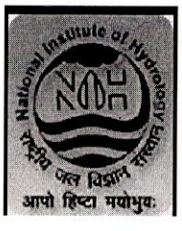
(18)

An Integrated Impact Assessment Based on a sustainable livelihoods framework

Final Thesis Report

Submitted By

Shreya Kuruvilla
Masters in Sustainable Development Practices
5/20/2016



DECLARATION

This is to certify that the work that forms the basis of this project "INTEGRATED IMPACT ASSSESSMENT BASED ON A SUSTAINABLE LIVELIHOODS FRAMEWORK" is an original work carried out by me and has not been submitted anywhere else for the award of any degree.

I certify that all sources of information and data are fully acknowledged in the project thesis.

Shreya Maria Kuruvilla

Date: 20/05/2016

CERTIFICATE

This is to certify that SHREYA MARIA KURUVILLA has carried out her major project in partial fulfillment of the requirement for the degree of Master of Arts in Sustainable Development Practices on the topic "INTEGRATED IMPACT ASSSESSMENT BASED ON A SUSTAINABLE LIVELIHOODS FRAMEWORK" during January 2016 to May 2016. The project was carried out at the NATIONAL INSTITUTE OF HYDROLOGY.

Date: 20/05/2016

(External Supervisor)
Dr. V.C. Goyal
Head (RMOD)
Research Management and Outreach Division
National Institute of Hydrology, Roorkee.
University, Delhi

(Internal Supervisor)
Dr. Kamna Sachdeva
Assistant Professor
Dept. Of Natural Resources
TERI University, Delhi

Dr Shaleen Singhal
Professor& Head
Department of Policy Studies
TERI University
New Delhi

ACKNOWLEDGEMENTS

I am extremely grateful to all those who have helped me make this project a successful one. There were many ups and downs along the way and the four months, were a testing period of our hard work and endurance. I would firstly like to thank my external supervisor; Dr. V.C .Goyal for his unending support, encouragement and motivation during the entire project period.

Considering the commitment required for completing a Master's thesis, there is always a need for constant guidance. I'd like to thank my internal supervisor Dr. Kamna Sachdeva who has given me direction during this project.

I wanted to extend my gratitude to Ms Ekta and Ms. Nisha who were perennially a helping hand and supported us time and again during our stay at National Institute of Hydrology.

The guidance and support of faculty and supervisors is not always enough. The affection and motivation provided at every step of the way made the hardships and difficulties so much easier. I'd like to thank my friends Apoorva Sharma, Dr. Kumkum Sharma, Shaurya Kuthiala, Vijaylakshmi Yadav, Meeta Gupta, Kausi Timsina, Richa Goel, Akshita Marwah, Anuradhika Kundra, Maria Mathew, Ashwin Pai, Dhruv Mahajan and Vikrant Bhandari for their constant support, unending encouragement and affection that made it possible for me to successfully complete my thesis.

Contents

ABSTRACT

Climatic variability and weather related changes have had a significant impact on the lives of people. In rural areas, one sees an even harsher impact of these changes on the lives of people. Climatic variability is also accompanied by natural disasters which have had a significant impact and disastrous which has been characterized by damage to property, loss of lives and many others which deter the harmonious lives of people. Therefore assessing the degree of damage is required in order to come up with a plausible solution to assist those who are victims of these natural calamities. It is in this context that the concept of vulnerability is rather important. The understanding and definition of vulnerability has changed overtime with researchers putting forth aspects of vulnerability that has changed the dynamics of the concept in itself. Vulnerability has been continuously evolving and is a study in itself. There are varied literature and work that have used the framework of vulnerability as an important tool of analysis. One such framework is the Livelihood Vulnerability Index. This framework has been used in this study as well. The study has gone one step further and created a gender based livelihood vulnerability framework as well. The study area, Tikamgarh is located in drought prone Bundelkhand; Madhya Pradesh. The people of this area have experienced severe drought for over five years. This implies an augmented and extreme scarcity of water which has inadvertently had an impact on the livelihood of the people in the area. The project undertaken in this area focuses on addressing the pertinent issue of water scarcity along with creating systems that can change the lives of people. Designing of a livelihood vulnerability Index implies taking into consideration various aspects that showcase the quality of life of the people and more importantly their ability to cope. Vulnerability and resilience despite being two opposite ends of the spectrum are interrelated. The degree of vulnerability will help understand the pattern of resilience. The following study is both a quantitative and qualitative one that showcases the degree of vulnerability by quantifying it into an index and qualitatively by showcasing the findings of the field survey that had been undertaken. This combination can help understand the situation and context from varied perspectives and take into consideration aspects of vulnerability and its analyses.

INTRODUCTION

The National Institute of Hydrology has undertaken a study in the area of watershed development and has conducted extensive research for the same. The area of study is one that is amongst many others a drought prone region and has been inflicted with this plight for many years. The project is one that is sponsored by TIFAC (MoS&T, GoI) that aims on integrating hydrology, climate change and livelihood issues.

The project has been able to successfully bring out the water situation of the area which takes into consideration the situation of the water in the area and also the plausible effects of the watershed in the area that it covers. A detailed study on the various blocks and the villages that have been covered under that area has been able to take into consideration the technicalities associated with the water situation of the area along with understanding the water demands and water use of the selected area.

Before we analyse the livelihood component of the area, one must consider the perspective from which livelihoods has been understood for the purpose of this project. In this particular project, a sustainable livelihoods framework would be used as a research paradigm. Many government and nongovernmental organisations and development agencies have undertaken the sustainable livelihood framework because they believe that it is an effective and powerful tool that incorporates a practical way of thinking and implementing development. Sustainable livelihoods more than anything else is also a way of thinking and takes into consideration varied measures and dynamics that are used to scrutinise the varied aspects of poverty and its dynamics. One does not have a fixed strategy or approach to define the sustainability of livelihoods, but there are elements in the approach that go into making it a sustainable one. When one looks at the livelihoods approach they understand it as being built on a set of key

principles. These principles tend to be people centred, responsive and multi dimensional. These principles are backed by a set of tools that are used enhance the quality of the study and give it credibility. There are an array of frameworks that have been used in such studies ranging from a participatory poverty assessment, gender and stakeholder analysis, and environmental checklists that have been used in such studies. This study in particular uses participatory rural appraisal tools (PRA) tools and techniques as an analysis of field data. However the most important tool and framework that needs to be taken into consideration in this study is the Livelihood Vulnerability Index (LVI).

In the context of vulnerability, women tend to be a more vulnerable as a gendered group. According to the UNDP "*Prevailing social inequalities mean women typically have less means and capacity to cope and adapt and consequently bear a disproportional burden of increased competition and climate change induced consequences on water.*" – (UNDP, 2016). In the rural Indian context, the gender divide is evident. In this context considering the socio economic status; which is characterised by large scale migration men tend to leave for cities in search of jobs while the women are left behind with menial income and no source of livelihood. These make it difficult for the women there to survive in conditions of drought making them a highly vulnerable group of people. This is the reason why, along with livelihood vulnerability the study has also been able to look into a gender based livelihood vulnerability index which showcases the comparative and differentiated vulnerability in the specific context.

Along with drafting techniques to combat the water situation of the area, the project has taken into consideration the component of livelihoods in order to get a holistic picture of the water demands and needs of the area. Considering the fact that Tikamgarh has been undergoing drought for over three years, the effects of drought o the people of these areas are beyond disastrous. During 1967-1991, droughts accounted for the 50% of the natural disasters (all types), affected 2.8 billion people, and have been responsible for 35% of the 3.5 million lives lost (Rao, 2000). In recent years large-scale intensive droughts have been witnessed

in all continents leading to huge economic losses, destruction of ecological resources, food shortages and starvation of millions of people. It is in this context studies pertaining to livelihood have been taken into consideration and thereby the LVI IPCC framework of construction of a livelihood vulnerability index has been used for the study.

Prior to this, Development Alternatives, a partner with National institute of Hydrology also worked with analyzing vulnerability in the context of livelihoods in the area. They used the Fuzzy Cognitive Mapping (FCM) framework in order to understand and analyze vulnerability. The results of the study would be challenged in my study. The study has taken into consideration varied indicators and a livelihood vulnerability index has been constructed following which the IPCC approach using sensitivity, exposure and adaptive capacity would be used to measure LVI.

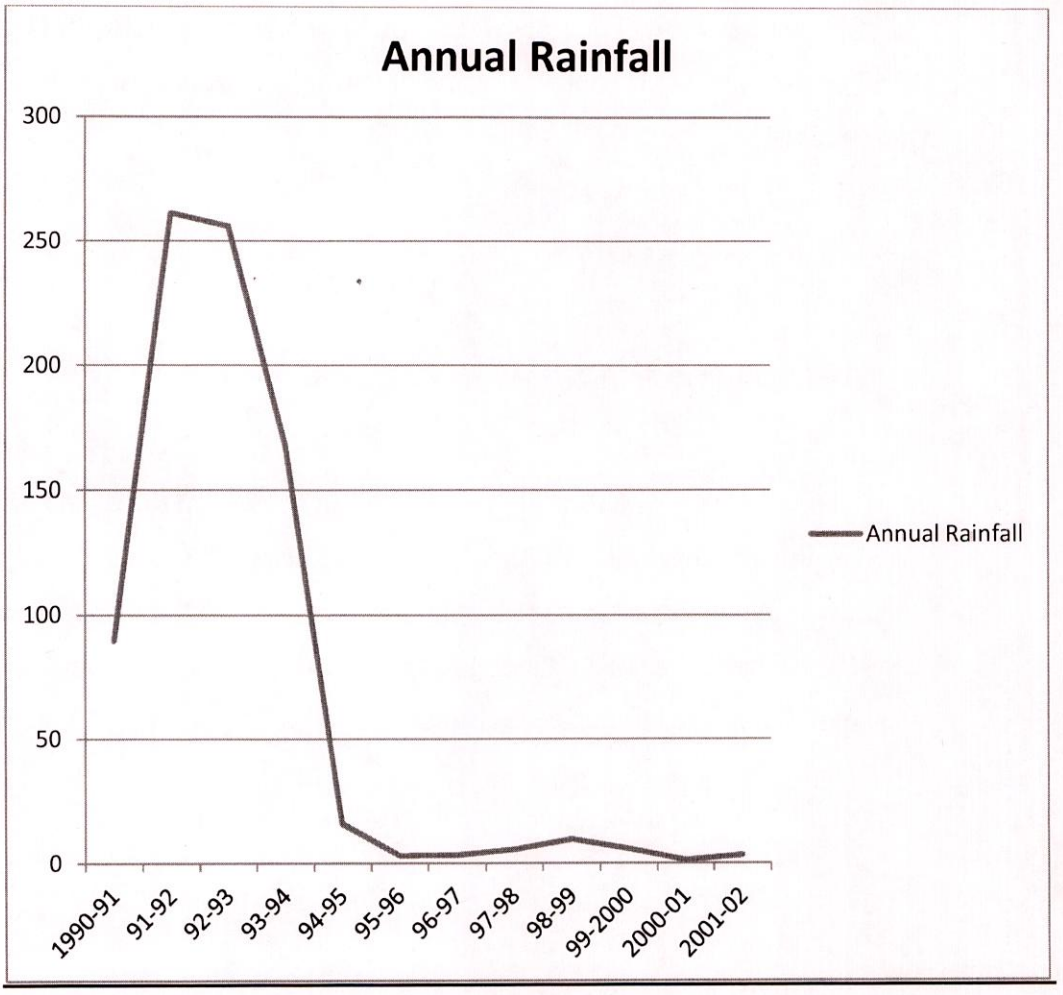
Considering the dynamic of gender and water, studies have showcased how women as a gender group are an important component that need to be considered when understand water usage at the domestic level. The primary data study was able to showcase that domestic usage of water and water requirements of the family were managed by the women. In addition to that, considering that migration was the only source of livelihood, and women were left behind without a stable source of income, women tend to be a more vulnerable group as compared to men. It is in this context that this project has focused on creating a gender based livelihood vulnerability index in the particular area.

Vulnerability analyses would then be used to address the question of coping mechanisms along with resilience and resilience patterns of the area. In order to address the question of sustainability, it is important to take into consideration coping strategies and its longevity. In the course of the study all these questions would be answered and areas addressed.

The following study will now showcase both a quantitative and qualitive aspect of vulnerability which is context specific ; focusing on Tikamgarh region of Bundlekhand.

IMPORTANCE OF USING THE LVI FRAMEWORK

It is rather clear and evident from the graph given below that the region has been receiving close to negligible rainfall for over five years. This combined with the inability of the water resources to sustain the social system has made it a severely drought prone one. Shortage of rainfall also implies the inability of the people of the village to practice agriculture.



(This data has been collected by NIH and provided after permission to be put in the study)

The region does not have any well developed systems of irrigation that would help in a situation of water scarcity. The sources of water present in the villages both Tikamgarh and Palera are minimal. In this case one needs a well defined framework to analyze vulnerability so that the required decisions are made accordingly.

The issue of water scarcity has reached a dangerous point. Despite a slight variation in the nature of water scarcity in both the regions, the core issue continues to be the same. Assessing the degree of vulnerability helps give an idea of the gravity of the problem which if quantified into numbers can help assign a value to vulnerability.

Livelihood vulnerability has been chosen as a tool and a framework in a variety of studies which are similar in nature.. By assigning a value to vulnerability, these studies have been able to showcase the nature of the problem and its intensity.

The use of a gendered approach seemed pertinent to the study for a variety of reasons, so that inadvertently women become an important target group in this study. Through the gendered approach women would not only become an important highlight of the particular project but their issues would also be addressed as a group so that the required reforms can be undertaken thereafter.

In the course of the study the positive and negative effects of using LVI will be scrutinized and looked into but after a comprehensive research, this seemed like the most valid tool that one could use for the study.

BACKGROUND AND RATIONALE

The concept of vulnerability and its relation to livelihoods is a complex one and deals which deals with a myriad of aspects. Despite the relation and close connection between the two, the nature of the relationship also helps in realizing the framework and approach that needs to be adopted and followed. In this case a sustainable livelihoods framework and approach is what has been adopted in the course of the study. The concept of sustainable livelihoods and its understanding has been mentioned below. This framework does not necessarily showcase the degree of vulnerability of the project area that has been surveyed but the principles that are used to assess livelihood are taken into consideration and understood in the context of vulnerability.

According to Roger Calow, 2015 (Calow, 2016) a sustainability framework in livelihood can be used in order to address the question of sustainability when it comes to livelihoods. An important feature for effectiveness of development activities in water and various other sectors is that it takes into consideration a myriad of aspects. Some of the key aspects include;

1) A broad analysis of livelihoods and the factors that influence them are including the wider "vulnerability" context in which people live. The role of resources such as water, in combination with other assets in supporting economic and human development.

2) Making more informed choices about the types of development activity that will contribute the most in reducing poverty based on the above analysis would be taken into consideration.

3) Poverty related indicators rather that water supply coverage become the important benchmark against which all impacts and outcomes were measured.

4) Putting people at the centre of analysis and objective setting is also an important aspect that one needs to consider if one needs to understand the functions and ways in which a livelihoods framework operate.

These are some of the key features that one takes into consideration when we try and understand sustainability and the principles using which it operates. One of the most important features of a sustainable livelihoods framework is the role and importance of the people. According to the work done by Calow; a livelihoods approach puts people on the centre stage as compared to the resources used. The usage of resources is always understood in the context of these social systems.

The evolution of such an understanding has changed overtime. In the past a concern with water resources themselves has tended to detract attention from the more important issue of how water is accessed and used in combination to other assets to sustain livelihoods. A livelihoods approach emphasises the importance of seeing livelihoods cross sectorally. These cross sectoral perspectives are important because of its holistic nature. The holistic nature of approaches is evident in the design of the project itself but the nature of the interventions and measures that are undertaken are focused on achieving one specific target and goal.

The role of water for supporting livelihoods through health, economic, and environmental linkages make it easier to predict the effects on different groups of water interventions. This in turn can indicate the types of water activities that is required to reduce poverty. A focus on a wider water supply linked livelihoods linkages through the impacts on household labour and income generation would lead to changes in the way water supply activities are conceived and implemented.

Understanding the sustainable livelihoods approach is important but now the real question is addressing the question of sustainability in the context of these

approaches. This sustainable livelihoods framework approach would be used in this particular study because of the very nature of the approach in itself. The question of sustainability would also be addressed in the context of vulnerability and adaptive capacity itself. Let us now look at the concept of vulnerability and towards the end of the study a parallel between the two would be drawn out.

Vulnerability as a subject is one that has been extensively researched and used in various projects in order to understand the dynamics of climate change and its resultant impacts. Many of the vulnerability related studies are context specific, and take into consideration the varied ways in which climatic conditions and natural disasters have affected various areas and social systems, and the ability of these systems to cope with a natural disaster. The vulnerability approach has been revised time and again and a multiplicity of approaches has been used for the same. Before we go into the various methodologies that are used to assess vulnerability, it is important to understand how the study of vulnerability is relevant in these contexts.

According to (Fussel and Klein 2006), (Klein, 2006)conceptually 'vulnerability' has been used for many purposes which include disaster risk management, address questions pertaining to food security and deals with a socio political analyses of the area. The change in climate is used as an important tool to assess vulnerability primarily because it is important to understand the degree of damage that has been caused in a particular system and the nature of coping mechanism that is required.

One also needs to comprehend that vulnerability was not always a well established concept and area of study like it is today. Vulnerability started as intitally as a 'single stressor, single outcome' approach, which was primarily implied focusing on merely the physical impact of a disaster and its negative outcomes (Eakin & Luers 2006). (Leurs, 2006)Vulnerability took into consideration the risk or hazard or biophysical approaches to vulnerability were concerned with the 'likelihood of injury' and damage caused as the core concern

. (White, 1978) Subsequently, scholars posited that vulnerability is not confined to only the devastations caused by disaster to the physical environment, but also the impact on the social, economic, and political environments (Phillips, 1999) United Nations Office for Disaster Risk Reduction United Nations Office for Disaster Risk Reduction (UNISDR, 2004). Moreover, the activities of people in view of their varying age, gender and ethnicity characteristics are equally (Juntunen, 2005). The pressure-and-release model assessed vulnerability in terms of a politico-ecological (Hewitt, 1983) or politico-economic framework (Bohle, 2001). Later, the focus shifted to mitigation and control of disaster through coping measures, and then to adaptation of resilience measures, which is considered the opposite side of vulnerability (Holling, 1996). Finally, a comprehensive view of vulnerability, taking into account exposure, susceptibility, socio-economic conditions and resilience measures of households, was considered more appropriate in understanding disaster impact. (Birkmann, 2006)

Having understood of vulnerability and its relevance, it is now important to look at the various methodologies that have been used to calculate vulnerability. Chambers and Concoway,1992 showcase the use of the sustainable livelihoods approach looks at five types of household assets namely natural, social physical and human capital to design a tailor made development progaramme which would be specific to that particular area. It is important to note that the sustainable livelihoods approach is by far an important and useful framework, since it takes into consideration the concept of sensitivity, exposure and adaptive capacity. The IPCC approach however consists of minor and major components which range from climatic disasters and their impacts to resources that are used by a social system. A variety of major components have their subcomponents which ultimately contribute and go into creating an index. The IPCC approach tests mainly three aspect; Adaptive Capacity and Exposure. This is the main feature of the LVI.

Adaptive Capacity: This takes into consideration and helps understand the ability of a social system to cope and adapt to a disaster. This capacity can be quantified by taking into consideration a number of indicators which are mainly characterized by the institutions and social systems in the area.

Sensitivity: In the context of sensitivity, the resources and the resource use patterns of the area primarily are the ones that are taken into consideration. This showcases the extent to which a social system is sensitive in a particular area in the context of the resource availability and the resource use.

Exposure: This indicator takes into consideration the natural disasters and calamities and its repercussions on the village areas.

All these three features go into making the IPCC approach which is the framework that has been incorporated in this study.

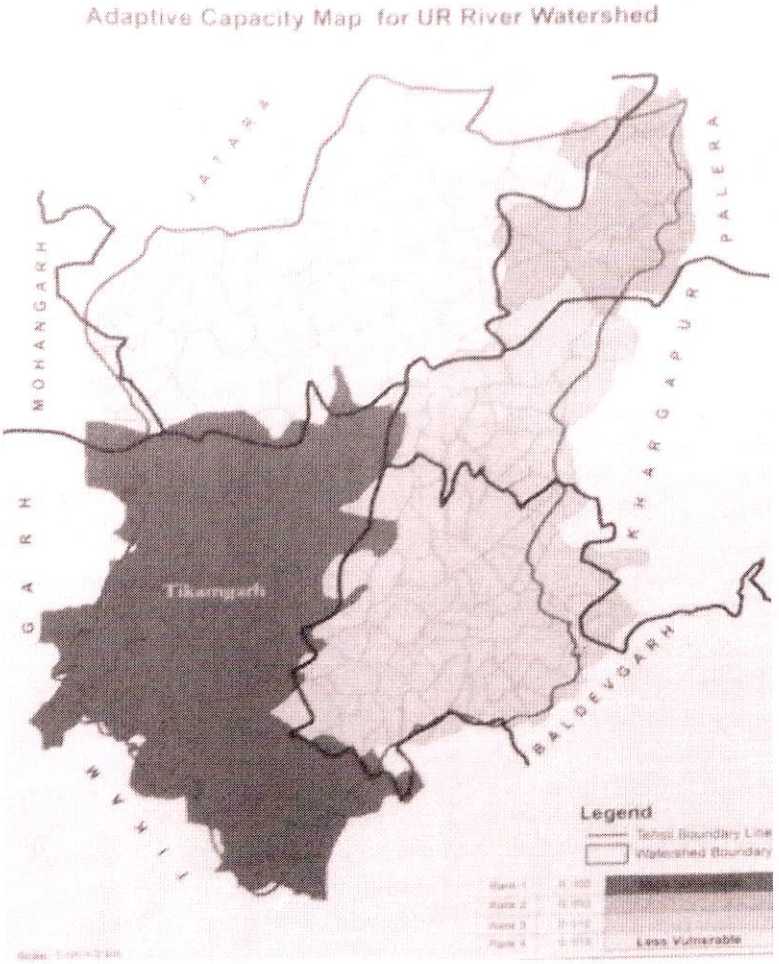
The question now arises as to the usage and relevance of vulnerability in the existing project. The report produced by National Institute of Disaster Management (Bundelkhand) was able to bring to light the various ways in which studies pertaining to vulnerability were necessary and the extent to which it helped. There were a number of studies related to drought and socio-economic factors of vulnerability and mitigation measures were carried out in Bundelkhand region. Some of the reports provide a profound insight into the problem and strive towards correction measures. Recent and most comprehensive detailed report on Drought Mitigation Strategies in Bundelkhand by Interministerial team chaired by Dr. J.S. Samra, based on a thorough study of the social and economic scenario, recommends the mitigation strategies specific to the area that can be effective in drought management. Efforts to study various aspects of natural resources, agro forestry, water management, and perspective planning for the region has been reported in publications by Indian Grassland and Fodder Research Institute (IGFRI), the National Research Centre for Agro forestry (NRCAF) and U.P. Council of Agricultural Research (UPCAR). (IGFRI, 2000)

In the current project and area of study, use of LVI was primarily done in order to understand if the community has the ability to cope with persistent and recurring droughts. A TIFAC (GoI) sponsored project in the region of Bundelkhand focuses on integrating Hydrology with climate change and IWRM along with livelihood issues. A vulnerability assessment of the Ur river watershed was carried out in Tikamgarh district, Bundlekhand. This was a

combined study undertaken by Development Alternatives and National Institute of Hydrology (DA; NIH, 2015) . The report aimed and bringing out the current trends in vulnerability and used the Fuzzy Cognitive Mapping (FCM approach) to analyse vulnerability. The results of which will be questioned in my study. (Alternative, 2015)

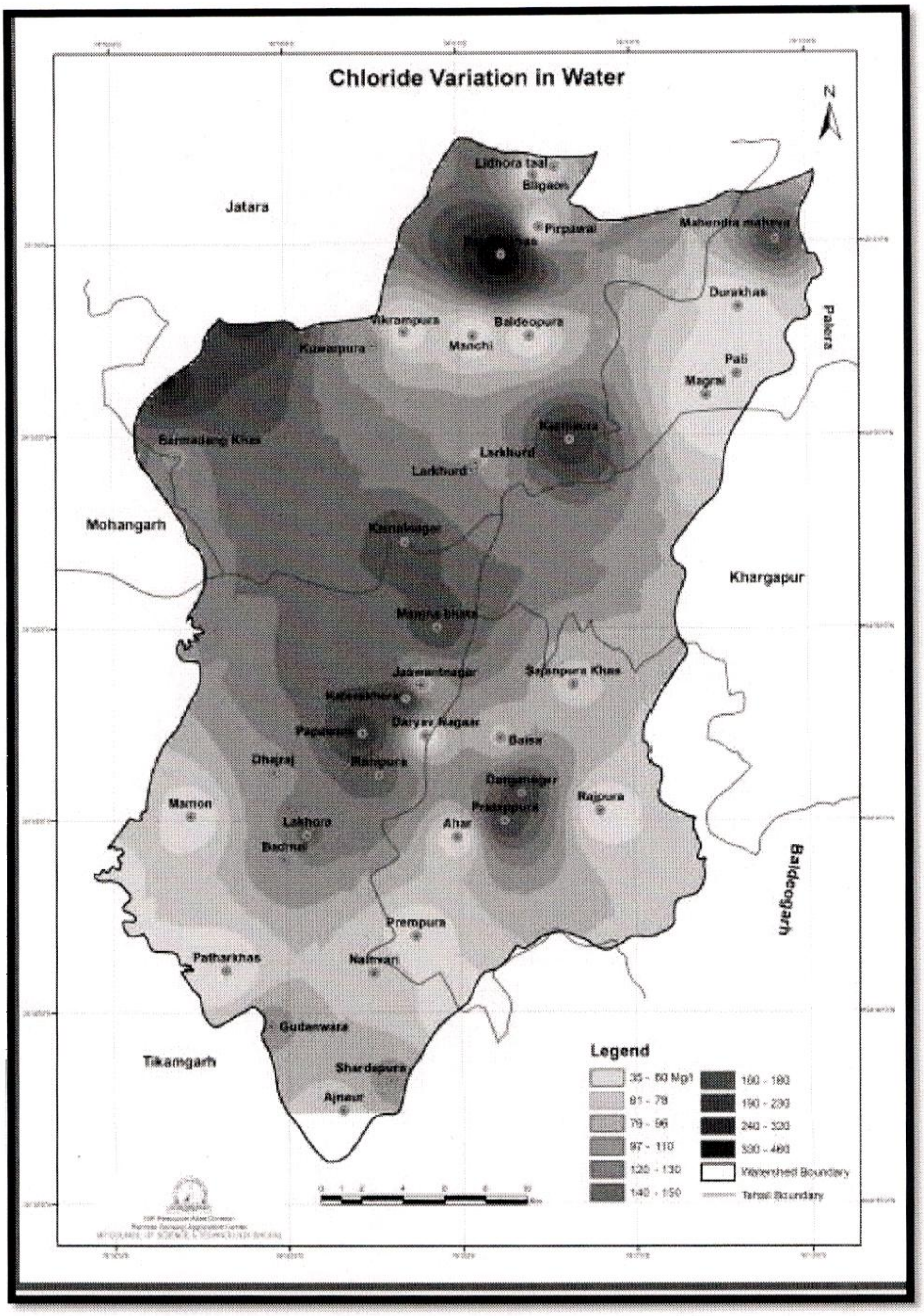
PRELIMNARY STUDY:

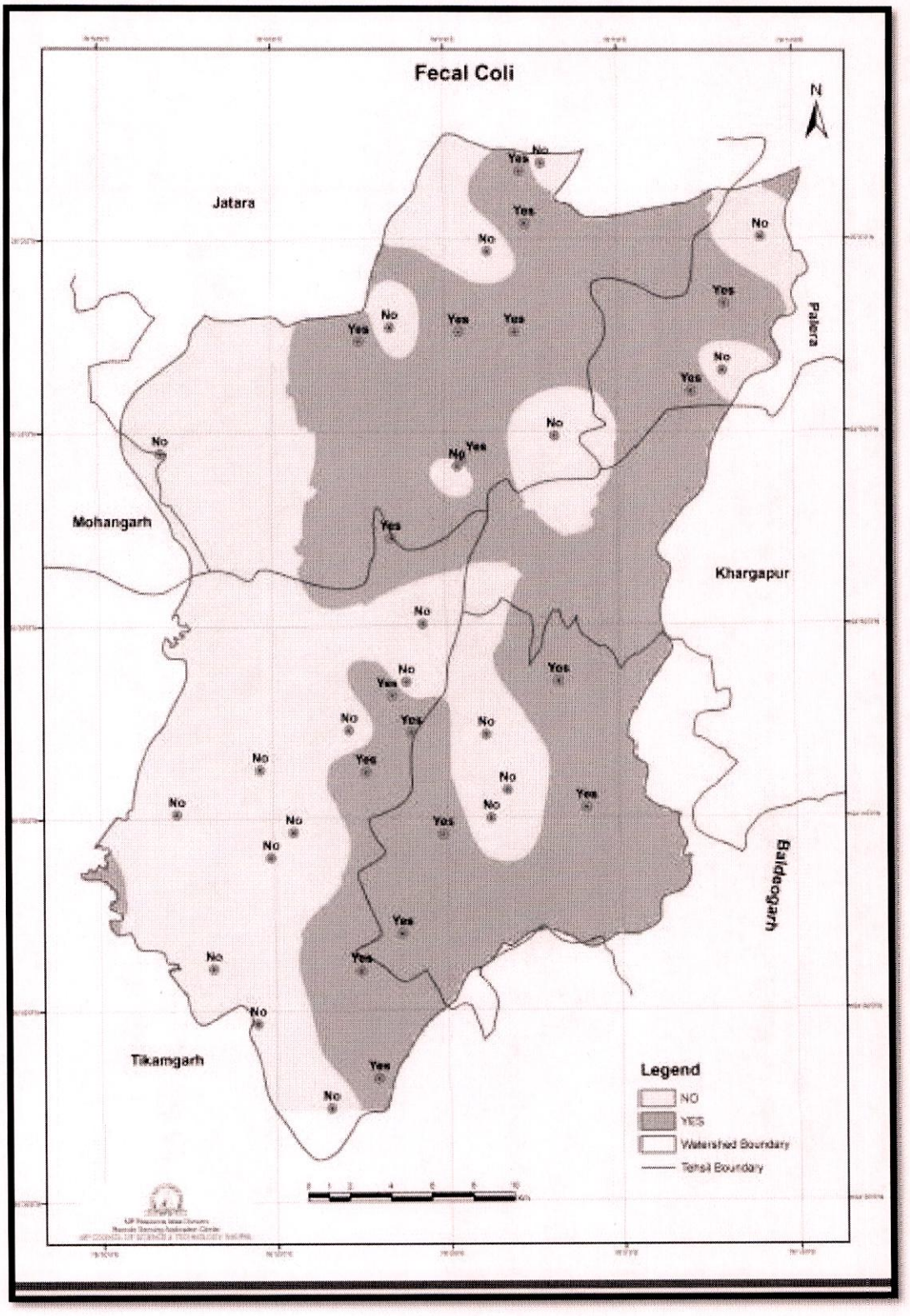
The study was carried in two tehsils namely Tikamgarh and Palera tehsils. Prior to the field survey, data collected in the already existing study was used as a pre-requisite for selection of the villages. The following vulnerability map showcases Tikamgarh and Palera tehsils as most vulnerable, which is the reason why these two areas were selected for the purpose of the study. (DA; NIH, 2015)

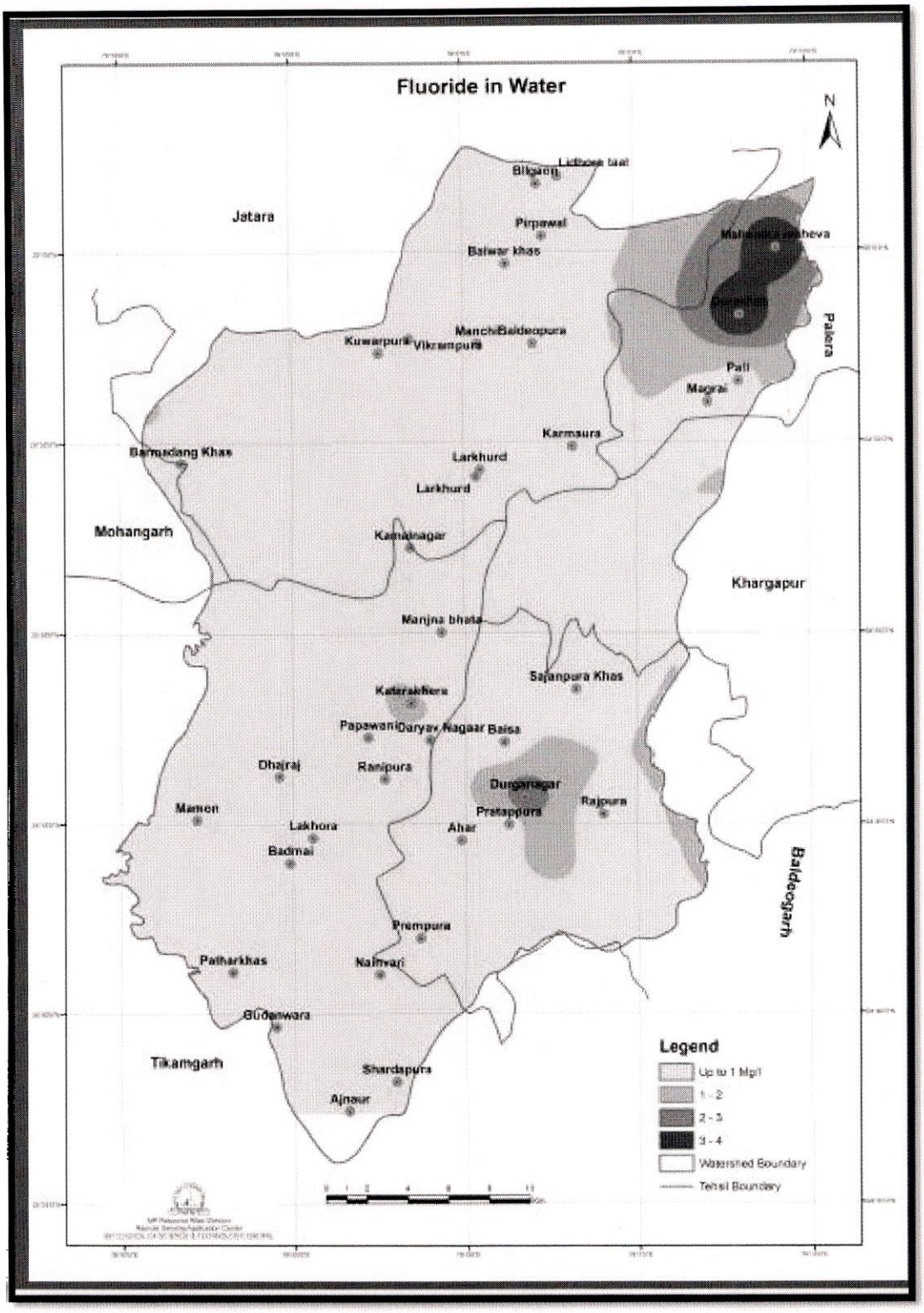


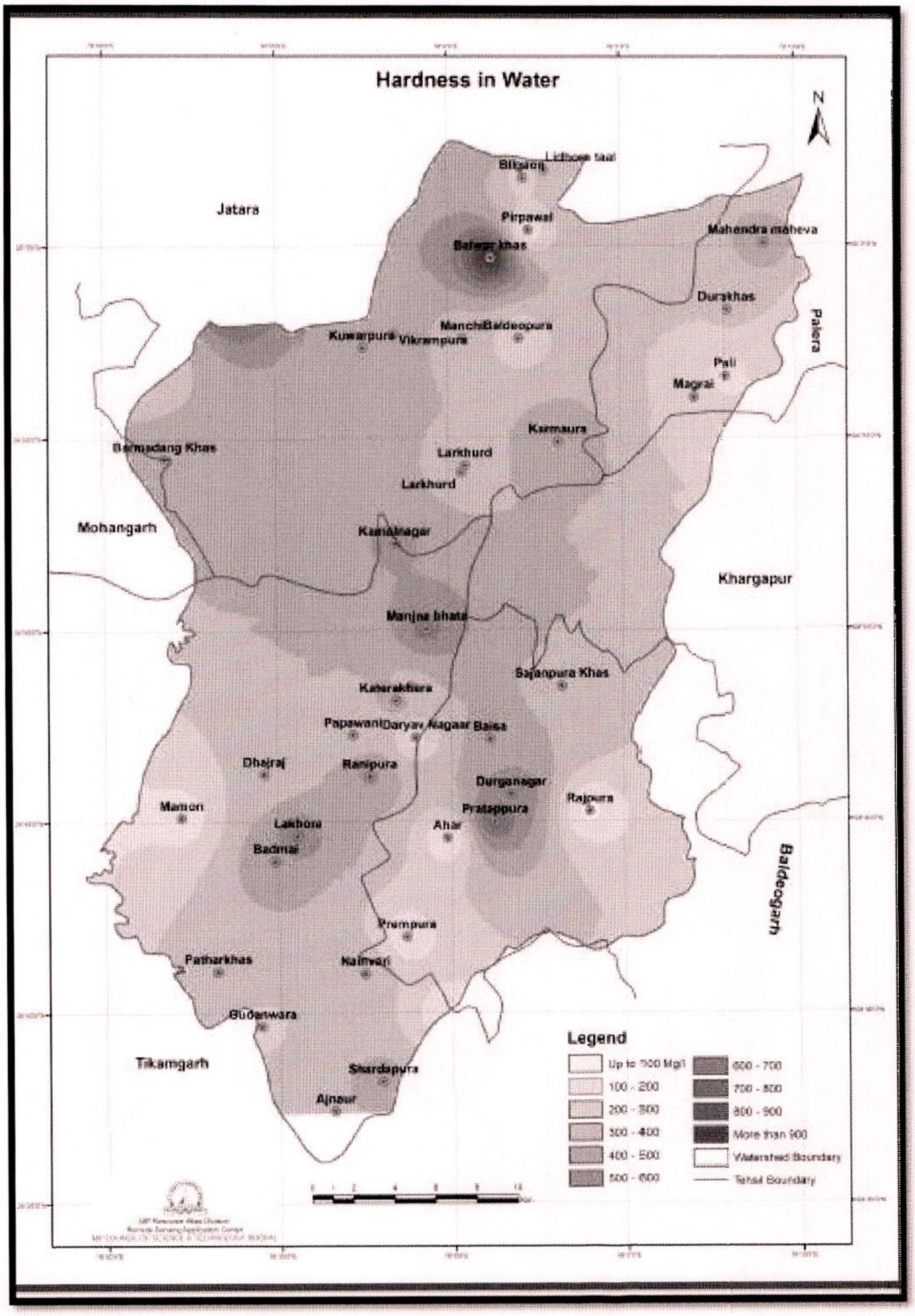
WATERQUALITY MAPS:

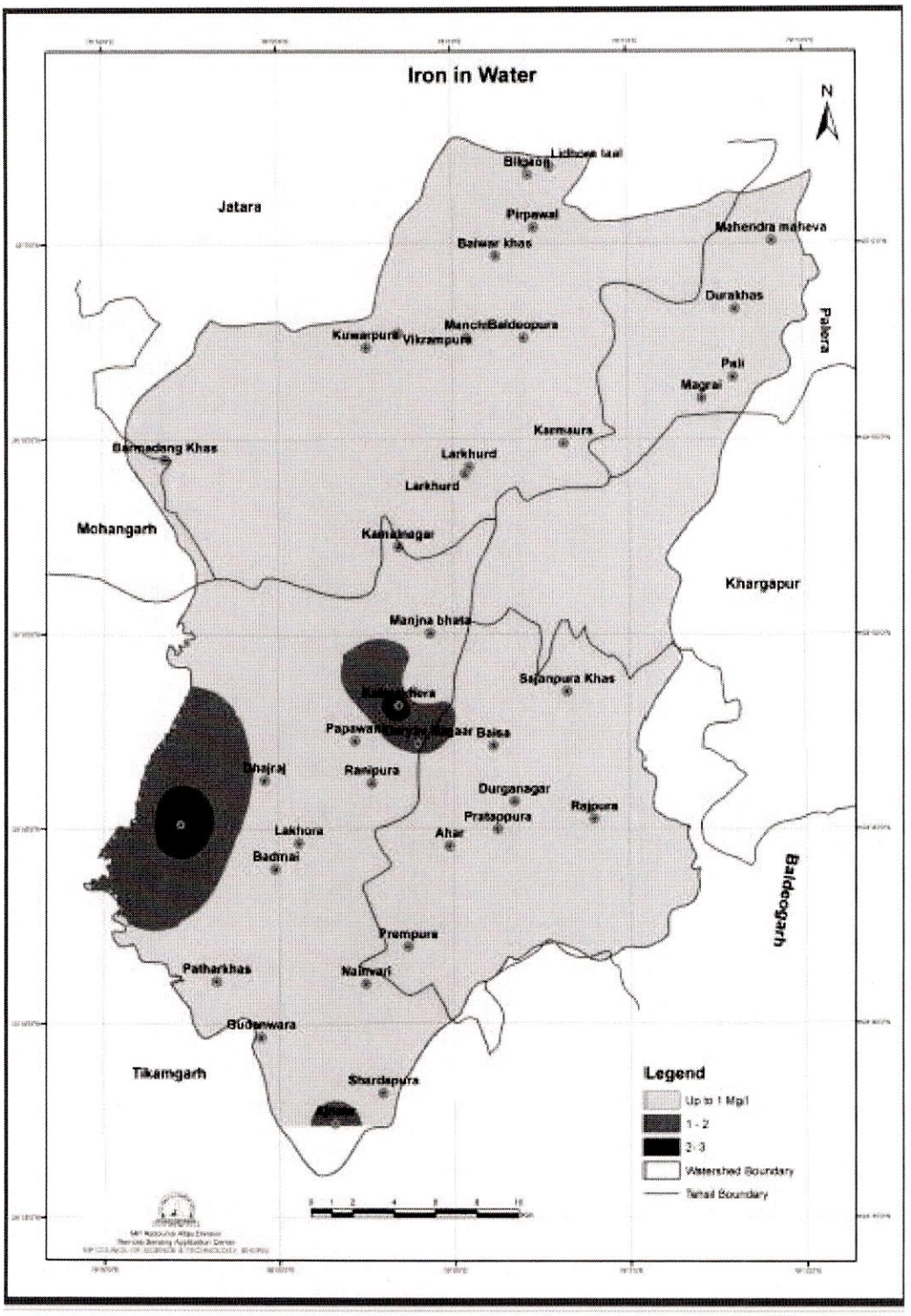
The following water quality maps showcases high chloride variation in Katarkhera and Papwani villages of Tikamgarh and Mahendra Maehva in Palera. Other water quality data such as fecal coli form, fluoride and hardness also showcased the same villages. It was then understood that these area have sevre water contamination and these were some of the reasons for selection of the villages.


Chloride Variation in Water
N
Jatara
Lidhora taal
Bilgaon
Pirpawal
Mahendra maheva
Durakhas
Palera
Pali
Magrai
Vikrampura
Baldeopura
Manchi
Kuwarpura
Larkhurd
Mohangarh
Khargapur
Jaswantnagar
Sapanpura Khas
Daryav Nagar
Baisa
Dhajraj
Rampura
Rajpura
Mamon
Lakhora
Ahar
Pratappura
Baldeogarh
Prempura
Patharkhas
Naimvan
Gudanwara
Tikamgarh
Shardapura
Ajnaur
Legend
35 - 60 Mg/l
61 - 78
79 - 96
97 - 110
120 - 130
140 - 150
160 - 180
190 - 230
240 - 320
330 - 460
Watershed Boundary
Tehsil Boundary


Fecal Coli
N
Jatara
Patera
Mohangarh
Khargapur
Balabgarh
Tikamgarh
Legend
NO
YES
Watershed Boundary
Tehsil Boundary


Fluoride in Water
N
Jatara
Pirpawal
Baliwar khas
Kuwarpura
Vikrampura
Manch
Baldeopura
Pali
Magra
Karmsura
Bamudang Khas
Larkhurd
Larkhurd
Mohangarh
Kamalnagar
Khargapur
Manjna bhata
Sajanpura Khas
Katarakhera
Papawani
Daryav Nagaar
Baisa
Dhajraj
Ranipura
Durganagar
Pratappura
Rajpura
Mamon
Lakhora
Ahar
Badmal
Prempura
Patharkhas
Nalmvari
Gudanwara
Tikamgarh
Shardapura
Ajnaur
Palera
Baldeogarh
Legend
Up to 1 Mg/l
1 - 2
2 - 3
3 - 4
Watershed Boundary
Tehsil Boundary


Hardness in Water
N
Jatara
Lidhora taal
Pirpawai
Mahendra maheva
Durakhas
Palera
Pali
Magrai
ManchiBaldeopura
Kuwarpura
Vikrampura
Karmaura
Larkhurd
Larkhurd
Mohangarh
Khargapur
Manjna bhata
Sajanpura Khas
Papawani
Baisa
Dhajraj
Ranipura
Durganagar
Pratappura
Rajpura
Mamon
Lakhora
Badmai
Ahar
Baldeogarh
Prempura
Patharkhas
Budanwara
Tikamgarh
Shardapura
Ajnaur
Legend
Up to 100 Mg/l
100 - 200
200 - 300
300 - 400
400 - 500
500 - 600
600 - 700
700 - 800
800 - 900
More than 900
Watershed Boundary
Tehsil Boundary


Iron in Water
N
Jatara
Pirpawal
Mahendra maheva
Balwar khas
Durakhas
Palera
Kuwarpura
Vikrampura
Pali
Magrai
Karmaura
Larkhurd
Mohangarh
Kamalnagar
Khargapur
Manjna bhata
Sajanpura Khas
Bhajraj
Rampura
Durganagar
Rajpura
Prasopura
Lakhora
Ahar
Badnai
Baldeogarh
Prempura
Patharkhas
Nalnwari
Budanwara
Tikamgarh
Shardapura
Legend
Up to 1 Mg/l
1 - 2
2 - 3
Watershed Boundary
Tehsil Boundary

It is evident from the abover water quality data and maps the various villages that need to be selected. On the basis of the maps, the vulnerability assessment that has already been undertaken the villages have been selected, the methodology section will deal with this further.

RESEARCH OBJECTIVES AND QUESTIONS

OBJECTIVES:

1) To understand the existing livelihood situation of the area.
2) To assess the livelihood situation of the area using the LVI IPCC approach.
3) To understand differentiated vulnerability in the village by using a gendered approach.

RESEARCH QUESTIONS:

1) What are the various sources of livelihood and are they a stable source of income?

2) How has vulnerability helped in understanding the impacts of climate change on the people?

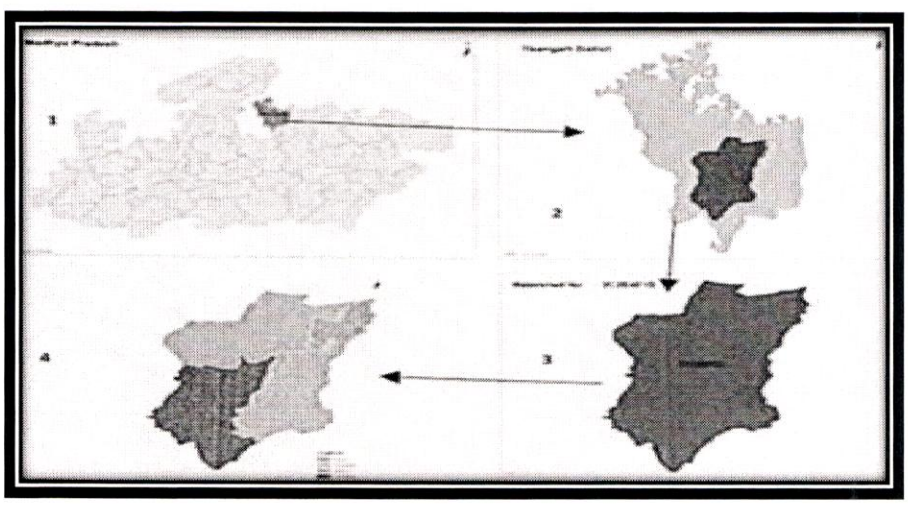
Research Argument: The area of study is highly prone to drought and the current situation of the villages and systems make them highly vulnerable. As a group, females are more vulnerable than males.

METHODOLOGY AND AREA OF STUDY

STUDY AREA

The area of study is the drought prone region of Madhya Pradesh; Bundelkhand. The study area is located in Tikmgarh distict which consists of four blocks namely Jatara, Palera, Tikamgarh and Baldeogarh. The Ur river watershed has a geographical area of 934.2 sq km . The length of the watershed is about a 119 km from north to south with an average width of about 18 sqkm. The mainland extends between $24^0 35'0''$ N and $25^0 05'0''$ N and between $78^0 50'0''$ E and $79^0 10'0''$ E longitudes and has an elevation of 400 m above the mean sea level. The Ur river watershed has been marked out using GIS techniques and the required interventions in the areas have been done thereafter.

In this study only Palera and Tikamgarh tehsils have been used for the baseline study. Based on the features of the study the data will be extrapolated for the entire district in the future course of the project. There were six villages that were covered in the study. The villages that were surveyed in Palera were Mahendra Maheva, Psli and Ghura and in Tikamgarh the villages surveyed were; Katarkhera, Maumun and Papawani. These villages come under the watershed area and were selected based on a number of criteria which include water quality data, studies done on vulnerability amongst others.



METHODOLOGY

This study has used the Livelihood Vulnerability Index framework to ass vulnerability. The LVI IPCC approach that takes into consideration adaptive capacity has been used as a methodology to assess the vulnerability of people of Tikamgarh district. Prior to assessing of LVI, other procedures and methodologies were also used and these are the following:

1) Collection of Primary Data

   1.1) Drafting of questionnaire: A primary data study was understood as a vital pre requisite prior to creating the vulnerability Index. Data from field survey was then collected.

   1.2) Use of Participatory Rural Appraisal Techniques: PRA tools and techniques were used to collect data in the village. The results of which would be showcased in the study.

2) LVI Indicators: Primary data that was collected was used in formulating the indicators required to calculate vulnerability

3) Gender based LVI: Constructing of LVI would inadvertently lead to drafting of a gender based livelihood vulnerability Index which would analyze vulnerability in a gendered perspective.

FINDINGS:

The field visit to Palera before anything else was a learning experience in itself. It was a shocking and a valuable experience to actually feel the severity of drought and its implications in these areas. The issue of drought in these areas goes beyond annual rainfall which is evident in the inability of the existing water resources of the land to meet the demand of these social systems. The following are key findings that had been collected during the field survey in the area and will touch upon various aspects of the village systems and its functioning.

FINDINGS: PALERA VILLAGE

Demographic Profile	➢ On an average there are about 10- 20 people who reside in each household. ➢ The major decision making activities are done by the men and not the women. ➢ Men are the heads of the household and not the women ➢ Even if the husband is not present in the village and have migrated I search of jobs, the decisions are made by the men of the other households. ➢ The women and men in these villages are highly uneducated and come under the category of unskilled labour. ➢ Every household has at least one dependent member/ aged individual who is in the need of constant medical care.

Water	➢ Considering the household size, water demands of these individual households are also much higher. ➢ The women of the village spend hours to try and fetch water. ➢ In a village of 300 households, there would be only one functioning hand pump in the village. ➢ The wells in the villages have dried up and they press soil to get water out to drink. ➢ The women would have to travel long distances in search of water and stand in queues for hours. This procedure takes up most of their time wherein women spend at least 7 to 8 hours in a day on in search of water. ➢ Absolute shortage of water makes it difficult to find water to drink, let alone be used for irrigation purposes. ➢ The women of these villages attempt to go to other villages that are better endowed with water resources to fetch water and are met with persecution. ➢ There have been incidents of major fights between the villages where one accuses the other of stealing their water. Women have mentioned that they sometimes sneak into these villages at wee hours (2-3 AM) to fetch water.

Food and Agriculture	➢ Severe scarcity of water implies that the question of practicing agriculture does not arise. ➢ This puts them in a highly vulnerable because they clearly have no alternative source of income or livelihood. ➢ Other than the monsoon months, these villagers have no produce that they can rely on forcing them to ally with the existing national food distribution in these areas (ration). ➢ However these in itself address questions pertinent questions relating to food and nutrition security. ➢ During the monsoon months they are able to grow enough to even sell their produce and use that income for most of the year. ➢ Major crops that are grown during this time of the year are Urad, Blackgram and Tilli.
Soil Health	➢ The villages have clearly affirmed that the quality of soil has majorly deteriorated overtime. ➢ A 20 percent loss is what has been recorded in this scenario. ➢ This has had its implications on cropping patterns as well. ➢ The villagers are also blatantly unaware of any soil health card or other schemes that are provided by the government, ➢ Fertilizers are used on a large scale in these area.

	➢ There haven't been measures that have been undertaken towards preserving soil moisture.
Institutional Arrangements	➢ There is an absence of functioning institutional structures in these villages. ➢ In the context of SHG's there are barley one or two functioning SHG's that are present in the village. ➢ The women are only namesake members of these SHG's. ➢ The men control the finances and maintain the registers of these SHG's. ➢ The women are completely unaware of the finances of these SHG's or the possible schemes that these SHG's can avail. ➢ These institutions are setup but are not fully functioning and have not been able to take any major decisions in the past. ➢ It is interesting to note that the even the sarpanch of these villages might be women but the actual functioning power and authority lies in the hands of the men of the village. ➢ The panchayat however has not been able to take any major decisions or help out the villagers in their water scarcity issue in any constructive way.

FINDINGS : TIKAMGARH VILLAGE

The villages of Tikamgarh are in a slightly better functional state as compared to Palera village. They don't face issues pertaining to water shortage as much as

they do towards contamination of water. However, a lot of the sitations are similar for both villages

Demographic Profile	➢ On an average there are about 7- 10 people who reside in each household. ➢ The major decision making activities are done by the men and not the women. ➢ Men are the heads of the household and not the women ➢ Even if the husband is not present in the village and have migrated in search of jobs, the decisions are made by the men of the other households. ➢ The women and men in these villages are highly uneducated and come under the category of unskilled labour. ➢ Unlike in Palera village, every household does not have a dependent/ aged person who requires constant medical care.
Water	➢ Considering the household size, water demands of these individual households are also much higher. ➢ Water is easily available to the women of these villages ➢ They have to only walk 15 steps away from their house to acquire water from their hand pump. ➢ The average time taken to collect water however has increased as it takes more time to pump out water.

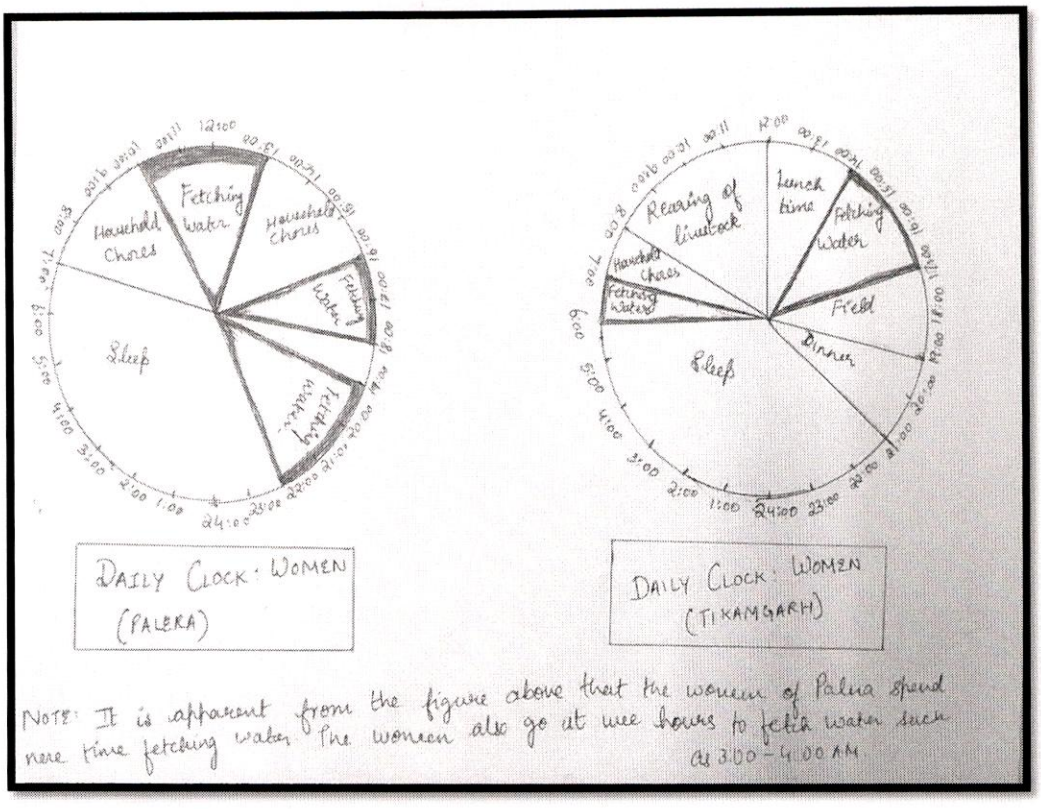
	➢ The villagers however have complained about severe contamination in the water. ➢ There have been complaints of iron pieces found in the water and red colored water. The red color is primarily due to rust and rust deposits in the water. ➢ The villagers have shown their displeasure towards the issue but nothing has been done by the local authorities. ➢ Water is used for irrigation, household chores and for livestock.
Food and Agriculture	➢ Agriculture is a source of income and livelihood for the people in the village. ➢ There are irrigation facilities that have been setup in the field as well. ➢ Feritlisers are used in the field ➢ The people are not aware of the various soil health schemes that have been provided to the people. ➢ The people have been able to sell their produce in the market as well. ➢ The people also rear livestock in the village unlike in Palera. ➢ Both men and women work in the field but the women perform most of the labour. ➢ Major crops that are grown during this time of the year are

	Urad, Blackgram and Tilli.
Soil Health	➢ The villages have clearly affirmed that the quality of soil has majorly deteriorated overtime. ➢ A 20 percent loss is what has been recorded in this scenario. ➢ This has had its implications on cropping patterns as well. ➢ The villagers are also blatantly unaware of any soil health card or other schemes that are provided by the government, ➢ Fertilizers are used on a large scale in these areas. ➢ There haven't been measures that have been undertaken towards preserving soil moisture.
Institutional Arrangements	➢ The villages on an average have 5-10 SHG's per village. . ➢ These SHG's are also functioning SHG's. ➢ The women are only namesake members of these SHG's. However they do have a role in the decision making processes. ➢ The men control the finances and maintain the registers of these SHG's. ➢ The women are completely unaware of the finances of these SHG's or the possible schemes that these SHG's can avail. ➢ The SHG's in these villages have taken decisions on an

	administrative level as well such as supplying food for school students. ➢ It is interesting to note that the even the sarpanch of these villages might be women but the actual functioning power and authority lies in the hands of the men of the village. ➢ The panchayat however in this case is not isolated from the rest of the village but the decision making of the panchayat is still questionable.

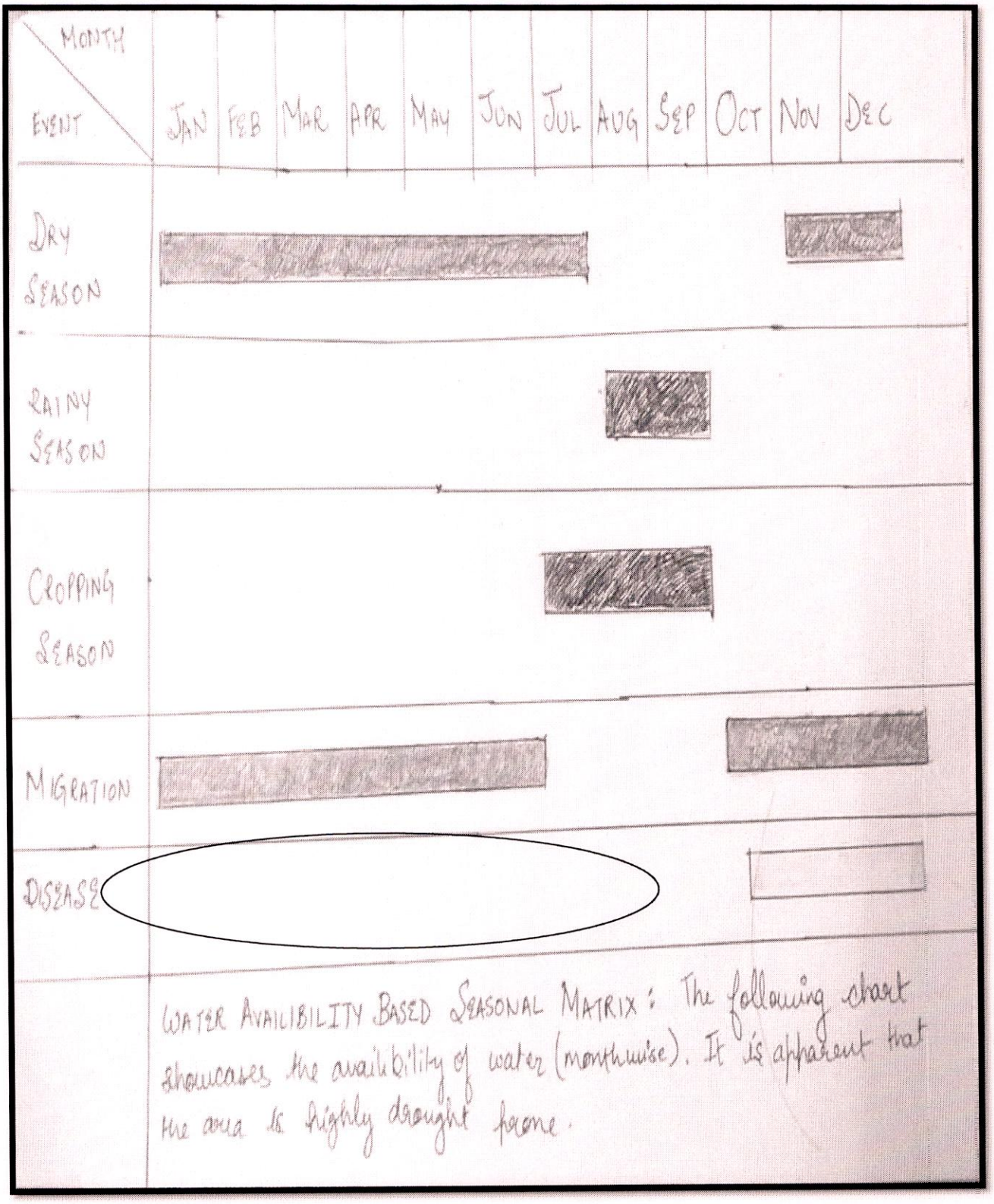
ISSUES PERTAINING TO WATER SCARCITY:

The stark difference in water shortage has already been mentioned in the list of findings. The following daily clock of the women showcases the strak difference between the two.



MIGRATION TRENDS

There might be a slight difference between the two regions in terms of the findings but both these areas experience severe migration. The people of the village and mostly the men in the village migrate during the summer months. The following seasonality showcases this.

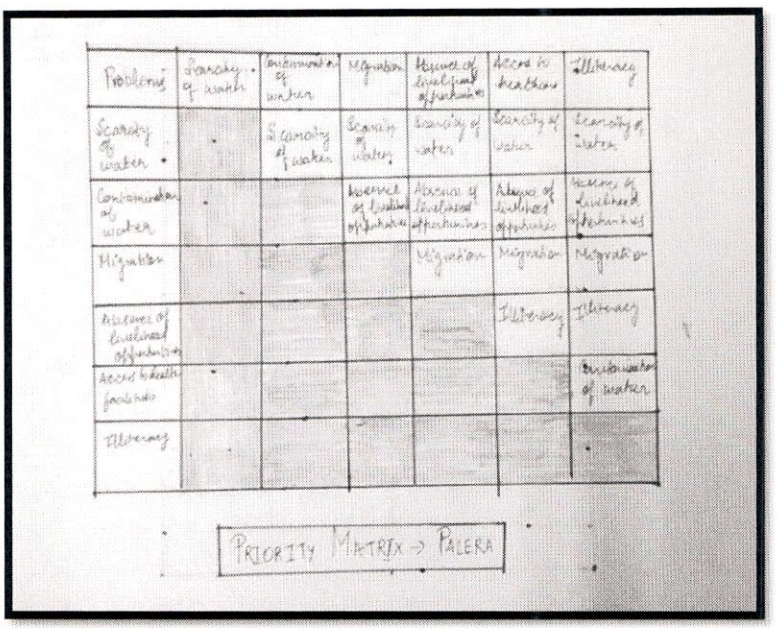


WATER AVAILIBILITY BASED SEASONAL MATRIX: The following chart showcases the availability of water (monthwise). It is apparent that the area is highly drought prone.

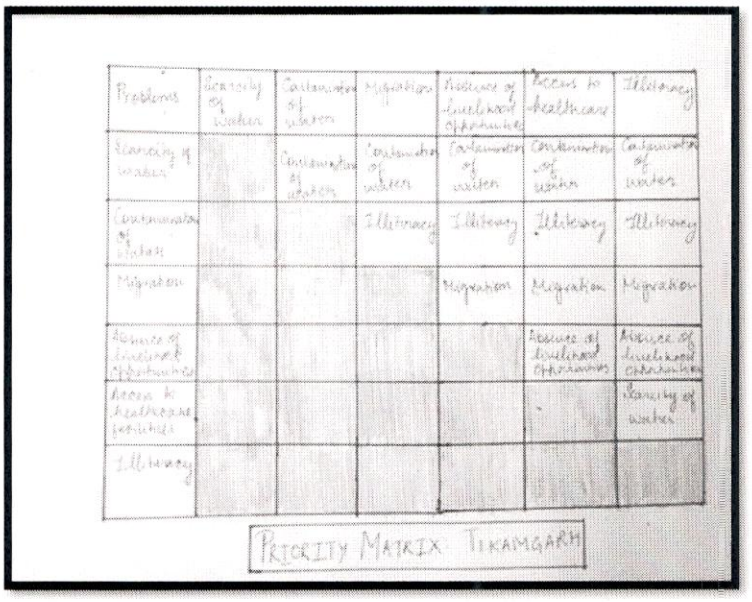
ISSUES OF PRIORITY

The following Priority Matirix showcases the difference in priority over issues in the two villages. These are interesting and give a glimpse of the stark contrast between both the villages.

PROBLEM	RANK
Scarcity of water	1
Contamination of water	5
Migration	3
Absence of livelihood opportunities	2
Access to healthcare facilities	6
Illiteracy	4



PROBLEM	RANK
Scarcity of water	5
Contamination of water	1
Migration	3
Absence of livelihood opportunities	4
Access to healthcare facilities	6
Illiteracy	2



ANALYSIS

LIVELIHOOD VULNERABILITY INDEX

The livelihood vulnerability index of this study area was designed to capture impact of climate change in the area. The index in this particular study has taken into consideration seven major components. Within these components there were sub components that were used for the study and generated a component value. The following major components would be chosen for the study:

a) **Socio Demographic profiling:** This section contains the demographic structure of village at the household level. Showcasing of individual household level demographic data was required for the study. The data collected from the survey is used in the section. This section contains details of number of people who head the household amongst others. This section has three subcomponents.

b) **Livelihood Strategies:** This section contains details pertaining to livelihood of individuals in the area. It takes into account details pertaining to migration of the villagers in the area and details associated with agriculture and other livelihood generating activities. This section is has five sub components.

c) **Water:** This section contains details of the water situation of the area. This is the most important section of the study and contains details of the water situation, domestic use of water and water demand of the area. Considering the fact that this is a drought prone area, this section is a rather important aspect and will showcase the depth of water scarcity in the area. This has 9 sub components.

d) **Food:** This section contains details on the food produce sold in the market amd cropping details. This section has 3 subcomponents.

e) **Soil Quality:** This section contains details pertaining to the quality of the soil in the area and its deterioration. This has three sub components.

f) **Institutional Arrangements:** This section contains details on the existing systems and institutional structures of the area. This section showcases existing and functions and systems that operate in the villages.

g) **Natural Disasters and Climate Variability:** This section contains details on climate change and its resultant impacts. This is an important component to showcase impact of climatic changes in the area.

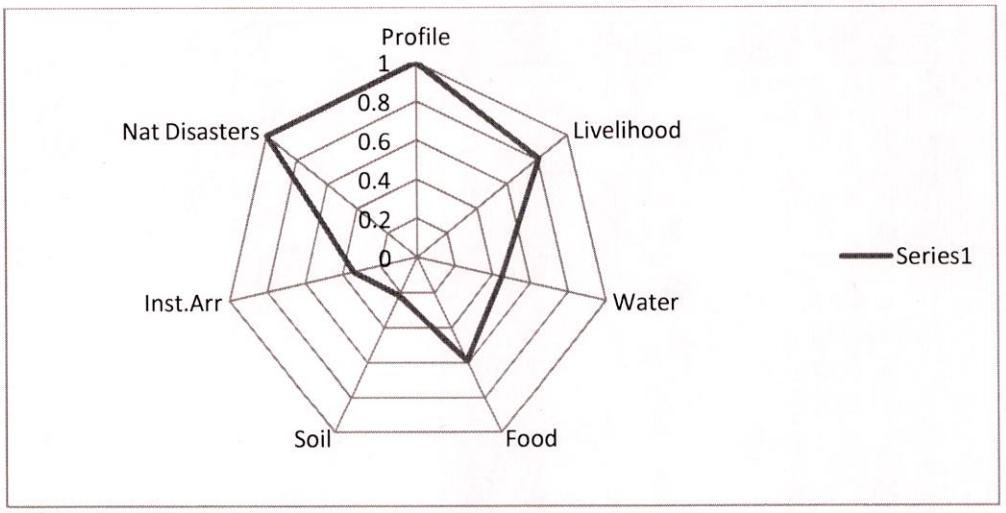
The following is the LVI result of Palera.

	SOCIO DEMOGRAPHIC PROFILE				
Dependency Ratio		0.33	0.38	0.00	0.87
Percentage of female Headed Households		50	100	0	0.5
Percentage of household heads that did not complete school		50	100	0	0.5
Percentage of old members in household needing constant medical care		28	100	0	0.28
COMPONENT VALUE					1
		LIVELIHOOD STRATEGIES			
Percentage of household where members have migrated permanently		3	100	0	0.03
Percentage of households where members have migrate seasonally		100	100	0	1
Percentage of housholds that dependent on agricultre for sustenenance only		100	100	0	1

Percentage of households dependent on non farm activities.		100	100	0.00	1
Percentage of Households that have zero income from agriculture due to water shortage.		100	100	0.00	1
COMPONENT VALUE					0.81
		WATER			
Average time taken to fetch water (in hours)		2	3	1	0.7
Water demand of individual households(litres)		44	48 (4*12 buckets)	40 (4*10 buckets)	0.5
Average days without water supply per household.		319	365	273	0.5
Percentage of households whose main water source is ground water.		33.33	100	0	0.33
Change in groundwater levels in the past years.	mbgl	4.04	4.96	3.4	0.41
Percentage of households dependent on natural water sources		67	100	0	0.67
Percentage of deaths due to thirst.		2	100	0	0.02
Average number of working handpumps in the village		1	2	0	0.5
COMPONENT VALUE					0.45
		FOOD			

Percentage of produce in the market.		51.67	100	0	0.52
Percentage of households that are dependent on ferilisers		100	100	0	1
Average crop diversity Index		0.25	1	0	0.25
COMPONENT VALUE					0.59
		SOIL QUALITY			
Percentage of landholdings that have been effected by the poor soil quality.		33.33	100	0	0.33
percentage of households where cropping patterns were affected because of poor soil quality		33.33	100	0	0.33
Percentage of households that practise soil water conservation techniques.		0	100	0	0
COMPONENT VALUE					0.22
		INSTITUTIONAL ARRANGEMENTS			
Number of SHG's in the village		5	12	1	0.36
Number of watershed committes in the village		1	1	0	1
Number of SHG's where finances are maintaned by SHG members		0	0	0	0

Percentage of households depending on local governance institutions for water needs		0	0	0	0
COMPONENT VALUE					0.34
	NATURAL DISASTER AND CLIMATE VULNERABILITY				
Number of drought years		6	6	0	1
Percentage of households affected by drought		100	100	0	1
Amount of livestock loss due to drought in a day		7	15	2	0.38
Number of farmer suicides due to drought		1	1	0	1
Percentage of households that are facing sevre loss of income due to drought.		100	100	0	1
COMPONENT VALUE					1



MAJOR COMPONENT VALUES	Values
Profile	1
Livelihood	0.81

Water	0.45
Food	0.59
Soil	0.22
Inst.Arr	0.34
Nat Disasters	1
	4.41
LVI :	0.63

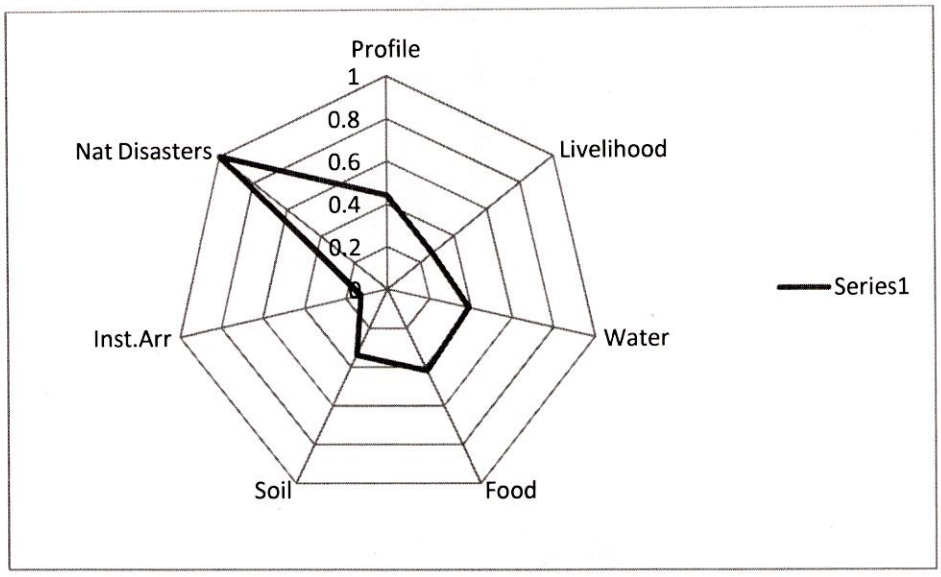
LVI Tikamgarh

		SOCIO DEMOGRAPHIC PROFILE				
	Dependency Ratio		0.33	0.38	0.00	0.87
	Percentage of female Headed Households		30	100	0	0.33
	Percentage of household heads that did not complete school		30	100	0	0.33
	Percentage of old members in household needing constant medical care		24	100	0	0.24
	COMPONENT VALUE					0.44
			LIVELIHOOD STRATEGIES			
	Percentage of household where members have migrated permanently		1	100	0	0.01
	Percentage of households where members have migrate seasonally		100	100	0	1

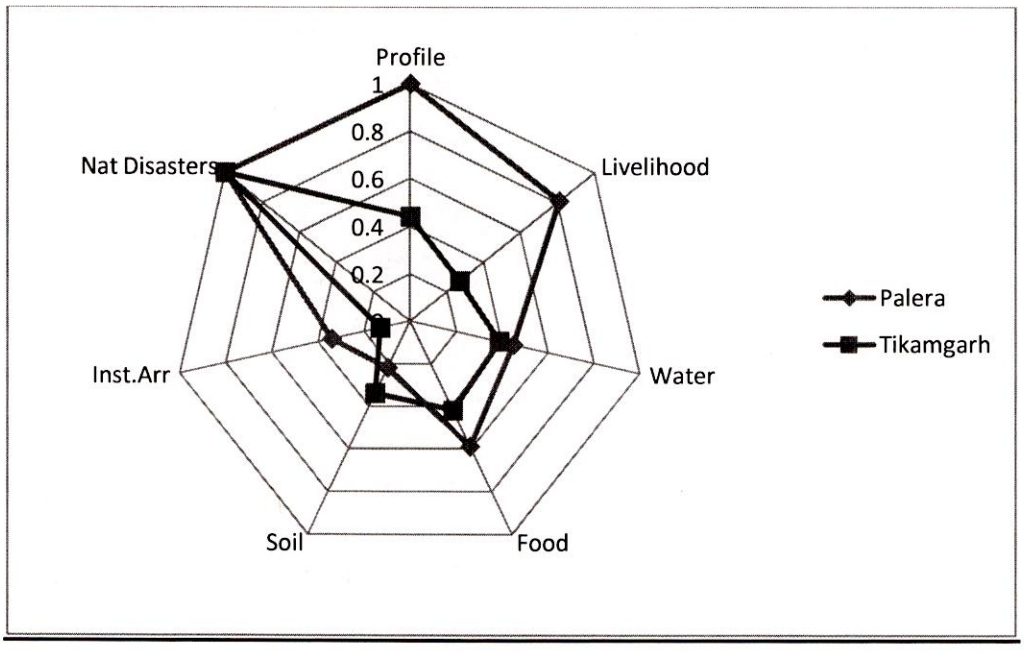
	Percentage of housholds that dependent on agricultre for sustenenance only		0	0	0	0
	Percentage of households dependent on non farm activities.		30	100	0.00	0.33
	Percentage of Households that have zero income from agriculture due to water shortage.		0	0	0.00	0
	COMPONENT VALUE					0.27
			WATER			
	Average time taken to fetch water (in minutes)		15	30	10	0.25
	Water demand of individual households(litres)		100	120 (30*4)	80 (20*4)	0.5
	Average days without water supply per household.		319	365	273	0.5
	Percentage of households whose main water source is ground water.		16.67	100	0	0.17
	Change in groundwater levels in the past years.	mbgl	6	9.7	2.7	0.47
	Percentage of households dependent on natural water sources		67	100	0	0.67
	Percentage of deaths due to thirst.		0	0	0	0

	Average number of working handpumps in the village		3	5	0	0.6
	COMPONENT VALUE					0.39
			FOOD			
	Percentage of produce in the market.		70	80	50	0.00
	Percentage of households that are dependent on ferilisers		100	100	0	1
	Average crop diversity Index		0.2	1	0	0.25
	COMPONENT VALUE					0.42
			SOIL QUALITY			
	Percentage of landholdings that have been effected by the poor soil quality.		17	100	0	0.17
	Percentage of households where cropping patterns were affected because of poor soil quality		17	100	0	0.17
	Percentage of households that use fertilisers on landholdings.		100	100	0	1
	Percentage of households that practise soil water conservation techniques.		0	0	0	0
	COMPONENT VALUE					0.34
			INSTITUTIONAL ARRANGEMENTS			
	Number of SHG's in the village		10	25	1	0.36

	Number of watershed committes in the village		0	0	0	0
	Number of SHG's where finances are maintaned by SHG members		0	0	0	0
	Percentage of households depending on local governance institutions for water needs		17	100	0	0.17
	COMPONENT VALUE					0.13
		NATURAL DISASTER AND CLIMATE VULNERABILITY				
	Number of drought years		6	6	0	1
	Percentage of households affected by drought		100	100	0	1
	Amount of livestock loss due to drought in a day		2	3	0	0.67
	Number of farmer suicides due to drought		0	0	0	0
	Percentage of households that are facing sevre loss of income due to drought.		100	100	0	1
	COMPONENT VALUE					1



MAJOR COMPONENT VALUES	Values
Profile	0.44
Livelihood	0.27
Water	0.39
Food	0.42
Soil	0.34
Inst.Arr	0.13
Nat Disasters	1
	2.99
LVI :	0.63



Livelihood Vulnerability : Palera	Livelihood Vulnerability: TIkamgarh
0.63	0.43

INFERENCE

- Scale of Analysis: 0-1
- The LVI result of Palera village is 0.63. This value is closer to 1 and showcases high vulnerability.
- The LVI result of Tikamgarh village is 0.43. This value is less than 0.5 and showcases lower vulnerability.

ADAPTIVE CAPACITY

This is a very component of the LVI IPCC framework. An analysis of all three will come up with an understanding of the resilience pattern of the area.

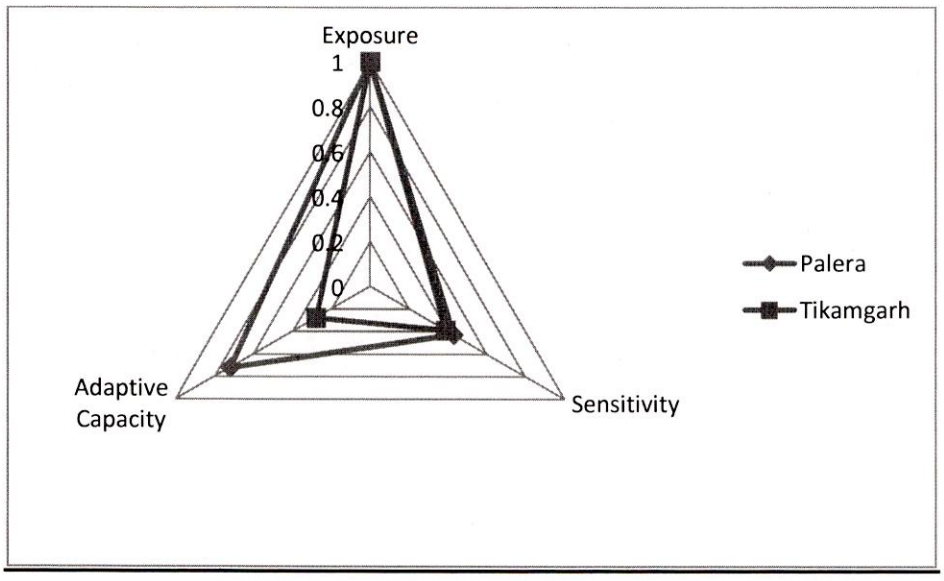
PALERA:

ADAPTIVE CAPACITY			
		VALUES	COMPONENTS
Socio-demographic Profile		1	4
Livelihood Strategies		0.81	5
Institutional Networks		0.34	4
			Factor Val: 0.72
SENSITIVITY			
Food		0.59	3
Water		0.45	8
Soil		0.22	3
			Factor Val: 0.43
EXPOSURE			
Natural Disasters and climate vulnerability		1	5
			Factor Val: 1

TIKAMGARH

ADAPTIVE CAPACITY			
		VALUES	COMPONENTS
Socio-demographic Profile		0.44	4
Livelihood Strategies		0.27	5
Institutional Networks		0.13	4
			Factor Val: 0.72
SENSITIVITY			
Food		0.42	3
Water		0.39	8
Soil		0.34	3
			Factor Val: 0.43
EXPOSURE			
Natural Disasters and climate vulnerability		1	5
			Factor Val: 1

COMPONENT	Values: Palera	Values: Tikamgarh
Exposure	1	1
Sensitivity	0.43	0.39
Adaptive Capacity	0.72	0.28



INFERENCE

- Adaptive Capacity for Palera village: 0.72
- Adaptive Capacity Tikamgarh is 0.28;
- This showcases that Palera has lesser ability to adapt as compared to Tikamgarh.

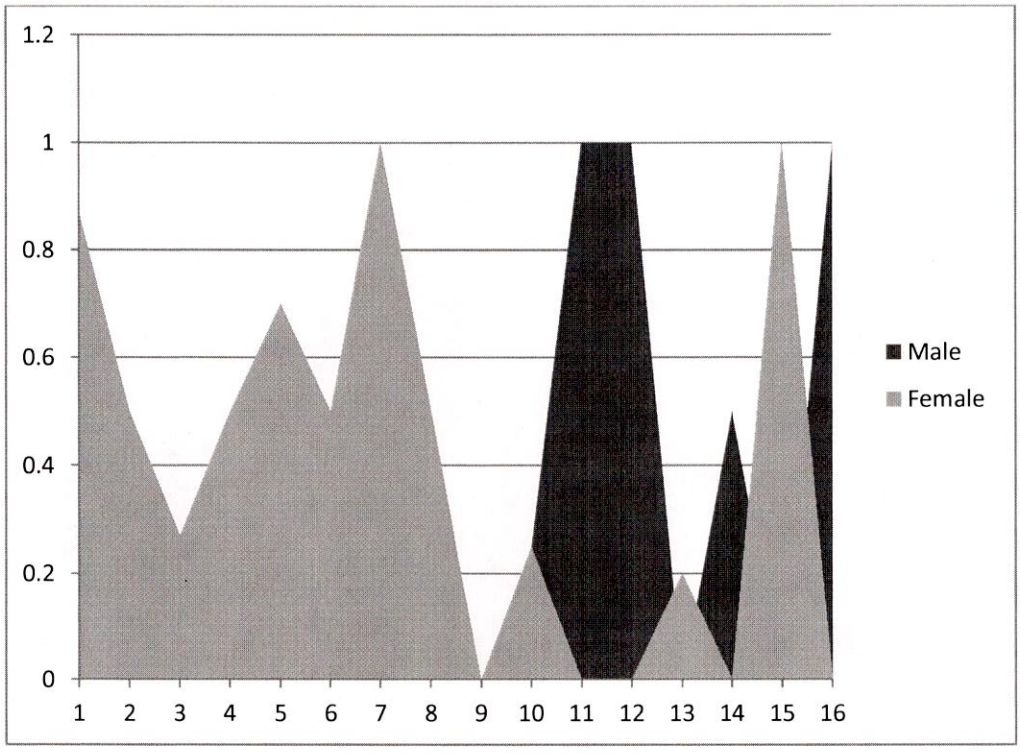
ANALYSIS GENDER LVI :

In order to prove our research argument about differentiated vulnerability, a gender based vulnerability index has been constructed. The following is a table of both.

GENDR LVI: PALERA

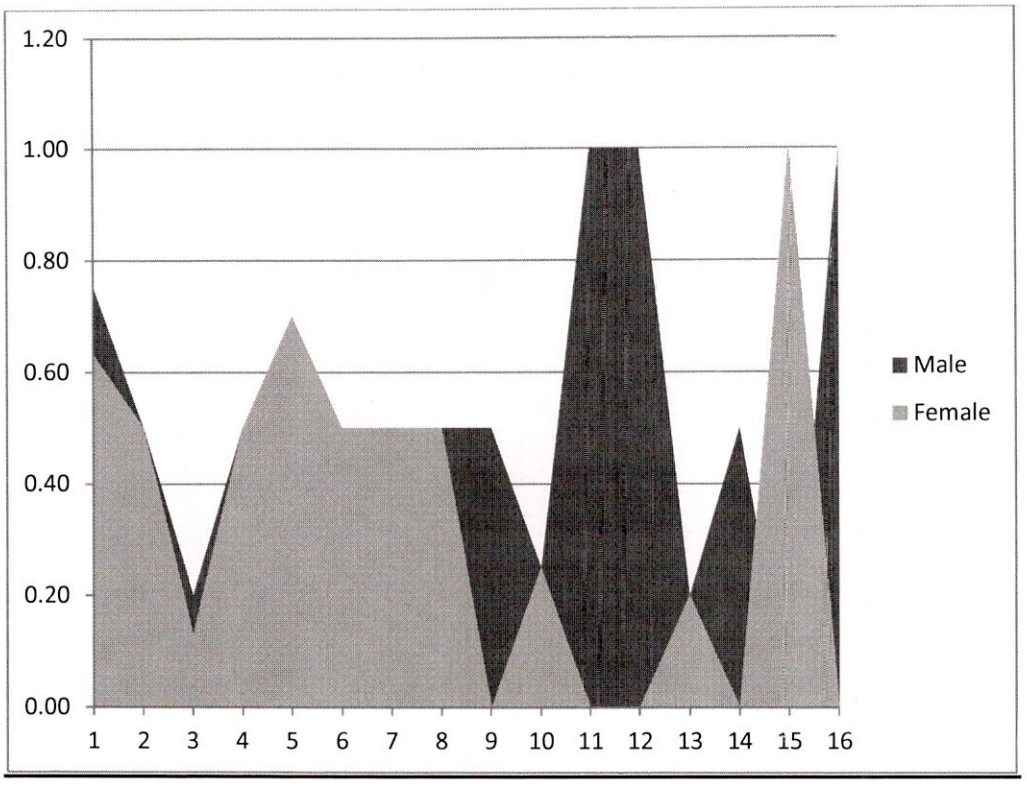
Indicator	Male	Female
Dependency Ratio	0.51	0.87
% of household heads that did not complete school	0.5	0.5
% of households with members needing dpependent care	0.07	0.27
% of household memebers who are not working within the community	0.5	1
% of households with easy access to healthcare		
% of households where women have to go and fetch water (in hrs)	0	0.7
Access to maternal healthcare (dis in km)	—	
Fetching of water	0	1

Access to primary education		
% of households where children have gone for higher studies		
Average crop diversity index		
Average days without water supply		
Migration for employment	**1**	**0**
Earning members of household	**1**	**0**
Contribution towards agricultural activities		
No: of people with bank accounts	**0.5**	**0**
Membership in SHG's	**0**	**1**
Maintaince of finance registers	**1**	**0**



GENDER LVI: TIKAMGARH

Indicators: Tikamgarh	Male	Female
Dependency Ratio	**0.75**	**0.63**
% of household heads that did not complete school	**0.5**	**0.5**
% of households with members needing dependent care	**0.2**	**0.13**
% of households with easy access to healthcare	**0.5**	**0.5**
% of households where women have to go and fetch water (in hrs)	**0**	**0.7**
Access to maternal healthcare (dis in km)		**0.5**
Fetching of water	**0**	**0.5**
Access to primary education (in metres)	**0.5**	**0.5**
% of households where children have gone for higher studies	**0.5**	**0**
Average crop diversity index	**0.25**	**0.25**
Migration for employment	**1**	**0**
Earning members of household	**1**	**0**
Contribution towards agricultural activities	**0.2**	**0.2**
No: of people with bank accounts	**0.5**	**0**
Membership in SHG's	**0**	**1**
Maintaince of finance registers	**1**	**0**



INFERENCE:

The gendered analysis in both cases showcase women as more vulnerability as compared to males.

POLICY ANALYSIS

The National Relief Disaster Fund (NDRF) has launched a relief scheme for victims of drought in the region of Bundlekhand. The scheme is a a relief of Rs 1,304 Crore for farmers in the region. There are various aspects to this scheme since this intervention by the government aims at providing fast and effect relief to the people as soon as possible.

Under the MNREGA policy of the scheme, this also includes an increase in employment days; 100-150 days in the programme. This amendment aims at providing employment during the year in the non monsoon season, so that these MNREGA actvitieis can be a source of livelihood for the people living in the area.

A drought risk assessment would be undertaken in the area as well to come up with a successful policy intervention.

The bone of contention and point of debate still remains the implementation of the scheme and the ability of the individuals to access these various benefits. There still exists a lack of awareness of regarding the interventions of the government and the means to access them. During the interview with the villagers;

most of them were disgruntled with the very idea of compensation. As far they were concerned money is not the solution but a plan on providing water sources would be of great help. A faster and more accessible solution to access water has been asked for.

CONCLUSIONS AND RECOMMENDATION

It is evident that vulnerability as a component can give a multiplicity of analysis. However it is recommended that action is taken by villagers to cope with drought. Some of it are the following:

a) Use of drought resistant seeds
b) Encouraging mixed cropping
c) Employing different agricultural methods such as ridges and furrows.
d) Encourage multi cropping
e) Institutional Capacity building.
f) Forming an institutional system such as farmer adaptation clusters so that a sound institutional mechanism can be set up for the same.
g) Knowledge sharing and communications amongst the villagers.

Ground water recharging such as check dams and gabion structures :

National Institute of Hydrology under its project would be creating a gabion structure in the area specially designed to help combat water challenges of the area. Use of differential irrigation techniques is also a possibility in this scenario. An integrated watershed management programme would be used in the project space. This would take into consideration the various water harvesting techniques that could be used by the villagers in the area.

The purpose of the study was to understand the livelihood situation of the area and it has been successfully been able to do so. The use of LVI as a comprehensive tool to assess vulnerability is still questionable, however social science constantly innovates tools and techniques of research, there could be a possibility of altering existing tools and framework. Let us hope they do justice to these concepts so that plausible to development challenges can be addressed.

REFERNCES

Alternative, D., 2015. *Vulnerability assessmnet of Bundelkhand* , s.l.: s.n.

Birkmann, J., 2006. *Measuring vulnerability to natrual hazards.* Tokyo: s.n.

Bohle, H., 2001. Vulnerability and criticality: Perspectives from social geogrpahy. *IHDP* , Issue 2, pp. 1-7 .

Calow, R., 2016 . *Sustainable Livelihoods : Elimination of poverty* , UK : British Geological survey .

Hewitt, K., 1983. *Interpretations of calamity.* Winchester: Allen & Unwin.

Holling, C., 1996. Engineering withing ecological constraints. *Engineering resilience vs.ecological resilience,* pp. 31-44.

IGFRI, 2000. *The greens and beyond,* s.l.: s.n.

Juntunen, L., 2005. Addressing social vulnerability to hazards. *Disaster safety review* , 4(2), pp. 3-10.

Klein, F. a., 2006. *Understanding Vulnerability,* s.l.: s.n.

Leurs, E. &., 2006 . *Vulnerability and related aspects* , s.l.: s.n.

Phillips, B. &., 1999. What's gender got to do with it ?. *International Journal of mass emergencies and disaster,* 17 (1), pp. 5-11.

UNDP, 2016. *www.undp.org.* [Online]
Available at: http://www.in.undp.org/
[Accessed 16 May 2012].

UNISDR, 2004. *United Nations Office for Disaster Risk Reduction (UNISDR).* [Online]
Available at: www.unisdr.org
[Accessed 26 May 2016].

White, B. K. a., 1978. *Understadning Vulnerability* , s.l.: s.n.