8.5.5. The extent of annual flood inundation in Bangladesh is variable and unpredictable and is the result of spatial and temporal variations in snow melt and the amount of rain falling in the upper catchment areas of the main rivers flowing through the country. In a 'normal' flood season approximately 25% of the floodplain is flooded to a depth of >90 cm at some time during the monsoon, with a further 41% flooded up to 90 cm (FAO/UNDP, 1988). However, simultaneous high rainfall in the catchment areas of the Padma and the Jamuna rivers may result in both reaching peak discharge rates at the same time causing extreme flooding downstream (see Craig et al 2000).

8.5.6. Extreme flooding in Bangladesh frequently damages and disrupts transport and communication systems. In the most severe cases, lives are lost, human health is put at risk as drinking water supplies become contaminated, and homes are destroyed. Many types of crops, and including HYV wet-rice grown on low-lying land, are susceptible to damage from uncontrolled flooding. Given that 85% of the population are dependent on agriculture for a part or whole of their livelihoods, and that almost half of GNP is derived from agriculture, damage to crops caused by extreme flooding presents a serious threat to the welfare of Bangladeshi households as well as to the national economy.

8.5.7. Flood control, drainage and irrigation (FCD/I) engineering projects have provided a means of partially controlling floodplain inundation and preventing extreme flooding, and are said to have contributed to enhanced agricultural yields (Hoggarth et al., 1999a). Between the mid-1960s and 1991 over 7,500 km of embankments, 7,900 hydraulic structures (including sluice gates and regulators), more than 1,000 river closures and c. 3,200 km of drainage channels were completed. Nearly 200 FCD/I schemes cover c. 23% of the total area of the country or 40% of cultivated land. With increasing demand for greater agricultural output and economic stability, more schemes are planned for the future (Rahman et al., 1994; Sultana and Thompson, 1997), with the area under FCD/I schemes projected to increase from 4.35 million ha in 1995 to 5.74 million ha in 2010 (Craig et al).

8.5.8. Unless mitigation measures are implemented and, as importantly, maintained, FCD/I infrastructure may have a negative impact on the productivity of the inland capture fisheries. However, there are alternative perspectives on the impact of floodplain infrastructure. In what follows I draw heavily on the important review by Craig et al 2000).

8.5.9. Scientific perspectives on the impact of hydraulic structures on inland capture fisheries.

Craig et al (2000) suggest that FCD/I schemes may obstruct the lateral migrations of rheophilic whitefish species and the passive drift of larvae from rivers to modified floodplains. However, they also suggests that existing modifications to hydrological regimes probably have an insignificant effect on floodplain fish production although they may cause reductions in catch per unit area and fish biodiversity.

8.5.10. Craig et al (2000) say that there have been many unsubstantiated claims about the effects of FCD/I schemes on the country's fisheries (Halls, 1998). Arguably, the most objective research began under the Flood Action Plan (FAP). As part of the overall programme, a

number of supporting studies were undertaken to address the potential environmental impact that might be anticipated following implementation of the FAP. The most significant of these from a fisheries impact perspective were FAP 12 and FAP 17.

8.5.11. In 1991, under FAP 12, 17 FCD/I schemes of different types located throughout Bangladesh were evaluated using RRA and interview techniques. Reductions in catch rates were reported by fishers both inside and outside the schemes. Thompson and Sultana (1996) found that in 13 of the studied FCD projects (76%), fishers were negatively affected, and in several projects fishers had to become wage labourers due to the reported decline in the fishery.

8.5.12. For the FAP 17 project, in a study at more than 100 sites inside and outside eight FCD/I schemes across the country, and representing four different habitat types was undertaken. However, firm conclusions about the impact of the schemes on the fisheries were inconclusive and often contradictory (see Craig et al 2000, Halls, 1998). On the basis of an 8 year study, G.J. de Graaf, et al (pers. comm.), were unable to detect any significant differences in catch rates before and after the completion of the Tangail Compartmentalisation Pilot Project (CPP) in north-central Bangladesh. However, they explained this as being due to the fact that flooding inside the CPP has been virtually unaffected by existing flood control measures.

8.5.13. Halls et al. (1999) compared relative catch per unit area (CPUA) and production potential for six 'key species' of the floodplain fish community sampled inside and outside a functioning FCD/I scheme. The CPUA was found to be 60-104% greater outside than inside, while growth rates, condition, and fecundity were either significantly ($P < 0.05$) higher inside the scheme, or not significantly different ($P > 0.05$) between the two sampling locations. No significant ($P > 0.05$) differences between sampling locations were detected in length at maturity (L_{m50}), spawning period, or instantaneous total mortality rate (Z). In another study monitoring catches at the same site (Halls et al., 1998; Hoggarth et al., 1999a), it was concluded that whilst some fish were capable of penetrating sluice gates, the lower CPUA recorded inside reflected the areas partial inaccessibility to highly prized migratory whitefish species. In their absence, the composition of species inside the scheme were dominated by much smaller, resident blackfish.

8.5.14. Craig et al (2000) conclude that 'Hydraulic engineering structures are increasingly forming an integral part of the Bangladesh floodplain environment and economy. Although hydrological modifications within these schemes appear to have little impact on the production potential of individual fish, their levées and embankments can significantly diminish the recruitment to modified floodplains of prized rheophilic whitefish species. The effects are manifest in lower catch per unit area and local species diversity, as well as potentially more extreme-flood-prone main river channels. More subtle effects may have been, and may remain, undetected. It is likely that further flood control schemes will be constructed until it is perceived that further improvements in agricultural output and economic stability no longer outweigh the costs of their proven impacts, including those related to fisheries.'

8.5.15. The impact on different livelihoods of this change in species composition and volume of fish on modified floodplains remains unclear. Full-time fishers are primarily fishing to generate income, and a reduction in the number of prized species inside FCD/I schemes is likely to reduce this opportunity (although reductions in volume could be compensated for through price increases due to scarcity, and substitution of greater numbers of lower value fish). Part-time and subsistence fishers may be less affected since they may not have the appropriate gear for catching the higher valued fish species but are exploiting the lower value species which Craig et al (2000) suggest are relatively unaffected by compartmentalisation schemes.

8.5.16. SE Asian concerns about the impact of dams and large hydraulic structures

Dams, more than almost any other type of large infrastructure project, affect people's livelihoods. Dams can improve downstream agricultural productivity through improved and reliable irrigation. However, they can bring about changes to river flow and interrupt fish migrations which can induce changes in fish communities and diminish production. Families living in the irrigation area may be forced to sell their land due to changes in flooding patterns, lack of capital to exploit the improvements in irrigation, or speculative pressure. Upstream from a dam, the creation of a reservoir may submerge thousands of houses or fields and destroy the income generating activities of farmers or fishers.

8.5.17. **Cambodia** Ecological change, due to water infrastructural development in the upstream countries, has reduced the flood in the entire Cambodian inland wetland system, resulting in fish habitat loss.

8.5.18. **Laos** There are concerns in Laos about hydro-power development (with dams likely to displace whole communities and impact on river flow regimes and potentially wild fisheries) (Rigg and Jerndal 1996). However, if Laos is to increase foreign exchange earnings quickly, then hydro-power is an obvious option, and one that the Lao government has opted for enthusiastically. From 1993 the Lao PDR has had agreements with Thailand to supply electricity (1,500 megawatts by 2000) from hydro-electric power development.

8.5.19. The high productivity of the Mekong River System relies on the seasonal inundation of forest and floodplains. Since the early 1950s nearly 6,000 large and small dams have been built in the lower Mekong basin, including thirteen generating an output of 10 MW or more of hydropower. The Government of Lao PDR aims to construct 23 dams by 2010 and the People's Republic of China (PRC) reportedly has plans for twelve more power projects on the Mekong main channel, including two large reservoir projects that may have a significant impact on the downstream flow regime. Furthermore, China is also planning to blast a navigation channel through to Lao PDR- which could have dramatic downstream effects. The cumulative impact of these large hydrological structures on river flow regimes and on inland capture fisheries remains unknown.

8.5.20. There have been various concerns and campaigns related to resettlement, deforestation and environmental changes that are predicted if proposals for 60 dams in Lao PDR are implemented. For example, Usher (1996) has considered the politico-economic factors influencing the evaluation of the impacts of the Nam Theun Hinboun hydro-power project

which led NORAD to conclude that no people's land or homes would be flooded and no serious environmental impacts were expected. This conclusion was disputed by a range of parties. For example, Skoglund, a Swede working for the Mekong committee, suggested that there would be a considerable impact on the fisheries, and that 'this is not just an environmental issue. It's a livelihoods issue, especially for poor people. To destroy that resource is just not acceptable.'

8.5.21. As Usher (1996) points out, the official argument goes that 'some have to suffer for the benefit of the majority'. However, with the dams being built or planned in Laos today, the 'costs' will all be borne in Laos by the environment and rural peoples, while the 'benefits' will be exported to Thailand. Apart from cash, Laos will not gain 'development' in any conventional sense, while it is extremely doubtful that the affected communities and environments will derive any direct developmental benefits at all from the economic returns.

8.5.22. The main concerns regarding fish are that the migrations and complex biology of riverine fish associated with flood pulses will be disrupted, and with them not only the fishery in Lao PDR (including locally important subsistence fisheries in the upland areas – see later) but also that in Cambodia.

8.5.23. **Vietnam** It is certainly the case that there is a considerable amount of FCD/I infrastructure on the floodplains of Vietnam. The country report does not give much information regarding the threat of hydraulic infrastructure to the inland capture fisheries other than to list it as one of a number of possible reasons identified for falling fisheries production figures in the Mekong delta region. These include in poor knowledge in fishery technology, use of harmful gears such as electrical shock and chemicals, use of nets with small size mesh to catch fish in the breeding season, and reduction in recruitment of these aquatic resources due to dams and embankments.

8.5.24. However, the recent construction of the Yali Falls Dam in Vietnam just about 70 km from the Cambodian border has supposedly had negative impacts on the livelihoods of an estimated 20,000 downstream villagers, but has created opportunities for those above the Falls. In addition to flooding impacts from dam releases, villagers report a severe decline in fish stock and serious health hazards (Mckenney, 2001).

8.5.25. **Mekong River Commission** In relation to managing the potential impact of infrastructural development on aquatic resources throughout the Mekong basin (e.g. dams, weirs and particularly large structures associated with hydroelectricity generation), the Mekong River Commission has suggested that the significance of aquatic resources - particularly fisheries - to the region as a whole, to poor people and local communities, and to neighbouring countries, needs to be better reflected in EIAs, social impact assessments, benefit-cost analyses, and policy decisions and basin level negotiations.

8.5.26. **Impact of irrigation water abstraction on inland capture fisheries**

Bangladesh The traditional cropping pattern on the floodplain was to use broadcast-sown, long-stem local rice varieties grown in flooded paddies during the pre-monsoon and monsoon seasons, and dry-land crops such as pulses and oilseeds cultivated in the winter dry season.

The predominant pattern is now based on high yielding varieties (HYVs) of transplanted monsoon-season rice and irrigated HYV *boro* rice in the dry season. The agricultural production pattern has shifted towards irrigation-dependent cropping in the dry season. Shallow and deep tube-wells draw on groundwater for the irrigation water required to support production, while mechanised or manual low-lift pumps draw on surface water in dry season water bodies (Brammer, 1997). Upper groundwater aquifers, however, are hydraulically connected to streams, rivers and water bodies, thus groundwater development affects surface water resources.

8.5.27. It has been estimated that at full groundwater development, 2,305 million m³ of dry season surface water will be lost (Khan, 1993). For example, Barr and Gowing (1998) reported that at a 535 ha *beel* with 90 ha of perennial water, there were 91 functioning tube well pumps used for irrigation and five low-lift pumps, with capacities of about 50 ls⁻¹, drawing directly from the *beel*'s surface water. Low-lift pumping directly reduces the size of dry season water bodies, concentrating fishes, making them easier to catch and stimulating increased involvement in fishing by farmers (FAP 17, 1994a). (There may, however, be some compensatory return from irrigation run-off from water sourced from deep tube-wells). The impact on fish stocks of low-lift pumps drawing water from, and drying out, surface water bodies, however, still needs to be quantified (FAP 12, 1992).

8.5.28. **Laos** is looking to expand its production of wet-rice, and will increasingly be abstracting water from the Mekong in order to do so. (Thailand is planning to do the same in order to develop agriculture in the drier north of the country). This will require agricultural intensification through the development of irrigation infrastructure. This may or may not provide greater opportunity to fish species. According to some commentators (e.g. Nguyen Khoa et al 2003), land use change in rice based farming systems is potentially the largest single threat to fisheries production in Laos. Development of intensive rice farming practices that maintain as much aquatic resource productivity as possible is a key challenge.

8.5.29. Ryder (1996 in Lorenzen et al 2000) emphasises that, 'given the nature of the biodiversity in the Mekong river and floodplain system, and the historical importance of the flood pulse in its evolution, it is vital that this system of flood-pulses is maintained in the light of hydraulic engineering proposals for the basin such as major hydro-electric dams which have been criticised outside Lao PDR on various grounds'. On the other hand, while the flood pulse may be affected (and there are suggestions that this will have impacts on river hydraulics and land and water characteristics in the lower catchment countries of Cambodia and Vietnam), the development of irrigation infrastructure may perhaps extend fish habitat considerably on the modified floodplain and particularly into irrigated rice-fields. Lorenzen et al (2000) have investigated this and the impact of irrigation development on the fisheries in Laos.

8.5.30. Irrigation development is proceeding rapidly, based mostly on small to medium scale schemes. The fisheries impacts of such schemes have been evaluated in a recent DFID project (Lorenzen et al. 2000). Lorenzen et al's assessment is that weir irrigation schemes are associated with a 40% reduction in household fish catches from a non-impacted mean of 30 kg/household/year. (However, this difference reflects a change in fishing effort as well as in resource abundance.)

8.5.31. Dam irrigation schemes are associated with no significant overall effect on household catches in villages in the vicinity of the newly created reservoir. However, catches from floodplain areas declined significantly by 58% from a non-impacted average of 78 kg/household/year. This was largely but not fully compensated for by increased catches from the reservoir. (Again, differences reflect a change in fishing effort as well as in resources abundance.) The relatively moderate net impacts even of significant modifications by dams are likely to reflect the fact that a large share of capture fisheries production in agricultural areas is derived from rained paddies, and these have not so far been modified significantly, even in irrigated areas. Net impacts may be spatially differentiated, and overall negative impacts may occur downstream of the dam where the reservoir is less accessible.

8.5.32. Pump irrigation schemes abstracting from major rivers had no significant effect on catches from the irrigated areas. None of the irrigation schemes had significant effects on fish species diversity. Measured effects on species richness were as follows: weirs -3%, dams +8%, pumps (irrigated area) -13%.

8.5.33. The development of individual, small-to-medium scale irrigation schemes is associated with moderate, but significant negative impacts on local aquatic resources. Nevertheless, fisheries resources can remain productive and diverse and add substantial value to the use of water in irrigation. However, proliferation of small-to-medium scale irrigation schemes may lead to cumulative impacts in excess of those established by Lorenzen et al (2000).

8.5.34. Interestingly, given government (and international concerns) about the reduction of forest areas in Laos through conversion of dry forest to wet-rice land, there is evidence that the building of micro-dams and other alterations to local watersheds, can also perhaps enhance wild fisheries (see Haylor et al 1997:34.). However, given the fact that the majority of rice produced in Lao is upland rained rather than irrigated rice, the opportunities for mitigating forest loss through enhancing wild fisheries may be limited.

8.5.35. **Technical solutions mitigating potential impacts of floodplain infrastructure**

Bangladesh Despite some uncertainty surrounding the impact of hydrological structures on the biological status of the fisheries in Bangladesh, various technical initiatives which seek to mitigate any impact these structures may have on the fisheries have been suggested. Key ones are improved management of sluice gates to assist fish migration and the provision of dry season refugia. Hoggarth et al. (1999a), and Sultana and Thompson (1997), have suggested that fish yield from FCD/I schemes can be increased and biodiversity maintained by simple sluice gate management practices designed to take advantage of the strong migratory tendencies for fishes to enter such schemes and by improving sluice gate design to maximise the passive drift of fry to modified floodplains. Limitations on the use of 'interception' fishing methods at sluice gates were also recommended to ensure escapement of migrating fish onto the floodplain.

8.5.36. Importantly, Halls (1998), has suggested that floodplain fish production is most strongly dependent upon recruitment and therefore on the (density-dependent) survival of the spawning stock, and that this is most sensitive to hydrological conditions during the draw down and dry season period when fish densities are at their highest, although flood season

hydrological conditions become increasingly important with increasing dry season water heights.

8.5.37. These predictions are consistent with those of Welcomme and Hagborg (1977) and suggest that:

- (i) the same yield can be taken under various combinations of high and low water regimes, and, therefore
- (ii) the loss of yield associated with hydrological modifications during the flood season may be compensated by maintaining greater dry season water heights, and
- (iii) the most important measure for increasing yield is the retention of the maximum possible water height during the dry season.

Such measures, however, must ensure that ‘dynamic edge effects’ which are largely responsible for the fertility of the floodplain, are not diminished by creating less ephemeral conditions or larger dry season areas upon the floodplain (see Craig et 200).

8.5.38. In addition, recent research in Bangladesh under DFID’s NRSP (Barr 2000, Barr et al 2000a, b) has taken a more systemic approach to floodplain management which seeks to overcome the sectoral approach to floodplain natural resource management usually taken by government ministries and some primary stakeholders. Here the focus is on working towards integrated floodplain management (IFM) in which the needs of the agricultural and fisheries sectors are both taken into account. With a pro-poor focus, and accepting *in situ* hydrological structures on the floodplain as a given, the study seek to demonstrate that by ‘tweaking’ the timing of flood ingress and egress from poldered areas considerable benefits for the fisheries on which the poor and landless depend for part of the year can be achieved with very little loss to agricultural production. For example, the study models the costs and benefits of retaining flood water for a slightly longer period in poldered areas at the end of the wet season in order to give fish a better opportunity to spawn and grow.

8.5.39. If such an integrated approach to floodplain management is to be achieved, it will require primary stakeholders to resolve conflicts between groups who are in competition over the use of multifunctional resources and agree a way forward. It will also require government ministries and other secondary stakeholders to establish partnerships for supporting them in this. In linking this kind of analysis to conflict management and consensus building methodologies, the challenge will be to ensure that all stakeholders are aware of the likely costs of inaction and the benefits to all to be gained from addressing the problem in an integrated way, and then getting agreement to proceed with an IFM plan (see section 11).

8.6. The impact of introduced exotic species on inland capture fisheries

8.6.1. Cultured fish production has been identified as having potential for maintaining growth in national production and for adding value to rural livelihoods (see Section 5). However, there are also genuine worries that the study countries are focusing too much on aquaculture with its reliance on exotic fish species and that these will threaten the wild fisheries on which poor people depend as exotics escape.

8.6.2. **Laos** Lorenzen et al (1998) have investigated the scale of the problem in Laos and their findings may (with caution) be extended to the other study countries. They note that several exotic species of tilapia and the African catfish have been widely introduced throughout Laos for aquaculture and fisheries enhancement. Some of these have developed self-sustaining populations in the wild.

8.6.3. Impacts of tilapia and carp stocking on the diversity and abundance of wild fish stocks in small waterbodies have been analysed by Lorenzen et al (1998) and Arthur (unpublished). Neither study found evidence of any negative effects of the stocked exotics on native species assemblages. This suggests that the exotic species currently used in Lao aquaculture pose at best moderate risks to biodiversity. (Although some concerns over impacts of cultured fishes were expressed by fishers in the PRAs conducted for the present study).

8.6.4. Lorenzen et al (1998) also note that at present, habitat modifications for aquaculture are insignificant. This may change in the future should aquaculture adoption increase significantly. In which case, the number of escaping exotics might pose a threat to wild fish biodiversity.

8.6.5. **Vietnam** Stocking fingerlings in rivers and lakes, for example grass carp and silver carp in the Red River (the impacts of such public stocking with exotic fishes appear not to have been discussed or assessed).

8.6.6. Impact of aquaculture and ‘privatisation’ of CPRs on livelihoods of the poor

Of potentially greater concern to the livelihoods of the poor in general is the potential impact of aquaculture on their nutritional status. Those involved in aquaculture are primarily concerned with farming valuable fish to meet market demand. There are issues around the expansion of aquaculture on the floodplains. The floodplains are primarily a CPR during the wet season, and the poorest rely on harvesting the aquatic resources they contain (particularly ‘trash’ species) as a subsistence expenditure-saving strategy when alternative opportunities are at a premium. There must be concerns that aquaculture expansion on the floodplains will erode poor people’s rights and their access to the CPR, despite government wishes for more community-based natural resource management.

8.6.7. As Haylor et al (1997:34) have noted for southern Laos, the conversion of dry forest to wet-rice land through the building of micro-dams and other alterations to local watersheds can enhance wild fisheries through the extension of habitat. The conversion of ‘waste land’ to wet-rice agricultural land has been an ongoing trend throughout the study countries over the past century. This potentially has increased the overall habitat for inland wild fish species.

8.6.8. However, both in new locations for wild fish and in older areas of irrigated rice, the gain for the inland capture fisheries may be temporary unless other factors intervene. Due to a variety of pressures, the direction of change is from forest to rice field. Where the latter are irrigated, there may be a tendency towards intensification of fish production, though there is little evidence for this in Laos. However, intensive cultivation of high yielding rice varieties is probably largely incompatible with any intensive form of fisheries production, due to low

water levels and high agrochemical use. Thus while Haylor et al (1997) note that in one of their study villages, a newly established one, 'wild fish availability from the dry forest area (10km from the nearest permanent river) is low but appears to be increasing as the result of micro-watershed development around the village', Meusch (1996) notes that in one of his study villages, an older established village, farmers reported a decrease in wild fish availability over the past two decades from paddies and other water sources.

- 8.6.9. Again, the pressure on wild fish in rice-fields is likely to increase as farming systems are adapted to 'semi-intensive' and 'intensive' cultured fish production, since farmers are likely to erect perimeter netting to protect their investment by excluding wild piscivorous fish which predate on stocked fish – particularly while they are still young (Haylor et al 1997). There may well remain wild fish 'sanctuary' rice fields scattered among netted fields stocked with cultured fish. Farmers consulted by Haylor et al (1997) suggested that while rich and middle-ranked people have more land which is better suited to intensive fish production, not all of them would be interested in this strategy due to the attractions of business which was less risky. However, such 'sanctuaries', being open-access, are likely to be under considerable pressure from opportunistic fishers, since the owners of netted and stocked rice-fields will deny them access to theirs.
- 8.6.10. Aquaculture is important to Laos in terms of potential future overall production and it has received much attention from DLF. However, in terms of importance to the livelihoods of the poor, while aquaculture development has been a major focus of national and international fisheries development efforts in Laos, the overall importance of aquaculture to fisheries production and the livelihoods of the poor have remained limited. In a survey in Savannakhet province, only six percent of households considered themselves fish farmers, cultivating ponds of an average area of 0.12ha. Production from aquaculture was estimated to contribute 2-10% to total fish catches in the study area, with the bulk of fish production being based on capture fisheries (Lorenzen et al. 2000).
- 8.6.11. A recent fisheries survey in Luang Prabang Province carried out by the Living Aquatic Resources Research Center (LARReC) 72 % of all the households in all the surveyed villages were engaged in capture fishing and the collection of aquatic animals. In contrast aquaculture was not as important as capture fisheries. Only 2% of households ranked it at all as important for food, and only 0.5% of households for income. (The Country PRA Report: Laos 2003, Table 2 confirms this.) Reasons for this are the limited number of poorer people who have ponds and the capital costs of managing aquaculture, which tend to put it beyond the reach of the poor. As Lorenzen et al. (2000) note, when comparing socio-economic indicators between adopters and non-adopters of aquaculture it is likely that aquaculture is more readily adopted by households that are already better off.
- 8.6.12. The contribution of aquaculture and culture-based fisheries to total fish production in Laos is officially given as 22 %, but this may be a gross overestimate. The above household surveys in different rural areas of Laos yield a consistent estimate of about 2% of households engaging in private aquaculture, with an average pond size of 0.12 ha. Scaled up to about 1 million households, this gives a pond area estimate of just 2400 ha which, with a realistic average production estimate of 650 kg/ha/year gives a total production of no more 1560 t. Official production estimates for culture-based fisheries appear to be equally optimistic.

While the precise contribution of aquaculture and culture-based fisheries is subject to debate, it is clear that capture fisheries account for the bulk of aquatic animal production in Laos (Lorenzen et al 2000).

8.6.13. The production figures for inland capture fisheries and aquaculture in Laos and Vietnam show the dramatic increase in tonnage which can be achieved from the latter sector. It may be thought this might reduce some of the pressure on the wild fisheries, leaving more of this resource for poorer people as those with ponds and closed water-bodies intensify aquaculture there. However, Lorenzen et al (2000) suggest that the effects of aquaculture adoption on household fishing are marginal. Adopting households reduce total (pond and open water) fishing effort significantly by about 31%, and increase total catch slightly by 17%, leading to a large effective increase of CPUE by 105%. Hence adopters gain primarily in labour use efficiency rather than total quantity of fish produced (and consumed). Adopters reduce fishing effort in open waters significantly by 36%, while maintaining catches almost unchanged and again gaining in labour efficiency. This suggests that adopters become more selective in their open water fishing, concentrating on activities that provide good returns to labour and harvesting from their pond at other times. Overall, however, adopters do not significantly reduce their harvest of wild fish.

8.6.14. **Vietnam** Aquaculture has also become an importance sector in Vietnam. Aquaculture is very well developed with 407,000m tonnes reported national production in 1999. The Government has taken a number of measures to support aquaculture development as it recognises the contribution of aquaculture to poverty alleviation and rural development; but has tended to ignore inland capture fisheries. In Vietnam the potential area for planned aquaculture development is estimated at 1.82 million hectares including one million hectares of freshwater, 375,500 hectares of brackish water and 445,000 hectares of marine water. The potential capacity of domestic aquaculture production is 3.5 million tons per year, of which 30-40% is used for export.

8.6.15. The HEPR strategy recognizes that ‘aquaculture can be an entry point for improving livelihoods, planning natural resource use and contributing to environmental enhancement,’ but that the inland fisheries are still of major importance to livelihood of the rural poor.

8.6.16. The Ministry of Fisheries (MOF) played a limited role in the first decade of the HEPR strategy, but in 2000 MOF hosted a Scoping Meeting on “Sustainable Aquaculture for Poverty Alleviation” (SAPA) which was attended by representatives from many ministries, as well as provincial government agencies, people's organizations, and international organizations and donors.

8.6.17. The meeting identified several key issues including: the need to build a poverty oriented approach to policy involving better understanding of the livelihood goals of poor people as a basis for identifying aquaculture interventions; the poor technical knowledge base amongst practitioners; weak capacity among institutions at all levels; poor infrastructure and the importance of cooperation among agencies involved in implementing and supporting poverty alleviation through aquaculture (MOF, 2001).

- 8.6.18. There are different opportunities for aquaculture in different regions of Vietnam. In the mountain regions where wild fish stocks have declined but water is stored in reservoirs, poor people stock fish and are reducing their vulnerability to crises and improving their food or financial security (DFID 2000c). In the Mekong delta area, frequent flooding makes it essential for farmers to elevate land for housing and crops giving rise to ponds and canals and rice fields and aquaculture is practised in these by 60-70% of households.
- 8.6.19. Aquaculture has potential to provide high returns to those who engage in it. The issue as concerns poverty alleviation is whether the poor have access to waterbodies and can afford to invest in this technology. In terms of government's concerns not to allow economic reform to lead to social inequality, there is some indication that more intensive aquaculture systems such as coastal shrimp farming have caused inequality (DFID, 2000c). Presently the wild fishery, both inland and coastal, is of greater importance than aquaculture to the poor (cf. Wysocki and Friend 1998). Additionally, while poor people have generally not benefited from aquaculture extension, the view is that they have tended to become more reliant on wild aquatic resources as a result of indebtedness, landlessness and displacement. Given this the inland capture fisheries take on greater significance in securing the income and dietary well-being of poor and landless Vietnamese, while threats to the sustainability of the resource will need to be identified and dealt with urgently.

9. Threats to the fisheries: fishing effort

9.1 Impacts of fishing effort on the inland fisheries: Bangladesh

9.1.1. If the resource is declining, this would be a significant threat to the livelihoods of all who have some dependence on the resource, and particularly to those of poorer people who rely on the fisheries and other LARs for subsistence, for income generation and as a reserve of last resort. Overfishing is frequently identified as depleting the resource. But is there overfishing and is the resource declining? There is considerable uncertainty about this, due to difficulties/inadequacies in collecting data on catch and the monitoring mechanisms used. Certainly there are many anecdotal references in the literature to overfishing and worries are expressed at local level and by environmentalists to the effect that floodplain fisheries are being depleted.

9.1.2. **Bangladesh** Bangladesh's National Environmental Management Action Plan (NEMAP)(1995) estimates that floodplain fisheries have been reduced by about 70% in recent years. Fishers frequently report that catches are declining, as is the size of the fish caught. Given growing populations and increasing numbers of fishers, the pressure on the resource is certainly increasing, and individual fishers' catches may be declining. However, overall production from the fisheries is still increasing in response to demand for fish, while the trend in the fisheries is for further commercialisation. One suggested scenario is that at some stage, if not already, the fisheries could collapse.

9.1.3. However, as Halls and other have indicated for Bangladesh, and which may be true for SE Asian floodplains too, due to the dramatic seasonal shifts in fish habitat, the high growth rate of floodplain fish and their high annual mortality rate are natural features of most floodplain fish species, though not necessarily all. Thus fishing effort may have little impact on the long term viability of the stock, so long as sufficient survive to breed the following season and repopulate the floodplains. As Craig et al (2000) and others have indicated, other factors which interfere with this part of the lifecycle of floodplain fish species, for example infrastructure which interferes with fish migration, may have a greater impact on long term sustainability of the resource than fishing effort.

9.1.4. **Bangladesh** DOF has maintained records of fish production of inland and marine water since 1960, estimated on the basis of per capita fish consumption obtained through national nutritional surveys conducted in 1962-64, 1975-76 and 1980-81 in conjunction with DOF field experience, until 1983-84 when a fishery statistical system was developed under the FAO/UNDP financed Fisheries Resources Survey System Project.

9.1.5. A review of existing literature and secondary stakeholders discussion, suggests that the inland capture fisheries are declining (see Country Status Report: Bangladesh 2003). However, according to DoF's estimates they have been increasing since 1990. The reasons for this contradiction is unclear. However, it may be that total catch is increasing due to increased fishing effort although the catch per unit effort or per fisher is decreasing, or it may be that the recorded increase in catch is due to weak and old data base and a faulty data collection system. This is a weak area in inland fisheries management which needs to be

addressed properly. The present fisheries data base and data collection system and the reliability of the data have been questioned by different agencies and the need for a strong fisheries data base and statistically sound data collection system have been suggested.

9.1.6. Certainly Craig et al (2000) conclude that

‘Whilst catch trends alone cannot always be relied upon to determine the exploitation status of fish stocks, the national catch statistics appear to offer little support to the widespread notion that Bangladesh fisheries are overexploited. With the exception of the main rivers, catches from other sectors (including total inland catches) are, based on the statistics, increasing or remaining relatively stable. The accuracy of the national statistics, however, is questionable, and the results of biological assessments suggest that many stocks exhibit extremely low annual survival rates. However, by combining the catches of many different species in a single ‘other species’ category, the national statistics may also be concealing the extinction of certain fish species or the effects of ecosystem overfishing.’

9.1.7. Two implications may be drawn from the above:

9.1.7.1.a) **for livelihoods.** Restrictions on catch effort may make little difference to the long term viability of the resource, but will have a negative impact on livelihoods of both f/t and p/t fishers, and may reduce the total catch available for consumption by the population as a whole.

9.1.7.2. Interventions designed to improve recruitment, to enable longer growth periods for fish, and to enable a proportion to survive to the next season – that is better management of fishing seasons and of refugia - may achieve the long term sustainability of the resource with a much reduced impact on livelihoods. There is evidence from Laos for example (see Lorenzen et al 2000) that total catch by those who fish for longer but slacker periods and those that fish for shorter but more productive periods differ little. In the absence of alternative livelihood strategies, subsistence farmer-fishers tend to fish over longer periods (with a lower return to effort than those who fish only during the most productive season), and will continue to do so. However, as national economies grow and diversify, and as opportunities for other livelihood strategies increase and subsistence strategies decline, fishing effort is likely to become concentrated in those seasons which give the most return to effort.

9.1.7.3. However, there is also a need to look very carefully at which stakeholders are most likely to benefit from particular interventions. Just as some interventions (such as FCD/I) have favoured farmers over fishers, so there is the potential for some interventions in the fisheries sector to favour wealthier groups over poorer ones.

9.1.7.4. For example, Hoggarth and Kirkwood (1996) investigated the effects of four management strategies (a 50% reduction in overall fishing effort, a closed season during the high water period, an increase in mesh size and a ban on gillnets) on the catches of different species using different gear types. It was predicted that management strategies would give substantial re-allocations of yields between gear types. All four strategies benefited the brushpile (*katha*) fishery operated by wealthier fishers with land for their

katha considerably more than the gears typically operated by poorer fishers such as push-nets and hooks. The high water closed season was found to particularly benefit *katha* and the de-watering gears used during the dry season. The reduction in effort gave rise to increased catches of larger fishes (mostly by brushpiles and large hooks) but reduced the catches of smaller species of fishes taken by seines and push nets. The gillnet ban was found to almost double the catches of the *katha* fishery, but gave far fewer benefits to users of other gears (traps and push nets), typically poorer fishers.

9.1.7.5. Due to the balance of benefits to some gears and losses to others, however, no overall gains were achieved from any of the four strategies. It was concluded that management tools might thus be used to redirect benefits to preferred gear or fisher socio-economic categories, rather than to increase overall yields (see Craig et al 2000).

9.1.7.6. Such a conclusion also suggests that while the monofilament gill-net receives considerable condemnation from commentators as a major cause of overfishing, this opprobrium may be misplaced. While it does catch small (undersized?) fish, these nets are mostly used by poor small-scale fishers while their catch, according to Hoggarth and Kirkwood's (1996) argument, would otherwise be caught by more professional gear (such as barrier nets) or aggregated in *katha* – both of which are usually owned by wealthier people.

9.1.7.7.b) **for monitoring the status of the resource.** There is a need for more research to understand the nature of the resources (fish ecology), and the complex interactions of the different fish species with the environment and with each other, a need for better mechanisms for monitoring the status of the resource, and a need for further investigation as to which interventions are best likely to conserve the resource with minimum negative impact on livelihoods of the poor. This will also require improvements in monitoring practice in order to get a better grasp of the impact of different interventions and mechanisms potentially impacting on the resource, only one of which is human fishing effort, together with a better understanding of which stakeholders are most benefited by different interventions.

9.1.7.8. For example, in Bangladesh prior to 1984, fisheries production was estimated from per capita fish consumption and population numbers derived from the national population census, but are now monitored through the Fisheries Resources Survey System (FRSS). The Bangladesh FRSS entails a main river and floodplain two-stage stratified surveys where both catch and effort are sampled in space and time and then raised using information on the numbers of boats or fishing households at each village and, for the fishery as a whole, collected during the frame survey. Catches from *beels* are sampled only during the draw down and early dry season period between December and February to provide estimates of catch per unit area (CPUA). Total annual *beel* catch is then estimated as the product of the mean sample CPUA and the estimated total area of *beel* habitat (see Craig et al 2000).

9.1.7.9. The frame survey has been criticised on the grounds that it requires updating and that existing sample sizes are generally inadequate. Information provided by the FRSS has been criticised for being incomplete, inconsistent, inaccurate and outdated (World Bank,

1991), while it has also been suggested that the output should be more timely and orientated to providing more relevant information if it is to be of use for management and planning (FDL, 1994). As Craig et al 2000) note, due to a combination of factors including lack of resources and capacity to apply them as well as the inadequacy of existing models for describing dynamic multi-species floodplain fisheries, technical management models such as surplus production or yield-per-recruit, are rarely applied in Bangladesh to identify optimal harvest strategies.

9.2. Impact of fishing effort in the SE Asian countries

9.2.1. **Cambodia** The PRAs suggest that the fisheries are being degraded. The main reasons given in the literature for degradation are poverty which prevents poor people complying with the law, poor enforcement of fishing regulations, and people's lack of knowledge of the situation throughout the country. There is a considerable problem of illegal fishing and of conflict between fishers groups and between fishers, lot owners and other stakeholders.

9.2.2. **Laos** Respondents in the current project's PRA exercises state that the number of fish species, and particularly high value species, has declined in the last 20 years. 'According to the part time fishers, big fishes are now almost disappeared from the rivers. Number of cultured fishes in the water bodies have increased. These fishes are occupying the niches of the other rare or extinct fishes. The overall earning of the fishers have been decreased. Some of these part time fishers were full time fishers before.' Causes of fish decline cited include the use of pesticides, harmful gears and the catching of brood fish during the breeding period (Country PRA Report: Laos, 2003, text and Table 12).

9.2.3. It is important to note that the pressures bearing on the fisheries have changed. Traditionally, Fishing was conducted almost entirely for subsistence purposes, with the exception of a small amount of barter trade for certain high quality preserved fish like "*some pa eon*" and "*pa chaos*" (Baird et al. 1998a). However, the NEM reform programme, the increased availability of new technology (such as mono-filament gill-nets, motorised boats and ice-coolers), and particularly the opening up of market-links to the provincial capital and to Thailand, have led to a shift from subsistence to commercial fishing. A significant number of Lao households, particularly Lowland Lao close to the Mekong and its tributaries, now depend on fish sales for a considerable proportion of their income. As Baird (1999) notes, in southern Laos 'changes were occurring rapidly, and while most villagers were becoming aware of the over harvesting problems facing their fisheries, only limited action had been taken to reverse the perceived downward trend in aquatic animal populations.'

9.2.4. Commentators note that the level of fisheries exploitation is generally very high, although there is a great deal of local variation (driven largely by population density relative to the extent of local water resources). As elsewhere, the fishery is inherently multi-species and multi-gear, exploiting virtually all fish species as well as various invertebrates. Garaway (1999) and Lorenzen et al (2002) have demonstrated that relationships between catch and effort show the asymptotic pattern typical of aggregated catch-effort relationships in multi-species fisheries, where a constant level of catch is maintained over a wide range of high effort levels. However, both suggest that the constant catch is likely to mask a change in

species composition from larger and higher value species to smaller, low value species with increasing effort.

9.2.5. Thus aggregate natural fish stocks may be declining due to a range of unfavourable human-induced disturbances including deforestation in the upland, water pollution and dam construction (Phonvisay 1994). Cavas (1994) suggests riverine fisheries have declined by up to 20%, while Phonvisay (1994) suggests production in lakes and reservoirs declined by about 60% between 1980 and 1994. However, there are no convincing data to support the widespread assumption of an overall decline (see Lorenzen et al 2002). Catch per fisher may have declined as the result of increased numbers of fishers exploiting the resource, but overall catch has been maintained or has increased (which may suggest that optimum off-take levels have not yet been reached). However, since fishery statistics do not record the catch landed by species, it is not possible to say whether fishing effort is changing the composition of species in the fishery.

9.2.6. However, as in Bangladesh, so there are uncertainties in Laos about the quality of the data. In **Lao PDR** the fishery statistics system is a part of the agricultural statistical system, which is derived from different statistical agencies whose primary functions are generation, processing, analysis and dissemination of official statistics. Government agencies of different institutional levels are involved in the generation of fisheries statistics. There are constraints in generating appropriate fisheries information. These include:

- lack of guidelines and incentives to enumerators to produce reliable data,
- data generated are not used in an efficient manner, and
- limited human resources capacity and know how on data collection and gathering.

Because of the lack of reliable information, aquatic resources are under-evaluated by policy makers. This raises the question as to the sustainability or not of aquatic resources that are being exploited, since changes in water and land use may be promoted by government in ignorance of the significance of associated losses in aquatic resources to livelihoods of the poor (Country Status Report: Laos 2003).

9.2.7. **Vietnam** National statistics indicate that fish production from natural sources is falling gradually, and this may indicate that there is over-exploitation of the resource. Indeed many writers suggest that this is so while also cataloguing the harmful fishing methods (gill nets, explosives and the like) which they take to be responsible. 9.2.7. However, biophysical factors such as land conversion, irrigation infrastructure and the like may have a greater impact. Additionally, national production figures may mask changes in fishing effort that may be taking place. Thus as Vietnamese households becomes wealthier and can afford the technology, there may be a trend by households to switch from exploiting the wild fisheries to aquaculture which can give higher returns for less effort. Certainly as production from the inland capture fisheries has declined, so production from aquaculture has soared (see Section 5).

9.2.8. **The status of the fisheries in SE Asia**

In the absence of detailed research into the impact of fishing effort on the inland capture fisheries in study countries, the best guide to their status is currently likely to be catch statistics. However, where there is a decline in annual catch (as in Vietnam), it is necessary to

separate out whether the decline can correctly be attributed to fishing effort (i.e. overfishing) or to other causes. The work by researchers such as Halls and Lorenzen and their collaborators has indicated that attribution can be complex, not least because fishers and other stakeholders make subjective evaluations of fisheries status and probable impacting factors and because fishing effort in particular is subject to subtle socio-economic influences.

9.2.9. However, in assessing the status of the fisheries of the SE Asian countries, it is worth keeping in mind Craig et al's (2000) conclusion that 'Whilst catch trends alone cannot always be relied upon to determine the exploitation status of fish stocks, the national catch statistics appear to offer little support to the widespread notion that Bangladesh fisheries are overexploited' At present in Bangladesh, Cambodia and Laos, production from the inland capture fisheries is still increasing. Only in Vietnam is production falling, but the reasons for this are complex and may not necessarily indicate that overall fish stocks are falling.

9.2.10. Finally, while the evidence presented above suggests that the fisheries as a whole are still sustainable in the study countries, it says nothing about changes in species composition. To quote Hoggarth et al (1999) 'Asian fisheries are highly productive, with average catches around 100kg per hectare of floodplain. Surprisingly, this overall catch rate is not strongly affected by the amount of fishing. Though heavy fishing may over-exploit certain species, these may be replaced by other members of the multi-species stock...Heavy fishing of floodplain fish stocks thus mainly affects the *species* of fish caught, not the total weight of the catch.'

9.3. Human impact on the sustainability of other LARs

9.3.1. In the case of other LARs, there does appear to be clearer cases of over-exploitation, although attribution to human collecting effort rather than other causal factors may still be uncertain.

9.3.2. For example, some species of aquatic resources (e.g. frogs) have shown a decline in **Bangladesh**. Frogs legs, mainly of *Rana tigrina* collected from the wild, were extensively exported during the mid-'70s until 1990 when their collection and export was banned due to an apprehended decline in their population. Thousands of poor rural people were engaged in frog collection and trading at that time, while at its height the strategy made a small but significant contribution to rural livelihoods (particularly those of women and the landless). (A decade has already passed after the ban but the frog population has not re-established itself. The reasons for this are still unknown.)

9.3.4. Again, different varieties of snails are available in the inland and marine water of Bangladesh. Inland snails are mainly used as duck-feed, while recently snail's meat has been extensively used as feed in shrimp farms. Snails are collected by poor people, and this has become a good source of income of them. However, there are concerns that this extensive collection of snails may lead to extinction of the resource.

9.3.5. In **Cambodia** the rare water-birds of the Tonle Sap are said to be seriously threatened by hunting and egg collection for food. Rural communities also harvest large numbers of water snakes in the wet season, and Stuart *et al* (2000) question whether this exploitation is sustainable and what indirect economic impact this might have from increased rodent numbers. Freshwater turtle populations are also exposed to intensive exploitation for local subsistence and to supply the Chinese food markets. Many globally threatened species of turtle inhabit Cambodia's inland waters, and populations of these turtle species throughout the region have declined substantially in recent years.

9.4. Mitigation of fishing effort

9.4.1. A major driver to potential over-exploitation is the commercialisation of any resource (and including the fisheries) brought about by market access. With increasing demand for fish from growing populations and improving infrastructure, pressure on the resource is set to intensify. Given that the fisheries have historically generated revenue for study country governments, the latter have naturally been keen to ensure that the resource is not over-exploited.

9.4.2. Whether or not fishing effort is currently a threat to the sustainability of the resource, all study country governments have historically perceived it as a threat and have sought to mitigate its impact. The strategy for this has generally been through central government's promulgation of regulations governing resource exploitation. Thus stipulating who can fish (thereby theoretically excluding large numbers who might fish and whose livelihoods could benefit from the fishery), and stipulating where, when, with what, for how long, and with what effect these rights holders may fish (regulating fishing seasons, gear type and net size, rights holders and so on (as encapsulated in Cambodia's 'burden book').

9.4.3. These fishery regulations have changed over the years in all study countries in response not only to the perceived state of the resource but also in response to governments' changing policy goals. The current trend is to move away from central management of the resource with gains for national production and revenue, to more devolved management (including CBFM) with gains for poverty alleviation. It is understood that with the development of markets and with demand for fish likely to increase, management of the resource will still be necessary to ensure its sustainability, but that that this may best be done through co-management arrangements which exploit the strengths of local knowledge and management expertise supported by the state.

9.4.4. Devolving management should entail a wide-ranging review of inland capture fisheries' regulations to determine which need to be established on the national level and can feasibly be enforced, and which are best left to local management bodies. The questions must be: How necessary are current regulations, given our greater technical knowledge of the dynamics of floodplain fisheries and the pressures impacting upon them? Are the regulations a constraint to access by the poor to the opportunities that the fisheries represent?

- 9.4.5. Regulations, historically geared to national production and government revenue needs, tend to seek to restrain the amount of fishing in order to improve the types of fish caught and the overall value of the catch. However, given that present policy goals are directed to providing greater opportunity for poor people's livelihoods, and given that heavy fishing of floodplain stocks does not presently affect overall production but may reduce the catch of more valuable species (since these are usually the first to decline), there is no reason for regulations to be continued in their present form. That is there needs to be greater flexibility in the setting and enforcement of regulations so as to match them to local context and local need. There is no reason why, for example, there should not be a mix of use rights which enable a variety of poor user groups to exploit the resource according to the gears they can afford, and limiting off-take by those who can invest in the most productive gears, while ensuring equitable access and ensuring the sustainability of the resource.
- 9.4.6. Nevertheless there are specific aspects of fishing effort which can threaten the sustainability of the resource by threatening recruitment. These mainly relate to specific types of gear in specific locations at specific seasons. In particular 'barrier' gears set to catch fish as they migrate onto the floodplain at the beginning of the wet season and migrate off it as the water level drops again, and 'hoovering' gears used to take all fish stranded in dry season waterbodies. The threat of these is clearly laid out in Hoggarth et al (1999), and as the latter say 'Managers must ensure that barrier gears do not prevent the upstream spawning migration of whitefish, and that hoovering gears do not catch *all* the blackfish during the dry season.' However, given the high natural mortality rate of most species exploiting the floodplains (as noted for example by Craig et al 2000), there should be opportunities for developing fisheries management which exploits the high productivity of the fisheries while ensuring the survival of a proportion of adult stock to secure high annual recruitment levels. Some of these mitigation measures (controlling dewatering, the use of explosives, poisons and electric fishing; establishing fish refugia, establishing fish passes and so on have already been discussed).
- 9.4.7. Given the discussion in the preceding sections concerning the likely and potential impacts of different pressures on the fisheries, there is a need for information sharing between and with the various sectoral bodies governing floodplain resource use and local management bodies (such as communities). In particular all need to be aware that the impact of a range of activities (loss of access to spawning and over-wintering habitat, water pollution and so on) may be more detrimental to the sustainability of the resource than fishing effort.
- 9.4.8. The challenge will be to allow local communities to manage the resource without undue interference from government – that is to trust them to manage the resource responsibly and sustainably – while ensuring that use rights are apportioned clearly. This will require that management bodies have an incentive to manage responsibly, are supported in their needs for information and other inputs and in their enforcement of local regulations, and that mechanisms for resolving conflicts over natural resources are put in place and are effective (see Section 10). Governments will also need to ensure that local management bodies are addressing national environmental and social development goals (i.e. poverty alleviation), and that the value to be obtained from the resource is not captured by elites.

9.5. The role of local knowledge

9.5.1. Hoggarth et al (1999) spell out a number of management implications of floodplain environments, some of which need to be dealt with at the catchment scale and others which can be dealt with at local level. These include the need:

- for managers of fisheries and other floodplain resources to discuss their impacts on each other (ie. to collaborate),
- for impacts of floodplain modifications to be assessed and managed at both catchment and local scale,
- for local management because of the variability in habitats between localities,
- for flexible management regimes because of the uncertainty in hydrological regimes,
- to ensure floodplain diversity is maintained so that high fish biodiversity is sustained,
- to ensure river channels are maintained for fish migration and access to spawning grounds.

9.5.2. It is the variability in fish habitat, in the different structural disturbances on the floodplains, and in the socio-economic circumstances of user groups, and the uncertainty of hydrological regimes, which makes flexibility in management so important to success. Local knowledge of local context is a key strength in dealing with variability and uncertainty.¹⁴

9.5.3. For example, in **Laos**, within the main river channels, certain sections are better suited as dry season fish habitats than others. In particular, deeper sections of the river are used by a large number of species during this period of the year. The importance of these deep pools is already recognised by local fisher communities who sometimes impose harvest restrictions upon them (see Baird 1999), and there have been local initiatives to develop and expand such networks. This means that dry season fish habitat in the riverine system is critical and any changes that would reduce these pools or intensify fishing effort are likely have an impact beyond the locality and affecting the whole of the fishery. Fisher communities can manage exploitation of these locations by those within their communities, but find it more difficult to manage that by outsiders who may have powerful patrons. In short, there is competition between user-groups over the resource which can lead to overfishing and/or capture of the value of the fisheries by powerful elites. (See also comments by respondents at the Great Lake survey site in Cambodia that it was difficult to deal with the fishing pressure by seasonal migrants to the lake – Country PRA Report; Cambodia 2003).

9.5.4. **The Laos** Country status report also notes that ‘A good example of progress in management approaches in the Mekong is afforded by the relatively successful application of the use of local ecological knowledge in research and policy formulation. This has led not only to cost-effective means of obtaining information but also a much greater general recognition of the value, extent and relevance of the local knowledge of natural resources

¹⁴ For an detailed exposition of fishers’ indigenous knowledge about fish species and ecology see Alam M. xxxxx . For a more technical approach see Halls et al (2000)

held by rural communities. This includes not only knowledge regarding livelihood-related information, but of natural history and biodiversity in a more general sense. Although these approaches have yet to lead to actual improved management, they are certainly making a significant contribution to management information. Additionally, and perhaps more importantly, the approach is also laying better foundations for the participation of resource users in future resource co-management systems.’

10. Threats to livelihoods of the poor: competition and conflict management

10.1.1. While overfishing can impact on the livelihoods of all those who gain a benefit from the resource, whether food or income, a reduction in the resource can impact on different groups in different ways. In **Bangladesh** for example, larger fish are usually marketed and form a part of full- and part-fishers income-generating strategies, while smaller fish, shrimps and the like may be sold or may be kept for household consumption. For those with simple gears almost all their catch is such 'trash' fish, and is an expenditure saving strategy. Shifts in the availability and market price of different fish species, perhaps due to the substitution of smaller varieties for larger ones as the latter become scarcer, can lead to a reduction in the volume of fish in the diets of poor people as more fish of the species the poor depend on are marketed.

10.2. Competition between users in different resource sectors

10.2.1. Competition for use of the floodplain centres on two main areas of water management: the use of surface water for irrigation of crops in the dry season, and the control of flooding in the monsoon season. Surface water bodies are no longer of interest only to fishers and there is competition for water resources between surface water irrigation and fishing. Where the resource is scarce, as in the dry season, competing demands for water can result in conflict, denial of traditional access rights, diversion of water and control of the resource by powerful and influential sectors of the community (the impact of water abstraction for irrigation during the dry season has been discussed in Section 8).

10.2.2. **Bangladesh** The Bangladesh government's intention since 1974 has been to ensure national food security through intensifying wet- rice production (see Dixon 2000, Craig et al 2000). With government and donor bodies subsidising intensification, this has led to heavy investment in new rice technologies (HYVs) and the associated technologies and infrastructure required to support them. Bangladesh has been successful in achieving food grain self sufficiency but this has been at the expense of increasing competition between groups over floodplain land use during certain periods of the year, and over water use during the dry season, and has potentially been at the expense of the fisheries which provide the main source of protein in people's diets.

10.2.3. Meanwhile the change in cropping pattern associated with agricultural intensification has also impacted the fishery through its effect on the labour market. The traditional, rain-fed cropping pattern provided little labouring work during September-October and January-March; for many the September-October period was a period of particular distress and famine. The shift to irrigated dry season rice cropping has provided an increased demand for labour during December-February (transplanting) and April-June (harvesting and processing), both of which complement the main fishing season. The harvest period for broadcast monsoon season rice is now less important, leading landless labourers to seek fishing opportunities at this time, which is the peak of open-access fisheries, when the flood is receding (FAP 17, 1994b), thereby resulting in increased pressure on the floodplain fishery

and increased competition between full-time fishers and part-time fishers (landless labourers) and those who may be moving into the fishery more permanently (Barr et al xxx).

10.2.4. Who gains and who loses?

Bangladesh Government subsidisation of agricultural intensification has tended to favour those who have access to land. Except for those with tiny plots of land (the near-landless), those with land can be regarded as 'non-poor' in terms of Bangladesh national indicators of well-being, (the extent of land-ownership equating closely with wealth-status. While government subsidies have now been discontinued, agricultural intensification now has a momentum of its own which better-off landowners will naturally be unwilling to compromise. Meanwhile the poor, while deriving employment benefit from agriculture and associated service industries, are increasingly dependent for part of the year (the wet season) on other livelihood strategies for food security and economic survival. One of these livelihood strategies is fishing (Barr 2000, Dixon 2000).

10.2.5. Given the shifts in cropping patterns and associated seasonal labour regimes, it is not surprising that there are reports of conflict between land-based producers, whose goal is to increase the area of flood-free cropland, and those whose production systems are primarily or partially based on aquatic resources. Fishers and boatmen the groups are the groups most commonly affected by the negative impacts of FCD/I schemes. In the FAP12 studies, all FCD/I schemes except submersible embankment types were found to have reduced access to subsistence fishing in open water bodies, yet the numbers of landless people entering them were found to have increased by at least 50% over the past few years. These schemes also affected the livelihoods of f/t fishers so that many were seeking other forms of work, at least on a part-time basis, while up to half had withdrawn from full-time professional fishing entirely. The studies did recognise, however, that this impact was partially mitigated by a modest increase in agricultural labouring opportunities (FAP 12, 1992).

10.2.6. The majority of those who make a living on the floodplains depend on a combination of aquatic and terrestrial production. Nevertheless, since the landless poor are normally dependent on aquatic resources for at least part of the year, they need to have access to these at that time. However, being poor (and perhaps Hindu) full- and part-time fishers normally lack the political and social capital to stand up to the dominant land-owning (Muslim) majority. Thus, there is the threat of the loss of access to CPRs by the poor as more powerful rent-seeking groups appropriate them for their own use.

10.2.7. In Bangladesh, agricultural land is held under private title (while it is above the flood), but when it is submerged to a depth of more than knee-height it becomes a CPR in which (if it is not leased as a *jalmahol*) anyone can fish. Additionally, even on shallow-flooded land that remains private property but where the owner is not utilising the aquatic resources, poor people can harvest these resources. However, as the value of the fisheries rises, land-owners often use various devices (*Katha*, brush piles) to concentrate fish on their land for harvesting when the flood-waters recede, or may fence off areas in what is customarily a CPR. In both instances they deny access to others – and frequently back this with force.

10.2.8. Such constraints on access to CPRs (a *de facto* 'privatisation' of the resource) may be flouted by individual subsistence fishers, or may be more actively resisted by fisher groups and even whole communities (see Dixon 2000). However, given the value of the resource, the low entry costs to their exploitation, and uncertainties over access rights, there is considerable potential for conflict between different groups of fishers, between groups from different social and occupational strata, and particularly between groups with different perspectives on land and water use on the floodplains. As Craig et al (2000) note, FCD/I projects in which the benefits of flood control have accrued mainly to those farming inside embankment schemes have been responsible for exacerbating social tensions between different groups, and particularly between farmers and fishers over the timing of sluice gate opening to allow fish and fry into the floodplain (FAP 12, 1992).

10.2.9. Meanwhile doubt has been thrown on the overall economic value of FCD/I schemes. For example Islam (2000), using an economic optimisation model, has examined the trade-off between agriculture and fishing at different levels of flood control in the Bangshi-Dhaleswari-Kaliganga (BDK) scheme in north-central Bangladesh. Islam calculated that whilst medium and high levels of flood control embankment improved agricultural returns, all levels of embankment decreased returns from fisheries. Furthermore, when the operation and maintenance costs of FCD/I infrastructure were included, the net returns from the floodplain was greatest with no flood control infrastructure in place. Islam concluded that, although the model was highly sensitive to the price of fish, structural changes to the floodplain aimed at achieving agricultural growth may be somewhat misdirected in their failure to fully value the floodplain fisheries (Craig et al 2000).

10.3. Fishery Management Policy

10.3.1. **Cambodia** Since 1979, the main policy of the Fishery Department has been to sustain the catch from the fisheries and conserving the natural aquatic resource in order to supply sufficient food to people. The First Socio-Economic Development Plan is designed to meet domestic consumption needs and promote exports in order to contribute to the national budget, while sustainably managing the resource.

10.3.2. The fishing concession system remains the primary means by which DOF manages Cambodia's fisheries, but reforms started in October 2000 to reshape this management approach. Key elements include the reduction of concession fishing lot areas and promotion of community-based fisheries management (CBFM). However, the real challenge comes in implementing the reforms at local level. For example, the current draft sub-decree on community fisheries not only calls upon fisher communities to undertake a role in management and enforcement; but also restricts their activities to family-scale fishing. Thus areas that have previously been fished using large-scale commercial gear will now be fished entirely with small-scale gear which fishers have argued are insufficient to meet their needs (even with the greater resource access).

10.3.3. WRI (2002) in its review of decentralisation in SE Asia has notes that ‘ In some cases, local decision-makers and communities prefer environmentally sustainable practices that are disqualified by the rigid policy guidelines of central governments...Inflexible policies undermine local strengths in natural resources management. It is also typical for central governments of this region to retain control of the most lucrative national resources, giving local people little or no access to productive lands. In these cases, food security continues to concern communities, and the potential of decentralization to promote a sustainable livelihoods approach is not even tested.’

10.3.5. Vietnam

Fisheries The resolutions of the Party Congresses VII, VIII, IX and the Decree of the Party Central Committee defined that in parallel with economic development and growth, Vietnam must concentrate on Hunger Eradication and Poverty Reduction. The resulting Hunger Eradication and Poverty Reduction (HEPR) strategy under the Ministry of Labour, Invalids and Social Affairs (MOLISA). Over the last 10 years many policies, institutional changes, programmes and projects have been put into place to promote agriculture and rural development, build up irrigation systems, strengthen credit policies, support the marketing of products, all to increase the living standards especially of the poor. The intention for 2001-2010 is to expand the poverty alleviation content of HEPR, to eradicate hunger and enact policies that encourage communication of appropriate technologies, strengthen and diversify capital assets and reduce the vulnerability of the poor. Inter-ministerial co-operation is coordinated by MOLISA; with each line ministry responsible for formulation of policy and the mechanism by which this is implemented, and to provide implementation guidance at the local level (DFID, 2000c).

10.3.6. During the first decade of the HEPR programme the Ministry of Fisheries (MoFI) played a limited role. Its focus was primarily on industrial and commercial scale development (including marine fisheries), and especially of aquaculture. (The success of the latter as far as fish production is concerned is shown by the national catch figures which have grown over the years – see Figure 1). As DFID (2000c) notes the intention of that report was to identify different dimensions of poverty in Vietnam, and also specific districts or communes where there are significant numbers of poor people whose livelihoods are dependent on aquatic resources.

‘That this has not been possible from secondary sources is an indication of the orientation of those conducting poverty analyses and the lack of engagement with the poor by the Fisheries sector in Vietnam. The former is clearly an issue that needs to be addressed in future poverty analyses; the latter is now a key concern for the Ministry of Fisheries.’ Quite simply ‘There is virtually no information on the small-scale wild fisheries in streams, rice fields, flooded forests, flood plains and back water swamps that other limited evidence suggests is of such importance to poor people.’

10.3.7. It is not clear from other data whether the concerns voiced in DFID (2000c) are now being addressed by government. If they are, they are at a very early stage of development, and there will remain a need for ‘mainstreaming’ poor people and dependence on inland capture

fisheries in the consciousness of staff of line ministries, particularly those that are concerned with land-based agricultural production and the infrastructure which supports this.

10.4. Devolution of fisheries management: CBFM and access issues

10.4.1. The study countries are similar in pursuing decentralisation reforms, although the extent to which budgetary control and decision-making authority rather than simply implementation responsibility is actually devolved varies. Indeed, in this they are similar to governments across the world, including liberal democracies and authoritarian regimes.

10.4.2. In many respects Bangladesh and the three SE Asian study countries are following similar paths as regards their integration into the world economy. They have sought to diversify and liberalise their economies, have sought foreign investment and are increasingly oriented towards producing for the market. Bangladesh has perhaps gone furthest along the market route, but in all countries there still remain many constraints to achieving the efficiencies which the market can bring.

10.4.3. Among the many motivations of governments to decentralize, one of the most common is a desire to improve the efficiency of government administration and the delivery of public services by bringing decision-making and implementation closer to the target population. Decentralization is regarded as a natural complement to economic liberalization and the imposition of fiscal discipline. It may also be motivated by the desire to empower citizens and increase public participation in the development planning and implementation process, though how far this holds in the study countries, where civil society is still underdeveloped, is a matter of debate.

10.4.4. Thus, for example, line agencies operating at the local level still tend to be upwardly accountable to production quotas and export targets that do not match local priorities for subsistence or local tolerance for risk. In Vietnam and Laos in particular, market regulation by the central government is still strong and directly affects the dynamics of decentralization. Specifically, control of production and market access is undermining governments' commitments to local consultative processes, as well as reducing market opportunities (see WRI 2002).

10.4.5. Historically governments in the study countries have been responsible for management of the inland capture fisheries, although the implementation and enforcement of fisheries regulations has proved difficult. Reasons for this have included difficulties in applying generic regulations to the complexity of the resource and its habitat at the local level, the often covert resistance of resource users to such management when it threatens their livelihood needs, and the lack of capacity of states to enforce regulations or to effectively monitor the status of the resource at the local level.

- 10.4.6. In the absence of strong central management, a variety of informal management arrangements have tended to emerge at local level which have allowed states to extract benefit from the fishery for revenue purposes, have allowed different user groups to exploit the fishery, but have also allowed rent-seeking by powerful interests. As the fisheries have become more commercialised, so these interests have sought to extract greater benefits – sometimes in ‘partnership’ with political interests, but also simply through the use of force. This has been, and continues to be, a threat to the livelihoods of the poor dependent on the fisheries.
- 10.4.7. Additionally, government policies to increase food production have led to a bias in which land and water resources have been co-opted for agriculture production. This has led to reduction in fish habitat and threats to fish ecology through land conversion, intensification of agriculture during the dry season, and disturbance of fish migration and spawning opportunities. By impacting on the resource, this has impacted on fishers livelihoods, while at the same time it has led to the development of powerful agriculturally-oriented interests lobbying governments for continuing support for agriculture, while enabling the wealthier to diversify and rent-seek in the more profitable fisheries.
- 10.4.8. The threat of increasing social inequality to growth-led poverty reduction is particularly likely in the context of changing institutional frameworks such as the shift in all study countries to decentralised governance of natural resources.. The flux that accompanies such change often provide powerful elites with opportunities to rent-seek and capture valuable resources. As will be discussed this is a very real threat that community-based fisheries management (CBFM) has to deal with. At the same time limitations in the extent of decentralisation by line ministries can reduce market opportunities and thus potential economic growth.
- 10.4.9. In order to address all these issues, address potential threats to the resource and to livelihoods, while still maintaining production, governments have begun to shift from centrally managed systems and to experiment with devolved co-management arrangements involving partnerships in which both communities and government have parts to play. These partnerships use the capacities and interests of local fishers and the community to complement the ability of the government to provide enabling legislation, enforcement and conflict resolution, together with other assistance.
- 10.4.10. The formulation and enactment of policy and laws are rather easier to achieve than their implementation. There is as yet insufficient ‘joined-up’ government where issues affecting livelihoods are looked at more holistically by departments with interests in different sectors. Indeed there is a lack of overall coordination among different organizations and agencies at all levels which is a major constraint to proper management.

10.4.11. Again all study country governments have been used to governing by edict, and line ministries are more comfortable with formulating policy than with enacting it. Staff in line ministries are still more used to reacting to orders handed down from above, rather than actively seeking opportunities to improve services, while corruption and alliances between powerful interests and local government officials can subvert implementation and enforcement.

10.4.12. For example, as the Bangladesh Country Status Report (2003) notes, the Department of Fisheries (DOF), which is responsible for enforcement of laws/regulations relating to fisheries management, does not have sufficient manpower, authority for conducting mobile courts or logistic support for efficiently enforcing the laws. Though DOF is responsible for overall development and management of fisheries resources and improvement in the socio-economic condition of the fishing community, DOF has limited authority and resources to perform its mandate. There is also local and political influence that hampers enforcement.

10.4.13. Matters at the local level are also a constraint. User groups remain wary of governments and their intentions, and make *ad hoc* (informal) arrangements for meeting their livelihood needs. Thus the Bangladesh Country Status Report (2003) notes that

‘poor fishers understand the implication of regulation and are always afraid of violating them, but in practice they violate it on the grounds that they would have to starve if they are to obey the law. Sometimes the fishers become hostile and aggressive to the law-enforcing body at field level. The relation between the local level DOF staff responsible for implementing Fish Acts and the fisher is in general good as they at heart realize that what they are doing is illegal and against the interest of the resource. There are of course reverse situations where the fishers are exploited /oppressed by local body, DOF personnel, and law enforcement agencies (police). But in general they (fishers) obtain legal support from DOF and other law enforcement agencies against any illegal acts by local elites.’

10.4.14. **Bangladesh** In keeping with GoB’s drive to improve the productivity and sustainability of the inland fisheries, GoB and donors are exploring the devolution of their management to the local level. This strategy is identified as potentially having an impact upon rural poverty. However, there have been questions as to how this local management is to be achieved (Hoggarth et al 1999).¹⁵

10.4.15. ICLARM (2000) has demonstrated that constraints to successful fisheries resource management lie as much in the socio-political realm as in the technical. Research suggests that local communities can better manage inland fisheries resources when management is devolved to them and where rights to their use are clarified. Faced with limited institutional capacity and resources, the Government of Bangladesh is increasingly devolving management responsibility to communities. This has demanded significant institutional reform, particularly with respect to the transfer of water body ownership and access rights,

¹⁵ As Hoggarth et al (1999) note ‘All fisheries depend on an interaction between the environment, the fish... and the fishers... [while] the complexity of each of these factors is at a maximum for flood plain fisheries resources.’

while establishing and ensuring the continuity of these projects has been time and resource intensive.

10.4.16. Despite these constraints community management of the inland fisheries of Bangladesh is becoming more common. In relatively closed systems such as *beels* and *haors* this can be easier to achieve with reasonably equitable benefits sharing by all. However, Bangladesh's current open access policy for most rivers and extensive floodplains, can lead to severe competition for the resource between different fishing groups, and groups using different types of gear, and can make co-management difficult. Additionally CBFM projects often fail to ensure access to the resource by the poorest people (p/t subsistence fishers and landless poor) during flood recession in the post-monsoon season when fishing activities are most productive, even though many will fish illegally anyway.

10.4.17. Cambodia Faced with perceived degradation of fisheries resources, and growing conflict between different user groups, the Cambodian government is moving towards more CBFM initiatives. Under current fisheries policy reform, in early 2001 56% of fishing lot areas were released to more than 200 communities, which in conjunction with local authorities will manage, conserve, develop and sustainably use fisheries resources in order to protect rights and benefits of the people. The legislation calls upon fisher communities to undertake a role in the management and enforcement of designated fishing areas, while restricting their activities to family-scale fishing. This in itself has caused problems, since fishers have argued the catch using this gear alone is insufficient to meet their needs (even with the greater resource access).

10.4.18. Nevertheless there are worries as to whether CBFM can really manage conflicts and can really deliver on its promise. For example in **Cambodia** the Country Status Report identifies the challenge to establishing community fisheries, as including:

- Ethnic divisions, which are widespread. There is antipathy between Khmers and Vietnamese and Cham minorities, who accuse each other of illegal fishing. The management plans require longer term cultural change in order to resolve these problems.
- Perceptions among some DOF staff and others in the fisheries sector that community fisheries will lead to over-fishing.
- Lack of experience with community fisheries in Cambodia.
- Potential for the transaction costs of negotiating and enforcing community fisheries to outweigh the benefits.
- Perceptions that establishing community fisheries will simply provide a means for local authorities to expropriate fishing rights and sell them.

10.4.19. Additionally in the Cambodian fishing lot system, local communities often remain unaware of the burden book and its detailed regulations. Such a lack of transparency has contributed to conflict. The large floodplain fishing lots often have villages located within or in close proximity, with access to these areas often being at the behest of the lot owner. Along with the illegal extension of boundaries - which is common - this has proved to be a source of conflict.

10.4.20. The DOF recognises that CBFM ‘can be an invaluable tool to improve governance and ensure more equitable and sustainable natural resources allocation by involving communities in decision-making process. The development of transparent and participatory decision-making can assist conflict resolution, peacefully resolving situation where communities have felt compelled to resort to protests and petition.’ However, the Country Status Report: Cambodia (2003) also sounds a note of caution in noting that

‘there is no guarantee for an improved management without legislative structures, funding or training to support the establishment of community fisheries in these areas. They can effectively become open access areas, leading to confusion over access rights, alleged uncontrolled exploitation and illegal fishing. Concerns have been raised that there has been undue haste to develop community fisheries in order to fill the gap after removal of lot ownership. In the absence of immediate action this could lead to problems due to poor understanding of the concepts, vital information such as maps, fish catch and stock, fisher’s need and environmental considerations, together with a failure to develop and implement effective regulation and structures.

10.4.21. In **Laos** formal responsibility for aquatic resources management rests with the Livestock and Fisheries Department under the Ministry of Agriculture and Forestry. In practice there is little active management of natural aquatic resources by the Department. Although there are regulations, for example banning the use of destructive fishing gear and the capture of fish during the spawning season, these cannot realistically be enforced by the government. Indeed involvement of the Livestock and Fisheries Department in aquatic resources management is primarily focused on aquaculture and culture-enhanced fisheries. Natural aquatic resource issues are becoming increasingly integrated with aquaculture development. This is evident in tendencies such as the development of native species for aquaculture, or the development of rice-fish culture technology with explicit consideration of wild as well as cultured stocks.

10.4.22. The lack of involvement of the Livestock and Fisheries Department should not be taken to imply that destructive fishing is rampant. Rather, fishing is often regulated by local customary rules. Given high social capital at the village level, and a relatively low level of socio-economic differentiation between households in villages, and a coincidence of interests in terms of reliance on and uses of communal resources such as fisheries, the potential for effective local management of such resources is good.

10.4.23. Indeed indigenous CBFM appears to be widespread. According to Baird (1999) 52% of villages surveyed reported that they have some form of local management system for their resources. These include conservation zones and restrictions on seasons, gear, the blocking of migration routes, and the catching of certain species. These often apply to migratory species and relate to specific spawning sites. However, the current management activities appear to relate only to fishing effort and access.

10.4.24. Interestingly, there also appears to be an association between villages which have successfully implemented aquatic resource management plans and relatively remote villages with a high level of community spirit and solidarity. It appears that activities and conditions that increase solidarity at the village level (i.e. have a high degree of social capital) also indirectly benefit community-based natural resource management (Baird 1999) (see below).

10.4.25. However, while community management initiatives can be highly effective in regulating aquatic resource use locally, they are less effective in dealing with pressures on resources that arise outside the local area, such as cumulative effects of irrigation development. This should constitute an important area for government intervention and management, but at present it receives little attention.

10.4.26. Lao inland fisheries have been faced with dramatic changes in fishing and fish marketing practices which according to Baird (1999), have resulted in apparent declines in fish and other aquatic resource stocks due to over harvesting and destructive resource-use patterns. Yet experience in some locations (e.g. Khong) suggest that common property regimes do not always just break down when faced with crisis. In Khong for example, many villages have responded by strengthening their management systems to ensure that aquatic resources are managed more sustainably. In Khong over the last five years 'there have been no major conflicts between villages with regards to village boundaries as they relate to aquatic resources. In fact, villagers appear to have a clear sense of aquatic resource territoriality' (Baird 1999).

10.4.27. Whether the experience of Kong is replicable elsewhere in Laos, particularly where wet-rice field enhancement and 'privatisation' of the resources they contain is proceeding, remains uncertain. Again as a consequence of the difficulties in sustaining such initiatives when several villages are involved, active management is largely restricted to small areas and individual water bodies.

10.5. Social Capital

Without that there is the danger that fisheries resources will become *de facto* open access property regimes rather than community-based CPRs. This section briefly considers the extent of social capital at the community level in the study countries. All stakeholders need to recognise that the floodplains and the communities on them are complex systems - 'heterogeneous wholes' consisting of many groups with different portfolios of livelihood strategies - yet that there are interdependencies between them.

10.5.2. **Bangladesh.** While there is solidarity at the household level, within the community there can be significant divisions with households belonging to different and competing politico-religious groups (*somaj*). Bangladesh society is extremely competitive, with a large population competing for limited resources, while local cultural practice has historically been geared to opportunistic individualism and political leverage in securing access to resources

(notably clientage, factionalism and community violence). This has usually proved more effective than relying on kin. Indeed poverty corrodes links between close kin, while shared wealth buttresses kin links. As a rule of thumb, poorer households have less kin-based social capital - and possibly weaker social capital networks (both linking and bridging) than wealthier ones. There are also considerable wealth differences between households, with wealth equating closely with size of landholding, and a tradition of power and patronage in gaining access to resources. Certainly in the problem census exercises carried out by ICLARM, those from poorer strata (landless men, landless women, and fishers) noted 'lack of unity' as a livelihood constraint while those from wealthier strata did not.

10.5.3. Despite this individualism, people can and do co-operate when they recognise that they have shared interests and there are interdependencies between groups. There is an order on the floodplains, which is the outcome of actors responding to changing biophysical, local politico-economic and wider policy environments and negotiating between themselves. The issue for the poor of course is whether they have the ability (or political capital) to negotiate an outcome which gives them access to opportunity, rather than having better-off groups close these off as they seek their own betterment (see Dixon 2000).

10.5.4. In this respect there tends to be a lack of economic bargaining power or cooperative spirit among many full-time fishers due to the lack of fishers' cooperative organizations. ISPAN (1992, FAP-16) states that though there exist fishermen cooperative societies in many areas, these cooperatives are in the name only. They are controlled by local rich and influential persons who get lease of the water bodies through the cooperative societies. Fishers suggestion was to empower the Fishermen's Cooperative Societies so that they can solve their problems and get rid of the rich and the powerful who provide means of managing the fisheries. CIDA (1998) reports that in Kawadighi *Haor* area in Moulvibazar.

10.5.5. There are fishermen's organizations, but they are not active and are in papers only. Some NGOs are working in this area to create awareness about the natural resource conservation and management needs and to organize people including fishers. Barr et al (2000b, 2001) found similar technical and institutional constraints being voiced by fishers in PRAs at a number of sites. The issue here is how can fishers' collective management capacity be built so they can withstand the depredation of rich people, manage the fishery and enforce compliance with fishery regulations, while enabling others to fish on a subsistence basis.

10.5.6. SE Asia

In the SE Asian countries community social capital is generally high due to a history of cadres under the now defunct commune system, while the isolated subsistence nature of communities has kept social differentiation in check and has led to a dependence of households on kin, neighbours and community for support in times of need. With the opening up of these communities under national economic reform programmes, and the emerging orientation towards the market, increasing household self-sufficiency and social differentiation may weaken these communal ties. However, at present (as instanced above) the evidence suggests that communal solidarity is assisting in the informal management of the fisheries.

10.5.7. Where there are fishing communities embedded among larger and more dominant agricultural populations, these similarly have developed more internal cohesive relations than links to external supporting agencies. This can provide a platform for community-based initiatives, but also maintains the isolation of fisher communities.

10.5.8. **Cambodia** The Country PRA Report (2003) reports that the members of fishing communities are often related, and usually help each other in times of need, though of course individual households are pursuing their own livelihoods, and there is a developed labour market since those with land and large fishing lots need labour, and those without land must sell their labour. There are also usually a number of local institutions (pagoda committees, commune committee, village development committee) which give the community greater solidarity. At the Mekong downstream PRA site

‘The primary objective of the village is to control access to village resources by regulating utilization based on private ownership principles, and to stop outsiders to cultivate new plots there. There are five fisheries community committees responsible for fisheries conservation. Local leaders also act as arbitrators when there are conflicts between households in the village and between nearby villagers, including fisheries resource conflicts. Conflicts are solved at the village level with the group of village/fisheries community committee if the magnitude of conflict is small. Three-person in village committees including the village leader have done arbitration in times of conflicts. For bigger conflicts, the village committee would file the case to the commune council.’

10.5.9. However, while family, neighbours and community (i.e. social capital) can be a major buffer against shocks, some studies suggest that these have been weakened by the recent history of upheaval, deprivation, and imposed collective organisation. Nevertheless, while local organisations may be weaker than elsewhere, communities do still work together, and local networks have strengthened in a period of stability (DFID 2000).

10.5.10. **Laos** Rural Laotian villages generally have a strongly integrated social structure, with village elders being respected and community members having a well-defined sense of mutual responsibility. ‘Rural society is characterised by semi-independent villages engaged in semi-subsistence agricultural production. Ethnic, geographic, and ecological differences create variations in the pattern of livelihoods from one area to another, but the common threads of village self reliance, limited regional trade and communication, and identification with one's village and ethnic group persist regardless of the setting’ (Ireson 1995).

10.5.11. There is also a relatively low level of socio-economic differentiation between households in villages. Households cooperate informally, especially within kinship groups and in agricultural work. Labour exchange may occur for almost every task associated with rice farming, although it is most common for transplanting, harvesting, and threshing. Kinship and social networks are also an important source of food security. Households may receive gifts of rice, vegetables or fish at a time of need and reciprocate when in surplus. Wealthier

households may make unreciprocated gifts to those more frequently in need. Moreover, shared understandings and the social expectations of neighbours circumscribe the actions and decisions of villagers. High levels of cooperation and mutual dependence between villagers are characteristic of rural communities (Ireson, 1995, 1996).

10.5.13. There are some worries, however, that since the NEM reform programme is accentuating inequalities within communities, this could threaten village support networks and communal solidarity (Trankell 1993 in Rigg 1997, Baird 1999). There is a tradition of committee decision-making and, where there is irrigation infrastructure, water use groups for managing water allocations. On external measures, wealth differences between families are not pronounced and most people would be classified as poor, but Haylor et al (1997) did find in their Savannakhet study that when using local wealth ranking indices - which classified families into poor, middle and rich - there were differences between families and between villages.

10.5.14. **Vietnam** The country's history of resistance to foreign intervention has left a legacy of strong community values (and concern about poverty), and determination to maintain national control and direction of its policies. Since the dismantling of communes under the '*doi moi*' reform programme the family is again becoming important. In the Mekong delta there is widespread membership of a number of people's organisations.

10.5.15. There is also evidence that the social capital represented by the family was weakened under collectivisation in Vietnam. However, this was replaced by strong neighbourly and communal ties, though these were not an incentive to economic growth. Under the *doi moi* reform process, and in order to stimulate production, emphasis has again been placed on the family as the unit of production. In consequence, with households being granted secure use rights to the land they work, and able to retain value derived from their labour, agricultural output has grown steadily. At the same time, a strong communal ethos has been retained, while Vietnam's population and government appear keen to limit the potential gap between rich and poor which they regard as divisive.

10.5.16. Full-time fishers named fellow fishers, their hamlet and their village as the most supportive of their livelihoods, fish traders as necessary to their livelihoods but not necessarily supportive, and fishers from outside and those who used destructive fishing gear as the biggest constraint to livelihoods. Government agencies hardly figured at all. Again, when doing the 'problem cause-effect' (impact) exercise, full-time fishers identified effects (such as shortage of working capital) as impacting on the community rather than just on their own households (Country PRA Report: Vietnam 2003 Table 15).

10.6. Platforms for CBFM and conflict management

10.6.1. **Bangladesh** There have been a number of recent initiatives to research how conflicts between different natural resource user groups might be best resolved, and consensus built for integrated floodplain management (IFM) with gains for the poorest. Earlier research under

DFID's FMSP has developed a methodology for conflict appraisal and management xxx , while research under DFID's NRSP (Barr et al 2001) have developed a methodology for achieving consensus management of floodplain natural resources which is being translated into action plans for IFM by communities on the ground with support from local partners. Meanwhile current research under DFID's NRSP is developing a methodology for identifying appropriate institutional arrangements for better IFM (Refs). These methodologies are being taken up and developed further by local partners, and are being disseminated more widely through ICLARM.

10.6.2. The challenge now is to move beyond methodological development to achieve their practical uptake and monitor the benefits achieved for the livelihoods of those (particularly the poorest) who are dependent upon them. This will require improving the sustainability of local institutions and developing management systems for the larger fisheries in which government will continue to play a role. Hoggarth et al. (1999) have developed guidelines for the management of the floodplain river fisheries, while Craig et al (2000) suggest that the extensive variability in the ecological and social characteristics of floodplain fisheries requires flexibility in management to meet local needs.

11. Conclusion: vulnerabilities, access and livelihood constraints, data gaps

11.1 Vulnerability

11.1.1. The Sustainable Livelihoods approach deals with vulnerability under three headings: shocks, seasonality, and trends. Three elements which in the literature are considered in relation to their negative impacts on livelihoods.

11.1.2. **Shocks** can be of many kinds, for example a disastrous flood or drought, sickness of a family member, or the death of the main wage earner in a household. Where financial and other resources are slim, such shocks can reduce households to poverty and can reduce those already poor to destitution. Much effort by governments and NGOs has gone into trying to reduce the negative impact of shocks on households, for example providing 'bridging' finance to help families through 'crisis' situations (e.g. flood relief).

11.2. Seasonality

11.2.1. **Seasonality**, as indicated in previous sections, forces large numbers of poor households to build portfolios of livelihood strategies. Diversifying livelihood strategies here is not only sound business sense, it is a necessity. Only wealthier households have the luxury of relying on one main strategy to support them throughout the year and from year to year, the poor must do so if they are to survive. However, the need to take part in seasonal activities can also offer the poor access to new opportunities which those that have a sole livelihood strategy may not have, but instead may be 'locked' into a declining resource sector.

11.2.2. Again governments have expended much effort in seeking to reduce the negative impact of seasonality on livelihoods. In Bangladesh and Vietnam governments have in particular sought to reduce the threat of floods to their populations. However, there is an issue as to whether they have overstepped the mark. Seasonality is a normal process and the rural populations of the study countries are adapted to it. Flood control can be justified where it is likely to be destructive (such as in parts of highland Vietnam), or where there is high value infrastructure (such as towns and cities). However, there are many instances where flood control, while appearing to generate a benefit (protection of agricultural land), generates a disbenefit as well (reduction in fish habitat), and with negative consequences for some livelihoods.

11.2.3. The key trend in Bangladesh and Vietnam is for intensification of agriculture, and it is likely that the same will occur in the other two countries. This will involve the conversion of land, such as forest, swamp, mangrove, and other areas defined as 'waste land' (suggesting that it is not utilised or is under-utilised) to agricultural use. It will also involve the intensification of agricultural production through HYVs, HEIs and provision of FCD/I infrastructure.

11.2.4. For example, Bangladesh has long been on the path of agricultural intensification as indicated by the proportion of its crop land which is irrigated (from 17% in 1981 to 43% in 1997). In Vietnam the key trend is rice intensification (from 180-210 day rice monocrop of about

1 t.ha⁻¹ to two short duration crops in 100 days of about 8-10 t.ha⁻¹), together with mangrove, and Melaleuca forest destruction, and the reduction of forest cover in the northern uplands. (24% of Vietnam's cropland was irrigated in 1981, compared with 31% today). Laos (with 19% irrigated) and Cambodia (with only 7%) lag far behind. Yet the Laotian government plans to increase the extent of irrigated cropland considerably in the hope of becoming a major rice exporter like its neighbours Thailand and Vietnam.

11.2.5. Meanwhile, As DFID (2000) notes 'Growth has not been "agriculture-led" in Cambodia – one striking statistic is that, while Gross Domestic Product (GDP) grew at about 6% on average between 1990 and 1995, rice production was stagnant at -0.1%. Rice yields are very low at about 1.3 tonnes per hectare on average in Cambodia, compared to over three tonnes in neighbouring Thailand and Vietnam. What could increase rice productivity?' DFID suggests physical investments to boost yields and measures designed to make agricultural markets function more effectively are needed, such as better irrigation and water management, better rural access, better access to information, and better management of property rights for land and better security.

11.2.6. However, while this may indeed be the right overall package for Cambodia, there is a need for governments not only to taken into account the costs and benefits of structures which they perceive as increasing productivity and reducing the impact of seasonality, but also to consider which social groups are bearing the costs and which the benefits. In the context of vulnerability, they need to consider whether flood control and the intensification of agriculture are increasing the vulnerability of the poor or not.

11.2.7. For example, in **Bangladesh** resource use patterns are adapted to the temporally and spatially dynamic interface between terrestrial and aquatic natural resources. In consequence the rural population is vulnerable to seasonality and to natural shocks and trends, while households build 'portfolios' of livelihood strategies to reduce vulnerability.

11.2.8. In the past (and indeed into the present) Bangladesh citizens, particularly the rural poor, have been vulnerable to natural disaster - including cyclone, flood and even drought. Due to flood control and drainage measures and the introduction of dry season irrigation and high-yielding varieties of rice, vulnerability to natural disaster and food insecurity has in general been reduced at the national level. However, some groups, and particularly the poor and landless, remain more vulnerable to seasonality and natural shocks since they often build their houses in low-lying areas (such as government *khars* land), or are forced to colonise very marginal areas including the transient islands (*chars*) which appear in rivers and river deltas.

11.2.9. Attempts to reduce vulnerability to flood have had mixed consequences for different livelihoods in Bangladesh. In brief, government and donor concerns about food self-sufficiency have led to a focus on agricultural intensification through the introduction of HYV rice which is not flood tolerant, and consequent FCD/I infrastructural development (embankments and dry season irrigation) to accommodate it.

11.2.10. However, this has been achieved at a price. Firstly, HYV species require High External Inputs (HEI) such as inorganic fertilisers and technical support, while their widespread uptake has led to a dramatic reduction in indigenous foodgrain species. This has made Bangladesh more

vulnerable to sudden shocks (such as the 1987, 1988 and 1998 floods), and input supply constraints. Short-stemmed HYV rice are particularly prone to damage from abnormal flooding, while the non-availability of fertiliser inputs at critical growing seasons can lead to dramatic falls in yields (see graphs in Palmer-Jones 1999). Meanwhile the development of dry season irrigated rice has been achieved through huge investment in Shallow (STW) and Deep Tube Wells (DTW). Additionally, the cultivation of HYVs and increase in cropping intensity through extending cultivation into the dry season, has been facilitated through huge investments in FCD/I measures. The environmental impact of these has caused concern to many observers.

11.2.11. Cambodia The vulnerabilities that most Cambodians face and the various assets on which they call in making a living and in coping with crises is summarised in the DFID Country Strategy Paper (2000). It notes that ‘most of the rural population lead precarious lives, even those not under the “poverty line”.’ One of the characteristics of their poverty is vulnerability to shocks, of which there are many and including farm failure, health shocks and chronic illness, and rural crime and insecurity. 45% of people borrow money for health emergencies.

- PRA s at Great Lake site mention drought: natural calamity in 1998 drought and rodents, which caused decrease in rice production.
- Flood: In 1995 villagers faced one natural calamity (flood) and abundance of *Mimosa pigra*.

11.2.12.In rural Cambodia, given the vagaries of agricultural production, wide fluctuations in income, the high incidence of shocks (illness, accidents, etc.) and the paucity of reserves i.e. savings and food stocks, especially for poor households, common property resources, especially aquatic resources are of pivotal importance in ensuring food security.

11.2.13. Laos The PRA report (2003) noted that flooding is a normal event for the fishers. During high flood they cannot catch fish and are unable to work. However, after the flood they get more fish. Due to diseases they have to suffer and also cannot work.

11.2.14. Vietnam suffers from floods, typhoons, and drought. In the South Central area in late October/ November typhoons are common and destructive and can represent significant shocks to coastal people’s livelihoods. In the Mekong delta region flooding occurs from August to November) and land regularly floods to 0.3-3m and farmers in these vulnerable areas cannot grow rice. Flooding in the delta can submerge even towns and roads, break dykes and destroy bridges, causing serious damage to agriculture. Serious floods tended to occur in 4 year cycles but recently have been an annual occurrence. . During the flood season fishing is an important source of livelihood. In the dry season the river flow can be reduced by 95% and saline intrusion occurs.

11.3. Trends

11.3.1. Trends can be in the political, social, economic and natural resource sectors. Much of the discussion in the previous sections has been over trends in natural resources. The main focus of interest has been in what is happening in the fisheries sector as a result of trends in other sectors. We have seen that, with the study countries now undergoing periods of peace and stability and opening up their economies to global financial flows and demand for their products, the

proportions of their populations who are poor are falling. This trend is set to continue, despite the fact that due to overall population growth actual numbers may be increasing. Trends associated with this include increasing urbanisation, non-farm employment in rural areas and diversification of national and rural economies. These, and the positive trend in human capital gains, are helping to reduce the proportions of those in poverty. However, the gains are more rapid in urban than in rural areas. Governments are now more conscious that their rural areas have missed out on the benefits of growth over the past few years. All are now beginning to address the issue, particularly through the development of infrastructure to open rural areas to market forces, and through devolution to allow greater flexibility in response. All four countries are at an early stage in this process.

11.3.2. The impact of this process in the natural resource sector has been variable. Opening the sector up to market forces without appropriate regulation and, more importantly, capacity to enforce those regulations has had negative environmental impacts (for example a reduction in forest cover in SE Asia), and negative impacts on the livelihoods of the poor (who have depended on NTFPs as a component of their livelihoods). Meanwhile, government policies to ensure national economic growth, through for example the export of timber products in SE Asia and increasingly through the export of rice (in Vietnam, and also planned for in the other countries), may have negative impacts on the livelihoods of poorer members of their communities (who again depend on the fisheries and LARs for their livelihood security). Certainly government policies which prioritise agriculture over the fisheries provide a subsidy to land-based livelihoods, which tend not to be those of the poorest, who are landless or near-landless.

11.3.3. Research in Bangladesh and Laos suggest that the impact of floodplain infrastructure on the resource itself (the inland capture fisheries) may not be of the order that some have feared. Although individuals may perceive the resource to be declining, production from the inland fisheries is still rising nationally in those countries, as it is in Cambodia, though it is falling in Vietnam. However, there are concerns as to the robustness of data generation techniques, and a need for the development of better monitoring procedures which generate data of use to local level and community-based natural resource managers.

11.3.4. Demand for fish and fish products is likely to grow due to growing country populations, wealthier urban populations, and demand from overseas. This is likely to increase fishing pressure, though it may also lead to greater intensification of aquaculture. The first may or may not have a negative impact on the resource, depending on whether an optimistic or pessimistic view is taken on the dynamics of floodplain fisheries (see next paragraph). Growing numbers exploiting the resource, however, look likely to reduce the catch per fisher if not the overall production from the fishery. Demand is also likely to increase the incentive for elites to capture the wealth of the fisheries for their own benefit - for example through *de facto* 'privatisation' of the commons.

11.3.5. The second, aquaculture, is most likely to benefit those who have access to a pond. In Bangladesh the poor, not having land or finance, rarely have such access. Instead they depend on the CPR of the fisheries. In SE Asia, where much of the population has access to land (due to government policies of land redistribution), aquaculture may be more likely to benefit the poor. However, there are landless poor people for whom this does not apply, and who similarly rely on

the CPR of the fisheries as a major component of their livelihoods. Certainly research indicates that aquaculture's contribution to overall fisheries production is small in all countries except Vietnam, but is set to grow. More importantly, however, is that even if the sector does grow, it is unlikely to benefit the poorest to any great extent. Archetypically the poor depend on foraging in shallow water rice fields for smaller fish species ('trash' fish), leaving the capture of larger and higher value fish to professional (full-time) fishers who can afford the gear or who are employed by elites investing in the sector. There is a danger that if and when rice-fish technology takes hold, rice-fields may increasingly become 'enclosed' by their owners and off-limits to the poor as *de facto* CPRs.

11.3.6. With the trend to devolve management of natural resources to the local level, governments are increasingly interested in CBFM, though local communities need to be better consulted about how this is to be achieved. There are potential gains in this for the poor if the appropriate structures are put in place to prevent rent-seeking by elites, and the poor are ensured a say in their management.

11.3.7. There will be many issues to resolve, not least as to who should have a voice, and how costs and benefits should be apportioned. For example, should anyone be allowed to fish if they are fishing with simple gear and for household use only, or might this reduce previously 'traditionally' controlled commons to open-access, with potential for Hardin's 'tragedy of the commons.'

11.3.8. The management regime is likely to differ from fish habitat to fish habitat, and from season to season, and will need to take into account the impact of fishing effort on stocks as well as impact on different livelihoods. However, research suggests that those areas where fish 'overwinter' (in dry season refugia) will require better management than at present, while fishing in rice fields and seasonal floodplains can continue at a high level of effort, so long as measures are put in place to allow a proportion of juveniles to escape to their dry season refugia.

11.3.9. As importantly, and at a level higher than the community, there will be a need to ensure that floodplain infrastructural impacts on fish migration (both adult and fry) are mitigated, though communities can assist by managing the timing of flood ingress and egress better where FCD/I is in place.

11.4. CPRs: food security and safety nets

11.4.1. Given the importance of fisheries in poor people's livelihoods, particularly subsistence farmers, it is important to ensure access to them. However, as noted previously, there is the threat of privatisation of the resource.

11.4.2. While the role of fisheries in the livelihoods of the poor has already been emphasised, a comment needs to be made in the context of vulnerability and in relation to their role in expenditure-saving and as 'safety nets'. There are two natural resource sectors – fisheries and forests - in the four study countries which are exploited not only for income generation, but for the wide range of goods and services (NTFPs) they can provide households. As noted, these goods and services frequently make up the shortfall in poor households' needs and which, being

impoverished, they are unable to access through the market. As such exploitation of these resources functions as an expenditure-saving device, contributing to household food security, and enabling scarce money from income-generating strategies to be allocated to other activities.

11.4.3. Prior to colonial intervention in the region, and with smaller populations the majority of fisheries and forests were common pool resources which were either ‘open access’ in not being claimed by any group as exclusively theirs and thus ‘unmanaged’, or were managed under a variety of community property right regimes. Where individual households and communities managed particular resources, use rights if not exclusive ownership rights became established. Given the multifunctionality of the resources, these use rights were complex and overlapping. They could be the basis of conflict between groups, with stronger groups securing greater access and with weaker groups having to exploit more marginal areas, and perhaps becoming poorer as a result.

11.4.4. As elsewhere in the world colonial and post colonial governments have regarded ‘wild’ natural resources, such as forests and fisheries, as state-owned resources to be used for revenue generation. As such, states have historically allocated rights to specific agents or companies for their exclusive use in return for a fee and, since the the land and water areas involved are often too large for them to exploit alone, have left it to them to sub-let to others for a use-fee. These commercial arrangements have shifted what were non-market goods into the market economy and have inevitably reduced access to them by the poorest, other than illegally. Yet, in the absence of state safety-nets or local social capital (in the form of family or community networks) on which to fall back, the poorest are extremely vulnerable to shocks. In a globalising world, with growing populations and rapidly decreasing access to CPRs, downturns in world and national economies can spell disaster. On a smaller scale, a sudden event, such as a death in the family or crop failure, in the absence of the access to CPRs can result in destitution.

11.4.5. This is not just an issue for the poorest in these communities, it is also issue which affects what have been termed the ‘nearly poor’ – those who are above the poverty line but who may fall beneath it again as the consequence of shock. Given immediate needs, the poor and nearly poor normally have limited asset reserves to fall back on. Rural households rarely have many cash savings, while there are few formal options for obtaining credit. In this context CPRs again perform the function of a safety-net which enable individuals and households to substitute ‘cheaper’ resources which they might not usually access for those they more commonly use. Not only is this an expenditure-saving strategy, it also reduces the erosion of assets – a critical factor if the nearly poor are to climb out of poverty permanently.

11.4.6. Literature in the CBFM field accepts that fisheries can be managed by communities. In effect this is saying that the resource can be managed on behalf of a variety of user groups belonging to the community (F/t, p/t, and subsistence), but that it should remain a community resource and should not be ‘privatised’ by individuals. Such use rights, and rules of management should emerge in relation to the local context (see Ostrom) and should not be imposed by edict by central authorities who do not have the local knowledge and flexibility germane to that context.

11.4.7. There remain a variety of questions in relation to this approach in terms of social equity, the access of outsiders who assert partial use-rights but who rights may be denied under current legislation, and how to manage migrant fish species on a catchment basis. (see FAO Management Guidelines, Hoggarth et al). The latter will be particularly important to secure in relation to gears (nets, hoover-nets), which seek to monopolise the resource for one location.

11.4.8. This in turn leads on to management of upstream activities so that externalities are internalised and not passed on to downstream users. There are opportunities to draw on research on the catchment management of water resources – particularly in relation to water quality and quantity, and its use for alternative activities. In relation to this there will be a need to capture the full cost as well as the full value of activities which have historically not been included in environmental impact assessments (EIAs), and natural resource use assessments. The poor have historically borne the greater burden of the cost of environmentally damaging practices by the better off – proper costings and ‘the polluter pays’ principle can help re-address this.

11.4.9. **Threat**

There are threats to CPRs. Access to them is of course key to this asset-saving strategy. However, not only are fisheries and forest resources becoming harder to access (legitimately) due to changes in property rights regimes, but the resources themselves may be under threat of being degraded.

11.4.10. For example, Bangladesh landless and marginal households are not self-sufficient in food. Samina and Worby (1993) found that at a small, 2 ha *beel* there were 12 families with members owning between 0.04 and 0.8 ha. This land provided self-sufficiency in rice for 15 days to 6 months respectively. Floodplain households must thus undertake many activities to maintain their livelihoods. For the poor, common pool resources (CPRs) serve as ‘ecological reserves’ which can be tapped for, *inter alia*, food as part of a broader strategy of expenditure saving (Poverty Issues in Bangladesh: A Strategic Review. 1998. unpubl. report commissioned by DFID – Bangladesh, Dhaka.).

11.4.11. Common pool resources such as the fisheries (and forests) are also a safety net on which the poor and those retrenched from their primary occupations can fall back in times of economic shock. It has already been noted that landless poor in Bangladesh turn to fishing for income and/or subsistence on a seasonal basis when flooding prevents their employment in the agricultural and service sectors. In **Vietnam** it is reported that workers retrenched by industry turn to fishing as an alternative occupation during periods of economic downturn. While the impact of this increased fishing effort is not known, such opportunistic fishing is difficult to control, while it provides a valuable role in supporting the livelihoods of poorer households.

11.4.12. **Cambodia** ‘The real threat to rural livelihoods is the combination of increasing land pressure and decreasing access to CPR. Furthermore, decreasing access to CPRs will affect the livelihoods of the more vulnerable households compared to those with better assets or livelihood means. Similarly, Kato (1999), in her study of landless in Takeo province notes that, as access to CPRs becomes more restricted, diminished, and priced out of reach, the poverty and vulnerability of Cambodia’s rural poor will intensify’ (Anon 2001).

11.4.13. As DFID (2000) notes 'The rural poor have little to sell if things go wrong. Selling their land is an option, but this leaves them with fewer productive assets and in chronic poverty. They need continued access for (sustainable) use of "common resources" such as forests and lakes. Government must be careful that sustainable community use is not cut off as part of any crackdown on illegal logging or fishing.'

11.5. Access and Use Rights

11.5.1. Bangladesh

Access to fishing grounds is frequently an issue for full- and part-time fishers. In the river-estuarine-mangrove areas access is reported to be open, in the other environments leasing and licensing restrict access to those who pay, and on the floodplain landowners now make some restrictions on fishing. (Country PRA: Bangladesh 2003). Access to fishing grounds is also an issue for subsistence fishers who can access rivers and canals and floodplains during the monsoon, but face restrictions by lease holders in the peak fishing season and in areas dominated by others (for example shrimp farmers).

11.5.2. Given the strength of feeling across all wealth categories concerning access rights, it is clear that implementing fisheries regulations which limit access will be a difficult task to enforce. If pressure on the fisheries has to be reduced to ensure the sustainability of the resource, then there may have to be an extended period of public education of the need for it, together with interventions to reduce groups' dependence on and opportunities to profit from the resource.

11.5.3. The main mechanism for allocating fishing rights to specific individuals and groups has historically been through the auction of rights to the highest bidder. This has been useful in generating revenue for the government. However, since the auction mechanism allocates the value to be derived from the fisheries to the wealthy (usually rent-seeking elites) and seeks to exclude those most seasonally dependent on the resource, the policy conflicts with governments' poverty elimination goals. Indeed if the policy were to be strictly enforced, it would lead to considerable social conflict between different groups. In practice, most lease holders, recognising that enforcement costs are too high and that most subsistence fishing gives poor returns to fishing effort and is unlikely to reduce the catch of the commercial fish they are targeting, turn a blind eye to much opportunistic fishing.

11.5.4. The auction system illustrates an instance of policy being a constraint to access to opportunity by the poor, and is indicative of a redistribution of a public good from poor to rich. More recently, study country governments have sought to bring greater coherence to their poverty elimination policies by seeking to allocate fishing rights to poorer groups - in particular fisher groups - and more recently by devolving fisheries management to the community-level. In both cases the issue of excludability still exists - who should be excluded from the fisheries, and who should bear the costs of enforcement? The danger still exists that elites will continue to rent-seek (e.g. by using a proxy to compete at auction, or using force to extract a toll from fishers), and that poor people will be excluded from the fisheries.

11.5.5. However, governments are experimenting with CBFM and local arrangements, which permit subsistence fishing by all who wish to (including both rich and poor) and the sustainable extraction of the main value of the resource by designated rights holders (fishers (?)), is more likely to have the flexibility needed to deal with the environmental and socio-economic issues involved.

11.5.6. **Cambodia** As in Bangladesh, the fishing concession system remains the primary means by which DOF manages the fisheries. According to current Fisheries Fiat Law, the inland capture fishery is divided into 3 categories:

- **Large-scale fishing lots** are operated under two-year concession gained via public auction.
- **Middle-scale fisheries** originally operated under a system of licensing.
- **Small-scale family fisheries** These fishers are allowed to fish anywhere at anytime, except within fishing lots during open season and in the protected areas. This scale of fisheries is intended for “subsistence”.

Although the fisheries legislation is geared towards resource conservation and control, it is probably not well understood by most fishers – nor even perhaps by some fisheries officials. The poor, and practically impossible, enforcement of the country's fisheries legislation (given rent-seeking and corruption by officials) is a major constraint to achieving long –term sustainable resource use.

11.5.7. Reform of management of the fisheries started in October 2000. Key elements include the reduction of concession fishing lot areas and promotion of community fisheries management. Thus areas that have previously been fished using large-scale commercial gear will now be fished entirely with small-scale gear which fishers have argued are insufficient to meet their needs (even with the greater resource access) (Country Status Report: Cambodia 2003).

11.5.8. The PRAs at the Tonle Sap survey site suggest that access to fisheries resource and other common properties such as inundated forest, wild vegetables, various fish species, fresh water shrimp and other aquatic resources (shellfish for household consumption) are not a problem and indeed are free to all villagers. However, there is normally a village committee which oversees management of this resource. At the Great Lake survey site respondents said that they have free access to fishing ground because most of them do small-scale fishing which is tax-free under current regulations though local officials and police sometimes extract ‘fines for the breaking of regulations’ (Country PRA Report: Cambodia, 2003).

11.5.9. Respondents at the Great Lake site similarly did not have any access problems with regards the area they were allowed to fish as community members. However, there was friction with a large fishing lot operation due to the latter's blocking of fish migration routes, encroachment on the common area, preventing of fishing near the lot and so on.

11.5.10. **Laos** Institutional arrangements for aquatic resources management in Laos have been studied in detail by Garaway (1999), and only a note is given here. Formal responsibility for aquatic resources management rests with the Livestock and Fisheries Department under the Ministry of Agriculture and Forestry, though in practice there is little active management of natural aquatic resources by the

department. Laos has a devolved government structure where provinces enjoy a great deal of autonomy. This *de facto* autonomy is partly precipitated in an almost complete lack of resources on the side of higher levels of government to fund such developments or enforce rules.

11.5.11. However, this should not be taken to imply that destructive fishing is rampant (Lorenzen 2000). Rather, fishing is often regulated by local customary rules, and community-based management systems are generally wide spread throughout the country (Country Status Report: Laos, 2003).

11.5.12. The PRAs in Laos indicate that full-time fishers at the study site did not see access to the fishery as a problem. They did note that some communities along the river had their own rules for managing the fisheries, but also that all who wished to fish did get the opportunity to do so.

11.5.13. **Vietnam** The PRAs in Vietnam similarly indicate that neither full- or part-time fishers see access to the resource as a problem *per se*, but rather the problem is competition between natural resource users (fishers with fishers, and with agriculturalists) over what are multifunctional resources – floodplains. That is, between wetlands on which the fisheries depend, but which become dry land for part of the year, versus arable land whose productivity is threatened by flooding for part of the year. The trend, supported by government, is towards securing the resource as arable land at the expense of the floodplain fisheries. This is a problem not only for the inland capture fisheries and LARs on the floodplain, but a problem for those that exploit them.

11.6. Livelihood constraints faced by fishers

11.6.1. Access to the fisheries does not appear to be much of an issue for fishers in any of the study countries. This may possibly be because the majority of those who fish do not know or understand policy made by their governments, while implementation and enforcement of centrally-formulated fisheries policy is almost impossible given the extent of the fisheries, the lack of capacity in line ministries, and the near universal tendency to subvert regulations where necessary in order to make a living. Given lack of active management by states, other than to extract revenue for the state, the fisheries have generally taken on the character of ‘open-access’ CPR’s, - except that informal (‘traditional’) management rules have tended to emerge in response to fishing pressure.

11.6.2. However, while access does not currently appear to be an issue to fishers in any of the three main categories identified, they do face a variety of other problems in their livelihoods. The majority of these have to do with their personal and communal poverty, but also with perceived threats to fisheries resources, with the former frequently being seen as a greater constraint to livelihoods than the latter.

11.6.3. **Bangladesh** There is almost universal agreement among full- and part-time and subsistence fishers that catches are declining, while in several environments species diversity are also reported to have fallen in the last 20 years. Only in the deeply flooded *haor* area does the environment appear to be more stable, and fish are increasing in their importance in fisher livelihoods. However, despite the trend reported in declining fish catches, this was only the top

ranking problem in the floodplain PRA site.

11.6.4. Common problems reported include lack of capital and gear, siltation of rivers, canals and beels in the inland floodplain systems (fish habitat), poor infrastructure (roads, electricity), lack of safe drinking water, and insecurity (robbery) (Country PRA Report: Bangladesh, 2003).

11.6.5. **Cambodia** The problems faced include: lack of road, lack of irrigation dam, lack of clean water source and sanitation facilities, decline in the fisheries and increasing use of illegal fishing gear, lack of land for farming rice, inadequate sized fishery, crop pests (rats), population increase. Flooding of homes was not normally a problem since most houses were built on stilts above the floodwaters.

11.6.6. At the Great Lake survey site fish yield decline is identified as one of the core problems. The root of the problem was perceived to be fishing pressure (the use of more efficient and also illegal gears, population increase, and more fishers - including migrant fishers-), and reduced access to fishing areas and the blocking of fish migration routes by the local commercial fishing lot. Perversely respondents also mentioned that prices for fish and fish products had dropped over the years (which suggests that, if production figures are also correct, there are still plenty of fish, but that the respondents – for one reason or another – are not benefiting as much as they previously had (Country PRA Report: Cambodia, 2003).

11.6.7. There are probably a complex of reasons for this, and current Fisheries Fiat Law may also be implicated. It may have thrown 'open' fisheries which were historically far more controlled by the lot and licensing system and by the community, and thus may now be attracting migrants who come for the main fishing season only. This not only puts pressure on the resource, but also diverts production into the latter's livelihoods (since they may stock up with fish products for the dry season.) The large movement of people to the Great Lake during the flood season may perhaps be a response to recent legislation opening up the fisheries to family-scale fisheries, rather than being traditional. (A similar 'open access' policy in the rivers, instituted by the government of Bangladesh, has led to a considerable increase in fishing pressure there too). Here a policy supposed to support livelihoods of the poor may actually be contributing to unsustainable fishing pressure with long term implications for the poor. Meanwhile fishing pressure due to increased population (and fishers) and reduced access (due to the commercial fishing lot) is probably reducing the amount of catch per fisher while overall production is increasing (as indicated by falling prices).

11.6.8.Laos The main problems that full time fishers in the Laos PRA exercise identified were that the perceived decrease in fish species (larger and higher value fish were now rare or extinct), while the number of escaped cultured fish in the river was increasing. There was also greater bank erosion and silt deposition along the river, and respondents felt that the overall quality of fish habitat had declined. As evidence they noted that fish were more plentiful in the 1980's when there were no fishing restrictions, but today even with conservation zones fish populations had actually decreased. However, they also said that there was greater fishing pressure (overfishing, an increase in the number of fishers) and a greater use of harmful gears.

11.6.9.Flooding of homes was a problem for them with about 40% of fishers households facing this problem, while they were unable to fish in the river during periods of high flood and thus lose a source of income. However, fishing in flooded rice fields at this time provided some substitute. Lack of electricity and in particular roads were a problem, since they were unable to transport fish to the city where they would get a better price.

11.6.10.Those whose livelihoods are based on a mix of strategies which include farming and fishing face the same kinds of difficulties as full-time fishers – in particular water-borne disease and malaria, but also a lack of infrastructure such as school, electricity, road and safe drinking water. Lack of electricity supply and the decline in fisheries were ranked as serious problems by respondents in all agro-ecosystems. 'According to them lack of government initiative for rural development is the main causes of their sufferings' (Country PRA Report: Laos, 2003).

11.6.11.Vietnam The most pressing problems identified by full- and part-time fishers and fish traders in the PRA exercises on the Mekong floodplains were the lack of access to working capital, the decline in the natural fish stock, and in the case of fish traders, landlessness. However, the lack of suitable fishing grounds (i.e. reduction in these due to poldering and the conversion of floodplain to flood-free arable land), and the increase in the number of fishers exploiting dwindling resources were mentioned as the next most pressing problems. The use of illegal gear which threatened the sustainability of the resource was next (Country PRA Report: Vietnam,2003).

11.6.12.Flooding was not normally a problem in the Mekong delta region (except for the poorest with poorly built houses) since most houses were raised on platforms above the flood. Only in the upland areas is flooding more catastrophic, in particular washing away land and houses or covering agricultural land with flood debris and stones (see Beckman et al 2002).

11.7. Data gaps

11.7.1.Townsley (1998) has emphasised the fact that 'Data which indicates the relative importance of aquatic resources in rural livelihoods are rarely available.' He also notes that it is possible to obtain certain information - nutritional data showing the contribution of fish to rural diets, fish catch statistics and fish supply data. The data assembled at the beginning of the report and compiled from the Country Status Reports indicate the importance of fish to national economies, to people's diets and to rural livelihoods. However, it has not been able to identify their importance to specific sections of study countries' population other than tangentially. However, what the Country Status Reports and the Country PRA Reports have done is to provide

some indication of actual and potential threats to the resource and to the access of different livelihood groups to them.

11.7.2. Townsley (1998) also says that 'given the paucity of adequate quantitative data on the role of fisheries in rural livelihoods, more qualitative indicators become particularly important.' While this is so, there is also a need to treat qualitative information with some caution. As the authors of the Bangladesh Reports note

'From the review of existing literature and secondary stakeholders discussion, it would seem that the inland fisheries (capture) are declining, though according to DoF's estimates they are increasing since 1990. The reasons this contradiction is unclear. However it may be that total catch is increasing due to increased fishing effort although the catch per unit effort or per fisher is decreasing, or may be that the recorded increase in catch is due to weak and old data base and a faulty data collection system. This is a weak area in inland fisheries management which needs to be addressed properly. The present fisheries data base and data collection system and the reliability of the data has been questioned by different agencies and the need for a strong fisheries data base and statistically sound data collection system have been suggested.'

11.7.3. The authors of the **Lao** Reports similarly note problems associated with their data systems. Thus government agencies of different institutional levels are involved in the generation of fisheries statistics, while 'Constraints in generating appropriate fisheries information include

- lack of guidelines and incentives to enumerators to produce reliable data,
- data generated are not used in an efficient manner, and
- limited human resources capacity and know how on data collection and gathering.'

11.7.4. Similarly in Vietnam, the authors of the Reports note that 'Despite an overwhelming volume of statistical data on poverty, using a range of economic indicators, there is almost no data available on the role of aquatic resources in poor people's livelihoods... Official data either fails to break down the range of aquatic resources among the whole resources systems, and/or fails to disaggregate into wealth categories. ... Data on professional fisheries overlooks what can be anticipated to be a far larger number of people who combine fishing with other livelihood strategies, and who are not classified and do not classify themselves as 'fishers'... Policy makers have paid inadequate attention to floodplains and rivers and the many freshwater fishes occurring there and data on the productivity and importance of these resources as a whole and to poor people are simply lacking.

11.7.5. It is hoped that the output from the current project gives some insight into the livelihoods of the groups which have some dependence on the inland capture fisheries, including both those of full-time fishers and those who include fishing as a part of wider livelihood strategies, and into the opportunities and threats which they face. There remains a need for further work on a number of fronts including:

- ❖ further work from a livelihoods perspective (particularly in the SE Asian countries)
- ❖ further work from an institutional and governance perspective (as governments reform their fisheries policy and move towards CBFM)

- ❖ further work on appropriate fisheries data systems (to ensure their relevance in the context of CBFM and poverty alleviation).

Acronyms

AMFC	Assessment of Mekong Fisheries Component
<i>Aratdar</i>	Fish Trader
<i>Baors</i>	Big depression which is inundated during rainy season
BCAS	Bangladesh Centre for Academic Studies
<i>Beel</i>	Big depression which is inundated during rainy season
<i>boro rice</i>	dry season rice (Bangladesh)
CBFM	Community-Based Fisheries Management
<i>Charlands</i>	Land recently emerged from the river due to deposition
CPP	Compartmentalisation Pilot Project (in north-central Bangladesh at Tangail)
CPR	Common property Resources
CPRGS	Comprehensive Poverty Reduction and Growth Strategy (Vietnam)
CPUA	Catch Per Unit Area
DLF	Department of Livestock and Fisheries (Laos)
DOF	Department of Fisheries (Bangladesh, Cambodia)
<i>doi moi</i>	Vietnam
EIA	Environmental Impact Assessment
FAO	Food and Agricultural Organisation
FAP	Flood Action Plan (Bangladesh)
FCD/I	Flood Control Drainage and Irrigation infrastructure
GDP	Gross Domestic Product
GoB	Government of Bangladesh
GoC	Government of Cambodia
GoL	Government of Laos
GoVN	Government of Vietnam
<i>Haor</i>	Big depression which is inundated during rainy season
HDI	Human Development Index (of the UNDP)
HEIs	High External Inputs (Cost of seed, fertiliser, pesticide etc.)
HEPR	Hunger Eradication and Poverty Reduction (Vietnam)
HES	Household Expenditure Survey (Bangladesh)
HH	Household
HYV	High Yielding Varieties (of food grains – usually rice)
IFAD	International Fund for Agriculture Development
IFM	Integrated Floodplain Management
IPM	Integrated Pest Management
<i>Jalmahal</i>	Section of river, <i>individual</i> or group of <i>beels</i> (depression), or individual pond owned by the state but leased out for fishing.
<i>Jele</i>	Fisherman (Bangladesh)
<i>Katha</i>	brushpile in the water (a fish aggregating device)
<i>Khas</i>	national land held by government (Bangladesh)
<i>Khals</i>	Canals, water channels (Bangladesh)
<i>Kua</i>	Ditch or hole (for aggregating fish) (Bangladesh)
<i>Kutchra</i>	mud brick (Bangladesh)
LARReC	Living Aquatic Resources Research Center (Laos)

LECS	Lao Expenditure and Consumption Survey
MAFF	Ministry of Agriculture, Forests and Fisheries (Laos)
MOEF	Ministry of Environment and Forests (Bangladesh)
MPO	Master Plan Organisation (Bangladesh)
<i>Mohajan</i>	Money lender (Bangladesh)
MOWR	Ministry of Water Resources (Bangladesh)
MOL,	Ministry of Land (Bangladesh)
MOF	Ministry of Fisheries (Vietnam)
MOFL	Ministry of Fisheries and Livestock (Bangladesh)
MOLISA	Ministry of Labour, Invalids and Social Affairs (Vietnam)
MPO	Master Plan Organisation (for management of floodplain infrastructure)
MRC	Mekong River Commission
NEM	New Economic Mechanism (Laos)
NTFPs	Non Timber Forest Products
PRAs	Participatory Rural Appraisals
SAPA	Sustainable Aquaculture for Poverty Alleviation (in Vietnam).
<i>Somaj</i>	Politico-religious village grouping (Bangladesh)
T&V	Training and Visit (Agricultural extension approach)
VLSS	Vietnam Living Standards Survey
VND	Vietnamese Dong (currency)

Exchange rates

£1 sterling = 90.96 Bangladesh taka

£1 sterling = 11,939 Lao kips (@ 3/1/02)

£1 sterling = 24,261 Vietnam dong (@ 2/4/03)

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Appendix 1

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<http://www.worldbank.org/poverty/wdrpoverty/report/tab3.pdf>

Table 1. Size of the economy

Economy	Surface area	Population	Gross national product (GNP)				GNP per capita			Avg. annual growth rate (%)
	Population Millions	Thousands of sq. km	People per sq. km	of dollars	Billions	Avg. annual growth rate (%)	Dollars	Rank	Rank	
	1999	1999	1999	1999	1999	1998-99	1999	1999	1999	1998-99
Bangladesh	128	144	981	47.0	50	5.0	370	167	3.3	
Cambodia	12	181	67	3.0	133	4.5	260	186	2.2	
Lao PDR	5	237	22	1.4	160	4.0	280	184	1.5	
Vietnam	78	332	238	28.2	60	4.2	370	167	2.9	
Low income	2,417	4,227	73	987.6		4.4	410		2.5	
Thailand	62	513	121	121.0	31	4.9	1,960	102	4.1	

Table 2. Quality of life

Economy	Growth of private consumption per capita		Prevalence of child malnutrition				Life expectancy at birth				Adult illiteracy rate		Urban population % of total	Access to sanitation in urban areas % of urban pop. with access
	Avg. annual growth rate (%), 1980-98	Distribution-corrected 1992-98	% of children under age 5	Under-5 mortality rate Per 1,000	Years 1998	% of people 15 and above 1998	% of people 15 and above 1998	% of total 1990-96						
	1980	1998	Males	Females	Males	Females	1980	1999	1990-96	1990-96	1990-96			
Bangladesh	2.1	1.4	56	211	96	58	59	49	71	14	24	77		
Cambodia	..	..	..	..	330	143	52	55	43	80	12	16	..
Lao PDR	..	..	40	..	200	..	52	55	38	70	13	23	70
Vietnam	..	..	40	..	105	42	66	71	5	9	19	20	43
Low income	1.4	..	..	..	177	107	59	61	30	49	24	31	56
Thailand	5.1	3.0	..	..	58	33	70	75	3	7	17	21	98

Table 3. Population and labor force

Economy	Population		Labor force				Female		Children ages 10-14					
	Total Millions	Avg. annual growth rate (%)	Ages 15-64 Millions	Total Millions	Avg. annual growth rate (%)	% of labor force	% of age group	1980	1999					
	1980	1999	1980-90	1990-99	1980-90	1990-99	1980	1999	1980	1999				
Bangladesh	86.7	127.7	2.4	1.6	44	74	41	66	2.2	3.0	42	42	35	29
Cambodia	6.8	11.8	2.9	2.8	4	6	4	6	2.6	2.8	55	52	27	24
Lao PDR	3.2	5.1	2.3	2.6	2	3	..	..	..	..	..	..	31	26
Vietnam	53.7	77.5	2.1	1.8	28	48	26	40	2.7	1.8	48	49	22	7
Low income	1,613	2,417	2.3	2.0	890	1,417	709	1,085	2.1	2.4	38	38	24	19
Thailand	46.7	61.7	1.7	1.2	26	42	24	37	2.7	1.7	47	46	25	14

Table 4. Poverty

Economy	National poverty lines								International poverty lines					
	Survey year		Population below the poverty line (%)		Survey year		Population below the poverty line (%)		Survey year		Population below \$1 a day	Poverty gap at \$1 a day	Population below \$2 a day	Poverty gap at \$2 a day
	Year	Year	Rural	Urban	Year	Year	Rural	Urban	Year	Year	%	%	%	%
Bangladesh	1991-92	46	23.3	42.7	1995-96	39.8	14.3	35.6	1996	29.1	5.9	77.8	31.8	
Cambodia	1993-94	43	24.8	39	1997	40.1	21.1	36.1			..	..	..
Lao PDR	1993	53	24	46.1		..	..	..			..	..	..
Vietnam	1993	57	25.9	50.9		..	..	..			..	..	..
Thailand	1990	..	..	18.0	1992	15.5	10.2	13.1	1998	2	0.5	28.2	7.1	

Table 5. Land use and agricultural productivity

Agricultural

Economy	Land under permanent crops		Irrigated land		Arable land		Agricultural machinery		productivity		Food prod. index	
	% of land area		% of cropland		Hect. per cap.		Tractors per thousand agric. workers		Agr. value added per agricultural worker		1989-91 = 100	
	1980	1997	1979-81	1995-7	1979-81	1995-7	1979-81	1995-7	1979-81	1996-8	1979-81	1996-8
Bangladesh	2.0	2.5	17.1	43.4	0.10	0.06	0	0	212	276	79.2	110.8
Cambodia	0.4	0.6	5.8	7.1	0.29	0.34	0	0	..	408	48.9	130.6
Lao PDR	0.1	0.2	15.4	18.6	0.21	0.17	0	0	..	548	70.8	126.7
Vietnam	1.9	4.7	24.1	31.0	0.11	0.08	1	4	..	230	63.8	140.5
Low income	1.0	1.4	19.9	25.5	0.22	0.19	..	..	..	"	71.3	124.3
Thailand	3.5	6.6	16.4	23.9	0.35	0.28	1	7	634	932	80.4	112.6

Table 6. Water use, deforestation, and protected areas

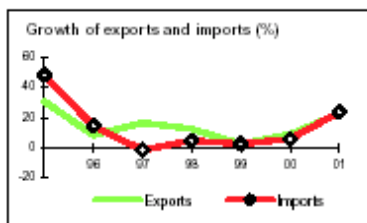
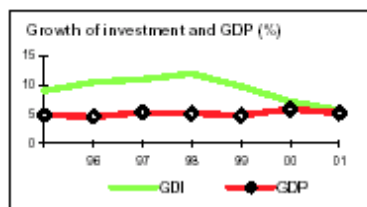
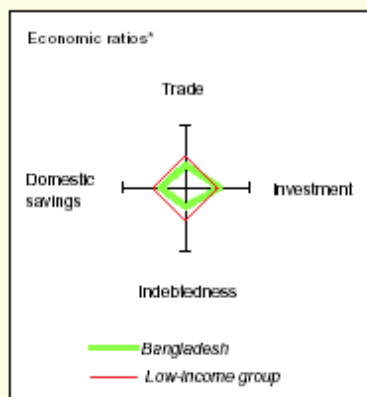
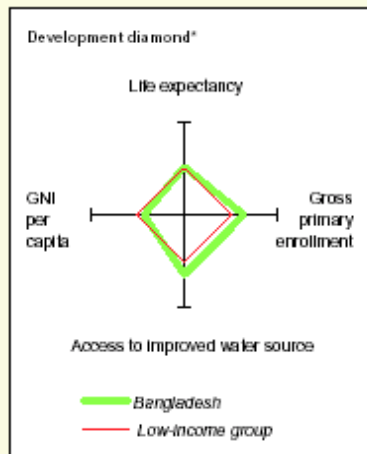
Economy	Freshwater resources		Annual freshwater withdrawals				Access to improved water source			Annual deforestation		Nationally protected areas	
	Cu. meters per capita		Billion % of total resources		% for agric. Ind. % for domestic		% of pop. with access			1990-95		1996	
	1998	1998	% of total resources	% for agric. Ind.	% for domestic	Urban	Rural	domestic	Urban	Rural	Square km	Avg. annual % change	Thousand square km	% of total land area
Bangladesh	9,636	14.6	1.2	6	2	12	47	85	88	0.8	1.0	0.8	
Cambodia	41,407	0.5	0.1	94	1	5	20	12	1,638	1.6	28.6	16.2	
Lao PDR	56,638	1.0	0.4	82	10	8	40	39	..	..	0.0	0.0	
Vietnam	11,647	54.3	6.1	86	10	4	53	32	1,352	1.4	9.9	3.0	
Low income	5,538	..	..	87	8	5	..	..	45,130	0.7	1,852.4	5.6	
Thailand	6,698	33.1	8.1	91	4	5	94	88	3,294	2.6	70.7	13.8	

Appendix 2 World Bank 'At a glance' Tables

Bangladesh at a glance

9/13/02

POVERTY and SOCIAL	Bangladesh	South Asia	Low-Income	
2001				
Population, mid-year (millions)	133.4	1,380	2,511	
GNI per capita (Atlas method, US\$)	370	450	430	
GNI (Atlas method, US\$ billions)	48.6	616	1,069	
Average annual growth, 1995-01				
Population (%)	1.7	1.9	1.9	
Labor force (%)	2.9	2.4	2.3	
Most recent estimate (latest year available, 1995-01)				
Poverty (% of population below national poverty line)	36	..	..
Urban population (% of total population)	25	28	31	
Life expectancy at birth (years)	61	62	59	
Infant mortality (per 1,000 live births)	60	73	76	
Child malnutrition (% of children under 5)	61	49	..	
Access to an improved water source (% of population)	97	87	76	
Illiteracy (% of population on age 15+)	58	44	37	
Gross primary enrollment (% of school-age population)	122	101	96	
Male	125	109	103	
Female	120	93	88	
KEY ECONOMIC RATIOS and LONG-TERM TRENDS				
	1981	1991	2000	2001
GDP (US\$ billions)	19.5	31.0	47.1	46.7
Gross domestic investment/GDP	15.9	16.9	23.0	23.1
Exports of goods and services/GDP	6.5	6.8	14.0	15.4
Gross domestic savings/GDP	9.7	11.4	17.8	16.2
Gross national savings/GDP	14.5	13.7	23.0	20.5
Current account balance/GDP	-4.3	-3.1	0.0	-1.7
Interest payments/GDP	0.3	0.5	0.4	0.5
Total debt/GDP	23.9	42.6	33.1	32.7
Total debt service/exports	16.8	20.9	9.1	7.3
Present value of debt/GDP	..	..	20.3	..
Present value of debt/exports	..	..	110.6	..
	1981-91	1991-01	2000	2001
(average annual growth)				
GDP	4.1	5.0	5.9	5.3
GDP per capita	1.6	3.3	4.2	3.4
Exports of goods and services	8.4	13.2	8.6	22.8
	2001	2001	2001-05	
STRUCTURE of the ECONOMY				
	1981	1991	2000	2001
(% of GDP)				
Agriculture	..	30.4	25.5	24.1
Industry	..	21.7	25.3	25.9
Manufacturing	..	13.4	15.2	15.6
Services	..	47.9	49.2	50.0
Private consumption	89.9	84.5	77.6	79.3
General government consumption	6.7	4.1	4.6	4.5
Imports of goods and services	19.0	12.4	19.2	22.3
	1981-91	1991-01	2000	2001
(average annual growth)				
Agriculture	2.5	3.3	7.4	3.1
Industry	5.2	7.3	6.2	7.2
Manufacturing	3.3	6.9	4.8	6.7
Services	3.9	4.7	5.5	5.5
Private consumption	4.0	3.9	5.3	6.2
General government consumption	4.6	4.4	0.9	4.5
Gross domestic investment	2.1	9.6	7.3	5.8
Imports of goods and services	6.6	10.8	5.7	23.5

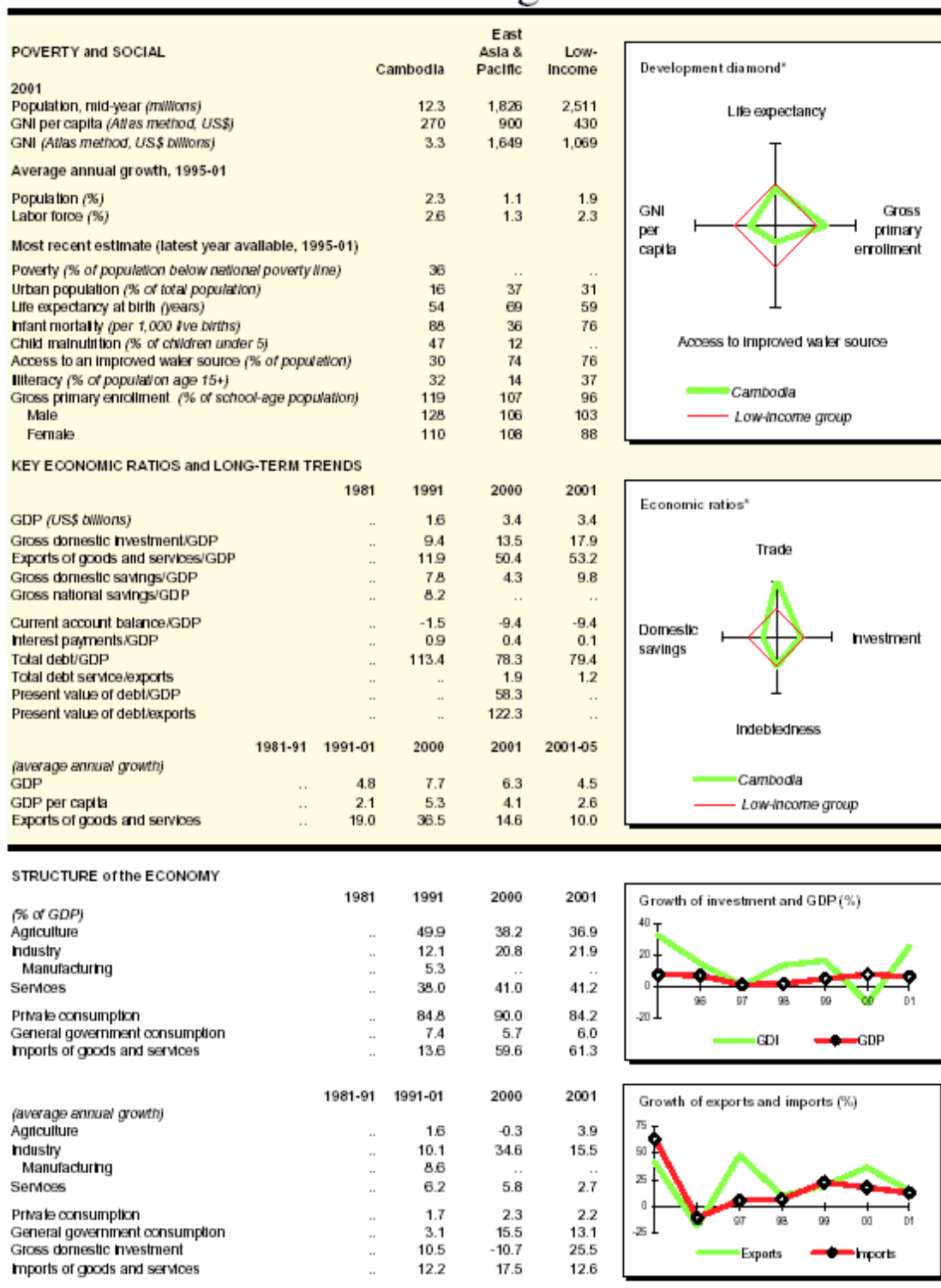


Note: 2001 data are preliminary estimates.

* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

Cambodia at a glance

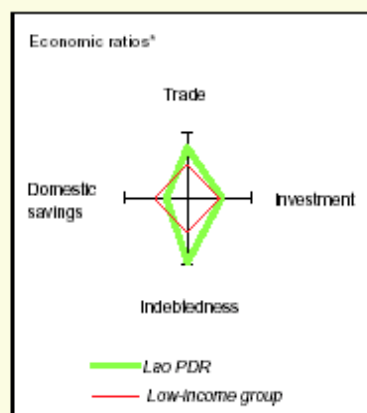
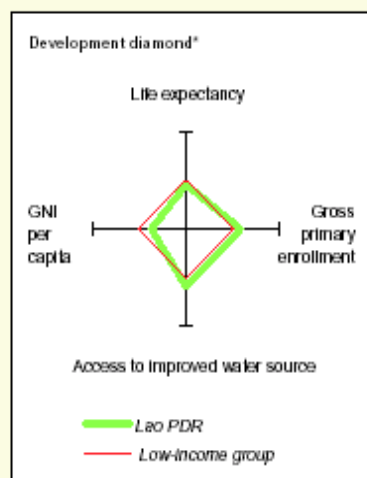
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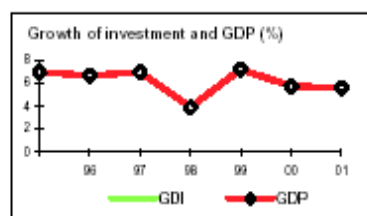
Lao PDR at a glance

9/11/02

POVERTY and SOCIAL	Lao	East	Low-	
	PDR	Asia & Pacific	Income	
2001				
Population, mid-year (millions)	5.3	1,826	2,511	
GNI per capita (Atlas method, US\$)	320	900	430	
GNI (Atlas method, US\$ billions)	1.7	1,649	1,069	
Average annual growth, 1995-01				
Population (%)	2.5	1.1	1.9	
Labor force (%)	2.3	1.3	2.3	
Most recent estimate (latest year available, 1995-01)				
Poverty (% of population below national poverty line)	..	..	..
Urban population (% of total population)	24	37	31	
Life expectancy at birth (years)	54	69	59	
Infant mortality (per 1,000 live births)	93	36	76	
Child malnutrition (% of children under 5)	..	12	..	
Access to an improved water source (% of population)	90	74	76	
Illiteracy (% of population age 15+)	50	14	37	
Gross primary enrollment (% of school-age population)	112	107	96	
Male	123	106	103	
Female	101	108	88	
KEY ECONOMIC RATIOS and LONG-TERM TRENDS				
	1981	1991	2000	2001
GDP (US\$ billions)	..	1.0	1.7	1.8
Gross domestic investment/GDP	21.8	22.1
Exports of goods and services/GDP	..	13.0
Gross domestic savings/GDP
Gross national savings/GDP
Current account balance/GDP	..	-10.8	-8.5	-6.1
Interest payments/GDP	..	0.3	0.5	0.6
Total debt/GDP	..	182.5	146.2	141.7
Total debt service/exports	..	6.3	7.7	7.9
Present value of debt/GDP	70.6	..
Present value of debt/exports	228.9	..
	1981-91	1991-01	2000	2001
<i>(average annual growth)</i>				
GDP	4.1	6.5	5.8	5.7
GDP per capita	1.7	3.8	3.4	3.3
Exports of goods and services



STRUCTURE of the ECONOMY				
	1981	1991	2000	2001
<i>(% of GDP)</i>				
Agriculture	..	58.2	52.8	50.9
Industry	..	16.8	23.0	23.4
Manufacturing	..	12.5	17.1	17.7
Services	..	25.0	24.2	25.7
Private consumption	..	..	..	..
General government consumption	..	..	..	..
Imports of goods and services	..	25.2	..	..
	1981-91	1991-01	2000	2001
<i>(average annual growth)</i>				
Agriculture	3.3	5.1	4.9	3.8
Industry	8.3	10.5	8.5	9.7
Manufacturing	11.4	11.8	..	..
Services	3.8	20.5	4.9	4.4
Private consumption	..	..	..	..
General government consumption	..	..	..	..
Gross domestic investment	..	..	..	..
Imports of goods and services	..	..	..	..



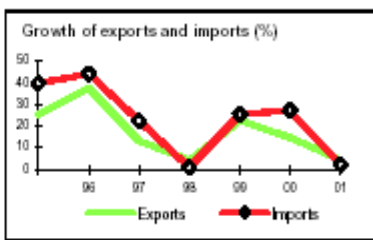
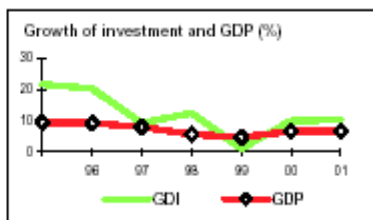
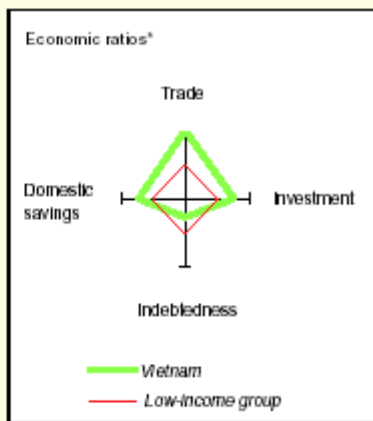
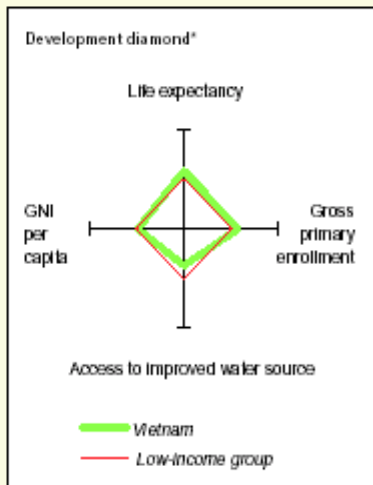
Note: 2001 data are preliminary estimates.

* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

Vietnam at a glance

9/12/02

POVERTY and SOCIAL	Vietnam	East Asia & Pacific	Low-income		
2001					
Population, mid-year (millions)	78.7	1,826	2,511		
GNI per capita (Atlas method, US\$)	420	900	430		
GNI (Atlas method, US\$ billions)	33.4	1,649	1,069		
Average annual growth, 1995-01					
Population (%)	1.5	1.1	1.9		
Labor force (%)	1.7	1.3	2.3		
Most recent estimate (latest year available, 1995-01)					
Poverty (% of population below national poverty line)	32	..	..
Urban population (% of total population)	25	37	31		
Life expectancy at birth (years)	69	69	59		
Infant mortality (per 1,000 live births)	37	36	76		
Child malnutrition (% of children under 5)	34	12	..		
Access to an improved water source (% of population)	56	74	76		
Illiteracy (% of population age 15+)	6	14	37		
Gross primary enrollment (% of school-age population)	110	107	96		
Male	113	106	103		
Female	107	108	88		
KEY ECONOMIC RATIOS and LONG-TERM TRENDS					
	1981	1991	2000	2001	
GDP (US\$ billions)	..	9.6	31.2	32.7	
Gross domestic investment/GDP	..	15.0	29.6	30.9	
Exports of goods and services/GDP	..	32.6	55.0	54.7	
Gross domestic savings/GDP	..	16.5	27.1	28.9	
Gross national savings/GDP	..	16.9	31.4	32.2	
Current account balance/GDP	..	-2.0	1.6	1.8	
Interest payments/GDP	..	0.3	0.9	1.1	
Total debt/GDP	..	243.4	41.2	38.4	
Total debt service/exports	..	6.3	7.5	6.7	
Present value of debt/GDP	..	..	35.7	..
Present value of debt/exports	..	..	64.3	..
	1981-91	1991-01	2000	2001	2001-05
<i>(average annual growth)</i>					
GDP	4.9	7.7	6.8	6.8	7.0
GDP per capita	2.5	6.1	5.4	5.4	5.6
Exports of goods and services	..	21.3	14.8	4.5	..
STRUCTURE of the ECONOMY					
	1981	1991	2000	2001	
<i>(% of GDP)</i>					
Agriculture	..	39.5	24.5	23.6	
Industry	..	23.8	36.7	37.8	
Manufacturing	..	13.3	18.6	19.6	
Services	..	36.7	38.9	38.6	
Private consumption	..	77.1	66.5	65.0	
General government consumption	..	6.3	6.4	6.2	
Imports of goods and services	..	31.1	57.5	56.8	
	1981-91	1991-01	2000	2001	
<i>(average annual growth)</i>					
Agriculture	4.3	4.7	4.6	2.8	
Industry	..	11.7	10.1	10.3	
Manufacturing	..	12.1	11.7	11.3	
Services	..	7.4	5.3	6.1	
Private consumption	..	11.1	3.1	4.5	
General government consumption	..	10.6	5.0	5.5	
Gross domestic investment	..	18.6	10.1	10.5	
Imports of goods and services	..	29.1	27.3	2.3	



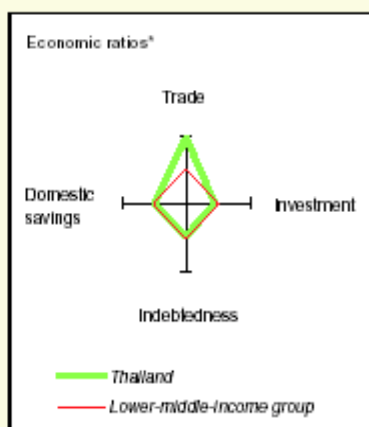
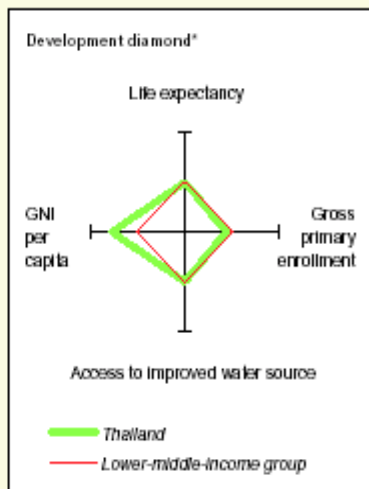
Note: 2001 data are preliminary estimates.

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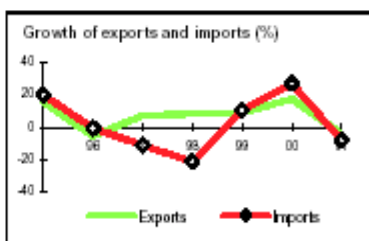
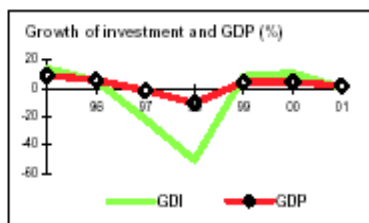
Thailand at a glance

9/23/02

POVERTY and SOCIAL	Thailand	East Asia & Pacific	Lower-middle-income		
2001					
Population, mid-year (millions)	61.2	1,826	2,164		
GNI per capita (Atlas method, US\$)	1,930	900	1,240		
GNI (Atlas method, US\$ billions)	118.4	1,649	2,677		
Average annual growth, 1995-01					
Population (%)	0.7	1.1	1.0		
Labor force (%)	1.2	1.3	1.2		
Most recent estimate (latest year available, 1995-01)					
Poverty (% of population below national poverty line)	..	..	..
Urban population (% of total population)	20	37	46		
Life expectancy at birth (years)	69	69	69		
Infant mortality (per 1,000 live births)	28	36	33		
Child malnutrition (% of children under 5)	18	12	11		
Access to an improved water source (% of population)	80	74	80		
Illiteracy (% of population age 15+)	4	14	15		
Gross primary enrollment (% of school-age population)	94	107	107		
Male	95	106	107		
Female	92	108	107		
KEY ECONOMIC RATIOS and LONG-TERM TRENDS					
	1981	1991	2000	2001	
GDP (US\$ billions)	34.8	98.2	120.7	114.7	
Gross domestic investment/GDP	29.7	42.8	22.7	24.0	
Exports of goods and services/GDP	23.8	36.0	67.1	66.3	
Gross domestic savings/GDP	23.4	38.3	31.4	30.1	
Gross national savings/GDP	22.3	35.1	30.1	28.7	
Current account balance/GDP	-7.4	-7.7	7.7	5.4	
Interest payments/GDP	2.0	1.8	3.1	3.0	
Total debt/GDP	31.1	38.4	66.0	58.5	
Total debt service/exports	20.3	13.0	15.5	20.5	
Present value of debt/GDP	63.4	..	
Present value of debt/exports	89.0	..	
	1981-91	1991-01	2000	2001	2001-05
<i>(average annual growth)</i>					
GDP	8.2	3.2	4.6	1.8	3.7
GDP per capita	6.5	2.4	3.8	0.9	1.8
Exports of goods and services	15.5	8.5	17.6	-4.2	2.3



STRUCTURE of the ECONOMY	1981	1991	2000	2001
<i>(% of GDP)</i>				
Agriculture	21.4	12.6	10.3	10.2
Industry	30.1	38.7	40.5	40.0
Manufacturing	22.6	28.2	32.0	32.1
Services	48.5	48.7	49.3	49.4
Private consumption	63.8	54.5	57.1	58.3
General government consumption	12.8	9.2	11.4	11.6
Imports of goods and services	30.1	42.5	58.4	60.2
Growth of investment and GDP (%)				
	1981-91	1991-01	2000	2001
<i>(average annual growth)</i>				
Agriculture	3.9	1.9	4.9	..
Industry	10.9	4.5	5.2	..
Manufacturing	10.7	5.8	6.0	..
Services	7.9	3.1	4.0	..
Private consumption	6.9	3.5	6.1	0.3
General government consumption	3.8	4.6	2.6	1.6
Gross domestic investment	11.6	-6.0	10.9	0.6
Imports of goods and services	14.1	3.1	27.3	-8.3



Note: 2001 data are preliminary estimates.

* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

(Thailand is included as a regional comparator)

(N.B Only page 1 of each of these World Bank tables have been included here).