CHAPTER - I
INTRODUCTION

The present study is an attempt to understand the link between natural resource degradation and poverty among people dependent on these resources. This is done by examining the impact of depletion of marine resources on the livelihood and socio-economic condition of the small-scale marine fishing community in South Kerala.

1.1 BACKGROUND OF THE STUDY

1.1.1 Dependence of poor on natural resources

Degradation of natural resources such as land, forest, marine and fresh water, bio-diversity, etc. threatens the livelihoods of people, especially the rural poor. The poor people depend mainly on these freely available natural resources for their livelihood and survival strategies. They fish from ponds, rivers and the sea, gather fuel wood from woodlands, forests and roadside trees, collect fodder, graze their animals and hunt in the forests. They also collect non-timber products like gums, resins, wild fruits and berries, etc. from forests. These resources provide them a range of goods for household use in various capacities as consumer durables, production inputs, and capital assets. They also perform an important safety net function and safeguard against exogenous stresses and shocks. Even when the poor have access to other resources, these natural resources provide a cushion to them during periods when income from other sources declines or becomes unavailable; and natural resources are sometimes the only asset to which the poor people have access (Shyamsundar, 2002). It is these groups that are the most impacted due to the declining natural resource environment, especially in the absence of any successful process of regeneration. According to the World Development Report 2000/2001, referring to Amartya Sen, "poor people live without fundamental freedoms of action and choice that the better-off take for granted. They often lack adequate food and shelter, education and health, deprivations that keep them from leading the kind of life that everyone values. They also face extreme vulnerability to ill-health, economic dislocation, and natural disasters. And they are often exposed to ill treatment by institutions of the State..."
and society and are powerless to influence key decisions affecting their lives" (World Bank, 2001). In this present study an attempt is made to understand the way in which natural resource degradation affects poor people with special reference to small-scale marine fisheries of Kerala. Before discussing the link between natural resources and poverty, it is necessary to discuss the concepts of natural resources and poverty.

1.1.2 Concept of natural resources

Classical economists used land as a generic term to describe natural resources. Broadly defined natural resources include all the 'original' elements that comprise the earth's natural endowments of the life support systems: air, water, earth's crust, radiation from the sun, etc. The natural resources may be broadly classified into 'renewable resources' and 'non-renewable resources'. Renewable resources are natural resources capable of regenerating themselves within a relatively short period provided the environment in which they are nurtured is not unduly disturbed, e.g. fish, forests, soil, etc. The renewable resources are further classified into biological and flow resources. (Examples of flow resources are solar radiation, wind, tides and water stream.) Non-renewable resources are resources that exist in fixed supply or are renewable only on a geological timescale, where regenerative capacity can be assumed to be zero, for all practical purposes. These may be classified into recyclable (e.g. metallic minerals) and non-recyclable (e.g. fossil fuels). The term ‘environment’ generally means a natural resource base that provides sources (material, energy, resources, etc.) and performs as a sink functions (such as absorbing pollution). The term also includes resources that people have relied on and no longer do so, either because the resources are depleted or because they have been replaced by some other resource or technology (Bucknall et al., 2000).

In economic analysis, the difference between a natural resource and an environmental resource lies primarily on the focus of analysis. In natural resource economics, the emphasis is on the inter-temporal allocation of extractive non-renewable resources and the harvest of renewable resources. In other words, natural resource economics is mainly concerned with rates of
exhaustible resource depletion and the determination of optimal harvest rates for renewable resources. Environmental economics, on the other hand, focuses on pollution; and the primary focus is as how to use or manage the natural environment as a valuable resource for disposal of waste.

What does environment degradation mean? The term ‘degradation’ can be interpreted in different ways. As a working definition the term ‘environmental degradation’ can be used to imply (i) depletion (the damage to a natural resource system, which affects present or future human needs negatively) and (ii) pollution (leading to a damage to human health or decline in the capacity of the environment to sustain natural systems). Environmental degradation is a sub-set of environmental change.

The main causes for natural resource degradation are (i) market failure, (ii) policy failure, (iii) institutional failure, and (iv) population growth. Market failure happens when clear or values for natural resources do not exist or when markets function poorly or distorted relative prices result in miss-allocation of resources, excess resource exploitation and subsequent degradation by private and public users. Policy failure manifests itself when inappropriate government policies, or absence of required policy result in market distortions for natural resource use, aggravated market failures, and natural resource degradation by private and public users. Institutional failure takes place when a country lacks the necessary government structures, environmental legislation and regulations, or when a decline in traditional land-use management processes result in natural resource degradation. Population growth intensifies pressure on the land base in excess of its carrying capacity. Population growth is commonly cited as a major contributor to environmental degradation on the ground that it leads to increased consumption and higher demand for natural resources.

1.1.3 Poverty and natural resource degradation

The link between poverty and natural resource degradation has been the subject of many studies, most of them relating to rural livelihoods. Poor people depend for their livelihood, on various activities which include farm and non-farm activities, petty trade, wage labour, etc. Majority of them, especially those
in rural areas, tend to depend on natural systems, directly or indirectly, for income generation, subsistence and shelter. Therefore, a declining resource base affects their well-being and in turn some times forces them to degrade the environment resource base even further. It is widely hypothesised that there is a spiral or circular relationship between poverty and environmental degradation. In other words, the hypothesis suggests that environmental degradation leads to poverty which in turn leads to further degradation. Some authors argue that poor people extract more natural resources and cause greater environmental degradation than others due to excessive reliance on the natural resource base and the placing of high discount rates on future returns. On the other hand, there are several studies which point out that since poor people depend more heavily on a limited natural resource base, they attach greater value to its conservation and so have developed sustainable management strategies (Reddy, 1999). Poverty is sometimes associated with environmental degradation; but there does not necessarily exists a direct causal relationship between the two. The poverty trap thesis implies that the poor lack the ability to forgo present subsistence in favour of savings for future consumption or environmental quality. This handicap coupled with their high degree of resource dependence, leads to preoccupation with short-term results, thus generating environmental degradation (During, 1989). However, there is little empirical evidence to conclude with certainty the causative link. Some cases support the theory; others disprove it.

The present study is an attempt to examine the impact of natural resource depletion on the livelihood of the poor in the small-scale fishing community in the case of the coastal fishery sector of Kerala. There exists little empirical evidence on the nature and extent of poverty in these communities and on the relative importance of different causes of poverty.

1.1.4 Resource degradation in open access fishery

The depletion of marine fishery is a phenomenon experienced the world over and many people are concerned about this phenomenon. Several causal factors underlie it. Economic considerations and the existence of an open access fishery, may presumably provide a possible causal link.
The economic theory of fish resource exploitation has been built up on the basis of relatively simple biological and economic models. One of the biological models is known as the Schaeffer growth model developed by Schaefer (1954). The model postulates that the growth of a stock of fish depends on the size of the standing fish stock. At a small size, the growth rate is small, but it increases as the stock becomes larger until a point is reached beyond which growth declines with further increase in stock. This implies an inverted U-shaped curve as shown in the lower panel of the Figure 1.1.

The curve in the upper panel of Figure 1.1 is the logistic curve, which shows the size of the population at different points of time. The implication is that in a stable and unmanaged ecosystem, over time, the biomass of the fish population tends to rise towards the definite maximum size of K, which is the carrying capacity that can be supported in a particular area. It also shows that because of the self-regenerative capacity, within certain limits, it is possible to harvest the resources while maintaining the size of the underlying population. As shown in the upper panel of the Figure 1.1 the maximum productivity corresponds to the inflection point on the population growth curve.

Fishing effort is introduced into this model in the form of human intervention causing fishing mortality in addition to natural mortality. It follows that there exists an inverse relationship between fishing effort and the size of standing stock. When this relationship is looked in conjunction with the relationship between natural growth and stock, we obtain an inverted relationship between effort and growth. Since sustainable catch exactly equals the growth at the corresponding level of effort, the sustainable catch-effort relationship is identical to the growth-effort relationship. In the initial stages of exploitation of fishery, expansion of effort brings about more or less proportional increase in catch; but as effort expands the rate of increase of catch declines, until a point referred to as the maximum sustainable yield (MSY) is reached, beyond which additional effort reduces sustainable catch.

During the fifties, the fundament of modern fisheries research was laid by the biologists Schaefer and Beverton and Holt, and by the economists Gordon and Scott (See Schaefer, 1954; Beverton and Holt, 1957; Gordon, 1954; Scott, 1955). Gordon's seminal paper still provides the essentials for understanding the problems with fisheries. The model he developed, based on the logistic growth model extensively used by Schaefer, is commonly referred to as the Gordon-Schaefer model.
Figure 1.1 Logistic Curve and Schaefer Curve
Illustrating the Formulation of MSY

[Graph showing Logistic Curve and Schaefer Curve]

- Population Size axis
- Time axis
- MSY point
- K point

MSY
Population Growth
Population Size
K
Fishing takes place because fishing is profitable to fishermen. In considering the effect of fishing on a stock of fish, it is necessary to examine the economics of fishing from two points of view: first the economics of the whole fishery, i.e. the economics of the industry and secondly the financial consideration of the individual fishermen, i.e. the economics of the firm.

Figure 1.2 is a standard figure for explaining the economics of fishery exploitation as developed by Gordon (1954). As in most economic models, it is assumed that price of fish remains constant, the cost per unit of fish caught remains constant for all quantities caught, there exists a single species fishery and finally fishers operate in perfect competitive conditions.

Under these assumptions, the total revenue (TR) curve has the same shape as the sustainable yield curve given in Figure 1.1. Assuming a constant average cost per unit of fishing effort, the total cost (TC) is graphed as a straight line as given in Figure 1.2. Putting revenue and cost together, we obtain a complete bio-economic model, in which the net economic yield or resource rent is obtained as the difference between total revenue and total cost. The maximum resource rent is obtained at $E_{MEY}$ level of effort where the marginal revenue of effort equals the marginal cost of effort. This level of effort however, is not tenable in an unregulated open access fishery, and gravitates towards a much higher level of effort at $E_0$ where all resource rent is dissipated.

Under an open access regime, access to the fishery is unregulated and is free and open to any person who has the capability and the desire to harvest. Its exploitation will then result in over-fishing and the resource rents will dissipate over a period of time\(^2\). The free access equilibrium is then reached at $E_0$ where total cost is equal to total revenue, that is at point D in Figure 1.2.

\(^2\) Resource rent, defined as the surplus value over and above the opportunity cost for all the factors of production, arises from the ownership of, or access to, a valuable resource in limited supply.
Fisheries in the open access system is a classical example of a common pool resource (CPR) that can be exploited by anyone and is sensitive to over-exploitation. One of the methods of classification of resources followed in resource management is that of the properties of 'exclusion' and 'subtractability'. Exclusion refers to the degree to which access to the resource could be restricted. Subtractability deals with whether or not one person's appropriation of a resource reduces the availability of that resource for others.
(Randall, 1983; Hussen, 2000). These two properties lead to the generation of a two-by-two typology of resource as given in Table 1.1.³

<table>
<thead>
<tr>
<th>Excludability</th>
<th>Subtractability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficult</td>
<td>Public goods</td>
</tr>
<tr>
<td></td>
<td>Common pool</td>
</tr>
<tr>
<td></td>
<td>resource</td>
</tr>
<tr>
<td>Easy</td>
<td>Toll goods</td>
</tr>
<tr>
<td></td>
<td>Private goods</td>
</tr>
</tbody>
</table>

As will be seen, the types of resources to which access cannot easily be denied are 'public good' and 'common pool resources' (CPR). The boundary between public goods and CPR is not, however, clearly fixed. This is due to the property of subtractability cross-cutting the four types of goods. Public goods are considered low in subtractability, while by definition CPR is high in subtractability. Marine fishing which supports a few fishers using traditional fishing methods, has almost no subtractability. The commons is then a public good. However, when the commons is appropriated by a large number of fishers and that also using modern fishing technology, it becomes unequivocally a CPR. The difficulty of exclusion (referred to as the free rider problem) combined with high subtractability can lead to the CPR dilemma referred to as Hardin's (1968) 'The Tragedy of Commons' if no effective mechanisms exist to regulate access to the resource and its use⁴. Gordon's (1954) basic argument is that in an open access fishery, resource rents will dissipate over a period of time.

In short, open access regimes result from the absence of well-defined property rights. Access to the resource is unregulated and is free and open to everyone (Feeny et al., 1996). Rent is completely dissipated at open access equilibrium.

---
³ There are other classifications of resources that have different problems and appropriate solutions.
⁴ When Gordon (1954), Scott (1955) and Crutchfield (1956) found that the core problem in fishery was open access and that many stocks were in serious decline, their recommendation was to restrict access.
1.2 STATEMENT OF THE PROBLEM

Kerala State with a coastline of 590 kms has plenty of marine resources with a predominance of oil sardines, mackerel, anchovies and prawns. The potential of marine fishery resources of the State within a depth of 200 m range is estimated at 7.51 lakh tonnes. (See Table 1.2)

<table>
<thead>
<tr>
<th>Depth zone</th>
<th>Area (Sq. kms)</th>
<th>Pelagic</th>
<th>Demersal</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 50 m</td>
<td>15993</td>
<td>342000</td>
<td>229000</td>
<td>571000</td>
</tr>
<tr>
<td>50 – 200 m</td>
<td>23146</td>
<td>124000</td>
<td>56000</td>
<td>180000</td>
</tr>
<tr>
<td>0 – 200 m</td>
<td>39139</td>
<td>466000</td>
<td>285000</td>
<td>751000</td>
</tr>
</tbody>
</table>

Source: Dept. of Fisheries, GOK, 2002

The fishing activity in the marine sector, however, is largely concentrated in the inshore areas within a depth range of 0-50 m. Against the optimum sustainable yield of 5.7 lakh tonnes, the fish landing from this inshore area is now around 6.0 lakh tonnes thus leading to a resource depletion crisis Govt. of Kerala (GOK, 2004). In Kerala, the marine fishery sector is de jure under state ownership, but de facto it is unregulated and is open access in nature. Against this background, the development programmes undertaken by the government in the sector, which included modernisation of country crafts, popularisation of new generation crafts, and subsidised distribution of suitable complements of fishing gear, have led to an enormous increase in fishing pressure. Increase in fish prices due to increased demand both in the domestic and the export markets, has also promoted large-scale investments in craft, engine and gear leading to over-capitalisation. High price and high demand for prawns in foreign market are responsible for the anarchic growth of the number of mechanized boats in Kerala (Rajasenan, 1987). The fishery resource forecast based on ‘auto regressive moving average’ (ARMA) shows stagnation with reference to most of species in Kerala (Rajasenan, 1987). The enormous increase in the number of fishing crafts especially in the number of motorised country crafts and the use of ring seine, a prohibited fishing gear, are considered to be the main causes of resource depletion. Indications are that large potential resource rents are lost in fisheries because of over-fishing.
Marine fishing is a traditional activity of certain communities in the coastal area of the State. It is estimated that in Kerala about 8.4 lakh fisherfolk depend on marine resources for their livelihood\(^5\). Modernization ideologies in the early sixties aimed at increasing the extractive capacity of the fisheries sector and access to investment funds, led to a dualism in the form of coexistence of large-scale mechanized fisheries side-by-side with small-scale artisanal fisheries. In the years that followed the rapid expansion of the mechanized sector cut into the harvest of artisanal fishermen. The artisanal fishers responded to the new developments by going in for motorising their country crafts. The expansion of motorisation was very fast; and in order to cope with intensive competition new types of gears like ring seines were also introduced. Of the initial stages while these changes enabled the fishermen to fish more efficiently and to expand their activity space, the continuation of the process led to stagnation in fish production. Further, with about 50 percent of the fish output cornered by the large-scale sector and another 40 percent by operators of large seines in the motorised sector, traditional fishermen especially those in the non-motorised sector found themselves marginalized (Yohannan et al, 1999). As more and more fishermen motorised their crafts, fishing pressure increased on the limited fishery resources, which led to resource depletion. Individual catches and income began to level off and non-motorised operations lost ground. At the same time, increasing cost of operating motorised crafts reversed their initial advantage over the non-motorised crafts. The income distribution has thus become highly skewed since the mechanized trawlers and those using large seines account for only a small percentage of active fishermen.

It is believed that with modernization of fishing technology, economic and social stratification and inequality in the fishing communities have increased. The costs of resource degradation are disproportionately borne by the poor who are the primary users of the commons and environmental resources. For many fisherfolk in the small-scale sector, daily earnings from fisheries are low, fluctuating and often uncertain, affecting their livelihood security. For them

\(^5\) The sector provides direct employment to 1.8 lakh active fishermen during 2001-02 (GOK, 2004). The population figures are estimates provided by the Directorate of Fisheries, Government of Kerala.
outward movement to non-fishing activities is difficult because of lack of knowledge of opportunities and lack of skills. To understand their plight, poverty has to be seen not only as income-poverty, but also in its wider sense to encompass low levels of achievement in education, health, sanitation and socio-political status. Some anecdotal evidence exists to show that fishing communities have above-average poverty rates, but few hard data and analyses are available on the nature and extent of poverty in these communities, and on the relative importance of different causes of poverty and on the most effective actions to alleviate poverty (FAO, 2001). The real benefits of fisheries development policies followed by Government and the general trends of economic growth do not seem to have reached the people in the lower strata of the fishing community. In order to evolve policy initiatives for sustainable improvement in the living conditions of the fisherfolk, it is essential to have a clear understanding of the nature and extent of poverty in all its different dimensions and also to find out its causes and consequences.

**1.3 REVIEW OF LITERATURE**

In this section we present an overview of poverty-environment linkages, poor peoples’ dependence on common property resources and concepts of poverty and inequality, and its measurement based on the available theoretical literature as well as empirical studies carried out in different parts of the world.

**1.3.1 Environment and natural resources**

Natural resource and environmental degradation, and the resulting economic and social impacts are often viewed as a problem unique to developing countries. Deforestation, soil erosion, siltation of rivers and urban pollution are serious barriers to sustainable development in most of the low income countries of the world. However, degradation of natural resources and the environment is common to some degree throughout the world, across different economic and political systems and touching both the rich and the poor countries.

Natural resources, both renewable and non-renewable play a central role in the development of an economy. Renewable resources naturally regenerate themselves within reasonable time. These resources include forests, fish,
wildlife, water, agricultural crops, and even soil. Stocks are not fixed but can be increased or decreased. Renewable resources take many forms. Some, like forests, can be stored in the sense that the harvesting decision can occur at various times over the life of a stand of trees. Economics can help producers understand the optimal age to harvest a forest. Property rights in forestry for managed commercial stands are often efficient. Other renewable resources such as communal forests and fish however, tend to occur under less efficient property rights regimes. While biological growth functions in the case of both forests and fish are basically similar, the economics of their harvesting are slightly different from each other.

A major question relating to natural resources of a region is: how long and under what conditions can natural resources continue to support economic and social development? If natural resources are managed properly, they can contribute to development over an extremely long time period; some would argue for an indefinite time period. One among the major causes for natural resource degradation is the intervention of human activity in natural systems. Most human activities comprise the transformation of resources into products and services that are useful to human beings. Despite the income level and the stage of development, any economic activity would alter the state of the environment in one way or another and has the potential to cause a number of negative impacts in the form of unsustainable depletion of natural resources. Thus, degradation of natural resource bases is having a substantial negative externality impact on developing economies. It is apparent that the intensity of suffering of the poor from the adverse impacts of environmental shocks is much higher than that of rich. Owing to lack of proper assets, the poor are less capable of coping with those impacts.

All over the world, in the course of economic growth and development, the nature, the content and the quality of environment undergo changes. This environment-economy nexus is of great concern to all societies. The manner in which these two are related to each other is also a question posed by development thinkers. Based on a similarity between an inverted U shaped curve developed by Simon Kuznets (Kuznets, 1955) showing how income inequality changed as per capita income in a country increases, Panayotou
(1993, 1995) noted the similarity between the two patterns and it is considered. It was probably Panayotou who first coined the term ‘Environment Kuznets Curve’ (EKC) as in environmental studies. Panayotou investigated the EKC hypothesis for sulphur dioxide, nitrous oxide, suspended particulate matter and deforestation. All the fitted relationships were found to be consistent with the EKC hypothesis. This relationship was also explored by Stern et al. (1996) who also critically reviewed the literature on the existence of meaningful EKC relationships.

‘Environmental Kuznet Curve’ shows how environmental quality or pollution change with changes in income in a country. The interpretation of EKC is that an increase in economic activity is accompanied by deterioration in environmental quality, but that beyond a turning point, as income increases the demand for a cleaner environment reduces the level of pollution.

Recently, many studies have made evident the existence of an inverted U-shaped relationship between environmental quality and per capita income level (See Torras and Boyce, 1998; Grossman and Krueger, 1996; Beckerman, 1992). Data analysis seems to demonstrate that in the early stages of the economic growth process (the transition from agricultural to industrial society), environmental quality falls, but then, as income exceeds a threshold level and the economic structure moves from industry to services, it starts to rise. However, it is worth noting that rural environment, urban centres, and industrial location face quite different environmental problems. Rural population is more concerned with the use, control, accessibility, and management of natural resources. The problems in urban centres relate much more to air, water and noise pollution, and waste disposal (sewage and solid waste) (Ahmed, 1995).

Environmental conditions often have a major influence on the livelihoods, health, and security of poor people. It is widely accepted in the literature that natural resources are crucial to the routine functioning of poor households providing them sources such as materials, energy and water as well as performing sink functions such as absorption of pollution. These items could be public or semi-public goods such as open access watersheds or common property grazing lands; or private goods such as air inside a house or
household drinking water. It is often stated that poverty and environmental degradation are intimately connected, so that poverty is seen as both a cause and an effect of natural resource depletion, in a downward spiral. If the environmental resource remains a common pool resource in nature, the tendency to become degraded is all the more strong.

1.3.2 Poverty-environment linkages

In the late 1980s, the World Commission on Environment and Development (WCED, 1987) known as “Brundtland Commission” drew attention to some important links between increasing poverty and environmental degradation. The report pointed out that “many parts of the world are caught in a vicious downward spiral: Poor people are forced to overuse environmental resources to survive from day to day, and the impoverishment of their environment further impoverishes them, making their survival even more difficult and uncertain” (WCED 1987:27). This hypothesis was later called as the “poverty-environment hypothesis” and was presented by the Brundtland Commission in the context of making proposals for “Sustainable Development” (SD).

The poverty trap thesis specifies a circular or a spiral relationship between poverty and environmental degradation; in other words, it suggests that environmental degradation leads to poverty, which in turn leads to further degradation. It is widely viewed that poverty is the main cause of environmental deterioration, because the poor are not in a position to use natural resources sustainably (Duraiappah, 1996; Prakash, 1997).

“Environmental deterioration hurts the poor more than the rich” (Dasgupta, 1996; Kadekodi, 2001). In primary rural areas where people live in a local biomass-based economy it is plausible that environmental degradation or lack of natural productivity in the environment leads to poverty due to the lack of surplus, the thinness of markets, the absence of institutional developments, etc. However, the second aspect of the poverty trap namely that poverty leads to degradation has not been adequately demonstrated (Prakash, 1997). It is argued that environmental degradation is a negative externality whose causal roots, as well as solutions lie in institutional and policy issues rather than in poverty itself. There has been much controversy surrounding poverty-
environmental degradation nexus. However, a rising trend is in evidence in economic literature which disputes the conventional theory and argues that simple generalizations of this multidimensional problem are erroneous and that a more complex set of variables are in play (Leach and Mearns, 1995).

The actual effects of and responses to poverty-environment interactions for particular groups of poor people depend on three things. First is the availability of environment resources. Second, are the factors that determine the ability of different groups of people to gain access to and make effective use of environmental resources. Third, are the changes in environmental entitlements over time. Environment entitlements are one among several kinds of livelihood sources for the poor; they are especially important in their livelihoods, largely because of lack of alternative choices.

It is usually stated that environment is an income-elastic commodity. In the later stages of development, environmental quality improves because people become more environmentally conscious and can afford to build up political pressure for the enforcement of environmental regulations and for increasing budgetary expenses for the protection of the environment (Panayotou, 1995; Grossman and Krueger, 1995). The assumption is therefore that individual demand for environmental quality rises with income.

With the goal of better understanding of the relationship between poverty and common-pool stocks of natural assets, Gupta et al. (2005) investigated the extent to which rural households use and depend on common-pool natural resources for their daily livelihood. Using survey data collected from 550 households in 60 Indian villages, they estimated the contribution that natural resources make to rural household incomes. Like other previous studies, their also established that resource use increases monotonically with income. In their sample, poor households use fewer resources than do rich households. Unlike previous studies, however, it does not find that resource dependence necessarily decreases with income: poor households are not necessarily more dependent on natural resources than are the rich. Instead, they found evidence that dependence follows a U-shaped relationship with income: dependence declines at first but then increases with increase in income, especially in areas
where forests are abundant and grasslands are well stocked. This result suggests that households in rural areas do not turn to the environment only in times of desperation. Richer households, which tend to have broader sets of options to choose from to earn a livelihood, turn to the environment as a profitable source of income.

The study conducted in 29 villages of the Shindi ward in southern Zimbabwe shows that environmental resources account for roughly 35 percent of the average total household income and that the poorer the household, the greater is the share of income from environmental resources. However, even though the poor are more resource dependent, they generally use less of these resources than the better off. The poorest households use three to four times lower in quantity terms than the richest (Cavendish, 1999a). Cavendish also attempted to quantify the contribution of environmental resources to household welfare, where most standard household budget surveys omitted this source. His study showed that incorporating environmental income in household accounts resulted in dramatic and significant reduction in poverty by 50 percent or more than conventionally measured. (Cavendish, 1999b)

The study carried out by Cardenas (2001) deals with inequalities in the commons by drawing some lessons from two sources of field evidence from different regions and villages in Colombia. The following four sets of results emerged from the empirical evidence: i) land inequality increased the negative effect of population pressure over the conservation of the village commons; ii) lower exit options outside the use of the experimental commons induced greater cooperation by those with poorer private options and higher dependence on the conservation of the commons; iii) actual assets inequality in a group of experiment participants induced greater wealth distance which reduced the possibility of cooperation via self-governed mechanisms; and iv) familiarity with commons dilemmas and lower levels of private assets were associated with higher levels of cooperation in the experiments. The results provide some parallels and methodological complementarities that could contribute in a rather inconclusive way on the literature, and also a revisit to the relation between poverty, inequality, and conservation of natural resources.
The ‘vicious circle’ hypothesis links poverty with degradation. The vicious circle of poverty perception lies in the fact that in developing or relatively poor economies the poor depend directly on the natural resource environment for their livelihood. Since these poor who are dependent on nature for livelihood, they are the vulnerable to natural calamities, environmental degradation and ecological disasters (Nadkarni, 2000). As noted by Bina Agarwal, the first victims of any environmental degradation are the women among the poor. A fuel wood shortage as result of deforestation would force village women to travel miles in search of firewood (Agarwal, 1986). Women’s vulnerability to health and environmental degradation has been well documented by Nadkarni, (2000).

Some studies, on the other hand, have also pointed out that since poor people depend more heavily on a limited natural resource base, they attach greater value to its conservation and so have developed sustainable management strategies (Reddy, 1999). Dependence on common property resources is more crucial for poorer households since environmental degradation substantially increases the survival risk of the poor (Jodha, 1990).

Dasgupta (1993) describes how closely poor people depend on their surrounding environmental resource base for their livelihood, and how poverty can be a driving force to environmental degradation. Based on theory and some empirical evidence he argues that poverty is both a cause and an effect of resource degradation or lack of access to resources, including natural capital. To exemplify the above arguments, he describes how poor nomadic dryland herdsmen often are excluded from formal credit, capital and insurance markets and are forced to invest their capital in cattle, resulting in non-sustainable herd sizes and overgrazing.

Reardon and Vosti (1995) took issue with “the narrow focus of the current poverty-environment debate” and argued that the strength and direction of the poverty-environment links in rural areas vary according to the composition of the assets held by the rural poor and the types of environmental problems they face. Some other researchers and policy makers however have used the
poverty-environment hypothesis as if it asserted a permanent link between increasing poverty and environmental degradation.

For analysis of the poverty and environmental resource degradation (P-ERD) links, Reardon and Vosti (1995) suggest the use of a 'investment-poverty' measure, the cut off point of which is defined as the ability to make minimum investments in resource improvements to maintain or enhance the quantity and quality of the resource base – to forestall or revise resource degradation. The notion of poverty is examined in the context of categories of assets and categories of environmental change. The most effective way to simultaneously reduce poverty and enhance resource base is to understand what categories of assets poverty and conditioning variables are driving households behaviour and focus effort on these variables.

The nature of property-rights regimes and the pattern of distribution of access to natural resources not only affect levels of poverty in any specific region, but in the long run, they also affect the quantity and quality of the environmental resource-base (Dasgupta and Maler, 1991). It is therefore argued that appropriate property rights allocation is one of the major determinants of long term economic and ecological sustainability of the commons as well the social sustainability of people depending upon these resources. Poverty can lead to a high dependence upon, and consequent degradation, of natural resources. Exclusion from crucial resources following changes to property right regimes acts as the main catalyst for increasing deprivation and vulnerability of poorer households.

The linkages between poverty and environment are complex, they require local-specific analysis to understand, and there exists no simple causal link. In many areas, the non-poor often causes the majority of environmental damages through land clearing, agro-chemical use, polluting water, and air. In some cases, the privileged groups force the poor on to marginal lands, where they would be unable to afford conservation and regeneration measures; and their land use practices further damage an already degraded environment. The relationship between poverty and property-rights over natural resources is complex. In the words of Hayes, “it is important to understand the fuller range
of empirical poverty-environment links than those entailed in the poverty-environment hypothesis; to understand the broader social, political and economic conditions which determine how these conditioning factors and poverty-environment links can be used in fashioning better policies aimed at poverty reduction and environment management” (Hayes, 2001).

Markandaya (2001), while discussing the linkages between poverty and environment, writes: “there are two broad questions: does the poverty damage the environment or does the environmental degradation hurt the poor? At the cost of some loss of accuracy, the broad answer to the first question is ‘no,’ and the answer to the second question is ‘yes’. Of course there are complex issues and these simple answers will not always hold.” In many cases natural resources may be the only asset to which the poor people have access and hence they are the most affected in the face of resource degradation. But the way in which natural resource degradation affects the poor and the extent to which it affects individual groups depend to a large extent on the types of ‘poverty’ of such groups and their asset portfolios.

Thus, as mentioned earlier, ‘poverty-environment linkages’ are dynamic and context-specific — reflecting both geographic location and economic, social and cultural characteristics of individuals, households and social groups. Different social groups prioritize different environmental issues. In rural areas, poor people are particularly concerned with secure access to, and the quality of natural resources — arable land and water, crop and livestock diversity, fishery resources, forest products and biomass for fuel. For the urban poor, water, energy, sanitation and waste removal, drainage and secure tenure are key concerns. Poor women regard safe and physically close access to potable water, sanitation facilities and abundant energy supplies as crucial aspects of well-being, reflecting their primary role in managing the household (Brocklesby and Hinshelwood, 2001).

### 1.3.3 Poors’ dependence on common property resources

Common Pool Resource (CPR) is defined by Ostrom (1990) as “a natural or man made resource system that is sufficiently large as to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits from its
use." The critical distinction between 'open-access resources' and 'common property' is that open-access is a free-for-all, while common property represents a well-defined set of institutional arrangements concerning who may make use of a resource, who may not make use of a resource, and the rules governing how the accepted users shall conduct themselves Bromley, (1991).

Common property is frequently confused with open access property, in which the resource is available to anyone who can access and use it. Swaney (1990) and others suggest that the Latin term res nullius be used to describe open access or non-property and that res communes be used to describe common property. The confusion between the commons and open access has led to notable misunderstandings within contemporary natural resource users.

Some salient distinguishing characteristics of private property resources (PPR), common property resources (CPrR), open access resources (OAR), and common pool resources (CPR) as summarised by Singh (1994) are given in Table 1.3. The principal difference between CPrR and CPR is that in the former case the holders have well defined property rights, but in the latter case such rights may or may not exist. The distinction is very fine, but it is important when considering those natural resources used in common by identifiable groups of people, for example fisheries. In this sense CPrRs constitute a subset of CPRs.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Type of resource</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PPR</td>
</tr>
<tr>
<td>Property rights are well-defined</td>
<td>Yes</td>
</tr>
<tr>
<td>User / User's group is identifiable</td>
<td>Yes</td>
</tr>
<tr>
<td>Resource is accessible to everybody</td>
<td>No</td>
</tr>
<tr>
<td>Resource is used in common</td>
<td>No</td>
</tr>
<tr>
<td>Rules, regulations, and conventions governing the use of resource exist</td>
<td>Yes</td>
</tr>
<tr>
<td>Exclusion of free-riders is difficult</td>
<td>No</td>
</tr>
<tr>
<td>Use of resource is subtractable</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 1.3 Some principal distinguishing characteristics of Private Property Resources (PPR), Common Property Resource (CPrR), Open Access Resources (OAR), and Common Pool Resources (CPR)

According to the economic definition, a common good is located between a ‘pure private good’ and ‘pure public good’. The difference resides in the concepts of jointness and exclusion. A pure private good is a good with the property of exclusivity, which means that the consumption of the good in question by one individual will prevent another from consuming it as well. The owner of such a good can dispose of it as desired and can deny other people access to the good. On the other hand, a public good can be jointly consumed with others and is therefore non-exclusive. Any individual can freely consume it without denying others the ability to benefit from it. Most fisheries are open access or common property resources and hence arises the problem of market failure. In open access fishery property rights are not well-defined or not at all defined; such situations often leads to over use of the resources.

Public goods have two characteristics, non-rivalry in consumption and non-excludability. Non-rivalry in consumption means that two or more persons can use the good simultaneously without interfering with one another’s use of the good, while non-excludability means that no one can be excluded from using the good. Whereas fisheries in the open access system is a classical example of a common pool resource sensitive to exploitation. CPRs are resources that have high subtractability and where exclusion from the resource is difficult. (Table 1.1 shows resource classifications by subtractability and exclusion). Subtractability means that a use of one unit of the resource removes that unit from anyone else’s use. Exclusion is on whether it is easy to limit access or impossible to do so.

Bardhan (2000) discusses a general model of collective goods; he introduces a distinction between public goods and the commons. When the positive spillovers from the provision of these collective goods outweigh the negative spillovers associated with common use, it is a case of public goods. When negative spillovers dominate the positive ones, then the collective good is a common-pool resource. Positive spillovers include the benefits to third parties such as unpolluted air that results from a pollution-abatement technology. The negative spillovers are the classic congestion externalities of common-pool resources: when more fishers exploit an open-access fishery, for example, it raises costs for all fishers.
Common property resources are inefficiently allocated because users cannot earn rents by conserving them from other users—a violation of the ‘exclusivity’ principle of property rights. In his influential article, "The Tragedy of Commons," Hardin (1968) explained why a scarce resource open to all is subjected to overexploitation. He explained the situation with an example of a pasture open to all herdsmen for grazing cattle. He pointed that eventually the pasture will become over-grazed because each herdsman tries to capture all the benefits by adding more cattle. Since all herdsmen are assumed to behave in the same way, the carrying capacity of the land will eventually be exceeded, resulting in degradation and loss for all. Hardin saw over-exploitation as an inevitable outcome of the use of common goods, even when individuals sharing the benefits of such resources acted in an economically rational way. He called this phenomenon 'the tragedy of the commons'. The concept has been used to explain over-exploitation in fisheries, forests, overgrazing, air and water pollution, abuse of public lands, population problems, extinction of species, misallocation in oil and natural gas extraction, ground water depletion, and other problems of resource misallocation (Stevenson, 1991). Hardin's arguments have been formalized in the form of a 'Prisoner's Dilemma Game' (Runge, 1981).

The prisoner's dilemma in game theory represents problems of social cooperation, free-riding and public goods provision. It is largely responsible for the negative view economists and policy-makers have toward commons management and social cooperation. Why this is so is described in the outcomes of a prisoner's dilemma game. The best outcome is free-riding - enjoying the public good, but not contributing to its sustenance. The second best outcome is enjoying the public good and contributing one's share. The third best option is doing without the public good. The worst case is one of having others' free-ride on one's contribution (Hausman and McPherson 1996).

Critics argue that Hardin's tragedy of commons is applicable only to open access resources where no property rights are assigned, and not to commons i.e. common property resources (Ciriacy-Wantrup and Bishop, 1975; Runge, 1981; Bromley and Cernea, 1989). Hardin's tragedy of the commons often results, not from any inherent failure of common property management, but
from institutional failure to control access to resources, and to make and enforce internal decisions for collective use. Given that fisheries are usually either open access or common property resources fishers have the tendency to over-fish beyond the MSY and is a case subject to the Hardin’s tragedy of the commons. Since open access fishery management exhibits many characteristics of public good, it is difficult to manage.

There exists lots of empirical studies showing the poor people’s dependence on CPR and the manner in which their livelihoods evolve around them. There are also studies showing different views where the poor or the rich over exploit these resources as well as in cases in which the community itself manages the CPR. One of such studies by Jodha (1986) found from a survey of 82 villages in India that the poor obtained 66 to 84 percent of fodder from CPRs in some states. Moreover, the CPRs provided 137 to 196 days of employment per household and 14 to 23 percent of the income of the poor. Poor people are commonly bound to reside in areas with poor environmental quality. According to another study, the area under CPRs has declined by about 33 percent over a period of 20 years (Pasha, 1992). The literature has repeatedly stressed on the need for effective people’s participation in preventing over-exploitation of the CPRs by the better off and in protecting forests in particular. Defining “the poorest” as the poorest 20 percent among the total population of all developing countries, Leach and Mearns (1991) have shown that 60 percent of them live in ‘ecologically vulnerable areas’, including rural areas of low agricultural potential and squatter settlements within urban areas.

The study conducted by Gowda and Savadatti (2004) in four villages in Dharwad district of Karnataka attempts to determine the contribution of common property resources to the biomass requirements of the rural people. Their findings are that overexploitation has resulted in the degradation of the CPRs, which are increasingly unable to meet the needs of the rural communities. Measures to ensure retention, regeneration, and sustainable utilization are needed if a CPR crisis is to be avoided.

Field observations on CPRs have shown that traditionally they have been subject to some form of collective management or the other, an arrangement
which ensured their sustainable management. In the Indian context the existence of institutions of sacred groves and Van Panchayats which have evolved over the years to restrain indiscriminate use of forests, and that of Pani Panchayats for managing irrigation tanks and canals is proof that rural people in developing countries had the necessary vision and resourcefulness to promote sustainable and equitable use of resources. Case studies of such institutions have been fairly well documented (Wade, 1998; Singh and Ballah, 1996).

Since fishery is a natural resource, the depletion of fish by one group of fishermen creates externalities for another group (Grima and Berkes, 1989). Under an open access management regime, resources that fall into this category are subject to use by any person who has the capability and desire to harvest or extract the resources. Their exploitation will then result in symmetric or asymmetric negative externalities. The rivalry in consumption of a common pool resource indicates that extraction by one user of the resource precludes another user's possession. Like public goods, CPRs are low in the property of exclusion and they create ‘free rider problem’.

Among the resources typically creating a commons dilemma, living marine resources are a classical example (Gordon 1954; Berkes 1994). In many parts of the world access to them is open, and fish stocks are heavily over-exploited. However, many argue that despite the simplicity with which the tragedy of the commons seems to explain environmental degradation and despite their widespread use, the tragedy of the commons model is seriously flawed both theoretically and empirically. Scholars primarily from the disciplines of cultural anthropology and institutional economics also have severely criticized the model for ignoring the historical contexts which created specific resource-use situations (e.g. McEvoy 1986; McCay and Acheson 1987; Berkes et al. 1989; Feeny et al. 1996). In most indigenous cultures in the Pacific (as well as in other parts of the world), however, complex and sophisticated systems of managing them either directly or indirectly have been established and proven to be efficient over long periods of time (Campbell, Menz and Waugh 1989; Ruddle and Johannes 1990; Hviding, 1996).
When the distribution of access rights is so unequal that it loses its legitimacy, relations between the poor and the rich users tend to be unstable and hostile with the consequence that the latter do not feel any more secure about the future state of their rights. They may then react by exploiting the resource as intensively as possible without any regard for the viability of the resource base (Boyce, 1994; Baland and Platteau, 1996).

1.3.4 Poverty and inequality

Poverty may be approached from objective or subjective viewpoint. The objective perspective, which is also referred to as the welfare approach involves normative judgements as to what constitutes poverty and what is required to move people out of their poor state. The subjective approach places a premium on people’s preferences, on how much they value goods and services.

The traditional approach to poverty is characterised by the fact that poor people are identified according to a shortfall in a monetary indicator. The theory implicitly underlying this assumption is the utilitarianism theoretically based on the criteria of utility and practically on the use of income or expenditure as proxy of well-being. Henceforth, the criterion of poverty reckoned in terms of income and poverty is defined as lack of economic welfare, i.e. income. In the case of the absolute poverty approach, poverty is lack of income required to satisfy the essential requirements for physiological survival. In the case of the relative approach of poverty, poverty is lack of income in order to reach the average standard of living in the society in which one live.

Most conceptions of poverty are concerned with flows of income, where poverty implies low levels of per capita income/expenditure. That is to say people whose income/expenditure is below a threshold level are defined as poverty stricken. The World Development Report 2000/2001 of World Bank (2001) enlarges this traditional conception of poverty to encompass both low levels of income/expenditure and low levels of achievement in education, health and nutrition status, with two other dimensions, namely vulnerability and powerlessness. Dercon (2001) defines vulnerability, as “well-being and poverty are the ex-post outcome of a complicated decision process of individuals and
households over assets and incomes, faced with risk. Vulnerability to poverty is the ex-ante situation, i.e. before one has knowledge of the actual shocks that will occur. Vulnerability is determined by the options available to households and individuals to make a living, the risks they face and their ability to handle risk.”

It is difficult to find a single measure for this multidimensional concept of poverty, and most studies take each dimension separately. In some studies, the various dimensions have been grouped into homogenous categories. For example, one approach takes a fivefold ‘asset vulnerability framework’ which considers labour, human capital, household assets, household relations, and social capital (Moser, 1998). The “World Development Report 2000/2001” groups the different dimensions of poverty as opportunity, empowerment and security; and recently capabilities (human capital) has also been included as a separate category.

It is also recognized that poverty is not a static condition but a dynamic process. Large numbers of people move into and out of poverty during given time periods. Distinctions therefore may usefully be drawn between the ‘always poor’, the ‘sometimes poor’ (‘tomorrow’s poor’), and the ‘never poor’ (DFID, 2001). In most countries, the ‘sometimes poor’ exceed in numbers the ‘always poor’.

Asian Development Bank’s (ADB) Participatory Poverty Assessment in Kerala, 2002 as cited in Srivastava (2004) differentiated among the characteristics of the ‘poor’, the very poor and ‘the poorest’. “Although the poor may have small plot and huts to live in, they do not have basic amenities and physical assets. The very poor... are those who do not have more than one source of income, however irregular that income might be. The very poor are frequently engaged in casual coolie jobs which do not yield steady income. The very poor include those who have lost everything on account of fire or other disasters. This type of poverty... could be a temporary state, provided the victim has ‘social capital’ to leverage government and community resources to rebuild their lives. The majority of these communities [poorest] belong to various tribes who live in remote forest areas. There is also a significant proportion of Scheduled
Castes... who depend excessively on the forests for their livelihood. Families where the head of household is either mentally or physically challenged, or too old or chronically sick to work would fall into the category of the poorest. There are some women-headed households where the dual task of earning a livelihood and managing the family erodes the earning capacity of women. Then we have beggars who are totally destitute and are categorized as the poorest.

This wider conception of poverty appears to be particularly well-suited for small-scale and artisanal fishers (FAO, 2001). In the FAO report on “Code of Conduct for Responsible Fisheries in Poverty Alleviation,” poverty has been portrayed thus: “the nature of poverty is usually associated with low income and consumption, low attainment levels in education, health and nutrition, high vulnerability, and powerlessness”. Whilst there are many characteristics of poor households that are typical, there is no one established, and accepted, theory or conceptual framework that can explain the causes of poverty in all situations. However, evidence points to several interrelated and re-enforcing causes including (i) poor economic performance, (ii) weak asset base and landlessness or land-poor, (iii) political instability and conflict, (iv) poor and inadequate public service delivery, (v) income and gender inequality and (vi) erosion of traditional safety nets. Additional factors that could play a particular role in small-scale fisheries include (i) the high risk nature of fishing activities, (ii) the geographic remoteness of many communities, (iii) the frequent low socio-political status of the fishing occupation and fishing communities, (iv) unfavourable conditions for organizing (absence from home; remoteness; geographic spread), (v) insecure access to natural resources, especially fishery resources and land; and (vi) the proneness to depletion and dissipation of resource rents because of open or quasi-open access to fishery resources."

Poverty is thus a complex and multi-dimensional phenomenon, which goes beyond the notion of income, and encompasses social, economic, and political deprivations. Lack of opportunities limits the abilities of the poor to secure gainful employment and bring about improvement in their lives. Since poverty is a multidimensional problem, solutions to poverty cannot be based exclusively on economic policies, but require a comprehensive set of well-coordinated
measures. Individuals and families can be said to be in poverty when they lack the resources to obtain the type of diet, participate in the activities and have the living conditions and amenities which are customary, or at least widely encouraged or approved, in the societies to which they belong. Their resources are so seriously below those commanded by the average individual that they are, in effect, excluded from ordinary living patterns, customs and activities."

Recent academic and policy debates concerned with attacking poverty reflect a growing awareness of (a) the importance of lack of assets as both a symptom and a cause of poverty and (b) the value of the livelihood concept in understanding how the poor call upon a range of different assets and activities as they seek to sustain and improve their well-being (Dorward, et al., 2001). However, well-being is a complex notion with many different dimensions whose definition is disputed. What are the most important characteristics of poverty and well-being and how are they best measured? What characteristics does a ‘good’ poverty or well-being indicator exhibit? The term ‘well-being’ denotes that something is in a good state. The term does not specify what that something is and what is considered ‘good’. A dictionary defines well-being as "a good or satisfactory condition of existence; a state characterized by health, happiness, and prosperity; welfare."

Poverty has essentially three closely interrelated aspects, namely, ‘poverty of money’, 'poverty of access', and ‘poverty of power’. These three aspects of poverty make the working, living and social environments of the poor extremely insecure and severely limit the choices or the options available to the poor to improve their lives.

A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (Chambers and Conway, 1992). In recent debates on poverty alleviation the sustainable livelihood approach (S L Approach) has gained much importance. A livelihood comprises the capabilities, assets and activities required for a means of living. The approach lays emphasis on capabilities and assets; and distinguishes five categories of such assets namely, human capital, natural capital, financial
capital, social capital and physical capital (DFID, 1999; 2001a). Subject to the 'vulnerability context' of particular groups these assets are to be transformed by means of various structures and processes into livelihood outcomes. Poverty can be considered as an inadequate livelihood outcome.

In this sense, poverty is defined by the lack of those resources, goods, activities and services that allow the individual to participate in the general standard of living of the community to which he belongs: it is a state of relative deprivation, strictly linked to the examined society. It is important to stress that non-monetary indicators are specifically related to material deprivation, based on lack of financial resources. So, persons who are unable to take part in the customary social activities because of poor education or ill health, can be said to be 'marginalized' and 'socially excluded'; but they will be termed as 'poor' only if their difficulties are caused by material and financial deficiency.

Even though income and consumption are important indicators for addressing poverty-environment interactions; they are also equally important for improving the asset base of the poor. Assets include natural capital (land, water, forest, minerals, fish, etc.), physical capital (basic infrastructure), human capital (skills, knowledge, health, ability), social capital (relationships of trust, groups, networks, customary laws), and financial capital (monetary resources). With improved access to and control over different types of assets, the poor are better able to meet basic needs and to create different livelihood options. In his seminal study Robert Putnam uses social capital to refer to dimensions of social organization that generate multiple horizontal linkages and foster the development of social trust, collective reciprocity, and tolerance (Putman, 1993). Social capital consists of the stock of active connections among people: the trust, mutual understanding, and shared values and behaviours that bind the members of human networks and communities and make cooperative action possible (Cohen and Prusak, 2001).

Numerous poverty definitions and manifold possibilities of poverty measurement exist. These include indirect, direct, relative, absolute, income-based, deprivation-based, consumption-based, budget-standard based, primary, secondary, tertiary, consensual, political, subjective, and objective
poverty lines, to name a few. This list of poverty definitions, while incomplete, shows that the questions such as "what is poverty and how could/should it be measured?" cannot be answered unambiguously.

Inequality is often studied as a part of the broader analysis concerning poverty and welfare and is sometimes used in composite measures. Poverty and inequality are usually measured using quantitative indices. For example, when policies are implemented to reduce poverty, it becomes important to measure the evolution of these indices, and especially the decomposition of the observed variation, in order to evaluate the contribution of potential explanatory factors. Since Atkinson (1970), economists have been sensitive to the welfare assumptions embedded in an inequality measure. One of the most important assumptions is the Dalton principle (more commonly referred to as the Pigou-Dalton transfer principle), which requires that inequality measure falls when a transfer is made from an upper to a lower part of a distribution. Sen (1976) ushered in a parallel scrutiny of poverty measures, likewise driven by the Dalton principle. The literature on inequality and poverty has however seldom converged completely on a common set of assumptions.

The term 'inequality' suggests a departure from some idea of 'equality'. In mathematical terms, 'equality' represents the fact that two or more given quantities are of the same size, and inequality merely relates to the differences in the quantities. But from the social point of view, the term 'equality' has overtones as a standard, which a society can attain. Indeed the concept is difficult to define; but perception of inequality affects economic choice and political decisions. There has been much debate on whether inequality should cover ethical concepts such as the desirability of a particular system of rewards or simply reflect the difference in a particular attribute (or attitudes) such as income, wealth, etc.

With the recent resurgence of interest in equity, inequality, and growth, the possibility of a negative relationship between inequality and economic growth has received renewed interest in the literature. Policymakers addressing the impact of inequality on growth should be more concerned about households' access to assets - and to the opportunities associated with them - than about
the distribution of income. Asset inequality - but not income inequality - has a relatively great negative impact on growth and also reduces the effectiveness of educational interventions.

'Utilitarianism' is an ethical theory which asserts the goodness of a state of affairs in terms of the sum total of the utilities accruing from that state to individuals in the society. Conventionally, it is assumed that each person's utility function defined in terms of his income is increasing, concave (which guarantees that the marginal utility is non-increasing) and indefinitely differentiable. Maximisation of the social welfare function implies that the optimal distribution of income is one in which each person's marginal utility is equal to each other person's marginal utility. Clearly, equality of marginal utility will translate into equality of income only in the special case of all persons sharing the same utility function (Sen, 1973).

Another ethical theory is Nozick's 'entitlement' theory, in which for distributive justice, the rules governing acquisition, transfer and rectification (of past injustice) should be such that they are not volatile of anybody's rights. The emphasis here is on 'equal rights' (Subramanian, 1997).

The Rawlsian theory of justice focuses advantage in terms of an index of 'primary goods', which includes rights, liberties, incomes, opportunities, and the social bases of self-respect. Rawl's first principle of justice demands that each person is to have an equal right to the most extensive basic liberty compatible with a similar liberty for all. The second principle requires that priority be given to maximising the advantage of the worst off person (Rawls, 1971).

Sen's theory of capabilities focuses on the capabilities of people to function. A functioning is a state of being or doing (e.g. a state of being in good health, or a state of being able to move). A list of various states of being and doing (referred to as a functioning n-tuples) together with a capability set (collection of functioning n-tuples) define the freedom available to a person. Sen is concerned to argue for equality on the space of capabilities (Sen 1980, 1984).

Cowell (1995) sets out three ingredients of principle of inequality measurements:
1. Specification of an individual social unit such as a single person, the nuclear family, or the extended family.

2. Description of a particular attribute (or attributes) such as income, wealth, land ownership, or voting strength.

3. A method of representation and/or aggregation of the allocation of the attribute among the individual units in the population.

The preceding brief discussion on the notion of inequality indicates that each theory is concerned with a demand for equality on a different space or domain; and the pursuit of equality in one space may well promote inequality in some other space (Sen, 1992).

So far we have been discussing the poverty environment linkages, poor people’s dependence on common property resources, concepts of poverty and inequality, and their measurement based on existing literature. Even though there exists abundance of literature related to these areas we have limited the review to concepts and areas appropriate to the study and cited from literature only extracts quite relevant to the research focus of the present study.

1.4 STUDY GOAL

The overall objective of the study is to understand the economic condition of fisherfolk in the small-scale sector in the context of change in access to and depletion of marine resources.

1.5 RESEARCH QUESTIONS

1. What is the extent of income inequality among the small-scale fishing community? What are the causes of this inequality? Which are the groups in the lower strata?

2. How poor are the small-scale fishery households and who are the poorer?

3. What are the characteristics of the poor that distinguish them from the non-poor?

4. What are the determinants of poverty? Depending on these factors, what is the risk of a household being poor?
5. To what extent do the different groups depend on fishery resources for livelihood?

1.6 HYPOTHESIS

The inequality in the distribution of household income is closely related to inequality in the distribution of fishing assets.

1.7 CONCEPTS AND DEFINITIONS

1.7.1 Concepts

Inequality

The overall level of inequality in a population group, in other words the distribution of income, consumption, or assets, is an important dimension of well-being of that group. The concept is based on the idea that the way individuals or households perceive their position in the society is an important aspect of their welfare. Some commonly used measures of inequality are 'Gini coefficient' and 'Theil Index'. In the present study, we use a monetary measure of well-being and the choice is between using income or consumption as the measure. Most analysts argue that detailed consumption expenditure data obtained from a household survey, if available would be a better indicator of well-being than income\(^6\). In the present study, we use data on monthly per capita consumer expenditure as the indicator of well-being.

Poverty

Poverty implies pronounced deprivation in well-being. It is usually considered as an economic or social condition without direct reference to environmental or natural resource parameters, except in a generalised way. Traditionally poverty used to be defined on the basis of household income or consumption, taking this as the best proxy for welfare. People whose household income or expenditure lies below a threshold level, defined as the poverty line, are categorised as poverty stricken. The use of such a narrow indicator to determine poverty levels has been widely criticised. Of late, mainly in response to these criticisms, definitions of poverty have moved beyond this single dimension, to include utility and capability based concepts. The concept of

\(^6\) For more details see Lipton and Ravallion, 1995; Coudouel et al., 2002; Deaton, 2004.
poverty thus becomes multi-dimensional. All of these measures do not necessarily be relevant in every context, but in general, each is needed to capture something missing in others (Ravallion, 1996).

Poverty may be viewed in absolute and in relative terms. Absolute poverty refers to subsistence below minimum, socially acceptable living conditions, usually established based on nutritional requirements and other essential goods. In other words, absolute poverty is a level of poverty at which certain minimum standards: for example nutrition, health and shelter - cannot be met. The people in this condition earn incomes lower than that required as the minimum amount required per person. The term “absolute poverty” is perhaps slightly misleading, since there is no “absolute” standard that defines absolute poverty. The level of income necessary for maintaining this minimum standard is often referred to as the poverty line, a line which different institutions and individuals define differently. Relative poverty is on the other hand a poverty measure based on a poor standard of living or a low income relative to the rest of society. Unlike absolute poverty, it does not necessarily imply that physical human necessities of nutrition, health and shelter cannot be met; instead, it suggests that the lack of access to many of the goods and services expected by the rest of the contemporary society leads to social exclusion and damaging results for the individuals and families in relative poverty. Relative poverty compares the lowest segments of a population with the upper segments, usually measured in income quintiles or deciles. Absolute and relative poverty trends may move in opposite directions. For example, relative poverty may decline while absolute poverty increases if the gap between the upper and the lower strata of a population is reduced by a decline in well-being of the former at the same time when additional households fall beneath the absolute poverty line.

One of the consequences of using relative poverty to judge societies over time is that the poverty line tends to rise as incomes rise. This may be desirable if it reflects a changing social consensus about minimum acceptable standards of living. However, it would be less desirable if it leads to social and economic policies which give undue emphasis to reducing inequality keeping the incomes
of the poorest at levels lower than what they might have had, were absolute poverty measures used to guide policy.

Most concepts of poverty are derived from perceived causes of poverty. A 'physiological deprivation' approach focuses on the non-fulfilment of basic material or biological needs such as shelter, nutrition, health, etc. A 'social deprivation' approach focuses on a lack of resources required to participate in activities and enjoy living standards that are customary. The 'capability' concept of poverty focuses on expanding people's opportunities and spans both the psychological and the sociological realms of deprivation. Thus, poverty is "not merely in the impoverished state in which the person actually lives, but also in the lack of real opportunity – due to social constraints as well as personal circumstances - to lead valuable and valued lives" (UNDP, 1997).

Various concepts and definitions exist on poverty. However, the main focus has been on whether households or individuals possess enough resources or abilities to meet their current needs. The concept is based on a comparison of households/individual's income, consumption, assets, or other attributes with some defined threshold below which households/individuals are considered poor in that particular attribute.

Further, vulnerability defined as the probability or risk today of being in poverty (or falling deeper into poverty) at some point in future is also a key dimension of well-being, since it affects individual's behaviour (in terms of investment, production pattern, coping strategies) and their perception of their own situation.

In the present study, the focus is on an objective quantification measure of poverty. In order to compute a poverty measure one needs (a) an indicator of well-being, (b) a threshold to which each individual's/household's welfare can be compared (referred to as the poverty line) and (c) a poverty measure. Poverty is proposed to be estimated using a monetary dimension using per-capita household consumption expenditure as an indicator of well-being. The next step is to define a poverty line, which is a cut-off point separating the poor from the non-poor on the basis of the chosen indicator. There are two main ways of setting this poverty line – relative and absolute. The relative poverty
line is anchored in relation to the overall distribution of income or consumption in the population group. On the other hand, an absolute poverty line is defined on the baseline of some absolute standard of what the household should be able to extend in order to meet their basic needs. For making a monetary measure, the absolute poverty line is usually based on estimates of the cost of basic food needs, and to this measure a provision is added for non-food needs. Since a sizeable proportion of the fisher folk is considered to be surviving with the basic minimum or less, an absolute rather than a relative poverty line is considered to be more relevant in this study. Most popular poverty measure have used the nutritional norm and defined the poverty line in terms of a determined minimum calorie requirement (Green and Thorbecke, 1986; Ravallion and Bidani, 1994). An alternative method is to set the poverty line on the basis of subjective perception or self reported measure of poverty. Of course, self-reported measures have important limitations; in general, the observed perception of poverty need not provide a good basis to establish priority public action.

1.7.2 Definitions

1. Small-scale fishery: In the literature on fisheries, there exists no standard definition for small-scale fisheries. A variety of terms is used, such as traditional, artisanal, subsistence, etc. which, although not synonymous are often used interchangeably to convey the smallness of operations relative to those of industrial fisheries. There are however, certain characteristics common to all of them. By virtue of their limited fishing range and related socio-economic characteristics, they are confined to a narrow strip of land and sea around their community, operate near their home base, are basically dependent on natural resources, and have limited set of options. In the present study, the term small-scale is used to mean both small and traditional in the sense of using traditional gear, including those upgraded. According to this definition, fishermen using crafts with outboard motors are also covered by the term small-scale fishery.

2. Household: A group of persons living together and taking food from a common kitchen constitutes a household. There can be more than one family under the same roof cooking separately; they are considered as separate
households even if they are close relatives. In the household temporary visitors are excluded, but temporary stay away are included. e.g. A son or daughter residing in a hostel for studies is excluded from the households of their parents, but a resident domestic servant is considered as a household member.

3. **Household member:** A person living in the household for the majority of days during the last reference period is treated as a member of the household. However, a person taking food with his family but sleep elsewhere due to shortage of space, is also a household member. But if a person of the family working elsewhere and has come to the house only once in a while during the reference year is not considered as a household member. His earnings to the house is considered as remittance.

4. **Head of household:** An adult household member who makes important decisions in the house is considered the head of the household. He/She may or may not be an earner and may or may not possess wealth, but can be a prime decision-maker concerning the household.

5. **Usual activity:** The usual activity of a person is determined on the basis of various activities pursued by him/her during a reference period of 365 days, adopting a ‘relatively longer time’ criterion.

6. **Reference period:** For collecting data on consumption expenditure two types of reference periods were adopted. For food and other items of monthly expenditure, the previous 30 days were taken as the reference period to minimise the recall bias. In the case of items like clothing, footwear, furniture, household utensils, household maintenance, etc; the reference period was 365 days. For determining the occupation and the activity status also the reference period was also 365 days.

7. **Household consumer expenditure:** The expenditure incurred by a household on domestic consumption during the reference period is the household’s consumer expenditure. The household consumer expenditure is the total monetary values of consumption of various items (purchased as well as home grown).
8. *Monthly per capita consumption expenditure (MPCE):* For a household, MPCE is arrived at by dividing 30 days' total consumer expenditure divided by the size of the household. A person's MPCE is understood as that of the household to which he or she belongs.

9. *Fishing assets:* In the small-scale fisheries sector the main fishing assets are the craft and the gears. Other fishing assets used for fish-related activities include equipments for processing and fish trade. The value of the assets is determined on the basis of purchase price and subsequent additions and/or alterations effected and allowing for depreciation. Only those equipments that were currently in use would be counted for valuation.

10. *Non-fishing assets:* Only productive items have been considered as assets in the study. These include agricultural land, vehicles for transport and investment in trade/business. In determining fishing and non-fishing assets, working capital has not been included.

1.8 ANALYTICAL FRAMEWORK

1.8.1 Determination of household well-being

The analysis starts with the perception that the coastal communities use natural resources primarily as an asset for income generation; it follows that increase in income from these resources are one of the principal factors of reducing poverty. It is recognized that environmental resources also provide life-supporting services and confer many intangible aesthetic and cultural benefits (Duraiappah, 2001). But we mainly confine our enquiry to the concept of economic use, i.e. the opportunities to convert resources for the purpose of production, consumption, and exchange.

Income differences between fishermen in the same locality arise mainly due to the differences in fish catch and its price. If prices are treated as 'given' catch can be explained on the basis of technology used, input combination, technical efficiency, and last but not the least by pure luck. (In the short-run, in a specific location, resource abundance may be assumed to be constant.) In order to test whether the catch differentials in the small-scale sector are due to the difference in production techniques and variable input use, an input-output
relationship (referred as the ‘fishery production function’) may be formulated and applied to a cross-sectional data on a sample of fishery units in the study area. The results would give insight into the ways in which fishing income might be increased.

The next attempt is to understand the well-being of the people in the community. The standard of living is one of the most commonly used indicators of well-being and is represented by household income, from all sources and in all forms (i.e. cash as well as kind). Adjustments are to be made in the gross income for tax payments, receipts of subsidies, etc. to arrive at the disposable income. For comparison across households, age structure, household size etc. are also to be taken into account. Since it is difficult to get reliable data on household income, household consumption expenditure is often used as a proxy variable. While use of income as a measure of standard of living has its own advantage (e.g. extent of contribution of different source of income), consumption expenditure will be a better indicator for the following reasons. In the first place, it can be said that actual consumption is more closely related to a person’s well-being in the sense of having enough to meet current basic needs. Secondly, consumption can be better measured than income, especially in the case of poor households whose incomes keep fluctuating, and include non-monetized items (especially when consumption consists of own production goods also). Thirdly, since consumption expenditure reflects the household’s access to credit markets or savings at times when current income is low or almost nil or fluctuates widely. Whether income or consumption expenditure is chosen, it is necessary to adjust for differences in needs between households. The standard method is to use the per capita income/expenditure by dividing total household income/expenditure by the number of persons in the household. The implicit assumption is that no economies of scale in consumption exist.

1.82 Measuring inequality and poverty

Inequality of income can affect economic choice and political decisions. It is therefore desirable to assess the inequality in the levels of living of the households in the study area. The percentage of food items computed from
household expenditure data is an indicator of the standard of living; the higher the ratio the poorer the household. Fractiles of income distribution Lorenz ratio, Gini coefficient, and Theil index are more refined indicators of inequality. Once the extent of inequality is assessed, we would like to get an insight into the contributing factors to inequality. If the inequality measure can be decomposed to explain the contribution of different groups with a particular characteristics it will give an insight into the structure of inequality and contributing factors. The Theil Index is amenable to decomposition of overall inequality into (i) a component of inequality between chosen groups and (ii) remaining inequality within groups. The percentage of inequality contributed by the between group inequality to the overall inequality can be considered as an indicator of the amount of inequality explained by the between groups with particular characteristics.

The conventional view is that a society's welfare is contributed by two factors – income and the extent of inequality in the distribution of income. The notions of poverty and inequality are closely related; for a given mean income, the more unequal the income distribution the larger the percentage of people living in 'income poverty'. In the case of fisher households the daily earnings are fluctuating and uncertain. There is some evidence that traditional work-sharing and output-sharing systems of fishing communities provide some insurance for these vulnerable groups against destitution and hunger. In spite of these traditional mechanisms there exists some anecdotal evidence that inequality has increased in fishing communities subsequent to motorisation; but little is known whether poverty has increased. In this context the cross-sectional data collected in the study can be used to assess the extent of poverty among the fisher households, and to assess the risk today of being in poverty.

Three ingredients are required in computing the poverty measure. First, relevant dimension and indicator of well-being has to be chosen. Second, is the selection of a poverty line, that is, a threshold below which a given household or individual is to be classified as poor; and finally a poverty measure to be used is to be chosen.
For the indicator of well-being we will continue the use of monthly per capita consumer expenditure (MPCE). For poverty line, we confine ourselves to the use an absolute measure based on the subjective perception of fisher households on poverty translated into a monetary measure. For measuring poverty, it is convenient to use FGT measure, because of its decomposability and simplicity of interpretation. In order to understand who are the poor and what are the differences between the poor and the non-poor, a poverty profile of different socio-economic groups would be developed. The profile could include information on the identity of the poor in addition to their education, activity, etc.

1.8.3 Determinants of poverty

When the determinants of poverty are identified from the data, their contribution to pushing a household into the poverty group will be assessed using a binary logistic regression model. The probability or risk of being poor in poverty or falling deeper into poverty is a key dimension of well-being. This vulnerability dimension affects individual’s behaviour and their perception of their own situation.

\[(1) \log \left( \frac{p}{1-p} \right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_i X_i \]

where, \( p \) is the probability of the responding variable to the explanatory variables.

1.8.4 Factors influencing household income

Once an assessment of the level and disparity of standard of living is made, and the factors influencing well-being or the absence of it are identified, the next step is to assess how these factors influence the well-being of the households. In the fishing community, income is mainly from fishing and fish-related activities; and production depends on the ownership and utilisation of factors of production and access to natural resources. Non-utilisation or under-utilisation of productive resources or resource depletion affects resource rent.

---

1 It is important to note that several correlates or determinants of poverty are not quantifiable. For some other variables, one has to use a proxy, which might not fully reflect the underlying dimension. Here we would use only three dimensions that are quantifiable or for which a proxy variable is available.
A fishery household may receive income from non-fishing activities also. Non-fishing income is derived from ownership of or access to assets such as land, building and vehicles, in the form of rent; from financial resources in the form of interest; from employment in the agricultural, industrial or service sectors, in the form of wages/salaries; and from enterprises in form of profits. Income may also be obtained through government’s transfer payments, remittances, social sharing, etc. A suitable model linking household income and explanatory variables will be developed and the parameters will be estimated using the data from the household survey. Since fishery resource in a specified location may be assumed to be constant it can be eliminated from the model.

1.9 STUDY AREA
The geographical area selected for the present study is a fishing village in the coastal area of Thiruvananthapuram District, the southern District of Kerala. This District has a predominant position in marine fisheries, accounting for about 13 percent of the coastline and 11 percent of the continental shelf area of the State. The continental shelf in this part is narrow and the inshore sea steep slopped and surf ridden. Compelled by the oceanographic feature, fishermen of Thiruvananthapuram have developed highly skilled fishing methods.

About one-fifth of the marine fishermen of Kerala is from Thiruvananthapuram District; and about 39 percentage of fishing crafts of the State are from this part (SIIFFS, 1999). Kattamaram is the predominant craft in the District; in fact Thiruvananthapuram has a large concentration of kattamaram accounting nearly 82 percent of the State’s total. From the early eighties, consequent on the introduction of OBM, plywood canoes have become a prominent craft in this region. With the advent of motorisation the operation of kattamaram units is said to have declined. Fishermen here use a variety of gears which includes gillnets of various sizes and meshes, hook and line, boat seine and shore seine. In terms of number, gillnets rank first followed by hook and line.

In order to collect primary data to seek answers to the research questions Pullivilla, a typical coastal fishing village in Neyyattinkara taluk of Thiruvananthapuram district was chosen. In addition to the typical
characteristics of the fishing villages of the district, the main factors influencing the selection of this particular village were the following:

1. The village has a long history of small-scale fishing;
2. There are a large number of households depending on marine resources;
3. Both motorised and non-motorised fishing techniques and a variety of gears are in use; and
4. Social characteristics typical of small-scale fishing community in the district are present.

The fishing village is a narrow steep of land between the highway and the sea, and the infrastructure facilities available are more or less the same as in the neighbouring villages.

1.10 SURVEY METHOD

The primary data for the study were collected through a sample survey of households in the study area. The frame to select the sample was prepared by listing all the houses in the village. In this enquiry information on household size, means of livelihood, ownership of fishing equipments, etc. was collected. The households were then grouped into (i) households possessing fishing assets (in the form of equipments), (ii) households without fishing assets but mainly dependent on fishing and/or fishery-related activities and (iii) other households (hereinafter referred to as 'other coastal households'). These categories formed three strata for selection of sample households for the detailed survey. From each stratum a sample of 25 percent of the households were selected by the method of systematic sampling.

From the selected households data on demographic characteristics of household members, details of fishing and non-fishing assets possessed, employment particulars, information on income from different sources, consumption expenditure, etc. were collected through personal interviews using a structured interview schedule (vide Appendix I). In order to overcome the effect of seasonality the interviews were spread over a period of eight months with a break of one month during the monsoon period of June-July. The
reference period for data on employment, income and expenditure was 30 days previous to the date of enquiry. The fieldwork was carried during the period February – December 2004.

Along with the household survey, data on costs and earnings were collected from a sample of 70 fishing units in the village by personal enquiry. The units covered did not constitute a random sample since the data could be collected only from those willing to furnish the details and maintaining the records of the activities. The data collected reflected the fishing activities and earnings during the preceding 12 months. Data in the schedules were entered into a database, cleaned and edited. The exploratory and confirmatory analysis were carried out using SAS, STATA and SPSS softwares.

1.11 LIMITATIONS OF THE STUDY

The linkages between natural resource degradation and poverty are dynamic and context-specific, reflecting the geographical location and socio-economic and cultural characteristics of the individuals/households and the institutional framework in which they operate. In this study we take a static approach in which we assume that the natural resources are already degraded. Further, the study is location-specific and any generalisation from of the findings of the present exercise has to be made with caution. In order to establish that resource degradation is affecting the people depending on it, it is necessary to collect and analyse data on the biological, economic and social aspects of the fishery as well as its past and present institutional framework. The required economic data would include price information by species, cost and composition of fishing effort (number of and size of fishing vessels, gear type, employment, fishing time, etc.), income distribution, etc. Information on social aspects should cover mobility, opportunity for non-fishing work and participation in community activities. Institutional information relates to community organisation, access to the fishery, relationships with other fisheries, organisational production, marketing channels, customary relations etc. The list is only indicative of the items of information needed for a detailed study. A discussion of the methods of gathering this information is beyond the scope of
this study. The present study has been carried out keeping these limitations in mind.

1.12 STRUCTURE OF THE THESIS

This thesis is documented in seven chapters including this chapter. Chapter II deals with the evolution of marine fishery sector of Kerala from the early modernisation era starting from the sixties up to the present. From cross section data, income differentials among fishing units are estimated using production function technique and their details discussed in Chapter III. Socio-economic conditions of the fishing community in the study area based on the household survey data is the topic of discussion in Chapter IV. Measurement and decomposition of inequality and poverty exercises are undertaken in Chapter V along with determination of poverty and a brief discussion on the poverty profile. In Chapter VI the factors influencing household income are analysed and the magnitude of dependence of fisherfolk on fishery resources examined. In the final Chapter VII, we present the summary of the discussions and the broad conclusions emerging therefrom.