EXPLORING STATUS OF INDIGENOUS PRACTICES FOR SUSTAINABLE FOREST MANAGEMENT IN KALAMPADA VILLAGE, THANE, MAHARASHTRA, INDIA

By

VAIDYA PRAJAKTA KIRAN

September 2015

Thesis Presented to the Higher Degree Committee

Of Ritsumeikan Asia Pacific University

in Partial Fulfillment of the Requirements for the Degree of

Master of Science in International Cooperation Policy

ORIGINALITY OF CERTIFICATION

I, VAIDYA Prajakta Kiran, hereby declare that this thesis titled, “Exploring status of Indigenous Practices for Sustainable Forest Management in Kalampada village, Thane, Maharashtra, India” is my individual work and has not been submitted in any form for the award of another degree or diploma at any university or other institute of tertiary education. Information derived from the published and unpublished work of others has been cited or acknowledged appropriately.

ACKNOWLEDGEMENT

Firstly, I wish to thank my supervisor, Professor Dr. Francisco P. Fellizar, Jr, for his everlasting motivation, patience and encouragement. His support and invaluable insight enabled me to complete this thesis.

I would like to express my deepest gratitude to my mother, Dr. Sujata Vaidya, to whom I wish to dedicate this thesis. Her unending help and love throughout the study was of great emotional support. I wish to thank my father, Kiran Vaidya for providing me with the opportunity to fulfill my dreams of attending APU in Japan. To my sister, Sunayana Pathak and her husband, Nakul Pathak for their constant support and faith in me.

My deepest gratitude to the interview respondents, Mr. Abhay Joshi, Mr. Khemnar, Shahapur Baba and the Adivasi of the Kalampada Village for their invaluable time and patience to assist me throughout my research.

My sincere appreciation goes to my friends, in India and Japan, who have been very supportive throughout my studies. Shruti Bhattepatil, Shraavani Sistla, Vivek Kapoor, Adiba Muminova, Sarah Arshad, Barbara Escudero, Ananya Suresh, Abey Kainady, Karan Sathe, this journey would have been impossible without your constant love and support.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
ICSU	International Council for Science
IIPS	Institute for International Policy Studies
IK	Indigenous Knowledge
IKS	Indigenous knowledge systems
NGO	Non-Governmental Organization
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programmes
UNESCO	United Nations Educational Scientific and Cultural Organization
WB	World Bank

ABSTRACT

Traditional indigenous knowledge has become a popular subject of study for its inherent value and its contribution to forest sustainability around the world. Indigenous knowledge (IK) (also known as traditional knowledge) can be described as the wisdom, traditions, techniques and practices of indigenous people or local communities which they have followed for many generations.

In the past century, deforestation has been a major global issue. Endeavor to revive the forests has become a priority agenda globally. World authorities like UN, UNESCO, World Bank have encouraged forest restoration with various incentives for all nations. Numerous research programs have been put into force for sustainable forest management.

As defined by the United Nations, sustainable forest management (SFM) is a dynamic and evolving concept that aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations.

Across the world, studies are being conducted to understand the value and practical aspect of traditional practices followed by the indigenous people, who had been able to live in harmony with the surrounding forest, practicing long term sustainable forest management systems.

This research is a study of the traditional practices undertaken by the settled Adivasi of Kalampada village, Thane district of Maharashtra. The study explores and recommends the significance of reevaluation of current practices and possible benefits of using the traditional Adivasi practices in sustainable forest management.

It is a descriptive research which compiles information from interviews and personal observation as methods for data collection. This study is confined to the Kalampada Village. The interview respondents were chosen from the Kalampada Village and government officials who worked with the Adivasi.

The indigenous practices towards sustainable forest management by the Adivasi included symbiotic, deeply respectful, regenerative and humble techniques. Some of the techniques included collection of dry/dead wood (not cutting live trees), their semi-nomadic lifestyle that enforced using only as much was required, religious and social-cultural norms that promoted re-plantation and restricted entry to certain sections of the forests thereby preserving plant and animal life, belief in sacred trees and forest life, and recognizing the values derived from plants, trees and animals which led to their conservation. All these practices maintained and conserved the natural forests. Defaulters were severely punished thereby ensuring adherence to rules. Many of these practices are kept alive and are being revived by the Kalampada settled Adivasi, in their efforts towards SFM.

The study reinforced the prevalent understanding that tribal knowledge is not backward but is simple and holistic in nature. The tribal people with IKS have to be included in policy making and execution for a futuristic reforestation effort. The study also supports the notion that traditional practices as a part of indigenous knowledge systems has great value and needs to be a part of futuristic forest management and sustained environment. Indigenous knowledge along with today's modern information and technology has great potential in tackling global issues in sustainable and efficient ways.

CHAPTER 1

INTRODUCTION

1.1. Background of the study

Millions of people from around the world are entirely dependent on forests for their livelihood. 350 million people depend on forests for basic survival and income and about 1.2 billion people rely on agro forestry farming. It was estimated that approximately 60 million indigenous tribal people were almost entirely dependent on forests (World Bank, 2004).

Traditional indigenous knowledge has become a popular subject of study for its inherent value and its contribution to forest sustainability around the world. It is believed that wherever traditional indigenous knowledge is considered, there is a holistic benefit, especially in maintaining and protecting the natural resources and the environment. Indigenous knowledge possesses inbuilt systems that protect biodiversity and maintain healthy ecosystems.

India is a sub-tropical country in the Asian continent. India had an approximate 20.5 percent forest cover in 2001 as compared to 27 percent forest cover in 1965

(Negi, Forest Area of India). According to World Bank (2012) forest statistics show that efforts by the Government and private bodies had improved the forest cover to 23.1%.

India is rich in its natural resources, with forests comprising a large part of it. The forests range from tropical rainforests in the Andaman and Nicobar Islands and Western Ghats to the coniferous forests in the Himalayas. India is blessed with fertile green cover along the Ganga Plains and the hot Gobi Desert to the North-West. Indigenous Adivasi people of the Western Ghats have been a part of the forest and have successfully lived-in harmony with the forests for hundreds of years.

In India, the tribal indigenous people comprised of 461 ethnic groups recognized as Scheduled Tribes (Mikkelsen, 2014). The term ‘Adivasi’ refers to the nomadic tribal indigenous people living in various parts of India that were prominent in forest cover. Since independence in 1947 from British rule, the Indian Government took efforts to settle the nomadic and semi-nomadic Adivasi for their betterment.

The word ‘Adivasi’ implies *Adi*, original or coming from an olden time and *Vasi*, inhabitants or dweller. Commonly, Adivasi refers to the tribal people who

lived in and off the forests. The Adivasi people have an estimated population of 84.3 million in India. This comprised of about 8.2% of the total population. Many indigenous ethnic groups were not officially recognized. Including these, the number of indigenous tribes could have been as high as 635 (Mikkelsen, 2014).

For centuries the Adivasi tribes, who were semi-nomadic lived in the forest without damaging the forest reserves. They had self-sustaining practices and had minimal interaction with non-forest dwellers, rural and urban people.

Traditional indigenous methods have started attracting attention of various government and non-government agencies in the past decade. Traditional practices of the Adivasi are being considered as beneficial for sustainable forest management.

Traditional practices of the Adivasi cover an array of concerns such as agriculture, animal rearing, medicine, health care, natural resource management and biodiversity protection. This traditional knowledge can be of great value to modern concerns of environmental problems. Ancient practices did not create problems of deforestation, water cycle disturbances, and depletion of natural resources. Tribal knowledge can contribute to finding solutions to various diseases, forest sustenance techniques and cattle rearing. These can also help with

contributions to economic sustainable options, especially in the forest covered areas. These practices can be valued not only for their cultural purpose, but also for their contribution towards economic sustainability of the Adivasi. In most countries, authorities are evaluating the benefit of using traditional indigenous systems and practices for sustainable development.

Studies had been conducted across the world, where the importance of ancient traditional practices of the indigenous people proved its worth in sustainable forest management. The study conducted by the researcher is a study of traditional practices as followed by the Adivasi community in the Kalampada Village. This area possesses a moderately dense forest area in the Thane district, Maharashtra.

The choice of Kalampada Village was made due to its accessibility, and also as few of the settled Adivasi people were known to the researcher. Kalampada Village was a suitable example of settled Adivasi tribes, who still followed many traditional practices as their settlements were at the edge of forest area. Most of the Kalampada community is still dependent on forest produce for their sustenance. They also formed a good example of the impact of Government policies to revive forest cover and traditional practices. The study is a description of information gathered from

the Adivasi people about their views on the success of some policies and the failure of others.

The Kalampada Villagers have been interacting with the Government and Non-Governmental Organization (NGO) officials to improve their situations and were open to discussions to share their knowledge, experiences, views and efforts in forest management using techniques that had been prevalent in their Adivasi culture. This study supports the importance of ancient traditional knowledge and practices in sustainable forest management.

1.2 Assumptions of the Study

A few assumptions were made of the study area. These included:

i. Indigenous knowledge systems (IKS) exist and are still being practiced in forest management
ii. IKS is beneficial to forest management
iii. There are threats and opportunities for preserving IKS

1.3 Research Questions

This study primarily attempted to answer the question ‘What traditional practices as a part of indigenous knowledge are being used for forest management in the Kalampada Village?’

It further explored the following:

1) What traditional systems were practiced by the Adivasi for forest conservation in the past by their forefathers who were the semi-nomadic Adivasi?
2) What are the current practices?
3) What factors changed the traditional practices?
4) What do Adivasi of the Kalampada Village recommend to improve their current socioeconomic conditions?

1.4 Objectives of Research

i. Identify the traditional practices of indigenous people used for sustainable forest management in Kalampada Village, Thane, India.

ii. Describe the current state of ancient indigenous practices used in the Kalampada Village

iii. Identify factors affecting the community and problems faced by the Adivasi of Kalampada Village

iv. Identify and explore the suggestions by the settled Adivasi community of Kalampada Village, and the officials supporting their movement for improving the conditions using IKS.

1.5 Significance of the Research

Forest depletion is a global problem. There is a need to adopt all possible methods to restore forest cover and support communities' dependent on forests. There is a direct link between the Gross Domestic Product (GDP) and forest cover of any country, as majority of people depend directly and indirectly on forest

produce (World Bank, 2011). It has been claimed by numerous researches that ancient traditional indigenous practices are far more beneficial in maintaining a balanced local ecosystem and sustained forest management.

By including indigenous knowledge and practices in current forest management techniques, practical measures can be taken towards more efficient sustainable forest management. Traditional knowledge, practices and systems include tribal skills and teachings that sustained the well-being of local forests, biodiversity that includes plants, animals and natural ecosystem for generations.

The significance of this research is to assist policy makers and implementers in considering ancient traditional forest management techniques and practices of the Adivasi people towards economic stability and sustainable forest management in Maharashtra, India. Traditional practices are forest-friendly, do not depend on modern technology and relatively easy to implement.

1.6 Limitations of the Study

The region chosen for the study covered only one part of the Western Ghats of India. Traditional practices that formed the lifestyle of semi-nomadic

Adivasi have changed in modern times, where much of the Adivasi community has settled and adopted agriculture based life. The ancient traditional systems are preserved and practiced by very few Adivasi in modern times. Ancient traditional practices are still followed by few Adivasi clans that live in deep forests. These Adivasi living in deep forest areas were inaccessible to the researcher.

This study was confined to unstructured interviews and observations with the Adivasi of the Kalampada Village in Thane district, Maharashtra, India. Information was also obtained from three separate individual interviews that gave a better insight into the prevailing conditions of the settled Adivasi. This study described the benefits of ancient traditional practices and indigenous knowledge systems in the efforts towards sustainable forest management, in the revival of a harmonious ecosystem and forest management.

The study identifies traditional forest management methods which are still used in current times. The fieldwork indicated much more research needs to be done to explore the underlying causes of change and practical problems being faced by the Adivasi from a historic perspective. As quoted by the Director General of Police, Mr. Ajay Joshi (one of the respondents), who worked with the Adivasi of Thane district, ‘The policies regarding indigenous tribes are made in AC rooms

with no ground work experience'. Practical problems faced by the Adivasi challenge the theoretical decisions made by policy makers who had little experience of forest life.

The time spent with the community proved a limitation as much more information could have been collected with more time.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter includes the derived understanding of indigenous practices as a part of Indigenous Knowledge Systems, its importance to sustainable development, and an overview of sustainable forest management. It also contains the literature review of a few selected papers that explore similar topics from around the world on the value of traditional indigenous knowledge and practices, followed by the views of the researcher. Information derived from these various reports has its relevance to the study conducted in the Kalampada region in Maharashtra, India.

Indigenous knowledge can be described as knowledge gained from experience and observation, and refined to be adopted as beneficial processes that were practiced by numerous generations together by the people of a specific land area of a specific culture. The indigenous knowledge systems of the Adivasi were invariable simple, with deep respect to maintaining forest biodiversity, surrounding geographical terrain, local ecology and the need of the people with considerations

to long term benefits. Indigenous knowledge used by the Adivasi living in or off forest produce had maintained the green cover, biodiversity and used natural produce without harming the forest ecology.

Scientific research applied in one country cannot be entirely replicated in different regions of the world like technology. Each system applied for forest conservation needs to be customized for different regions around the world. The climate, soil, vegetation pattern, indigenous trees in any forest cover greatly varies in different regions. Policies made by local government for the management and conservation of forests, must take into consideration the unique local climate, soil and water conditions, flora-fauna that form a part of the local environment.

According to the United Nations Food and Agriculture Organization (FAO, 2005), an estimated 18 million acres (7.3 million hectares) of forest were lost each year. Circumstances that have driven a community towards deforestation depended on the changes in socioeconomic conditions, population growth, industrialization and governing leaders of that area. Conditions prevalent in Africa, North America, Far East, Australia or any other part in the world has distinct differences prevalent in the geographic terrain, and socioeconomic conditions of the people of that land. Implementation of forest management has a different approach in developed and

underdeveloped countries. Underdeveloped countries depended on forest produce for their economic sustainability.

One common feature that had risen from the numerous studies conducted across the world stated that indigenous people had protected the forests using traditional systems in sync with their terrain, especially protecting local plant and animal species; maintaining a balanced ecosystem, protection from encroachment of foreign species, land rotation for cultivation and resisted over-harvesting.

Traditional practices became a part of the culture and rituals, and were imparted through proactive participation between different generations (for example, father teaches son how to fish without harvesting small, young fish; what parts of plants could be used for food, medicine; protection from wild animals; overcoming diseases; for cultivation; and these were incorporated in cultural rituals). Cultural and religious practices included protecting the forest and forest products. Fearful punishments and strict law were a part of the rituals which protected the forests.

The importance and use of traditional indigenous knowledge has been recognized by many international bodies. The Rio Declaration, the Convention on Biological Diversity and documents submitted from the World Summit on

Sustainable Development, and other international instruments and forums have emphasized the current (and future) relevance of Indigenous Knowledge (Kothari, 2007). The World Intellectual Property Organization, the International Labor Organization, the Food and Agricultural Organization, the World Health Organization, UNESCO, UNEP, UNDP, the UN Commission on Human Rights have emphasized the importance of study and possible inclusion of traditional indigenous practices in sustainable forest management.

The World Conference on Science, organized by UNESCO and the International Councilor Science (ICSU), in its Declaration on Science and the Use of Scientific Knowledge, accepted the importance of indigenous knowledge and the need to respect and encourage its use for various forms of human activities (Nakashima, D., & Elias, D. (Eds.), 2002).

2.2 Understanding Indigenous Knowledge

Indigenous knowledge (IK) (also known as traditional knowledge (TK) and local knowledge) refers to the long-standing information, wisdom, traditions and practices of certain indigenous peoples or local communities (Kothari, 2007).

Traditional knowledge is a cumulative body of knowledge, know-how, practices and representations maintained and developed by people with extended histories of interaction with the natural environment. Indigenous knowledge systems form sophisticated sets of understandings, interpretations and meanings that form a part and parcel of a cultural complex that encompasses language, naming and classification systems, resource use practices, ritual, spirituality and worldview (Nakashima, D., & Elias, D. (Eds.), ICSU, 2002).

The Director General of United Nations Educational, Scientific and Cultural Organization, Federico Mayor (1994) gave the importance of indigenous people and their practices as (Nativescience.org):

"The indigenous people of the world possess an immense knowledge of their environments, based on centuries of living close to nature. Living in and from the richness and variety of complex ecosystems, they have an understanding of the properties of plants and animals, the functioning of ecosystems and the techniques for using and managing them that is particular and often detailed. In rural communities in developing countries, locally occurring species are relied on for many - sometimes all - foods, medicines, fuel, building materials and other

products. Equally, people's knowledge and perceptions of the environment, and their relationships with it, are often important elements of cultural identity."

Indigenous knowledge is what indigenous people know and what they have known and done for generations, with practices that evolved through trial and error and proved flexible enough to keep up with changing times (Melchias, 2001).

An example of indigenous knowledge is on the uses of the Neem tree (*Azadirachtaindica* or Margosa) native to India, Pakistan and Bangladesh. It has been known and has been used for generations for its detoxifying properties. It is used for improving liver functions, detoxifying the blood, balancing blood sugar levels and treating various skin diseases. This tree is considered to be sacred. The felling of Neem tree was considered taboo amongst the indigenous forest tribes and often resulted in the banishment of the guilty.

Forest biodiversity was protected under religious rituals. Many plants and animals were forbidden from being killed or from being removed from the forests. Local trees were protected from being cut unnecessarily, and cultural rituals included planting rare plants and trees, thereby protecting the ecological balance and maintaining a stable ecosystem. At the same time exotic animals or plants were discouraged from being grown or reared in their lands.

Traditional knowledge is expressed through symbolism in arts-and-craft as well as practices under religious, seasonal, ceremonial, regular and occasional events. Any kind of sustainability discussion (whether environmental, social or economic) always included the virtue of traditional knowledge. Local-level informal innovations of folk people had close relations with the ecosystem and were value oriented, community-centric and became a part of the cultural life (Gupta, 2011).

There are varied definitions of indigenous knowledge, but they all share a few common aspects. The features of indigenous knowledge adopted by the World Bank (Woytek, R., &Gorjestani, N., 1998) distinguished indigenous knowledge from other knowledge systems.

i. Indigenous knowledge is local. It is rooted in particular communities and linked to broad cultural traditions.

ii. Indigenous knowledge is a set of experiences generated by the people living in those communities.

iii. It is considered to be tacit or understood knowledge and hence not easily explainable.

iv. It is transmitted orally, through imitation or demonstration. It is often learned through repetition. Repetition is a defining characteristic of tradition, even when new knowledge is added. It aids in the preservation and reinforcement of the knowledge systems.

v. It is experimental rather than theoretical. It is formed through generations of trial and error.

World Bank further indicated that indigenous knowledge is dynamic in nature. The fundamentals of IKS of a region remained the same across generations. The practices underwent changes according to the local need and circumstances that were adapted by the people. Older indigenous practices were changed with the changing circumstances due to war, disease or governance and were sometimes hidden in folklore when not followed for a time span. The knowledge propagation followed an informal pattern, specifically bound to a particular area, orally taught through generations.

"Indigenous knowledge is the local knowledge – knowledge that is unique to a given culture or society. Indigenous knowledge contrasts with knowledge system generated by universities, research institutions and private firms. It is the

basis for local-level decision making in agriculture, health care, food preparation, education, natural resource management, and a host of other activities in rural communities" (Warren, 1991).

Indigenous knowledge was not written, but its values were recorded and preserved through songs, rituals, folklore, and practices down the generations. IK can be summed up as holistic, dynamic and adaptive in nature and closely related to the survival of the people who depend on it.

When these practices are put together they form an integrated knowledge system which helped local communities follow sustainable management techniques. It formed a set of rules which guided ethnic communities with their daily life through rituals. Different ethnic groups had their own individual systems of propagating their teaching from one generation to another. For example, this knowledge was used for self-protection during war times by using their surrounding environment.

Due to overpowering colonial regulations in most of the underdeveloped countries, indigenous knowledge systems weakened over the decades. In the quest for modernization and economic gains, many tribes were stripped of their lands and property rights by the governing body. The tribes were forced to follow the

invaders' rules and punished if they used their local teachings. This forced indigenous tribes to abandon their original teaching and thus the practical value was lost through the passage of time, only remembered as cultural rituals folklore and grandmother's tales.

The role of traditional indigenous knowledge is regarded as old-fashioned and outdated by a majority of the youth in current times. It was often neglected by environmental policy makers who failed to see its worth in development and forest restoration. Even if the knowledge was being used, it eliminated any credit to the people who had used the practices for generations. Indigenous knowledge is not as yet made a part of modern educational curriculum to encourage its value for the forthcoming generations.

2.3 Theoretical Support

2.3.1 *Theory of knowledge in indigenous traditions*

"*Sophisticated knowledge of the natural world is not confined to science. Human societies all across the globe have developed rich sets of experiences and explanations relating to the environments they live in. These 'other knowledge*

systems' are today often referred to as traditional ecological knowledge or indigenous or local knowledge. They encompass the sophisticated arrays of information, understandings and interpretations that guide human societies around the globe in their innumerable interactions with the natural milieu: in agriculture and animal husbandry; hunting, fishing and gathering; struggles against disease and injury; naming and explanation of natural phenomena; and strategies to cope with fluctuating environments." (Nakashima, D., Prott, L., & Bridgewater, P., 2000)

This theory emphasizes on the importance of ancient traditional practices. It values the basic understanding of local environment which includes soil, terrain, and climatic patterns.

Tribal people followed practices based on experience and inherent conditions for many generations. Although these practices were not recorded in a written manner, they were passed on orally, or through practices, rituals and folklore for generations. Their practices were based on profound knowledge that had prevailed, and proved sustainable for the forests. Modern studies on ancient traditional practices have shown that the practices of the tribal forest dwellers were

useful. Many of the modern scientific studies can be greatly benefited in practical implementation using traditional knowledge.

2.3.2 *Indigenous Wholistic theory*

Indigenous theory is rooted intimately within Indigenous knowledge, perspectives, cultures and traditions. Indigenous wholistic theory is holistic and multi-layered, which encompasses the spiritual, emotional, mental and physical elements of being (Absolon, K., 2010). It considers the past, present and the future.

Indigenous wholism theory is based on the teachings of the natural elements such as the land, sun, water, sky and all of creation. It is an ancestral concept to indigenous people. Indigenous wholism emphasizes on the phrase of ‘we are all connected’. It considered these connections and perceived each feature in relation to the whole. The dynamics of realities of the tribal were created because of the relationships and experiences of the interconnections in nature (Absolon, K., 2010).

Traditional indigenous practices as followed by the forest dwellers were and in many instances still are considered outdated and unscientific.

Contrary to this statement, it has been established in numerous studies undertaken across the world that traditional practices have proved far more beneficial as they take into consideration the ecology, climate, and long term sustainability goals and was scientific in their approach. These practices offered a well-balanced lifestyle for the tribal people. Older practices did not consider immediate economic gain that has been an approach in modern forest management policies.

Indigenous practices were not focused on one resource alone. They considered the entire environment as a connected entity. Tribal practices derived benefits from multiple resources and included the long term sustainability of the forest produce. This ‘wholistic’ perspective ensured the sustainability of all the natural resources that were available to them. Traditional indigenous knowledge and practices need to be considered as a priority in sustainable forest management.

2.4 Sustainable Development and Indigenous Knowledge

There are many definitions of Sustainable Development. The most commonly used definition is from the World Commission on Environment and Development, stated in 1987. The Brundtland Commission introduced the concept of sustainable development in its report 'Brundtland Commission Report'. It identified Sustainable Development as "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." It explained that social, economic and environmental progresses are attainable within the limits of earth's natural resources (World Commission on Environment & Development, 1987).

Sustainable development involves ensuring the success of goals like, rise in real income, increase in educational standard and health facilities of the nation and in the advancement of the general quality of life (Pearce, Makandia & Barbier, 1989).

Sustainability could be classified into four categories, namely environmental sustainability, economic sustainability, socio-political sustainability and cultural sustainability. Economic sustainability includes services, household

needs, industrial growth, agricultural growth and efficient use of labor and energy. Social sustainability covers equity, participation, empowerment and social mobility. Environmental sustainability included biodiversity, natural resources, carrying capacity and ecosystem integrity. Cultural preservation formed its own branch as traditional cultural practices that were being lost in recent years, forming the fourth pillar of sustainable development.

In current times, many of the developing countries are facing issues of sustainability due to external social or religious war, terror attacks, poor governance, economic poverty, drought and famine.

Many of the sustainability objectives (economic, social and environmental) seem to conflict with each other in the short term. For example, people may desire fresh air to breathe, but at the same time want a pollution creating car. Responsible use of natural resources can ensure that there are resources available for sustained industrial growth in the long term.

"*No single approach to 'sustainable development' or framework is consistently useful, given the variety of scales inherent in different conservation programs and different types of societies and institutional structures*" (Heinen, 1994).

Sustainable development is the need of the world. The economic policies and decisions taken in the past few generations affect us today. Likewise the decisions we take today will affect the future generation. Sustainable development is concerned with the development of a society in which the costs of development does not transfer to future generations, or attempts to compensate for such costs (Pearce, D., & Atkinson, G., 2002).

Indigenous knowledge has provided the basis for problem-solving strategies for local communities, especially the poor and underdeveloped nations (World Bank, 1998). It has been considered as an important part for global development. The study of traditional indigenous knowledge that a local community possess can be used to improve local conditions and many instances improve modern techniques used towards development for optimal results.

Indigenous knowledge is not commonly used in current management practices. Adopting practices based on IK in the local setting can help improve the sustainability and be considered to assess development that is eco-friendly. Sharing indigenous knowledge between and amongst various communities can help enhance cross-cultural understanding and promote the cultural dimension of development (World Bank, 1998).

In Agenda 21 (Robinson, 1993), the Program of Action for Sustainable Development adopted by UNCED in Rio in 1992 contained a series of recommendations about the relevance of traditional knowledge to the implementation of sustainable development policies and programs. These recommendations addressed various sustainable development issues like human health, land resources, deforestation, desertification and drought, sustainable agriculture and rural development, marine resources, freshwater resources, the role of farmers, the role of science, education, public awareness and information, and information for decision-making (Agenda 21, United Nations University).

"*Indigenous people and their communities have had a historical relationship with their lands and are generally descendants of the original inhabitants of such lands. The term 'land' is described as the environment of the areas which the people concerned traditionally occupy. The Indigenous communities comprise of a significant percentage of the total global population. They have developed over many generations a holistic traditional scientific knowledge of their lands, natural resources and environment. Indigenous people and their communities should enjoy the full measures of human rights and fundamental freedom without hindrance or discrimination. Their ability to*

participate in sustainable development plans had been limited due to economic, social and historical factors. In view of the interrelationship between the natural environment and its sustainable development and the cultural, social, economic and physical well-being of indigenous people, national and international efforts to implement environmentally sound and sustainable development should be recognized, accommodated, promoted and used to strengthen the role of indigenous people and their communities"

(United Nations Environmental Programme, Recognizing and strengthening the role of indigenous people and their communities**)**

The objectives and goals declared by the Agenda included:

a) "Establishment of a process to empower indigenous people and their communities through measures that include:

i. Adoption or strengthening of appropriate policies and/or legal instruments at the national level;

ii. Recognition that the lands of indigenous people and their communities should be protected from activities that are environmentally unsound or that the indigenous people concerned consider being socially and culturally inappropriate;

iii. Recognition of their values, traditional knowledge and resource management practices with a view to promoting environmentally sound and sustainable development;

iv. Recognition of traditional and direct dependence on renewable resources and ecosystems;

v. Development and strengthening of national dispute-resolution arrangements in relation to settlement of land and resource-management concerns;

vi. Support for alternative environmentally sound means of production to ensure a range of choices on how to improve their quality of life;

vii. Enhancement of capacity-building for indigenous communities, based on the adaptation and exchange of traditional experience, knowledge and resource-management practices, to ensure their sustainable development;

b) Establishment, where appropriate, of arrangements to strengthen the active participation of indigenous people and their communities in the national formulation of policies, laws and programs relating to resource management and other development processes that may affect them, and their initiation of proposals for such policies and programs;

c) Involvement of indigenous people and their communities at the national and local levels in resource management and conservation strategies and other relevant programs established to support and review sustainable development strategies, such as those suggested in other program areas of Agenda 21."

Agenda 21 had not been implemented to the advantage and satisfaction of indigenous peoples (Tauli-Corpuz, 2006). It was stated that in many areas and situations, the conditions had worsened due to conflict in understanding and implementation of Agenda 21 between the government executes and local indigenous people. The ongoing conflicts revolved around allocation of land and their resources, were examples that people assigned by the government were not familiar with indigenous situations, so failed to implement what they had signed at the Rio convention. Competition still continued over the control of the depleting resources of the world. Indigenous peoples who had protected these resources were not given instruments to continue their roles as guardians of the forests. Tauli-Corpuz also stated that from the Indigenous people's perspective, the major weakness of the Rio documents was that they operated within the framework of the dominant development paradigm, which regarded economic growth through more

competitive and liberalized markets as the way to development. UNCED was supposed to be about looking for the balance between economic growth and environmental sustainability, not about questioning the economic growth model as the main reason for environmental degradation.

Unfortunately, indigenous knowledge is not yet fully utilized in developmental processes. Standard belief implied that development usually requires technological transfer from locations that are considered more advanced. This has been one of the major causes for overlooking indigenous knowledge as a potential method towards the attainment of sustainable development (Sathaye. J et al., 2007)

From the perspective of the social-cultural domain, information about nature and how to conduct eco-friendly practices existed in the indigenous knowledge systems. Indigenous knowledge had been useful for responding to environmental challenges. The transfer of knowledge and practices has been rooted in the culture of the indigenous people across the world. This is through folklore, rituals, and ceremonies and cultural that affected all members' right from birth, initiation into adulthood, marriage, death and as an important part of all social

gathering. Such knowledge that supported sustainable forest management existed in their belief system and formed their moral values.

Traditional and indigenous people have valuable lessons to offer about successful and unsuccessful adaptations to change, lessons which could be vital in the context of global change (Macchi, M., & Oviedo, G., 2008). They used natural resources without exploiting them. This was looked on as less-profitable by many market oriented economies. Most economies opt for maximizing their profits without much regard to the environment. When indigenous practices were considered for economic development, they were assumed to be outdated, time consuming and not financially beneficial for short term. Actually, these IK based practices are extremely helpful to the environment and other sustainable activities. They tackled the problems of the environment through nature's natural regeneration cycles.

"*Traditional knowledge has no longer been viewed as part of a romantic past, as the major obstacle to development, as a necessary starting point, and as a critical component of a cultural alternative to modernization*" (Norgaard, 1984).The main strength of traditional practices for sustainable development is

because they have grown in close contact with specific cultural and environmental conditions (Zwahlen, 1996).

Traditional knowledge in current times may not always guarantee sustainability. For example, slash-and-burn technique used in many mountainous regions in current times has proved to be harmful if sufficient time is not given to regenerate the forests. Indigenous knowledge should be considered by the scientific and economic community along with modern technology towards sustainable development.

2.5 The role of Indigenous Knowledge in Sustainable Forest Management

2.5.1 *Forests*

Forest plays an important role for all life on Earth. The production and consumption of wood products, non-wood forest products and forest service meet food, energy, shelter and health needs, as well as generate income (State of the World Forest, 2014). Forests play a significant role in the lives of people. A few statistical data provided in the State of the World Forests (2014) mention:

1) The formal forest sector employed around 13.2 million people across the world and at least another 41 million are employed in the informal sector.
2) Wood energy is sometimes the only source of energy in rural areas of less developed countries and is particularly important for poor people.
3) Forest products make a significant contribution to shelter at least 1.3 billion people, or 18 percent of the world's population.
4) A major contribution of forests to food security and health is the provision of wood fuel to cook and sterilize water.

Forests form natural, complex ecosystems, made up of a variety of trees, plants, animals, insects and birds that form a balanced biodiversity. Forest ecosystems include the soils, water bodies, flora and fauna and influence the atmosphere around them. It was estimated that two-third of the world's forest is currently distributed among 10 countries (International Union for Conservation of Nature).

Forests play an important role in climate change mitigation, water cycle, trapping and storage of carbon and provide oxygen. Forests nurture a great variety

of plant and animal species. Yet, at the same time, the destruction of forests sends six billion tons of carbon into the atmosphere (FAO). To preserve and manage forests, there is a need for sustainable forest management.

Forests and people have a complex relationship. There is a strong dependency on forests for getting clean air to breathe, food and water, fuel, shade and shelter, and for economic gain. Human inhabitants started clearing forest land for agriculture. Large scale agricultural conversion had a tremendous effect on communities dependent on forests.

Deforestation led to the destruction of critical stock of fuel, fodder, food and building materials. The modern man is now exploiting these resources for short term economic gain without proper sustainable forest management creating irreversible damages.

"*More than 1.6 billion people around the world depend to varying degrees on forests for their livelihoods – not just for food, but also for fuel, livestock grazing and medicine. Of these, an estimated 350 million people live within or close to forests, largely dependent on these areas for subsistence and income; while an estimated range of 60 million to 200 million indigenous people are almost wholly dependent on forests*" (World Bank, 2002)

Deforestation occurs mainly due to conversion of forest cover to agricultural lands, felling of trees by logging companies, destruction of forest covers by mining companies. Many state and government projects have encroached into forest areas, damaging forest cover.

It became difficult for indigenous tribes dependent on forest produce to survive and they gradually settled outside the forest area. Short sighted policies made by many governments and authoritative institutes failed to sustain the forest cover of the past. Their policies were unsupportive to the traditional indigenous knowledge.

Indigenous knowledge and indigenous people are of immense and potentially valuable resource to improve national forest management (Lammerink, 2007). The challenge remains in ways to merge indigenous knowledge with formal modern knowledge related to forest sustainability.

Tribal people, who earlier lived in forest area, now have been allotted lands, or have been forced to migrate to other lands or cities in search of livelihoods. Since they are unskilled in modern technology, they remained unemployed, becoming a burden in the urban population.

Uncontrolled removal of forests for self-sustenance became a mean of livelihood for many of the tribal. At the same time, outsiders to forest areas found an easy and legitimate reason of tree felling and removal of rare plants and animals from the forests, causing an almost irreversible damage to forest cover. This reduced forest cover indirectly affected the entire local community. The erosion of natural and biological resources goes hand in hand with disappearing traditional knowledge and diminishing cultural diversity (Lammerink, 2007).

Modern science and technology has made it possible to produce various products of daily life, comfort and leisure faster and more efficient on larger scales to meet the growing demands of people. For the greed of economic growth natural habitats were destroyed. There was an ever increase in waste, garbage and pollution.

2.5.2 *Sustainable Forest Management*

Sustainable Forest Management is defined by the General Assembly of the United Nations (2007) as:

Sustainable forest management as a dynamic and evolving concept aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations.

The criteria of sustainable forest management are characterized by seven elements by the Food and Agriculture Organization of the United Nations:

(i) Extent of forest resources- It includes the goal of maintaining adequate forest to support the social, economic and environmental objectives related to forests and forestry within a country or region.

(ii) Forest biological diversity- It allows species to evolve and dynamically adapt to changing environmental conditions, to maintain the potential for tree breeding and improvement and to support their ecosystem functions

(iii) Forest health and vitality-This criteria describes how Abiotic and Biotic factors affect forest health and vitality

(iv) Productive functions of forest resources- Forests provide various wood and non-wood products. It indicates the economic and social utility of forest resources to national economies and forest-dependent local communities.

(v) Protective functions of forest resources- This criteria describe the protective functions of the forests that include the prevention and mitigation of erosion and loss of soil, the preservation of drinking water resources, the stabilization of stream banks or sand dunes, and the reduction of noise pollution.

(vi) Socioeconomic functions of forests – Forests provide benefits ranging from quantified economic values associated with forest produce to less tangible services and contributions to society.

(vii) Legal, policy and institutional framework- The national legal, policy and institutional framework related to forests constitutes the fundamental basis for sustainable forest management.

(Food and Agriculture Organization of the United Nations, 2010)

Forest and forest produce have contributed to people's livelihoods, generated income and employment. It is vital to follow practices towards sustainable forest

management. These include protection of trees and plants, birds and animals belonging to the forests, forest and forest resources, efforts towards a-forestation to revive forest resources, minimizing the damage to wildlife and the natural biodiversity. For example, saplings of indigenous trees and plants were planted where old trees may have been cut down.

Forests have natural biodiversity and become the key to protect different life forms. Many forests are rich in plant varieties and provide plants with medicinal value, economic value and habitat for indigenous species that depend on them. A rich forest cover helps maintain the water cycle and provides oxygen, thereby supporting the natural environment.

Indigenous people and communities living in forests and depending on the forest for subsistence number around 600 million people worldwide (Salim and Ullsten, 1999). Indigenous people of many countries are completely dependent on forest and forest resources for their survival. Forests are of aesthetic and spiritual importance to them. Deforestation continues at an alarming high rate- around 13 million hectares per year (FAO, 2005).

2.5.3 *Indigenous Knowledge and Sustainable Forest Management*

The people living in forest areas over generations have built a special bond with the forest, plants, and animals and lived in harmony within these forests. The systems and rituals they developed included practices that ensured protection of the forest and all its inhabitants and at the same time, living comfortably off the forest produce forming the first basis of traditional indigenous knowledge for sustained forest management.

Indigenous knowledge of various cultures around the world includes a vast complex science and philosophy that is still under study in modern times. Traditional practices of the forest dwellers around the world were not formally recorded, but preserved in rituals and became a part of the culture, history and personality of that tribe.

The indigenous people of the forests, though not formally educated were aware of climate changes, the food value of various plant and animal species, using specific herbs or plants to combat disease and developed useful crafts from local plants. The tribes collected specific forest produce for trading with the outsiders or buying products to support their lives. For example, in India, collection of dried and dead wood was exchanged for salt and clothes. No living trees were cut and proved

to be a viable practice for sustainable forest management. The practice was nurtured over generations, and has been an essential tool for living off land produce without damaging the natural biodiversity.

Each community around the world developed practices that were designed to the local terrain. Living in dense forests or deserts became viable when these traditional practices were followed.

With respect to the study area of Kalampada, IKS included practices to support the lifestyles in moderately dense forest situations. These forests are home to many rare species of plants and animals. The forests catered to all the daily needs of the inhabitants and it was in tribal people's interest to protect the forest produce for sustained lives of future generations. An important aspect of the traditions followed by the Adivasi people is the deep respect for natural biodiversity and practices that protected young plant and animal life, ensuring availability for future generations and of minimizing any damage caused in harvesting by enforcing plant and animal protection. The sustainability of forest produce is seen in their daily lives which have simple values of living in harmony with their surroundings; their attitude to use only as much as is required, leading to conservation of forests.

2.6 Examples of Indigenous Knowledge practices

Nature has always fulfilled the needs of people. Food, shelter, clothing, culture, lifestyle of the local communities was based on natural surroundings. People derived medicines, livelihoods, household implements, farming, and ornaments from the forests that were in harmony with the local natural conditions.

Each indigenous clan had set of unique practices used to conserve forests, or for agricultural methods which were well preserved within the culture of the tribe. For example, some tribes developed skills of combining different herbs or leaves to produce dyes for cloth; of using specific tree bark to be converted into papyrus that could record pictorial parts of their culture; of developing techniques to harness metal to make simple tools and different jewelry, of carving wood and stone for different objects.

Traditional indigenous knowledge has assisted the communities to become self-sufficient in terms of food, clothing, health, entertainment and protection. While using the local resources for their personal gain, the ancient people had also learned to preserve the natural resources that ensured regeneration of vegetation and habitat.

The world has realized that indigenous communities with their traditional knowledge have developed systems which preserved ecology in all ways and also support their local lives. Indigenous knowledge has proved useful in every sector of the daily lives of people, namely, agriculture, medicine, forestry, fishery, health and storage of drinking water.

An example of indigenous practices is reviewed:

2.6.1 *Altiplano Community, Peru*

The WaruWaru restoration plan was a rural development initiative for the Altiplano community. It aimed to recover the practices invented by the Tiahuanaco culture. The system had made it possible to bring into production the low-lying, flood prone and poorly drained lands found all over the Altiplano(Ho, 2002).

Restoration of the *waruwaru* practices had demonstrated the potential of traditional knowledge in sustainable crop harvesting. As marginal lands were being reclaimed, the indigenous practices had proved to be effective for improving soil conditions.

The practice made it possible to use lands that were previously impractical. The fallow, low-lying and flood-prone lands of the Altiplano recovered their value

and became a resource for communities that had suffered from poverty and land shortage. The *waruwaru* system provided poor farmers with greater harvest security and reduced the risks associated with natural calamities such as famine and drought.

It is seen that the revival of ancient practices is beneficial to the rural communities. Indigenous knowledge had helped revive fallow land and also ensured economic sources for the Altiplano community.

2.7 Case studies of Indigenous Knowledge in Sustainable Forest Management

2.7.1 *Aka tribe, India*

The role of indigenous knowledge systems for the conservation of forest resources, which included plants, animals and sacred groves, is of great importance to the Aka tribes (Nimachow, G., Joshi, R. C., & Dai, O., 2011). The Akas are a small tribal group inhabiting Arunachal Pradesh which is the north-east sub-Himalayan regions of India.

The traditional knowledge of the Aka tribe included the practice of the traditional jhum or shifting cultivation. Their culture had a deep respect for all

plants and animals. They did not cut down certain species of plants and animals and also left the pregnant and immature animals. Only those plant parts which are required were collected, that too in small quantities. This ensured the protection of plants and animals and also promoted sustainable forest management.

Conservation of forest resources was not a new concept for the tribal people. Their culture, faith and beliefs include protection of the sacred groves, from which removing plants and animals were considered taboo.

The tribes were connected to the forests for their livelihood. This included their diet, which consisted of vegetables, fruits and nuts gathered from the forest. Forest material was used for construction, utensils, and hunting, fishing and food-gathering implements.

Their traditional rituals and beliefs indirectly helped them conserve forests. Sacred groves were considered as a home to the gods, and left untouched. It was believed that any interference would lead to the death of the person. This belief protected the area and kept it free from human interference, ensuring the protection of the groves.

The Akas conserved their fish by practicing traditional techniques such as netting, use of bamboo traps and the use of bait, which were less accurate. They

spared the small fish, ensuring the supply for future generations. Chemicals and blasting was strictly prohibited in areas of water reserves.

The inbuilt mechanism in their social and cultural systems was targeted at sustainability and conservation of the forest. It restricted the over-exploitation of any forest produce. There are many myths, songs, folktales and proverbs regarding the creation and existence of forest resources. Their culture entirely revolved around the protection of the forests.

Information derived from the study of this tribe, highlights the need to re-evaluate traditional knowledge and practices that deeply respected forests and forest produce with equal emphasis on protection and propagation of forest plant and animal life. Traditional knowledge allowed the local Aka tribe to extract all livelihood material (food, clothing, housing, etc.) without damaging or depleting the forest. They had a futuristic culture.

It can further be noted that changes in forest cover and the depletion of natural resources were done by outside contractors involved in timber and forest resource exploitation.

2.7.2 *Dayak people, Borneo, Indonesia*

The Dayak are the indigenous community living in the Kalimantan area of the Borneo Island. They have their own traditions and practices for the sustainable use of forest resources (Dhiaulhaq, 2011).

The potentials of the practices of the Dayak people for promoting sustainable forest management in Kalimantan, Indonesia was explored. The researcher has also identified the traditions and practices used for sustainable forest management.

The indigenous practices followed by the Dayak people included the system of Tana Ulen or protected sites. Some of the practices included restricting access and extraction of natural resources that was prohibited except when permission from the leader was authorized. These permissions were usually limited to the collection of food or flowers for traditional rituals and celebrations. The restricted sites included forest groves, primary forests, and funeral sites.

Other practices included prohibition of cutting small trees, encouragement to develop forest gardens, where mixed fruit forests were grown. A variety of trees, crops and herbs were also grown in such forest gardens that had economic (fruit

trees, honey trees, rattan, medicinal plants) value. These forest gardens also provided food, firewood, medicinal plants for the Dayak themselves.

Similar to other case studies of indigenous tribal people, the Dayak also faced marginalization by the Indonesian government. Their practices were ignored and regarded as old fashioned by the Indonesian government.

In another part of Borneo, a sub-group of the Dayak community called Dayak Kenha people lived in the Setulung Village, near the Malay-Indonesian border of the Island. The Oma'lung tribe in the Setulang Community had made efforts to save the forests from deforestation.

They followed the traditional practice of restricting access to the forest and its resources. They also practiced shifting cultivation and agro-forestry which benefited humans and animals. These tribes relied on the income generated from farming and forest products. They never destroyed the forest lands for farming purposes.

The Oma'lung tribes looked at the death of trees as a tragedy. They were always ready to support forest conservation programs. In the 21st century, the Oma'lung tribe had adopted modern techniques to protect their resources. The Reduced Emissions from Deforestation and Degradation Program (REDD) aimed

at reducing carbon emission from deforestation and degradation. It offered to pay the tribe to conserve and protect their tree (Lim, A., Patron, L., & Williams, C., 2009).

Oma'lung tribes were paid for the services that they would have anyway performed, even without the extra financial benefit. The tribe had complained that REDD did not actually reduce emission, but merely gave a false sensation that emissions were actually being reduced. The Indigenous people's community had protested against this policy. They termed these activities as 'unethical commoditization of their sacred lands that will permit the Carbon Cowboys to continue polluting.' The REDD program also created tension and rifts amongst the neighboring community as only parts of the community benefitted while others did not.

2.7.3 *Hani Tribe, China*

The Hani tribes in China were related to agro forestry, forest conservation, cultivation practices, forest management, planning, income generation and protection of forest resources (Tillmann, 2002).

The Hani (Akha) tribe lived in the Mengsong, Xishuangbanna region, in the Yunnan province of China. The Indigenous community leaders planned the revival of rattan (*Daemonoropsdraco)* with a long term vision over a hundred years ago. Rattan is used as raw material for furniture and for making strings used in the annual festival of Hani. It had an economic value to provide income. It had ecological benefits as the cultivations improved fallow management, protected larger trees on which the rattan vine climbed and directly and indirectly supported and enhanced biodiversity.

The system of cultivating rattan was initiated by the chieftain of Mengsong, over a hundred years ago. The chief recognized the rampant depletion of rattan cane that was collected from forests all around the area, used in exchange for rice, especially for the poor families. The chieftain had recognized the value of growing rattan to match the 7-13 years of swidden (slash and burn) fallow cycle. The practice resulted in the improvement of a protected forest area, where the biodiversity, including plants used by the community for food or medicine was not allowed to be over-harvested. This entire plantation to harvest process was conducted throughout the year, giving the people of the village a viable work schedule, source of income and stability.

At the same time, this traditional practice and knowledge allowed a healthy forest dependent economy and promoted forest protection in the Hani community.

The local people had learned to manage the forest produce, resulting in long term biodiversity, ecological stability with due respect for the plant and animals.

They knew how to maintain the forest cover and preserve plants by including certain rituals that included selecting seeds at festive times to propagate rattan and other plants and trees to protect the biodiversity. So, even when it became necessary to clear forests for agro plantation, rituals included transplanting seedlings to reviving forest cover. The Hani tribe was dependent on the forest for their livelihood and used other forest products for food and income generation along with other purposes. They also knew how to protect areas of biodiversity and organized themselves so that the swidden fields were beneficial to all members of the community.

The chieftains had promoted ancient legends, where it is said that the gods had condemned the people to death by strangulation if they cleared the forest and damaged the plant and animal community. The Hani people celebrated the ‘Yeku’ festival that involved swinging on the rattan vines. This was supposed to protect the locals, and show the plants and animals that the Akha (Hani people) had been

punished for damaging plants and animals. The swinging festival also included the collection and distribution of seeds and seedlings from the forests to relatives and neighbors. These consisted of different varieties of plants, thereby protecting the diversity and enhancing the revival of the forests. No exotic plants were allowed to be planted.

This cultural practice was orally transmitted generation to generation and documented only 1990, when ethno-botanists recognized the value of this practice. The systems they initiated have been continued to date. This indigenous knowledge and cultural practices by the Hani had been responsible for supporting the growing Hani population with sustainable income and at the same time was beneficial for forest management.

Cultural rituals of the Hani people have shown customs adopted mainly cared for maintaining the forests with indigenous biodiversity and for sustainable livelihood of the local community living off the forests. Such practices were protected with cultural folklore, religious systems that supported and respected forests, animal and plant life within. The fear of punishment as in the cultural folklore actually protected the forest and forest produce.

2.7.4 *Mapuche tribe, Chile*

The Mapuche were the indigenous clans and made up of about ten percent of the total population of Chile. They were economically, spiritually and culturally connected and dependent on the forests (Cooper, 2010).

The researcher explored the value of ancient traditional knowledge of forest resources and strategies for sustainable forest management in Chile, and the steps taken by the Chilean government in forest management.

The traditional practices used for sustainable forest management included planting native trees to prevent soil erosion and to reforest the logged area. A few sacred trees like the Alerce (*Fitzroyacupressoides*) trees were prohibited to be cut and were declared a natural monument in 1977. Other trees were valued for their use in daily items. The *Berberidopsis Corallina*, a vine found in Chilean coastal forests had been used traditionally for making trays and baskets. This was managed by re-harvesting it every three-five years.

The researcher also stressed on the negative effects on forest development as the Mapuche tribes were not considered and their traditional knowledge was ignored while making government policies. The government policies were

primarily aimed at economic development, giving little importance to sustainable forest management. This led to unrest and biased implementation.

Due to unfair land allocation, policies were made to rehabilitate the forest Mapuche tribes. There have been many disagreements between the indigenous tribes and the government. The forest lands had been destroyed for timber production without much effort in forest protection as practiced by the tribes for generations. Traditional ancient indigenous practices had been discarded, as the tribal people did not have methods to record their knowledge that was passed traditionally by word of mouth from one generation to the next, or to finance or support themselves. The traditional practices of the indigenous people were not taken into consideration as there was/is no representative of the Mapuche clan in government policy making communities.

Deforestation led to depletion of forest resources that had resulted in negative effects on the local indigenous economy, traditions and cultural practices. In all this, traditional sustainable practices were lost in forest management. Practices which aimed at the long term benefits were replaced by short term economic goals.

The Mapuche clan conducted practices to manage the forests in a balanced and sustainable way. The author believes that the traditional knowledge of the Mapuche could contribute and enhance modern management strategies.

Unfortunately, in spite of showing promise of a sustainable future, the Chilean government does not give much importance to the practices of the indigenous tribe.

The researcher suggests that government policy makers must include the local people inhabiting the forest areas for which the policies were made. There should be a proper balance between economic development and sustainable forest management with a long term view in mind.

2.7.5 *Mugabe Community, Zimbabwe*

The Mugabe Community resides in the Mugambe communal area, Zimbabwe. They have unique traditional practices for sustainable forest management, which were studied by Tanyanyiwa1 and Chikwanha (2011). The researchers focused on the aim of gathering an understanding of human behavior and the reasons that governed such behavior towards forest management.

The indigenous practices of the Mugabe community included the belief in supernatural spirits governing the community. Folklore expressed that the ancestral

spirits inhabited the trees of the surrounding forests. It was believed that the spirits punished the people who indulged in forest mismanagement and rewarded people who practiced good management of forest resources. The Mungabe community believed that the most sacred forest products were connected with ancestral spirit habitation and rainmaking. The community performed various ceremonies under sacred trees to honor the departed. Mismanagement of sacred forests was prohibited as it was believed that the person would receive a curse from the ancestors. These sacred beliefs had led to the preservation and management of forest resources.

Outsiders were prohibited to harvest the forest fruits for commercial purposes. This prohibition protected the trees, the fruits of which were also consumed by the monkeys and baboons of that area, protecting their habitat.

With the passage of time, these practices were considered old and unscientific by the youth of the community itself. The youth did not believe these stories and considered it as outdated. The lack of understanding the value of their traditional practices and the actual knowledge and wisdom in forest protection in the youth made them lazy to preserve the forests in the same intensity as their ancestors. Punishment and reward system as in folklore as part of their indigenous knowledge systems had helped in maintaining biodiversity and protecting forest cover.

These traditional practices were handed down the generation by word of mouth. The practices were passed from generation to the next generation through proactive learning and were oral in nature; there were no documentations of the practice.

Lack of documentations kept the system aloof and isolated. As such the practices could not be studied to be included in government policies for forest management.

Government policies did not take into consideration old traditional knowledge systems. Further, the modern education system did not encourage the youth to support ancient knowledge.

The researchers strongly suggest that traditional tribal knowledge had been dismissed as unsystematic and cannot be captured and stored is in danger of becoming extinct.

2.7.6 *Soligas Tribe, India*

Traditional knowledge can benefit and add to the modern scientific approaches to forest management, and be considered as a source of baseline data to fill information gaps that cannot otherwise be addressed or to provide an alternative management approach from which scientists and managers might learn (Rist, L., Uma Shaanker, R., Milner-Gulland, E. J., &Ghazoul, J., 2010). Ecological knowledge taken from traditional information needs to be considered along with modern scientific methods for the safest, optimum sustainable forest management.

A study was conducted in the Biligiri Rangaswamy Temple Wildlife Sanctuary located in the state of Karnataka, India. This area was threatened by fires, encroachment from villages and the spread of alien plant species. The indigenous Soliga community resides in this area.

Most of the Soliga tribes are now settled farmers specializing in the harvest of Amla (Indian gooseberry). Unfortunately, Amla plant is not native to these lands and the plantation got severely infected with wild mistletoe. Most of the farmers belonging to the original tribes of the forest were able to identify the flora and could differentiate between the indigenous and invasive species. The problem of infectious mistletoe possessed a great threat to the economy of that area. In spite of

modern technological advancement the scientists had to rely on old traditional practices to rid the forest of mistletoe infestation. Scientists could not cope with the mistletoe on modern technology alone and had to rely on olden traditional practices. The Ancient tribes were aware of the simple methods of dealing against this disease.

The authors argued that instead of using traditional knowledge alone, it would be wiser to infuse the ancient knowledge with current technological advancement for optimum result. The author emphasized that conservation and resource management would benefit if indigenous knowledge could fill in the information gaps and highlight promising directions for management and future research, but must be used in full recognition of its limitations.

Traditional knowledge and scientific knowledge should go hand in hand for developments for the best possible sustainable practices.

2.8 Chapter Summary

More than eighty percent of the world is dependent on forests, directly or indirectly. Ancient traditional indigenous knowledge and practices are gaining importance in today's world. Wisdom, techniques, philosophy and practices handed down through generations in traditional indigenous communities have proved its worth in sustainable forest management. This statement holds true for forest management in all parts of the world, irrespective of the economic and technological development in the countries.

In current times, scientific communities accept the value of indigenous knowledge systems and have begun to review the practices and implement them for sustainable forest management.

The traditional knowledge systems and practices of the tribe were invariable simple, with deep respect to the surrounding geographical terrain, local ecology, and needs of the people with considerations to long term benefits.

The demand for land and forest products has increased tremendously over the past few decades. There is a higher demand for commodities to meet the growing population.

Sustainable forest management was described as a dynamic and evolving concept that aimed to maintain and enhance the economic, social and environmental values of the forests for the benefits of present and future generations by United Nations (2007). The seven criteria of sustainable forest management included the extent of forest resources, biological diversity, forest health and vitality, productive functions of the forest resources, protective functions of the forest resources, socioeconomic functions and legal, policy and institutional framework.

As reviewed in the case studies the indigenous practices used for sustainable forest management included: restricted areas, selective use of plant and animal life, sparing young and scarce species of flora and fauna, religious and social customs of planting seeds and seedling for festivals and occasions, restricted use of forest produce, fear of punishment and belief in spiritual entities guarding the forest lands.

Traditional indigenous practices might not work alone in current times. It is proven through the case studies that incorporating scientific knowledge with traditional indigenous practices can give rise to optimal techniques for sustainable forest management.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Study Area

Kalampada Village is a small village-hamlet located on the edge of deep forests of the Vikramgad Taluka of Thane District in the state of Maharashtra, India (***Figure 3.1***). Taluka is a sub-division of a district, often formed by a group of several villages for revenue purposes. The Kalampada Village belongs to the Konkan division, which is the western coastal strip of the state. It is surrounded by Vada Taluka towards south, Jawhar Taluka, on the east, Dahanu Taluka, on the north and Palghar Taluka on the west (***Figure 3.2***).

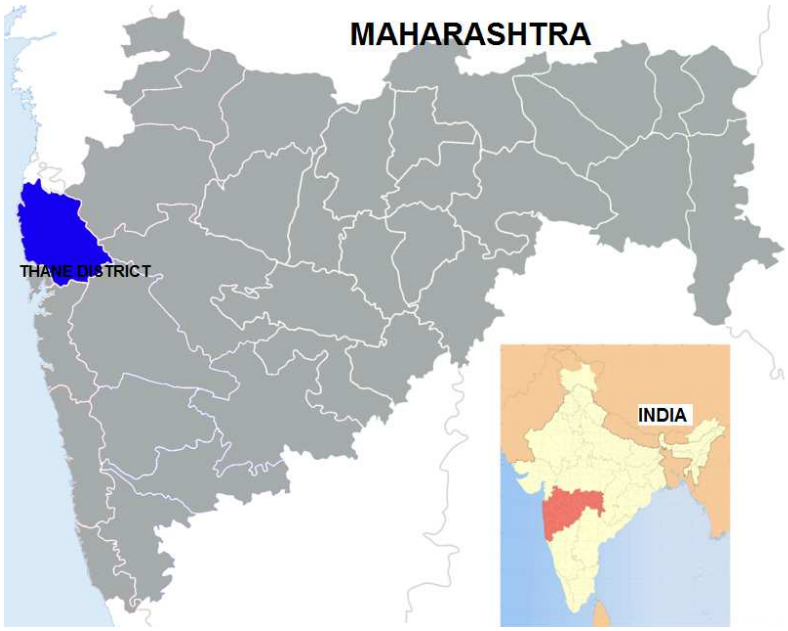

Figure 3.1 Thane District in Maharashtra, India

Figure 3.2 Kalampada Village in Thane District

The Kalampada region used to be a thriving forest area with ample natural water supply from rivers and good rainfall. It was populated in indigenous trees of which numerous were rare medicinal plants and highly valuable timber trees. Over the past five decades, outsiders to the forest dwellers, including foreigners, government officials who did not belong to that locality and traders interested in timber, invaded the forest areas, which resulted in tree felling and disruption of natural forest coverage. Today the Kalampada forests face multiple threats, including heavy deforestation, and encroachment from villages on the borders of the remaining forest land. Deforestation had led to disruption in water cycle leading to lack of rainfall and drying up natural lakes. The Kalampada Village has evolved along the forest edge, where the tribal have been rehabilitated.

In current times, the Government has taken various initiatives to protect forest cover; revive the ecology and rehabilitate the Adivasi, who were dependent on these forests. Kalampada enjoyed the benefits of various schemes run by private interested individuals, NGO activities and Government schemes to rebuild forest cover.

Numerous NGOs and private individuals have understood the value and practical aspect of traditional indigenous knowledge, practices of the Adivasi of Kalampada forests and have taken measures to revive the same.

3.1.1 *Forest Cover in Thane District, Maharashtra*

The forests cover in Maharashtra was 50,632 km^2 of the total 307,713 km^2 geographical area. The forests comprised of 16.45% of the State (India State of Forests 2013, 2013) [Appendix A]. The State constituted 8,720 km^2 of very dense forests; 20,770 km^2 of moderately dense forests and 21,142 km^2 of open forests.

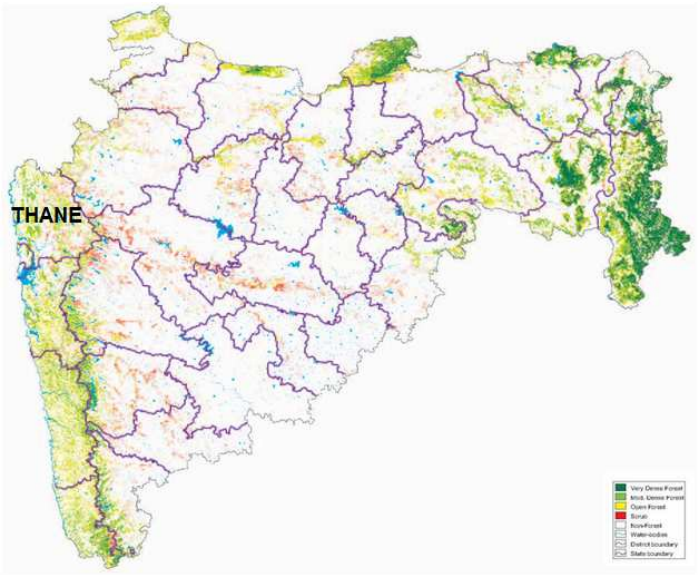

Figure 3.3 Forest Cover Map of Maharashtra (IIPS-Envis Center on Environment and Population)

The forests of Maharashtra have greatly reduced from 62,254 km^2 (20.87%) in the 1980s (Forest Department of Maharashtra cited in Shah. D.) [Appendix B].

Thane District lies in the region of 'Moderately Dense Forests'. Moderately dense forests include all lands with a forest cover having a canopy density of 40 to 70 %. Thane District has a total area of 9,558 km^2 in Maharashtra of which 2,912 km^2 are forest lands. This roughly consists of 30.47% of the total geographical area in Thane (India State of Forests 2011, 2011) [Appendix C].

3.1.2 *Tribal People of Kalampada Village*

The Kalampada Village is home to the Adivasi community which comprised of the Bhil, Warli and Gond clans. Traditionally a semi-nomadic, the Adivasi were settled into villages and allotted land for agriculture by the Government after the independence of the country.

The tribes in the past were endogamous. After the independence from British rule, indigenous tribes were encouraged to settle into villages and the community members scattered and settled in different areas. The new villages became a settlement for Adivasi from different clans. Their interaction with non-tribal people increased, and eventually the Kalampada village, as in current

date, became a settlement for families of different tribes including new members who were outsiders (non-tribal). Marriages between the new settled families made the Kalampada Adivasi community more exogamous. In Kalampada (similar to other settled tribal villages), three tribes had settled together and through the passage of time had intermingled.

Hence, in the recent years, people residing in Kalampada Village, belong to numerous clans and tribes. The village comprised of families originating from different clans. In the past, when the Adivasi were semi-nomadic, each clan had its distinct culture, rituals, trading specialty and were known for specific skills. Certain tribal groups were better known for rearing cattle; some clans were known for expertise in fishing; some were known for their knowledge and use of plant/tree based medicines. Some had a strong culture which comprised of dance, music and painting.

During the field visit, an elderly Adivasi quoted ‘the concept of different tribes/clans amongst the Adivasi was not important. The emphasis on differentiation in tribe classification was actually only an effort by the Government authorities. We consider all clans as our brothers of a large family. The only difference was of the place they lived in and the trade they had’. In line with this

and with equal respect to the different original clans, the researcher found it practical to simply refer to these tribes as ‘Adivasi’, rather than referring to their individual clan names.

The Kalampada Village comprised of about 12 households with a total population of 58 people. Most of the villagers were senior citizens as the majority of the youth had left the village for education or for jobs.

The Adivasi community depended on trees, plants, animals and forest products in their daily lives. The forests provided food, medicine for the tribal and fodder for the animals. Traditionally, the Adivasi communities practiced stable forest preservation methods and mutually had a very sustainable livelihood from the forests.

The Kalampada village was chosen as the study area since it was accessible to the researcher. It remains to be the last few villages where forest dependent indigenous tribes practiced traditional systems and field research was possible. Other indigenous tribes lived deep in the forests of Maharashtra, so were inaccessible and the forests were dangerous to visit.

3.2 Research Design

There are many types of studies of which, Yin, R.K (1984) described three of them as exploratory, descriptive and explanatory. For further description, exploratory case studies act as a pilot to other case studies and research questions. Descriptive case studies provide narrative accounts and explanatory case studies attempt to test theories.

This research is a descriptive case study. It is also an exploratory study of the Adivasi communities' traditional knowledge of forests for supporting sustainable forest management. It is of qualitative nature as it is related to concepts, opinions and behavior or practices of people in social settings.

This study was aimed at exploring the traditional practices of the Adivasi done in the past and those practices which are prevalent today. It described the Adivasi people's practices, beliefs, as well as their views regarding the environment and their contribution in managing their forests. Methods of data gathering included interview, observations and review of secondary data information. Survey questionnaires were not possible as a majority of the community did not know how to read or write.

3.3 Research Methods

The methods chosen for this thesis were interview, observation and background study of other existing published data. Interviews and observations are important sources of compiling data in a case study (Yin, 1994).

3.3.1 *Interview*

An interview is an exchange of views between two or more people, on a subject of mutual interest (Kvale, 1996). The purpose of the interviews in this research was to collect information from the Adivasi about the local practices used by the people who were directly dependent on the forests. Information gathered gave explanations on past and present practices. Interviews were appropriate as the villagers were illiterate and semi-literate in terms of reading and writing (Mudimu & Muchengeti, 2002).

Cohen et al. (2000) had explained interviews of four types which were distributed as structured, unstructured, non-directive and focused interviews. In structured interviews, questions are ready in advance in an organized and defined form. Unstructured interviews are more flexible, where the questions are

open-ended, allowing for more freedom. In non-directive interviews the interviewer has minimal control, and the respondent has freedom of expressing themselves freely whenever they choose. Focused interviews were developed from the non-directive interviews in the aim for more research control.

The researcher followed an unstructured and non-directive type of interview with the Adivasi residing in the Kalampada Village, where the conversations were of informal style allowing the respondents to talk and give information naturally and freely. The interviews conducted were of individual participants and focus groups. Focus group interviews consist of a select members who are brought together to discuss a particular subject (Cohen et al., 2000). These responses are used as representation of the group. Focus group discussions were conducted in the village, where settled Adivasi members were more comfortable discussing issues in a group rather than individual interviews. Individual Interviews were conducted with Government officials in Pune and Kolhapur and the head of Shahapur Village.

3.3.2 *Observation*

Observation is a technique to collect data from live situations (Cohen et al., 2000). Similar to interviews, observations can also be described as highly structured, semi structured and unstructured. In highly structured observations the researcher knows in advance what they will be looking for in an organized manner. In semi-structured observations the researcher knows a part of the general issue and looks for data in a less organized manner. For unstructured observations, the researcher carries out the observation and then sees its significance in his research (Cohen et al., 2000).

The field research for this thesis included staying in the house of the *Sarpanch* (Village head) of the Kalampada Village and following their daily life, visiting parts of the farms, attending their religious ceremonies, group discussions and understanding their simple lifestyle. The field study consisted of a stay of two nights and three days. It gave the researcher the opportunity to interview the Adivasi, collect data first hand and understand their practices and lifestyles which were still forest dependent to an extent. The observations were of unstructured nature where the researcher interacted with the people and lived amongst them to gain deeper knowledge about their lifestyle.

Figure 3.4 Field Observation- Fences made of Bamboo cane

3.4. Interviews

3.4.1 *Individual Interviews*

The researcher had the opportunity to conduct personal interviews with the following:

a) Mr. S.B. Khemnar, Joint Director of Agriculture, Pune, Maharashtra

b) Shahapur Baba, one of the spiritual leaders of Thane District, Maharashtra and,

c) Mr. Joshi, the Director General of the Police force, Kolhapur, Maharashtra.

All the respondents had been directly involved with the Adivasi for decades. The respondents had witnessed and participated, to an extent, in the Adivasi culture and lifestyle.

a) Mr. S.B. Khemnar - *Joint Director of Agriculture, Pune region, Maharashtra State, India.*

Mr. S.B. Khemnar came from an Adivasi tribe. His father had left the forests to bring up his children in small towns. Mr. Khemnar had a deep insight about the practical conditions that were governing existing practices in forest management. He assisted the researcher to understand how the situations have changed over many generations for the tribes who are directly dependent on the forests.

Mr. Khemnar's family, namely his grandparents came from the tribal areas from the forest near Sangamner district in Maharashtra. His father was amongst the many that had left the tribe, migrating to rural areas looking for work. After which Mr. Khemnar completed his education in a city college.

Mr. Khemnar shared information about the Adivasi culture, their faith and methods of living in proper harmony with the forest; their changing circumstances and the practical reason for the change in their situation. Being a government

official, he had been following the government guidelines that were designed for rehabilitation of the Adivasi. Amongst these Government directives, the important ones, as he mentioned were encouraging farming and agriculture for the settled Adivasi, ensuring schooling for the children and modern medicine for the tribes. He also mentioned how education imparted did not benefit the Adivasi children to support the forest that was a natural custom for the earlier tribes. He also said enforcing tribes to develop agriculture made them dependent on government aid and the current generation had almost forgotten traditional practices of forest sustainability.

The interview was unstructured in nature, with information gathered from narrations in the form of stories and his personal experiences. The language of the interview was conducted in 'Marathi', the native language of the Official and Researcher (from Maharashtra, India). The information received was of the general tribes in Maharashtra, and with specific reference to the tribes which resided along the Konkan division of Maharashtra.

Mr. Khemnar informed the researcher about the forest-dependent Adivasi tribes, who still lived deep in the forests. These tribes did not interact with outsiders, so interviewing them was practically not possible. Mr. Khemnar

emphasized on the importance of the Government efforts to rehabilitate the Adivasi people and how there was a great gap in the practical situations and planned policies.

b) Shahapur Baba – *Spiritual Leader of Shahapur Village, Thane District.*

The person interviewed in Shahapur village of Thane District was known as 'Shahapur Baba' (***Figure 3.5***). The title 'Baba' is used as a title in respect for the head of the family, or as in this case, the spiritual guide of the local district. Shahapur Baba is approximately 88 years old and had been residing in Thane for over 70 years. He had been directed to stay in the then dense forest of Shahapur as an ascetic. He has personally seen the transformation of dense forest lands into a moderately dense forest land. During the 70 odd years of living in these lands, he had observed the original tribal inhabitants, their practices and beliefs. He shared how the practices had changed over the years and the reasons for declining forests.

He informed about how the Adivasi forest dwellers, themselves felled trees for timber under instructions from outside agencies in a pretext to increase farm lands and for economic gain. Indiscriminate tree felling without proper land survey led to the disruption of water tables. For example, 60 years ago wells generated

water at a depth of 10 meters. In current times, wells need to be drilled more than 50-70 meters to get some water. This has directly affected the survival of trees under natural forest cover.

The depletion of water table, reduced rainfall and the apathy of the people further depleted forest cover leaving behind scanty trees and shrubs. Efforts towards tree plantation were hampered due to non-availability of natural water. The land marked for agriculture could not be sustained due to the same reason. The vicious cycle resulted in conversion of thriving forests into scanty forest cover.

In the want for food and economic stability, more forest areas were cleared to be sold for industrial development.

Shahapur Baba also told the researcher of the efforts made to revive the rituals that protected plants, trees and encouraged man-made ponds to harvest water as a joint effort with NGOs. He explained how during religious gatherings under his guidance, the importance of tree plantation and preservation was taught and encouraged with a reward system. Marriages and social gatherings at his Ashram always included tree plantations and oath taking by all members to protect, preserve and revive the forest.

Private groups had undertaken surveys to mark and protect rare plants, plants with medicinal value as used in traditional healthcare under Shahapur Baba's guidance, in an effort to revive forest cover.

Figure 3.5 Shahapur Baba

c) Mr. Abhay Joshi – *Director General, Police, Sawantwadi, Kolhapur*

A telephone interview was conducted with Mr. Abhay Joshi, the Director General, Police, Sawantwadi, Kolhapur. The information provided by him was on his personal stay, interaction and study based on the Adivasi of Kalampada Village and in Vikramgad forest areas of Maharashtra.

Mr. Joshi lived within the forest, alongside the Adivasi for over three years in his capacity as Police official and came in direct contact with the Adivasi and their culture. His experience in understanding the changing forest cover and the importance of the tribal practices motivated him to start an education and skill promoting NGO for the revival of ancient traditional practices. His NGO initiative at Thane aims to educate the tribal youth on forest sustainability. His efforts included educating the youth to gain better respect for forest produce and give them more opportunities to revive traditional knowledge in forest sustainability. He is encouraging the youth to find gainful occupation in the forest regions and preserve the ecology.

Mr. Joshi's efforts have seen results in the plantation drive undertaken by the youth and the Adivasi of Kalampada during festivals and cultural gatherings. The groups were taught the medicinal value of plants; crafts made out of forest produce without damaging trees and plants, rearing cattle with fodder from the forest, and agricultural practices using traditional systems of organic manure and trading that are also economically beneficial to the tribe.

3.4.2 *Group Interviews*

The researcher was accompanied by two guides, named Kailash Kuttliya and Ramdas designated by Mr. Joshi, throughout the stay in the Kalampada Village. They were the volunteers in the NGO started by Mr. Joshi to rehabilitate indigenous tribal people. They assisted the researcher to reach the Kalampada Village, introduced the Kalampada Sarpanch, facilitated the meetings between the researcher and different villagers, and helped with lodging and travel. As the researcher is a girl, Mr. Joshi thought it necessary for personal safety and a trustworthy local guide to help during the study time. One of the guides (Ramdas) is the nephew of the Sarpanch. So, interacting with the villagers was greatly simplified.

These guides provided valuable information about traditional practices, current practices that motivated the youth to preserve forests, and sustainable practices. Originating from the Adivasi lineage, information provided by them about the practices used in the past and present by the indigenous communities was truly insightful.

The guides accompanied the researcher to give a clearer view and understanding of the lifestyles of the Adivasi. The Adivasi were enthusiastic in

their answers which were sometimes half stories and were later clarified by the guides.

a) The Kalampada Villagers

The researcher conducted 5 sets of group interviews in the Kalampada Village (***Table 3.1***). The community came from tribes whose forefathers were nomadic Adivasi, living in harmony with the forest. Changing circumstances led to the settlement of the tribe adopting agriculture, and establishing a settled village.

The dialect spoken by the tribe was essentially Marathi. Vada region Marathi has its typical unique style, reference words, and distinct intonations. It was relatively easy to understand and the guides helped in clarifying few statements which were not familiar to the researcher. These statements invariably included references to a ritual, habitats or specific names (name of trees or animals) which were unknown to the researcher. No translation was necessary.

The villagers came in groups for discussions. They felt more comfortable in groups and added to each other's story throughout the narrations.

Figure 3.6 Group Interview with the Kalampada Villagers

The five sets of group interviews consisted of:

Table 3.1 Group Interview Respondent composition (Total 32 members)

Group	**Number of members**	**Gender**	**Role of members**
1st group interview	15 members	Males	Chief of the village (Sarpanch) and members of the Village
2nd group interview	2 members	Males	NGO volunteers
3rd group interview	4 members	Females	Members of the Sarpanch (host) family
4th group interview	6 members	Males	Neighbors of Sarpanch
5th group interview	5 members	Males	Farmers of the Village

Including three individual interviews and thirty-two members in group interviews, a total of thirty-five interviews were conducted.

CHAPTER 4

FINDINGS AND DISCUSSION

4.1 Socio-demographic characteristics of the respondents

A total of 35 individuals, of which 89 percent (31) were male and the remaining 11 percent (4) females, were interviewed. Sixty percent (21) of the respondents was village elders, who were aged above 48 years. These also comprised of the Village head and the decision community of the Kalampada Village. Six percent (2) of the respondents were government officials of Maharashtra State, and were directly working with the indigenous tribes while the remaining thirty-four percent (12) comprised of the general population in the village that consisted of farmers and the youth.

Table 4.1 Profile of Respondents

Age group	**Respondents**	**Percentage**
Elders	21	60
Government Officials	2	6
General	12	34
Total	35	100

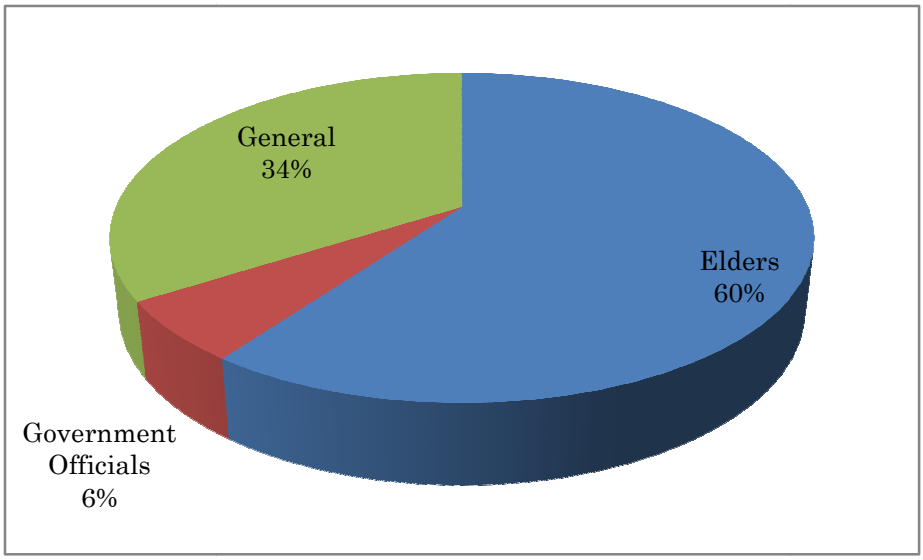

Figure 4.1 Profile of Respondent

Women comprised of a small percentage of the respondents due to conservative cultural norms in the Adivasi community. With respect to this tradition, the researcher was only able to conduct informal interviews with the women of the host family (4 members).

The family hosting the researcher had two daughters (Aged 14 and 21). They were extremely helpful and forthcoming with information that gave a deeper insight into the views of the youth coming from the settled Adivasi tribes. Their views helped understand the contribution of women and young population from the Adivasi.

Woman contributed equally as men in all the rituals and daily life of the Adivasi. Although they did not participate openly in the tribal decision making, their contribution and needs were always considered by the tribal chieftains.

A majority of the Adivasi Villagers (94%) accepted that specific practices were followed for conservation within the community. The Adivasi villagers believed that their indigenous forest management practices eroded or were hidden due to enforcing government policies that did not support traditional rituals, deforestation activities, decline in the authority of the Adivasi leaders (disregard of Adivasi from an outsider's perspective), and the settlement of the nomadic tribe and over dependency of government aid. The traditional practices were also believed to generate less income. Hence they gradually lost importance in the younger generations.

Table 4.2 Villager's Views on Indigenous Forest Conservation Practices

[Members: Total 33 individuals (government officials are not included)]

Statements	**Agree**	**Disagree**
In the past traditional practices were followed for forest management by the Adivasi of Kalampada Village	94% (31)	6% (2)
These traditions are still in practice today	30% (10)	70% (23)
Reason of decline in traditional Adivasi practices:		
Enforced government policies that did not include tribal rituals	87% (29)	13% (4)
Deforestation activities by outsiders	66% (22)	34% (11)
Decline in the authority of the Adivasi leaders	45% (15)	55% (18)
Settlement of nomadic Adivasi	60% (20)	40% (13)
There is an effort by the Government to encourage Adivasi practices in forest management	12% (4)	88% (29)
There is an effort by Non-governmental agencies to encourage Adivasi practices in forest management	91% (30)	9% (3)
There is a possibility of integrating Adivasi traditional practices with modern practices to assist reforestation	97% (32)	3% (1)

Most of the Kalampada Villagers did not believe that the traditional Adivasi forest management practices were still in use. The village elders believed that the youth had been discouraged to work in the forests. The Adivasi people received money from the authorities to rear animals and develop cultivation lands or crops in compensation for their forest rights. This had caused many of the youth to become lazy and abandon their traditional practices.

As quoted by one of the Adivasi youth, ‘Why should we work? We’re getting money, and that’s all we care about now. As long as we can buy food and have a house we’re happy. Working in the forests is troublesome. Why take the extra effort?’

The villagers who followed the traditional practices used their skills in agriculture and cattle rearing. Some of the traditions included recognizing rare medicinal plants, protecting and nurturing these plants and using them for their medicinal value.

The Kalampada Villagers accepted that the leading causes of the diminishing forests were due to increase in forest land acquisition for agriculture activities, uncontrolled and excessive felling of trees for timber and other forest produce. New settlement encroached in forest areas reducing tree cover. The villagers complained

re-plantation of trees that was a ritual followed earlier was not being done in a sustainable manner.

Table 4.3 Causes of diminishing forests according to the Adivasi Villagers

Causes of diminishing forests	**Agreeing Respondents**	**Percentage**
Forest land acquisition for agriculture	22	66
Felling of trees for timber and wood products	31	93
Settlement encroachment into forests	25	75
Government officials over indulgence in forest produce	20	60
Forest fire	4	12
Lack of water to sustain any plantation	33	100
Total (Kalampada Villagers and Shahapur Baba)	33	100

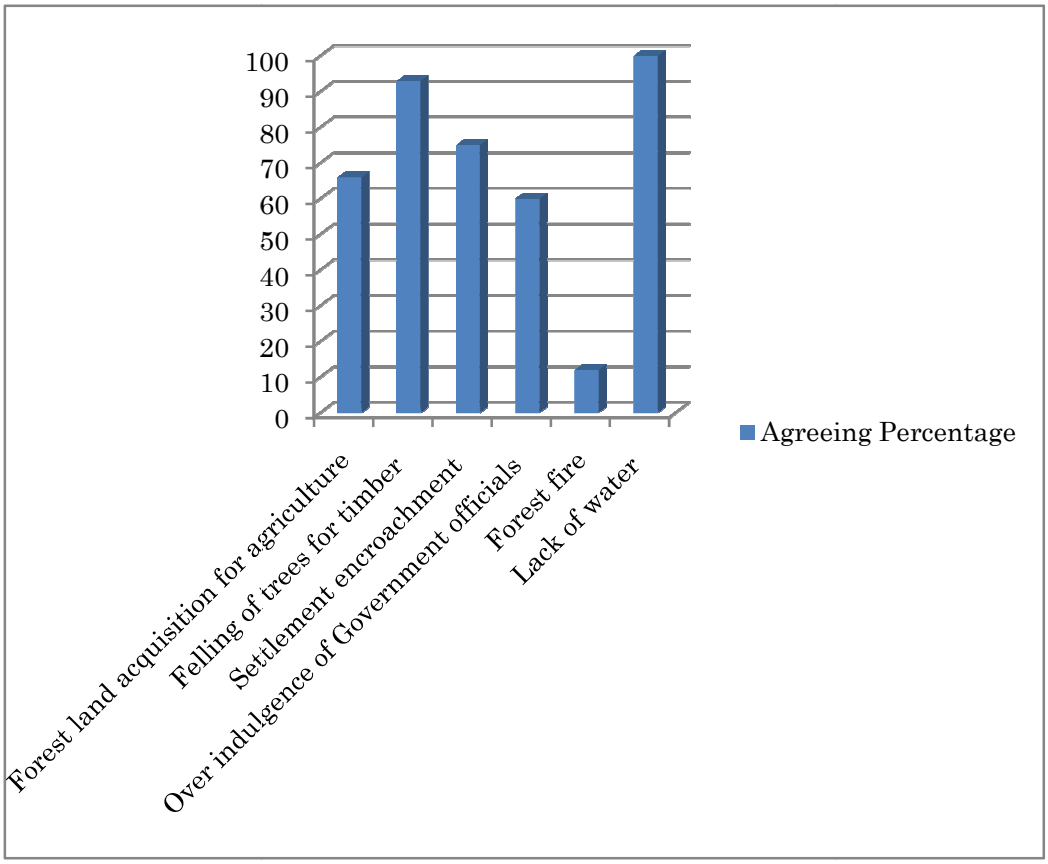

Figure 4.2 Causes of diminishing forests

4.2 Adivasi life in the Kalampada Village

The Kalampada Village consisted of about 58 Adivasi members. The Village comprised of a majority of male (32 members) over females (26 members). Most of the youth (below the age of 25) had left the village for studies or to find employment to neighboring towns or cities.

The Adivasi lived in clustered family units. The relationship amongst the Adivasi was extremely strong. Sons were valued in the tribe. Living with or visiting extended family did not require any permission. Offering food to guests and families was considered as a privilege. Whatever food was available was shared with love and dignity. Regardless of the family's economic conditions there was always a helping hand from other members of the tribe. The responsibility of weddings and important events in one family was shared by the entire village.

The Village had a leader (Sarpanch) with a small community of four members as the village head's guide and the decision body. Each individual regardless of age had an important position in the tribe. Some families looked after cattle rearing; some families in protection of the village; while some families were allowed to enter deep forests to collect medicinal and rare plants. These responsibilities were passed down the generations.

Adivasi women are extremely hard working and participate in all activities of the Adivasi culture. Traditionally, the women folk were sent into the forests to gather dead wood for sale or exchange for other household items. They were well versed with information on different plants and their food and medicinal value.

The women of the tribe knew the various food traditions that protected the

health of the Adivasi clan, especially when they needed to travel for trade. This included recognizing special herbs to give good health, different herbs to burn to protect from forest spirits (mostly indicating animals and insects), preserving food for the travels and managing waste without creating pollution in the forest. They collected seeds and scattering them in parts of the forest as a part of the village ritual. This Adivasi practices promoted reforestation but an Adivasi lady had informed that it was the rituals that protected the health of the tribal people.

The womenfolk of the Sarpanch family shared various traditional folklore that explained the value of various customs. Stories and rituals told about the history of brave people, stories that imbibed the protection of different animals and the beauty of forest flowers. Some of their songs explained moral values while selecting a bride and looking after old people of the family. They explained how different ornaments and jewelry pieces indicated the original tribe and the status of the family in the tribe.

As a ritual after the death of a family member, the body would be burnt inside a pyre of wood collected. This wood was collected from forest ground. No live branches were cut. Symbolically, the family of the deceased would break earthen pots to release the departed. The ashes were thrown into flowing water as a symbol

to release the soul. Rituals included planting trees by the family members and close friends of the departed, anywhere in the forest, as a memory to the departed person. This ritual too encouraged tree plantation.

The youth were given the freedom to choose their life partners. The couple would spend time to know one another for compatibility before being wed. If their personalities matched, messages would be sent to the bride's family of the marriage. The parents did not interfere with their children's decision. If the bride was not compatible with the new family, she was allowed to return to her original family. The search for a suitable groom would then resume.

Marriage ceremonies were a gathering of members of the entire village and neighboring villages. There was no concept of personal invitation for the wedding. It was considered as a village event. All members participated together in cooking, eating, dancing and sharing stories.

Tattoos were also common amongst the tribes. Generally symbols of the family would be tattooed on the hands. Commonly variations of the *Tulsi* leaf (holy basil plant) or special geometric patterns were tattooed on the hand. Thus, in case a child or any family members were lost they would be redirected based on these identifications.

In some household meals were eaten by facing different directions. This discouraged talking while eating amongst the family members as a sign of respect to food. Food was considered as an ‘offering by God’ or locally known as *prasad*, and never wasted.

In other households, food also considered as an ‘offering from god’ was eaten with great pleasure. Families and neighbors would be invited for meals. Music and stories would be shared over food. Usually the men would sit in the main hall of the house while women would serve. Women would later eat together in the kitchen.

Traditionally food was served from earthen pots and eaten in plates made out of intertwined leaves. All were biodegradable and when put into a pit did not create any pollution. This practice has changed. Currently plastic plates have replaced them.

The tribes had simple attires, distinct jewelry and colors of cloth. Men used to wear attires called ‘*langotis*’. Langotis were simple cotton pants. Women usually dressed in saris, which were knee length or *cholias* which consisted of a top and a long skirt. The tribes would wash their clothes and bathe in the river water. *Shaar* or white mud was used as soap. This mud was wet with water and scrubbed on the clothes for cleaning.

Clothes were usually woven from cotton and spun in a few homes. Wool collected from rearing sheep was used to make strong blankets and protective coats. Wool would be compressed and bound with paste made of tamarind. These sheets were pressed against each other by rolling the hands against the surface. It took around 2-3 months on an average to make a blanket. The Adivasi would rarely change their clothes. Baths were only taken if considered necessary and if enough water resources were available.

Although these were simple lives of the settled Adivasi people, there is a positive change in Kalampada where a greater awareness was being generated to value older traditional practices in socioeconomic development. The Sarpanch of Kalampada Village had taken efforts to conduct informal teaching and revival of IKS for the benefit of the village economy, and at the same time, using modern techniques of water management to overcome the biggest challenge the villagers faced.

Revival of earlier techniques of plant protection, seed propagation, animal protection and developing local ecology with non-interference had been a great contribution of Kalampada. The Village head was educated in the surrounding rural village but was greatly influenced by his grandfather who protected traditional

systems fiercely to persevere them. The Sarpanch recognized the benefits derived from tribal practices, and with the help of NGO aid, had started a positive movement for increasing the awareness of IKS in the Village and neighboring villages.

He had developed a farm for turmeric, as was taught by his grandfather, preserving an old tradition and used modern drip irrigation to support the farming and conserve water. With the help of older villagers, the Adivasi had identified many rare plants and flowers and built fences around these forest sections that protected them. Adivasi were threatened with severe punishment if encroached in these protected areas, thereby promoting natural biodiversity in those patches.

Collecting dead wood to cook in homes was slowly discouraged, while the use of solar panels for light and soft cooking was being encouraged. Kalampada Villagers have taken efforts to dig manmade ponds to collect rainwater that supports local farming which has improved their overall economic condition. The Sarpanch invited all youth and youngsters of Kalampada families in an effort to bring back the love and pride their forefathers had for forests.

4.3 Interview Questions

In context with the researchers study, indigenous knowledge system is defined as those systems which are handed down generation to generation amongst the Adivasi. Since there were no written records, indigenous knowledge was passed down from father to son or elders to youth through practical interactions. It included animal rearing, plant study for food and medicine, study of trade routes, climate indications, farming methods and protection of plants and animals. All these were passed on by learning through hands-on experience.

According to Mr. Khemnar, all the indigenous practices of the Kalampada Adivasi were in harmony with the environment and there were no known incidences of waste, garbage, epidemic illness or loss of rare plants and animals in earlier days. The Adivasi knowledge had always respected nature's systems, plant and animal life.

Most of the interview questions asked was open-ended and the conversation flowed across many topics and local stories that gave great insight into the practices of the Adivasi in sustaining the forests peacefully. The questions asked concerned

with the issue of sustainable forest management, and how indigenous knowledge contributed towards it.

Table 4.4 consists of the questions that were asked in various combinations. The answers corresponded in the mixture of stories of the past, individual grievances of current practices and their concerns for the future in forest sustainability and their own economic stability.

Table 4.4 Interview Questions

Number	Interview Questions
1	Give examples of practices followed by the tribe in the past which were important for reforestation.
2	What were the practices for the protection of the forests and biodiversity?
3	What religious and social practices influence the tribes in sustaining forest conditions? Who practiced them?
4	How are the practices preserved?
5	Which of the practices are still in use?
6	What is the current economic condition of the Villagers?
7	What issues are faced by the Kalampada Adivasi in forest management?
8	What do Kalampada Adivasi recommend to improve the conditions of their local forests?

4.4 Traditional practices for Forest Management

The Adivasi traditional conservation practices were not of forests alone, but of their entire environment. In agreement to the 'wholistic theory' they believed that the forests, lands, water and animals were all connected to each other and the

clan. Conservation of one led to the preservation of others. The Adivasi were in sync with the forests and had a deep understanding of the life cycle of the plants and their uses. They treated the forests with respect, and preserving plant and animal life was a part of their social-cultural well-being and religion. From interviews and focus group discussions conducted in Kalampada Village, the following older practices were identified.

4.4.1 Semi-nomadic lifestyle

Earlier tribal Adivasi had led a semi nomadic lifestyle and had temporary settlements near small natural clearing of forest areas. They relocated their living settlements every few months and thus no single area of the forest got depleted to suffice their needs. Only what was needed for survival at that moment was taken from the forest. Very little forest produce was collected to be preserved. This avoided over harvesting. Cow dung and dry wood from the forest was the only fuel required for domestic use.

The Adivasi lived in simple huts. The huts were built from bamboo/cane (*baass*) with mud thatched roofs. The walls were cemented with a mixture of mud, grass and cow dung. The houses had four walls, and a door made out of cane.

Houses were designed in a manner to keep them cool and protected from the wind and rain. If the houses collapsed or were destroyed, there was no damage to the environment since all the building material was completely biodegradable. The floors were coated with cow dung, which kept the insects away.

The earlier Adivasi houses were small. The houses were not designed for storage, and only had enough place to sleep and rest. Cooking was done on simple *'chuulas'*, earthen enclosures to burn wood as cooking fire, which were in the open sections of the house. Water was collected from natural wells or ponds. Water consumed for domestic use would flow into small kitchen gardens, where a few select plants were grown.

These houses were mainly used during the night or by the elderly and infants. Since the Adivasi were nomadic only few selected women would stay back at home to take care of the elders.

In today's Kalampada Village the houses are much larger with different sections in the house which includes a kitchen, a living room, a meeting rooms and rooms for storage. The kitchen essentially stored some water and grains. Grains were stored in cylindrical structures built in the coolest part of the house. The walls of the structure were made out of mud and cow dung and covered with a wooden

platform. The mixture preserved grains for longer life also kept away insects. Once the storage was emptied the structure was completely removed and a new structure was built. The old mixture of the storage was used as fertilizers.

All the families had reared cows, sheep and goats. This was a symbol of their wealth and property. All the cattle belonging to the entire clan grazed in the open area and were taken by the Adivasi from one place to another for grazing or trade.

4.4.2 Gathering dry/dead wood

The lifestyle of the Adivasi was simple. They required wood, cane and grass for constructing houses, making simple farming tools, making storage baskets and nets for catching fish. Dead wood and dried leaves were used as firewood. Fires were small made in clearing and doused after use. Forests fires never occurred from this reason.

The Adivasi believed in the simple philosophy of ‘Take what you need, leave the rest alone’. They would only gather fallen branches or remove dried parts of trees. Damaging a living tree was considered as taboo. The tribe moved along the forests to collect dead wood, and was not tempted with a specific area alone.

The Adivasi made sure that small plants and saplings were not harmed. They scattered seeds of useful plants and trees as they travelled through the forests. This helped reforestation and also protected many plants and animal species.

4.4.3 Sacred forest life

The Banyan tree (*Ficusbenghalensis*), *Saag* (teak wood), *Saal* (another type of timber wood) and the *Peepul* tree (Sacred Fig) were considered to be sacred and cutting these trees was punishable. If these trees were cut without permission of the tribal chief, it would lead to the banishment of that person from the tribe. Severe punishment also included tying the criminal to a tree for days. Generally the Adivasi stayed clear of these trees as they were believed to be inhabited by spirits. This belief is still prevalent in many villages.

Other sacred trees and plants, for example the holy basil plant were used in rituals and cultural practices during marriages, funerals, disease outbreaks and unexpected disasters.

All religious and social events of the Adivasi included offering prayers to trees, scattering seeds or planting saplings in route of their travels or near the settlements.

Many animals were also specifically protected. Insects and birds were not hunted as their role in the balanced system was known and respected. Fishing nets were designed only to harvest big mature fish, protecting the next generation of fish. Incase small fish were caught; they would be released back to the water bodies.

4.4.4 Use of certain plant species by the Adivasi

The Adivasi conserved forests for the benefits they derived from it. Trees were a part of the Adivasi livelihood in the Western Ghats of Maharashtra for centuries. They were a source of medicine, food, fodder, construction materials, shade and for other purposes as shown in *Table 4.5*. Table 4.5 shows the trees that were commonly used by the Adivasi living in Maharashtra. These form a small percent of the actual available forest cover.

Table 4.5 Use of Plant and tree species

Local name	**Botanical name**	**Uses**
Aam (Mango)	*Mangiferaindica*	Fruit as food; Mango leaves were used for religious purposes. Its medicinal properties were used to aid digestion
Aghada	*Achyranthesaspera*	Used for cleaning teeth and other medicinal uses
Ashoka	*Saracaasoca*	The Ashoka tree is considered sacred by the Adivasi. The tree is famous for its timber value. The seeds and leaves are used in local herbal medicine
Avla (Indian Gooseberry)	*Phyllanthusemblica*	Fruit; High medicinal value. Used to treat common illnesses and stomach pain
Baas (Bamboo)	*Bambuseae*	Bamboo sticks were used as pillars for constructing houses. The gaps between the bamboos were cemented with mud. Bamboo nets were prepared to trap fish. These were of circular shapes with one side closed. Gently placed in rivers, they would trap fish for food.
Bora Berry	*Ziziphusmauritiana*	Fruit; It is a rich source of Vitamins and minerals
Chickoo	*Manilkarazapota*	Fruit; Medicinal Value- Used to treat

(Sapodilla)		diabetes
Haldi(Turmeric)	*Curcuma longa*	Medicinal properties; used as a spice in cuisine
Henna	*Lawsoniainermis*	The dye prepared from henna is used to create temporary tattoos and it had medicinal properties for the treatment of hair
Jamun	*Syzygiumcumini*	Fruit; Wood; Medicinal properties- used to treat diabetes.
Mahwa	*Madhucalongifolia*	The flowers of the Mahwa tree are used to prepare alcohol. Mahwa oil is used to treat skin diseases and headaches.
Neem	*Azadirachtaindica*	Neem is greatly valued for its medicinal purposes. They are planted near wells or river bodies to purify the water. This water became therapeutic in nature, leading to a stronger immunity. Neem was also used to protect from insects of that area. Its properties discourage growth in pests and insect population.
Nirgundi (five-leaved	*Vitexnegundo*	Leaves of Nirgundi tree were spread along the land patches, dried and burnt.

chaste tree)		The ash was mixed in the soil before plantation. Modern analysis of this plant has shown them to be a powerful organic fertilizer and a pesticide. This practice is even prevalent today and this kind of organic fertilizer has kept their land and crop chemical free.
Tulsi (Holy Basil)	*Ocimumtenuiflorum*	Tulsi was valued for its medicinal and religious purposes. It is used to cure common illnesses like fever, cold and cough.
Vat (Banyan)	*Ficusbenghalensis*	These trees were primarily used for shade. They are considered to be sacred and cutting them is taboo. It is said in folklore that spirits that inhabit the trees curse those with misfortune who cause trouble for them. These protect the trees.

The plant species mentioned in the table are found in the Western Ghats of Maharashtra. There are many lesser known trees and plants used by the Adivasi people, but the information was not disclosed. These remain a secret within the tribe.

Fruit eaten by animals and birds were the best carriers of the seed for new plants to propagate. Specific plants were purposely grown for medicinal values in the natural clearings in the forests. All rituals included scattering of seeds in the forests, planting of saplings in the forests or settlement to maintain tree cover. Seeds were especially thrown near water bodies for better survival.

Domesticated animals included dogs, cows, sheep, goat, some horses and donkeys. The animals were not kept in enclosures, but left to graze in the open. Only during trade travels, the herds would move in disciplined routes. Without harming the animal (for name stamping), each Adivasi family knew which animal belonged to their herd.

Cow dung, sheep and goat droppings were used as fertilizers. These practices are still prevalent today.

With clean forest surroundings, the Adivasi were not exposed to pollution and other harmful agents. They believe that the forests had natural healing properties which kept them strong and healthy. They had a high regard for the medicinal values derived from plants and trees. For example, '*Raktachandan*' or Red Sandalwood is known for its ability to absorb radiation. These trees were conserved in the surroundings to strengthen the immunity of the tribal people.

According the one elder, ‘A walk through the forest, consuming leaves from specific trees worked very well as treatment for many diseases’.

4.4.5 Social and Religious customs

Religious customs evolved over generations and according to folklore were directives given by the gods or the spirits of the elements and spirits of forests. These could not be changed by man and often when not followed in the true spirit of the custom carried severe punishment. At the same time, religious customs when followed properly were promised with awards given by the gods that included good health, prosperity, growth of family and protection from enemies and diseases. Religious customs were directed by the religious head, priest, and medicine man/woman of the tribe.

Social customs evolved from fruitful group activities on which the culture of the tribe became distinct. Social activities included rituals that were a part of marriages, deaths, trading, farming, seasons for the best harvest and digging wells for water. Tribal customs, whether social or religious had a deep fundamental respect for the forests, the elements governing their life, gave significant respect to animals and plants and enforced a harmonious relationship with the surrounding.

Amongst the important social customs planting trees was considered vital. Usually five trees would be planted on the occasion of marriages. One or two trees would be sown in the honor of a deceased member. These practices were not compulsory but dependent on the family unit. Plants and trees like Mango, Jamun, Pimpal, Tulsi (Holy basil) would be purposely grown for religious rituals. In case of illness, the required amount of herbs would be harvested from the forests. These, then would be immediately replaced by planting new seedlings.

Rituals included using specific plants and herbs that were burnt. This kept harmful insects and diseases away. These rituals were done to coincide with changing climate, which was the time when common diseases attacked. Before planting seeds prayers were offered to the forest lands.

The indigenous forest management traditions had existed in the community for generations. According to the Villagers, in the past, those who disobeyed the practices were punished by the tribe. Punishment would often include banishment from the tribe and forest lands. Thus, the severity of the system had ensured that the practices were followed by all members of the tribe.

4.4.6 Agriculture

Natural clearings in the forest were developed as temporary farms, for grains and vegetables (***Figure 4.3***). The farm areas would be selected on the availability of natural water and sunlight.

Clearings would be made with tools made from forest cane. Bulls would be used to pull the hoe to till the soil.

Leaves of *Nirgundi* were spread on the soil and burnt. This practice removed harmful insects from the soil and added organic fertilizer of *Nirgundi* which is rich in nitrogen. This ritual protected the future crop like a pesticide and also nurtured it as a fertilizer. Another part of the ritual included putting cow dung into the farms. This further enriched the soil.

Figure 4.3 Plantations by the Adivasi Villagers

The Adivasi were completely dependent on rains for their farming. They had limited knowledge of irrigation in the past. Adivasi would carry water from nearby lakes and rivers for their crops. Grain selection was high in nutrition value and sustained the tribal in the past.

The Adivasi followed ‘shifting agriculture’, which included burning the cropped area after use. Before relocating themselves to a new area the plants were burnt to give way for new species. By burning the plant, the soil was considered to be fertilized with the ashes. This land was left and reused the following year giving enough time for the natural rejuvenation of the soil.

4.4.7 Trees and forest cover

Trees were protected in the forests by religious rites. If s member of the Adivasi needed to break a living tree, it was mandatory for them to plant seeds and saplings in replacement of this tree. Saplings were protected by fences built from cane that protected the plants from grazing animals.

Trees like Mango, Sapodilla and Ashoka (*saracaasoca*) would grow naturally in the forests. These trees required large amounts of water, which was supplied by rains.

Banti trees would be planted by the tribe. The seed of the Banti plant was removed, crushed and roasted and considered as a delicacy.

As a religious custom, many sections of the forest were taboo for entry. These areas protected rich biodiversity of the forests.

These practices were successful in the sustainability of forest cover in the past. In the present situations, these practices alone are not enough to revive the forest cover, considering the over-harvesting of trees and other important plants from the forests without equal importance to re-plantation of trees.

The depletion of tree cover had affected the water table that naturally nurtured forest plants. Reduced forest cover is also responsible for the reduction and changes in rain cycle as per numerous studies.

Also from the interviews conducted with the Government Officials; it was found that no significant consideration was given to the tribal Adivasi conservation practices.

Modern conservation practices overlook the traditional Adivasi practices as old fashioned and outdated. With the increased pressure on land and forest resources, extensive use of the older traditions was not encouraged.

This study reiterates the following:

i. Traditional practices of the Adivasi which were holistic in nature need to be considered by the policy makers to implement sustainable forest management.

ii. The Adivasi people who were aware of the traditional practices need to be consulted and made a part of the organizing committee for the socioeconomic welfare of the Adivasi and the forests.

iii. Education imparted to Adivasi and to rural children, youth have to include ecological preservation, forest sustainability for an overall benefit for the future.

Forest Management Criteria

According to the State of Forest Report (2013), the tree and forest cover had slowly started improving due to the restoration programs of the Government and NGOs. Traditional practices are being included in these programs to an extent. Tribal forest restoration practices need to be encouraged in policies. The simple traditional practices of the Adivasi can be implemented on a large scale in the forest cover all over the country.

The forests were protected by the Adivasi with the help of social and traditional practices, re-plantation of rare and valuable plants, and sparing plants because of the fear of punishment or banishment for the community.

The productive benefits of the forests included timber, house building material, special wood for various implements, various plants for fodder and food, different plants, roots, seeds, leaves that had specific medicinal value. Many plants used to make different products for rituals, jewelry, artifacts and clothing. Wood was used as fuel/ different animal, birds and insects and fish found in the forest were used for food and medicine. Animal hide, wool and skin were used for clothing. Different ores and minerals were used for making implements, weapons, utensils and appliances. All of the above were also harvest to be used for trading for other daily requirements. Since the needs of the nomadic tribe were simple and restricted, in older days overuse was not an issue.

With the decrease in forests the Adivasi could not be dependent of forests alone, and had to accept Government aid to fulfill their lifestyle needs.

Forest biodiversity was protected with the specific rituals of the Adivasi that did not allow the use/ consumption of certain plants and animals. Many areas of the forest had restricted entry or were the entry was considered as taboo. This

indirectly preserved the ecosystem and biodiversity unique to that forest terrain. The various tree and plant species found in the Kalampada Village have been mentioned in Table 4.5.

If plants or trees were cut down for any purposes they would be replanted in multiple amounts. It was taboo to harm young plants and animals which ensured their survival. Following the motto of ‘taking only what you need’, no forest product, animal or plant life was taken for greed.

According to Mr. Khemnar, no forest fire or wastage problems had occurred in the past where the Adivasi were concerned. Forests had natural healing properties which the Adivasi used to benefit from. Forest health and vitality was maintained, as the Adivasi used to respect and treasure nature.

4.5 Transfer of Traditional Indigenous Knowledge through generations

There was no concept of formal education or recorded knowledge in the nomadic tribes before the Adivasi settled in villages. Knowledge and information on topics would be orally transmitted and learned through observation, activities, rituals and customs. The children and youth would follow the elders and learn the

various practices as a part of their daily lives. The Adivasi possessed sharp observational skills and a very strong memory.

Problems faced by the tribe would be commonly discussed where youth participated and learnt from older people, and by guidance from the few senior members who interacted with other clans. The information provided by the elders taught the youth about the understandings of weather changes and disease management. All clans would meet together in specific times of the year to participate in trade, exchange informal notes and learn from one another's experience.

Knowledge was passed on in the forms of dances, songs, plays and stories. Religious rituals were passed on through *bhajans* (religious songs), prayers and *pravanchan* (discourses) given by senior member. These were important to revive and respect the spirit of the forest. Religious discourses highlighted moral conduct, and importance of plants and animals in the forests. Religious customs spoke about all parts of forests that included trees, plants, animals, birds, insects, water bodies, soil and the Adivasi people as belonging to one huge family.

Some songs spoke of the history of the Adivasi, agricultural practices, animal behavior, self-protection, recognizing and overcoming diseases and

interesting stories of bravery. In this manner important information was preserved and propagated with ritualistic viewpoint.

Figure 4.4 is a picture of a social gathering during the festival of 'Mahashivratra', which was in honor of Lord Shiva. The men performed songs and dances, which told the courageous stories of their Lord.

Figure 4.4 Gathering of clans for the festival of 'Mahashivratri'

4.6 Changing lifestyles and Current situation of the Adivasi

After the independence of India from British rule, in 1947, in a bid to rehabilitate the nomadic Adivasi, the tribes were encouraged and often forced to adopt agriculture and take up permanent settlements. Clearings were made in forests to promote agricultural plots. Grains like rice, *Jwari*, *Ragi*, millets, vegetables, and herbs were commonly grown by the Adivasi for their economic benefit. Prior to this the Adivasi had cultivated different grains that did not require extensive water management and could not be traded with the rural people. These grains were high in nutrition but were not very popular with non-forest inhabitants. These agricultural products fetched a good commercial value.

Currently living in permanent settlements (***Figure 4.5***), the Adivasi are learning new farming techniques. Older practices are also being encouraged to preserve rare plants in the forests. Many medicinal plants are being revived and cultivated by traditional systems.

Figure 4.5 Permanent Settlements in the Kalampada Village

Earlier, the Adivasi used to practice barter exchanges. But with the introduction of modern economic concepts such as 'money', the tribes traded their agricultural and forest produce through intermediate marketing people. The tribe did not know how to deal with money and stored their money with the '*saukhar*' or village bankers. There were no written records of what was given or received. They simply trusted the *saukhars* with their monetary resources. The Adivasi did not know how to count and trusted their memories for what was given and what will be received. The simple minded Adivasi was very often cheated. Currently the Adivasi are encouraged to open Bank accounts, participate in trade and understand trends in the open market.

The original intention of settling Adivasi with agriculture was encouraged with a reward system, where the Adivasi would be paid by the government for rearing cattle, planting trees or supporting agriculture. The older Adivasi believed that in due course of time government officials with vested interests distorted these systems. The younger generation of the settled Adivasi was happy with the rewards and became too lazy to actually practice any systems that were originally intended.

Most of the Adivasi have educated their children, in the rural areas or towns and have lost touch with dependency on the forests.

More and more Adivasi are now, reviving the practices and traditional systems of their ancestors. The few who are making individual efforts towards tree plantation and forest management are doing it out of love for the forests. These people are now making the younger generations aware of ancient traditional systems that are eco-friendly and sustainable.

Government schemes to promote tree plantations was not working, essentially because water that is vital to sustain these plants was not available. Nearby rivers and streams had dried up [Appendix D]. Different NGOs took extra efforts in promoting water harvesting and management techniques to overcome lack of water.

Skills, knowledge, craft of the Adivasi are being promoted by government schemes. Few NGOs or private industries have promoted tribal skills like Warli paintings, *Bastar* craft and jewelry making that have proved economically beneficial.

The biggest threat of losing traditional knowledge was that the olden systems were never recorded formally. What is available now is partial information and only that which is considered popular or usable by the settled Adivasi.

Many NGOs and private corporations are now taking extra measures to compile various aspects of the older traditional knowledge to study it better. The study will create awareness of beneficial ancient traditional practices.

There are a few Adivasi tribes still living deep in the forest area that do not mingle with rural people and distinctly discourage any contact with officials. Even today, they follow old practices and live in, and off the forest, successfully sustaining the forest. Their love for forests and the traditional ways and knowledge has been preserved by their strict system of non-communication with outsiders.

4.7 Problems faced by the Adivasi

The Adivasi lived peacefully in the forests for generations. In the recent past, changes in political and economic activities and interference from external governing sources changed the balance and forest existence. Economic gain, industrial development, greed and illegal activities reduced the forest cover and disrupted the natural ecology.

The Adivasi people were used for felling tree and harnessing different forest produce by government and outsiders, and got blamed for causing deforestation. This had put the Adivasi in unfortunate circumstances leading to formations of government policies to remove them from their nomadic life in the forest and taking up agriculture and settlement in order to protect the remaining forests.

Since the Adivasi were taken advantage of, the government has started encouraging the tribal people to educate themselves and live in villages. With economic concepts introduced to the younger members of the tribe, the traditional values were lost. These members disrespected the age old customs and preferred working for immediate wages.

Lack of water had become one of the major issues faced by the Adivasi of the Kalampada Village. The surrounding water bodies had slowly dried up. The women of the Village have to travel long distances each morning collecting two to three pots of water to sustain their families for the day. Promised tanks of water are now being delivered to the village during the dry season. Efforts towards revival of forests were hampered by the lack of water.

Due to the lack of water, old traditional practices of planting specific trees and plants could not be continued. This situation indirectly forced the Adivasi to depend on external aid further. The status of 'self-dependent' was slowly diminishing.

As the population of the villages increased more trees were cut. Gradually the lifestyle of the people had changed. Tree plantation is now being encouraged to compensate for this. The Adivasi respondents insisted that the lack of rain water was the major cause of the disappearance of indigenous plants.

Expansion of villages and encroachment from surrounding villages possessed a threat to the peaceful lifestyle of the Adivasi. According to the Interviewee, the village called 'Bhingar' which was once 1-2 kilometers away from

the forests edge. But due to expansion of the villages, Bhingar had encroached into the forests further reducing the tree cover.

Due to deforestation activities and changed weather conditions indigenous trees could no longer survive in their altered environment. Alien species, like the Indian gooseberry, were introduced to the local lands, but took a lot of effort and time to grow. These new trees could not adapt to the environment easily. Since they did not belong to the natural biodiversity, other plants could not be compatible with the new species.

Tree plantations under enforced policies were chosen for their economic value, fruit and timbre. In due course these planted trees; were harvested creating the depleted of green cover, thus entering a vicious cycle. This experience has prompted government and NGO institutions to reconsider traditional customs to revive natural forest cover.

During the interview, when asked if there was still hope for the revival of indigenous practices, one of the village interviewees replied with a negative answer. He answered, ‘There is no hope for change with the current lifestyle. The government officials seem to enjoy personal gains without benefiting the tribes.

The villagers have lost their faith in the government because of the corrupt middlemen'.

Yet, the active youth who wanted to bring about a difference agreed that with great efforts the practices as well as the forests could be revived. According to them it was a matter of awareness and perseverance. They believed that the help of external aid and efforts taken from the community themselves, tribal practices and knowledge could be revived and implemented in existing policies.

4.8 Recommendations by the Respondents

Recommendations given by the respondents are:

i. Water reserves to be created to sustain plantations: The Government had been periodically supplying the Adivasi villager's saplings every year as a part of the reforestation policy, but the plants did not survive due to lack of ground water or rain water. The Villagers wanted the Government to supply or make provisions to get water throughout the year. When there is water the trees will naturally get replenished.

ii. The villagers should be made responsible to look after plants and trees for the proper growth and development, rather than just receiving aid from the government. This would encourage the Adivasi to revive their tribal practices to manage forest resources. Incentives for rearing cattle, protecting rare species of plants and trees, increasing forest cover should be implemented.

iii. Government officials need to be selected from the Adivasi, or local villages, who genuinely care for the forests and know the local culture. The villagers claimed that officials, who did not belong to that terrain, or those not familiar with forest ecosystems, were not committed to preserving the local forests. All officials in charge should spend time in the village to know its terrain and people. They believe that continuous fieldwork by the officials is most important if any desirable change is to be brought about.

iv. The education given to the youth should include forest management, ecosystem knowledge, and the students should be encouraged to develop skills that will promote forest preservation. Rather than general formal education, specific education concerning forests should be promoted amongst the villagers, and those people who need it. This would teach them

to stop felling tree. Combined with the indigenous tribal knowledge as practiced by their ancestors, they will be able to revive the benefits of past practices and improve the surrounding environment. The villagers commented that there was no sense in current formal education that was common to the whole state, as it did not teach the local villagers to respect or know their local terrain.

v. Government and NGO schemes that will be economically beneficial for the Adivasi in preserving their ancient skills of forest management should be popularized. The skills should generate income so the Adivasi are not forced to leave their traditional practices and their villages. More efforts need to be made in reviving and recording ancient tribal practices and knowledge. Many aspects of this ancient knowledge when supported with modern technology will prove beneficial to the socioeconomic conditions of all people.

4.9 Different views amongst the Adivasi

In the 33 people interviewed that were conducted in the Kalampada Village and with Shahapur Baba it was found that different groups of people had different views regarding indigenous knowledge and its relevance to forest management.

A part of the Adivasi community was content with the changing Government and NGO schemes that sustained their lives with the external aid. These Adivasi were not taught the importance of the traditional practices. They wanted to continue living their lives without much effort and depended on the Government for their regular allowances. They did not want to take the extra effort of reviving their ancient traditional culture.

Another group of the Adivasi wanted to revive traditional tribal practices, but was waiting for external sources to bring about some change. They realized the value of sustainable practices, but required guidance and encouragement to implement the practices.

Motivated Adivasi villagers saw the importance of their traditional practices and wanted to revive their culture. They had taken the efforts of educating their families' traditional values and practiced them. Some of them had also set out

of the Village to spread the awareness of their existing conditions in order to bring about change. These Adivasi were looking forward for similar research studies to be conducted, so that the larger masses were aware of their current lifestyle. They hoped that through education a change could be made for a better future.

There is a group of Adivasi, who is working with an NGO, called BIAF in rural areas. The NGOs aimed to educate the rural and tribal village people of their own traditional culture. The practices and content taught by these institutes encouraged the youth to adopt their original practices in their daily lives. According to a BIAF NGO worker, 'The formal education taught to the children does not make a huge difference when they step into the real world. They are not taught how to farm or care for the forests. Our institution aims to help these children understand the value and importance of forests. With this practical knowledge they are better equipped for the future'.

4.10 Comparison with Indigenous Knowledge Systems across the world

As seen from the case studies reviewed in chapter 2, a lot of similarities can be noticed in traditional indigenous tribal practices prevalent around the world. All nations with tribes living in forests knew the importance of natural resources and treated nature as a sacred entity with respect. Trees were not harmed for economic purposes. Only what was required was taken from the forests. Excessive harvesting was discouraged. Care was taken that enough was left for the future.

The importance of the traditional practices that have been followed by the simple tribal or rural people has lost its significance due to the interference and pressure of economic gain enforced by outsiders to the terrain. Policies made by governments emphasized on economic development and the quest for modernization invariably encroached on forest area. Tribal people who could have been supported were stripped of their land and property rights. Encouraged to settle in villages, old nomadic traditions are threatened to be lost in time.

Ancient traditional practices were regarded as outdated, non-scientific, not economically viable in policy making. Although, over the past few decades local governments, international institutions and scientific reviews have accepted the

worth of traditional practices for long term benefits of ecosystems and forest management. The current trend in all countries who value balanced ecosystems and forest management have begun to review traditional practices as a part of indigenous knowledge systems for the long term benefits of the overall economy and progress of the nation. There are more instances where scientific information is used alongside traditional indigenous knowledge for optimal results in sustainable forest management.

The outcome of this study, based on the interviews taken and the field study, reinforced the theory that traditional practices as a part of indigenous knowledge systems has great value and needs to be a part of futuristic forest management and sustained environment. Indigenous knowledge along with today's modern information and technology has great potential in tackling global issues in sustainable and efficient ways.

4.11 Chapter Summary

The older generations of tribal Adivasi initially depended on the forests. They had lived peacefully in the forests for generations. They benefited from the forests by taking care of it and in return were awarded with food, shelter and medicine provided by the forests. The traditional ways of gathering, fishing and use of material for construction were sustainable, biodegradable and did not harm the forest ecology. Their social and religious practices had contributed to the protection and management of forest resources.

The ancient traditional practices for sustainable management of forests included collection of dry/dead wood, their semi-nomadic lifestyle, religious and social-cultural norms, belief in sacred trees and forest life, and recognizing the value derived from plants and trees which led to their conservation. The elders, who had lived in the forests for decades had a close relation to the forests as their lives were closely associated with the surrounding forests.

Currently, the local communities are aware of the important benefits of the traditional practices of the past.

From the study it is seen that the major threats to the natural forests were because of deforestation activities, permanent settlement of outsiders and increase for agriculture land. Trees were felled for quick economic gains without realizing the consequences for the future generations. The younger generation of the Adivasi, who were tempted with monetary benefits, did not follow the traditional conservation practices to revive forest cover.

Efforts are now being taken by the Government, NGO's and the Adivasi themselves to restore forests and their traditional culture.

The study supports the notion that traditional practices as a part of indigenous knowledge systems has great value and needs to be a part of futuristic forest management and sustained environment. Indigenous knowledge along with today's modern information and technology has great potential in tackling global issues in sustainable and efficient ways.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

In the past 150 years, deforestation has been a major global issue. Endeavor to revive the forests has become a priority agenda of many countries. World authorities like UN, UNESCO, World Bank have encouraged forest restoration with various incentives for all nations. Numerous research and implementation programs had been put into force for sustainable forest management. Across the world, studies are being conducted to understand the value and practical aspect of traditional practices followed by the indigenous people, who had been able to maintain a balanced forest cover and sustained forest management.

The Government of India has been taking conscious efforts to increase forest cover and evaluate different methods of sustainable forest management.

This research is a study of the traditional practices undertaken by the Adivasi of Kalampada village in the Thane district of Maharashtra. The study highlights the importance of traditional practices that are being considered strongly

around the world towards sustainable forest management. The study reveals the benefits of ancient practices, the methods of implementations and the significance of re-evaluation of current practices and possible benefits of using the traditional Adivasi practices in sustainable forest management.

The study is descriptive research which used interview and personal observation as methods for data collection. This study was confined to the Kalampada Village only. The interview respondents were chosen from the Kalampada Village and government officials who worked with the Adivasi.

5.2 Conclusion

5.2.1 *Traditional practices used in the Kalampada Village*

Traditional practices of the Adivasi people that conserved forest area and preserved forest wealth, mostly revolved around rituals, religious practices that promoted socioeconomic sustainability.

The traditional practices consisted of:

i. Gathering from forests, only as much as was required for immediate use. This included fire wood, vegetable and plants for food and medicine

ii. Replanting plants used for house building, tools, for example, cane grass which was used for building walls of huts and agricultural tools.

iii. Using cow dung and sheep/goat droppings and special plant leaves as fertilizers for shifting cultivation.

iv. Skills were nurtured to create artifacts, baskets and medicine that were traded for other essentials for the village people.

v. Plantation of specific trees, plants of medicinal value and rare species as a part of rituals and festivals to balance the tree count.

vi. Many plants and animals and delicate ecosystems were left untouched. This system was protected with religious and spiritual reasons.

vii. Most forest conservation practices were controlled with severe punishments or rewards to maintain and protect the forest cover.

Most of the techniques used in the past cannot be implemented at the same level in the present world. Practices, which were considered ‘sustainable’, then, do not have the same socioeconomic value today. Modern techniques integrated with traditional methods will be of great value in today’s world and prove to be far more sustainable for the forests with a long term vision.

5.2.2 *Problems faced by the Kalampada Villagers*

The biggest problem the Adivasi faced was the lack of water. Nearby rivers and lakes had dried, forcing the women to travel long distances to collect water. The loss of water discouraged the plantation of trees and plants. This had resulted in trees only being cut instead of replanting them after their uses.

Currently, many Adivasi living in villages depend on government aid for their livelihood. Policies made by the government have been misused by officials not belonging to the forests and tribes making many of the settled Adivasi leave behind their traditional practices and adopt agriculture systems unfamiliar to them. A part of the younger generation of the Adivasi has become dependent on government aid and did not want to take extra efforts to revive their forest lands.

The Adivasi were encouraged to settle in villages and mingle with the rural communities. This led them to adopt practices which were foreign to them and led to the loss of some of their original practices.

5.2.3 *Current state of indigenous practices in the Kalampada Village*

The government of India has taken steps to study the causes of depletion in forest cover. Indigenous practices are now being studied by public and private agencies. In the past the indigenous knowledge systems were not acknowledged and the Adivasi were encouraged to live in permanent settlements. Government officials who did not belong to the Adivasi could not understand the importance of their practices.

This situation is currently changing. There is a support for a mixture of modern and traditional practices to be implemented. For example, *Haldi* (turmeric) plantations were grown in vegetation patches with the help of drip irrigation. This ensured the uses of *haldi* for culinary and medicinal benefits, with the help of modern irrigation methods (drip irrigation) to ensure the plant's survival.

Another example can be seen in building the homes of the Adivasi. The walls are still made of bamboo cane and mud. At the same time the use of solar cell was popularized to provide basic electricity to the Villagers.

Various NGOs are reviving the traditional skills of the Adivasi that can support them economically. Forest ecotourism is being popularized to increase the awareness of forest and Adivasi conditions amongst the urban and rural people.

Government officials have accepted the use of organic fertilizers (cow dung and goat droppings) and are encouraging the farmers to adopt these safe methods. The grains used by the Adivasi are encouraged in rural and urban setting to increase the economic value of the tribe. Policies based on reward systems are being revised to include the Adivasi rituals and systems to revive forest covers.

Traditional tribal forest routes that the nomadic people used for trade are being considered to support transport without disturbing forest cover.

5.2.4 *Strategies suggested by the Kalampada Villagers*

The strategies suggested for the betterment of forests by the Kalampada Adivasi include:

i. Water reserves to be created to support forests and plant vegetation.

ii. Adivasi skills should be encouraged and promoted amongst the younger generation.

iii. Opportunities for jobs should be created to support the Adivasi economically. These jobs should be available in forest areas where the traditional skills will be valued and implemented.

iv. Government officials, who create policies for the forests of that area, should include Adivasi members in the community.

v. The system of reward should be increased as it would encourage the youth to participate in forest management.

5.3 Recommendations

Traditional practices and knowledge of the Adivasi are valid even today in increasing forest cover and their traditional methods were, and can still be a great source of sustainability to the effort of forest management if considered in the same spirit as the older generation of Adivasi people.

5.3.1 *Recommendations for policies*

i. Tribal village heads or members should be included in creating policies of the area of concern.

ii. Holistic management should be considered that includes land regeneration, forest ecosystem rehabilitation and water management. Severe

punishments should be given to people who indulge in excessive forest produce harvesting.

iii. Development of tourist forest villages should be encouraged to sensitize the public on the natural, long term benefits of tribal practices and sustained ecology.

iv. Increasing education and income generation activities amongst the youth should be encouraged for the sustainable management of forests.

5.3.2 *Recommendations for practice*

Efforts like Mr. Joshi's NGO need promotion and encouragement. The youth is the future of the society. Educating the youth from the settled tribes towards skills that will revive traditional systems and encouraging them towards forest revival with reward systems (rather than making them dependent on government aid); creating jobs and income opportunities for them will make forest management an economically viable decision.

Incorporating traditional indigenous knowledge with modern scientific knowledge will give long term benefits in sustainable forest revival and also assist the socioeconomic development of the Adivasi.

Documenting the traditional methods and practices of Adivasi people will greatly benefit the community, especially in the field of medicine, agriculture, water management, biodiversity preservation and balanced ecosystems in the environment. It will also assist researchers and policy makers to enhance their knowledge in these subjects, assisting them for future similar studies.

The youth should be encouraged to learn and appreciate the traditional tribal practices which were designed for forest management. The Government and other related agencies should be encouraged to undertake combined (traditional and modern) practices with the aim of integrating them into existing policies for better long term sustainability of the Adivasi and forests.

Medicine, handicraft, animal rearing, forest tourism, simple lifestyle models, and other indigenous practices with forest ecosystems should be encouraged as a livelihood for the settled tribal Adivasi. At the same time, the conditions of the Adivasi and their efforts to maintain forests should be encouraged and taught to the general population of the urban settlements. This will increase the support for sustainable techniques integrating tribal indigenous knowledge in the current policy systems.

5.3.3 *Recommendations for future research*

The viability of traditional practices have a ‘wholistic’ approach, and equally consider forest revival, biodiversity conservation, and have long term impacts on the environment should be encouraged to be studied.

Indigenous people need research in which their opinions are heard. This aims to ensure that the community problems can be solved and the knowledge they have to offer can be respected and implemented for long term sustainable goals.

More traditional practices can be discovered with similar studies. These practices have potential in assisting policy makers and scientific theories.

REFERENCES

Absolon, K. (2010). Indigenous wholistic theory: A knowledge set for practice. *First Peoples Child & Family Review*, *5*(2), 74-87.

Agenda 21. Unpublished raw data, United Nations University,. Retrieved from http://www.unutki.org/default.php?doc_id=48

Barasa, D. W. (2007). Indigenous Knowledge Systems and Sustainable Development in Africa: Case Study on Kenya. *Indigenous knowledge systems and sustainable development: relevance for Africa*, 141.

Boven, K., &Morohashi, J. (2002). *Best practices using indigenous knowledge*. The Hague: Nuffic.

Cohen, L., Manion, L., & Morrison K. (2000).Research Methods in Education (5th Edition). London: RoutledgeFalmer.

Convention on Biological Diversity, (2009). *Sustainable forest management, biodiversity and livelihoods: A good practice guide.* Montreal.

Cooper, D. (2010). Indigenous Knowledge and Sustainable Forest Management in Chile. *World*.

Dhiaulhaq, A. (2011, November 1). The Potentials of Dayak People in Promoting Sustainable Forest Management in Kalimantan, Indonesia. Retrieved February 14, 2015, from https://dhiaulhaqreview.wordpress.com/2011/11/01/the-potentials-of-dayak-people-in-promoting-sustainable-forest-management-in-kalimantan-indonesia/

Dunn, M. (2013, September 19). Knowledge framework for indigenous knowledge systems. Retrieved May 15, 2015, from

http://www.theoryofknowledge.net/areas-of-knowledge/indigenous-knowledge-systems/knowledge-framework-indigenous-knowledge-systems/

FAO. (2005). Global Forest Resources Assessment 2005: Progress Towards Sustainable Forest Management ,Forestry Paper 147, FAO, Rome.

FAO Focus Area fact sheet: Sustainable forest management. (n.d.). Retrieved May 3, 2015, from http://www.fao.org/docrep/015/i2763e/I2763E04.pdf

Food and Agriculture Organization of the United Nations. (2010). *Global forest resources assessment 2010: Main report*. Food and Agriculture Organization of the United Nations.

Forest Cover. (2013). In State of Forest Report 2013 (pp. 11-32). Dehradun: Forest Survey of India (Ministry of Environment & Forests).

Grenier, L. (1998). *Working with indigenous knowledge: A guide for researchers*.IDRC.

Gupta, A. D. (2011). Does indigenous knowledge have anything to deal with sustainable development? *Antrocom Online Journal of Anthropology, 7*(1), 57-64.

Heinen, J. T. (1994). Emerging, diverging and converging paradigms on sustainable development. *The International Journal of Sustainable Development & World Ecology, 1*(1), 22-33.

Ho, R. (2002). WaruWaru, a cultivation and irrigation system used in flood-prone areas of the Altiplano. In K. Boven& J. Morohashi (Eds.), *Best practices using indigenous knowledge* (pp. 190-197). The Hague: Nuffic ;.

IIPS-Envis Center on Environment and Population.(n.d.). Retrieved March 17, 2015, from http://www.iipsenvis.nic.in/newsletters/vol3no4/map_of_maharashtra.htm

India. (2014). In C. Mikkelsen (Ed.), The indigenous world 2014 (pp. 336-346). Copenhagen: International Work Group for Indigenous Affairs (IWGIA).

Jarvis, M., Lange, G. M., Hamilton, K., Desai, D., Fraumeni, B., Edens, B., &Ruta, G. (2011). *The changing wealth of nations: measuring sustainable development in the new millennium*. Washington, D.C.: World Bank.

Kothari, A. (2007). Traditional knowledge and sustainable development.*International Institute for Sustainable Development, Draft for Discussion, September, Canada*.

Kvale, D. (1996). Interviews. London: SAGE Publications.

Lammerink, M. (2007).Enhancing indigenous people's forest knowledge.*Endogenous Development and Bio-cultural Diversity,* 410-421.

Lim, A., Patron, L., & Williams, C. (2009, July 28). Forbidden Forest of the Dayak People - Our World. Retrieved February 11, 2015, from http://ourworld.unu.edu/en/forbidden-forest-of-the-dayak

Macchi, M., & Oviedo, G. (2008). *Indigenous and traditional peoples and climate change: Issues Paper*. International Union for Conservation of Nature.

Macy, J. (2002). The use of locally produced clay pots modified for safe storage of drinking water in the home–a component of CARE Kenya's Nyanza Healthy Water Project. In K. Boven& J. Morohashi (Eds.), *Best practices using indigenous knowledge* (pp. 30-37). The Hague: Nuffic ;.

Maharashtra. (2011). In State of Forest Report 2011 (pp. 170-175). Dehradun: Forest Survey of India (Ministry of Environment & Forests).

Map of Thane.(n.d.). Retrieved May 4, 2015, from http://en.wikipedia.org/wiki/List_of_towns_and_villages_in_Thane_district#/media/File:MaharashtraThane.png

Melchias, G. (2001).Biodiversity and Conservation. Enfield: Science Publishers, Inc.

Mudimu, E. and Muchengeti, W. (2002). Business Statistics, Zimbabwe Open University, Harare.

Nakashima, D., &Elias, D. (Eds.). (2002). *Science, traditional knowledge and sustainable development*.ICSU.

Nakashima, D., Prott, L., & Bridgewater, P. (2000).Tapping into the world's wisdom. *UNESCO sources*, *125*, 12.

Negi, M. (n.d.). Forest Area of India: Geographical Distribution of Forest Area of India. Retrieved May 13, 2015, from http://www.yourarticlelibrary.com/environment/forest/forest-area-of-india-geographical-distribution-of-forest-area-of-india/13855/

Nimachow, G., Joshi, R. C., & Dai, O. (2011).Role of indigenous knowledge system in conservation of forest resources-a case study of Aka tribes of Arunachal Pradesh. *Indian Journal of Traditional Knowledge*, *10*(2), 276-280.

Norgaard, R. B. (1984). Traditional agricultural knowledge: past performance, future prospects, and institutional implications. *American Journal of Agricultural Economics*, *66*(5), 874-878.

Pearce, D., & Atkinson, G. (2002). *The Concept of Sustainable Development: An Evaluation of Its Usefulness Ten YEARS after Brundtland*. CSERGE Working Paper PA 98-02. London: Centre for Social and Economic Research on the Global Environment.

Pearce D, Markandya A, Barbiereb, (1989) Blueprint for a Green Economy, Earthscan, London.

Rist, L., Uma Shaanker, R., Milner-Gulland, E. J., &Ghazoul, J. (2010). The use of traditional ecological knowledge in forest management: an example from India. *Ecology and Society*, *15*(1).

Robinson, N. A. (1993). *Agenda 21: earth's action plan*. Oceana Publications, Inc.

Salim, E. and Ullsten, O. (1999).Our Forests, Our future, World Commission on Forests and Sustainable Development, Cambridge.

Sambhav, K. (2012, February 8). India's forest cover declines. Retrieved May 21, 2015, fromhttp://www.downtoearth.org.in/content/india-s-forest-cover-declines

Sathaye, J., Najam, A., Cocklin, C., Heller, T., Lecocq, F., Llanes-Regueiro, J., ...& Winkler, H. (2007). Sustainable development and mitigation. *Climate Change 2007: Mitigation of Climate Change*, 691-743.

Shah, D. (n.d.). Forest Management Practices in Maharashtra: People's Participation, Conservation and Policy Issues.

Sharma, S. N. (2013). Sustainable Development Strategies and Approaches.*International Journal of Engineering and Technical Research (IJETR), 2*.

State of the world's forests 2014: Enhancing the socioeconomic benefits from forests. (2014). Rome: Food and Agriculture Organization Of The United Nations.

Tanyanyiwa, V. I., &Chikwanha, M. (2011).The role of indigenous knowledge systems in the management of forest resources in Mugabe area, Masvingo, Zimbabwe. *Journal of Sustainable Development in Africa*, *3*(3).

Tauli-Corpuz, V. (2006).The Implementation of Agenda 21 and Indigenous Peoples". *Implementing Agenda, 21*.

Thane District | Thane District Map.(n.d.). Retrieved May 3, 2015, from http://www.onefivenine.com/india/villag/thane

Tillmann, T. (2002).Protection and cultivation of rattan by Hani (Akha) People in Yunnan, Southwest China. In K. Boven& J. Morohashi (Eds.), *Best practices using indigenous knowledge* (pp. 161-167). The Hague: Nuffic ;.

United Nations Environment Programme, Agenda 21. (n.d.). *Recognising and strengthening the role of indigenous people and their communities*. Retrieved December 21, 2014,
from http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID =52&ArticleID=74

United Nations Forum on Forests.(n.d.).*About UNFF History and Milestones of International Forest Policy*. Retrieved September, 2014, from http://www.un.org/esa/forests/about-history.html

Varte, I. Z. Role of Indigenous Traditional Knowledge in Sustainable Resource Management (With special reference to North East India).

Warren, D. (1991). Using indigenous knowledge in agricultural development. Washington, D.C.: World Bank.

World Bank.(2002). A revised forest strategy for the World Bank Group. World Bank, Washington, DC

World Bank. (2004). Sustaining forests a development strategy. Washington, D.C

World Bank, (2012). *Forest area (% of land area)*. Retrieved from The World Bank website: http://data.worldbank.org/indicator/AG.LND.FRST.ZS

World Commission on Environment and Development. (1987). Our common future. Oxford, UK- Oxford University Press.

Woytek, R., &Gorjestani, N. (1998). *Indigenous knowledge for development: A framework for action*. Knowledge and Learning Center, Africa Region, World Bank.

What is Traditional Knowledge? (n.d.). Retrieved October 5, 2014, from http://www.nativescience.org/html/traditional_knowledge.html

Wigrup, I. (2005). The role of indigenous knowledge in forest management: a case study from Masol and Sook Division, West Pokot, Kenya.

Yin, R. K. (1984).*Case study research: Design and methods*. Beverly Hills, CA: Sage.

Yin, R. (1994). *Case study research: Design and methods* (2nd ed.). Thousand Oaks, CA: Sage Publishing.

Zwahlen, R. (1996). Traditional methods: a guarantee for sustainability. *Indigenous Knowledge and Development Monitor*, *4*(3), 1-7.

APPENDIX

A] Forest Cover in India, 2013

States/UTs	Geogra-phical Area	2013 Assessment				Per cent of Geogra-phical Area	Change in Forest Cover wrt ISFR 2011	Change Percent	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest Forest	Total Forest Forest				
1	2	3	4	5	6	7	8	9	10
Andhra Pradesh	275,069	850	26,079	19,187	46,116	16.77	-273	-0.10	10,465
Arunachal Pradesh	83,743	20,828	31,414	15,079	67,321	80.39	-89	-0.11	121
Assam	78,438	1,444	11,345	14,882	27,671	35.28	-2	0.00	182
Bihar	94,163	247	3,380	3,664	7,291	7.74	446	0.47	115
Chhattisgarh	135,191	4,153	34,865	16,603	55,621	41.14	-53	-0.04	117
Delhi	1,483	6.76	49.38	123.67	179.81	12.12	3.61	0.24	2.24
Goa	3,702	543	585	1091	2219	59.94	0	0.00	0
Gujarat	196,022	376	5,220	9,057	14,653	7.48	34	0.02	1,492
Haryana	44,212	27	453	1,106	1,586	3.59	-22	-0.05	150
Himachal Pradesh	55,673	3,224	6,381	5,078	14,683	26.37	4	0.01	298
Jammu & Kashmir*	222,236	4,140	8,760	9,638	22,538	10.14	-1	0.00	2,105
Jharkhand	79,714	2,587	9,667	11,219	23,473	29.45	496	0.62	670
Karnataka	191,791	1,777	20,179	14,176	36,132	18.84	-62	-0.03	3,216
Kerala	38,863	1,529	9,401	6,992	17,922	46.12	622	1.60	29
Madhya Pradesh	308,245	6,632	34,921	35,969	77,522	25.15	-178#	-0.06	6,389
Maharashtra	307,713	8,720	20,770	21,142	50,632	16.45	-14	0.00	4,157
Manipur	22,327	728	6,094	10,168	16,990	76.10	-100	-0.45	1
Meghalaya	22,429	449	9,689	7,150	17,288	77.08	13	0.06	372
Mizoram	21,081	138	5,900	13,016	19,054	90.38	-63	-0.30	0
Nagaland	16,579	1,298	4,736	7,010	13,044	78.68	-274	-1.65	2
Odisha	155,707	7,042	21,298	22,007	50,347	32.33	1444	0.93	4,424
Punjab	50,362	0	736	1,036	1,772	3.52	8	0.02	37
Rajasthan	342,239	72	4,424	11,590	16,086	4.70	-1	0.00	4,211
Sikkim	7,096	500	2,161	697	3,358	47.32	-1	-0.01	311
Tamil Nadu	130,058	2,948	10,199	10,697	23,844	18.33	219	0.17	1,212
Tripura	10,486	109	4,641	3,116	7,866	75.01	-111	-1.06	66
Uttar Pradesh	240,928	1,623	4,550	8,176	14,349	5.96	11	0.00	806
Uttarakhand	53,483	4,785	14,111	5,612	24,508	45.82	12	0.02	262
West Bengal	88,752	2,971	4,146	9,688	16,805	18.93	3810#	4.29	111
A&N Islands	8,249	3,754	2,413	544	6,711	81.36	-13	-0.16	57
Chandigarh	114	1.36	9.66	6.24	17.26	15.14	0.26	0.23	0.56
Dadra & Nagar Haveli	491	0	114	99	213	43.38	2	0.41	1
Daman & Diu	12	0	1.87	7.4	9.27	8.28	3.27	2.92	0.96
Lakshadweep	32	0	17.18	9.88	27.06	84.56	0.06	0.19	0
Puducherry	480	0	35.23	14.83	50.06	10.43	0.06	0.01	0
Grand Total	**3,287,263**	**83,502**	**318,745**	**295,651**	**697,898**	**21.23**	**5871**	**0.18**	**41,383**

** Includes Jammu & Kashmir area outside LOC that is under illegal occupation of Pakistan and China.*

The negative change in forest cover of Madhya Pradesh as compared to previous assessment is mainly attributed due to inclusion of some non forest area as forest cover. Similarly in West Bengal the change in forest cover in present assessment is due to exclusion of some areas as forest cover in the previous assessment due to poor quality satellite data.

Source: Forest Survey of India (Forest cover, 2013)

B] Forest Area of Maharashtra, 1981-1998

Sr. No.	Indicators	Triennium Average			1981 - 1998	
		1981-83	1988-1990	1996-1998	CGR (%)	CII (%)
1.	*Forest Area*					
	- Total forest area (Sq. Km.)	62254.0	62882.0	64424.3	0.20	1.75
	- Forest area harvested (Sq. Km.)	786.4	293.7	218.1	-13.12	59.18
	- Forest area as % of geographical area	20.87	20.75	20.22	-0.18	1.75
2.	*Revenue and Expenditure*					
	- Revenue from forest	67.47	129.41	129.17	4.66	18.23
	- Expenditure on forest	39.60	105.71	147.28	24.06	42.38
3.	*Labour Employed and Coupes Worked*					
	- Labour employed in forestry operations ('000' mandays)	26877.3	40518.3	35237.7	3.06	21.60
	- Labour employed per sq. km. of forest area (in mandays)	432.0	643.1	536.1	2.73	21.85
	- Wages paid to labour (Rs. Lakhs)	1866.3	4119.3	9802.0	15.04	18.60
	- Percentage of forest area worked by					
	(a) Forest department	57.7	68.8	71.3	1.49	28.43
	(b) FLCS	42.3	31.3	28.7	-3.19	56.82
	- Total No. of coupes worked	825	664	279	-12.22	66.59
	- Total coupes worked per '000' sq. km. of forest area	13.2	6.4	4.3	-12.41	67.24
4.	*Offences and Fires*					
	- Number of forest offences	87109	84121	65475	-2.14	9.96
	- Number of fires	1376	1343	1633	1.72	45.60
	- Size of fire (Sq. Km.)	214.7	336.9	436.7	5.15	44.14
	- Area destroyed by fire as % of forest area attempted for fire protection	0.4	0.6	1.0	-3.19	56.82
5.	*Plantation and Afforestation*					
	- Plantation under various activities (Ha)	23393.3	23781.3	58821.3	5.37	48.29
	- Afforestation under various activities (Ha)	28220.7	71032.0	87759.7	10.00	33.01
6.	*Value of Forest Produce (Lakh Rs.)*					
	- Major – (i) Timber	3684.5	8453.6	4872.6	1.13	29.82
	(ii) Firewood	827.9	1164.2	505.6	-5.63	49.82
	(iii) Total	4512.4	9617.7	5378.2	0.19	30.12
	- Minor forest produce	1028.3	1389.9	5720.3	16.37	56.79
	- Grand total (major + minor)	5540.6	11007.6	11099.3	5.32	15.25
7.	Outstanding forest revenue (Lakh Rs.)	765.4	1683.2	2267.3	7.91	17.05

Source: Computations are based on figures obtained from annul publications of Forest Department of Maharashtra, 'Annual Report on Administration, Silvicultural Research and Economic Research, Nagpur., (Cited in Shah.D., n.d.)

Notes: 1) CGR = Compound Growth Rates; CII = Coppock Instability Index;

2) All growth rates significant at 1 per cent level of probability;

3) NS = Non significance of CGR at 1 per cent level of probability

C] District wise distribution of forest cover in Maharashtra

Number of districts: 35 (area in km²)

District	Geographical area	Very dense forest	Mod. dense forest	Open forest	Total	% of G.A.	Change*	Scrub
Ahmadnagar	17,048	0	69	217	286	1.68	0	555
Akola	5,390	11	96	215	322	5.97	0	8
Amravati	12,210	655	1,455	1,077	3,187	26.10	0	116
Aurangabad	10,107	19	101	437	557	5.51	0	193
Bhandara	3,588	130	546	215	891	24.83	0	21
Bid	10,693	0	13	162	175	1.64	0	357
Buldana	9,661	23	137	429	589	6.10	0	163
Chandrapur	11,443	1,342	1,592	1,140	4,074	35.60	-9	56
Dhule	7,189	0	70	251	321	4.47	0	103
Gadchiroli	14,412	4,733	3,396	1,966	10,095	70.05	1	20
Gondia	5,733	884	824	303	2,011	35.08	0	37
Hingoli	4,686	0	10	104	114	2.43	0	47
Jalgaon	11,765	52	363	770	1,185	10.07	0	69
Jalna	7,718	1	16	48	65	0.84	0	55
Kolhapur	7,685	65	1,038	672	1,775	23.10	0	88
Latur	7,157	0	0	5	5	0.07	0	25
Mumbai City	157	0	0	2	2	1.27	0	0
Mumbai Suburban	446	0	62	58	120	26.91	0	0
Nagpur	9,892	372	953	698	2,023	20.45	2	77
Nanded	10,528	60	434	420	914	8.68	0	128
Nandurbar	5,961	0	418	796	1,214	20.37	0	30
Nashik	15,530	0	351	738	1,089	7.01	0	319
Osmanabad	7,569	0	3	40	43	0.57	0	49
Parbhani	6,355	0	4	46	50	0.79	0	49
Pune	15,643	0	757	975	1,732	11.07	0	493
Raigarh	7,152	13	1,248	1,603	2,864	40.04	0	70
Ratnagiri	8,208	33	1,911	2,255	4,199	51.16	-1	2
Sangli	8,572	0	95	49	144	1.68	0	156
Satara	10,480	119	569	588	1,276	12.18	0	365
Sholapur	14,895	0	8	39	47	0.32	0	50
Sindhudurg	5,207	89	1,372	1,112	2,573	49.41	-3	47
Thane	9,558	0	1,281	1,631	2,912	30.47	0	222
Wardha	6,309	10	419	430	859	13.62	-1	82
Washim	5,184	5	113	214	332	6.40	0	28

Source: (Maharashtra, 2011). In State of Forest Report 2011

D] Dried Rivers in the Kalampada Forests

E] Collection of Wood; Shed for animals

F] Traditional Family of the Kalampada Village

G] Current Forest Cover