Livelihood Vulnerablility To Climate Variability

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This document has been adapted from a PhD research study titled **"Livelihood Vulnerability, Exploring Links with Climate Variability : A Case Study of Konda Reddis in the Agency Areas of East Godavari".** This document focusses on 'Climate variability and its impacts and explores coping measures undertaken by the Konda Reddis of Pathakota .

This research study was undertaken in Pathakota Panchayat of East Godavari District of Andhra Pradesh in the years 2014-2016. The researcher, has been associated with LAYA, an organisation based in Visakhapatnam which has been working with tribal communities over two decades on several sustainable development issues.

The overall research has immensely benefited from the insights shared by the entire LAYA team members and direction provided by the Executive Director.

This research is dedicated to

the people of Pathakota whose livelihoods and survival is being increasingly threatened by Climate Change.

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THE ABSTRACT

Climate Change presents perhaps the most profound challenge ever to have confronted human, social, political, and economic systems. Globally, it is causing devastating effects on human society including drastic changes in agriculture, water resources, coastal regions, health, economy, biodiversity and other extreme climate events. Climate variability and Change has its links with poverty, livelihoods and development, disproportionately impacting the most vulnerable and marginalised who have contributed the least to problem but are the most impacted.

Literature review indicates that Climate Impact assessments made by the General Circulation Models are limiting as these do not provide information for small regions especially impacts of climate change on livelihoods of communities like the tribal regions which are less explored and less known, making the future scenarios more uncertain for taking responsive adaptation decisions. The current research aims to contribute to responding to this gap of community centric livelihood vulnerability studies specifically from a climate variability perspective. It attempts to understand the relationship between livelihoods and climate variability for a forest dwelling Particularly Vulnerable Tribal Group (PVTG), Konda Reddis of East Godavari district of Andhra Pradesh.

The key research questions that the study attempted to answer were:

a. What are the drivers of current vulnerabilities among the Konda Reddis of Pathakota?
b. What role does Climate variability and Change play in the current vulnerabilities ?
c. How is the local community responding to the current vulnerabilities?
d. What needs to be done among the community under study to protect them from long term Climate impacts.

The study adopted the Exploratory Case Study as the Research Strategy (Yin, 1987). The study was explorative in nature trying to critically look at the dimensions of vulnerabilities from a peoples' perspective. The theoretical framework of the research was largely guided by the social constructivist framework with the sustainable livelihoods and entitlements approach adhered to a political economy framework. The methods used for studying the case were a combination of quantitative and qualitative method viz: household surveys (100), focused group discussions (4), selected in depth interviews (9), interviews with key respondents (12), local experts (5), community meetings and participant observation. Primary data was collected using household survey schedule on the sociodemographic characteristics of the households, land and sources of livelihood, assets, food, water, health, social networks ,governance and Climate variability and extremes. Primary data on Rainfall and temperature data was collected from the Regional Horticulture station, Pandiramamidi, FGDs were done using FGD guides. Interviews with a range of government officials were done using open ended interview schedules. Secondary data was accessed through Handbook of Statistics of the East Godavari district, PESA Act and rules in AP, State of Environment Report, state government websites, mandal level administrative records wherever accessed were collected and closely studied. Relevant Policy documents of the state and the mandal was also studied. Administrative documents collected

and closely studied. Relevant Policy documents of the state and the mandal was also studied. Administrative documents collected from Integrated Tribal Development Agency ITDA), Girijan cooperative corporation (GCC) was referred.

The data and information generated from all sources was translated, cleaned and entered across thematic areas. The data was collated and findings were analysed using MS excel, frequency tables and cross tables. The use of multiple sources of data collection and evidence building helped in developing converging lines of arguments while also triangulating the findings and observations. In all, information from different sources were corroborated, evidences recombined to answer the research questions.

The study identified the key drivers of current vulnerabilities were those related to a) socio demographic shifts related to youth and education and growing health burden; b) land use change including shifts in crops and cropping pattern, increased commercialisation c) declining dependence on forests, especially NTFP for livelihoods and decline in flora and fauna biodiversity, d) ineffective local institutions and governance. Climate variability was identified as yet another factor driving current vulnerability of the Konda Reddis of Pathakota. It was observed that the community has been coping and adapting with the current vulnerabilities including climate variability in recent times but most of these are short term in nature, some being maladaptive and lacking a long term climate and sustainability perspective.

The study concluded in favour of building Climate Resilient Livelihoods through a Community Based Adaptation Approach. This approach is guided by the Community Based Adaptation (CBA) framework that is responsive to the local context, carbon friendly, based on community wisdom to manage local ecosystem, decentralised governance and an equitable approach to building

social capital. In sum, the study points towards the enhancement of adaptive capacity as a necessary condition for reducing current vulnerabilities including poverty, particularly for the least carbon emitters and the most vulnerable regions and socio-economic groups like the Konda Reddis of Pathakota.

I. INTRODUCTION

" The most devastating effects of climate change are visited on the poor, those with no involvement in creating the problem. A deep injustice . . . "

- Archbishop Desmond Tutu, March 2017

The United Nations Framework Convention on Climate Change (UNFCCC) is an intergovernmental treaty, to address the challenge of Climate Change, in its Article 1, defines Climate Change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods (UNFCCC 2011)".Climate Variability' refers to variations in the prevailing state of the climate on all temporal and spatial scales beyond that of individual weather event. Climate change therefore refers to a long periodic aggregate form of Climate variability whereas climate variability is a short periodic aggregate form of weather trends." It can therefore be asserted that climate change is a macro phenomenon and climate variability is a micro phenomenon.

1.1 CLIMATE CRISIS, POVERTY AND DEVELOPMENT

The crisis of climate change is not just a scientific one, but of a cross cutting nature which encompasses economics, sociology, geopolitics, local politics challenging the very structure of our global society and its current unequal development trajectory. Globally, Climate Change is causing devastating effects on human society including drastic changes in agriculture, water resources, coastal regions, health, economy, biodiversity and other extreme climate events (IPCC AR5). The key findings from the fifth Assessment report IPCC (AR5,2014) points out to the human interference with the climate system is increasing, which is posing risks for human and natural systems. It states that there is clear evidence for a 0.6-degree rise in global temperatures and 20 cm rise in sea level during the 20th century. The IPCC synthesis report also predicts that sea level could rise by between 20 cm and 88 cm by the year 2100. In addition, weather patterns will become less predictable and the occurrence of extreme climate events, such as storms, floods, and droughts, will increase. Many regions are experiencing altered hydrological systems, affecting water resources in terms of quantity and quality by changing precipitation or melting snow and ice. Glaciers continue to shrink almost worldwide due to climate change affecting runoff and water resources downstream. Many terrestrial, freshwater, and marine species have reported shifts in their geographic ranges, seasonal activities, migration patterns, abundances, and species interactions in response to ongoing climate change (Summary for Policymakers, Assessment Report (SPM AR5). For each of these impacted areas, scientists and social scientists have made estimates of the potential direct impacts and highlighted the irreversibility of the impacts if we continue to disrupt the climate system. Resource depletion, drought, and disease has been predicted, leading to socioeconomic upheaval (Calvin 2008). More specifically, IPCC, AR5 states with high confidence the negative impacts on crop yields being more common than positive impacts for a wide range of regions and crops. Decline in agricultural output in areas that depend on rainfed irrigation would lead to the

problem of food security becoming acute. The decline in yields affect human consumption and nutrition of the population dependent on such agriculture. The impacts of climate change on human health has been documented with local changes in temperature and rainfall altering the distribution of some water-borne illnesses and disease vectors incidences being on the rise.

AR5, points out to the intrinsic link that Climate change shares with poverty, livelihoods and development. Climate-related hazards exacerbate other stressors, often with negative outcomes for livelihoods, especially for people living in poverty. These Climate-related hazards affect poor people's lives directly through impacts on livelihoods, reductions in crop yields, or destruction of homes. Poverty causes insecurity and vulnerability and reduces people's ability to cope and to adapt due to 'double exposure' (Brien et al. 2004).

> *" Be under no illusion: if global warming is not taken seriously, it will be the poorest people in our global community, as usual, who will suffer the most "*
>
> - Maslin

Not enough attention has been paid to the means which vulnerable people themselves use to respond to stresses (Wisner et al., 2004). Additionally, as Pachauri states in the foreword to Up in Smoke (Simms et al., 2004: 1), "Most notable as a major issue of concern is the nexus between climate change and the widespread prevalence of poverty in the world". Throughout the 21st century, climate-change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security, and prolong existing and create new poverty traps. (IPCC WGII AR5).

1.2 CLIMATE CHANGE IMPACTS IN INDIA AND ON FOREST DEPENDENT COMMUNITIES

Developing countries have lesser capacity to adapt and are more vulnerable to climate change damages, just as they are to other stresses. This condition is most extreme among the poorest people (IPCC 2001). It has been noted that the impacts of climate change fall disproportionately on the most vulnerable and marginalised who have contributed the least to cause the problem and that have the least resources to cope with it (Heltberg et al, 2008; Mendelsohn et al.2006; IPCC, 2007). India has 700 million people who depend upon climate-sensitive sectors like agriculture, forestry and fisheries for livelihood. Any adverse impact on water availability due to recession of glaciers, decrease in rainfall and increase flooding would threaten food security, cause die back of natural ecosystems including species that sustain the livelihood of rural households, and adversely impact the coastal system due to sea-level rise and increased extreme events. (NATCOM 2012).

India has witnessed an increase in the surface air temperature in the past century. A warming trend is visible along the west coast, central India, interior peninsula and the North –East India (NAPCC 2008). Unusual and unprecedented spells of hot weather is expected to occur far more frequently and cover much larger areas. The west coast and southern India is projected to shift to new, high temperature climatic regions with significant impacts on livelihoods and food security. The rainfall patterns have undergone major shifts in India. A decline in monsoons rainfall since the 1950s has already been observed. The frequency of heavy rainfall events has also increased. It is estimated that a 2-degree rise in the world's average temperatures will make India's monsoon very unpredictable.

These impacts will amplify existing risks and create new risks for natural and human systems and severely impact delivery of many ecosystem services for

natural and human systems and severely impact delivery of many ecosystem services for communities who depend most on natural resources (Burton and others, 2002; Simms and others, 2004) and will be generally greater for disadvantaged people and communities in countries at all levels of development (AR5 2014).More importantly it points towards the impacts on the poor natural resource dependent communities. The question of Climate therefore is of significance in a country like India where over sixty percent of the population is directly and indirectly dependent on natural resources for their livelihoods.

The impact of Climate variability and Change has also been observed among the forest dependent groups. Most of the forest dependent communities in our country belong to a social group called 'tribes'[1]. These tribes are considered backward as most of them are forest dependent societies and reside in remote areas who have adopted their own distinct way of life. Among the tribes, the Particularly Vulnerable Tribal Groups (PVTGs) societies are even more underprivileged and over time have become more and more marginalized. What distinguishes these PVTG societies from other marginalized societies is their tremendous dependence on the environment for their survival.
Today the tribes are recognised as a distinct entity whose struggle has always been to safeguard their rights over natural resources against the pressure to control by mainstream society.

India's forests which cover nearly 23.4 per cent of the country's geographic area plays an important role in maintaining biodiversity, biomass supply, watersheds and most importantly livelihoods[2] of its forest dependent

[1] The Europeans regarded the colonised people whose technology and civilisation were relatively less advanced than theirs as primitive. In time the term tribe acquired a broader meaning of "primitive group'.

[2] Livelihood is defined as the capabilities, activities and assets required for a living (Carney 1998; Sunderlin et al. (2005) and note that poverty is typically an outcome-based measure of the livelihood performance (Sunderlin et al. 2005).

communities. Forest communities depend on forest ecosystem services include supporting, regulating services, provisioning and cultural services, as defined by the Millennium Ecosystem Assessment (2003). Many forest communities rely heavily on forest products for self-consumption and commercial use, both as the 'daily net' and 'safety net'. Resource extraction (provisioning services) from forest areas, including timber and non- timber forest products (NTFPs), has by far been cited by local communities as one of the greatest available benefits (Sekhar, 1998; Bauer, 2003; Bajracharya et al., 2006; Arnold and Perez, 2001).

Several other such forest and ecosystem communities and tribes in other parts of the world have been experiencing severe changes in Climate for eg. shifts in winds, pattern of rainfall, new species etc. Several other tribes across the world, such as the Inuits of Northern Canada, Quechua of the high Andes talk about sea ice thinning, melting of glaciers respectively. Similar experience of indigenous people from over the world are experiencing and living and with changes in climate which for them is current and real and not a phenomenon of the future. Quoting Susan and Mark in their book titled Anthropology and Climate Change:

> *" Everywhere, from high-latitude taiga and tundra regions, to high-altitude mountain ecosystems, from tropical rain forests to near sea-level coastlines, there are compelling similarities in the narratives, accounts, and experiences of indigenous and local peoples who are already seeing and experiencing the effects of climate change. For them, climate change is not something that may happen in the near or far future but is an immediate, lived reality that they struggle to apprehend, negotiate, and respond to "*
>
> - Crate and Nutall 2009

The extreme level of dependence of such groups more specifically the Particularly Vulnerable Tribal groups (PVTGs) on natural resources makes them one of the most negatively impacted groups in India. Since the large-scale macro scenarios developed through General Circulation Climate Models (GCM) do not provide high resolution information for small pockets and regions, the impacts of climate change in distantly located areas including far flung tribal inhabited region are less explored and less known. Further, such community voices have not been considered in climate policy decisions. Together with the lack of sub micro understanding of each region, its ecosystem and current vulnerability of its people has created limitations in understanding the local social – ecological linkages and developing adequate climate proof response mechanisms to safeguard the interests of such communities from a long term sustainable development perspective.

II.
THE STUDY REGION

2.1 AGENCY AREA

LAYA has been working with one of the most remotely located PVTGs called the Konda Reddis. In this research study we explore the perception of Climate Change among the Konda Reddis, inhabiting a forest ecosystem in Pathakota Panchayat in East Godavari district of Andhra Pradesh. The panchayat is unique as it is part of the erstwhile Agency Area[3] under Rampachodavaram Divison in East Godavari District.This study region has a rich history which is important to understand the current study context. Even before the Rampa Rebellion[4] of 1879, from where Rampachodavaram division

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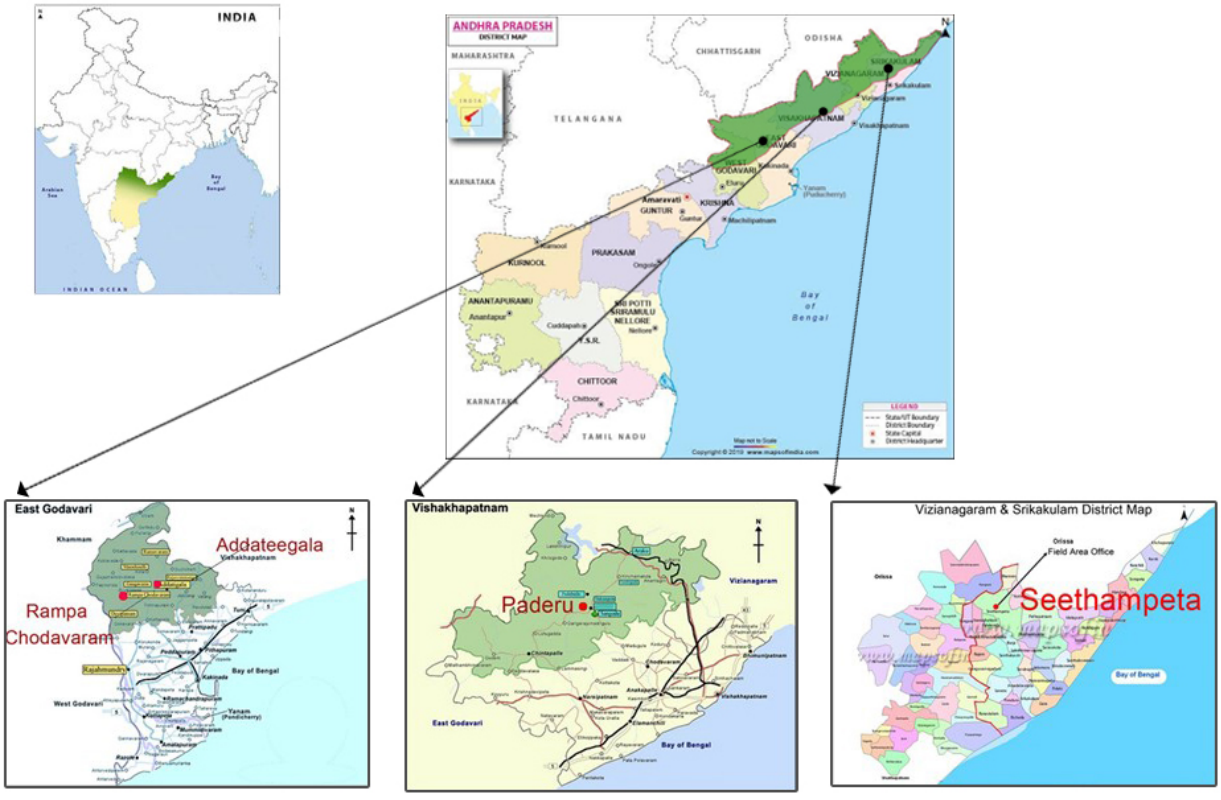
[3] Scheduled areas came to be known as those outlying areas during the colonial rule which did not come under the direct purview of civil, criminal and revenue administration. These areas were known as 'agency areas' and placed under the administrative control of 'agents' who were of the rank of District Collectors. These areas are also popularly known as 'agency areas' (Rama Reddi, 1987)

[4] 'Rampa Rebellion' refers to a full-scale rebellion of the hill tribes against the oppression of the zamindars and Madras government after it introduced a toddy tax. Restriction imposed on podu cultivation, creation forests reserves, increased axe tax, introduction of opium into the hills for revenue, prevention of the customary right to make toddy and collection of forest produce which were measures that drove the tribal people of Rampa to rebel repeatedly against the process of reservation culminating into the Rampa Rebellion.

gets its name , traders and moneylenders were pushing into the hills and beginning to undermine the traditional economy. With the construction of metaled roads into the inaccessible parts of the Rampa territory in the 1880, large scale commercial exploitation of forest began (Arnold, D.1982). Moreover, the Godavari river facilitated the movement of non tribals from widely populated plain areas of the Godavari region to sparsely populated tribal areas by country craft and mechanized boats. Especially, in the East Godavari region, massive invasion into tribal areas by outsiders occurred after 1947. The forest department, in order to meet the requirements of Andhra Paper Mills and the growing demand for firewood and timber in the markets of the coastal plains, began the extraction of bamboo and timber from the northern hill forests on a very large scale beginning 1960s. The laying of roads in the hills to transport forests produce broke the isolation of many hill settlements (Rao, J. 1992).



2.2 TRIBES IN THE STATE

The state of Andhra Pradesh consists of thirty-five tribes with the population of 27.39 lakhs comprising 5.5% of the total population of the state. The four districts of Visakhapatnam, Vizianagaram, Srikakulam and East Godavari have the maximum number (about two third) of tribal population. Based on the ecological and geographical background of various tribes in Andhra Pradesh, they have been broadly classified into two categories Viz: Plain tribes and Hill tribes

LIST OF SCHEDULED TRIBES OF ANDHRA PRADESH

1	Andh, Sadhu Andh	18	Koya, Doli Koya, Gutta Koya, Kammara Koya, Musara Koya, Oddi Koya, Pattidi Koya, Rajah, Rasha Koya, Lingadhari Koya (ordinary), Kottu Koya, Bhine Koya, Rajkoya
2	Bagata	19	Kulia
3	Bhil	20	Malis
4	Chenchu	21	Manna Dhora
5	Gadabas, Bodo Gadaba, Gutob Gadaba, Kallayi Gadaba, Parangi Gadaba, Kathera Gadaba, Kapu Gadaba	22	Mukha Dhora, Nooka Dhora
6	Gond, Naikpod, Rajgond, Koitur	23	Nayaks
7	Goudu	24	Pardhan
8	Hill Reddis	25	Porja, Parangiperja
9	Jatapus	26	Reddidora
10	Kammara	27	Rona, Rena
11	Kattunayakan	28	Savaras, Kapu Savaras, Maliya Savaras, Khutto Savaras
12	Kolam	29	Sugalis, Lambadis, Banjara
13	Konda Dhoras, Kubi	30	Valmiki
14	Konda Kapus	31	Yenadis, Chella Yenadi, Kappala Yenadi, Manchi Yenadi, Reddi Yenadi
15	Kondareddis	32	Yerukulas, Koracha, Dabba Yerukula, Kunchapuri Yerukula, Uppu Yerukula
16	Kondhs, Kodi, Kodhu, Desaya Kondhs, Dongria Kondhs, Kuttiya Kondhs, Tikiria Kondhs, Yenity Kondhs, Kuvinga	33	Nakkala, Kurvikaran
17	Kotia, Bentho Oriya, Bartika, Dulia, Holva, Sanrona, Sidhopaiko	34	Dhulia
b) list of PVTGs			
1	Chenchu		
2	Gadabas, Bodo Gadaba, Gutob Gadaba, Kallayi Gadaba, Parangi Gadaba, Kathera Gadaba, Kapu Gadaba		
3	Kondareddis		
4	Kondhs, Kodi, Kodhu, Desaya Kondhs, Dongria Kondhs, Kuttiya Kondhs, Tikiria Kondhs, Yenity Kondhs, Kuvinga		
5	Porja		
6	Savara		

The Scheduled Castes and Scheduled Tribes Orders (Amendment) Act, 2002 | Source: Census of India 2011

The context of the Particularly Vulnerable Tribal Group (PVTGs) is worth a mention in the understanding of tribes in the Indian context. Certain tribes have been characterised as Particularly Vulnerable Tribal Groups (PVTGs) earlier known as Primitive Tribal Groups, on the basis of their greater 'vulnerability' even among the tribal groups. PVTGs, currently include seventy-five tribal groups, have been identified as such on the basis of the following criteria: i) forest- dependent livelihoods, ii) pre-agricultural level of existence, iii) stagnant or declining population, iv) low literacy rates and v) a subsistence-based economy. As per the 2001 census, these 75 PVTGs had a total population of 27,68,322. The majority of the PVTG population lives in the six States of Maharashtra, Madhya Pradesh, Chhattisgarh, Jharkhand, Odisha, Andhra Pradesh and Tamil Nadu. Odisha has 13 PVTGs, the largest number for any State followed by 12 groups in Andhra Pradesh. Even within the groups labelled PVTGs by the State, there is considerable differentiation, with respect to size. There is severe dearth of baseline information available on the PVTGs as noted by a Anthropological Survey of India (AnSI) publication which quotes that "Our findings revealed shocking facts, of the 75 PVTGs, base line surveys exists for about 40 groups, even after declaring them as PVTGs" in the publication: The Particularly Vulnerable Tribal Groups of India — Privileges and Predicaments. In recognition of their socio-economic vulnerability and dwindling population levels these groups are treated as 'endangered' and 'on the verge of extinction'

To sum up, the tribal population in the State of Andhra Pradesh and in the country as a whole, is the most deprived and vulnerable community that faces severe social and economic exclusion. Although certain constitutional safeguards are provided, no significant economic, social and political mobility has taken place across this community. Contrary to Scheduled Castes and other Backward Castes who witnessed certain degrees of progress because of protective discrimination policies of the government, the Scheduled Tribes

remain abysmally backward and socially excluded, still living in harsh environs. (Reddy and Kumar, 2010).

2.3 THE KONDA REDDIS OF EAST GODAVARI

Quoting from the cardinal work "The Reddis of the Bison Hills" of Christoph Haimendorf the reference to the Konda Reddis[5] "G.E.C Wakefield mentioned in an article on his visit to the Godavari gorge, a race of hillmen called Reddis, who lived in widely dispersed hamlets and used to hunt the bison with bow and arrow but no aboriginal tribal described as "reddis" was listed in the Hyderabad census until 1931'. The Konda Reddis of the hill Reddis are now enlised under the PVTGs of India. We find the Reddis living along the banks of river Godavari or in the broad valleys of the foot-hills and the ones living on hills of the Eastern Ghats. The ones living along the banks are larger settlements could have developed as the Reddis turned from their old pursuits of food-gathering and shifting cultivation to a new economic system based on regular work for wages and, where land lends itself to ploughing, on permanent cultivation (Hameindorf 1945).The hill Reddis their traditional home is the densely wooded main ranges and the up- land valleys of the Eastern Ghats, and it is to this association with mountain-regions inhabited by no other folk that they owe the name of Konda or Hill Reddis.

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[5] A word must be said as to the scope of the term ' Reddi.' The Konda (or Hill) Reddis are by no means the only population known as ' Reddis.' For Reddi is also the name of a section of Kapus, cultivators and land-owners of the Telugu country, who hold a high position in Hindu society, and from whose martial branch the Reddi Kings of Rajahmundry are said to have sprung. E. Thurston quotes a statement of F. R. Hemingway in his short article on the Konda Reddis 1 according to which "they call themselves by various high-sounding titles, such as Pandava Reddis, Raja Reddis, and Reddis of the solar race (Suryavamsa), and do not like the plain name of Konda Reddis." Within the Hindu caste of Reddis there are numerous sub-sections such as Panta Reddis, Kil Reddis, Bhumanchi Reddis, Motad Reddis and Paknat Reddis, but none of these stands in any close contact with the Konda Reddis, who form a strictly endogamous group and a distinct cultural unit.

Image 3.2 :
A Konda Reddi couple
Deseeding Tamarind

Quoting from the cardinal work "The Reddis of the Bison Hills" of Christoph Haimendorf the reference to the Konda Reddis "G.E.C Wakefield mentioned in an article on his visit to the Godavari gorge, a race of hillmen called Reddis, who lived in widely dispersed hamlets and used to hunt the bison with bow and arrow but no aboriginal tribal described as "reddis" was listed in the Hyderabad census until 1931'. The Konda Reddis of the hill Reddis are now enlised under the PVTGs of India. We find the Reddis living along the banks of river Godavari or in the broad valleys of the foot-hills and the ones living on hills of the Eastern Ghats. The ones living along the banks are larger settlements could have developed as the Reddis turned from their old pursuits of food-gathering and shifting cultivation to a new economic system based on regular work for wages and, where land lends itself to ploughing, on permanent cultivation (Hameindorf 1945).The hill Reddis their traditional home is the densely wooded main ranges and the up- land valleys of the Eastern Ghats, and it is to this association with mountain-regions inhabited by no other folk that they owe the name of Konda or Hill Reddis.

Haimendorf's description of the Konda Reddis 'A primitive type, frequent throughout the tribe and most common in the remoter hill-villages, is characterized by a broad, sometimes heart-shaped face with a small pointed chin, high and prominent cheek bones and a flat nose, whose bridge is straight,

sometimes slightly concave and not excessively broad though the nostrils are wide.A mass of tangled hair and an unkempt beard framing their coarse features, their sturdy limbs naked but for a small ragged cloth, a strung bow, and a bundle of arrows in their hand, they tread the mountain paths with springy gait and lordly air and a look in their dark eyes that is free and unconcerned. He adds that although some Reddis could pass as Koyas and others as low-caste Telugus, the types predominant in the tribe are of a distinct order, considerably more primitive than either Koyas, Bastar Gonds or Konds.

The Reddis have practised podu, the slash and burn cultivation which requires them to keep moving every couple of years. Hill-settlements have therefore rarely been permanent. When the Reddis have cultivated the surrounding slopes for some time and have exhausted the possibilities of new fellings in the vicinity, they shift their houses to another site more conveniently situated for their new cycle of podu cutting. While plough-cultivation, restricted to the small areas of flat land, is a comparatively recent innovation.

> *" Very illuminating in this respect are the conditions in the Northern Hills, East of Patakota and Gurtedu. If we leave Pathakota and the broad valley of the Gumma Revu and strike south-east into the hills, we pass only seven houses during a climb of some three miles. These stand in small clearings, singly and in groups of two or three, while the surrounding hill slopes bear good forest and show few signs of old fellings. In an area of about twenty square miles, the densely forested mountain tract to the north and east of Katramraj Konda stretching towards the Sileru, I counted only twenty-six houses, of which ten form the village of Siramkota, while the others stand alone or in small groups. In this densely forested mountainous tract the available land many times exceeds the needs of cultivation, and it is not surprising that here the distribution of podu-fields constitutes no problem. No other condition makes for such smooth working of joint ownership as an abundance of the commodity to be shared, and individual proprietor- ship must hold little attraction where a surplus of hill-slopes suitable for cultivation permits every man to follow his own inclination in the choice of a site and to take under the axe land to the limit of his family's working capacity' "*
>
> - Haimendorf

In August before the first crop is gathered, the Reddis' podu resembles a garden rather than a grain field. There is a multitude of crops, all intermingled the early ripening small millets with their delicate ears bowed and heavy with grain, some tinted gold and others purple, white and mauve blossoms of

flowering pulses and the stout, brilliantly green stalks of the great millet. The first crops to ripen are sama (Panicum miliare) and korra (Panicum italicum), which are harvested between the end of August and the end of September Before the Reddis begin reaping, they perform the sama katta, the first-eating ceremony, which culminates in the offering of the new grain to the departed.

The Reddis dependence on nature's wild produce is still quite high and food gathering continues to occupy a prominent place in their economy. Except in those areas, where the influence of more advanced populations has led to a gradual emancipation from older economic methods, there are many days and many weeks when the Reddis rely for food on collecting the edible fruits and plants of the forest. Of all the wild plants that contribute to the Reddi's diet, the Caryota, a sago-like palm, locally known as jirigu chettu is certainly the most important (Refer image 2). It occurs erratically throughout the Reddi country, favouring the higher rather than the lower slopes, and supplies the Reddi with his favourite palm-wine. The pith of the trunk, moreover, provides him with a substantial food, which helps to bridge the gap between his grain harvests. At the height of the palm-wine season, which coincides with a time when there is little work on the fields, Reddis with caryota palms give little thought to serious activities.

The Konda Reddis in the uplands have settlements of up to ten or more houses, but in many cases they also possess houses near their fields, where they used to live for the larger part of the cultivating season. The traditional konda Reddi houses the floor-space is divided between two main parts, an inner living room and a verandah left open but it is often closed in by wattle- screens. The hearth (poi), generally consisting of three stones, stands in a corner or to one side against the wall.

The worldview of the Konda Reddis and their independent spirit is clearly expressed in one. Quoting from the 'Reddis of the Bison Hills'

> *" It was man himself who discovered how to raise a crop, just as he found out how to draw wine from palm trees; the gods did not teach him anything "*
>
> - Reddis of the Bison Hills

Within the sphere of his own culture the Reddis observe accurately and acts rationally. It is only when he comes in contact with entirely new situations where his cultural background no longer dictates the general lines of his behaviour, and no accumulated experience helps him to gauge the ultimate consequences of his actions, that he appears simple-minded and is easily deceived and exploited. Bartering his goods or labour the Reddi often cuts a poor figure beside the shrewd trader from the plains; but if we were to turn the tables and imagine that same trader or indeed ourselves, provided only with a bow, an axe and a digging-stick trying to avoid starvation among the jungle-clad hills of the Reddi Country, we should appreciate the great amount of practical topographic, botanical and zoological knowledge and experience of the Reddis.

The poor development of the Reddis can be attributed to geographical isolation, lack of entitlements , adequate infrastructure and poor governance. The Reddi country is gradually opening up to outside forces but is still avoided by most outsiders; this must also be one of the main factors that have led to the preservation of their tribal individuality and their traditional mode of life to a certain extent. The study of climate

Image 2 : Caryota Palm

variability with this particular community was undertaken as this location can be treated kind of greenfield, which still has some of the green cover, relatively limited (but growing) external influences of commercial agriculture, low levels of industrialisation etc. It can still be a ‘virgin” in many senses. Further the population of Konda Reddis is one of the highest this region.

III. CLIMATE VARIABILITY & ADAPTATION RESPONSE AMONG THE KONDA REDDIS

The study attempted to understand and analyse the manifestations of Climate Variability and extreme events among this community. It explored the local climate impacts and its linkages with livelihoods. Coping and adaptation measures undertaken by the community has also been assessed and examined.

For the purpose of this study, it is important to note that we use the term 'variability' instead of Climate 'Change' as Climate Change classically refers to changes over a 30 years long time period. Climate change data for distant panchayats like Pathakota is difficult to obtain. Variability data and information was relatively easier to gather which could also be corroborated with peoples recall memory which typically recalls short period of changes.

Methodology :
Data and Information collection was done by using both primary and secondary data. Primary data was collected through survey of 100 households, together with FGDs with male, female farmer groups and village elders.

Secondary data was collected from District handbook of Statistics the secondary meteorological data obtained from the Chief Planning Officer's Office (CPO). Temperature and rainfall Data was collected from the nearest Horticulture Research Station (HRS), Pandiramamidi. Coherent data at Pandiramamidi was available only for the past five years at the time of this research. This was preferred to the CPO data as Pandiramamidi station data was likely to be more reflective of Pathakota' climate due to its relative proximity to Pathakota (85 kms) than CPO Kakinada (172 kms). Data limitations prevented from taking up statistical calculations, for calculating deviations and variations but since the purpose of the research was to understand how changes in local weather patterns were affecting the local community, their land and their livelihoods, an analysis of current variability was considered adequate.

CLIMATE VARIABILITY IN PATHAKOTA

The observed climate variability over India has been extensively studied and documented. (Parthsarthy et. al, 2011, Rupa Kumar, K., Pant, G. B., Parthasarathy, 1994, Guhathakurta, P. and Rajeevan, M.,2008). Most lately the book 'India in a warming world' edited by Navroz Dubash (2019) presents climatic trends over the next few decades. Taken together these studies highlight that India's climate variability is dominated by variability across its seasons (interseasonal) and across years (inter annual). This has given rise to extremes in seasonal anomalies resulting in severe droughts, floods, heavy rainstorms. The most important part of the climate system in India is the Indian summer monsoon or South West monsoon (SW). Most part of our country receive their annual rainfall during the summer monsoons, while some parts of the country, mostly the south eastern states also receive rainfall from the winter rains or the North East rains. The quantum and distribution of the

rains also vary from west to east across the country. Rainfall increases almost threefold from west to east. Temperature variability has been observed over seasons with pronounced warming during the winters. Further, variability is observed in the mean annual number of rainy days[6] with 20 days in the western region to over 180 days in the North Eastern part of the country. The variability is also seen with relation to the distribution and intensity of rainfall on a regional and local level.

From the community perspective in Pathakota, a brief summary of the salient features of observed Climate variability and change that emerged from Focus Group Discussions[7] from the community in Pathakota is presented below.

1. High temperature with increase in warming periods through the year
2. Loss of rainfall predictability
3. Delayed rainfall[8] – Delay is becoming a new normal. Monsoons in the area arrive after the 12th of June and retreats by mid-September.
4. Sporadic showers are experienced, sometimes very heavy showers. Continuous rains over few days takes place only in some area.
5. 'Dry years' with less rainfall on the rise
6. Rainy days decreasing with more rain in less days.
7. Winter rains getting more and more unpredictable.

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[6] Days with rainfall over 2.5 mm

[7] Considering that the recall period of people is best for past 5-6 years, we have attempted to study the temperature and rainfall data of the region and related it to the Konda Reddi experience in Pathakota.

[8] Delayed in climatic terms refers to delay in monsoon arrival from a 30 year average. For the community the delay refers to operational and agricultural delays.

8. Winters arriving a month late and leaving early (2 weeks to 3 weeks before) in this area.
9. Sharp changes in seasons

Responses from the surveyed households across a range of climate variability parameters can be seen from Table 3.1. It was observed that unpredictability of weather is a key characteristic. Erratic monsoon has been a common observation among households along with forty-three households reporting the intensity of rains to be high. Increase in warming period with extension of summer months with increase in dry spells was experienced by the households.

Climate variability parameters	Very High	High	Moderate	Low	Very Low
Rise in temperature	11	66	19	4	0
Rise in intensity of rains	43	38	12	7	0
Occurrence of drought	0	16	69	13	2
Rise in water logging	13	34	47	6	0
Rise in incidences of heat waves and sun strokes	27	42	31	0	0
Frequent variations and unpredictable weather	100	0	0	0	0
Extension of summer months	0	81	14	5	0
Extension of winter months	0	0	0	21	79
Erratic monsoons	83	17	0	0	0
Rise in severe cold waves	0	18	73	9	0
Hailstorms	0	0	34	66	0
Rise in infection diseases	32	61	7	0	0
Rise in pest infections	7	79	11	3	0

Table 3.1
Perception of climate variability and extremes across households | Source: Primary Survey of households

In the words of Murla Abbaireddy, the priest from Kopullakotta village, 56 years recalls "we came here about 20 years back. We used blankets from the onset of North East monsoons for a good three months, now we use blankets for not more than 3 weeks in December-January. The dry hot period has become the longest, the monsoons are behaving in a way that it has become difficult for me to suggest sowing dates for the community. Farming decisions have become very difficult to make."
Abbaireddy's words capture the reality that the community is facing with climate variability and change.

The following section presents the factors affecting local climate variability :

- Temperature Variability and Extremes - Maximum and, Minimun
- Rainfall – South West (SW) and North East (NE)

3.1 TEMPERATURE VARIABILITY AND EXTREMES

Changes in temperature was highlighted as one of the key aspects impacting livelihoods. The maximum and minimum temperatures highlighted the trends and the status analyzed. The assessment of the status draws from the standard definitions of the Indian Meteorological Department [9].

[9] A 'rise' defined an increase over 2 degree while an 'appreciable rise' lies in the range of 3-4 degrees, 'marked rise' in the range of 5-6 degrees and large rise over 7 degrees

MAXIMUM TEMPERATURES

Month	Normal	2012	2013	2014	2015	2016	Status Above Normal Normal
January	25.6	29	29.4	30.2	31.6	31.3	Appreciable Rise
February	26.7	32	31.6	31.4	32.8	32.1	Appreciable - Marked Rise
March	27.8	31.9	35.9	36.1	38.5	34.6	Marked - Large Rise
April	32.1	37.1	33.8	34	35.2	35.1	Rise - Appreciable Rise
May	35.3	36.7	38	38.4	39.7	40.6	Rise - Marked Rise
June	34	34.1	31	31.6	33.3	37.6	Below Normal - Little - Appreciable Rise
July	31.4	32.8	31.2	31.4	30.3	33.4	Little - Appreciable Rise
August	31.8	33.6	27.1	32.9	31.8	31.8	Below Normal - Normal Rise
September	30.7	33.4	30.7	32.6	31.7	31.2	Normal Appreciable Rise
October	29.7	31.3	32	31.7	31.1	30.8	Little - Appreciable Rise
November	27.3	28.5	31.2	31.6	29.1	29.1	Rise - Appreciable Rise
December	26.1	27.4	20.6	20.8	27.4	26.3	Below Normal - Little Rise

Table 3.2
Maximum Temperature Variability | Source: Author Collated and analysed with data from Horticulture Research Station(HRS)

Pandiramamidi, Rampachodavaram
Notes: The deviations in temperature was analyzed to interpret the 'status' and deviations of variability based on Indian Meteorological Department (IMD) definitions.

Table 3.2 indicates that the mean maximum temperature for all the months except the months of December is higher than the normal[10] maximum

[10] Normal conditions describe what is normal for an area using the most recent statistically adjusted 30-year interval of average weather conditions.

temperature values across five years. (When the value of a variable is within one standard deviation of either sides of its mean value, we say that of the variable is within normal range or simply normal. When the value of the variable is one standard deviation above (below) its value, it is above (below) normal. The highest deviations against normal temperatures was observed for the month of January, which is regarded as the coldest year, with the lowest normal temperature where the increase in temperature was over six degrees. The month of March too showed high variability with temperature in 2015 reaching 38.5 from its normal value of 27.8, an increase by over 10 degrees. December also showed an increase from the normal but had two years in 2013 and 2014 with low temperatures than normal. Temperature in May 2016 was the highest in the recent past. The sun strokes reported by households as part of the household survey and during community meetings can be corroborated from Maximum temperature in May reaching over 40 degrees. However, it is to be mentioned that a lack of panchayat /village level metrological data limits drawing conclusions on the trends emerging from the HRS data.

> ***However, it can be broadly concluded that the maximum temperature values across months is on the rise, especially the warming in post monsoons and winter seasons only with exception for the month of December showing a sharp decline.***

The 'warming' been experienced by communities and short and sharp winters could be explained from this trend.

MAXIMUM TEMPERATURES

The mean minimum temperatures also showed an increasing trend. However, the increase in minimum temperature was not as pronounced as the mean

maximum temperatures. Months from July to November show the least deviations from normal month values.

> ***The most negative anomaly was observed for the month of December showing highest deviations from normal with an increase of over 9 degrees in 2013 and 2016.***

For both the cases of maximum and minimum temperatures the rise in temperatures could vary from "rise to marked rise" as per IMD.

> ***The maximum and the minimum temperatures also point towards the increasing difference between the monthly maximum and minimum temperatures (Table 3.3).***

Notes: The deviations in minimum temperature was analyzed to interpret the 'status' and deviations of variability based on IMD definitions

This could also suggest that characteristics of daily temperatures might be undergoing changes that relates to increase range between maximum and minimum daily temperatures. These trends could also point that the new normals would be systematically rising temperatures. Globally, multiple independent research groups perform their own analysis of the surface temperature data, and these all show a similar upward trend. Record-setting daily high temperatures have become more common than record lows. The decade from 2000 to 2009 had twice as many record highs as record lows. This could probably explain the overall 'warming" reports and 'long warming period' experienced by the community.

3.2 RAINFALL VARIABILITY

The amount and distribution of rainfall received over an area determines its agricultural production, irrigation, water and for maintaining forest health. The spatial and temporal distribution of rainfall therefore, determines the livelihood and economic status of its people, region, a state or a nation. Much of the information about the rainfall climatology of any region is mostly based on monthly, seasonal, and annual rainfall data that are derived from daily rainfall recorded at individual stations. Two relatively simple parameters which assist in providing a better picture of rainfall conditions than the monthly total alone, is the number of rain days. Rainfall intensity is yet another important determinant. These provide an indication of frequency of occurrence and a crude measure of intensity of rain, both of these characteristics having immense agricultural significance (Table 3.4) especially for the communities like the Konda Reddis who depend on rainfall for their food security, nutritional security, water for drinking and irrigation and overall wellbeing.

Months	Normal	Rainfall 2012 in mm	No. of Rainy Days	Rainfall 2013 in mm	No. of Rainy Days	Rainfall 2012 in mm	No. of Rainy Days	Rainfall 2012 in mm	No. of Rainy Days	Rainfall 2012 in mm	No. of Rainy Days
Jan	9.1	14	3	0	0	32	3	0	0	0	0
Feb	11.1	0	0	0	0	0.6	0	0	0	0	0
Mar	14.1	0	0	0	0	0	0	0	0	0	0
Apr	17.6	33.4	5	87	6	7.4	1	36.8	2	31.7	2
May	95.7	84.2	6	31.6	3	68.4	4	48.2	4	36	2
Jun	120.2	217.3	13	81.4	4	198.3	6	216.8	14	206.4	11
Jul	230.8	242	18	185.2	9	259.9	18	345.8	21	258	25
Aug	212.6	342.6	16	405.2	18	270.2	21	231.4	18	206.5	11
Sep	187.1	202.1	15	136.2	10	227.4	16	191.8	23	188.6	9
Oct	214.6	83.4	11	51.6	5	96.4	7	339	21	229	7
Nov	93.2	113.8	9	0	0	0	0	15.8	3	115.8	5
Dec	10.9	0.6	3	0	0	0	0	54.3	1	8.6	2
Total		**1333.4**	**99**	**978.2**	**55**	**1160.9**	**76**	**1579.9**	**107**	**1280.6**	**99**

Table 3.4
Month-wise Rainfall and Rain Days for the period 2012-2016 | Source: Collated and analysed from Horticulture Research Station (HRS), Pandiramamidi, Rampachodavaram

The study examined rainfall data for past five years and related it to the local level impacts being felt by the community in Pathakota. The data shows the following broad trends:

1. Annual Rainfall values for five years recorded a maximum of 1579.5 mm and the lowest value was 978.2mm.
2. Rains are received during South West (SW) monsoon during June to September, North east (NE) monsoon bring rains for three months from October to December, the winter rains in January and February while some sporadic rain during the hot period from March to May. (Figure 1.1 presents rainfall distribution across seasons).
3. Intensity of rains was observed to be increasing- more rains in lesser days. This is more pronounced during the monsoon season. 342 mm of rainfall was received in 16 days in 2012 following 405 mm of rain received in 18 days in 2013. Similarly, 270 mm was received in 21-day period is 2014 and 345mm of rainfall in the same time duration of 21 days in 2015. Intensity of rain per day varied from 10 mm to 22.5mm suggesting moderate rainfall[11] on all days.
4. Across the five years from 2012-2016, five months out of twelve show normal rainfall (January, June, July , September and December)while , three months of May, October and November show deficient rains[12], with April experiencing excess rains.
5. The north east monsoon rains, especially the November rains show extreme values from 0 mm (no rain)- 115.8 mm. The normal or the long-term average for November was observed as 93. 2mm.

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[11] The range for moderate rainfall lies between 7.6 – 35.5mm as per IMDs definition

[12] IMD defines 'deficient rainfall when Percentage departure of realised rainfall from normal rainfall is between – 20 % to -59 %. Normal when Percentage departure of realised rainfall from normal rainfall is between - 19 % to + 19 % ; excess is over 20 % or more and scanty lies between -60% to 99%

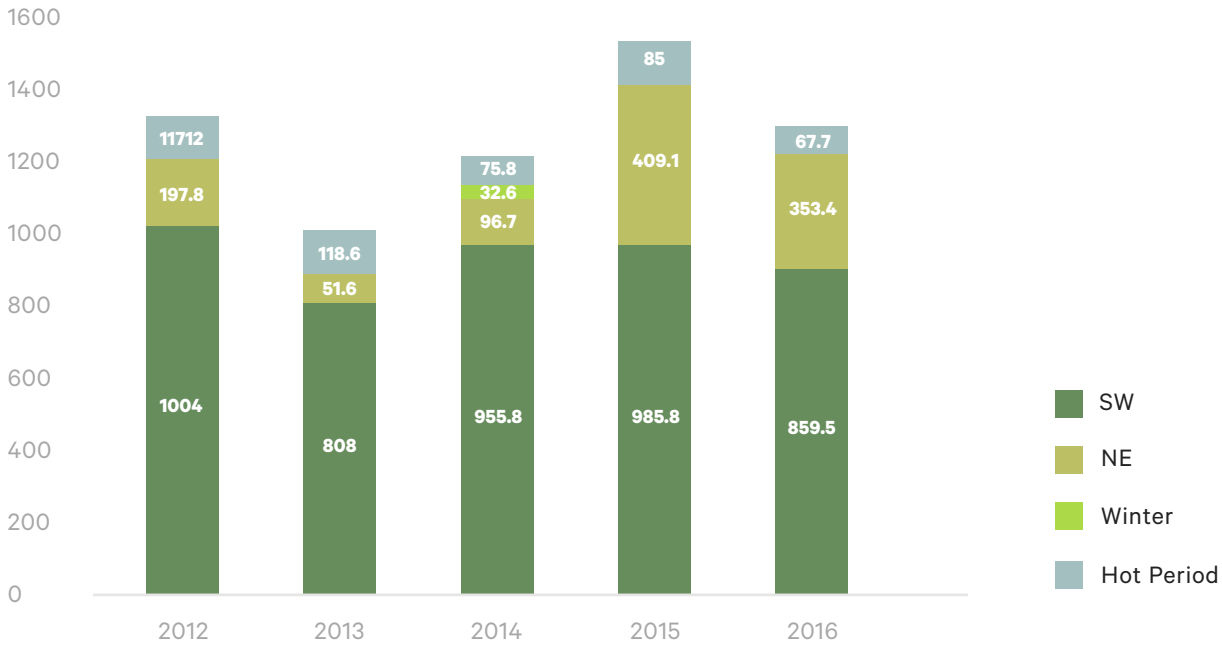

Figure 3.1
Rainfall Distribution Across Seasons in East Godavari | Source: Collated and analysed from Horticulture Research Station(HRS), Pandiramamidi, Rampachodavaram

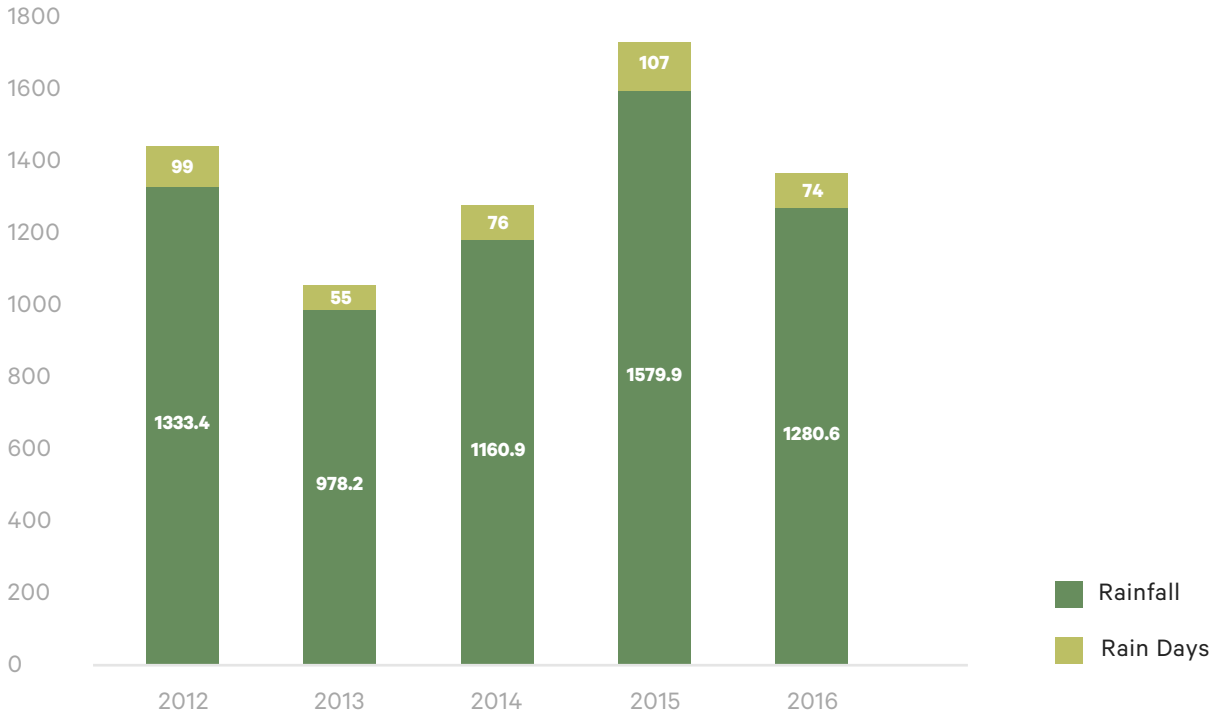

Figure 3.2
Total Annual Rainfall and Rain Days | Source: Collated and analysed from Horticulture Research Station(HRS), Pandiramamidi, Rampachodavaram

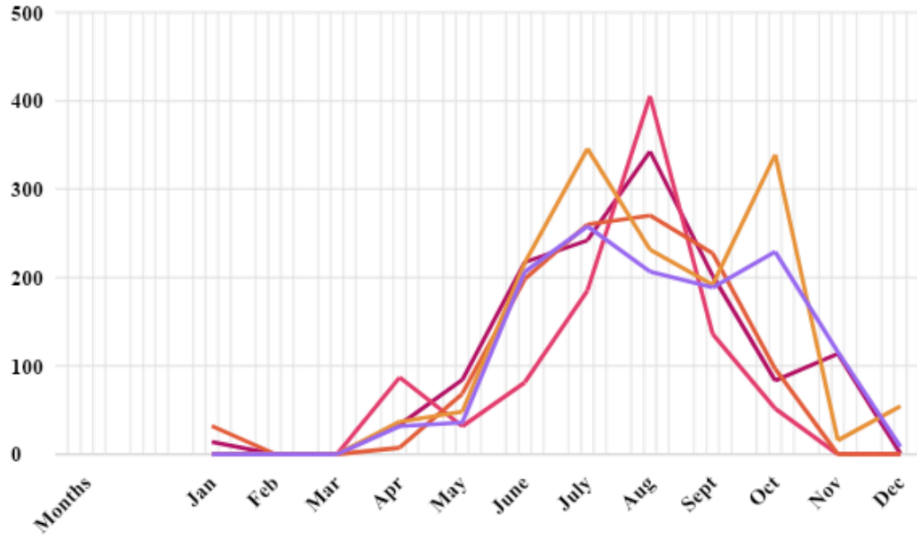

Figure 3.3
Month wise Rainfall for the Period 2012 - 2016 | Source (Series 1 – 5 corresponds to Years 2012 – 16) : Collated and analysed from Horticulture Research Station(HRS), Pandiramamidi, Rampachodavaram

The increase in the values of climate variables in the region seem to align with the larger IPCC scenarios (IS 92a) which shows marked increase from the 1961-1990 baseline value. While it is to be reiterated that the data for five years is too small to be making comparisons from any long-term average values but it is important to note that the annual values of climate variables is on the rise. In the following section we examine the characteristics of the South West (SW) and North East (NE) monsoons.

SOUTH WEST MONSOON

This monsoon brings the maximum amount of rain in the agency region. The annual rainfall ,peaks and extremes, deviation of values from the long-term average or normals, the relationship between rainfall and rainy days was analysed.

The maximum rainfall recorded during the SW Monsoon for the period from 2012-2015 was 405.2 mm for August 2013.The normal for the month of

August was 212.6mm. The minimum rainfall during the monsoon was 81.4 mm in June 2013, against the normal value for June at 120.2 mm. The range of peak values of the south west monsoon across these five years, with 258mm being the highest recorded rainfall during the SW monsoon during 2016 and 405.2 mm in 2013. All the months from June to September demonstrated higher rainfall values than the normal for those months. For example, the month of June, four out of five years showed an increase from normal. Similarly, the month of July also showed higher than normal rainfall for four out of five years. The rainfall in August showed higher value than normal across all the five years, while September rainfall figures showed three years showing higher than normal values.

We should mention here that the study by Kumar, K.K et al (2011) simulating summer monsoons over India stated that the all-India average monsoon rainfall is trendless over an extended period starting 1871. However, they observed in recent years that the characteristics of daily rainfall have been undergoing changes in a way that the frequency and intensity of heavy to very heavy rainfall events are increasing.

> ***This suggests that daily rainfall characteristics are emerging as an important factor in determining local climate variabilities.***

NORTH EAST MONSOON

The North East monsoon is very important for the region as the rains contribute to livelihoods through food crops and more from cash crop incomes. We examined the rainfall patterns over the past five years and related it to the information gathered from the community.

It was observed that the total rainfall rainfall data across years show extreme values from 51.6 mm in 2013 to 409.1mm in 2015. We also observed that in 2013 and 2014, months of November and December were dry with zero rains. October rains on the other hand showed deviations from its normal value of 214.6 mm. October shows a dip to as low as 96.4 mm and a high of 339 mm in 2015.The intensity of rains also pointed towards more rain in lesser days. 96.4 mm of rainfall were received in 7 days' period in 2014, while 229 mm of rainfall was received in the same time period in 2016. The occurrence of 'heavy rains' could be explained from this.

Year	SW	NE	Total Annual Rainfall
2012	1004 (75.29%)	197.8 (14.8%)	1333.4
2013	808 (82.6%)	51.6 (5.2%)	978.2
2014	955.8 (82.3%)	96.7 (8.3%)	1160.9
2015	985.8 (66.5%)	409.1 (27.6%)	1479.9
2016	859.5 (67.1%)	353.4 (27.6%)	1280.6

Table 3.5
Contribution of South West and North East Monsoons to Annual Rainfall for the period 2012-2016

The South West monsoon contribute in the range of 66.5 percent to 82.3 percent to the total annual rainfall over the period 2012-2016.The very important role played by the North East monsoon shows a great degree of variability. It ranges from 5.2 percent to 27.6 percent to the total annual rainfall. This variability could be a reason to have negatively affected cash crops like pulses as was reported by community and evident from the surveys and meetings with local scientists.

3.3 LOCAL LEVEL IMPACTS

1. Arrival of Monsoons and Impact on Agriculture Operations and Livelihoods
2. Impacts of Extreme events on farmer categories, sub seasonal variations
3. Climate variability and local level impacts on cropping System

    - Loss of crops, income and work days
    - Climate Variability and Local Health Impacts
    - Climate Impacts on Livestock
    - Impacts of Climate on Konda Culture
    - Shifting Plant habitats

ARRIVAL OF MONSOONS AND IMPACT ON AGRICULTURE OPERATIONS AND LIVELIHOODS

In the context of farming operations for this community, the arrival time of the monsoons is an important factor. The monsoon is deemed to have arrived only if IMD finds that 60% of the 14 enlisted weather stations in Kerala and Karnataka report rainfall of 2.5mm or more for two consecutive days after 10th May. 'Delayed' rainfall was pointed out as an area of concern by the community. Four out of five years from 2012-2016 were delayed. For the community any delay by 4-6 days has immediate impacts as the delay affects land preparation like ploughing that usually commences after the first showers. In East Godavari, farmers practice two sowing cycles :

1. June to September (Tholakari) by the South west monsoon which is the main agricultural season
2. October to December (Aparalu) when the North East monsoons bring rains for crops.The households under study also follow the same practice.

Sarpanch Baburao says "A delay by a week has perceptible impacts on sowing, germination, nursery management, transplantation, flowering and quantum of produce. Any delay shortens the monsoon period and crops do not attain full growth as the monsoons start retreating by mid-September. The delay also plays upon the availability of labour work force and increases agricultural pressure. This pressure is more for those households who have large Pallamu (paddy) lands and smaller family size".

IMPACTS OF EXTREME EVENTS ON FARMER CATEGORIES, SUB SEASONAL VARIATIONS

IPCC, SREX, Special Report on extreme events defines climate extremes as the occurrence of a value of a climate variable above a threshold value near the upper (or lower) ends of the range of observed values of the variable. Both extreme weather events and extreme climate events are referred to collectively as "climate extremes".

Episodes of heavy rainfall and high temperatures as observed above point towards extreme occurrences. 'Crop loss' was identified as the major impact of extreme climate variables. Extreme events were manifested as :

- the outbreak of diseases (among humans and livestock)
- increased incidence of malaria and
- heat strokes

Episodes of sun stroke can be related to decade high temperatures in May 2016 which people could immediately recall. New phenomenon in climate like random episodes of hailstorms and waterlogging mentioned can also be linked to heavy downpours and sudden sharp temperature decline in the winters. Sharp decline and losses from North East monsoon can be seen from no rain in 2013-2014 which not only impacts food crops but more importantly cash crops like pulses.

"Both food security and cash availability is impacted due to climate variability" says Baburao.

This variability in the North East monsoons has led to enormous dependence on moneylenders among this community. The most affected are the farmers who depend only on garuvu land (slope land) or have higher proportions of garuvu land. Impacts are therefore nuanced for different groups of households and different category of farmers.

The pattern of rainfall within the sub season was observed to be important from an impacts perspective. An area might receive a good quantum of rainfall, uneven distribution might negatively impact crop and Non -Timber Forest Produce(NTFP) biodiversity. The case of hill brooms was a case in point in the area under study. For example, the production of hill brooms was severely impacted in the year 2013 and 2014 due to rainfall fluctuations. The quality of brooms was very poor and did not fetch good price. This impacted the returns from hill brooms forms an important source of income for these communities in the month of May- August every year. Therefore, the production and sale was equally affected by local seasonal fluctuations. Similarly, the growth of several kinds of leaves and mushrooms and local fruits were impacted by the pattern of sub seasonal rainfall. From the farmers' perspective, the macro phenomenon of a 'normal' monsoon season may or may not deliver what they expect.

> ***The farmers want the right amount of rain at the right time (at the time of preparing the land for sowing and then at the time of germination), not good averages.***

The Konda Reddy farmers in Pathakota, needed to know how much of rain and when and at what place will be available to make the right cropping choices. This question has been the most difficult to answer despite advances in modelling techniques and methods.

> ***Forecasting techniques especially local forecasting[13] need to be developed to be able to support farmers with the right information (with little errors margins) to be able to help them take the most appropriate decision to secure their production and livelihoods.***

CLIMATE VARIABILITY AND LOCAL LEVEL IMPACTS ON CROPPING SYSTEM

1. Loss of crops, income and work days

We observed that climate variability affects production across all the major land types viz. pallamu (low land) and garuvu (slope land with slight gradient) and impacts cropping system. No rain, heavy and delayed rain affected the production of both paddy and grams and pulses as mentioned in table 3.5

Eighty-nine percent of the households reported that farming work is a function of weather while sixty-three percent of the households reported that they have lost workdays due to bad weather over the past three years. The number of days lost ranged from a week to three weeks during prime agricultural and harvesting season (refer figure 3.6).

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[13] Local forecast: In local forecast, whenever any weather phenomenon is expected, its intensity, frequency and time of occurrence is indicated. In the absence of a weather phenomenon, the local forecast describes anticipated sky conditions. The other parameters for which the local forecast issued include maximum temperature and/or minimum temperature, rainfall, wind and special phenomenon. It is valid for a radius of 50 km around the station and is updated 4 times in a day.

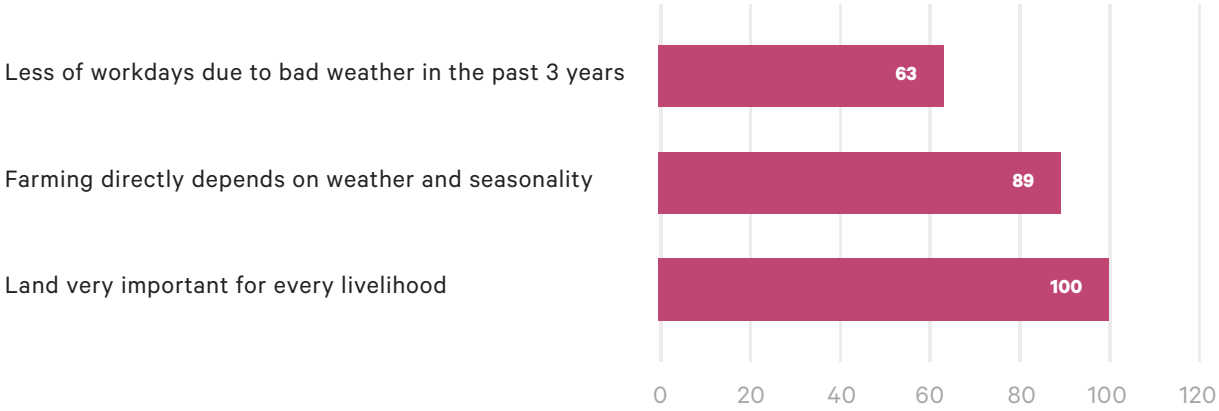

Figure: 3.4
Perception of Survey Households on Climate Variability and Loss of Working Days | Source : Survey

Empirical evidence pointed out that Climate variability was an important determinant in encouraging savings and making Self help Group (SHG) functional. The monthly contributions of members in SHGs in Pathakota was regular in the years having good rain and crops. The FGD with the women group suggested that SHG savings that the years of 2013 and 2014 were those where contributions to SHGs were marginal. and that borrowings from money lender increases during less rainfall years, freak rainfall years creating a high loan burden. Here it is important to highlight that the Economic survey of 2018 points that climate change could reduce annual agricultural incomes in the range of 15 per cent to 18 per cent on average, and up to 20 per cent to 25 per cent for unirrigated areas. This will result in reduced adaptive capacity for more than half of the population of the country and present a huge challenge to the food security.

2. Climate Variability and Local Health Impacts

The growing episodes of heat stress and strokes reported by the community point towards the increases in maximum temperature affecting health. Andhra Pradesh reeled under heat wave in 2003, killing 1421 people, which was an all-time high in the history of Andhra Pradesh.Long periods of heat impacts

health and studies point out that increase in temperatures would lengthen the transmission window, and alter the geographic range of important vector-borne diseases, malaria being a serious cause of concern in the region. Malaria is the one vector-borne disease most sensitive to long-term climate change. There is also historical evidence of the relationship between climatic conditions and vector-borne diseases. Excessive monsoon rainfall and high humidity were identified early on as a major influence, enhancing mosquito breeding and survival. Figure 3.5 points out to the climate factors affecting health wellbeing among the Konda Reddis of Pathkota.

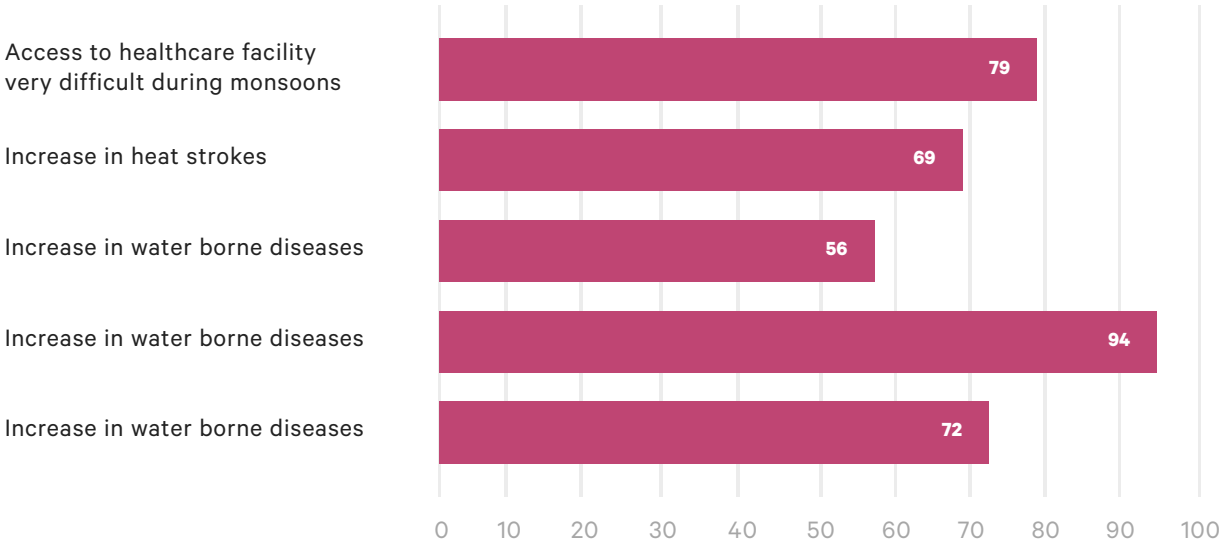

Figure 3.5
Impact of Climatic Factors on Health of Konda Reddis | Source: Primary survey

3. Climate Impacts on Livestock

Climatic changes were making rearing of livestock challenging in recent years as presented in Figure 1.6 which shows that eighty-two percent of the households rearing cattle find climate variability affecting livestock wellbeing. Frequency of occurrence of water borne diseases during monsoons was reported by fifty-eight percent of the households, while forty-seven percent of households reported outbreak of new diseases among goats during summer.

Another common problem among cattle (those rented out during the farming season) was the problem of mouth ulcers due to increased heat and motions problem due to ingesting infected water. Increased health issues was reported as one of the key reasons for not owning cattle.

Livestock rearing has been an important source of livelihood for the Konda Reddis. Livestock here refers to goats and chicken (and does not include cattle).. Goats are considered an investment and as said by a young tribal farmer in village Veerampalem that "goats are what ATM is to you" , however remarking that rearing goats is getting difficult every passing year. Another woman farmer Pathunu Narsamma from village Kothapakalu said that there has been a drastic decline in livestock rearing over the past ten years " rajma came up, livestock came down". The community meetings pointed towards the relationship between livestock rearing role of seasons as mentioned in figure 3.6 which highlights the health vulnerabilities of livestock to water borne diseases in the monsoons, increase of new diseases during summers particularly among goats.

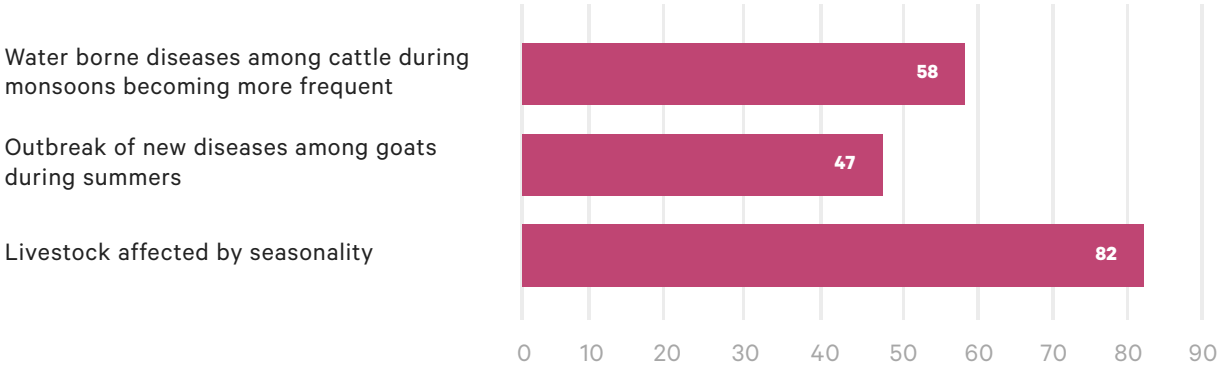

Figure 3.6
Livestock and Seasonality | Source: Primary survey

4. Impacts of Climate on Konda Culture

Indications of climate change on Konda festivals and celebrations could be one key change taking place (Refer table 3.7). The future shifts in the Konda Reddy ceremonial calendar was highlighted.

> *" Dudala panduga is not what it used to be many years back. We hardly get rabbits and wild rats as we used to.The big animals like the boar which we had in plenty is hardly to be seen "*
>
> - Saramkota Krishnareddy from pathakota village

The community meetings and FGDs indicated that shifts are pertinent given the delayed cropping system which impinges on the cultural practices of the Konda Reddis thereby undermining their cultural life and ethos.

Name of festival	Deity / Enviromental Aspect Worshipped	Month / Duration of Celebration
Gangalamma Panduga	Prayers for village welfare Annual harvest festival	May
Konda Podu Panduga	Start of podu cultivation	March
Dudala Pannduga	Hunting festival	October / March
Korra Kotha Panduga	Prayers offered on harvesting Kora sama grain and first eating	One day in October
Dasara Panduga	Jonna grains harvest festival and first eating	January
Dhanyam Kotha Panduga	Harvesting paddy and first eating	November - December
Pappu Panduga	Harvesting pulses and red gram	December
Adavi Rajula Panduga	Prayers to forest deity seeking protection while NTFP collection and hunting	January

Table 3.7
Potential List of Konda Festivals linked to Climate Change | Source: Primary data, FGDs

5. Shifting Plant habitats

The local level impacts observed was the upward movement of few species, where trees are gradually being found in the upper reaches including species of Tangedu, maddi, sinnem, singuda, vandanam, panasa, mamidi which are culturally relevant species enjoying a high degree of community dependence. This could also indicate overexploitation and selective felling of these species, could also indicate that germination and natural growth of these species is being affected probably by changing climatic conditions, as emerged during discussions with the village elderly.

> ***The collection of honey and beeswax has also been impacted in the areas. Temperature rise, change in crop pattern and forest cutting has reduced bees population in the region. Data from Girijan cooperative corporation (GCC) on honey and beeswax collection corroborated this change.***

IV. COPING & ADAPTING TO CURRENT CLIMATE VARIABILITY

> *The research pointed towards the following measures being undertaken by the community to tackle and respond to climate variability and extremes.*

1. Clearing Forest for developing Agricultural Land
2. Building Human Capital Through Schooling
3. Increasing Agricultural Labourers
4. Increasing dependence on village markets (shandy)
5. Increased Dependence on Public Distribution System (PDS)
6. Increased frequency of borrowings from the money lender

There is well established observation of human adaptation to climate change over the course of human history (Adger et al.2007). This study examined mechanisms by which the community was coping and adapting with existing and future vulnerabilities including climate variability and change. Coping is opposed to adaptation which is the process of adjusting to change (both experienced and expected), which is longer term (for example, over a decade or

longer". The Stockholm Environment Institute (SEI) defines "coping is a way of responding to an experienced impact with a shorter-term vision (for example, one season). Adaptation to climate change is long term in perspective and it is seldom undertaken in standalone fashion but as part of broader social development initiative. The following were identified as ways by which the community was responding to the existing vulnerabilities including climate variability.

1. Clearing Forest for developing Agricultural Land

Evidences indicated that this community has been clearing forest patches for current and future use. The reasons attributed for this conversion was to cope against decreasing productivity from land by increasing cultivable area, in order to provide buffer against erratic climate. It was also found that clearing forests is being done in to obtain land titles under the Forests Rights Act. Of the few cleared patches within the panchayat which varied from 0.5 acres to 4.5 acres were primarily used for horticulture, some were used for cashew plantations, mango plantations and pulse plantations while some were felt fallow. This process of coping involving natural 'habitat fragmentation'[14] in the forest ecosystem has often led to severe soil erosion where revival of the original micro ecosystem is considered to be mostly irreversible. (Haddad N.M et al 2015).

[14] Habitat fragmentation is defined as the breaking apart of continuous habitat in to distinct pieces, and can be understood in terms of three interrelated processes; a reduction in the total amount of original vegetation, subdivision of the remaining vegetation in to fragments, and the introduction of new forms of land use to replace lost vegetation, usually in the form of agriculture (Bennett & Saunders, 2010).

2. Building Human Capital Through Schooling

A doubling of literacy levels was observed in the villages between 2001 -2011 (census 2001 and census 2011). Household survey, community meetings, FGD with the youth and interviews with the residential tribal Ashram school teachers corroborated the changing situation. Uncertainties and agricultural risks appear to have encouraged the tribal community, with no culture of organized formal education to send their first-generation learners to school. This is being facilitated to provide opportunities for the children to be able to have alternative livelihoods in the future. However, this study also indicated that the schooling process has not led to education and empowerment of the tribal children but on the contrary has pulled them away from agriculture and their own realities. The objective of having alternate livelihoods (which is understood mostly as livelihoods 'other than agriculture') through investing in education appears to be a growing trend, but education to benefit whom and for what are the deep underlying questions.

3. Increasing Agricultural Labourers

Traditionally the forest dependent Konda Reddis in Pathakota panchayat have been involved with crafts making. With depletion of raw materials over years primarily of bamboo harvested by paper mills, crafts making has seen a sharp decline. Out of the hundred survey households only 19 families were involved with some level of craft making. Most of these households (79%) were women headed households. Such women were increasingly taking up to working as agricultural laborers. Landless, single women who depended largely on NTFP collections as major source of income are now increasingly working as agricultural labourers on the lands of large Konda Reddi farmers or on the land of other tribal communities.

> *" in these times we are sought by many families in the village and surrounding villages when the agriculture season in on. Since the children are mostly not available and the rains are now coming only for a short duration ; a lot of farming work opportunities' fall on us which is to be done in a short period. Earlier the families and children would be engaged on their lands "*
>
> - Naini Ravanamma of Chikalaveedilanka village

This is not the case anymore.

4. Increasing dependence on village markets (shandy)

An increasing dependence on shandy was observed among the community. One of the reasons for declining forest dependence for this forest community could be the growing prominence of village shandies which over the period of five years grew both horizontally in size and vertically in the increased diversity of shops in the shandy. The number of shops selling grocery had doubled from four to nine in 5 years from 2012-2017. New shops catering to home needs have emerged with four shops selling music players. The growth of the shandy indicates quick transition to a vibrant trading market. This point towards the increase in availability of cash among the community which seemingly comes from cash crops and government supported employment guarantee schemes like Mahatma Gandhi Rural Employment Generation Scheme (MNREGS).

5. Increased Dependence on Public Distribution System (PDS)

We found a high degree of dependence on the PDS by most of the families. In times of climate variability , declining production together with declining labour availability , PDS plays a vital role in meeting a certain level of food requirement especially for the landless and small and marginal households. However, our analysis indicated that PDS has been gradually creating an environment of overdependence on doles by the government. This could possibly be resulting in lack of innovation and self-reliance, important from a long term perspective. Alternatively a regional system of decentralized PDS with a potential to support local food production and economy could be a better mechanism for ensuring food and nutritional security.

6. Increased frequency of borrowings from the money lender

Regular borrowings take place mostly within families, friends and relatives among the Konda Reddis of Pathakota. Borrowings from money lender takes place only when the requirement is over over two thousand rupees. The frequency of borrowings from the money lender has increased both is quantum and frequency over the past few years, more so in case of years when the pulses have failed leading to a cycle of debt. The years 2013 and 2014 were particularly difficult for the households who lost their pulse crops due to no rain at the crucial time.

> *Our analysis pointed out that the coping mechanisms can largely said to be reactive in nature, without considering long term implications. Most of the coping mechanisms could have long term harmful impacts leading to maladaptation in the absence of climate and sustainability lens. As pointed out by Adger et al. (2007) that for effective adaptation to take place" anticipatory" planning in response to local models based scenarios of short, medium and long term climate impacts would be required. The reactive approach is viewed as in- efficient and could be unsuccessful in addressing irreversible damages such as species extinction or unrecoverable damage from climate impacts.*

Cropping Systems	Gradient (%)	Land Classification - Local	Perceived Impacts from climate variability
Crop system 1	Lowland (0%)	Pallamu	Heavy rain crop loss; high temperature affects grain filling
Crop system 2	0%	Pallamu	No rain crop loss; high temp crop loss
Crop system 3	0%	Pallamu	Heavy rain- less rain and high temperature- crop loss
Crop system 4	Above 2%	Garuvulu	Delayed rain affects seed sowing; short winters affecting crop cycles
Crop system 5	Above 2%	Garuvulu	Very delayed rain- No rain - no seed sowing or crop loss
Crop system 6	Above 2%	Garuvulu	No rain/ delayed rain -crop loss
Crop system 7	Above 2%	Doddulu with in Garuvulu	Delayed rain and high temperature- underground crops survive, survival of above ground crops unsure
Crop system 8	Above 5%	Metta Garuvulu	Delayed rain- affects germination- poor quality crops
Crop system 9	Above 10%	Podu	Untimely and delayed rain- benefits in case of early sowing of millets , a few crops can be harvested. Not all is lost

Table 3.6
Local level Impacts of Climate Variability on Cropping System | Source : Primary data, FGD and community meetings

> *This could indicate that Podu lands (high gradient slash and burn land) could be relatively more resilient as millets crops were not completely lost while even small levels of climate variability affected garuvu and pallamu production.*

V. CONCLUSIVE REFLECTIONS & WAY FORWARD

The warming of the atmosphere that blankets the earth and makes it habitable is the greatest threat that humanity faces in this century. One key development is that this statement does not need to be defended at any great length because a consensus on the facts and projections about climate change has been built up over the past three decades. The debate now is increasingly about the actions that need to be taken at various levels both for mitigating and for adapting human societies, most importantly the severely impacted, the first victims of the Climate crisis.

For Konda Reddis of Pathakota too, the significance of immediate and urgent response actions to safeguard the livelihoods cannot be overstated. The existing vulnerabilities were being compounded by local climate variabilities, especially rainfall and the community found itself wanting in responding to these changed climate realities.

The following could be a few ways to build long term resilience and address

the question of inclusive low carbon sustainable development pathway in Pathakota.

1. Climate Proof Farming Systems specially to safeguard the most vulnerable small farmers
2. Develop Community Climate Action Plans to reflect local reality
3. Promote Energy efficient Farming Techniques and Technologies for reducing farming losses
4. Community Based Adaptation Approach (CbA) for Resilience Building for local inclusive development

1. Climate Proofing Farming Systems to safeguard the most vulnerable small farmers:

"Depends on good rainfall" was often the response to questions on livelihoods . For this community, 'good rainfall' refers to the right quantum of rainfall at the right time time and of the right intensity and not just good averages . The case study evidence suggested that that the micro climate in Pathakota was changing and the change was manifested in various ways namely increased frequency of crop loss, health risks, depletion in quality of natural resources, cultural changes thereby impacting their livelihoods. This research also recognized that changes in climate variables (changes in time, intensity) has varying impacts on different group of farmers (large, medium , small and marginal men and women farmers)with different mix of land types. In terms of vulnerability, this case study evidence suggested that small and marginal farmers are more directly dependent on climatic conditions, as they have less opportunity to access other resources that reduces its impact. Climate proofing of farming systems needs to be promoted for safeguarding the livelihoods of these most marginalised communities.

2. Community Climate Action Plans that reflect local reality

The research recognized the need for village level/ panchayat level climate data and capacity to interpret such information to enable and equip the community to make informed farming decisions. In the absence of timely forecasting together with unpredictability has created a situation where decision making has become very tricky, especially in times when climate has become very unpredictable. The data available so far at the Mandal headquarters does not capture the local level microclimates and impedes efficient and informed farming decisions. The East Godavari District Agricultural Contingency Plans (DACP) has been developed as to serve as ready reckoner for line departments and farming community to manage various weather aberrations such as droughts, floods, cyclones, hailstorms, heat and cold waves addressing different sectors of agriculture including horticulture, livestock, poultry, fisheries. The contingency plan states that they are :

> *" plans are useful for preparedness and real time implementation towards sustainability of agriculture production system in the events of weather aberrations and extreme climatic events "*

The contingency plan for the East Godavari district was examined by contextualising it at the Pathakota level. We found that the plan was inadequate in serving as a contingency response given the diversity of land, farmer categories, micro ecosystems prevalent in this area. The plan can at best serve as a guideline for only for those category of farmers who could see the plan fitting into their farming economics. Such top down plans seem to have completely ignored the wisdom existing with the local community.

We also observed that the community was coping with the changing situation. Some of the coping measures undertaken are dangerous and unsustainable like those related to developing farming land out of forests, which need to be

addressed in the interest of sustainability and future well-being of these communities. No Crop insurance was available for farmers in the study area despite the operationalization of Pradhan Mantri Bima Yojana (national insurance scheme) which properly designed and targeted could play a vital role in overcoming climate related crop losses (e.g. pulses) and preventing getting farmers, especially small and marginal farmers into the debt trap. Falco et al (2014) ague that financial insurance for extreme events can play an important role in hedging against the implications of climate change.

3. Promote Energy efficient Farming Techniques and Technologies for reducing farming losses

For communities like the Konda Reddis, availability and access to machines or technologies that could help bring in efficiencies in agricultural operations in case of delayed rainfall or any such extremes could serve in reducing farming losses. Further adoption of energy efficient farming practices might help the community to conserve and protect natural resources in the light of depleting resources by Climate Change. The climate change-related threats to farming dependent population clearly represent threats to livelihoods and quality of life at local scales, and urgently calls for adaptation and mitigation strategies for agriculture (Coumou & Rahmstorf, 2012; Howden et al., 2007; McCarl, 2010). Adaptation actions could include list of adapative actions taken by this community. LAYA's experience together with reports from UNDP, FAO, World Bank and WRI report suggest actions like staggering crops, System for Rice Intensification, Bunding, Land water management, Live fencing, Homestead development, seeking external advice, use of mixed cultivars can be taken up among some adaptive actions, which would render agriculture as "climate proof agriculture". While most of these actions might help to reduce the

negative impact of increased temperature and erratic precipitation, but it is the combination of precise and timely information that enables the negative impact of climate variability to be minimized and adaptation strategies to succeed. In this context LAYA's narrative and the arguments of Davidson and Lyth (2015) for integrating climate education for core planning capabilities to aid adaptation thinking, planning and action among people and communities needs most attention.

4. Community Based Adaptation Approach for local inclusive development

For communities like the Konda Reddis, availability and access to machines or technologies that could help bring in efficiencies in agricultural operations in case of delayed rainfall or any such extremes could serve in reducing farming losses. Further adoption of energy efficient farming practices might help the community to conserve and protect natural resources in the light of depleting resources by Climate Change. The climate change-related threats to farming dependent population clearly represent threats to livelihoods and quality of life at local scales, and urgently calls for adaptation and mitigation strategies for agriculture (Coumou & Rahmstorf, 2012; Howden et al., 2007; McCarl, 2010). Adaptation actions could include list of adapative actions taken by this community. LAYA's experience together with reports from UNDP, FAO, World Bank and WRI report suggest actions like staggering crops, System for Rice Intensification, Bunding, Land water management, Live fencing, Homestead development, seeking external advice, use of mixed cultivars can be taken up among some adaptive actions, which would render agriculture as "climate proof agriculture". While most of these actions might help to reduce the

Going forward, this case study pointed towards the need to better understand the complex nature of livelihood vulnerability, adaptation in the relation to climate variability, climate change, social and economic stresses, poverty and resource endowments. Building adaptive capacities of the most vulnerable needs to explore these multiple development stresses to foster inclusive, resilient and sustainable communities. This would help the world meet targets of 'leaving no one behind' as outlined in the international frameworks of the UN Sustainable Development Goals and delivering 'Climate Justice' for the poor and the vulnerable as laid out in the Paris Climate Change Agreement.

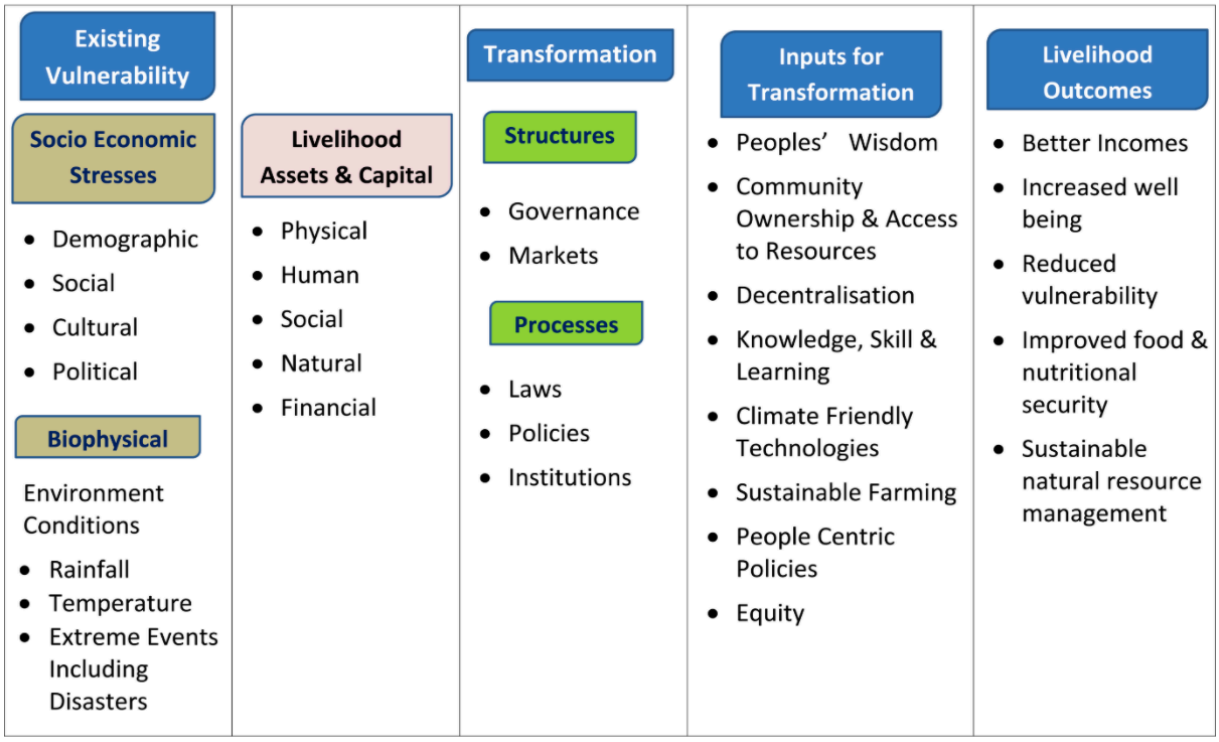

Figure 5.1: Towards Climate Resilient Livelihoods

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APPENDIX I

HOUSEHOLD SURVEY SCHEDULE

Household Interview Schedule :

HH Code :

Village Name :

Name of the Head of the Household :

1. Demographic Profile

1.1 Family Size

1.2 Number of Male in the Family

1.3 No of Females in the family

1.4 Number of Children in the family (6-18 years)

1.5 Age of members

1.6 Literates[15] in the family

1.7 Children[16] reside at home

1.8 Do all school going age children attend school in your family?

1.9 Have any of your children moved out out for education / work

1.10 Are your children able to access better opportunities after education?

2. Land and Livelihood Strategies

2.1 Do you have cultivable land?

2.2 Land used for cultivation in Acres. Irrigated/ non irrigated rainfed)

2.3 Is land an important asset for your present livelihood?

2.4 Has there been a change in use of land? In what way?

2.5 Production from the land/ crops harvested

2.6 Income per year

2.7 What activities does your family undertake for your living in a " normal" year?

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[15] Literates- who can read and write basic Telugu

[16] Children – under 18 years of age

2.8 Is your work dependent on weather and seasonality?

2.9 Have there been instances when you have not been able to work because of bad weather?

2.10 Does anyone in your family migrate for work outside?

2.11 Others livelihood options[17] : Leasing out land ( ) /craft making ( ) /Livestock rearing()/ Others

2.12 Do you have livestock? shed? Are the livestock affected by climatic variability?

2.13 Are you able to access adequate fodder for your livestock?

2.14 What are the problems that you face in providing care for your livestock during climatic changes or local seasonal variability? During monsoons/ summer/ winter/ others

2.15 Do you have Access to farm machines – No ( )/ if Yes ( ) what all machines

2.16 Do you have access to legal consistent electricity? Yes ( ) / No ( ) since when?

2.17 What do you use the electricity? what other energy sources do you use?

2.18 What cooking device is used in your household? Cooking fuel used?

2.19 Amount of cooking fuel used per day

2.20 Do you find any change in availability of firewood?

3. Health

3.1 Who takes decision on health care in your family?

3.2 Do you have a health facility around?

3.3 Average time to the nearest health facility

3.4 What mode do you use for reaching the health facility

3.5 Who helps you during a health crisis? Public hospitals/ Private hospitals/ Pharmacy/Traditional remedy/Quacks/Self/ Others

3.6 Monthly expenses on health

3.7 How do you meet these expenses?

3.8 What are the common health problem that exists in your family

3.9 Did any family member have Malaria this year/ previous year?

3.9 Which months of the year malaria is particularly bad?

---

[17] Please list other livelihood activities which are not listed in the schedule as it would help us determine the adaptive capacities

3.10 How many mosquito nets do you have?

3.11 What are the preventive programmes that you are aware of?

3.12 Does Climate Variability and change affected your health?

Monsoon

Summer

Winter

3.13 In what way?

3.14 What health challenges do you face in seeking adequate health care?

Lack of ANM / CHW

Long distance to travel

Long wait at hospitals

Repeated visits

Lack of money for private consultation

Lack of money for treatment (including medicines)

4. Food

4.1 Do you depend on agriculture for your food? Yes ( ) / No ( )

4.2 List of crops grown (crop calendar)

4.3 Has there been a change in crops that are grown - High/ moderate/ Low/ No change over the past 10 years

4.4 Is there a change in agricultural practices - High/ Moderate /Low/No change

4.5 Key changes and reason for changes

4.6 Cropping intensity?

4.7 Has there been a change in food habits[18]? High/ Moderate/ Low

4.8 What do you depend on the forest for

Food/ fuel/NTFP/agriculture implements/Medicinal purpose /hunting and trapping/ others

4.10 Do you save seeds ? Yes ( ) / No ( )

[18] Change in habits over the last 10 years

4.11 Do you use "improved seeds"? Yes ( )/ No ( )

4.12 Do you experience seed decays? Yes ( )/ No ( )

4.13 How much does the PDS help in food security. High/Moderate /Low

5. Water

5.1 What water source do you access for drinking?
Hand pump / wells/ spring water /stream water/ dug wells/ taps/ tanks/ ponds

5.2 Average time to reach the water source

5.3 Does your access to safe drinking water gets affected during summer and monsoon months?

5.4 How much of water do you store every day?

5.5 How many trips do you make every day for collecting water?

5.6 What water source do you access for agriculture?

5.7 Do you face any water conflicts? Yes ( ) / No ( )

4. Social Cohesiveness and Local Governance

6.1 Do you have membership to any organisation mandals/ CBOs

6.2 If yes which are these organisations
Member of of velugu ( )/ VTDA ( ) / Vidya Committee ( )/ water users committee ( )/ DWAKRA ( )/ Others ( )

6.3 What are the advantages of joining these groups?

6.4 When do members of your network come together?

6.5 Do you borrow or lend money Yes ( ) / No ( )

[19] Information on the purpose of borrowing and lending and during which time of the year

APPENDIX II

INTERVIEW SCHEDULE : SOCIOLOGIST AND DEVELOPMENT PRACTITIONERS

1. Years of engagement with tribal in the area
2. From when you began to now what have been the changes you observe?
3. What are the core issues that you observe in the region?
4. What according to you is the approach for bringing about developing among this community?
5. What issues have you been advocating for?
6. What has been the government response so far?
7. In what way do you think that climate concerns are being perceived in the development programme for this community?
8. Mainstreaming of adaptation, is that taking place?
9. What according to you are the barriers and challenges in responding to local climate variability and extremes in the region?
10. What according to you short term, midterm and long term plan for climate proof development for this community?

INTERVIEW GUIDELINE : GOVERNMENT OFFICIALS FOREST DEPARTMENT

1. Progress on FRA Claims (Individual and Community Forest Rights)
2. Policy on deforestation and strategy for Afforestation in the Rajamundry circle, especially NTFP?
3. How do you see the role of the community in afforestation?
4. Are decisions on the choice of species taken together with the community?
5. When was the last time you visited Pathakota?
6. How do you understand Climate change and integrate it in your plans?

BLOCK DEVELOPMENT OFFICER

1. What are the policies and programmes being implemented?
2. What measures have been taken to empower the Gram Sabha?
3. What are the challenges you face in facilitating development in this region?

GOVERNMENT HEALTH OFFICIALS

(Malaria Officer, ASHA worker, ANM, PHC Compounder and Clinician)

1. Biggest health issues in the area?
2. Challenges with Malaria response?
3. Approach to health wellbeing approaches for the PVTGs
4. Views on revival of traditional health practitioners?
5. Opinion on health well-being and climate variability.

APPENDIX III

FGD GUIDES : FGD WITH FARMERS

1. What kind of land is used for cropping?
2. What crops do you grow?
3. What change do you see from 10 years back to now?
4. Reasons for these changes?
5. How much land do you need for growing sufficient food?
6. Do you have surplus? If yes, where do you sell them?
7. What support do you receive from the government on farming (inputs, skill training , fertilizers and pesticides ,extension)
8. Role of males and females in farming across farming season
9. Who in your family decides what crops to grow?
10. Do you have a plan for increasing productivity from your land? If yes , how?
11. How does Climate Change affect farming?
12. What are the steps / measures you are taking to counter this?

FGD WITH FEMALE

1. What crops do you grow on your lands?
2. What crops did you grow ten years back?
3. Which land types do you prefer and why?
4. How do your children help you with farming?
5. What is that you collect from the forest these days?
6. What all did you collect in the past?
7. What are the reason for these changes?
8. What role does SHG play in securing self-reliance?
9. How are you involved with the Gram Sabha? Do you all attend meetings?
10. In what way do you think Climate is affecting you?
11. What aspects of livelihood is most affected by Climate change?
12. What are you doing to counter this?
13. How do you look at the local government engagement in your panchayat?

FGD WITH THE ELDERLY

1. What major changes in socio demographics do you see?
2. Major changes you see in farming?
3. Major changes you see in forests?
4. Community relationship with the forest?
5. Major changes/ shifts in Local governance system?
6. What are your views on traditional governance system and the current governance system?
7. Do you observe Climate Changing?
8. What are the Climatic changes that affects your livelihoods the most

FGD WITH THE YOUTH

1. What are you involved with currently?
2. Education? opinion on the ashram School?
3. How do you support in agriculture?
4. Employment scenario? Migrations (if at all)? Where? for what?
5. What are your future plans?
6. How do you perceive of your identity?
7. Development problems that you perceive: health, forest etc?
8. How do you connect with the forests? what do you collect?
9. Have you met the MDO /MRO/ PO to voice your concerns?
10. Any information or understanding of climate change? how do you articulate CC?
11. How do you look at contributing to addressing your local development issues?
12. Who is your role model?

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