YANGON UNIVERSITY OF ECONOMICS
MASTER OF PUBLIC ADMINISTRATION PROGRAMME

A STUDY ON THE PERCEPTION OF LOCAL RESIDENTS FOR ENVIRONMENTAL CONSERVATION OF INLE LAKE

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MPA - 24 (18th BATCH)

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A thesis submitted as a partial fulfillment towards the requirement for the degree of Master of Public Administration (MPA)

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ABSTRACT

The purpose of this thesis is to examine the perceptions of local residents through finding out some implementing activities and performance for the environmental conservation of Inle Lake which is located at Nyaung Shwe Township. This research use descriptive method. This study was initiated with qualitative approach for 204 respondents from the selected 9 villages by structured questionnaire reinforced by qualitative approach to the Key Informant Interview with authorized persons from different professionals. It is found that most of the local residents with medium level of basic services availability (accessing 3 to 4 services) whereas over half of respondents have possessed talented knowledge of environment. The respondents have positive perception to conserve from the deteriorated environment of Inle region but they are not supported to follow up positive behaviors on environment. To support the human behaviors beneficially to the environment, there is needed to understand the environmental conservation awareness but recently found that it was more influenced by basic services availability. In addition, the significant number of key informants stated that the main factor for environmental degradation problems is to reduce poverty. Regarding the result by interviewing to the key informants, there is the need for higher educating facilities for every rural area with the addition of employing opportunities to reduce poverty. It is evident that basic services and education are positively correlated to each other. Therefore, these two factors, basic services and education are major and crucial requirements to be fulfilled for supporting positive perception on the implementation of the environmental conservation of Inle Lake.

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LIST OF ABBREVIATIONS

AAC	Annual Allowable Cut
AHPs	ASEAN Heritage Parks
BANCA	Biodiversity and Nature Conservation Association
BSS	Burma Selection System
CF	Community Forest
CO_2	Carbon Dioxide
CSOs	Civil Society Organizations
DDA	Department of Development Affairs
DDT	Dichlorodiphenyltrichloroethane known as a colorless, tasteless and odorless crystalline chemical compound
DSWF	David Shepherd Wildlife Foundation
DWIRS	Department of Water Resources and Improvement of River Systems
ECC	Environmental Conservation Committee
ENGOs	Environmental Non-Governmental Organizations
FD	Forest Department
FAO	Food and Agriculture Organizations
FMU	Forest Management Unit
FREDA	Forest Resources, Environment, Development and Conservation Association
GFF	Global Environmental Facility
GHGs	Green House Gases
GIC	Golden Island Cottages Travel and Tour
IAS	Irrigation and Agriculture Sector
IBAs	Important Bird Areas
INGOs	International Non-government Organizations
KFS	Korea Forest Service
km	Kilometer
km^2	Square Kilometer
K_2O	Potash or Potassium Oxide

MAS	Myanmar Agriculture Service
MOU	Memorandum of Understanding
MSS	Myanmar Selection System
MBNS	Myanmar Bird and Nature Society
MCDC	Mandalay City Development Committees
MDGs	Millennium Development Goals
MFCC	Myanmar Forest Certification Committee
MTCC	Myanmar Timber Certification Committee
MOAI	Ministry of Agriculture and Irrigation
MOBA	Ministry of Border Affairs
MOFA	Ministry of Foreign Affair
MOLF	Ministry of Livestock and Fisheries
MOECAF	Ministry of Environmental Conservation and Forestry
MONREC	Ministry of Natural Resources and Environmental Conservation
NBSAP	National Biodiversity Strategy and Action Plan
NCEA	National Commission for Environmental Affairs
NCNPP	Nature Conservation National Park Project
NECC	National Economic Coordination Committee
NGOs	Non-Governmental Organizations
NWCD	Nature and Wildlife Conservation Division
PAs	Protected Areas
P_2O_5	Phosphoric Acid, Phosphorus Pent oxide
REDD	Reducing Emission from Deforestation and Forest Degradation
UN	United Nations
U.S	United States
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nation Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UN-REDD	United Nations Reducing Emission from Deforestation and Forest Degradation
WCS	Wildlife Conservation Society
WHO	World Health Organization
YCDC	Yangon City Development Committees

CHAPTER I
INTRODUCTION

1.1 Rationale of the Study

Myanmar's Inle Lake is often described as the most magical place in the country. Inle Lake, the second largest lake of Myanmar, is situated in Shan State in northeastern side of the country. The entire lake area is belonging to Nyaung Shwe Township. In geographical parameter, it is situated at the elevation of 2,915 feet above sea level. The mountains surrounding the lake have an elevation of over 3,500 feet which are very steep with deprived of vegetation covers thus enhancing the soil erosion and sedimentation in the lake. Inle Lake is famous due to its beautiful limn logical features, high biodiversity and distinct livelihood styles of local ethnic people. The native people, Inn-thar, have been living in and surrounding the Lake for several years symbiotically with their natural aquatic resources. The Lake is sustaining a lot of aquatic and terrestrial organism by its very wide watershed. The lake provides livelihood to the local people in terms of cultivating the variety of crops in floating islands, fisheries, gold and silver smith, cotton weaving, black smith, trade and transportation and source of electricity as well.

In addition, Inle region is combined with beautiful nature and pleasant weather. Nowadays, Inle Lake is suffering from the environmental degradation problems. Water surface area is remarkably decreased while the depth of water level is significantly reduced. Adding sedimentation problem caused by erosion, deforestation and increased reproduction of water hyacinths. And addition, most of the floating garden businesses are turning into farming and the main business of the Inle Lake's region is floating garden agriculture. Direct environmental impacts associated with these combined agricultural activities within the wetlands and surrounding hills of the lake include sedimentation, eutrophication, and pollution. Dumping of chemical fertilizer and pesticides, all forms of wastes into the Lake water has caused hazardous pollution impacting on the health and livelihood of local communities. Moreover, the local people are using imported hybrid varieties more and more which is high chemical demanding. Local people are meaningful

stakeholders as they depend in the Inle Lake in Myanmar for their primary livelihood. Nowadays, Inle Lake is facing the devastating effects of unsustainable natural resource use practices. It is getting worse with the adverse impact of climate change. The lack of scientific knowledge on agrochemical use is also threating the health of users and the water pollution. The lake is a vital part of a broader ecosystem and economy of the Shan State, providing many goods and services to its surrounding communities. Realizing the current conditions of Inle Lake, it is in urgent situation to carry out the conservation and rehabilitation activities of the Inle Lake and its surrounding. The sustainability of the Lake is solely depending on the awareness and behaviors but there has not been found any program to promote the local people's awareness and empowerment for their community based natural resource management interventions.

Therefore, the environmental management and conservation of the lake has been critical and the sustainability of the Lake is solely depending on the awareness and behaviors of the local people. Local people are unlikely to support for environmental conservation of Inle Lake if they have negative perceptions and attitudes towards them. The people need to be involved in every aspects of conservation from the planning right down to aspect of implementation. It is important to understand local people's perceptions and attitudes toward the conservation plan for its sustainability. Thus, local support is extensively important to ensure the conservation of highly pollution of wetland and reduce human impacts.

1.2 Objectives of the Study

The objectives of the study are to find out environmental performance of Inle Lake Conservation Activities and to examine the perception of local residents for environmental conservation of Inle Lake.

1.3 Method of Study

This thesis is descriptive method on studying secondary data collected from the MONREC, UNDP, published books, researched books and papers and departmental websites through Internet. A survey is conducted in order to collect primary data. A data collection is based by a set of questionnaire to a group of local residents of Inle Lake. Key informal interview with some administrators related with the program.

1.4 Scope and Limitations of the Study

This study focuses on the perception of local residents for the environmental conservation of Inle Lake while examining their environmental knowledge and behaviors. The key informant interview is conducted for 13 key authorized persons to find out their activities and performances as well as knowledge and perception for the environmental conservation of Inle Lake. This study was carried out for 204 households from 9 villages in Nyaung Shwe Township. These villages are covered for mountain area, foot of mountain, on the shore of the lake and in the middle of the lake. To understand highly attitude for their perception, the age of under 18 was entitled for this survey setting. The survey period was started from 1st June to 10th June 2019.

1.5 Organization of the Study

This thesis is described five chapters. Chapter I deals with introduction including rationale, objectives, methods, scope and limitations and organization of the study. Chapter II highlights literature review related to environmental conservation, economic development and environment. Chapter III presents about the description of the study area and environmental conservation of Myanmar. Surveyed findings from the villages and Key Informal Interview results are described in detail at the fourth chapter. Chapter V contains conclusions and recommendation to improve the implementation of programs and activities related to environmental conservation of Inle Lake.

CHAPTER II
LITERATURE REVIEWS

The aim of the chapter is to summarize the findings from the literature regarding the environmental conservation and rehabilitation activities and some of key features related for causing environmental degradation in developing countries. It then described the concept of the environmental aspects to alleviate poverty and lasting natural environment is essential for the sustainable region development which is required to meet the needs of social, environmental and economic conditions.

2.1 Brief History of Environmental Conservation

The environmental movement is a truly fascinating one with a long and complicated history. While it's absolutely not a requirement to be an environmentalist, knowing a little bit of the history is not only beneficial but also interesting. Being over two centuries long, the movement's history is full of many great ups and downs. Here is a brief history on the environmental movement.

Beginning in Europe in the very early 1800s, environmentalism came into existence through an ideology; Romanticism. Unlike what the name suggests, Romanticism was not an artistic and intellectual movement based on love but on emotion! Romanticism placed a lot of emphasis on nature, wanting people to appreciate the woods for their beauty, which challenged the solely scientific view many had of nature at the time. Later in the late 1800s, the environmental movement grew strongly in Britain as a response to the Industrial Revolution. With no environmental regulations to stop them, the factories of the Industrial Revolution polluted air and water and expanded out into beautiful farmland. Quickly, there was a backlash to the factories with people calling for wild spaces to be protected. Early conservation groups, like 'the Society for the Protection of Birds (1889)' and 'the National Trust for Places of Historic Interest or Natural Beauty (1894),' began popping up all over England.

The environmental movement began to take shape in North America when John Muir, one of the earliest environmentalists, convinced the U.S. congress to create the Yosemite National Park to preserve the beautiful valley. Many other conservation efforts began to take place across the continent with people trying to protect the dwindling American bison population. And in 1916, President Woodrow

Wilson founded the National Park Service, which deeply supported the growing environmental movement. In the early 20thcentury, environmental laws and government agencies began to pop up all over the world but especially in Nazi Germany! Several of the high ranking Nazis were environmentalists and wanted to protect the German forests. The environmental movement only continued to grow in the 1950s, 60s, and 70s with many influential books being published, such as 'A Sand County Almanac (1949)' and 'Silent Spring (1962).' Silent Spring, written by American biologist Rachel Carson, is especially influential as it exposed the harmful and dangerous effects of the pesticide DDT. The book was so important for the environmental movement that it leads to the creation of the Environmental Protection Agency in 1970 and DDT was banned in 1972. The 1970s were greatly important for the green movement with many groups, like Greenpeace, forming in the 1970s. The first Earth Day and the UN's first environmental conference also happened in the 70s. Into the 1980s, a growing awareness on global warming brought the environmental movement even more into the mainstream. Unfortunately, the environmental movement's strength has declined somewhat since the late 2000s after it hit a high with the anger following the great recession.

The history of environmentalism and its movement is one full of interesting twists and turns. There is perhaps no other movement in history where the Nazis actually did something good. With such a long history, it's important that we keep the environmental movement alive and well in the modern era.

Human misuse of natural resource was already recognized since the early century; Plato (427-347 BC), Greece Philosopher, described that heavy rains washed the soil into the sea after the trees were cut to build houses and ships. Some of the earliest scientific studies of environmental damage were carried out in the eighteenth century by French and British colonial administrators. These early conservation understood the connection between deforestation, soil erosion, and the local climate change.

2.2 Economic Development and the Environment

Environmental problems in developing countries have become increasingly critical in the last few decades. While the appearance of global issues has helped people to see that all countries are inextricably linked in the global environment more attention also has been directed at traditional air and water pollution problems of

developing countries. Developing countries, however, were thought to have fewer environmental problems because their preindustrial technology was more environmentally benign, and because they had not yet committed themselves to a materialistic style of life, with the negative trade-offs many believe that this implies. The massive environmental degradation has occurred in the developing countries. Rural areas have been large-scale soil erosion and water-quality deterioration, deforestation, and declining soil productivity. Urban areas have experienced seriously diminished air and water-quality. Furthermore, this environmental deterioration in developing countries is not just a matter of aesthetics or quality of life, but rather a more serious issue involving the diminishment of economic productivity and the acceleration of social dislocation. Environmental problems in developing countries are much more likely to be matters of life and death than they are in the developed world.

Natural Resources and Economic Growth

A catalog of natural resource issues with which developing countries are grapping would be extensive and would include the following;

(a) Managing the exploitation of nonrenewable resources such as oil and minerals
(b) Managing commercial forest resources and the conversion of forest land to other uses
(c) Preserving wildlife stocks that have varying local, regional, and international values
(d) Maintaining the optimal stock of agricultural soil productivity
(e) Developing and utilizing water resources in efficient and equitable ways
(f) Maintaining efficient levels of marine resources

But this list looks similar to a list of resource problems facing the developed countries. Most of the underlying concepts discussed as far are as applicable for developing countries as they are the developed world. Notions of efficiency, incentives, the importance of the distribution of net benefits, overexploitation of open-access resources, the importance role that property rights play and the occurrences of market failure and government failure are all ideas that are as important in the developing world as they are in the developed. But in developing economies the institutional landscape can be quite different, leading to an intertwining of political, social and economic elements in very ways. Another point of difference is that in

many developing countries, elements of the natural resource endowment are being relied upon to provide a major impetus for economic growth. Petroleum and mineral deposits, agricultural land forests, hydropower, and wildlife resources are looked on in different countries as sources of growth. So there are important questions regarding the nature of the connection, if there is one between resources and growth and the ways resources should be used if the objective is to stimulate economic growth.

2.3 Environmental Degradation in Developing Countries

Many people in the developed world have been brought to a realization of the existence of environmental problems in the developing world through recent global concerns, such as global warming and the rapid pace of species extinction. A disproportionately high number of the world's endangered species are the residents of developing countries, so efforts to preserve the habitats of these species have brought people to focus on the development-environment linkages in no industrialized countries. Similarly, the developed world's concern about global warming has heightened concern about deforestation because forests act to absorb atmospheric CO_2. In many developing countries the harvesting of fuel wood and timber and the conservation of forested lands to agricultural uses has led to high rates of deforestation has the potential to worsen the global greenhouse effect.

But from the standpoints of the developing countries themselves, their worst environmental problems are probably water and air pollution they suffer, especially in their expanding urban areas. In addition, water pollution is still responsible for vast amounts of diseases and lead to death in the developing countries. Lack of treatment facilities lead to widespread exposure to disease-bearing human wastes. In places such as watershed areas where there has been an expansion of industry, and the use of chemical fertilizers for floating garden agriculture, rivers, lakes or streams have contaminated with toxic chemicals and with heavy metals. Seepage of hazardous materials from industrial sites and waste dumps is increasingly threatening the groundwater sources toward which many countries are turning as surface waters become more heavily contaminated.

2.4 Factors of Environmental Degradation

There are many factors to cause environmental degradation problems. Among them, the factors described in the following are the most happening in developing countries.

2.4.1 Population Growth

Environmental degradation and social problems are often attributable to population pressure arise from growing human settlement, inequalities in the distribution of land, the lack of decent employment opportunities, and absolute poverty of many of the inhabitants. Population growth usually appears as the major cause for environmental degradation in situations where other elements of the local system such as consumption, production, institutions, and social structures are stagnant. Overall, population pressure is determinant in vegetarian loss, especially in the area with limited land reserves and energy sources. The unsafe disposal of waste leads to the degradation of the natural environments, wetland, natural habitats, forests and other fragile ecosystems are affected. Global interest in the relationship between population growths on the one hand, and resource availability and environmental degradation on the other, thrives across academic disciplines and geographic locations. International and domestic environmental organizations have consistently placed population growth high on their list of issues of concern. In Israel, however, the population–environment discourse has taken on unique characteristics, relegating the topic to academic insignificance or accepting.

Overall, the effect of population pressure and resulting environmental degradation has driven the countries into widespread food insecurity, drought and famine for the decades. The main factors that are responsible for environmental degradation in developing countries such as Ethiopia include the removal of vegetation cover through deforestation and overexploitation of forest resources, in appropriate land cultivation, and agricultural land expansion, overgrazing, and other as ultimate causes. Elias, (2002) has stated that inappropriate land use and subsequent agricultural productivity decline while increased human population is putting pressure on the natural resources for the demand of basic expanding crop cultivation and grazing land, and fuel wood demand (Teketay, 2001); it had a negative impact, and in turn exacerbated rapid land degradation.

Land degradation and other environmental deterioration are associated with demographic pressure because of intensification of agriculture. During the former process, growth in population leads to increase to demand for crops, fodder for the livestock and firewood for cooking, timber for construction of buildings. These changes affect the process of soil erosion, sedimentation, and flooding river basins, and loss of habitats.

2.4.2 Poverty

Poverty is considered as a great influence of environmental degradation. The poor are traditionally taken as the agents for causing society's many problems. Jalal (1993) argued that "it is generally accepted that environmental degradation, rapid population growth and stagnant production are closely linked with the fast spread of acute poverty in many countries of Asia". The World Bank joined the consensus when in the 1992 World Development Report, states that "poor families who have to meet short term needs mine the natural capacity by excessive cutting of trees for firewood and failure to replace soil nutriment".

The poor who live in rural areas frequently harvest natural resources for their survival or in order to meet basic needs. Due to the insufficient income, people overuse every resource available for survival or income generation such as selling firewood and charcoal, digging out the root of trees for medical purpose. These activities contribute deforestation but affect other environmental damages, like desertification, soil erosion, loss of biodiversity, local climate change and loss of water resources.

Living in poverty us associated with poor sanitary conditions, unabated sewerage systems, lack of clean water resources and increased exposure to environmental degradation. The UNEP (1995) study estimated 1 billion people with no access to running water while 1.7 billion do not have access to sanitation facilities. The World Health Organization (WHO) highlights four forms of diseases caused by water pollution from human and animal waste. " The number of people using improved drinking water sources reached 6.1 billion in 2010 -, up by over 2 billion since 1990. The number of people who do not use any facility and resort to open defecation has decreased by 271 million since 1990. But there remain 1.1 billion people with no sanitation facilities at all."

One of the major problems which urban poor face is indoor air pollution. Although substitute fuels are available, the poor use firewood due to both price and income effect. Indoor air pollution is emitted from biomass based cooking and heating stoves is known to be a primary contributor to respiratory problems." The poorest urban dwellers likely to suffer the following environmental problems including air pollution and unsanitary conditions, crowding can intensify exposure. Raw sewage runs in the streets, mixing with garbage and contributory with these conditions are enormous. The enormous economic costs resulting from large productivity and expensive medical care represent a drag on economic development."

To some extent, environmental degradation is the result of economic factors such as market failure that the nonexistent or poorly functioning markets for environmental degradation is a particular case of consumption or production externalities related by divergence between private and social costs. Growing economic activities (production and consumption) requires larger quantities of waste by products. Increased extraction of pollutants therefore, overwhelm the carrying capacity of the biosphere and result in the degradation of environmental quality and a decline in human welfare, despite rising incomes.

The early stages of industrialization, countries are generally accompanied by rising incomes and worsening environmental conditions. The typical source of externality is the absence if fully defined property rights. Common pool of resource is also exposed to poor regulation which leads to overexploitation and environmental degradation.

2.4.3 Deforestation

Deforestation is the cutting down of trees to make way for more homes and industries. Rapid growth in population and urban sprawl are two of the major causes of deforestation. Apart from that, use of forest land for agriculture, animal grazing, harvest for fuel wood and logging is some of the other causes of deforestation. Deforestation contributes to global warming as decreased forest size puts carbon back into the environment. Deforestation and overexploitation of vegetation Land clearing in a shifting cultivation is largely driven by population growth, through the growth in requirements of food and other agricultural products. Comparatively, forest clearing for pastures is a minor factor on a global scale (although it is important in certain countries). The other cause of destruction of vegetation cover is its overuse by

households, mainly from fuel wood collection. To cover vital energy needs, some households in developing countries resort to "free" gathered biomass fuels, including crop residues and animal dung but, most of fuel wood. When the annual use of wood exceeds the sustainable yield of wooded areas, forests and woodlands are gradually destroyed. This in turn triggers or accelerates soil erosion. Around 1980, FAO estimated that about 2 billion people (or ¾ of the population of developing countries at that time) depended on biomass for their daily energy consumption (FAO, 1983). But close to 1.4 billion of these could not meet their requirements without compromising future fuel wood supplies, and it was expected that the number would increase to 3 billion (2.4 billion in rural areas) be the year 2000. Overall, population pressure is determinant in vegetation loss, especially in areas with limited land reserves and energy sources. In the high population density areas of West Africa, for instance, concentrations of demand for arable land and fuel wood lie at the root of resource abuse. It is in these areas that patches of desertification are the most visible due to deforestation and mismanagement of natural resources (Gorse and Steeds, 1987).

Deforestation has led to severe cases of soil erosion and flooding, as the hydrological buffering services of local forest forests have been destroyed. As with many problems, deforestation is a more complex phenomenon than many references to it might suggest. Most forest land in developing countries is state property, to which individuals- farmers, foresters, foods gatherers, timber concessioners, recreationists and others have accessed on various terms. Individual access may be legal or illegal, regulated or unregulated, temporary or permanent. How the forest is used depends on the rules of access and their enforcement, and on the incentives facing the various participants in the process. The entire process can be broken into a two-step combination of alternatives:

1. First step: clearing the land
   (a) Harvest
   Commercial
   Subsistence (eg. firewood)
   (b) Destruction of trees (e.g., burning)
2. Second step: Using the land
   (a) Permanent agriculture (commercial or subsistence)
   (b) Shifting agriculture

(c) Forestry (natural or plantation)

(d) Abandonment

After one of the three land clearing options has been carried out, it is followed by one of the five land use options. In its broadest sense, deforestation refers to any set if decision that shifts land one forested into another use. Deforestation so defined that might not include replacing negative forests with forest plantations, through this shit would have substantial impacts on certain forest resources such as wildlife. A narrower definition of deforestation would be a shift away from forests that is driven by preserve incentives of public policies or institution.

2.4.4 Loss of Biodiversity

Biodiversity is important for maintaining balance of the ecosystem in the form of combating pollution, restoring nutrients, protecting water sources and stabilizing climate. Deforestation, global warming, overpopulation and pollution are few of the major causes for loss of biodiversity. Biodiversity problems reflect a conflict of interests between alternatives uses of resources and politicians survive by balancing the conflicting interests of their various constituencies; scientists and conservationists are not the only ones with a say on what is to happen in a particular habitat or to a species. Conservationists face two formidable problems in trying to keep biodiversity on the public agenda. First, no-easily-identified opponent is available against which conservation forces can be rallied, unlike headline-makers such as the hole in the ozone layer, climate change, and no newsworthy disasters have yet involved humans and the loss of biodiversity. Second, the loss of biodiversity has no immediate impact on lifestyles: if we are losing dozens or hundreds of species per day, then we are already living with the consequences of extinction without any discernable effects on our daily lives. One important problem may be the perception of reality by the general public. While many people may be concerned about the loss of species, few see any particular relationships between their own-life style and the loss of biodiversity.

2.4.5 Improper Agricultural Management

Population growth requires the extension of interference into new areas, and the subjection of these areas to the high levels of damage. It requires the occupation of sites of lower resilience and higher sensitivity for which existing management practices may be inadequate (Blaikie and Brookfield, 1987). Degradation then sets in,

unless particular measures are taken to protect soil structure and maintain fertility. But such measures usually are absent; since this kind of practices takes place in situations where low-cost solutions are sought because of resource limitation to invest in land protection. Examples of populations driven upland by the saturation of lowland resources, with ensuing degradation and at times ecological collapse, are numerous: Ethiopia, Haiti, Nepal and the Philippines being perhaps the best known. Population pressures play an obvious role in most of these situations, but it must also be noted that unequal land distribution can worsen those pressures notably.

The chief problem with shifting cultivation today is that increasing populations and the need for higher production to feed them are pressuring many farmers to shorten or even eliminate the fallow. As a consequence, yields are lower and soil damage greater (FAO, 1983). Lele and Stone (1989) have described that due to rapid population growth in Senegal and Tanzania, environmental damage has observed after deforestation and subsequent decline in soil fertility: Pingali and Binswanger (1988) also reported evidence from Africa, that farmer-generated technical change is capable of sustaining slow-growing populations, but not rapid growth in both rural and urban population food demand. This is because high population pressure creates stresses within existing systems. In addition, The main policy distortion here with environmental significance is subsidies for inputs such as irrigation, power, pesticides, and fertilizer. As is well known in theory, subsidies exacerbate the negative environmental externality of using these inputs, e.g., groundwater contamination through fertilizer application and such as the watershed area, the utilization of fertilization for floating garden agriculture arises not only water pollution for residents but also suffer from diarrhea can lead to death.

Requirement of Balance Fertilizer Application

The use of mineral fertilizer is intended to correct the imbalance or deficiencies on plant nutrients. Plants cannot distinguish between essential fertilizer and organic sources. However, it is easier to ensure a balance adequate supply of nutrients by applying the mineral fertilizer. There is widespread problem of unbalanced fertilizer use. In general, too much fertilizer is being applied and too little phosphorous, potassium and micronutrients. It means that large amount of P2O5 and K2O are being removed in the straw and gain at harvest which result in increasing imbalance in the soil nutrient content (Ghimire, 2002).

Organic mineral fertilizer is a type fertilizer comprising of composite organic wastes and inorganic materials. This type of fertilizer is produced commercially through fortification or blending of composite organic wastes such as cow dung, poultry dropping, market refuse and plant residues with inorganic materials, such as urea and rock phosphate for sustainable agricultural production. From an ecological point of view, the new approach of organic mineral fertilizer should aim at creating ecologically sustainable agricultural system adapted to local, climate, ecosystem, soil and availability of water. These three perceptive call for a large-scale re-orientation of most of today's agricultural activity (World's Commission on Environment and Development, 2004)

Problems in Utilization of Chemical Fertilizers

Continuous use of chemical fertilizers alone may lead to the deterioration of soil structure and fertility and consequently, of crop production. Therefore, appropriate alternatives to reduce the sole dependency on chemical fertilizers in agricultural production have been carefully explored. Contamination of soil by heavy metal through fertilizers such as cadmium from phosphoric fertilizers is also getting increasing attention of environmentalists (Kostial 1986). With the increase in crop yields from modern farming techniques reaching plateau in most of the countries and the environmental problems due to excessive use of chemical fertilizers and pesticides becoming a matter of concern, the need for sustainable agriculture is increasingly being felt.

Requirement of Utilization of Good Agriculture Practices for SoilFertility Management

In the process of attaining higher levels of food production for matching the demand of growing population during the past four decades, emphasis was laid on intensive agricultural practices. In the process of attaining higher levels of food production for matching the demand of growing population during the past 4 decades, emphasis was laid on intensive agricultural practices. The improper cropping systems and cropping patterns which is centered on the increase on the crop density per unit area and mono-cropping to compensate for less arable lands caused the increasing depletion of soil fertility.

The inability to formulate balanced fertilizer formula has wide and far reaching impacts on soil fertility characterized by serious nutrient deficiency and the increasing problems of soil degradation. The national government should provide equal and adequate attention to the judicious management of soil and environmental resources for sustainable plant growth and production in their country.

2.4.6 Lack of Waste Disposal Management System

Solid waste damps are seriously spoiling the environmental conditions in developing countries. Negative environmental impacts from improper solid waste dumping can be easily observed everywhere in the developing world. In Pakistan, due to a lack of proper planning and funding, the solid waste management scenario is becoming worse day by day. To highlight the main causes of improper solid waste management in developing countries, Rawalpindi city is selected as a case study. This city is facing miserable solid waste management crises due to rapid industrialization, urbanization and insufficient funding. Improper solid waste dumps are spreading different diseases in the study area. It is investigated during the research that due to rapid growth in population, increments in solid waste generation rate, management deficiencies, lack of legislative implementation and funding, the solid waste management systems of Rawalpindi are not working effectively. The major causes for the inefficient municipal solid waste management systems in Rawalpindi are the unintended invasion of the city, severe weather conditions, lack of social awareness/ community involvement, improper resources including improper equipment and lack of funds. An inefficient municipal solid waste management system may create serious negative environmental impacts like infectious diseases, land and water pollution, obstruction of drains and loss of biodiversity.

2.5 Natural Environmental Conservation Function

The variety of plants and animal species is essential for human survival. Human beings are integral part of nature. Human health depends ultimately on the health of its species and on the natural functioning of is ecosystems. An ecosystem is an array of living things and the physical and chemical environment with which they interact. Examples of ecosystems include forest, wetlands, grassland, streams and estuaries. Healthy ecosystems provide the conditions and processes that sustain human life. In addition to providing goods such as purification of air and water, the

binding of toxins, decompositions of water, mitigation of floods, moderation of storm surges, stabilization of landscapes and regulation of climate .

(a) Air Purification

Forests canopies function as particulate filters and chemical reaction sites that help regulated the composition of the atmosphere and purify our air. Particles resulting from the combustion of coal and oil, cement production lime kilim operation, incineration and agricultural activities are captured by forest canopies. Moist leaf surface also provide sites on which potentially polluting compounds can be transformed into harmless ones.

(b) Watershed services

Forests regulate water flows to downstream areas, yielding relatively regular and predictable flows. Deforestation often leads to disruption of the natural flow pattern, causing cycles of flood and drought. Forests, especially forest soils, also act like massive filters, purifying water as it drips through the forest ecosystem.

(c) Purification of Fresh Water

Wetlands absorb and recycle nutrients from human settlements. As water is flowed through wetland, plants, microbes and sediments processes, it strip out nutrients such as nitrogen and phosphorous. Plants take up these nutrients and incorporate them into root, stem and leaf-materials. Some microbes transform a water-soluble form of nitrogen into gaseous form of nitrogen. Constructed wetlands are designed to be used as nutrient retention and processing features of natural wetlands to remove nutrients and toxic from water.

(d) Binding Toxic Substances

Human activities have concentrated heavy metals, radioactive, elements and other toxins to various places, rendering some locations unusable and dangerous. Some vascular plants clean up such contaminated sites to concentrate toxic substances without harming themselves. For example, mustard plants accumulate lead and certain forms sop up arsenic.

(e) Detoxification of Sediments and Soils

Microbes can help detoxify some human generated wastes. For example, oil spilled into estuaries and marine poses health risks to human and other species. When certain compounds from petroleum hydrocarbon adhere to sinking particles, they settle to the sediment surface, where naturally occurring microbes can detoxify the compounds and ultimately degrade them to carbon dioxide and water.

(f) Mitigation of Floods

Floodplains are ecosystem that border rivers subject to flooding. Following excessive rains, flood water flowed over riverbanks and into these floodplain forest and wetland. Some of the water is soaked up by the soil. When the floodwaters recede, they leave behind nutrient rich settlements that enhance soil fertility, making these ecosystems extremely productive. Unaltered flood plains also provide habitats for many plants and animal species.

(g) Stabilization of Landscapes against Erosion

Forest and grasslands provide natural protection for soil against erosion in several ways. Plant canopies intercept rainfall and reduce the place with which rainwater hits the soil surface. Roots bind soil particles in place and prevent them from washing down slopes. And old root channels help to minimize the powerful force to surface runoff by routing water into soil profile.

(h) Buffering the Land against Ocean Storms

Salt marshes, mangrove forest, and other ecosystems butter the coastal line against ocean storms. Plants in these ecosystem stabilized submerged soil thereby preventing coastal erosion. These ecosystems are also breeding grounds and materials for commercially important fish and vital habitats for many birds and other species.

(i) Carbon Sequestration and Global Climate

Land ecosystems are large storehouses of carbon, both in plant tissues and soil organic matter. By absorbing carbon, these ecosystems help slows the growth of atmospheric carbon dioxide. Were it not for this terrestrial carbon sink, the rate of carbon dioxide accumulation in the atmosphere would be almost twice as fast as it is today, leading to more rapid climate change.

2.6 International Activities for Environmental Conservation

The Brudtland Commission report “Our Common Future (1987)” addressed the link between development and environment, and challenged policy makers to consider the interrelationship among environment, economic, and social issues. The Brudtland Commission is widely attributed with popularizing sustainable development internationally. It defined sustainable development as “development that meets the needs of the present generation without compromising the ability of the future generations to meet their own needs. The most immediate and one of the significant results if “Our Common Future” was the organization of United Nation Conference on Environment and Development (UNCED), also known as the Earth Summit which gathered many heads of States in Rio de Janerio in 1992.

The Earth Summit strengthened interaction among governments, NGOs, and scientists and fundamentally changed attitudes towards governance and the environment. Governments were encouraged to rethink the concept of economic development and to find ways to halt the destruction of natural resources and reduce pollution of the planet. The Summit resulted in several important steps towards sustainable development. Through the adoption of Rio de Declaration and Agenda 21, it helped formalized an international institutional framework to implement the ideas highlighted in “Our Common Future”.

Agenda 21 attitude a comprehensive plan of action towards sustainable development, it can be divided four main areas:

(1) Social and economic issues such as poverty, human health and population;
(2) Conservation and management of natural resources including the atmosphere, forests, biological diversity, wastes and toxic chemicals;
(3) The role of nine major groups in implementing the sustainable development agenda (local authorities, women, farmers, children and youth, indigenous people, workers and technological community, and business and industry and
(4) Means of implementation including technological transfer, financing, science, education and public information.

Global Environmental Facility (GEF) supported the finding for the implementation of Agenda 21 with participation of UNEP, UNDP and World Bank. Since 1991, the GEF has provided grand and generated to support about 2,000

projects that produce global environmental benefits in more than 160 developing countries.

The turn of the century brought sense of urgency to attempt to address the environment and development challenges. World leaders committed to free their people from the threat of living on a planet in which has been spoilt the environment by human activities, and whose resources would no longer ne sufficient for their needs. The Millennium Summit adopted the declaration and created eight Milennium Development goals (MDGs) to be better human well –being. The seventh millennium development goals targets for ensuring improved environmental sustainability and integrates the principal of sustainable development into country.

2.7 Reviews on Previous Studies

"Participation of Local People in Water Management: Evidence from The Mae Sa Watershed, Nothern, Thailand"(Helene Heyd and Andreas Neef, 2004) research focused on the local people's interests and strategies in water management and the transformation of participatory policies through government agencies at the local level. Government line departments were categorized into development-and conservation-oriented agencies. While government officers stressed the importance of stakeholder inclusion and cooperation with local people, there is a sharp between the official rhetoric and the reality on the ground. The analysis revealed that government officers, particularly in the fear of losing their traditional mandate and persistent stereotypes about local communities' incompetence to manage water resources in a sustainable way. The participation of local people in development activities and in the conservation and management of natural resources seemed to be at the stage of passive of at best consultation participation. In order to deal with the severely increasing water problem in northern Thailand, decision makers have to recognize the value of participation and promote a change of government officer's attitude towards local people through training programs and incentives. Communities and individuals needed to be made aware of their constitutional rights and potentials for cooperating with government agencies.

"Community Activities Contribution to Water Environment Conservation of Inle Lake" Mu Mu Than (2013) focused about the Inle Lake, is the most important lake in the Myanmar by virtue of its economic, social, cultural and ecological implications. It's also a prominent water resource for largest hydro-power generating

in country. The objective of this paper is to reveal the present situation in face of environmental degradation surrounding Inle region. It is found that local people are suffering natural disaster as drought because the lake is thought to be the most changing site in country as a result of both the tourism boom and increasing agricultural activities. Environmental survey results revealed that there are large numbers of migratory birds and species to lake that shows the environmental condition of the lake is favorable. In Inle region, reforestation, rehabilitation development of food security, income generation and environmental conservation activities stretch to some part of the area. But the tremendous amount of volume of work activities and fund requirement cannot be met only by a government agency or single organization. From this, it is ensure that community participation is the most important component of endeavor which is to be taken for improvement of the Inle Lake.

Nilar Swe (2014) studied on the effect of settlement on the environment of Inke Lake. According to this study, Inle Lake has been experiencing severe environmental and physical degradation. This study aimed to explore the major causative factors for degradation of environment of Inle Lake and to improve the awareness of local community on environmental conservation to support the effective management towards sustainable development. It highlighted the importance of the Inle Lake existence and focuses on perception changes of local community towards environmental conservation and sustainable development. There have different practices of human settlement in different locations. From that study, it was conducted that the community realized that their un-sustainable settlement effect on deforestation and environmental pollution. Recommended for systematic management plan at the local level should be developed to achieve the local development by managing the resources in sustainable ways.

CHAPTER III

ENVIRONMENTAL CONSERVATION PERFORMANCES OF MYANMAR

3.1 Environmental Conservation

The Ministry shall under the guidance of the Committee, maintain a comprehensive monitoring system and implement by itself or in co-ordination with relevant Government departments and organizations in the following matters:

(a) The use of Agro-chemicals which cause to impact on the environment significantly,

(b) Transport, storage, use, treatment and disposal of pollutants and hazardous substances in industries.

(c) Disposal of wastes come out from exploration, production and treatment of minerals, industrial mineral raw materials and gems.

(d) Carrying out waste disposal and sanitation works:

(e) Carrying out development and constructions:

(f) Carrying out other necessary matters relating to environmental pollution.

A person causing a point source of pollution shall treat, emit, discharge, and deposit the substances which cause pollution in the environment in accord with stipulated environmental quality standards.

The owner or occupier of any business, material or place which causes a point source of pollution shall or install or use an on-site facility or controlling equipment in order to monitor, control, manage, reduce or eliminate environmental pollution. If it is impracticable, it shall be arranged to dispose the wastes in accord with environmentally sound methods.

A person or organization operating business in the industrial estate or business in the special economic zone or category of business stimulated by the Ministry:

(a) Is responsible to carry out by contributing the stipulated cash or kind in the relevant combined scheme for the environmental conservation including the management and treatment of waste;

(b) Shall contribute the stipulated users charged or management fees for the environmental conservation according to the relevant industrial estate, special economic zone and business organization:

(c) Shall comply with the directives issued for environmental conservation according to the relevant industrial estate, special economic zone or business.

3.2 Formation of the Environmental Conservation

The Union Government shall form the Environmental Conservation Committee:

The Union Government shall form the Environmental Conservation Committee (ECC) with the Union Minister for the Union Ministry assigned by the Union Government as the Chairman and with suitable members to conserve the environment of the Republic of the Union of Myanmar;

The Union Government shall stipulate functions and duties of the Committee to implement the objectives contained in this Law.

The powers of NECC are as follow:

(a) Carrying out organizational education and activities relating to environmental conservation;

(b) Suggesting amending and inserting, as may be necessary, the lessons on environmental conservation contained in school lessons;

(c) Accepting donations, grants, materials and technological aids from local and foreign and managing and using such money, materials and technologies as may be necessary in environmental conservation works;

(d) Sending suitable suggestions and encouragements relating to environmental conservation to the relevant Government department and organizations;

(e) Asking necessary proposals and suggestions from the relevant Government departments and organizations for conservation and enhancement of environment;

(f) Prohibiting the relevant Government departments and organizations if the environmental damages arise or situations for damage arise and, if necessary, asking policy to the Union Government.

(g) Laying down and carrying out the Myanmar national environmental policies and other environmental policies for conservation and enhancement of environment with the approval of the Union Government.

3.3 Duties and Powers Relating to the Environmental Conservation of the Ministry

The duties and powers relating to the environmental conservation of the Ministry are as follows:

(a) Implementing the environmental conservation policies;

(b) Planning and laying down national or regional work plans relating to environmental management;

(c) Laying down, carrying out and monitoring programs for conservation and enhancement of the environment, and for conservation, control and abatement not to cause environmental pollution;

(d) Prescribing environmental quality standards including standards on emissions, effluents, solid wastes, production procedures, processes and products for conservation and enhancement of environmental quality;

(e) Submitting proposals to the Committee for economic incentive mechanisms and terms and conditions which may not affect the environment or cause least environmental affect for sustainable development in addition to legal affairs and guidelines relating to environment;

(f) Facilitating for the settlement of environmental disputes and if necessary forming bodies to negotiate such disputes;

(g) Specifying categories and classes of hazardous wastes generated from the production and use of chemicals or other hazardous substances in carrying out industry, agriculture, mineral production, sanitation and other activities;

(h) Prescribing categories of hazardous substances that may affect significantly at present or in the long run on the environment;

(i) Promoting and carrying out the establishment of necessary factories and stations for the treatment of solid wastes, effluents and emissions which contain toxic and hazardous substances;

(j) Prescribing the terms and conditions relating to effluent treatment in industrial estates and other necessary places and buildings and emissions of machines, vehicles and mechanisms;

(k) Negotiating, cooperating and implementing in respect of international, regional and bilateral agreements, instruments and programs relating to matters of environment;

(l) Implementing the international, regional and bilateral agreements accepted by Myanmar for environmental conservation and enhancement of environmental quality in accord with the guidance adopted by the Union Government or the Committee;

(m) Prescribing categories of hazardous substances that may affect significantly at present or in the long run of the environment;

(n) Promoting and carrying out the establishment of necessary factories and stations for the treatment of solid wastes, effluents and emissions which contain toxic and hazardous substances;

(o) Prescribing the terms and conditions relating to the effluent treatment in industrial estates and other necessary places and buildings and emissions of machines, vehicles and mechanisms;

(p) Negotiating, cooperating and implementing in respect of international, regional and bilateral agreements, instruments and programs relating to the matter of environment;

(q) Implementing the international, regional and bilateral agreements accepted by Myanmar for environmental conservation and enhancement of environmental quality in accord with the guidance adopted by the Union Government or the Committee; relating to environmental conservation.

The Ministry shall establish an Environmental Management Fund in the Union Budget in accord with the financial regulations and by- laws of the Union for effective implementation of environmental conservation works in addition to the receipt from the Union Consolidated Fund.

3.4 Environmental Conservation Law of Myanmar

The Environmental Conservation Law was enacted by the Pyidaungsu Hluttawon 30th March, 2012. The objectives of the law are as follows:

(a) To enable to implement the Myanmar National Environmental Policy;

(b) To enable to lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process;

(c) To enable to emerge a healthy and clean environment and to enable to conserve natural and cultural heritage for the benefit of present and future generation;

(d) To reclaim ecosystems as may be possible which are starting to degenerate and disappear;

(e) To enable to manage and implement for decrease and loss of natural resources for enabling the sustainable use beneficially;

(f) To enable to implement for promoting public awareness and cooperation in educational programs for discrimination of environmental perception;

(g) To enable to promote international, regional and bilateral cooperation in the matters of environmental conservation;

(h) To enable to cooperate with Government departments, Government organizations, international organizations, non-government organizations and individuals in matter of environmental conservation.

3.5 National Environmental Policy and Agenda 21

Myanmar's National Environmental Policy developed in 1994 for integration of environmental consideration into social and economic development clearly describes that " The wealth of the nation is its people, its cultural heritage, its environment, and its natural resources, the objective of Myanmar's environmental policy is aimed at achieving harmony and balance between these through the integration of environmental considerations into the development process to enhance the quality of the life of all its citizens. Every nation has the sovereign right to utilize its natural resources in accordance with its environmental policy: but great care must be taken not to exceed its jurisdiction or infringe upon the interests of other nation. It is the responsibility of the State and every citizen to preserve its natural resources in the interests of present and future generations. Environmental protection should be the primary objective in seeking development.

In compliance with Myanmar's National Environmental Policy, Myanmar Agenda 21 was developed in 1997 and it was a collaborative effort made by various government agencies in order to strive for the sustainable development of the country. Myanmar Agenda 21 is a blue print of the activities; contribute to biodiversity throughout the country for example, effort made in sustainable forest management, sustainable tourism and infrastructure development with a reduced impact on biodiversity. Within a framework of Myanmar Agenda 21, impact measure for biodiversity conservation is summarized.

National Commission for Environmental Affair (NCEA)

Prior to 1989, no governmental agency existed to oversee environmental matters in Myanmar. In 1987, the ministry of Foreign Affair (MOFA) began to assume authority over domestic environmental protection issues while the Cabinet retained responsibility for international environmental matters. In 1990, a new body known as the National Commission for Environmental Affairs (NCEA) was initiated by the MOFA to act as a central management agency for environmental consideration into Myanmar's Development plans. The NCEA's main mission is to ensure sustainable use of environmental resources and to promote environmentally sound practices in industry and other economic activities. NCEA is supported to formulate broad policies on natural resource management, to prepare environmental legislation, standards and regulations for pollution control, monitoring and enforcement to promote environmental awareness through public education and to liaise as necessary with international organization in environmental matters.

3.6 Government Agencies

The Ministry of Environmental Conservation and Forestry (MOECAF) is the most responsible agency for implementing the national policy on nature conservation in Myanmar but other ministries such as MOAI, MOLF, etc, share the common responsibility for environmental conservation. MOECAF is broadly implementing the mainstream conservation activities related to land degradation (through Watershed Management and Greening Semi-arid Zones), biodiversity conservation (focusing on protected Area System and Law enforcement) and sustainable use of forest resources (Sustainable Forest Management, Forest Planting, Community Forest and Law Enforcement). Some of these activities are also conducive to the conservation of coastal areas such mangrove rehabilitation and Coastal Watershed Management.

MOAI is also an important agency in influencing environmental matters relating to land use change and water resource while Myanmar Agriculture Service (MAS) is delivering extension service for sustainable land use technology. Water Resource Utilization Department and Irrigation Department under MOAI are concerned with improving water supply for agriculture. Key agencies other than MOECAF and MOAI in combating land degradation are the Ministry of Border Affairs (MOBA), National Race and Rural Development and the MOLF, Department of Fisheries under MOLF is responsible for not only fishery resource management but

also fish diversity conservation in both fresh water and marine environment. In terms of providing services for solid waste collection, Yangon Mandalay city Development Committees known as YCDC and MCDC are fully responsible for municipal affairs and development of these two majors cities, for the rest of the urban areas and townships throughout the country, solid waste management and drinking water supply are responsibility of the Department of Development Affairs (DDA) under the MOBA, National Race and Rural Development.

In respond to inland water pollution and air pollution from mobile sources and stationary sources, the following agencies are relevant in terms of partially bounded duties and responsibilities despite no clear-institutional focus on pollution control and monitoring. The Pollution Control Committee under Ministry of Science and Technology monitors pollutions through technology surveys and research. Department of Cottage Industry is responsible for supervision and monitoring of small scale cottage industries which are located in residential areas and emitting a great deal of foul smells. Local Industrial Zone Supervision Committees handle overall concern and supervision of industrial zones covering pollution aspects and liaising with respected government agencies. Ministry of Energy is also responsible for policy formulation for automobile fuel consumption and mobile source pollution to be controlled by quality of fuel. Department of Water Resources and Improvement of River Systems (DWIRS) under MOAI is responsible for improving water canals and river systems linked with sedimentation and water in rivers. Department of Health is partially responsible for improving rural water supplied and Sanitation and incorporating environmental health care activities such as surveying for toxic and hazardous materials.

3.7 Non-Governmental Organizations (NGOs)

In addition to government agencies, there are growing numbers of international and local NGOs addressing environmental issues over the decade. The local NGO with the largest program of conservation activities is the Forest Resources, Environment, Development and Conservation Association (FREDA), which was established by retired senior officers from the MOECAF and Myanmar Timber Enterprise. FREDA is currently implementing a number of pilot projects on sustainable forest management, and mangrove protection and rehabilitation, in collaboration with several Japanese NGOs. In addition, FREDA conducted the

Surviving Together Program at Alaungdaw Kathepa National Park, in collaboration with FD, Wild Aid and David Shepherd Wildlife Foundation (DSWF). This program included implementing conservation outreach activities and promoting alternative income generating activities for local communities.

Another local NGO engaged in biodiversity conservation in the Biodiversity and Nature Conservation Association (BANCA). BANCA mainly focus on bird conservation and its activities include a number of collaboration of Important Bird Area –IBAs (including two Drawin-Initiative funded projects), and publication of a local language field guide Shan State. BANCA has recently participated in a project namely "Conservation and Management of Lampi Marine National Park" collaborated with FS and Istituto Oikos, Italy.

A third local NGO engaged in biodiversity conservation is the Myanmar Bird and Nature Society (MBNs), which focuses in protection, research and public education related to birds and nature. MBNs has implemented a number of conservation projects, including a study on the ecology of White-browed Nuthatch at Natmataung National Park , an environmental awareness program for primary schools in Yangon and a national bird festivals. There are a number of other local NGOs in Myanmar, many of which have a principal focus on rural development or health. Several of these organizations are focusing on the natural resource sector, for example; Friends of Rainforest in Myanmar, which is working on promoting renewable energy resources, including fuel wood substitution and biogas use. These organizations make important contribution to biodiversity conservation, particularly nu addressing threats arising from unsustainable use of natural resources.

In addition to local conservation NGOs, international NGOs such as Save the Children, CARE, World's Vision, Wildlife Conservation Society (WCS) etc; are working in Myanmar. Among INGOs, WCS is the only INGO that has a memorandum of understanding with the MOEAF for implementing a specific biodiversity conservation and environmental management program in Myanmar. In particular, WCS is strengthening the institutional capacity of the NWCS of the FD specifically the capacity of staff for protected area management and research activities. The major achievement of WCS includes formulating a National Tiger Action and contributing to the expansion of protected areas, especially for establishing the World's largest Tiger Reserve. Other academic institutions and I NGOs like the Smithsonian Institution, California Academy of Sciences, Bird Life

International, Flora and Fauna International and Conservation International are working in Myanmar through their counterpart agencies, either government or local NGOs.

3.8 Forest Conservation in Myanmar

Forests are crucial for maintaining biodiversity and conserving environment. The survival of forests is also important for sustainability of other resources such as water and soils that are essential for survival and development of humanity. Myanmar contains more than half of mainland Southeast Asia's closed forest cover. To conserve forestry is the main factor to preserve the environment.

3.8.1 Forest Management System

Myanmar is rich in forest resources and about 47% of the local country‘s area is still forested. The Forest Department (FD) has systematically managed the natural forest since the advent of scientific forestry in 1855. There are 1,347 species of big trees, 741 species of small trees, 1,696 species of bamboos, 36 species of rattan and 841 species of orchids so far recorded. Myanmar selection system has been principle forest management since 1920, is merely a Selection-Cut-Improvement system with the main features managed under working plans, which generally from the working circles on the basic of the objects of management and accessibility, and also on the nature and form of the forest produce required.

The working circles consist of a group of reserves, which are divided into felling series for the convenience of working according to the drainage and geographical situation. The feeling series are subdivided into annual coupes, which can be subdivided into compartments. The compartments are the basic management units, which are approximately 250 hectares in size. Felling is regulated by area with tree number check. The felling series to be worked is divided into approximately 30 equally productive annual coupes. Each year, trees are selected for felling in one of these coupes and the whole felling series is therefore worked over felling cycle of 30 years. Traditionally, the yield capacity (Annual Allowable Cut-AAC) of the forest is determined from data obtained from forest inventory. The prescribed girth size varies with the type of forest. Myanmar forest management system is an environmental friendly system and poverty and food security issues could be solved by the conservation of forest.

Myanmar's formal forest management system, originally established during the British colonial era to manage its vast teak forests, has been undermined in recent decades as Myanmar's forest resources were exploited to finance the country's development and government. Lack of enforcement and adherence to Myanmar's forestry laws have resulted in significant deforestation and degradation of the country's forests.

Formal forest management has been documented in Myanmar since 1856, and the foundation of its current forest system is based on the policies designed by British colonists in the late 1800s. As a result, Myanmar became world renowned for its systems, especially its scientific forestry management method - the Myanmar Selection System (MSS) (formerly Burma (BSS). The MSS is the main system practiced in the management of natural teak-bearing forests in Myanmar today. However, despite relatively strong laws and regulations for harvesting and transporting forest products, the application of the MSS scientific forestry method broke down in the 1970s for political-economic reasons. Myanmar has established a Myanmar Forest Certification Committee (MFCC) and Myanmar Timber Certification Programmed (MTCP); however, these domestic standards do not differentiate between timber extracted from plantations, land conversion or natural forests. Myanmar does not currently have any areas of forest certified to internationally recognized certification standard (Forest Trends 2013).

3.8.2 Forestry Master Plan (2001-2030)

This Plan was initiated by Forestry Department as a National Forestry Program Exercise. Medium-term plans of 10 years for 62 districts (FMU) covering the whole country have been formulated and adopted for action. It has been mandated that 2.27 million acres of community forests will be established by 2030. However, so far, no community forests have begun harvesting timber on a commercial scale, so it is too early to determine how they will factor into the county's commercial forestry sector, if at all. No national government management plans have included community forests as providing timber for the country's wood sector, for example, and no certification programs plan to target community forests.

3.8.3 Community Forest

Informal common property regimes lack legal or administrative back-up and are, therefore, vulnerable to powerful interests. With increasing forest degradation around the world, governments have been rethinking forest governance since the 1970s, seeking to return control of forests to communities in order to achieve the twin goals of sustainable resource management and poverty alleviation.

Community Forestry simply involves communities receiving formal endorsement and rights from the administration to assume control, management and use of forests local to them. The basic logic for CF is as follows:

1. In forests adjacent to villages which have become degraded through being open access, the first step is to (re-) establish village institution regulating use and investing efforts in protection, regeneration and management. This often takes outside initiation and facilitation support, and also long-term back up.
2. Over time, the forest condition will gradually improve, leading to increased availability of desired forest products and services valuable to the local community.
3. Although households will have to reduce their forest use in the early years, often leading to hardship for those most dependent on the forest, in time there should be a higher level of sustainable forest product availability for them. Community Forestry has been highly successful in a range of counties, most famously Nepal (see Bhatta 2007) where virtually 100% of mid-hill forests are now under community management, and Mexico (see 9 Bray et al. 2006). In most cases this is leading to both regenerated and thriving forests, high levels of sustainable benefits for communities, and also tax revenues to the government.

3.8.4 Reducing Emission from Deforestation and Forest Degradation

Reducing emission from Deforestation and Forest Degradation (REDD) is a program that some developed countries provide incentives to avoid forest loss lost under negotiation within the United Nations Framework Convention on Climate Change (UNGCC) for some developing countries to protect the forests and profitable of them. It is being performed with the purpose of maintaining the forest by financial anticipating for the amount of stored carbon in the trees. The amount of carbon stored by forests depends upon the type, age, and health of the plants, the forest management

regime in place, and disturbance such as pets, insects, and fires. Deforestation affects the earth's natural ability to reduce the amount of carbon dioxide into emitted into the atmosphere. Deforestation rate between 1989 and 1998 was very serious. Although there is no consensus on the principle cause of deforestation, it is generally acknowledge that logging practice, agricultural expansion, and shifting cultivation, fuel wood cutting illegal trade, and population growth, construction of roads, dams and reservations are the main causes of deforestation. One major cause of deforestation that needs to be addressed especially in Myanmar is fuel wood cutting. Shifting cultivation is also attributing to deforestation and environmental deterioration. Consequences of shifting cultivation have adversely affected the environment in a number of ways, such as soil erosion and degradation, deforestation, sedimentation in water ways, flooding and erosion of land and marine biodiversity. The population growth is also main cause of tremendous loss of forests. The forest resources have come under growing population pressure, resulting in certain amount of deforestation. Other causes of deforestation in Myanmar are illegal extraction and logging concession and construction of dams, roads and reservoirs.

To reduce the causes to deforestation and forest degradation, the Kyoto protocol allows for several market-based mechanisms to assist developed countries to meet their emission targets. The funding country can then apply the emission reduction generated to help it to meet its Kyoto target. The mechanism is designed to support the sustainable development objectives of developing countries. A range of domestic actions can help to reduce emissions from deforestation and degradation; these include clarification and enforcement of land and forestry rights, the establishment of reserves or parks, ensuring the compensation or incentives for avoiding deforestation and altering policies that make deforestation alternative, such as agricultural subsidies. Much of these efforts have been focused in reducing the use of fossil fuels and changing the rate of land clearing and deforestation, and increasing the rate of reforestation.

Myanmar has been a member country of UN-REDD program in December 2011. As a member of country, Myanmar is effectively performing the environmental conservation activities based on forest conservation. MOECAF of Myanmar and Korea Forest Service (KFS) signed Memorandum of Understanding (MOU) for "Mitigation of Climate Change Impacts through reforestation of degraded and forests and REDD-plus Activities in Bago Yoma Region". The project area is located at Ye-

Tar-Shae Township, Taung Ngu District, Bago region. There are long term objectives such as to reduce climate change, to restore Bago Yoma forest and ecosystem, to manage forest sustainability. The project has been implemented with the following objectives;

(1) To reduce consequences of climate change and be sustainable forests, maintaining the ecosystem of forests, plantation forest projects are implemented as REDD- plus activities.

(2) To implement REDD-plus activities, measuring the amount of absorbing and preserving carbon dioxide of forest in project area and to specify the indicators of emission amount of carbon dioxide.

(3) To develop human resource in the aspect of REDD-plus activities and conserving ecosystem and to increase awareness of knowledge.

3.8.5 Watershed Management

Watershed degradation is another environmental problem in Myanmar. In upland areas, where most of Myanmar's remaining natural forests are found, forest cover loss has precipitated an environmental crisis. Water basin catchments in Myanmar are quite variable due to the difference in physiographic feature. A watershed is the area of land that drains into a single waterway or body of water. A small watershed of a few heaters that flows into a small streams part of a large watershed, until the combined watershed may become a major river basin draining millions of square kilometers. Most rivers begin in forested mountains watershed, follow course through the towns and villages and empty into the seas. Myanmar is richly endowed with water resources. The water ecosystem comprises the tributaries and distribution of the four major river systems contribute for the surface water resources of the country. Due to the favorable climate conditions and physiographic features, there are eight river basins namely, (1) Chindwin, (2) Ayeyarwady Upper (3) Ayeyarwady Lower (4) Sittaung (5) Rakkine (6) Taninthayi (7) Than-Lwin and (8) Mekong.

Table (3.1) The Salient Features of Rivers Basin in Myanmar

No	Name of Principal River Basin	Length (km)	Catchment Area (000' sq-km)	Annual Surface Water (km^3)
1.	Chindwin	900	115.3	141.293
2.	Ayeyarwady Upper	1310	193.30	227.920
3.	Ayeyarwady Lower	690	95.60	85.8
4.	Sittaung	320	48.10	81.148
5.	Rivers of Rakkine State	-	58.30	139.245
6.	Rivers of Tanintharyi Division	-	40.60	130.927
7.	Than- Lwin (From Myanmar boundary to its mouth)	1224	158.00	257.918
8.	Mekong (within Myanmar Terroitory)	350	28.60	17.634
	Total		**737.80**	**1081.885**

Source: Ministry of Agriculture and Irrigation (Irrigation Department)

As infrastructure development progressed in Myanmar, dams were constructed from the 1960s endowed for hydro power, irrigation, domestic and industrial water use; plus increased development of roads, towns and villages along the major river courses. Watershed conservation is needed for improved management of the watersheds of the country to ensure environmental sustainability and protection of these valuable infrastructures. Watershed ecosystems are being threatened by deforestation, unsustainable upland agriculture, overgrazing, poor soil management practice and socio-economic poverty.

The first National Watershed Management Project (duration 3 years) started during 1970 to 1973, within the watershed area of Kyet- mauk-taung Dam, situated near Mount Popa. The other project known as "Watershed Management Strategy" is operated in 1981 by cooperating with FAO, and UNDP. The project was specific t the watershed of the multi-purpose for Kinda Dam. The project accomplishments build up

a core of FD watershed management stuffs, demonstrated the superiority of community and farm based generating activities. Then, project activities were expanded in 1991 including watershed management interventions in the Inle Lake and Fugyi Reservoir catchments. “Watershed Management for Three Critical Area” was additionally established in 1994 to cover the watershed areas of Inle Lake, Ywa- Ngan (Kimda – Dam, and Phugyi Reservoir embracing about 0.21 million ha. The Ywa-Ngan catchment dependent Kimda Dam which supplement electricity to Mandalay and Upper Myanmar, while the Lawpita power station, that supply the major portion of the whole country’s hydroelectricity highly reliant on the Inle Lake. And the Phugyi Reservoir’s water supply also contributes a very essential component to meet domestic and industrial needs of Yangon.

The major activities carried out in these projects are, afforestation at bored land or degraded area to enhance the socio-economic development of rural people on a sustainable basic, reforestation, selection and allotment of sustainable cultivation, conservation and protection of natural forests within for watershed areas.

3.8.6 Wetland Conservation

Among ecosystem services, tangible and intangible benefits of wetland ecosystem gad influenced and are influencing the quality of life. People little more or less close to wetland areas enjoy these services of wetland ecosystem. Nowadays, unprecedented rate of vanishing wetlands and over exploitation of wetland resources are alarming to ecosystem degradation. Wetlands provide a variety of benefits to human based on their functions. Wetlands are one of the mist dynamic landscapes on the surface of the earth. Currently, wetland cane be defined as areas where more or less water exists throughout the year and where there is a primary factors controlling the environment and associated plant and animal life. Wetland can hold intense rainfall and discharge water into natural streams or rivers gradually and prevent possible flooding downstream.

At the same time, wetlands slow the water flows and encourage the deposition of sediments and nutrients carried in the water because nutrients are often associated with sediments and can be deposited and accumulated in the sub-soil. Normally, these nutrients rich floodplains are good for seasonal agricultural practice. Moreover, many wetland plants have the capacity to remove toxic substances that have come from pesticides, domestic and industrial discharges and mining activities. It can also be

important to preventing high concentrations of these nutrients reaching groundwater supplies or other water resources.

Carbon absorption is also one of the wetlands functions and it plays important role in mitigating the effect of climate change. Another important function of wetland is groundwater aquifer. Biodiversity conservation is also an important function of wetlands because wetlands are home to great diversity of flora and fauna species. The 3rd Five Year Action Plan on Establishing Watershed Plantation in Watershed Area of Major Dams, Reservoirs and Water Resources (2011-2012 to 2015-2016) was made. Watershed management is of paramount importance to Myanmar since the Government has made great strides in construction dams and reservoirs for hydropower generation and irrigation for national economic development and poverty reduction.

Table (3.2) Watershed Area and Volume of Water Flow of Rivers in Myanmar

No	Name of Rivers	Watershed Area (sq miles)	Volume of Water Flow (Cubic Feet) 000
1.	Chindwin	44500	114.50
2.	Ayeyarwady Upper	74600	184.70
3.	Ayeyarwady Lower	36900	69.53
4.	Sittaung	18600	65.76
5.	Rivers of Rakkine State	22500	112.84
6.	Rivers of Tanintharyi Division	15700	106.10
7.	Than-Lwin (From Myanmar to its mouth)	61000	209.01
8.	Mekong (Within Myanmar Boundary)	11000	14.29
	Total	284800	876.84

Source: Master Plan of Ministry of Agriculture and Irrigation (2000-2001 to 2030-2031)

3.9 Biodiversity Conservation in Myanmar

In Myanmar, the kings initiated biodiversity conservation as early as 1775 when teak was proclaimed as Royal Tree. The vicinity of the King's place was declared a refuge area for the wild animals in the city of Yadanarpon (now Mandalay)

in 1850. The first National Biodiversity Strategy and Action Plan (NBSAP) of Myanmar, adopted on 3 May 2012, contains 10 strategic directions on the following themes: (i) strengthening conservation of priority sites; (ii) mainstreaming biodiversity into other policy sectors; (iii) implementing focused conservation actions for priority species; (iv) supporting local NGOs and academic institutions; (v) creating capacity to coordinate conservation investment in Myanmar; (vi) scaling up the implementation of in situ and ex situ conservation of agriculture, livestock and fisheries biodiversity and genetic resource management; (vii) expediting the process of implementing the national biosafety framework; (viii) promoting the initiative to manage IAS; (ix) facilitating the legislative process of environmental protection and environmental impact assessment; (x) enhancing communication, education and public awareness on biodiversity conservation.

Priority actions have been established for each strategic direction, as have the major agencies responsible for implementation. In addition, a set of 9 action plans, based on the above strategic directions, has been established for five-year periods toward the sustainable management of the following sectors: forests; wildlife conservation and protected areas; freshwater resources; coastal, marine and island ecosystems; land resources; agriculture, livestock and fisheries; ecotourism; environmental quality and biosafety; mineral resource utilization. The NBSAP has been aligned with the National Environmental Policy, Myanmar Agenda 21, and the National Sustainable Development Strategy. The first protected area was established in 1920, it is Taunggyi Bird Santuary. In early 1980s, Nature Conservation National Park Project (NCNPP) was launched under the joint implementation of UNDP and forest department, and then modern conservation has formed under the NCNPP, Nature and Wildlife Conservation Division (NWCD) was formed under the Forest Department, and the NWCD is taking responsibility for the Pas management and biodiversity conservation. Myanmar Forest Policy (1995) mandates an increased in protected areas (PAs) to 5% of the country's total land. Later, this target was adjusted to 10% by 30 years National Forestry Master Plan of Ministry of Environmental Conservation and Forestry. Currently, Myanmar has 17% covered by biodiversity areas.

3.10 Protected Areas and Management

Protected areas (PAs) are important tools for biodiversity conservation and sustainable development. PAs safeguard ecosystems and their services, such as water provision, food production, carbon sequestration and climate regulation, thus improving people's livelihoods. They preserve the integrity of spiritual and cultural values placed by indigenous people on wild areas and offer opportunities of inspiration, study and recreation. Due to a long period of isolation, Myanmar has conserved an extraordinary natural and cultural heritage that is in part represented in its protected area system. The expansion of agriculture and industry, pollution, population growth, along with uncontrolled use and extraction of resources, are causing severe environmental and ecosystem degradation. Loss of biodiversity is the most pressing environmental problem because species extinction is irreversible. Realizing the urgency of Myanmar environmental challenges, several stakeholders, at national, international and regional level, have committed to support conservation and management of PAs. However, baseline information on natural resources, threats, management, staff, infrastructure, land use, tourism and research in Myanmar PAs was hardly ever updated and not systematically organized, thus limiting the subsequent planning and management of resources. Therefore, the aim of this publication is twofold: to raise awareness on the condition of the conservation of PAs and to mobilize national and international support for cost-effective initiatives, innovative approaches and targeted research in priority sites. Myanmar's PAs Represent all diverse forest types from alpine forest in the north and mangrove and tropical rain forest in the south. Seven of the 42 PAs of Myanmar are designated as ASEAN Heritage Parks(AHPs). The AHPs of Myanmar are Hkakabo-Razi National Park, Indawgyi Wetland Wildlife Sanctuary, Inlay Lake Wildlife Santuary, Natmataung National Park, Meinmahlakyun Wildlife Sanctuary and Lampi Marine National Park. In addition, Moeyungyi Wetland Wildlife Sanctuary has been designated as a Ramsar Site in 2005 due being as significant habitat for the globally important bird species. Seven areas that occupy 1.19% of the country total land have been proposed to be established as PAs.

To conserve the diverse forests and their associated wildlife across Myanmar, Nature and Wildlife Conservation Division (NWCD) has been set up under forest Department. In Myanmar, 42 protected areas covering 14645.74 square miles and

representing country's diverse forests have been established, and it is about 5.61% of the country's area. The Park Warden offices have been set up at the protected areas and patrolling is conducted to prevent hunting of wild animals. Environmental education is also conducted for the local communities surrounding the protected areas to get the local people's participation in conservation. In addition, the conservation activities are being conducted for the long-term existence of ecosystems and their associated biodiversity.

Forest Department, National Police Force, Customs Department, Border Trade Department and Administration Organizations are cooperating at the township level for taking action against hunting, illegal killing, transporting, trading, captive breeding, possessing and exporting protected wildlife mentioned above policy and laws related to biodiversity Myanmar has developed National level strategies and action plans, policies, laws and rule in order to sustain the biodiversity and to manage the PAs effectively.

Table (3.3) Some Protected Areas in Myanmar

No	Name	Areas		General Location
		Sq.km^2	Sq.mile^2	
1	Kakilu Wildlife Sanctuary	160.55	61.99	Kayin State
2	MeinmahlaKyun Wildlife	136.70	52.78	Ayeyarwady Region
3	Popa Mountain Park	128.54	49.63	Mandalay Region
4	Lampi Marine National Park	204.84	79.09	Tanintharyi Region
5	Lampi Marine National Park	48.84	16.54	Shan State
6	Parsar Protected Area	48.84	16.54	Shan State
7	Hkakaborazi National Park	3812.46	1472.00	Kachin State
8	Kyaikhtiyoe Wildlife Sanctuary	156.23	60.32	Mon State
9	Minsontaung Wildlife Sanctuary	22.61	8.73	Mandalay Region
10	RakineYoma Elephant Range	1755.70	677.88	Rakkine State
11	Panlaung-pyadalin Cave Wildlife Sanctuart	333.80	128.88	Shan State
12	Hponkanrazi Wildlife Sanctuary	2703.95	104.00	Kachin State

Source: Forest Department

CHAPTER IV
SURVEY ANALYSIS

4.1 Survey Profile

The Inle, the second largest Lake in Myanmar, is situated in Nyaung Shwe Township, Southern Shan State of Myanmar. Inle catchment area includes watershed of Taunggyi, Nyaung Shwe, Yaksauk, Pindaya, Kalaw, and Pinlaung Townships. The entire lake area is belonging to the Nyaung Shwe Township. The total estimated water surface area is 116 km^2 and catchment area is about 3682 km^2. It is an important water body as more than 1, 70,000 people inhabit the lake surroundings. This survey profile is based in Nyaung Shwe Township. Nyaung Shwe village is composed of 8 wards, 35 village tracts in land comprising 445 village tracts and 25 floating village comprising of 132 villages. Total population of Nyaung Shwe township is 177,332 .The population consists predominantly of Intha, with a mix of other Shan, Taungyo, Pa-O (Taungthu), Danu, Kayah, Danaw and Bamar ethnicities. Most are devout Buddhists, and live in simple houses of wood and woven bamboo on stilts; they are largely self-sufficient farmers. The following table describes the total population and household of Nyaung Shwe Township.

Table (4.1) Households and Population of Nyaung Shwe Township (2018 - 2019)

Sr	Description	Numbers of Houses	Households	Gender		Total Population
				Male	Female	
1.	Urban	2,689	3,046	6,921	7,385	14,306
2.	Rural	36,495	402,727	81,052	81,974	163,026
	Total	39,184	43,320	87,973	89,359	177,332

Source: GAD Nyaung Shwe, 2019

According to the table 4.1, 92% of the people in Nyaung Shwe Township live in rural areas while only 8% living in urban areas. It was noticed that transportation

and communication and basic services availability need to be improved. Most of their businesses and professionals are just relied on the environmental circumstances and sustainability of Inle Lake.

4.2 Survey Design

The survey questionnaire in this study is used both quantitative and qualitative methods to collect data and information to know about the perception of local residents for environmental conservation of Inle Lake. This study was carried out by quantitative method for 204 households from 9 villages in Nyaung Shwe Township while qualitative approach to the 13 key authorized persons from different professionals implementing environmental conservation activities. The study was also targeted to local residents limited over 18 years old comprised of both men and women from different status and occupations such as civil servants, farmers, business men/women, fishermen, artisans and so on. Data collection is carried out by structured questionnaire which is created in May 2019 to get overall understanding of current situation of the areas and to verify the specific answers of the individual questionnaire. There are 4 parts of the questionnaire (1) general question for their bio-data (2) basic service availability (3) knowledge (awareness) questions and (4) final part is conducted with perceptions for human behaviors on environment and environmental conservation plan of Inle Lake. The last part is compared to the perceptions based on the three different categories (education-awareness and basic services availability to support the final result.

Table (4.2) Surveyed Villages

Sr	Village Name	No. of Household	No. of Sample	Percentage
1.	Kalay Gyi	119	13	11 %
2.	Kalay Nge	164	18	11%
3.	Taung Chaung	80	9	11%
4.	Kay Lar	456	51	11%
5.	Shwe Pyi Thar	301	33	11%
6.	Yay Nway	160	18	11%
7.	Taung Chay	320	37	11%
8.	Inn dein gone	165	18	11%
9.	Kyauk Taw	59	7	12%
	Total	**1824**	**204**	**11%**

Source: Survey Data (2019)

In every village, around 20% is under 18 who were untitled for this survey's setting.

4.3 Survey Result

This section was described the resulted answers of the respondents and analytical findings by means of statistical techniques on collected data and information. There are two parts constituted with the selected villages households surveyed results and key informal interview results. Firstly, the selected village household result was described and then concluded by supporting of key informal interview result.

4.3.1 Demographic characteristics of the respondents

The distribution of demographic characteristics provides the information about the gender and age of the respondents with different education background, careers and professionals. The detail was described in below table.

Table (4.3) Demographic Characteristics of Respondents

Sr.	Description	Category	Number of Respondents	Percentage
1.	Gender	Male	90	44
		Female	114	56
		Total	**204**	**100**
2.	Age Group	18-42 years	132	65
		43 and above	72	35
		Total	**204**	**100**
3.	Education background	Primary	70	34
		Middle	57	28
		High	77	38
		Total	**204**	**100**
4.	Occupation	Civil servants	18	9
		Farmers/ gardeners	97	48
		Business men/women	24	12
		Fishermen	4	2
		Artisans	27	13
		Others	33	16
		Total	**204**	**100**

Source: Survey Data 2019

Table 4.3 shows that the demographic characteristic data expresses the background of the respondents in terms of gender, age, education and occupation, 44% of male and 56% of female were included in this survey. In age group, most of the respondents 65% out of total group are (18 to 42 years) and the rest 35 % are in the age of 43 and above. In their education background it was divided that 3 levels -34 % is the primary level, 28% is the middle school level and high level ranged from high school and graduates is 38% which is the highest percentage. In occupation view point, nearly half of the respondents are farming and gardening with 48%, only 9% of respondents are working as civil servants and 12% of respondents are running well their own businesses, 27% of respondents are artisans especially making goldsmith,

silversmith for men and weaving clothes for women and the rest16% of others are shopkeepers and workers earning a bare living.

4.3.2 Expression on Basic Services Availability

To develop knowledge about the environmental conservation of Inle Lake, one of the most important factors is to consider how much basic services accessibility percentage by villages and villagers around the Inle region. The following table is showing the 6 categorized questionnaires related to basic services.

Table (4.4) Number and Percentage of Basic Service Accessibility by Respondents

Sr	Description	No. of Respondents		Percentage of Respondent		Total
		Easy to access	Difficult to access	Easy to access	Difficult to access	
1.	Education facilities accessibility	196	8	96	4	204
2	Health Facilities accessibility	196	8	96	4	204
3.	Safety drinking water accessibility	80	124	39	61	204
4.	Latrine usage system	95	109	47	53	204
5.	Waste disposal system	13	191	6	94	204
6.	Fuel Consumption system (Electricity)	112	92	55	45	204

Source: Survey Data (2019)

As the above table (4.4), the education facilities and health facilities are the same percentage of 96% with easily accessing and only 4% of respondent in difficult situation. Government gives support for education facilities and services in almost every village which are strategic point for tourists and visitors attraction. The obscure villages are not accessed education and health care services and also it is too difficult

in transportation to attain these services. As Inle Lake is well-known for the biggest freshwater lake in Myanmar, but there is scarcity of safety drinking water for people living around Inle's environment.

Despite, safe drinking water is essential for every village, only 39% of the respondents are accessing safe drinking water through purifying system by community's activities and self-reliance group. Only good in economic status villages can capable of solving for accessing safety drinking water system. The poor villages or bad economic status villages are not accessed by safety water system. Usage of fly proof latrine is still difficult to explore for floating and mountainous villages. Floating villages are using the kind of latrines which are directed down to the lake and most of the mountain areas are still using to open defecation. Floating villages tried to use fly proof latrine system but cannot figured out.

Moreover, the respondents of 47% in the shore area can only easier to access fly proof latrine system while 53% of respondents of other areas are difficult in the utilizing of fly proof latrine. Waste disposal management is very poor for every village and 94% of respondents are used to destroy every kind of waste by burning method and only 6% of respondents could manage in systematic way. The last status about fuel consumption system revealed that 55% of respondents are using electricity for cooking meal but 45% of respondents are still using traditional ways like consumption of charcoals and woods.

Table (4.5) Levels of Basic Services Availability

No	Description	Basic service availability level			Total
		Low	Medium	High	
1.	Number of respondents	42	123	39	204
2.	Percentage of Respondent	21	60	19	100

Source: Survey Data (2019)

According to the above table (4.5), the medium level of the basic service availability reached the highest percentage of 60% than the rest ones. Representing of high level is the lowest percentage (19%). And 21% is standing at the low place. These three levels for basic service availability of respondents are categorized by 6

different types of services described in the table (4.5). The High level of respondents is sufficiently accessing up to 5 and 6 services, the Medium level is 3 to 4 services and the Low level is getting only 1 and 2 services. Some villages are not accessed any service and bad in economic status.

4.3.3 Knowledge of respondents for Environmental Conversation of Inle Lake

Knowledge is one of the significant factors to conserve the environment. Without knowledge, it would never be attainment of awareness for the environmental conservation. There are two parts of awareness related to environmental conservation. The following tables are described the detailed results of the surveyed respondents with awareness questionnaires.

Table (4.6) Knowledge about the Changing Environment

Sr.	Description	No. of Respondents		Percentage of Respondents		Total
		Yes	No	Yes	No	
1.	Do you notice that the environmental changing around your village?	204	0	100	0	204
2.	Do you notice that the loss of biodiversity in Inle region?	204	0	100	0	204
3.	Is there any necessary of environmental conservation activities for sustainable development Inle lake?	204	0	100	0	204
4.	Are there any dwellings in the village surrounded by stagnant water?	105	99	51	49	204

Source: Survey Data (2019)

Table (4.6) shows that awareness about the changing environment around Inle Lake. All the respondents notice that changing environment around their villages such as suffering from drought and becoming torrid weather. And also 100 % of

respondents are agreed with the statement of loss of biodiversity in Inle's region. Most of the accustomed species in birds and fishes of Inle's region cannot be seen and besides Inle's environment is gradually changing to the state of deterioration. There are more active activities to conserve environment for sustainable of Inle Lake. If not, Inle Lake will be disappeared in future and the economic status in this region will be deficiency. Inle Lake is one of the significant heritages added with the traditional culture for Myanmar. So the total respondents are said 'Yes' for statement 1, 2, and 3. Moreover, respondents in water area and shore area answered affirmative because most of the water area of Inle Lake is polluted by pesticides and chemical fertilizers used for floating gardens. But 49% out of total respondents, especially in mountain areas did not recognize that the water is reaching in contamination. In addition of some of the factories are located in mountain regions and the waste disposal system is not systematically managed. Thus, the risk of human behaviors effected to the Inle Lake and environment.

Table (4.7) Awareness for Inle's Environmental Conservation Management

Sr.	Description	No. of Respondents		Percentage of respondents		Total
		Yes	No	Yes	No	
1.	Do you know the environmental impacts caused by using agro-chemical?	149	55	73	27	204
2.	Is the only fact of increasing hotels and resorts are causing water pollution and air pollution in Inle region?	77	127	38	62	204
3.	Is there any local management system for the environmental conservation of Inle lake?	119	85	58	42	204
4.	Do you have any desire for following the local management system?	134	70	66	34	204

Source: Survey Data (2019)

Table (4.7) expresses that awareness for Inle environmental conservation management. This table is constituted with 4 questionnaires for their awareness for environmental conservation in selected villages of Inle's region. Most of respondents answered that the over using of agro chemical can give impacts to the Inle's environment such as water pollution, soil and pollution. Moreover, it can effect to the people's health and lead to death. Respondents with 73% understand the disadvantages of using agro-chemical but they cannot deny for their economy. Over half the respondents with 62% out of total notice the pollutions is caused not only from the fact of increasing hotels and resorts in Inle areas. There are many other factors such as human behaviors and misusing and overwhelming of natural resources.

4.3.4 Awareness Levels

To measure the awareness level that it is important to understand how much attention to the changing environment around the surrounded villages. In this section, awareness levels are included 3 parts: low, medium and high. To complete measuring of the awareness levels, there are constituted with 8 questions described details in above table (4.6) and table (4.7). The aware levels are divided depending on the results of responding to the questions. The amount of relevant answers help to categorize the levels: if a resident can respond to suitable answer for 1 to 3 of is for low level, 4 to 5 for medium and 6 to 8 is for high.

Table (4.8) Awareness Levels

Sr.	Description	Awareness Level			Total
		Low	Medium	High	
1.	**Number of respondents**	0	45	159	204
2.	**Percentage of respondents**	0	22	78	100

Source: Survey Data (2019)

Table (4.8) shows that the two levels of percentage for the high and medium and there is no respondent in the low level. So, the surveyed results are continued to consider for high and medium knowledge (Awareness) level only related to environmental conservation. As there is no respondent at the low level, the environmental education awareness programs from variety of organizations such as NGO, INGO and CSO activities are already performed in almost all villages. The resident with no education has experiencing about the environmental conservation.

4.3.5 Perceptions of Local Residents for Environmental Conservation of Inle Lake

Perceptions are one type of information that should not be missed to consider for environmental conservation. Studies on the perception on local people can provide important insights into observations, understanding and interpretation of the social impacts and ecological outcomes of conservation; the legitimacy of conservation governance; the social acceptability of environmental management. Perception of those factors contributes to positive or local evaluations of conservation initiatives. It is positive perceptions, not just objective scientific evidence of effectiveness, that ultimately ensure the support of local constituents thus enabling the long-term success of conservation. In this section, there are two parts to determine the perceptions of local residents concerned with the environment conservation of Inle Lake. The results of the questions are described in the following tables.

(a) Perception of local residents for Human Behaviors on Environmental Conservation

The environment is one of the most important components for mankind. Interaction between humans and environment that occur continuously will affect human behaviors on the environment. Human attitudes and behavior will determine the condition of the environment. The way human treat their environment will have an impact on the quality of human life itself. Lack of human behaviors care on the environment is leading to cause global environment damage. Environmental preservation and conservation are the main challenging facing today; therefore, it is important to know the perception about human behaviors and practices on environment. The following table is described in detailed result.

Table (4.9) Perception for Human Behaviors on Environmental Conservation

Sr	Description	No. of Respondents		Percentage of Respondents		Total
		Yes	No	Yes	No	
1.	It is easy to change our behaviors not to affect our environment.	90	114	44	56	204
2.	It is beneficial activity if we only conserve our environment without any cooperation.	59	145	29	71	204
3.	It is so expensive for implementing environmental conservation behaviors for our village.	108	96	53	47	204
4.	There are no impacts in climate change caused by environmental degradation problems.	36	168	18	82	204
5.	We do not need to conserve our environment for current situation.	21	183	10	90	204
6.	Local people's use of the wetland is detrimental to the sustainability to aquatic life.	81	123	40	60	204
7.	Our environmental conservation behaviors can persuade others to have desire to participate in this activity.	79	125	39	61	204

Source: Survey Data (2019)

Table (4.9) shows that the results for the perception of human behaviors on environment. Firstly, 56 % of respondents is at the side of "No" for changing easily for the getting used to the habit or behavior of people in this region. Because there is the wetland region and also people live intertwined with nature for a long time. Besides it is very difficult to change the behaviors for the people who live in water for the aspects of waste disposal and usage the type of latrine. There is no management

for the waste disposal system and garbage system in the water area except the popular palaces for example Phaung Taw Oo pagoda areas. If government or some organization manages for the systems, it would be support to change easily. Only residents cannot change it effectively and efficiently and there are no long-term active activities. For the second statement, there is non-beneficial if only they serve to conserve environment without providing from any organization. The villagers have not sufficient budget for conserving the environment having the status of struggling for their daily meal. The deduction from their expression, most of the percentage (71%) stands for the contraction.

For the third statement, over the half out of total percentage agree to conserve the environment of the wetland region is so expensive. The most area is covered by water and the transportation is difficult from place to place without the supporting of motor boat driven. The price of oil and gas for the transportation (boat) is raised day by day. Subsequently, the people in this region have to work not only for their living but also for the transportation. Considering for the fourth description, the residents have already noticed the environmental changing and environmental degradation happening in their surroundings. The consequences of environmental changing can impact the weather of this region. Therefore, the perception of residents denied for that there is no impact in climate change by the environmental degradation. Strongly agree that there is significantly changing in weather afore said suffering from draught and a torrid summer. Thus, acknowledge for the environment is to conserve effectively and efficiently not to prolong for the upcoming generations. Nearly gross percentage (90%) stands for the statement that environmental conservation activities and management plan is the essential duty to carry out for all the citizens.

The perceptions for both of the statements are ended with the much percentage at the negative. There is no doubt the shrinking of Inle Lake is due to the deforestation and climate change. Around 60 % out of total is supported at the disagreement to the both of last statements. The utilization of nature resources by local residents is not much effected to the environment as the local residents unnoticed that the misusing and overusing of natural resources in addition to substitution and following the short-term perception affect not only the aquatic life but also the whole environment. And adding to there is the man-made disaster of deforestation through slash and burn agriculture practice, cutting trees for household and cottage industries usage and

draining wetland for agricultural purpose surrounding the lake areas. But the negative perception of the statement is much more than positive.

For the last, only one cannot attain achievement without unity. Some of small organizations were implemented for environment conservation of Inle's regions but there is no long-lasting organization to sustain the conservation activities. They were a lack of sufficient cooperation between agencies where responsibilities interact, with action often undertaken in isolation, with unintended results. It is not smooth to sustain Inle Lake with insecure ongoing funding for sufficient scale to implement recommendation effectively and continuously. If INGOs or NGOs is provided for conservation, it would be effective to cooperate and only long-term strategy is the most efficient way to conserve the environment. Another factor to consider to is that the residents are struggling for their livelihoods, no time and extra finance for the conservation. It also requires assistance to enable local people from the lake region to shift from unsustainable farming to employment in the rapidly growing tourism industry.

(b) Perception for Environmental Conservation Plan of Inle Lake

Conservation efforts by the local people are increasingly seemed as important with respect to the Inle Lake. Without local support, the long-term existence of conservation plan is not assured. Local people are unlikely to support for environmental conservation of Inle Lake if they have negative perceptions and attitudes towards them. The people need to be involved in every aspects of conservation from the planning right down to the stage of implementation. It is important to understand that local people's perceptions and attitudes toward the conservation plan for its sustainability. Just as the people need to participate wholeheartedly, they must prepared to make sacrifices where it will be necessary to prioritize the needs of the Lake, to give back to the Lake what rightfully once belonged to the lake.

Table (4.10) Perception of Local Residents for Environmental Conservation Plan of Inle Lake

Sr.	Description	No. of Respondents		Percentage of Respondents		Total
		Yes	No	Yes	No	
1.	Do you have desire to sustain the Inle Lake?	204	-	100	0	204
2.	To conserve and preserve environment, environmental education and awareness program should be provided.	191	13	94	6	204
3.	To conserve Inle's lake, reducing usage of chemical fertilizer is the most important factor to consider.	137	67	67	33	204
4.	Ongoing process of environmental conservation plan of Inle lake is the excellent.	39	165	19	81	204
5.	The community activities are beneficial ways for implementing of environmental conservation plan.	155	49	76	24	204
6.	Individual's responsibility and performance is also effective for environmental conservation of Inle Lake.	181	23	89	11	204
7.	If Inle Lake's conservation plan is accomplished successfully, the economy status of Inle's region would be improved than before.	164	40	80	20	204

Source: Survey Data (2019)

According to the table (4.10), the perceptions of all respondents are positive to sustain Inle Lake as their livelihood and economy is solely depending on the life Inle's Lake in adding to this region is the interaction of people and beautiful nature

surrounded by the mountains. Therefore, total percentage (100%) of residents has the desire to sustain Inle Lake. for the sustainability of Inle Lake, it is necessary to consider how to conserve and preserve environment of the lake. There is also needed to the awareness for implementation of the conservation plan. Environmental education and awareness program should be provided for environmental conservation of Inle Lake and nearly total percentage (94%) out of 100% is agreeable while the residents have positive perception for this statement. Floating garden agriculture is one of the significant feature of Inle Lake, is also famous for the traditional cuisine and fresh vegetables. One of the main incomes of Inn-thar is from the floating garden, mainly crop is tomatoes. However, the most concerning threats originate from the "traditional" activities: the 32 km^2 of intensive floating tomato farm use staggering amounts of chemical products, which pollute the water, harm the local fauna and generate a dramatic expansion of water hyacinth. In the last decade, Inle Lake is fresh water lake likewise convenient for not only external use but also drinking water. Now Inle Lake water is polluted by chemical utilization, industries and other man-made short-term perception behaviors furthermore inappropriate for the drinking purpose.

Over 67% of respondents have perception for reducing chemical fertilizers to develop conservation of Inle Lake. The rest 33% of respondents who are the farmers and mainly business on the floating gardens have negative point for this statement. For the third question, as per MoECAF's request to assist in formulating a comprehensive Long Term Restoration and Conservation Plan for the Restoration and Conservation of Inle Lake, UN-Habitat with financial support from the Norwegian Government, assisted the Ministry in organizing a National Workshop from the 24th to the 25th of August 2011, at the Forest Department, Nay Pyi Taw, on the formulation of a Long Term Restoration and Conservation Plan for a period from 10 to 15 years. In accordance with a resolution passed at the above National Workshop, and in consultative agreement with MoECAF, UN-Habitat commissioned a team of international experts to assist in formulating the Long Term Restoration and Conservation Plan. Maintenance clearing and degrading of rivers, streams, lakes, reservoirs need to be undertaken at regular intervals to ensure a sustained supply of water to maintain their storage capacity. But as these operations are costly, labor and equipment intensive, most countries had not been able to undertake them. Irresponsible utilization of water from the rivers and streams that feed water bodies such as lakes, and excessive use of the underground water resource, has resulted in the

loss or severe degradation of large inland lakes and seas around the world. Therefore, only 19% of respondents believe that ongoing process is effective and Inle's environment would be improved in future.

The community activities are the most important factor considered to improve the environment. Without the effort of the local community participation, the plan would not be implemented successfully even in the huge budget founded projects. Clearly intention can be seen that 76% of agreeable perception is supported at beneficial factor of providing community participation for the environmental conservation. Not only the local residents but also visitors have the responsibility to participate and cooperate in the implementation activities for environmental conservation of Inle Lake. For this statement, 89% of respondents agree at the positive perception. Although Inle Lake is a major tourism place in Myanmar, it also faces severe environmental threats which jeopardize the whole region's economic system. If the environment of Inle Lake's region is healthier, the economy of this region would be better as before. Most of the respondents with 80% is voted for conservation plan is necessary issue to explore in favor of noticing their economic status.

4.3.6 Perceptions Based on the Combination of Three Categories (Education, Awareness and Basic Service Availability)

This section is described about the perception of both statements based on the three categories which were already expressed with above different tables. The outcomes for the combination results would be interesting. There are 6 major outcomes results prepared for perceptions based on the high education level shown in detailed as the following tables. The 6 major outcomes are classified as (1) High-High-High level (2) High-High-Medium level (3) High-High-Low level (4) High-Medium-High level (5) High-Medium-Medium level and (6) High-High-Low level. All the described levels are mentioned for education-awareness and basic service availability counting from the left to right. By extraction, although the education is the supportive category, when less supportive level of basic services could affect in the perception of people to conserve the environment.

Table (4.11) Six Major Groups Based on the High Education Level

Sr.	Groups	Respondents	
		Number of Respondents	Percentage of Respondents
1.	H-H-H Level	16	20
2.	H-H-M Level	47	61
3.	H-H-L Level	2	3
4.	H-M-H Level	2	3
5.	H-M-M Level	6	8
6.	H-M-L Level	4	5
	Total	**77**	**100**

Source: Survey Data (2019)

The above table (4.11) is described about the 6 major outcomes results and percentage of the respondents based on the high education level. It means that 77 out of 204 respondents are at the high education level that representing from high school to graduate. Based on the high education level, awareness and basic services availability levels are followed from high to low without deficiency. By using the outcomes of total six-grouped levels, the analyzing was shown the following table.

Table (4.12) Perceptions based on Six Major Groups Levels (Education-Awareness-Basic Services)

Perceptions		H-H-H Level	H-H-M Level	H-H-L Level	H-M-H Level	H-M-M Level	H-M-L Level
Human behavior on environment	Supportive	16 (100%)	38 (81%)	-	2 (100%)	4 (67%)	1 (25%)
	Non-supportive	-	9 (19%)	2 (100%)	-	2 (33%)	3 (75%)
	Total	**16**	**47**	**2**	**2**	**6**	**6**
Environmental conservation plan	Supportive	16 (100%)	45 (96%)	-	2 (100%)	4 (67%)	1 (25%)
	Non-supportive	-	2 (4%)	2 (100%)	-	2 (33%)	3 (75%)
	Total	**16**	**47**	**2**	**2**	**6**	**4**

Source: Survey Data (2019)

By analyzing the results on the combination of 6 major classification levels, the outcome of H-H-H level is the best and most supportive perception out of any other classification levels with complete 100% supportive answers on both sides of perception. The total respondents of attaining three categories at high level are 16.The perceptions of respondents who accessed high level of three categories (Education-Awareness- Basic Services Availability) are supportive for the human behaviors on environment and have aggressive knowledge and understanding for conservation of Inle Lake. Thus, the perception of H-H-H is leading to the positive perception to support the conservation of Inle Lake by providing beneficial environmental behaviors.

Compare to the level of H-H-M and H-M-M of the supportive side, the percentage is just slightly different because the awareness is not much influenced. However, checking the consequences between H-H-M and H-H-L level, the percentage of the supportive side is significantly declined whereas the basic services availability is more influenced than the awareness level. To be sure that H-M-H level, there is also 100% supportive respond at both sides although the awareness level is downgraded. So the influence factor could be recognized in here is that the basic

service availability. Therefore, to promote the environmental conservation activities though high supportive perception, there's need to be improved for sufficient basic services availability which may directly in line with increase economic status of this region. The more improving the economy of every household in this region, the more educated people emerging with high awareness level would be expected and as consequence the environmental conservation activities also would be more effective and efficient.

4.4 Key Informal Interview Result

This study is accomplished by the authorized person who is implementing the part of environmental conservation activities for sustainability of Inle Lake. According to this person suggestions and recommendations, this interview was carried out by face-to-face interview method with 13 respondents. They all answered with genuine feeling from the start of the questionnaire by paying high attention to improve environmental condition and with full concentration of ending with the willingness to sustain one of the remarkable heritages of Shan State, called "Inle Lake". KIIs interview are mainly conducted upon the evaluation of environmental activities and performances and their effectiveness, evaluation upon multi-stake participation on environmental conservation of Inle Lake, the potential hurdles and satisfactory factors upon environmental conservation activities of Inle Lake. It can be examined that the interviewees come from different occupation and education background but remarkably they are the key persons fulfill with theoretical and practical knowledge concerning with the environmental conservation of Inle Lake.

Qualifications and Occupations of Interviewees

The qualifications of the interviewees are presented as the following table;

Table (4.13) Qualification of Interviewees

Sr.	Particular	No. of interviewee
1	M.B.B.S	3
2.	M.Sc (Forest)	1
3.	B.C.Tech (Hons)	1
4.	B.Ed	4
5.	B.A (English)	2
6.	B.Sc (Maths)	1
7.	High School	1
	Total	**13**

Source: Survey Data (2019)

Table (4.14) Occupation of Interviewees

Sr.	Occupation	No. of Interviewee
1.	Intha Ethics Affair Minister at Shan State	1
2.	Medical superintendent of Nyaung Shwe Hospital (Nyaung Shwe TMO)	1
3.	Staff Officer at Forestry Department	1
4.	Director at GIC	1
5	Principal	4
6.	Teacher at B.E.H.S	2
7.	C.E.O at Inle Rose waste disposal management	1
8.	Secretary of Heart of Inle organization	1
	Total	**13**

Source: Survey Data (2019)

Clearly, it can be seen that almost all the interviewees are well educated and Out of 13, 31% are principle, 15.3% are teachers and 7.7% of each interviewees are Medical superintendent of Nyaung Shwe Hospital (Nyaung Shwe TMO), Staff

Officer at Forestry Department, Director at GIC, C.E.O at Inle Rose waste disposal management, Secretary of Heart of Inle organization.

Inle Lake Environmental Conservation Activities and Performance by Key Persons

The Inle Lake Conservation Activities support the sustainable management of natural resources in the catchment area of Inle Lake. The commitment of the Government of Myanmar is longstanding since Inle Lake and its catchment area have been experiencing severe environmental and physical degradation for several decades due to several human, natural anthropogenic factors. To overcome this, Forest Department has been undertaking several conservation interventions in the lake and the watershed, focused mainly in soil erosion, watershed management and biodiversity and forest conservation.. The Ministry of Environmental Conservation and Forestry (MOECAF) developed the 'Action Plan for Environmental Conservation and Sustainable Management of Inle Lake', which commenced in 2010 and will continue 2025 in 5-year stages, aimed at conserving the Inle Lake ecosystem with the active participation of local communities and stakeholders, while maintaining the national cultural heritage and local livelihoods. Activities aim to restore the environment stability of Inle Lake with the improvement of the quality of life of local communities. The Activities Strategy is set up with the consultation of different stakeholders including authority concern and has a strategic coverage of Kalaw, Pindaya and Nyaung Shwe. All the activities are mainly designed to be implemented with partners such as local NGOs and CSOs. The 'Long- Term Restoration and Conservation Plan for Inle Lake' has developed by UN-habitats in 2012 with financial support of Norwegian Government, was aimed to undertake a comprehensive hydrological, ecological and social assessment involving Shan State level government department, NGOs, and related stakeholders and local communities.

Concerning with the environmental activities and performance, the Inle Ethnics Affairs Minister has special responsibility of Inle Lake. As preserving the water level as the main important factor for Inle Lake conservation, the water level of the lake has fallen and the water quality has also suffered due to the irresponsible use of chemical fertilizers, the clearing of forests and expansion of floating farms plus silting. Preserving water level is the first priority of Inle because it is the main water supplier for the Lawpita hydropower. To perverse water level, the mainly authorized

for Inle water surface area usually has made mentoring in building up 10 man-made small dams at the South part of Inle Lake. Also, he has provided cultivation machine for digging up the stream for the satisfaction of local communities when implementation of forest plantation plan. The government's holistic plan for the conservation and management of Inle Lake are to be long-term and ongoing processes, which would be an integrated approach focusing on biodiversity conservation, integrity of the lake environment and improvement of the livelihood of local communities. Recent months have been politicians working to draw up a new conservation law for Inle Lake. On the ground the minister said that 10 dollars entree fee charged to foreigner meanwhile 45% of entree fee is used for the development and sustainability of Inle Lake. And 2% of the entree fee is used to promote tourism sector and 2% to 3% is allowed to support local CSO.

As a medical official, the superintendent of Nyaung Shwe take part in KII interview and his experiences and evaluations are spoken up concerning with environmental conservation activities around Inle. As a responsible person, environmental sanitation (health education activities) in Nyaung Shwe Township is mainly conducted for the local community and also he has actively led in reducing plastic bags and increasing waste disposal and non-smoking area around Phaung Daw Oo Pagoda. As an initiator, planation plan is started around hospital environment and medical centers.

As a forest department, watershed plantation establishment and natural forest conservation are currently contributed. Out of 13, 7.7% of key person from forest department said that the department is doing watershed management activities. It can be seen that the following activities: checking small dams construction around Inle Lake, soil conservation, environmental education awareness within the community, and prevention of forest fire, reforestation and forest plantation around Inle Region.

As another key person, the director from the GIC said that their organization preserves the water source especially in hilly region. Also, the organization has made awareness activity such as forest with plantation while visiting the Pa-O villages under CBT project and stated that at least one tree must be planted by every visitor. Likewise, in CIPAR project under PNO, the objective is to preserve of traditional culture and to value and cherish the natural resources for next generation.

It can be examined that 46% of key interviewees are from the education background like teachers and school principals. As they come from education

background, they usually get in touch with students and young people. Mostly, it can be explored that teachers have provided education awareness and plantation around the school area. Waste disposal management system and sanitation are applying as an outside curriculum of social subject. They usually contribute that waste management services are especially to reduce plastic pollution. Embracing the recycle and reuse methods, they usually nurture the young people to be nature lovers.

As a heart of Inle Organization, the key person said that the organization preserves the water resource like spring and soil conservation and control sedimentation; (pay more attention for the preservation water resource areas). By Implementing many environmental conservation and preservation long term plan like plantation plan, environmental preservation awareness program, and youth empowerment program and manage ecology conducive for children rights, the organization is currently supporting and participating as one of the environmental conservation activists of Inle Lake.

Effectiveness of Environmental Conservation Activities for Improving Inle Lake's Environment

Concerning with the effectiveness matters, many conservation activities like plantation plans, awareness programs are founded as distinctive amount. For the better results many key persons gave their different opinions in improving Inle Lake's environment. According to the Minister of Ethnics Affairs, it would not be effective if the local residents are still using short-term perception and only residents cannot maintain the nature and environmental changing problems. The superintendent of Ngwng Shwe remarked that it would be effective if forest rehabilitation areas could be efficiently implemented. The staff officer at forest department gave the opinion that it would be better if all organizations could be incorporated together with only desire to improve Inle Lake's environment. 54% of interviewees remarked that the most percentage of environmental and weather conditions are mainly depended on the forest and plants and many activities need to be effective for improving Inle Lake's environment. And 15.3% of key persons said that only if waste management system covers all areas of Inle region effectively, it can be said that it is effective to some extent.

Satisfaction on participation for environmental conservation activities of Inle Lake

All the interviewees responded “yes” for this question, however, only their participation and implementation activities for developing Inle Lake’s environment could not be sufficiently to rehabilitate from degradation problems. There is also needed more supporting and more participation to recover the Inle’s environment in a short-term. The official from education sector, 54% of interviewees believe that when students that have an understanding of environmental issues grow up they are more likely to choose environmentally friendly income generation activities. The education program combined with the environmental education and conservation activities will in the long run alleviate the impact of human behaviors on the surrounding environment and create sustainable livelihood. The long term, it needs to be design possible strategic plans from conservation to preservation. There is also poor rules and regulations enforcement in conservation activities. Although officials have regulations, terms and conditions concerning with the fraud manners of the community, the punishment is under effective level. Specified rules and regulations are carrying out without impressive tasks cannot prevent forest burning for shifting cultivation. So, more strictly rules and regulations should be provided.

Needs to control environmental degradation problems

According to their concerned subjects, the key persons made different opinions and remarks to control environmental degradation problems. Generally, it is happening based upon the community faults, government’s weak regulations, less awareness programs and many more. According to the interviewee No.1, the Minister pointed out that strong rules and regulations enforcement are needed to be established to control human wrong manners. In the hills, demographic growth has transformed slash-burn fire agriculture into a more permanent type with heavier impacts in term of erosion. The lake is now under severe threats of siltation, especially the western part. Therefore, the whole community needs to provide responsibility and accountabilities on all possible environmental degradation problems like responsible citizens. Local communities and outsiders need to be prohibited strictly from setting and using fire around these areas. Hopefully, a new conservation law for the lake could be drawn up by the lawmakers and specifically aimed undertaking to alter the lake’s degradation trend could be implemented as soon as possible.

From the forest department view, the official said that sustaining poverty is very important. The multi-stakeholders need to promote environmental sanitation awareness programs. By forbidding shifting cultivation, it can be prevented from land wasting. Another way is to give support to the organic products. Out of 14, 31% of key persons said that controlling poverty and population density is one of the best ideas in controlling environmental degradation problems. When analyzing the deforestation problems, many people overuse the nature gifts only for the sake of their living and also poor education makes deforestation and degradation problems more. Need to provide them with the skills to develop small businesses that utilize local available materials such as producing organic tomato juices and jam. By having quality education, people have rational thinking on environmental conservation and can use the nature's product more effectively and efficiently. Providing more awareness program to reach sufficient knowledge level is also important. The teachers from Inn Dein Gone and Ywama villages said that the villagers who took part the awareness program and the training showed they had a better understanding of the importance of preserving the lake and also the cause of water pollution. And the trainers also stressed the impact of plastic bags in the environment and the importance of storing and disposing of trash properly and also they are difficult to persuade other people to follow up. The other 7.7% said that more education services and employment opportunities are needed to be supported and also more environmental education awareness program are needed to be made within the community around Inle Lake. Besides there was no institutional mechanism to monitor and generate important data that could serve as useful tools for effective implementation. Cooperating with effective technician for solving the current environmental problems is the beneficial prospect.

Table (4.15) Key Persons Perceptions on Multi-stakeholders Participation

Representative Number	Perceptions			
	Public participation	Government Supporting	NGO/INGO Supporting	Business people Supporting
(1)	Good	Fair	Good	Fair
(2)	Poor	Fair	Fair	Fair
(3)	Good	Good	Unaware	Unaware
(4)	Good	Fair	Good	Good
(5) and (6)	Fair	Fair	Fair	Unaware
(7)	Good	Good	Fair	Good
(8)	Fair	Poor	Fair	Poor

Source: Survey Data (2019)

According to the above table, many key persons described their perception level on the multi-stakeholders participation in environmental conservation of Inle Lake. In this regard, little or less supporting are regarded as poor, existing but sometime uncover are regarded as fair and distinct and somewhat efficient state can be assumed as good. The Minister remarked that public participation on environmental conservation nowadays is high. People are willing to conserve the environment more than before as they love Inle lake and gradually noticed that environmental problems happening around Inle Lake is most responsible by theirs .For the government support, it cannot be said that satisfactory level and many environmental conserved programs are still in project pipeline and also the business community's supporting is fair stage. The superintendent said that the public participation is relatively low and the other stakeholders' participations are acceptable amount and they are leading to the greater progress. The official from the forest department said that he did not notice the INGO supporting and business community supporting. The Director at GIC commented that overall multi-stakeholders supporting are acceptable to distinctive amount. Out of 13, 46.1% (6 key persons) have not decided that properly and people and government participation is reached to the fair stage. Prominently, the representative of the heart of Inle Organization remarked that people and INGO supporting were reaching to fair level but the only poor management of government and irresponsible manners of business community

are only founded in the conservation of Inle Region. As a consequence, even though a large number of UN agencies, NGOs and INGOs had been operating several internationally funded programmes, little was achieved to arrest the rate of degradation of the lake.

4.5.7 Expression of Difficulties on Implementing Environmental Conservation Activities

The Ethnic Affairs Minister remarked that the authorities usually face the difficultly to control expanded land for field cultivated with crops. Trespassing in forestry areas and extending housing areas is more worsen to implement the environmental conservation activities. As a heath care provider, public participation is relatively poor to cooperate together is the only remark. The officials from forest department commented that nature environmental deterioration is happened without conservation for a long time ago. Careless people and untighten government regulation were worsen the Inle Lake surrounding. Also its environment is intertwined with human and nature and it can be said that one of worsen situations happened in environmental degradation. The Director said that some activities can suffer the resident's business as they were earned their livelihood by forest and water related businesses. Adding that creating more livelihood opportunities would play an important role. Although they have the awareness related to environmental conservation, they cannot figure out in reality. Teachers and Principle assumed that public has insufficient awareness and knowledge. The representative from the heart of Inle Organization spoke that the residents' first priority is trying for living. Although environment awareness exists, to some extent, it cannot change the existing behaviors and habits of residents. The conservation awareness programme need to be set out like more pleasant environment guarantee the residents' income level than relying on selling nature' gifts.

To be summarized, the major role to conserve in Inle Lake's region is strongly indicated that in preservation of forest and water. Environment and weather conditions are highly dependent on the health of the forests. Environmental problems of Inle Lake are happening from the environmental degrading effect due to increased population as urbanization increases. Moreover, large scale of deforestation and shifting cultivation practices are also severely threatening the environmental stability

of the entire watershed area in Inle Lake. The surrounding hills have also been stripped bare of trees harvested for their firewood. The residents of hilly region are in lack of knowledge and poor basic service availability from the government. Deforestation and more intense agriculture on watershed areas have brought in increasing amount of silt and pesticide into the swallow lake. As a consequence, sedimentation and siltation has been seriously affecting the surface areas of the lake which leads to the decrease in total volume of the lake. Furthermore, with the increasing population, construction of houses in watershed areas consume a great deal amount of timber twice as much as in ordinary construction of houses on the land. And also the lake is still surrounded by hilly regions whereas the slush burn for shifting cultivation is one of the most important factors which lead to severe watershed deterioration. Most farmers and local residents have poor education and basic services availability level which may happen watershed deterioration and environmental degradation. Besides most of the poor families who are living in rural areas, use to get their regular income from soil and forest resources. Therefore, they invest their farms, lands and may use forests for their business and livelihood than the conservation of their environment. If government and partner agencies provide and assist sufficient basic services availability and employment opportunities in rural areas, environmental condition of Inle region would significantly be improved and more effective in conservation works. In addition, community participation will be stronger if government and partner agencies conducted for the raising of awareness for the environmental conservation on lake and to reduce poverty rate in rural areas by providing necessary basic services. As local residents could attain enough basic services and employment opportunities instead of overwhelm-suing the natural resources, they would be expected to consider for promoting of themselves and their children education. Also local people must know the consequences of deforestation, sedimentation, shifting cultivation, uncontrolled burning and poor soil management practice etc. Therefore, government and partner organizations should share the knowledge about environmental preservation techniques with local people. Better coordinated and collaborated afford among organizations could gain the effective ideas for the decreasing of pollution and the avoiding of overlapping projects and activities. And lastly but not least, the prohibition of the deforestation with strong rules and regulations should be highly enforced, so that carried out conservation

activities will effectively be sustained as improved areas of green forest and clean environment, water and promote sanitation and hygiene practices.

CHAPTER V
CONCLUSION

5.1 Findings

The study found that there are different practices of local residents' settlement in different locations. And also their awareness, behaviors and perceptions are fluctuated mainly depending on their educations level and availability of basic services. According to the study, education and basic service availability are the most important factors to support the positive attitude for environmental conservation of Inle Lake. To the finding, nearly 100% of respondents are accessed education facilities and health care services while only 4% of respondents are in difficult situation to be accessed. Most of the respondents are not accessed safety drinking water system although Inle's area is fresh water lake area. Complete of total respondents are difficult to carry out systematic waste management system and there is no supporting service and system to control waste pollution especially in water surface area. And also fly proof usage system is still difficult for over half of the respondents. Electricity is provided to be accessed for all villages while fuel consumption is steadily reduced. Most of respondent is existed the medium level of basic services availability (it means getting 3 to 4 services) as the villagers are not provided by sufficient services.

Obviously seen that total respondents have knowledge about the changing environment around Inle's region and noticed loss of biodiversity considering that there is necessary for conserving Inle's environment. Over half of the local residents have knowledge about environmental impact of agro-chemical utilization as far as desire to follow up local management system for environmental conservation. Respondents of 78% out of total are the high awareness level while medium level with 22% by using knowledge tested questions. Nearly total of residents have the positive perception for supporting environmental conservation activities but positive environmental behaviors cannot be carried out because of lack of budget and insufficient basic services. Combined analytical results revealed that even same level of residents' education but differences in having basic services availability may cause

poor knowledge and practices for conservation of environment and as a consequence negatively impact on environmental degradation problems. When the residents have insufficient basic services, they only rely on extreme using of natural resources (soil and forests etc.) for their livelihood and daily income. Because they only focus on getting income easily by using of natural resources as short-term perception without considering for long term vision of environmental preservation and conservation. Currently, they only concentrate for getting regularly income instead of promoting themselves and their children's education. As a consequence, they always intend to use natural resources for their main livelihood resulting in works such as deforestation, shifting cultivation, using excess amount of pesticide with the combined factors finally cause the degradation of environment in a short period of time.

This survey exactly shown that 77 out of 204 respondents are in high education level while 39 respondents have accessed to sufficient basic services. Only 2 respondents are supported by the two services efficiently. Studying about their perception for environmental conservation of Inle Lake and focusing only on the high education group with different level of basic services availability. The supportive result from the different levels states that their perception could be changed by the level of basic services availability. The awareness level consists of only two categories of medium and high whether the education of these respondents are high or low (Not much effective).

According to the perception results on the combination of the three classifications in chapter 4 states that if basic service availability levels are high; their perceptions are directly indicated for the supportive answers. When the comparison was conducted between two major groups H-H-H (Education-Awareness-Basic Service Availability) level and H-M-H Education-Awareness-Basic Service Availability) level, the outcome results are the same 100% for supportive answers of both sides stating that awareness levels does not affect perception. In reality, the villages having access to sufficient basic services availability are more develop than other villages with poor basic services. Besides more educated people are increasing in the villages with enough basic services. It means if the people could have enough basic services, their education will automatically be improved in progress of awareness and then the perceptions would become more positive. In support to my findings, the significant number of KII states that the main factor to control

environmental degradation problems is to reduce poverty by providing necessary basic services such as safety drinking water, waste disposal system, electricity accessibility and so on. They have also stated the need for higher educating facilities for every rural area with the addiction of instilling of traditional culture and teaching them to value and cherish nature resources for the next generation.

Most farmers and local residents have poor education and basic services availability level which may happen watershed deterioration and environmental degradation. Besides most of the poor families who are living in rural areas, use to get their regular income from soil and forest resources. Therefore, they invest their farms, lands and use forests for their business and livelihood than the conservation of their environment. If government and partner agencies provide sufficient basic services availability and employment opportunities in rural areas, environmental condition of Inle region would significantly be improved and more effective in conservation works. In addition, community participation will be stronger if government and partner agencies conducted for the raising of awareness for the environmental conservation on lake and to reduce poverty rate in rural areas by providing necessary basic services. It is evident that basic services and education are positively correlated to each other. Therefore, these two factors - basic services and education are major requirements to be fulfilled for supporting the positive perception on the implementation of the environmental conservation activities of Inle Lake.

5.2 Recommendation

This study also reviewed that many local residents are recognizing the changes of environmental condition around Inle lake and they already have desired to participate in the environmental conservation activities. However, some of villages especially in water and mountain areas are lack of safe drinking water and sanitation services like utilization of fly proof latrine. Therefore, even though they are asking for enough basic services in their villages, they are still willing to participate in conversation activities unless spending money for these services.

The first priority is to promote accessibility/availability of basic services efficiently, especially for those who are only relying on wood as fuel. Besides, there's need to provide more employment opportunities instead of burning forest to extend shifting cultivation and to sell woods for daily income by deforestation. In order to reduce the poverty by supporting enough basic services especially in hilly regions by

means of providing necessary resources (both technical and financial) to produce organic vegetables and fruits which may cut the use of chemicals and pesticides and after that water pollution could be gradually decreased. Encouraging and welcoming the providers, well-wishers and practitioners for implementing of organic plantation program to control sedimentation and soil erosion should also be done. Government should also establish stronger rules and regulation for deforestation, making forest fire and trespassing areas etc. Government body and other organizations are needed to do more cooperative and coordinated ways for better solutions e.g. an idea to construct road without cutting long-living trees, etc. The coordination work could also reduce the overlapping of projects in one area and further extended works could be covered for overall Inle Region. The community based organizations and CSOs should try to establish well-functioning mechanisms for improving the participation of private sectors, government departments and development partner organizations to have effective collaborative implementation of environmental conservation works for the sustainability of Inle Lake.

Second priority might be the supporting in the areas of access and quality of education for all people around Inle Lake. So that they may gain awareness gradually and have chance to do income activities and livelihood works which will not being totally relied on utilization of natural resources.

Lastly the third priority is conducting effective awareness raising activities to be implemented not only for environmental perseveration but also to value the importance of education for their future lives.

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APPENDIX (A)

Survey Questions

Dear Sir/Madam,

I am a current student of Master of Public Administration at Yangon University of Economics. I am doing the dissertation related to the environmental conservation for Inle Lake. If you do not mind, I would like to request your completely response and opinion for my dissertation. Thank you deeply for your time, consideration and supporting.

Best Regards,

Thet Htar Swe

MPA-II 24 (18^{th} Batch)

Yangon University of Economics

Part I

Please tick the chosen answer.

1. Gender
   - □ Male
   - □ Female
2. Age
   - □ Between 13 years and 22 years
   - □ Between 23 years and 32 years
   - □ Between 33 years and 42 years
   - □ 43 years and above
3. What is the level of education?
   - □ Monastery education
   - □ Primary school
   - □ Secondary school
   - □ High school
   - □ University and above
   - □ Other
4. What is your occupation?
   - □ Civil servant

- Company staff
- Farmer
- Business person
- Fisherman
- Handicraft
- Other

5. How many years do you live in this village?
   - Under 1 year
   - Between 1 and 2 years
   - Between 2 and 5 years
   - Between 5 and 10 years
   - Above 10 years

Part II

Basic Services Availability

6. How is the situation of schools and education services centers in your village?
   - Located within village
   - Easier to access
   - Difficult to access
   - None
7. How is the situation of hospitals and medical services centers in your village?
   - Located within village
   - Easier to access
   - Difficult to access
   - None
8. What is the main drinking water source used by households in this village?
   - Public tap/ stand pipe
   - Tube well/ borehole or pump
   - Protected hand dug well/spring/pond or rainwater (with lid)
   - River/ stream/ lake/ dam
   - Other (specify)
9. What is the main type of toilet facility used by household in this village?
   - Fly proof latrine
   - Open lit latrine
   - Latrine pipe is directed into the lake
   - No facilities (bush/ field /river/ stream or lake)
   - Others (specify)
10. How do households dispose of most of their garbage?

- Collected by garbage truck/ public dump
- Burnt/ buried
- Use for fertilizers
- Dumped in stream / lake
- No fixed place/dumped without burning or burying
- Others (specify)

11. What is the main source of cooking fuel used by household?
    - Electricity
    - Gas
    - Charcoal/ firewood substitute
    - Firewood
    - Others (specify)

Part III

Knowledge of Environmental Changing

12. Do you notice that the environmental changing around your village?
    - Yes
    - No
13. Do you notice that the loss of biodiversity in Inle region?
    - Yes
    - No
    -
14. Is there any necessary of environmental conservation activities for sustainable development Inle lake?
    - Yes
    - No
15. Are there any dwellings in the village surrounded by stagnant water?
    - Yes
    - No

Awareness of Environmental Conservation

16. Do you know the environmental impacts caused by using agro-chemical?
    - Yes
    - No
17. Is the only fact of increasing hotels and resorts are causing water contaminant and air pollution in Inle region?
    - Yes
    - No

18. Is there any local management system for the environmental conservation of Inle Lake?
    - Yes
    - No
19. Do you have any desire for following the local management system?
    - Yes
    - No

Part IV

Perceptions of Local Resident on Environmental Conservation of Inle Lake

20. Perceptions for Human Behaviors on Environment

Sr.	Perceptions	Yes	No
1.	It is easy to change our behaviors not to affect our environment.		
2.	It is beneficial activity if we only conserve our environment without any cooperation.		
3.	It is so expensive for implementing environmental conservation behaviors for our village.		
4.	There are no impacts in climate change caused by environmental degradation problems.		
5.	We do not need to conserve our environment for current situation.		
6.	Local people's use of the wetland is detrimental to the sustainability to aquatic life.		
7.	Our environmental conservation behaviors can persuade others to have desire to participate in this activity.		

21. Perception of Local Residents for Environmental Conservation Plan of Inle Lake

Sr	Perceptions	**Yes**	**No**
1.	Do you have desire to sustain the Inle Lake?		
2.	To conserve and preserve environment, environmental education and awareness program should be provided.		
3.	To conserve Inle's lake, reducing usage of chemical fertilizer is the most important factor to consider.		
4.	Ongoing process of environmental conservation plan of Inle lake is the excellent.		
5.	The community activities are beneficial ways for implementing of environmental conservation plan.		
6.	Individual's responsibility and performance is also effective for environmental conservation of Inle Lake.		
7.	If Inle Lake's conservation plan is accomplished successfully, the economy status of Inle's region would be improved than before.		

Informal Interview Questions

1. Education
2. Occupation
   (If you are a government staff, please describe your official position.)
3. Have you ever been involved in environmental conservation activities of Inle Lake? If yes, which kind of performance?
4. Do you think that the environmental conservation activities can be effective to improve Inle Lake's environment? Please mention thoroughly.
5. Are you satisfied in your participation for environmental conservation activities in Inle lake? If yes or no, why?
6. Why is it necessary to control the environmental degradation problems?

7. What is your perception on public participation in environmental conservation activities of Inle Lake? (Government supporting, CSO activities, NGO/INGO supporting, Business man)
8. Is there any difficulty when implementing environmental conservation of Inle Lake? If difficult, please state why? If not difficult, please state why?

APPENDIX B

Map showing the Inle Lake Conservation Area, Shan state, Myanmar