CHAPTER 1
INTRODUCTION

1.1 General Background

Inle Lake, the second largest inland lake in Myanmar, is situated in Nyaung Shwe Township, in the southern part of Shan State. It is 22 km long and eleven kilometers wide and is situated about 880 meters above mean sea level. High hills flank the lake on both sides, so people in Myanmar recognize it as being set in the mountains. Ecologically, Inle Lake is home to a number of wetland species, such as migratory and residential birds and the Inle Carp, which locally is called *nga-phane*. In 1985, the Inle Wetland Wildlife Sanctuary (IWWS) was established by the Forest Department, and was identified as an ASEAN Heritage Park in 2004. Apart from its ecological value, the lake is also a major source of water for Lawpita hydro-electric power station and for Moebye dam. There are 29 creeks flowing into the lake, and among them, nine creeks are a key source of water for the lake.

One of the most important aspects of Inle Lake is that it is also a key tourist destination, due to its cultural and scenic value. It is also famous for the unique leg-rowing style of the Intha people – a rowing style that cannot be found anywhere else in the world. From the middle of the lake, one can take-in a panorama which includes distant white pagodas as well the lakeside, and along the horizon, fishermen using conical fishing nets, and using this curious local technique to move about the lake in their boats. It is also of great interest for the visitors to see houses set on the water, and many villages can be found on the lake as well as on land nearby. Navigating through the canals to the villages in the vicinity of the lake is an exciting experience for the visitors. There are also two hot springs; the one near Khaung Daing village being quite famous.

Inle Lake is also a popular pilgrimage site due to its many ancient pagodas and monasteries. Among them, Phaung Daw Oo Pagoda is particularly well recognized by

local pilgrims. According to a local legend, four Thayatkhan and one Myat Poung Myintzu Buddha image located in Phaung Daw Oo pagoda were brought to the site by the Myanmar King Alaungsithu, in Myanmar calendar year 482 (AD 1120). As a result, the famous and sacred Phaung Daw Oo pagoda has long been worshipped by people from far and near, and right up to the present day (Trustees Board of Phaung Daw Oo Pagoda).

According to 2010 statistics, Inle Lake and its surrounding areas have 36 village tracts and 34,272 households, and have a population of 173,099 (The New Light of Myanmar, 27th June 2011). Among them, fifteen village tracts are located on the lake (Mu Mu Than, 2006). The largest village on Inle lake is Ywama. Each of its two-storey houses has its own landing dock, and boats are kept at lake level. Every five days, a floating market brings buyers and sellers together in small boats, and there are also many other open-air markets that operate on a five day rotation basis. These markets sell a wide variety of fresh fruit, fish, vegetables, flowers and tobacco, as well as other goods.

Figure 1.1 Floating Market in Ywa Ma Village - 2008
(photo courtesy of Seint Sann Zaw)

Many ethnic groups reside on and around Inle Lake, including the Pa-O, Danu, Intha, Taung-yo, Shan, Karenni and Bamar groups. Among them, the Intha, whose name means 'lake dwellers', is the major group. The Intha is just one of the 135 ethnic groups in residing Myanmar. They are Tibeto-Burman and all speak the same language, but with different intonations and dialects. The Shan people call the Intha *Mant Naung*, where *Mant* means Burmese and *Naung* means lake, so together this means 'the Burmese in the lake'. The Intha people are staunch Buddhists, and around and on Inle Lake there are at least 1000 temples, pagodas, stupas and monasteries. Buddhism plays a very important role in every part of Intha life and culture, giving them their identity, security and traditions. Some of the Intha people believe in traditional animism mixed with Buddhism, and this means fear and superstition playing a key part in their everyday lives.

Every year, a famous one-legged boat race is held during the Inle Phaung Daw Oo Pagoda festival in October, a time when almost all the local boys and girls go to pagodas to carry out religious ceremonies and join in with festivals such as New Year and the Tazaungdaing Lighting Festival. Like others parts of the country, the Inle area hosts a lot of festivals almost every month.

The main livelihood activities of the Intha are the cultivation of floating gardens (hydroponics farming) and fishing. Floating gardens constitute the main income earning activity among the Intha, and the tomatoes they grow all–year-round on floating islands are very famous. These floating gardens are locally called *ye-chan* and are formed from the mass of grasses, reeds, sedges and other aquatic plants that grow in the area. Some gardens are submerged under water, while others float on top. The floating islands are pulled into position and fixed with bamboo poles. Floating islands on Inle Lake are the major production source in the area, supplying tomatoes to much of the country. Every year, millions of kilos of tomato are distributed around the country.

Fishing is the traditional livelihood activity of the Intha, and fish are the main source of food for the local people, as well as a key income source. Visitors are able to see the fishermen fishing on Inle Lake, and it is quite a natural scene. The Intha also work as blacksmiths, goldsmiths, weavers and in tourism. Traditional weaving is both for the local and commercial markets, and cloth woven from lotus is locally called *kyar thingan* and is unique to Inle. First, fibers from the lotus stem are extracted to make lotus thread, after which spinning is carried out by hand using a spindle. By using these Lotus thread fabrics, scarves for women, robes for Buddha images and monks, and shirts, jackets and neckties are woven. Some believe that lotus can absorb bad things from the body and bring good luck.

1.2 Statement of the Problem

Over the last decade, environmental degradation around Inle Lake has become severe due to a variety of anthropogenic factors. Ongoing improper “in-lake” and “near-lake” agricultural practices are the main cause of environmental degradation, with their impacts including deforestation, sedimentation, eutrophication, water pollution, water level decline and shrinkage of the water surface area. With

deforestation, the main causes are logging, shifting cultivation and improper ploughing systems. Due to deforestation around the catchment area of the lake, the remaining bare soil cannot maintain water and the lake dries up quickly. Moreover, when it rains, water flows directly into the lake, causing soil erosion. In this way, sedimentation levels have increased in the lake in recent years.

In the watershed area of the lake, people grow potatoes as the main cash crop and use pesticides to grow tomatoes – over and above the acceptable levels. The over-application of these pesticides is not only costly to the farmer, but also causes unnecessary pollution that may be harming the health of watershed residents (Butkus and Su, 2001).

Many sources have reported on sedimentation levels within Inle Lake. Sidle et al. (2007) state that sedimentation rates range from 0.65 million m^3 (Su and Jassby, 2000*)* to between 0.8 and 4.3 million m^3 per year (Volk et al., 1996). They also mention that, assuming a catchment area of 5,612 km^2 (Ngwe Sint and Catalan, 2000; cited in Su and Jassby, 2000), the average sediment yield is approximately 1.5 to 1.8 Mg per hectare per year. The downstream settlements within the Inle lake watershed are also affected by these off-site effects, the most evident being the decrease in size of the lake itself. Khin Thant (cited in Su and Jassby, 2000) report that in 1999 the lake was approximately 23 km long and eleven kilometers wide, but for 1996, Thi Dar Win (cited in Cho Cho San, 2006) reports that the lake area had decreased to eleven kilometers long by five kilometers wide. According to a study by Sidle et al. (2007), the open water surface of Inle Lake has reduced from 69.1 km^2 to 46.7 km^2, a drop of 22.4 km^2, based on a comparison of topographic maps in 1935/1937 and using recent remote satellite imagery. The New Light of Myanmar, a state-run newspaper, reported that the original water surface area of the lake was 100 square miles, but that that area had dropped to 24 square miles and was 21.66 square miles in 2007 (The News Light of Myanmar, 2011).

In the watershed area of Balu Creek, one of the main inlet water sources for Inle Lake, there is a coal mine power plant, near Tigyit village, and the soil dumped from the coal mine is creating man-made hills that block the flow of water, creating polluted and contaminated ponds. During the wet season, rain water slowly erodes the dumps and coal heaps at the factory, sending waste into Tigyit creek. Toxic fly-ash

waste from the power plant spreads out over the local area and also ends up in local water sources, some of which eventually flow into Inle Lake. As the coal mine has got deeper and been extended, so it has reached areas underneath water sources, and this water is then pumped out into Tigyit Creek, which flows through Balu Creek and into Inle Lake (Pa-Oh Youth Organization, 2011).

Around the lake area, the Intha people cultivate floating gardens, and these were introduced in the early 1960s (Sidle et al., 2007). Floating islands are formed from the decaying grasses growing in the marsh, on land and in the water around the lakeshore. Floating islands are soil-less islands that support plants such as coarse grass, reeds, sedges and duckweed (*Graminae and Cyperaceae)*. Dead aquatic and marsh plants become tangled together and are bound by bog masses and algae, forming expanses of fen peat which float freely. It takes around ten years for a mature island to form, and this can later be used as a water garden. Such floating masses are cut by saws into blocks two meters wide by up to 200 meters in length, from the natural floating beds. These mature islands can be used for up to fifteen years, depending on their buoyancy. This unique agricultural practice slows down silting in the lake, for farmers collect silt from the bottom of the lake and to use as the growing media (Cho Cho San, 2006).

The development of floating gardening has led to a reduction in the open water area of the lake, and the gardens can choke the lake's fragile ecosystem. On floating gardens, people grow various cash crops, such as tomatoes, cauliflowers, flowers, pods, cabbages and egg plants. Among these, tomato is the major cash crop. As the seeds are of a hybrid variety, the farmers have to use a lot of chemical fertilizers, pesticides and insecticides, leading to pollution of the water and also to eutrophication. According to local elders, water in the lake used to be very clean and could be drunk; however, nowadays, the water in the lake is not drinkable due to the poisoning of the water.

Other causes of water pollution are the direct latrine systems used by houses around the lake and dye from the weaving industry. In the weaving industry, chemical dyes are used as bleaching agents. Detergents from the washing of clothes also impact on the quality of the water, and no water treatment is carried out, with domestic drains flowing directly into the water (Akaishi, Fumiko, et al., 2006). Because Inle Lake is a

tourist site, there are many motor boats used for transportation and by tours, and the gasoline and diesel residues from these boats are also a source of water pollution. Added to this, the building of infrastructure in support of the tourist industry is also a key cause of lake ecosystem deterioration.

Inle Lake is also now experiencing a dramatic reduction in its water surface area due to sedimentation, and as the water surface is shrinking, pollution is rising. The fish population has dropped in recent years due to the lake shrinking and also pollution, with many of the local fish species threatened with extinction. Today, the fish catch per fisher is in decline; moreover, most of the fish caught are not native fish species, but Tilarpia.

It is clear that the rate of decline in the water level has accelerated in recent years. With global climate change, Myanmar has also experienced drought and water scarcity due to low rainfall levels - such as in 2009, and also significantly increased temperatures and a late monsoon - such as in 2010. As a consequence, in 2010 the water level in Inle Lake reached its lowest recorded level, causing a water scarcity and difficult water transportation conditions, plus problems for the floating gardens. Prior to 2010, the floating islands never touched the bed of the lake, but in the summer of 2010, the plants on the floating gardens became rooted to the bottom, meaning they could not float. When the water level rose again, the plants remained attached, meaning that the tomato plants became submerged and died. That is why most of the floating gardeners on the lake suffered a loss of capital, in both monetary and labor terms. A lot of capital investment is needed to support the floating gardening process, from seeding through to harvesting. As a result, the Intha have faced many difficulties in recent years, and in some cases the floating gardeners have had to sell their gardens to others, because they do not have enough capital to continue and have fallen into a debt trap.

Figure 1.2 Dried-up Lake Bed near the Famous Phaung Daw Oo Pagoda, in 2010
(Photograph - Eleven Media Group)

In 2011, although the water level did not fall as low as in 2010, the floating gardens in a few other villages touched the bed of the lake, meaning they could not cultivate and had to change their livelihoods. Some with enough capital bought motor boats and started running a boat service for pilgrims to the temple, while others started working as workers at other floating gardens, but are now also motor boat drivers.

The water flows in Inle Lake contribute to the socio-economic life of the local people, and the Lawpita hydro-electricity plant in Inlay Lake-Bilu Creek has been a key contributory factor in the socio-economic growth of Myanmar. So, the decreasing water level of and flow into Inle Lake is likely to lead to decreased electricity productivity for the entire country. Most of the local people do not worry about environmental degradation of the lake, despite the severe impact on their lives. Only a very few people are worried about the lake's environmental changes, because some believe that the situation is just temporary and in a few years will return to normal.

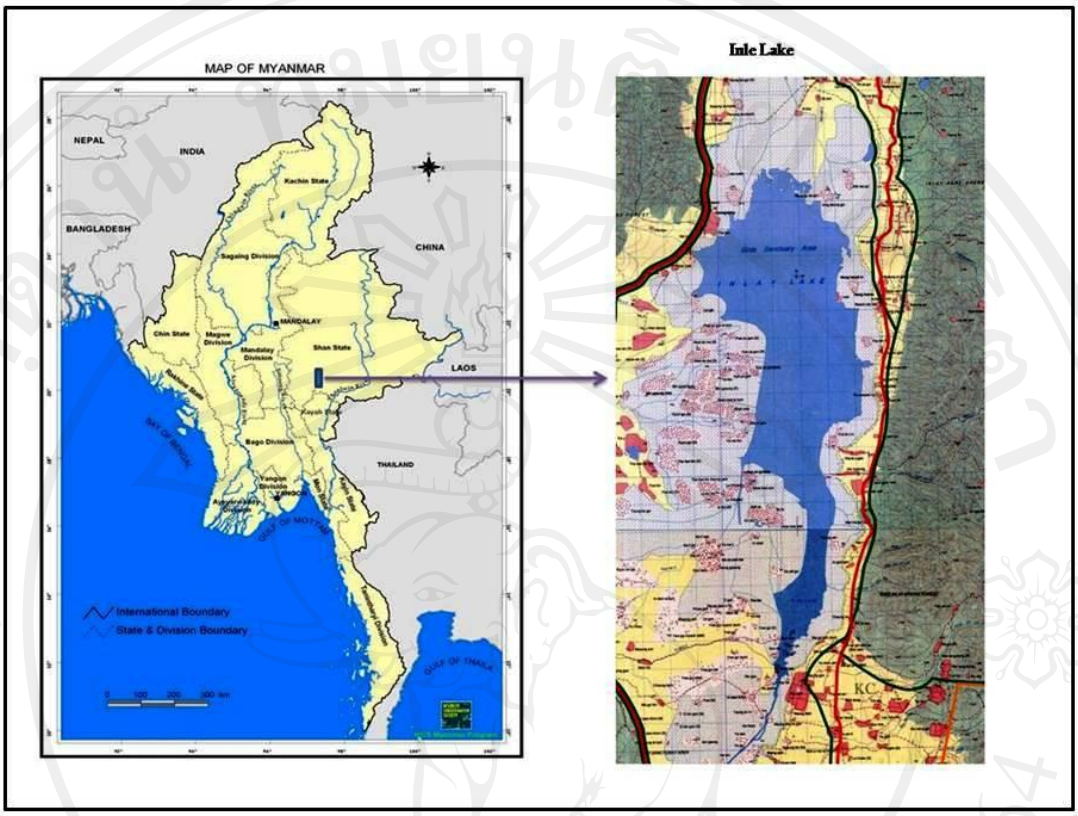

Figure 1.3 Map of Myanmar and Inle Lake

1.3 Research Questions

Relating to the current challenges in Inle Lake, my research questions are as follows:

1) Why and how has the Inle Lake ecosystem been transformed in recent years?
2) How has the environmental deterioration in the area affected the environmental entitlements of the Intha people?
3) How have the Intha coped with changes to the ecosystem in and around Inle Lake in recent years; changes that have threatened their livelihoods?

1.4 Research Objectives

The objectives of this my research were to focus on the following issues:

1) To investigate how environmental degradation has affected the livelihoods of local people, especially those cultivating floating gardens.
2) To understand how much local people rely on the environment around them and how they have coped with the environmental degradation taking place.
3) To explore the perceptions of local people regarding their common-pool resource; Inle Lake.

1.5 Literature Review and Theoretical Debates

1.5.1 Lake Ecosystem as a Common Pool Resource System

Inle Lake is one of the most important and productive environmental resources for the Inthe people in the study area. Their values and functions support other ecosystems and are significant for economic development. Lakes once proliferated throughout large areas of the world, but are now among the rarest and most at-risk ecosystems. Lakes support different activities; recreational, educational, scientific, aesthetic, spiritual and cultural, and these activities form an important component of and are critical functions influencing lake ecological functions. Despite their important role in sustaining the ecology, supporting economic development and elevating people out of poverty, almost all lakes in the world are threatened by diverse anthropogenic factors. Today, lakes are facing significant environmental degradation, such as sedimentation, water contamination, eutrophication, water level decline and changes in water quality. In Inle Lake, a comparison of lake features between the 1935/1937 topographic maps and the 2000 Landsat Enhanced Thematic Mapper/imagery, shows that about 93% of the 22.41 km^2 ‘‘loss’’ of open water over the 65-year period can be attributed to the creation of floating gardens and the transportation of depleted floating gardens to the lake margins (Sidle, Roy C., et al., 2007). Different kinds of environmental degradation have a negative effect on the livelihoods of local people who reside in the area.

Here, the lake can be seen as a “common-pool resource”, the term “common” used in everyday language to refer to a diversity of resources or facilities, as well as to the property institutions that are involved in the creation of joint ownership or access. Analytical advantages exist in separating the concept of resources or goods - as valued by humans, from the concept of the rules that may be used to govern and manage the behavior and actions of humans using those resources. On this point, a common-pool resource is a valued or human-made resource or facility that is available to more than one person and may be subject to degradation as a result of overuse. However, poverty itself can pollute the environment, creating environmental stress in a different way, for those who are poor and hungry will often destroy their immediate environment in order to survive (Report of the World Commission on Environment and Development: Our Common Future, 1987). Common-pool resources are those for which exclusion from the resource is costly, and for which one person’s use subtracts from what is available to others (Ostrom, et al., 2003).

Common pool resources can be categorized on different scales, such as the micro-, meso- and macro-scales. Micro level resources include common pasturelands, small forests and small surface water bodies, while meso level resources include large rivers and lakes, forests, and mountains or mountain ranges, some of which transcend nation-state boundaries. At the macro level, the global commons are the earth’s oceans, atmosphere and weather systems (Conroy, 2002).

The goods and events that individuals value differ in terms of how easy or costly it is to exclude or limit potential beneficiaries (users) from consuming them once they are provided by nature, or through the activities of other individuals. Fencing and packaging are physical means of excluding potential beneficiaries from goods. To be effectives; however, fencing and packaging must be backed by property rights that are feasible to defend. It follows that the feasibility of excluding or limiting use by potential beneficiaries is derived both from the physical attributes of the goods and from the institutions used in a particular jurisdiction (Ostrom, et al., 2003).

Excluding or limiting potential beneficiaries from using a common-pool resource is a non-trivial problem for many reasons. For example, the total cost of “fencing” an inshore fishery, let alone an entire ocean, is prohibitive. The case of Tonle Sap Lake in Cambodia is one example. The recent construction of large

hydropower dams in China and Laos is likely to cause an increase in the dry-season water level in the lower parts of the Mekong, and as a consequence in Tonle Sap Lake. The most evident change would be permanent submersion, in essence destruction, of remarkable areas of the flooded forests that surround the lake. The reduction in flooded forest area would lead to a loss of livelihood sources for a significant number of people, both due to a loss of forests and due to the subsequent negative effects on aquatic production levels. Large floods also impact livelihoods; for example, by changing rice cultivation patterns and making fishing more difficult, as fishing areas increase due to larger flooded area (Keskinen, et al.2007).

In other cases, the additional benefits from exclusion, or placing restrictions on use, are calculated to be less than the additional costs from instituting a mechanism to control use. In still other cases, basic constitutional or legal considerations prevent exclusion or the limiting of use. Knowing that a resource is one that is difficult to exclude, one can predict that "free riding" behavior will occur. Free riding is a term used to describe a situation in which some individuals "free ride" the efforts of other individuals, in order to provide either the good itself or the set of rules that would enable individuals to achieve a sustainable, long-term utilization pattern in relationship to a resource.

The goods and events that individuals value also differ in terms of the degree of subtractability of one person's use from that available to others. If a fisherman lands a ton of fish, that ton is not available to others. On the other hand, one person's enjoyment of a sunset does not subtract from others' enjoyment of the same sunset. Information is the extreme case of a good that is not subtractable. Most natural resources, on the other hand, are characterized by subtractable uses. Goods characterized by problems of exclusion without any substractability are considered to be public goods, and institutions well-adapted to providing public goods are unlikely to solve the over-harvesting and potential destruction problems faced in coping with common-pool resources, which are characterized by problems of exclusion and subtractability (Ostrom, et al., 2003).

Human beings use common-pool resources by harvesting or extracting some of the finite flow of valued goods produced by them, or by putting in unwanted by-products, thus treating the resource as a sink. In general, humans using resource of

this type face at least two underlying incentive problems (Burger et al., 2001; Ostrom et al., 1994). The first is the problem of overuse, congestion or even destruction, because one person's use subtracts from the benefits available to others. The second is the free-rider problem, one that stems from the cost or difficulty of exclusion from the benefits generated by the resource. The benefits of maintaining and enforcing rules of access and exclusion go to all users, regardless of whether they have paid a fair share of the costs. The institutions that humans devise to regulate the use of common-pool resources must somehow try to cope with these two incentive problems; however, they generally struggle with how to maintain both the resource and the institution itself (Ostrom, et al., 2003).

A key problem with common-pool resources is the high cost of excluding the free-rider. If exclusion is physically difficult and effective rules are not in place to limit who can use a resource and what can be withdrawn from it, then all harvesters face an incentive to increase their own harvesting rate without any concern for the impact of their actions on the costs for others (and eventually for themselves). Furthermore, the rules that govern a common-pool resource are themselves a public good because once they are provided, one person's use of the rules does not subtract from their availability for use by others.

Common pool resources contribute substantially to poor people's employment, income and assets accumulation in several direct and indirect ways. The degree and nature of common pool resources' contribution to livelihoods varies from one area to another, and from social group to social group, depending upon the availability, quantity and quality of these resources, and the socio-cultural traditions of the communities involved. However, in recent decades, with the growth of human and livestock populations, common pool resources have come under increasing pressure, with both land- and water-based common pool resources becoming degraded and shrinking in area (Conroy, 2002). The best tool to use for the sustainable management of a common-pool resource depends on the characteristics of the resource and of the users (Dietz, Thomas and et al., 2003).

1.5.2 Theory of "the Tragedy of the Commons"

In the commons, every user is locked into a system that compels them to increase their use without limits, but in a world that is limited. Each user attempts to achieve their own best interests in a society that believes in the freedom of the commons. Freedom of the commons; however, brings loss to all. The pollution crisis is also a kind of "tragedy of the commons" (Hardin, 1968), such as putting something into the water whether it be sewage, chemicals or radioactive waste, putting noxious and dangerous fumes into the air, or placing distracting and unpleasant advertising signs in the line of sight (Hardin, 1968).

The most basic lessons learned from studying actual common-pool resource management is that the notion of a "tragedy of the commons" (Hardin, 1968) is only found under very special conditions, that is, the situation does not arise in every context. However, under situations where there is institutional failure, a "tragedy of the commons" may be found. When resource users cannot communicate and have no way of developing trust in each other, or in the management regime, they will tend to overuse or destroy their resource as the model predicts. Under more typical circumstances of resource use; however, users can communicate and have ways of developing trust. Under these conditions, it is possible, though by no means certain, that they will agree on a set of rules (i.e., an institutional form) to govern their use patterns so as to sustain the resource and their own economic returns from it. Much of the research since 1985 can be seen as an effort to identify the situations in which resource users, by themselves or in conjunction with external authorities, will develop such rules, with accompanying incentives, and conform to them (Jensen, 2000).

Taylor (1990) states that the literature on common-property following Hardin (1968) has been dominated by the classical economic model of self-seeking and essentially unconnected individuals. However, in the real world, property is never absolutely individual or unrestricted (Taylor, 1990).

According to Ostrom (2003), some of the most challenging contemporary common-pool resource problems deal with the use of common-pool resources as sinks, those which degrade through pollution. Common-pool sinks range in size from the global atmosphere, which is affected by the behavior of individuals in all countries of the world, to local watersheds and airsheds, which are affected mainly by people in

a single location. When a resource is a sink, the problem of overuse means putting too much of a contaminant into the resource, in contrast with the more familiar problems such as too much water being extracted by users, leading to a reduction in water quality for others (Ostrom et al., 2003).

In the case of Qionghai Lake in Sichuan Province, China, water pollution has been severe since 1990. As a tourist destination, numerous hotel and restaurants around the lake put untreated domestic sewage containing detergents into the lake, a major cause of its increased phosphorus levels. When chemical fertilizers and pesticides from paddy fields surrounding the lake are overused, runoff from the paddy fields, as a non-point pollution source, brings fertilizer and pesticide residues into the water body (Yong, Chen and Wang Yiquan, 2003).

Similar experiences can be found in Lake Victoria, East Africa. In Lake Victoria, municipal untreated sewage, runoff and storm water, animal waste and maritime transportation waste have contributed to a decline the quality of the lake's water, both for animal habitats and for drinking use. Soaps and detergents used within the basin are outdated or banned and are contributing to eutrophication. Farmers and others also dispose of expired pesticides, medical waste and petrol station waste (Eric O. Odada, et al., 2004).

In the Inle Lake region, the Inthas use pesticides and insecticides on their floating gardens, and when they do so, it causes water in the lake to become contaminated and has a negative impact on the fish population. It should be noted that although the use of the common pool framework to understand sinks seems promising, this line of analysis has not been as well studied as that of resource extraction (Ostrom, et al., 2003).

1.5.3 Environmental Entitlement

Different factors may determine the environmental entitlements of a particular group of people, whether it is access to environmental resources or people's ability to make effective use of them. Environmental entitlements are one of several sources of livelihood for poor people, and in general the most important among others is the sale of labor. Environmental entitlements are especially important in the livelihoods of the poor, largely because of a lack of alternative choices, and can be seen as one among

several kinds of asset which can be drawn-down or built-up as a part of strategies for dealing with shocks and stresses of various kinds. The concept of 'environmental entitlements' is discussed in order to draw attention to the usually indirect nature of the linkages between poverty or wealth and environmental change. Environmental entitlements influence the resource-management decisions that people formulate, with intended or unintended consequences for the natural-resource base that may in turn alter people's environmental entitlements (Mearns, 1996).

Entitlements analysis is significant in helping to explain how the consequences of environmental change in general, and access to and control over natural resources in particular, are also socially differentiated (Leach and Maearns, 1991; Mearns, 1995). The term entitlement does not refer to people's rights in a normative sense - what people should have - but the range of possibilities that people can have (Sen, 1984). In Sen's words, entitlement represents "the set of alternative commodity bundles that a person can command in a society using the totality of rights and opportunities that he or she faces" (Sen, 1984).

According to Gore (1993), there are many ways of gaining access to and control over resources beyond the market, such as kin networks, and many ways of legitimating such access and control outside the formal legal system, such as through customary law, and social conventions and norms. Hence, it seems appropriate to broaden the entitlement framework to the whole range of socially sanctioned, as well as formal-legal, institutional mechanisms for resource access and control (Gore, 1993).

Leach et al., (1999) state that an endowment is the rights and resources that social actors have; for example land, labor and skills. Gasper (cited in Leach et al., 1999) pointed out that entitlement is legitimate, effective command over alternative commodity bundles. More specifically, environment entitlements mean alternative sets of utilities derived from environmental goods and services over which social actors have legitimate effective command. The alternative set of utilities that compromise environmental entitlements may include any or all of the following: direct uses in the form of commodities, such as food, water or fuel; the market value of such resources, or the rights to them; and the utilities derived from environmental

services, such as pollution sinks or properties within the hydrological cycle (Leach, et al., 1999).

There is a core area at the center of Inle Lake and this core area is bordered by red posts. The area is intentionally protected in order to maintain the stability of the lake's ecosystem. This core area is used for transportation route and as a fishing area, and people are not allowed to extend their floating gardens into this area. In the floating garden area, people do not have a legal right to float their gardens, but they have local, customary rights. The question as to why they do not have legal rights is that, as described above, the lake is also a wildlife sanctuary, so they sell, buy or inherit these areas according to their local, customary rights.

In order to fish, local people must have a fishing ticket, as sold to them by the winner of an auction. When they go fishing, they need to bring this ticket with them, as proof they have the right to fish, otherwise, they may be fined. In this context, for the Intha people lake's ecosystem can be seen as an endowment they have, but their entitlement to it may change according to their utility rights. Entitlement may be the fishing area for the fishers, the floating gardens area for gardeners, transportation routes for the motor boat drivers and tourist destinations for those who are engaged in the tourist industry.

In Ghana's forest zones, *Marantaceae* leaves are endowments that people fight for their rights over and in different ways depending on whether they lie inside or outside government-reserved forests. Off-reserve, an actor's endowment to leaves is based upon village membership. On farmland; however, collection rights are acquired through membership of, or negotiation with, the appropriate land-holding family or farm household. In the reserved forest, endowments depends on the Forest Department's permit system, with women often using established trading relationships as a source of finance for permits. Without such a permit, leaf-gathering is unlawful from the state's perspective, although it may be sanctioned by customary tenure arrangements grounded in different definitions of reserved land, such as ancestral farmland. The set of entitlements resulting from *Marantaceae* leaves may include direct use of the leaves or cash income from their sale. In practice, most women involved in gathering leaves prefer to sell them as an important source of seasonal

income. For entitlements mapping, both labor and marketing issues are important (Leach, et al., 1999).

According to Leach et al., entitlements can enhance people's capabilities, which are what people can do or be with their entitlements. For instance, control over fuel resources derived from rights over trees gives warmth or the ability to cook, and so contributes to well-being. To makes a priori an endowment or an entitlement, an environmental good or service cannot be inherited. The distinction between endowments and entitlements is up to empirical context and/or time, within a cyclical process. Entitlement at one time may be endowments at another time, and from which a new set of entitlements may be derived (ibid.).

In some cases, resource claims depend on existing power relations of some actors and their claims are likely to prevail over those of others. In South Africa, communities surrounding Mkambati which is one area of reserve are not legally allowed to hunt game in the government-owned reserve; however, groups of young men who have a good network with local civic organizations and their local chief, depending on his current political stance *vis-a-vis* the local authorities, regularly hunt within the reserve. They excuse their actions by calling on customary rights, locally called *ukujola*, which are based on historical claims predating the gazetting of the protected area, and which amount to legitimized poaching (ibid.).

Certain social actors may not be able to mobilize some endowments such as capital or labor, that are crucial to make effective use of others such as land, due to power relations in their kinship-based institutions. In some cases, these institutions control command over labor and are strongly disadvantaged in their ability to control their own labor and to call on that of others (ibid.)

An indistinguishable "environment" is one that has been substituted for by one that is disaggregated into particular environmental goods and services. Human action shaped ecological dynamics, and the distribution, quality and quantity of environments, are influenced by ecological dynamics. The relationship between a given "community" and the changing ecological landscape can be examined in terms of the ways different social actors gain capabilities, or a sense of well-being, by acquiring legitimate, effective command over resources through processes of endowment and entitlement mapping. Endowments for particular social actors are

different from environmental goods and services (which are given "in nature"). By contrast, capabilities are attributes of particular social actors, and so are included within rather than lying outside the differentiated social actors (ibid.).

1.5.4 Strategies of Livelihood Diversification

The term 'livelihood' entails an ensemble of activities, capabilities and resources needed to organize and maintain a living. In its simplest sense, a livelihood is a means of gaining a living (Chambers and Conway, 1991). A livelihood, according to Chambers and Conway (1991), comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. Livelihood best expresses the idea that individuals and groups strive to make a living, attempt to meet their various consumption and economic necessities, cope with uncertainties, respond to new opportunities, and choose between different potions (Ouden, cited in Legesse 2006:43). The term livelihood gained much analytical relevance in the late 1990s when the idea of *sustainable livelihoods* was popularized as a relatively coherent and integrated conceptual approach to reflect the environmental concern of development efforts of international organizations. Sustainable livelihoods lay emphasis on the livelihood systems of marginal groups, particularly the poor, and the way in which they adapt to maintain their livelihoods under conditions of severe environmental, socio-economic and political stress.

Chamber and Conway (1991) propose three concepts concerned with livelihoods, these being capability, equity and sustainability. The word "capability" has been used by Amartya Sen (1984), and means being able to perform certain basic functionings; to be capable of doing and being. For Sen, there is a subset of livelihood capabilities that include being able to cope with stresses and chocks, and being able to find and make us of livelihood opportunities. Equity means to end discrimination against all who are weak, while sustainability, in the context of livelihoods, means the ability to maintain and improve livelihoods while maintaining or enhancing the local and global assets and capabilities on which livelihoods depend. In this way, these three concepts: capability, equity and sustainability, are linked. Each is also both an end and a means, seen as good in itself and also seen in the extent that it can support the others (Chamber and Conway, 1991).

A livelihood is; therefore, seen as sustainable "when it can cope with and recover from shocks and stresses and maintain and enhance its capabilities and assets both now and in the future, whilst not undermining the natural resource base" (Carney, D. 1998:2). In this sense, Titi and Singh (1994:31) are of the view that a sustainable livelihood entails "People's capacity to generate and maintain their means of living, enhances their well-being and that of future generations." These capacities are contingent upon the availability and accessibility of options which are ecological, economical and political and which are predicated on equity, ownership of resources and participatory decision making.

Therefore, the idea of livelihood is concerned with both the influence of the environment on human life, and also human influences on the environment. A livelihood is environmentally sustainable when it maintains or enhances the local and global assets on which it depends (Chambers and Conway, 1991). This approach focuses on the nature and quality of the relationship between human communities and the ecosystem; how the environment provides the resource base for human existence and how the nature of the exploitation of these resources by human communities enhances or undermines the natural resilience of the environment. It captures the intricate web of interactions between human communities and their environment in which people's quest for generating and maintaining a living creates both environmental and survival problems. Moreover, environmental degradation often helps protect the resources of the poor (Chambers and Conway, 1991).

Here, livelihood security should be taken account when approaching the issue of livelihoods. Frankenberger (1996) states that "Household livelihood security is defined as adequate and sustainable access to income and resources to meet basic needs (including adequate access to food, potable water, health facilities, educational opportunities, housing, time for community participation and social integration)." The risk of livelihood failure directly affects the level of vulnerability of a household to income, food, health and nutritional insecurity. So, it can be assumed that livelihoods will be secure when households have secure ownership of, or access to, resources and income earning activities, including reserves and assets, to offset risks, ease shocks and meet contingencies (Chambers, 1989, cited in Frankenberger, 1996).

According to Bebbington (1999:2000), livelihood can be seen as a dynamic and holistic concept. Assets are not merely resources that people use to support livelihoods, but assets that give them the capability to be and to act. Assets should not be considered, not only as things that allow survival, adaptation and poverty alleviation, they are also the basis of agents' power to act and to reproduce, challenge or change the rules that affect the control, use and transformation of resources. The improved understanding of the holistic meaning of the livelihood concept reveals itself both in its view on livelihood outcomes and in its attention to a variety of capitals upon which the poor draw to shape their livelihoods. In the multiple dimensions of poverty, one thing should be accounted for, that is, how poverty is perceived by the poor themselves. Among conventional assets such as land, livestock or equipment, these include various elements of human capital and social capital (Bebbington, 1999:2000).

Assets are considered to be the stocks of different types of capital that can be used directly or indirectly to generate livelihoods (Carney, 1998). According to the livelihoods framework, five asset types exist. The first of these is "natural capital", which consists of land, water and biological resources such as trees, pasture land and biodiversity. The productivity of these resources may be degraded or improved by human management. The second asset is "financial capital", and this includes stocks of money or other savings in a 'liquid' form. In this sense, it does not include all financial assets; only easily disposable assets such as livestock, which in other senses may be considered as natural capital. It also consists of income levels and variability over time, and the distribution within society of financial savings, access to credit and debt levels. The third type is "physical capital", which is created by economic production and includes infrastructure such as roads, irrigation, electricity, reticulated equipment and housing.

"Human capital" represents the quantity and quality of labor available, and at the household level is determined by household size, but also by the level of education, skills and health of household members. "Social capital" refers to any assets such as rights or claims that are derived from membership of a group, and includes the ability of members of the to call on friends or kin for help in times of need, to seek support from trade or professional associations (e.g. fishermen's

associations) and/or from chiefs or politicians in terms of providing assistance (Carney, 1998). According to Dee Haan (2000), capitals do not necessarily have to be held in private property, because land, forests and lakes can be communally owned. The important matter is having access to the resources for use in need and in practice (Dee Haan, 2000).

To maintain livelihoods by providing flexibility among sources of income, diversification may be important in case primary activities fail (Berry, 1989). Livelihood diversification means attempts by individuals and households to find new ways to raise incomes and reduce environmental risk, which differ sharply ased on the degree of freedom of choice (to diversify or not), and the reversibility of the outcome (Hussein and Nelson, 1998:3).

In Tanzania, when the environmental deterioration of Lake Nyasa caused a decline in the fish catch and an inability to buy good fish, local people changed their livelihood strategies; diversifying their livelihoods for survival. The elders switched to eating inferior fish, which in former times they would not have considered. Both fishing styles and gear especially fishing nets were changed, while some also became involved in the trading of ornamental fish. Rice cultivation and dry-season gardening activities increased, though the farm size per household remained small. Keeping pigs became common among most households as a livelihood diversification strategy, while those local breweries who operated free of charge before the lean period, also became monetarized – with women becoming involved in this business (Nindi, Stephen J., 2007). In general there is common agreement that a fundamental motivation for diversification out of primary production activities is the environmental uncertainty associated with climatic variability (in particular, low and unreliable rainfall and drought) (Hussein and Nelson, 1998).

So, both push factors, such as environmental risk and falling income, and pull factors, such as changing terms of trade and perceptions of improved opportunities, may be involved in spurring on the process of livelihood diversification (Hussein and Nelson, 1998). The poor, in particular, normally have to diversify their livelihoods in order to survive in a risk-prone and uncertain world (Chamber, 1997), carrying out both on- and off-farm activities to generate an income additional to that created by normal household agricultural activities. According to Ellis (1997), the definition of

livelihood diversification is the process by which rural families construct a diverse portfolio of activities and social support capabilities in their struggle for survival and in order to improve their standards of living.

The point made by Ellis (1998:5) is that livelihood diversification is not necessarily synonymous with income diversification. However, many scholars but not all who study diversification tend to focus on different income sources and their relationship to income levels, income distribution, assets, farm output and other variables. The literature describes a range of different motives and pressures that contribute to explaining why diversification occurs and the patterns of diversity that may be observed. Some of the key determinants of diversification are seasonality, differentiated labor markets, risk strategies, coping behaviors, credit market imperfections, and inter-temporal savings and investment strategies. For the issue of seasonality, many of the patterns of diversity in rural household incomes, especially those involving on-farm and off-farm agricultural wage earnings, can be considered. Risk is often recognized as the primary motive for income diversification. In the real context, individuals and households are influenced by a multiplicity of factors that determine the livelihood changes they undergo (Ellis, 1998). The most commonly used descriptively is the household, usually a human group which shares the same hearth for cooking (Chambers and Conway, 1991).

For many researchers, the boundaries separating livelihood diversification, migration and agricultural intensification strategies are by no means clear. Moreover, many livelihood diversification strategies are frequently gender specific. In some contexts, men are able to avail themselves of diversification opportunities that are not open to women due to cultural constraints (Hussein and Nelson, 1998:8).

Diversification is a heterogeneous social and economic process, obeying a myriad of pressures and possibilities in the rural economy. It is shaped and affected by location, demography, vulnerability, income and education levels and many other factors within the local context. For a better understanding of diversification, social safety nets and poverty reduction policies should also be considered (Ellis, 1998).

1.6 Conceptualization of the Research

In this paper I intend to study three key areas, as shown in my conceptual framework diagram, and I use three concepts as my research tools: common pool resources, environmental entitlements (by borrowing from Leach Theory) and livelihood diversification.

To study the environmental degradation of Inle Lake, the concept of common pool resource will be used, as a lake is a kind of common pool resource. Here, I borrow the definition of the term "common pool resource" from Ostrom (2003), who said that a common-pool resource is a valued or human-made resource or facility that is available to more than one person and subject to degradation as a result if overuse (Ostrom, et al., 2003).

In the study area, many people rely on the lake environment for their livelihoods, so as pressure on the lake has increased, so the environment around it has deteriorated over time. How can the study population overcome what Hardin (1958) calls "the tragedy of the commons"? How can they overcome the problems faced by other common pool resources throughout the world? I also would like to study how my study population, from the Intha group, relies on the lake's environment and also their perception of the lake. Inle Lake plays a central role in their daily lives, and the connection between their lives and the environment has developed over the long-term.

For this, the group's access to natural resource will be explored by placing local people's rights within the context of their everyday inter-relationships with the environment. Their enjoyment of both direct and indirect forms of environmental service, through formal legal rights and informal customary rights, is related to their environmental entitlements. Concerning "environmental entitlement", the idea of Leach (1999) will be borrowed in this context. Environment entitlements mean alternative sets of utilities derived from environmental goods and services over which social actors have legitimate and effective command. The alternative set of utilities that compromise environmental entitlements may include any or all of the following: direct uses in the form of commodities, such as food, water or fuel; the market value of such resources, or of the rights to them; and the utilities derived from environmental services such as pollution sinks or properties of the hydrological cycle

(Leach, et al., 1999). Government institutions and local people negotiate for access to their environment.

A livelihood, according to Chambers and Conway (1991), comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. When an environment became unstable, then among five coping strategies people usually choose livelihood diversification in order to adapt to their changing situation, and according to their socio-economic background, especially their livelihood capital, they diversify their livelihood strategies. Analyzing their livelihoods and the type of livelihood resources available to them will help determines the level of sustainability of the local people's livelihoods and their long term well-being.

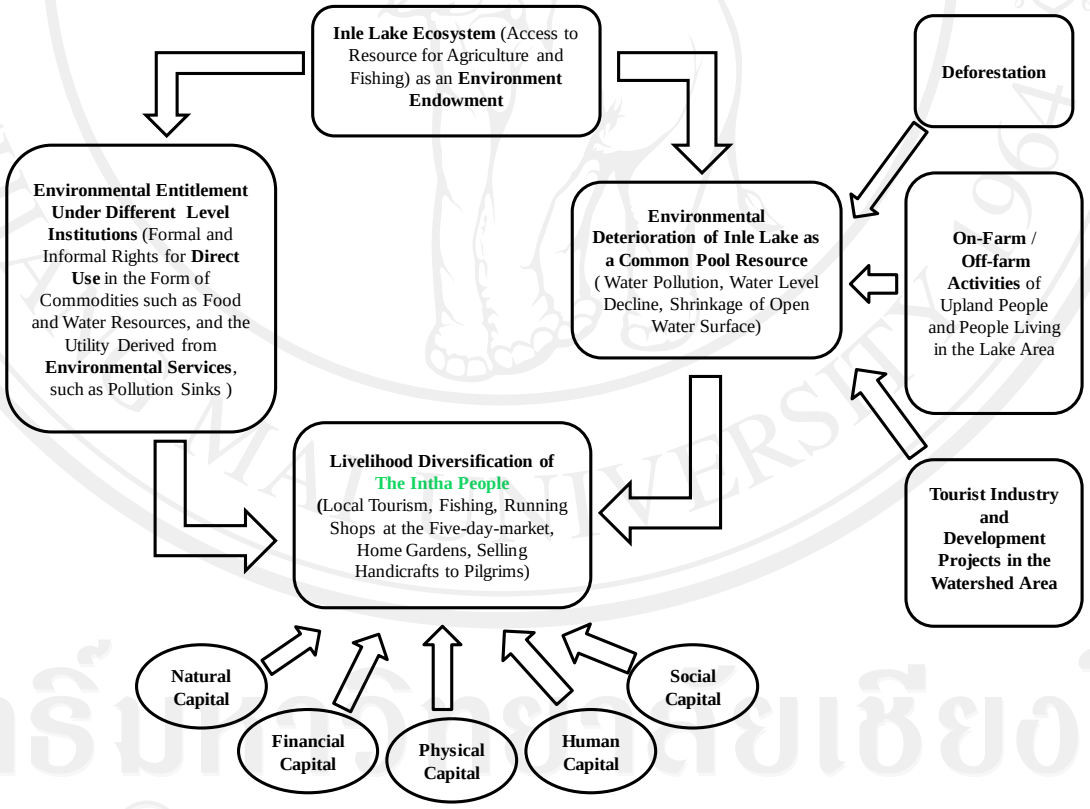

Figure 1.4 Conceptual Framework of the Environmental Entitlements and Livelihoods of the Intha People around Inle Lake in Myanmar

1.7 Research Methodology

1.7.1 Research Site

My research was conducted across a number of villages around Inle Lake, in order to capture information on the level of environmental degradation taking place there; however, the main village studied was Lwe Nyeint village. I chose this village to conduct my research because it is in one of the areas most severely affected by environmental degradation around Inle Lake. The village is located along the north-western shore of the lake and is comprised of 127 households, and with a population of around 500, all of whom are from the Intha group. Before 2010, their main livelihood activities involved floating gardening, while in their free time they practiced fishing - for food and to earn extra income. Very few people had motor boats or were involved with tourism at this time. Since the summer of 2010; however, their livelihoods have had to change due to environmental degradation. Their main livelihood activity, floating gardening, could not continue due to unfavorable environmental conditions, so now their main livelihood activities depend on their social networks, their kinship tied and their capital holdings. Those who have enough money have bought motor boats and are now engaged with the local tourism industry, taking care of local pilgrims who come from other area of Myanmar. To participate in the local tourism industry, nearly half of the households from the village have bought motor boats and motorbikes, and around fifteen of the households now own mobile phones. Other livelihood activities include small-scale fishing, trading and running home gardens, as well carrying out seasonal gardening according to the capital needed to generate a livelihood.

1.7.2 Unit of Analysis

My unit of analysis will be focused on the analysis of data collected from individuals, households and village level community representatives in the lake area. To study livelihood diversification activities, my unit of analysis will be the household, as it is the key single decision-making unit in the area, attempting to maximize its welfare through the capital available.

1.7.3 Research Methods

In order to collect my data from the field, I first went to the headquarters of the Dry Zone Greening Department (DZGD) within the Ministry of Environmental Conservation and Forestry, to report my arrival as I am a government employee. The Dry Zone Greening Department is my own department and I had to report my field data collection schedule, as is the normal procedure in the country. In the report, I needed to describe the research site where I would collect the data, the data collection period and the activities I would carry out. While at the DZGD, I asked for a recommendation letter from the Director, to facilitate my field data collection activities and ensure the support of the local officials, other government staff, plus NGOs. If I did not have a recommendation letter, the organizations I wished to speak to would not have been willing to share their data with me, although I have a student identity card, a government employee card and a national identity card.

After that I went to Taunggyi, the capital city of Shan State, to see the Director of the Forest Department and get permission to undertake my field data collection activities. I then went to Inle Lake, where I stayed in the forest camp throughout the whole period. During my last visit, after my preliminary data collection had been completed, I reported to the Director of the Forest Department personally, after which he attempted to have micro-credit facilities extended to my research village from the Government Cooperative Department. In my research village, there is a community forest and the Director tried to get micro-credit for this village is an incentive for them to carry out forest conservation. As a result of his efforts, the research village received 800,000 Kyats (the currency in Myanmar) from the Cooperative Department, after which the village committee thanked my director, plus thanked me, for without my efforts they would not have received his help. These efforts helped my data gathering in the village, though I still encountered some minor difficulties.

At first, most of the people did not want to answer my questions as they knew I am a government employee. As a result, I had to explain about my research and repeatedly asked them to recognize me as a student, not as a government representative. At the same time, I tried to become familiar with them in a tea shop,

having long conversations with them and developing a level of reciprocity. One of the minor challenges I faced was the language. Although they speak Burmese, the dialect and intonations they use are very different to most Burmans, so it was not easy to understand them as someone from another part of Myanmar. During my first visit to Inle Lake, I could not understand what they were saying to each other, and it took me about two weeks to understand them well. Even the local people from different villages have different intonations and so have problems understanding each other.

I conducted my field research in two key ways:

Secondary data collection: My first research question was concerned about ecosystem transformation around Inle Lake, so first I had to uncover documentation and literature related to this. First, I searched the Myanmar Encyclopedia, plus other literature about local history, oral histories and the legends of the Intha. I also found other researches about Inle Lake using the Internet, as well as library resources. I also gathered secondary data from government organizations such as the Forest Department, including its irrigation and wildlife divisions, the General Administration Department and the Fisheries Department. I also collected data from non-governmental organizations (NGOs), plus scoured newspapers, both national and international, as well as journals. I even gathered data from documentary films such as from the Inle Lake Phaung Daw Oo Pagoda Festival and 'Floating Tomatoes', a film that gives information about the floating gardeners around Inle Lake.

Field Data Collection: Based on my research questions, I conducted my field data collection activities using qualitative research methods. When I was preparing to write my thesis proposal, one of my friends, who is studying science at an international university, asked me why I wished to use qualitative methods, saying it would be better if my research findings could show statistical significance. According to Berg (2007), qualitative research refers to the meanings, concepts, definitions, characteristics, metaphors, symbols, and descriptions of things, while quantitative research refers to counts and measures. The essence of qualitative research is to seek answers to questions by examining various social settings and the individuals who inhabit these settings (Berg, 2007). Boeije (2008) states that the purpose of qualitative

research is to describe and understand social phenomena in terms of the meanings people bring to them. There are three key elements to this kind of research; looking for meanings, using flexible research methods to enable contact and providing qualitative findings.

The fundamental nature of qualitative research consists of two conditions; the use of close-up, detailed observation of the natural world by the investigator and an attempt to avoid prior commitments to any theoretical model (Van Maanen, Dabbs and Faulkner, 1982, cited in Yin, 1989). Qualitative procedures provide a means of accessing unquantifiable facts about the actual people researchers observe and talk to, or their personal traces (such as letters, photographs, newspaper accounts, diaries and so on). Thus, qualitative techniques allow researchers to share in the understanding and perceptions of others and to explore how people structure and give meaning to their daily lives (Berg, 2007). However, there is still a common objection to this method; that the findings cannot be tested, but have to be taken on trust (Arksey and Knigh, 1999).

Interviewing**:** Interviews can help explore areas of broad cultural consensus and people's more personal, private and special understandings. The purpose of interviewing is to find out what is in and on a person's mind, to access the perspective of the person being interviewed and to find out from them things that we cannot directly observe (Patton, 1990: 278, cited in Arksey and Knigh, 1999). Qualitative interviewing is a way of uncovering and exploring the meaning that underpins people's lives, routines, behaviors and feelings (Rubin and Rubin, 1995, cited in Arksey and Knigh, 1999), and focuses on the informants' understandings rather than checking the accuracy of the interviewers. Qualitative interviews allow for understandings and meanings to be explored in depth; moreover, they can help examine the context of thoughts, feelings and actions, and can explore the relationships between different aspects of a situation. Oral history interviews allow the reconstruction of aspects of the recent past that are omitted from documentary historical sources (Arksey and Knigh, 1999).

I carried out my informal interviews on various levels, such as with individuals, groups of households as well as local pilgrims and tourists. For the key informant interviews, I asked elders how they had dealt with experiences when they

were young. In this way, I was able to extract more detailed information about the lake's environment over time. I also approached local people of different ages, education and economic statuses, and also environmentalists, to get their ideas on the lake's environment, carrying out in-depth interview in order to understand how environmental degradation has impacted the lake. I held such interviews with village heads, abbots of the village monastery, older people, government staff and NGO staff.
Observation: Participant and non-participant observation was conducted in the field in order to understand how the villagers create the floating islands for their hydroponics farms, and also their ways of life - in order to understand how they develop their environmental entitlements. I also asked them about their daily use of the Inle Lake ecosystem, learning how Inle Lake is used as a pollution sink. I joined in the villagers' activities, to observe their everyday practices as well find out more about their perceptions of the local environment.

Household Survey: I conducted a questionnaire–based survey with some households in the village, to explore their socio-economic situation, their education levels, their incomes, the divisions of labor used and their culture.

Case Study: Yin (1990) describes a case study as a preferred strategy when "how" or "why" questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context. As a research endeavor, the case study contributes uniquely to our knowledge of individual, organizational, social and political phenomena (Yin, 1990). According to Gall, Borg and Gall (1995, cited in Berg, 2007), the case study method tends to focus on holistic description and explanation, and on general statements.

I applied the case study method to obtain the histories of the respondents, to explore their ideas and their experiences about environmental degradation, their knowledge, current livelihood activities and their income situation. In this way, it was able to assess whether the Intha people have been able to cope or not with the changing lake ecosystem, changes that threaten their livelihoods.

1.7.4 Data Analysis

Data analysis was carried out using the data collected in accordance with my conceptual framework. I recorded interviews, took notes and wrote a diary in order to better support my data analysis, and after collecting the data, transcribed the answers of local people, classified the data and started writing my thesis.

1.8 Thesis Organization

This thesis is organized into six chapters, each of which consists of environmental and livelihood linkages aspects. The first chapter provides a general background to the research context, together with the research problems, research questions, research objectives and research methodology used, plus a literature review regarding the concepts used. Within the literature review and theoretical debates, the first part looks at the lake as a common pool resource, and here I reveal the nature of common pool resource. The second part describes Hardin's "tragedy of the commons" theory and how people can overcome this trap. In the third part of this chapter, I discuss environmental entitlements in order to help answer one key question, plus examine the current situation at the study site in terms of the diversification of livelihoods there, as this is a major concern of this paper.

Chapter II investigates how the environment has deteriorated recently using a variety of secondary and primary data; asking people to give their opinions on their current environment.

Chapter III explores how people access their environmental services and resources, and how environmental degradation has affected their environmental entitlements, those crucial for their livelihoods.

Chapter IV investigates how social structures in the area are constructed, plus how the Intha use their household strategies within the local setting. I also discuss the key challenges they face when developing their livelihood strategies.

Chapter V is the main part of the thesis, in which I explore different case studies to understand the livelihood diversification strategies used to adapt to the

changing environment. Moreover, I describe and analyze the kinds of livelihood assets used to shape their survival strategies.

Chapter VI contains the conclusion of the thesis and encompasses the main findings of the study, a theoretical debate of the findings, the policy implications of these, plus describes the constraints I faced and gives my recommendations for further study.