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INSTITUTE FOR CLIMATE CHANGE AND ADAPTATION

AN EVALUATION OF THE IMPACT OF CLIMATE CHANGE-RELATED EXTREME EVENTS ON MENTAL HEALTH IN ISIOLO COUNTY, KENYA

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DEDICATION

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DECLARATION

I declare that this thesis is my original work, with exception of quotations from published and unpublished sources which are explicitly acknowledged. The materials herein have been similarity checked to avoid breach of intellectual property rights and where used they have been restated in accordance to set University Regulations on Conduct of Examinations. The data presentation methods such as diagrams are clearly captioned and citations included in the thesis text of any material not resulting from my own experimentation, observation or specimen-collection.

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ABSTRACT

Disaster risks posed by climate change expose uncertainties and dangers to physical environment and mental health globally. Global warming affects climate variability and extreme climate events leading to disaster risks and vulnerability to those events. The increasing disaster risks and/or impacts in Africa are caused by exposures and historical vulnerability to variability of climate. Isiolo County in Kenya is susceptible to the effects of extreme climate events and exposure to natural hazards, and the residents have limited capacity to adapt but also suffer from related mental health conditions that have not been researched with respect natural disaster risks. The overall objective of this research was to evaluate the impacts of climate change-related extreme events on mental health and develop the intervention strategies to deal with mental health in the context of a changing climate. The methods of data collection used included: data mining in published and unpublished sources*;* rainfall/temperature data derived from gridded 10km of sixteen satellite stations, from Kenya Meteorological Department (1984-2013); mental disorders epidemiological data (2006-2014) from the health information system, Isiolo County and in-depth observation among 60 in-patients and 121 out-patient; six focused group discussion and workshop sessions among selected sample size (N=24); key informants (N=35) and household socio-economic survey (N=288) was conducted to gather socio-economic aspects of the target population. These were utilized to gain insight and data compared to identify the linkages and existing gaps to be able mainstream mental health and extreme climate disaster risks. Generalized Pareto Distribution was used to generate mean excess for extreme temperatures and rainfall peak over thresholds (POT). Also, Palmer drought severity index used temperatures and standard precipitation index (SPI) values to estimate relative dryness. GIS methods were used to explore various properties of the climate system in Isiolo. The hazards and disasters were ranked according to the impacts and the probability of a hazardous event placed on scale 0-1; where 0 indicates no fatality and 1 fatality and socio-economic damages using IPCC risk assessment on severity of uncertainties of climate change related disasters. The quantitative data was analysed using statistical tools in Excel, SPSS version 20 while rainfall and temperature analysis was done using R software (version 3.21), ArcGIS and mental health data was ranked using criteria for Diagnostic and Statistical Manual of Mental Disorders plus International Classification of Diseases (ICD 11) diagnostic tools. The results revealed that the most common disasters risks include: drought and heat waves, strong sand storms, flash floods and floods. The duration of time, frequency and unpredictable weather variability events were above critical threshold, hence categorized as high risk, rated 1, hence fatal. Correlation analysis was done to determine the varying trajectories of sets of bivariate data and positive correlation was noted between mental disorder cases and total annual rainfall. The prevalent mental disorders included: anxiety (54%); 32% each for dissociative, sleeping, and adjustment disorders; and 39% for eating and poly-substance disorder. The mental disorder comorbidity revealed the association to disaster risks which increase mental illnesses. The study found that the prevalence rate of mental disorders was high and resilience was low. The study established that major health and non-health interventions during disasters included: provision of food and medicines (50.9% responses), support by Council of Elders (27.1% responses), restocking (10.2%) and minimal rehabilitation services (11.9% responses). The humanitarian programmes in rural areas is higher than in urban areas because the biggest risks of weather-related extremes lie in rural areas of which is expected to be pragmatic in future. The actor's involvement to manage disaster risks in context of climate change extreme events on mental health is dismal. The model of inclusivity and integration suggests overlapping and complementary practices of preparedness, response, and recovery. An alternative and participatory Climate Change Disaster Adaptation Model was devised to strengthen institutional coordination mechanisms and monitoring to improve adaptation and resilience building approaches. The study recommends development of robust environmental health procedures to diagnose mental disorders, mapping of disasters; mental disorder epidemiology and make it user friendly to advice policy, scale up solutions and accelerate evidence informed advocacy on adaptation and resilience mental health programme strategies.

Key Words: Climate Change, Disasters, Vulnerability, Mental Health, Policies and Strategies.

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LIST OF ABBREVIATIONS/ACRONYMS AND SYMBOLS

AAK	Agrochemical Association of Kenya
ACF	Action Against Hunger, United States of America
ADA	Alcohol and Drug Abuse
ADD	Attention Deficit Disorder
ADPC	Asian Disaster Preparedness Centre
AEA	America Evaluation Association
AMREF	Africa Medical and Research Foundation
AODS	Alcohol and Other Drugs
APA	American Psychiatric Association
ARC	ARGHYMET Regional Centre
AGRHYMET	Agriculture Hydrology Meteorology Research Centre, Niamey, Niger
ASAL	Arid and Semi-Arid Lands
CBDRM	Community-Based Disaster Risk Management
CBT	Cognitive Behavioural Therapy
CCA	Climate change adaptation
CCDAM	Climate Change Disaster Adaptation Model
CDKN	Climate and Development Knowledge Network
CDM	Comprehensive Disaster Management
CIDP	County Integrated Development Plan
CIMA	Centro Internationale in Monitoraggio Ambientale
CIOMS	Council of International Organization of Medical Sciences

CMIP	Climate Data Processing
CNS	Central Nervous System
CSO's	Civil Society Organizations
CVA	Capacity and Vulnerability Analysis
DRM	Disaster Risk Management
DRMA	Disaster Risk Management Authority
DRR	Disaster Risk Reduction
DRSR	Department of Resource Survey and Remote Sensing
DSM	Diagnostic and Statistical Manual of Mental Disorders
EMCA	Environmental Management and Coordination Act
ENNDA	Ewaso Nyiro North Development Authority
ENSO	El Niño Southern Oscillation
ERA	Environmental Research Agenda
ERD	Economic Recovery Strategy
ERSP	Environmental Research Service Provider
EU	European Union
FDGs	Focused Group Discussion
FH	Flood Hazard
FHI	Flood Hazard Index
FIGUSED-S	Flow, Rainfall Intensity, Geology, Land Use, Slope, Elevation, Distance Sensitivity Index
GAD	Generalized Anxiety Disorder
GESIP	Green Economy Strategy & Implementation Plan

GIS	Geographic Information System software
GOK	Government of Kenya
HFA	Hyogo Framework of Action
HH	House Hold
HIS	Health Information System
HNAP	Health National Action Plan
IAC	Inter Academy Council
IASC	Inter-Agency Standing Committee
IBM	International Business Machine Corporation
ICD	International Classification of Diseases
ICH-GCP	International Conference on Harmonization- Good Clinical Practice
ICIDP	Isiolo County Integrated Development Plan
IEBC	International Electoral Boundaries Commission
IFRC	International Federation of Red Cross
IPCC	Intergovernmental Panel on Climate Change
IPT	Interpersonal Psychotherapy
ISRN	International Scholarly Research Notices
JICA	Japan International Cooperation Agency
KII	Key Informant Interview
KMD	Kenya Meteorological Department
KMPH	Kenya Mental Health Policy
KNAP	Kenya National Adaptation Plan
KRCS	Kenya Red Cross Society

LCD	Low Carbon Strategy Development
LDC	Least Developing Countries
LSD	Lysergic Acid Diethylamide
MDAs	Ministries Departments and Agencies
MDD	Major Depressive Disorder
MDGs	Millennium Development Goals
MDMA	Methylenedioxymethamphetamine (Ecstasy)
MH- GAP	Mental Health Gap Action Plan
MNS	Mental, Neurological and substance abuse disorders
MOH	Ministry of Health
MTEF	Medium Term Expenditure Framework
NACOSTI	National Commission for Science, Technology and Innovation
NAP	National Adaptation Plan
NCCA	Nairobi City County Assembly
NCCAP	Kenya's Climate Change Action Plan
NCCRS	National Climate Change Response Strategy
NCDs	Non Communicable Diseases
NDCC	National Disaster Coordination Committee
NDMA	National Drought Management Authority
NDMEC	National Disaster Management Executive Committee
NDOC	National Disaster Operation Centre
NEMA	National Environmental Management Authority
NOS	Not Otherwise Specified

OCD	Obsessive Compulsive Disorder
OPHRs	Professionals with Other Roles
PFA	Psychological First Aid
PLA	Participatory Learning and Action
PTSD	Posttraumatic Stress Disorder
PWD	People with Disability
SAMI	Substance Abusers with Mental Health
SDGs	Sustainable Development Goals
SF	Sendai Framework
SOPs	Standard Operating Procedures
SPR	Skills for Psychosocial Recovery
SPSS	Statistics Package for the Social Sciences
SSDs	Subsurface Dams
SUDs	Substance Use Disorders
UN	United Nations
UNDHA	United Nations Department of Humanitarian Affairs
UNDMT	United Nations Disaster Management Team
UNDMT	United Nations Disaster Management Team
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNGRP	United Nations Global Research Programme
UNICEF	United Nations Children's Fund

UNISDR	United Nations International Strategy for Disaster Reduction
UN-OCHA	United Nations Office for coordination of Humanitarian Affairs
USAID	United States Agency for International Development
USGCRP	United States Global Change Research Programme
WFP	World Food Programme
WHO	World Health Organization
WMO	World Meteorological Organization
WRA	Water Resources Authority
WRUA	Water Resources Users Association

GLOSSARY OF TERMS

Adaptation to climate change: This refers to "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Human intervention may facilitate adjustment to expected climate change which moderates harm from impacts of extreme climate events" (IPCC, 2012).

Adaptive capacity: "The ability of communities, institutions or people to adjust to potential hazard, to take advantage of the opportunities, or respond to the consequences" (USGCRP, 2016).

Climate change: This refers to "permanent shift in the known average weather conditions by changes in the mean and/or the variability within the normal range of natural climate patterns observed over at least 30 years. This is characterized by extreme weather conditions, where rainfall and temperature pattern varies remarkably, either below normal or above normal without adhering to known seasons" (IPCC, 2014a; IPCC, 2012).

Climate resilience: "The ability of a system and its component parts to anticipate, absorb, accommodate or recover from the effects of a climate related hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration or improvement of its essential basic structures and functions to enable people to respond to climate risks" (UNISDR et al., 2018; GOK, 2016; IPCC, 2012).

Disaster risk management: This refers to "processes for designing, implementing and evaluating strategies, policies and measures to improve the understanding of disaster risk, foster risk reduction and transfer, and promote continuous improvement in disaster preparedness, response and recovery practices, with the explicit purpose of increasing human security, wellbeing, quality of life and sustainable development" (IPCC, 2012).

Extreme climate events: This refers to "occurrence of a value of a weather or climate variable above (or below) a threshold value near the upper (or lower) ends of the range of observed values of the variable. For simplicity, both extreme weather events and extreme climate events are referred to collectively as 'climate extremes'. They are unusual phenomena that occur when far in excess or below certain thresholds of weather/climate parameters are experienced, adversely impacting human and natural environment" (IPCC, 2012).

Disaster risk: This refers to "potential occurrence of floods and drought disaster risks that may cause loss of life, injury or other health impacts, damage to exposed assets (property, infrastructure, environmental resources), and loss of livelihoods and service provision. This is determined probabilistically as a function of hazard, exposure, vulnerability and capacity" (UNISDR *et al*., 2018; IPCC, 2012).

Disaster: This refers to "serious disruption of the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery" (IPCC, 2012).

Hazard: This is a physical event, or human activity that can cause the loss of life or injury, mental disorders, property damage, social and economic disruption, or environmental degradation" (UNISDR, 2012). Prolonged, continued chronic amounts of distress can debilitate people mentally. The hazards of hydro-meteorological origin include floods, drought, tropical cyclones and desertification" (IPCC, 2007; IPCC, 2012).

Exposure: This refers to "presence of people, livelihoods, environmental services, resources, infrastructure, and economic, social or cultural assets in places that could be adversely affected by climate change" (IPCC, 2012)

Hydro-meteorology: This refers to a "study of atmospheric water, especially precipitation, as it affects agriculture, water supply and flood control. Hydrometeorology deals with the occurrences, motion and changes of state of atmospheric water. This entails transfer of water and energy between the surface and the lower atmosphere" (Kelvin, 2016).

Incident: This refers a" measure of hazardous situations that in a population occurs over a duration of time, but still the impact of the event continues to linger" (USGCRP, 2016).

Mental disorder: This refers to "mental illness or psychological disorder; a mental or behavioural pattern or anomaly that causes distress or disability, and which is not developmentally or socially normative. Mental disorders are generally defined by a combination of how a person feels, mood, acts, thinks or perceives" (USGCRP, 2016).

Mental health: This refers to "a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community" (USGCRP, 2016).

Vulnerability: This refers to "the propensity or predisposition to be adversely affected physical and human environment" (IPCC, 2012). "Such predisposition constitutes internal characteristic of the affected person. This includes the characteristics of a person or group and their situation that influences their capacity to anticipate, cope with, resist, and recover from the adverse effects of extreme events that require immediate emergency response to satisfy critical human needs and that may require external support for recovery" (UNISDR *et al*., 2018).

CHAPTER ONE: INTRODUCTION

1.1 Preamble

The chapter details the international, national and local scenarios of climate change, natural disasters and briefs of policies in relation to mental health to give a gist to research problem. The context of the research area, the research questions, and the overall and specific objectives are highlighted. Besides, justification, significance, scope and limitation of the research are elucidated.

1.2 Background Information

The disaster risks arising from extreme climate events have tremendously increased the challenges facing human society recently. Climate change has altered weather patterns giving rise to increasing frequency and magnitude of extreme climate events. The extreme events include heavy rainfall, floods, flash floods and droughts. These extreme climate hazards are becoming more and more alarming due to the scale of destruction and devastation which is on the rise. Global demographic trends depict a gloomy picture of vulnerability to sudden-onset (floods) and slow-onset (drought) hazards and disasters (Banholzer *et al.,* 2014). Scientists have predicted that the disasters occurrence rate, magnitude and ferocity are likely to be more grievous due to the consequences of climate change (Elizabeth and Daniel, 2013).

Flood and drought disasters killed 700,000 people worldwide and economic devastation was approximated at US$ 1.3 trillion (UNISDR *et al.,* 2018; UNISDR, 2012) from the year 2005 to 2015. The same duration also saw disasters affect over 1.5 billion people with women, children and people in vulnerable situations excessively impacted worldwide (UNISDR *et al*., 2018; UNISDR, 2012). The results of extreme climate disasters globally are documented and well-articulated. The Climate Risk Index 2014 (Kreft *et al*., 2014) rates developing countries

especially in Sub-Saharan Africa as more prone to disasters, largely due to natural hazards related to climate change (UNISDR *et al*., 2018), than developed countries. This increases physical and psychological challenges. The weather related impacts have affected most countries according to available data (1993-2012), especially Haiti, the Philippines and Pakistan. The Asian Pacific region is most prone to extreme climate events. The disasters are very common in this region (Jamal and Zailina, 2016).

According to Orindi and Laurela (2005), some of the expected effects of climate change in East Africa include reduced precipitation, rise of temperatures, and high loss of moisture. This results to dry land and higher frequency of drought spells. Climate change is natural but becomes a disaster when it encounters vulnerability. For instance, excess flooding as a result of extreme rain triggered floods and flash floods cuts off transport and communication and disrupts normal functioning of the society. The other effects of extreme climate events include increased outbreak of fungal attacks and insect infestation of agricultural produce. The economic losses aggravate emotional destabilization. These ultimately increase national health care burden (USGCRP, 2016).

Climate change impacts are being felt equally in Kenya; for instance, Isiolo County. The arid and semi-arid lands (ASALs) cover about 80% of the country's land area besides experiencing persistent drought and flood (ICIDP, 2013). Medical research has ascertained that climate change related disasters prompt mental health conditions (Jonathan *et al.*, 2014; Greenough *et al*., 2014; Doherty and Clayton, 2011). The research on how climate change related disasters affects mental wellness of pastoral communities in Isiolo, Kenya, is very minimal.

Mental health is an important part of the overall health of the community and the persons living in deplorable conditions. Mental disorders cause a lot of suffering; retrograde significantly

attainment of balance to enjoy psychological resilience. The social exclusion and stigma of individuals is rampant. Mental disorders usually go unrecognized yet last a life time and can incapacitate (Dyregrov, 1989; Dyregrov, 1993). There is also a great financial implication of mental disability that requires prolonged psychiatric services and reduces the productivity of the person affected (Martin *et al*., 2011). Hence there is need to stimulate prevention and improve mental health of people within the framework of national policies and legislations (Medicinski, 2010). Extreme climate events may lead to despair, suicidal tendencies and, if prolonged, scatter hopes and expectation of recovery (Bourque and Cunsolo, 2014). Evidence show that the exposure to hurricane Katrina stressors was sharply linked to commonness of mental disorders amidst the population (Galae *et al*., 2007). Climate change-related disasters may prompt mental disturbances which are caused by crisis situations (Clayton *et al*., 2014).

Norman (2003) noted that a crisis is a problem which is overwhelming. When there are multisystem failures in major extreme events, the individual's or society is thrown off balance. "An unexpected situation or a circumstance threatens a person wellbeing" (Gary, 1998) in case of a sudden disastrous event. Too much burnout, combined with too little application of coping techniques leads to clinical depression and other related mental disorders (Bourque and Cunsolo, 2014). How individuals respond is determined by various factors, but cognitive aspect matters a lot (Clayton *et al.*, 2014). There remains a need to study more about the practicalities of cognitive judgments made under stress that sometimes differ from what individuals state they would hypothetically do in certain circumstances. Disaster psychology literature in relation to climate change is too scanty while the existing ones focus heavily on various contexts of disaster aftermaths, with the cognitive precursor of disasters sometimes bypassed. Mental disorders are health problems that significantly affect mood, thinking, behaviour and human interactions.

Physical and mental health of the individuals and communities are affected directly due to exposure of heat waves, drought and flood disasters. These present a situation where the immediate impacts tend to overwhelm the capabilities of the affected population (Francois *et al.*, 2014). The disasters of high magnitude leave many people traumatized and deprived of everything including loss of dignity (Obradovich *et al*., 2018). The level of exposure to disaster related stressors: serious injuries, fear of death or death, family separation by prolonged displacement may lead to acute or chronic mental disorders (Freedy *et al*., 2007).

The research on epidemiology of disasters is inadequate to advise on effective management and integrated implementation of the Paris agreement, Sustainable Development Goals and Sendai framework in the country. The actor's involvement to manage disaster risks arising from effects of extreme climate events on mental wellbeing is dismal. Globally the disasters are costly to already vulnerable populations whose distress levels are high in relation to environmental hazards (WHO, 2019).

1.3 Statement of the Problem

Disaster incidents caused by extreme climate events are on rise. The rising temperatures lead to events such as cyclones, heavy rainfall resulting in floods, sea level rise and alternated by drought spells (IPCC, 2013). According to the World Bank (World Bank 2013b), since 1980s the earth's atmosphere is impacted by extreme temperature anomalies that are expected to double by 2020 and quadruple by 2040 (Ruthrof *et al*., 2018). While climate change simulation models cannot cite reasons for extreme climate events. The uphill task of singling out between climate, development or environmental change disasters is challenging due to complex interactions of factors at play. Disasters are rapidly increasing in frequency, particularly in middle-income countries, posing a major risk to communities (Imelda and Zubair, 2004). There is urgent need to

conduct climate variability and extreme climate events vulnerability assessment in the community.

The horn of Africa's dry lands; lowlands of Djibouti, Ethiopia, Somalia and Kenya are acutely vulnerable to food security crises (World Bank, 2001a, UNISDR AF, 2017). Food insecurity and water scarcity may lead to mental disorders, for example, the children suffer from malnutrition and are at risk of diseases, and inadequate clean water makes the body more vulnerable (Clayton *et al.,* 2014). The social security is compromised and slowly leads to psychological vulnerability. When climate disasters strike, pastoral communities' family social systems are destabilized due to exposure to drought and flood. Further, land fragmentation, natural resources degradation and conflict aggravates the situation. By July 2017, for example, about 3.5 million people were in dire need of relief assistance while the malnutrition rate had reached an emergency level in dry areas of Kenya (IFRC, 2017). Drought thus caused a humanitarian crisis in Kenya, forcing the government to declare it a national disaster.

The Isiolo region suffers from inadequate programmes to enhance resilience to avert frequent crises therein that affect food, water or health requirements. To minimize the impacts and remove millions of lives out of poverty, food and social insecurity, USAID is advocating for evidence-based strategies to be used in future programming of humanitarian development. Also, these efforts are geared address climate shocks and urgent needs of the suffering (USAID, 2011a). In Kenya, Isiolo is rated among the seven counties affected by drought and that have chronic food deficit (World Bank, 2001). During more severe droughts, available pastures diminish and sources of water dwindle forcing the pastoralists to move to places which are productive. The competition for resources increases conflicts among communities (Feinstein International Centre, 2013).

The Isiolo County population mostly relies on mobile livestock rearing which is attributed to the seasonal variation of rainfall and abundant land resources (USAID, 2011b). Physical and social infrastructure are under-developed, hence health and education standards are low due to neglect and marginalization. The inadequate coordination of policy approaches and interventions in implementation stage renders the people's adaptive capacity low. These are further compounded by County governance structures which are relatively newly established under the Constitution of Kenya 2010, and ill-equipped to tackle increased climate and environmental risk. Conflicts between pastoral communities of Isiolo over land, pasture and water has greatly hindered building resilience and interventions as cattle rustling keeps occurring after every 3-4 months (ICIDP, 2013). Climate change is suspected to be the main driver of these problems. The most seriously impacted vulnerable populations are the elderly, People with Disability (PWD), infants and children under 5-years, and sick people.

Climate change is aggravating aridity, cyclical drought and unreliable rainfall in Northern and Eastern Kenya (UN-OCHA, 2009). Such phenomena have induced complex psychological consequences because it leads to increasing fears, uncertainties and other life threats (Keith, 2013). Their impact on the mental health of Isiolo County pastoral communities needs increasing awareness. This will accelerate incorporation of mental health and psychosocial (MHPSS) factors as an essential component of disaster planning, risk reduction, preparedness, response and recovery (Sdorow, 1993). The MHPSS components in natural disaster management need to be fully strengthened to protect vulnerable population due to climate shocks.

The disaster impacts on the psychosocial wellbeing of individuals depends on the nature of the event, the extent to which an individual is affected, the nature of the losses, pre-existing mental and psychosocial problems, and the intervention measures undertaken (Dodgen *et al.*, 2016). The

correlation between disasters, poverty, development and the human environment is really close (Padhi *et al*., 2018; Jongman *et al*., 2014). Repeated exposure to disaster can lead to chronic poverty and mental disorders, precipitated by continuous exploitation of environmental resources by the poor for survival and subsequent increase of disaster risk (Jongman *et al.*, 2014). The effects of disaster risks to mental health include, increased trauma related stressors, alcohol and drug abuse (ADA), and suicidal ideations (Clayton *et al.*, 2014). The resource scarcity as a result of anthropogenic climate change exacerbate innate and external personal conflicts (Colin, 2016). The perennial environmental scarcity increases mental health risks such as ADA addictive disorders due to extreme weather conditions vulnerability. These emotional instabilities are especially problematic for certain groups and interfere with the individual's functioning and well-being (Dodgen *et al*., 2016). Climate change extreme events and/or disasters impacts on mental health have not been identified in Isiolo County.

Mental health disorders exert considerable burdens on financial and health care systems, impacting negatively on the quality of life and the individual's productivity (Fadden *et al.*, 1987). This is compounded when substance abuse and mental illness co-occur, escalating risks. Globally, mental disorders are reported to be the leading cause of disability and prompt suicidal tendencies, but they are rarely investigated in the context of complex climate and environmental drivers. Substance use disorder increases the risk of both accidental and homicide deaths (Pedro *et al*., 2007). These may include self-centred and interpersonal problems such as; psychotic, bipolar, substance-related, somatoform, anxiety, eating and sleeping disorders. There is a large population of individuals with co-occurring disorders, who are Substance Abusers with Mental Health (SAMI) (Pedro *et al*., 2007). Globally, extreme climate events regulate local conditions which have mental health effect on communities. A wide perspective of natural hazards and

disasters in relation to mental health are seen as complex issues nested within the global setting. The assessment of the impacts and complexities of extreme climate disaster on mental wellbeing in Isiolo County is critical.

The first step towards reducing long term vulnerability to climate variability and climate change is climate risk management, which includes a development agenda (Martine and Schensul, 2013; Martin *et al.,* 2011). Their research shows substantial evidence on gender disparities in coping with natural disasters. The vulnerability of women with increased level of poverty exposes them further to mental health risks. The vulnerability of pastoralists in Isiolo County to common mental disorders arising from hazards and disaster impacts are unknown.

The policy makers have not linked up disasters with mental health strategic programmatic interventions to diminish the vulnerabilities of Isiolo pastoral communities. The synergism of policies and programmatic intervention can be effective when they are based on accurate information. Kenya is linked to the natural disaster processes by ARGHYMET Regional Centre Hyogo and Sendai framework which are the bases of initiatives at the grassroots. The collection of relevant statistical data and trend analysis is essential to highlight problems and development policy effectiveness. Assessment of mental and behavioural consequences of the climate change related disasters has been undertaken in order to facilitate permanent remedial strategies (Cohen, 2001). The coordination efforts have gained global momentum to address non-communicable diseases agenda among experts from all sectors. Mental disorders are among non-communicable diseases which have not been mainstreamed and integrated into sectoral programmes in the county government structures in Kenya. Also, mental health related interventions to support the local pastoral communities in Isiolo County have not been outlined.

1.4 The Study Area Context

Isiolo County, the focus of this study, is situated in the Upper Eastern region of Kenya, covering a total area of 25,605 km^2, within longitudes 36º 50'E and 39º 30'E and latitudes 0º 05'S and 2º N (Figure 1.1).

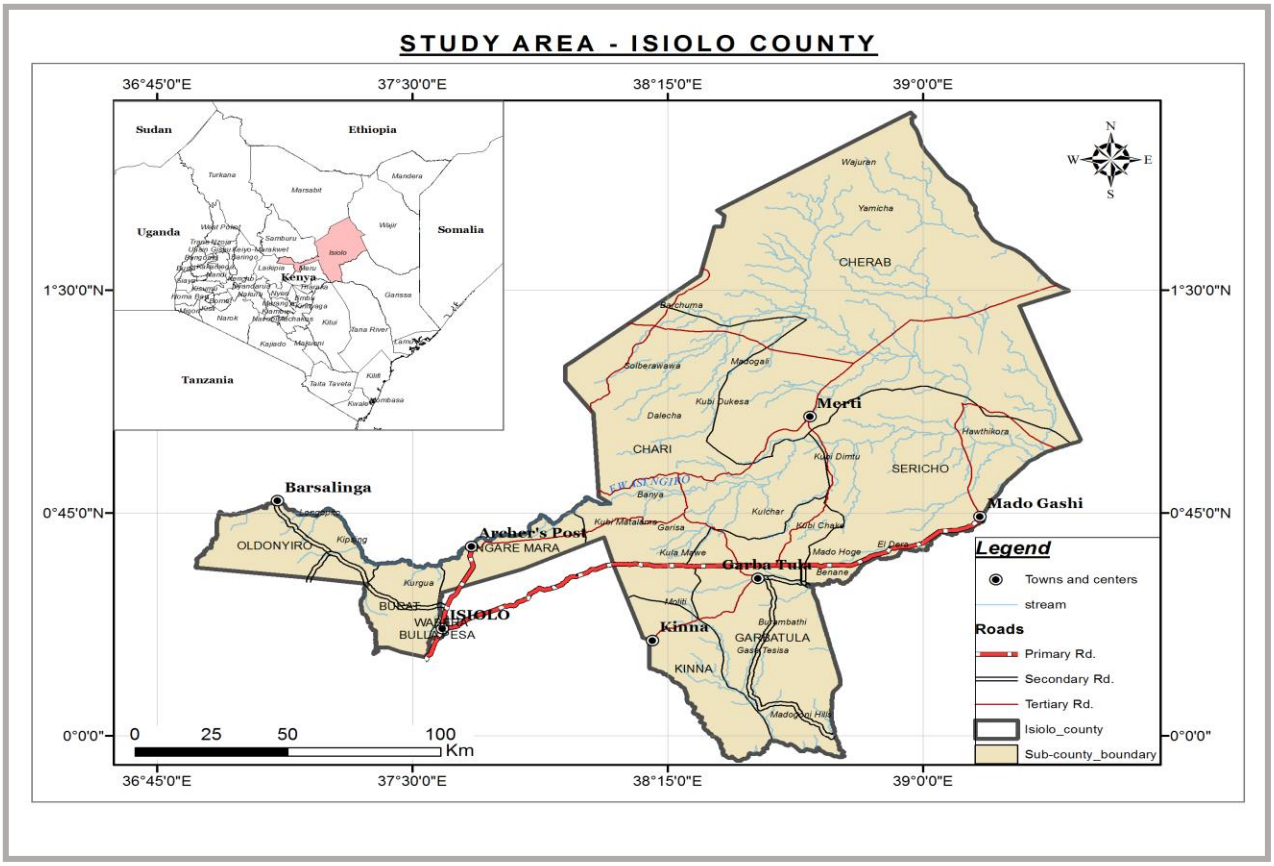


Figure 1.1: Delineated Study Area(@ Peninah, 2020)

Most of the land in the county is an undulating landscape. The plains rise from about altitude 200 m at Sericho-Modogashi area to about 300 m above sea level at Merti region (ICIDP, 2013). The nature of the terrain contributes to the dangers of floods and flash floods. The county raked 9th poorest in Kenya, with high poverty index of about 72% (Aldunce, 2012).

The Ministry of State for Development of Northern Kenya and Other Arid Lands, through the National Drought Management Authority (NDMA), has piloted projects to build climate resilience under the theme "Ending Drought Emergencies" and has worked on funding strategic

interventions for people and the local economy of Isiolo. Currently, funding has shifted from disaster response to disaster risk reduction education aimed to promote adaptation activities to climate change (Government of Kenya, 2007). The National Climate Change Response Strategy focuses on actions towards climate change adaptation and mitigation by local and national governments (Government of Kenya, 2018; Government of Kenya, 2010). NAPs and NDCs are built on foundation of Kenya Climate Change Action Plan to tackle climate change vulnerability as per Paris Agreement (KNAP, 2016). The Plan encourages person centred-developments in implementing adaptation and mitigation efforts. These entail streamlining climate change adaptation and mitigation strategies including disaster risk reduction, poverty reduction and environmental management.

The government has, to a large extent, been involved in lessening socio-economic susceptibility to disaster risks. However, regardless of a lot effort, many families and communities are defenceless in Isiolo County to disaster risks which continue to increase considerably (Peter, 2010). The major gap is that there is insufficient collective action in implementing innovative climate resilient programs in the County and the Country to address high stress levels affecting the population as a consequence of climate related disasters. The ICIDP draft takes cognizant of strengthening resilience and adaptive capacity to climate change (SDG 13) related hazards and natural disasters (ICIDP, 2018).

The Counsellors and Psychologists Act, 2014 is legal and policy document undergoing dissemination to improve quality and increase efficiency of the counselling profession. The Kenya Mental Health Policy (KMHP, 2015) is newly launched and coordination of the services with other government sectors and agencies is a challenge. The policy is meant to be used by professionals and para-professionals for delivery of quality mental health services (KMHP,

2015). The mental health policy recognizes the imperative for programme intervention approaches to cut across all sectors in implementing the policy. Besides, climate change advocacy is gaining roots in Kenya and the rest of the world. These are yet to be included in the county integrated development plans and annual implementation plans (KMHP, 2015).

1.5 The Research Questions and Hypothesis

1.5.1 The Research Questions

The research questions were:

a) What are the hazards and related disasters that can be attributed to climate change related extreme climate events in Isiolo County?
b) How are extreme climate events impacting on the mental health of the pastoral communities of Isiolo County?
c) What policies, disaster management and strategic plans exist to tackle mental health related to extreme climate/weather disasters?
d) How can mental health issues be mainstreamed in policies and strategic plans to ensure timely interventions in delivering holistic disaster adaptation solutions?

1.5.2 Hypothesis

The following alternative and null hypotheses have been adopted in the research study:

a) **H_0**: There are no extreme weather hazards and disasters experienced in Isiolo County
b) **H_1**: There are multiple climate change weather hazards and disasters experienced in Isiolo County
c) **H_0**: Climate change related extreme event disasters do not lead to mental health.
d) **H_1** The extreme climate disasters lead to mental health

1.6 Main Objective and Specific Objectives

1.6.1 Main Objective

To evaluate the impacts of climate change induced extreme events and the disaster management strategies to tackle mental health in the context of a changing climate.

1.6.2 Specific Objectives

a) To assess climate change-related disasters caused by extreme climate events (floods and drought) in Isiolo County;

b) To examine how the climate change related disasters impact the mental health of the pastoral communities;

c) To examine effectiveness of policies and programmatic interventions in management of mental health related to climate change disasters.

d) To evaluate mainstreaming of disaster risk management strategies into mental health policies and programmes in the context of a changing climate.

1.7 Justification and Significance of the Research

1.7.1 Justification

The study details the floods and drought hazards affecting the lives and livelihood of the populace in Isiolo County. The draft ICIDP 2018-2022 acknowledges existence of floods and drought prone areas in the county and the need for preparedness to combat the disasters (ICIDP, 2018). Jyotsana (2013) asserts that one outcome of climate change related extreme weather events is adverse mental health. There is a strong emphasis to improve current forecasting to include hazard forecasting, early warning systems and better ways to cope and adapt with present climatic risks (Bharwani *et al*., 2005). The environmental and mental health datasets are scarce and they are needed to integrate, "use and develop state-of-the-art modelling tools" (Greenough

et al., 2001). Such tools can be used by institutions for risks analysis and improved projected trends of extreme events and variability which will help in preparedness and mitigation. The multi-hazard analysis (floods and drought) is necessary to show how hazards interact to cause vulnerability that lead to mental disorders.

Climate change related extreme weather events affect urban and rural people's mental health, with often adverse effects on health, survival, property and ecosystems. The World Health Organization (WHO, 2018b), asserts that, the exact weight of mental disorders is slightly more than one in ten people globally (10.7). The report asserts that mental disorders remain widely unreported in low income countries and there is uncertainty of reliability of epidemiological data from the health sector because risk quantification, analysis and mapping is not done (MOH, 2014). Climate related mental health need to be singled out for study because the numbers of unstable individuals are on the raise (Padhi *et al*., 2015). Climate-health connections must be established to delineate associated impacts and institute appropriate surveillance measures. Most recently, much greater attention has been paid to understanding and addressing existing vulnerabilities to current climate variability and climatic extremes. The assessment of pre-existing vulnerabilities or those living in ecologically sensitive areas is paramount (Bourque and Cunsolo, 2014). The exposure, vulnerability hazard characteristics, and strengthening of governance structures at global to local level need documentation.

Evidence-based standards practices are useful to develop and co-ordinate action strategies for implementation of flexible psychosocial preparedness, prevention, response and recovery (EU, 2018; Osofsky *et al.,* 2007; Osofsky *et al.,* 2009). This is necessary to enable speedy, systematic responses that address the needs of disaster survivors (EU, 2018). The coping and adaptation of impacted population may be enabled through a strong, integrated and seamless community

mental health system. Frequent, adverse weather events erode the physical environment and in turn damage the social environment (Berry *et al*., 2010). The communities and government may provide institutionalized mechanisms to coordinated mental health support systems before it is a major challenge to public health (Jyotsana, 2013).

Mental health disorders related to variability and extreme events require solid research to unearth the extent of the impact it has on the population. Climate change is an all-inclusive issue which requires multi-faceted interventions (Garnaut, 2008; Pattberg, 2010). There is limited empirical research data on mental health impacts on people due to global environmental changes, and on how climatic change has influenced populations (NEMA, 2008), hence a need to detail mental health incidents and how the impacts can be managed more effectively and efficiently.

According to the UNISDR (2017), reforms are underway for national and regional institutional structures and legislative and policy framework in Africa to deal with Disaster Risk Reduction (DRR). The major institutions for DRR have a challenge to influence relevant sectors of government (ibid). The capacity to respond and recover is low to engage with communities at risk or implement local initiatives due to inadequate resources and capacity (UNISDR, 2017). The study assesses the psychological dimensions of climate change (Swim *et al*., 2017) induced extreme weather events. Also, the derived mental health surveillance data is necessary for psycho-social impacts planning. The United Nations emphasizes nexus on health and environmental through integrating them into policies. The absence of climate action seriously jeopardizes attainment of Paris Agreement under UNFCC and Sustainable Development Goals (Dakubo, 2010; Wang *et al*., 2019).

The stakeholder ministries and civil society organizations have to understand the reasons to mainstream mental health issues which manifest as a result of climate change related disaster

risks. This is not put into account in strategies and programmatic interventions to manage disasters. Resilience of individuals can wholly be attained when measures are put in place to address all human dimensions. This is in line with the Hyogo Framework for Action (HFA) 2005-2015 on resilience building to disasters for countries and grassroots population. The HFA gives a holistic understanding of disasters caused by anthropogenic susceptibility to disaster risks and offers comprehensive action-oriented policy guidance. The HFA stipulates institutions commitments to implement an effective disaster reduction agenda. The Sendai Framework 2015-2030, a successor of HFA, is the paradigm shift which emphasizes on the need for improved understanding of disaster risks dimensions (Tsegaye, 2016).

The development of an integrated environment and health policy framework is thwarted by inadequate capacity in low and middle income countries. The sectors tend to choose development of policies on their own and disregard linkages across sectors (Dakubo, 2010). According to the National Disaster Management Policy (NDRM), a whole cycle of disaster management includes: prevention, preparedness, response and recovery is necessary. It is therefore paramount to assess best practices in the communities to deal with climatic change disasters and combat mental health disorders (Howard, 2008). In Kenya, there is need to assess existing policies and strategies to establish coping and adaptation mechanisms of the exposed populations, because it is a challenge to environmental and health actions.

1.7.2 Significance

Climate change emergency situations are being aggravated by more frequent, prolonged and severe weather events (Berry *et al*., 2010). Climate and environmental data are vital for scientists and public health practitioners to establish linkages to public health. The hazard mapping information of extreme climate events is important for dissemination to end users. The

information is useful for developing country/county predictive models for related mental health risks and establish early warning systems.

There is need for adaptation strategies on the nexus between extreme climate events and mental health disorders. Through this research, it will be possible to identify how to enhance mental health surveillance by utilization of derived extreme climate events data. Such data is important as it would show the correlation between climate disasters risks and mental health. Also, such information can be translated and communicated for public health for action through various forums, including training in schools and web-based platforms. Continuous monitoring and sharing of data and information on mental health epidemiology will reduce community and individual risk behaviours. This is also critical to enable communities prepare for emergency health services and the policy makers to prepare for the future (Kjellstrom and McMichael, 2013).

The research is also significant in that it will explore mechanisms for close collaboration between development partners and stakeholders. This will ensure engagement to accelerate the delivery of crucial services and relay climate related risks to the health sector for quick implementation of relevant adaptation programmes to alleviate human suffering (WHO/WMO, 2016). Besides, the study is crucial for it will enable scaling up of holistic interventions to mitigate mental disorders. It is important to identify effective and efficient disaster management strategies to curtail the ever escalating dangers and uncertainties related to mental health and well-being (Kjellstrom and McMichael, 2013).

The multi-sectoral collaboration on health and climate change policy is uneven. An elaborate memorandum of understanding is important to specify roles and responsibilities in management processes of climate disaster risks and mental health. This calls for urgent development of Kenya

Health National Adaptation Plans and Health Nationally determined contributions for subsequent devolvement at county level

1.8 Scope and Limitation of the Research

The study area, Isiolo County, Kenya, was purposely selected as it is an ASAL and often experiences flash floods, droughts, and resource-related conflicts. All these, and floods in particular, cause huge losses of life and property in the County. A sample population was selected from Oldonyiro, Central Isiolo, Gabartulla, Cherab, Ngaremara and Sericho wards for the socio-economic survey, while a control population was selected from Wabera and Burat which have lowest exposure to climate hazards in Central Isiolo as it was not possible to cover the entire county due to shortage in human and funding resources. Venturing into the county interior was a challenge due to inaccessibility, and insecurity due to bandits and cattle rustlers. The nineteen research assistants (Annex 1) from each locality were deployed to assist in collection of data. The local trained research assistants were deployed in seven strategic locations in major wards to collect socio-economic data. Many of the interviewees were not able to answer all the questions asked due to high illiteracy levels and low knowledge of the concepts of climate change and mental health. The mental health concept in relation to climate change is a new study to most of the stakeholders. Besides, the Focused Group Discussion and Key Informant Interview participants (Annex 2) had insufficient knowledge on the relationship of extreme climate events and mental disorders. Sensitization sessions on the relationship of mental disorders verses climate change was conducted to enable the participants to acquaint themselves on the concepts of research study, using DSM 5 (Annex 3) and ICD-11 (Annex 4).

The rainfall, temperatures and mental health data were obtained from public institutions. The experienced psychiatric nurses and other assistant researchers worked in the field for two years.

The research assistants met inclusion and exclusion criteria in order to ensure reliability to mitigate the limitations above. Also, the research participants for the HH survey had to meet the following criteria: be able to read and write, or use an interpreter to help simply the concepts. Also, the psychiatric nurses did client profiling using intake sheet for psychiatric or psychological symptoms in the hospital or from referrals from other health facilities within Isiolo County. The KIs were basically policy implementers in the government, agencies and CSO's at local (Isiolo) and national levels.

Descriptive, simple regression and time series analysis of climate data (temperature and rainfall) as well as flood mapping were undertaken to assess how flood risk vulnerability are related. The mental health and climate data for the county was disjointed and archival storage and retrieval was difficult. Forecasting function helps one set of data to be used to predict another data set. The excel regression analysis statistical modelling predicts a value based on the relationship between two sets of data, calculates the relationship and automatically applies it to get an output and assumes it is valid. Substantiating health impact within the complex adaptive socio-ecosystem was an uphill task. The community stakeholders in FGDs, KI, HH survey and therapeutic sessions discussed openly on local conditions to identify: vulnerabilities, hazard profiles and actions. Iteration of the same questions in different context through probing was done to further get clarification and to qualify answers from community member's feedback. Also, the enhanced mental health checklist (Annex 5) was used hand-in-hand with the Missouri mental health flow chart (Annex 6) and in-depth observation guide for individual and group therapeutic sessions (Annex 7).

1.9 Layout of the Thesis

Chapter 1 introduces the key issues and objectives, scope and limitations of the research. Chapter 2 is a review of the literature and highlights current knowledge and knowledge gaps which are the focus of this research. Chapter 3 gives detail on the study area and outlines the methods used in the research. Chapter four to six present the results of the research and discussion and finally chapter seven gives the main conclusions and recommendations from the study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter critiques details of documented global, regional and local (Isiolo County) data and information to establish the current state of knowledge on the effects of extreme climate events on the mental health of impacted communities. It critically assesses these contextual relationships and highlights the glaring gaps in the context of the thesis research objectives.

2.2 Climate Change-Related Extreme Disasters and their Social Implications

Social inequalities to a large extent are due to social susceptibility. This varies among different classes of people over time. The vulnerability to extreme natural events are determined by prevailing vulnerable conditions of people or places (Burton *et al.,* 1993; Anderson, 2000). Vulnerability is also understood as a process by which susceptibility of people, infrastructure, communities and environments to extreme events occurs (Lewis J and Kelman, 2010; Wealer, 2014). During hurricane Katrina, the vulnerability was assessed by analysing socio-demographic characteristics; age and sex, race and ethnicity, occupation, education and marital status (Kessler *et al.,* 2006; Garth *et al.,* 2012; Sulliva *et al.,* 2013).

The act of separating "disaster management" by relevant ministries, departments and agencies of government to increase vulnerability of affected communities to disasters (Lewis, 2011). The losses are perpetrated by other departments under the name of "development" (Lewis, 1999), and in turn, vulnerability affects people's mental health. Socially created vulnerabilities are difficult to quantify and largely ignored, thus the absence of elaborate cost estimation reports or studies on social losses after natural disasters (Leila *et al.,* 2018). Individual characteristics of people such as sex, age, ethnicity, health, income, type of settlement and occupation are most often used to describe social vulnerability (Yoon, 2012). The damage on existing infrastructures compounds

the problems, subsequently affecting physical and mental health of people due to duress (Yoon, 2012; Frank, 1992).

Multi-dimensional factors such as pre-existing individual characteristics as well as economic status determine social vulnerability (Leila *et al.,* 2018). The exploration of other underlying factors of social vulnerability is still deficient due to the complexity of research on natural disasters (Yoon, 2011). Besides, social vulnerability constitutes inequalities of places, communities' characteristics and built environment. The susceptibility is determined by the kind of population such as special needs population especially the physically and mentally impaired and those without the normal social safety nets of the orphans and homeless that are necessary in disaster recovery (Leila *et al.,* 2018). The type of housing and durability of infrastructure are vital to determine social defencelessness to natural disasters (World Bank, 2001; UNDP/UNDHA and SPDRP, 1998).

Natural disasters affect health which is an aspect of the social vulnerability of a population (Kim *et al,* 2014). The risks during disaster situations are exacerbated by chronic illness and inadequate access to medication or treatment follow-up (Leila *et al.,* 2018). The interventions are limited amidst disaster risks uncertainties, and thus problems escalate to unmanageable and uncontrollable levels. There is likely to be significance increase in climate change impacts on the social determinant of health and the gap of health inequalities may widen (IPCC, 2014b).

2.3 Mental Health and its Implications

2.3.1 Environmental Factors Influencing Vulnerability

Global warming affects climate variability and extreme events, including those associated with El Niño Southern Oscillation (cf. Kelvin *at el.,* 2014), which are not only being experienced globally but also at local level in Isiolo County. The major causes of increasing disaster impacts are the exposures and historical vulnerability to variability of climatic patterns (Peter *et al*., 2016; Visser *et al.,* 2014). However, climate change vulnerability assessments are emerging practices, therefore there are as yet no defined spatial vulnerability assessments models (USAID, 2014).

The hydro-meteorological hazards droughts and persistent floods may lead to disasters that negatively affect life, physical infrastructure, the environment, and food production, among other effects. Most hazards create an emergency situation or an incident when it is active but can remain dormant with only a theoretical risk of harm (UNISDR, 2012; Helmers and Jegillos, 2004). For instance, recent devastating hurricanes were reported across Caribbean, Central and North America; Harvey in August, Irma and Maria in September and Nate in October 2017 (Alistar *et al*., 2018). The other storms which were reported in Atlantic area in 2017 were Helene, Isaac and Joyce, while tropical storm Olivia was reported in Hawaii (Wehner *et al.,* 2018). The super typhoon Mangkhut was the strongest tropical cyclone on record that swept over the Philippines with winds of 165 mph in 2018 (Wehner et al., 2018). Tropical cyclones especially typhoons and hurricanes directly affect the African continent resulting to torrential rains and floods (Fitchett and Stefan, 2014). The increasing magnitude and frequency of severe extreme climate events are associated with climate change (Gary and Rachel, 2004).

Extreme weather events impact adversely on human systems, welfare and security. The related consequences destroy costly infrastructural development which traps further fragile communities

into poverty (Kundzewicz and Matczak, 2015). Any governments or groups working to save life need to minimize such vulnerabilities by minimizing the hazard magnitude (which requires both local and global solutions or approaches), reducing predisposition of the poor to environmental shocks by supporting the affected communities to cope and adapt to the situations (World Bank, 2013). Social protection programmes are of important priority in order to reduce vulnerability while enhancing resilience through good governance and better resources management.

A risk becomes a disaster when devastating extreme events are not addressed to curtail life threatening situations. Hazard becomes a disaster when it coincides with a vulnerable situation, when societies or communities are unable to cope with it using their own resources and capacities. A disaster happens when hazards such as floods, drought, pest and diseases affect vulnerable populations as it causes damage, casualties and disruption to people's lives and properties and environment. Thus, a combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the negative consequences of risk is referred to as disasters (Bolin and Stanford, 1998; McCollum, 2006). Hazard and vulnerability interact together to create risk as shown in Figure. 2.1.

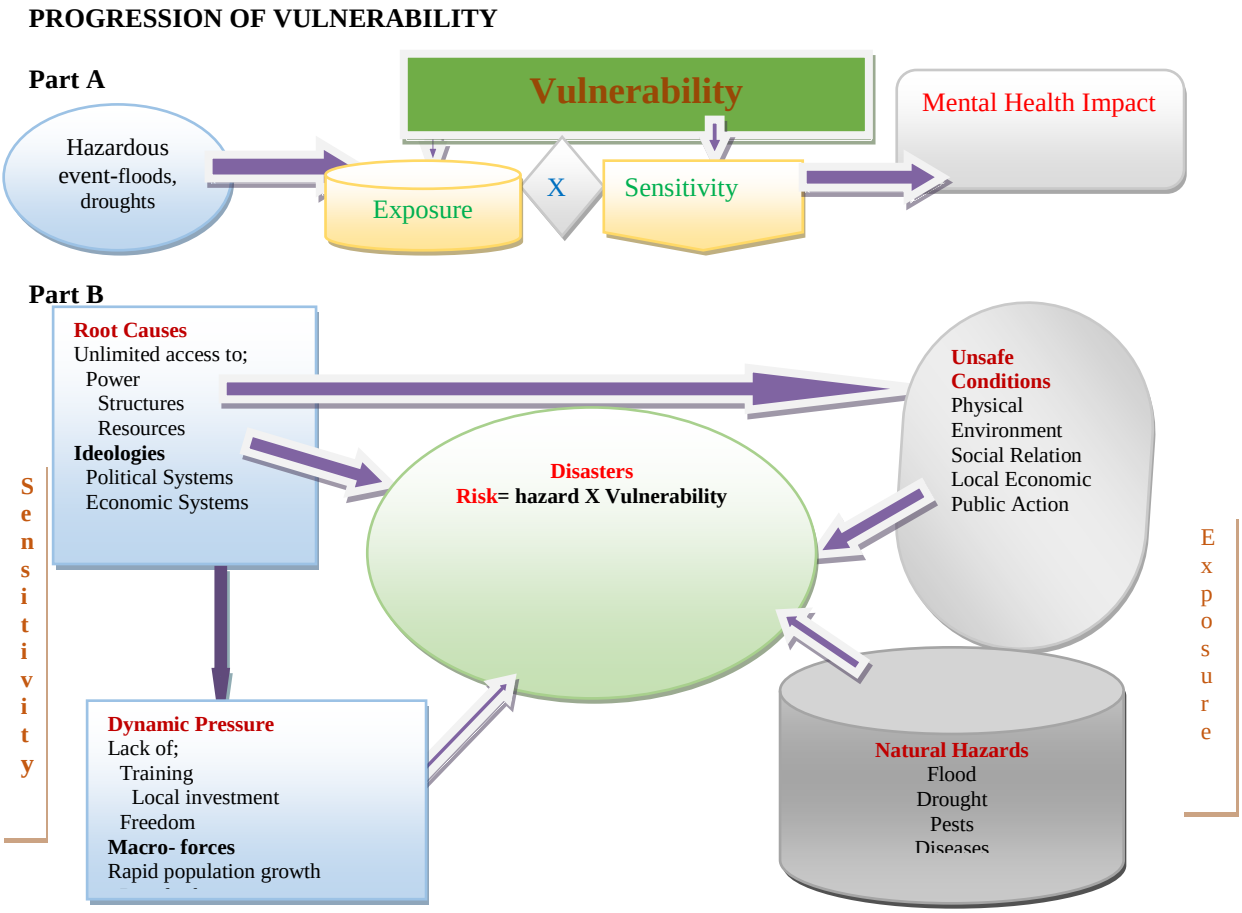


Figure 2.1: Progression of vulnerability (Source: adapted and modified from McCollum, 2006)

Other interrelated dynamics play a role to increase vulnerability and consequently mental health impacts. Such impacts include; declining agricultural productivity, reduced water resources and food security, collapse of livelihoods, increased poverty and hunger, deteriorating water security, and general loss of assets (Leila *et al*., 2018; Yoon, 2012). The arid regions including Isiolo are vulnerable to effects of extreme climate events where exposure to hazards is more pronounced and capacity to adapt is limited due to low level of knowledge and technology.

2.3.2 Data Sources on Mental Health

Global epidemiological studies on incidents and occurrence of mental illness are gaining momentum worldwide. WHO (2017a) estimates that "depression will be the second highest

cause of disease burden in the middle-income countries and will be highest in low-income countries by 2030". Nearly 300 million people suffer from a range of anxiety disorders (WHO, 2017a), and an equal number are documented for depression. Globally, depression accounted for 7.5% of the mental health illnesses, while disability and anxiety disorder accounted for 3.4%; this represents a 14.9% increase since 2015 (WHO, 2017a; Whiteford *et al.,* 2016). Depression is directly associated with the rise of suicidal deaths which are approximately 800,000 persons per year (WHO, 2017a). Regional prevalence rates for depression vary: in the Western Pacific the rate was 5.8%, while in Africa the rate was 5.4% (WHO, 2018b). More than 80% non-fatal disease (health loss) occurred in developing countries (WHO, 2018d).

Mental disorders are among the Global Disease Burden (GDB) under the category of Non-Communicable Diseases (WHO, 2018b; Becker and Kleinman, 2013). The country specific estimates of the disease prevalence are continuously becoming clear. The WHO efforts to work with researchers to update epidemiological data for mental and behavioural disorder is helping low and middle income countries with country-specific estimates, which have been rare (WHO, 2018b; Swim *et al.,* 2017, 2011). Recent reliable research data is necessary for effective mental health policy, planning and monitoring at all levels of government. According to Keyes (2005) "there is no healthy living without mental health", though mental disorders among populations usually might go unrecognized yet last a life time (Molloy *et al.,* 2015; Balbus *et al.,* 2000). A continuous assessment and diagnoses of psychosocial functioning during natural disasters are necessary to increase resilience in the communities in Isiolo County.

2.3.3 Criteria for Mental Health Classification and Diagnosis

The Diagnostic and Statistical Manual of Mental Disorders (DSM) (Annex 3) published by the American Psychiatric Association 2015, offers standard operating procedures for classification

of mental disorders diagnoses. The manual is relied upon, together with the mental and behavioural disorders International Classification of Diseases (ICD-11) (Annex 4), published by the World Health Organization (WHO, 2018a) by mental specialists, researchers and policy makers. The ICD-11 is produced by the World Health Organization for multidisciplinary use while DSM 5 is produced by the American Psychiatric Association to be utilised primarily by psychiatrists and psychologists. The main categories of disorder in the DSM 5 are used to code signs and symptoms of diseases, abnormal findings, complaints, social circumstances and external causes of injury or mental diseases. The DSM 5/ICD-11 diagnostic groupings which are etiologically associated with stressful life circumstances e.g. major depression, adjustment disorders and others, have not been researched in Kenya. The underlying risks factors especially natural disaster risk for fatal and non-fatal mental and behavioural disorder are not yet researched and documented in Kenya.

Mental illness is a synonym of mental disorder. These range from uncommon schizophrenia, other psychoses, bipolar, anxiety and personality disorder to common, mood disorder, substance abuse, binge eating and insomnia and cognitive decline disorders. The two main categories for the prevalent mental illnesses are depression and anxiety disorders. The mental illnesses related mainly to stressful situations are summarised in Table 2.1.

Table 2.1: Summary of mental and behavioral disorders in the ICD-11, 2018

Anxiety and phobia disorders
Traumatic stress disorders
PTSD
Complex PSTD
Prolonged grief disorders
Adjustment disorders
Attachment disorders
Reactive attachment disorders or insecure social attachment e.g. major depression inhibited/emotionally withdrawn
Disinhibited or indiscriminate social engagement disorders e.g. Attention Deficit Hyperactive Disorder
Acute stress reactions- not classified as mental disorder
Depression and other co-occurring mood disorders
Dissociative disorders

The DSM 5 tool, used for global assessment of functioning of patients, is the diagnostic and statistical manual for mental disorders. The tool is a helpful guide to clinical practice, teaching psychopathology and facilitates research on mental health. The tool provides classification, codes of medical record keeping and the criteria with defining features of diagnosis, treatment and prognosis of the patient mental disorder (America Psychiatric Association, 2013) shown in Table 2.2.

Table 2.2: Diagnostic and Statistical Manual of Mental Disorders (DSM) 5 (Source: America of Psychiatric Association, World Psychiatry**,** 2013)

Neurodevelopment disorders
Schizophrenia spectrum and psychotic disorders
Bipolar and related disorders
Depressive disorders
Anxiety disorders: PSTD, phobia, generalised anxiety disorder
Obsessive-compulsive and related disorders
Trauma and stressor-related disorders
Feeding and eating disorders: anorexia nervosa, bulimia nervosa
Somatic symptoms and related disorders: Physical illness related to psychological disorders
Elimination disorders
Sleep-wake disorders: insomnia
Sexual malfunctions
Gender dysphoria
Disruptive, impulsive-control, and conduct disorders
Substance–related and addictive disorders
Neurocognitive disorders
Personality disorders
Paraphilic disorders
Other mental disorders

2.3.4 Impacts of Extreme Climate Events (Droughts and Floods) on Mental Health

Extreme climate events may result in acute disasters that relate somewhat to different mental disorders, for instance, extreme anxiety reactions and Post-Traumatic Stress Disorder (PTSD) (Freedy *et al*, 2007). The stress resulting from incidents is referred to as "trauma" because it usually has the "capacity to overwhelming a person and produce an acute or prolonged state of

arousal in the nervous system" (Dyregrov, 1994). Stress affects the physical body, mind and the emotions with consequences that are painful and may be fatal. Many physical diseases originate from mental states. Also, problems related to thought, emotions and behaviour are caused by excessive stress. When stress is prolonged further, serious organic and mental disorder take over. "These psychosomatic diseases affect organs but have a psychological or emotional origin" (Melgosa, 2009). Intolerable levels of stress spring forth mental disorders common in various different areas globally. However, others take longer to go back to their original level of functioning because factors related to resiliency have been compromised, or the trauma experienced is of such a magnitude that greatly destabilizes their orientation (McEntire, 2015).

Green (1990) has provided non-exclusive proportions of psychological deep distress as "deadly or lethal, severe somatic injury or harm, exposure to the grotesque of dead bodies or body parts due to constant subjection to harm of very unpleasant hostile environment". Critical incidents, or sudden and unexpected events, have the capacity to disrupt one's life. Gladys (2009) asserts that "most people generally bounce back to psychological resiliency or emotional health but others require help to hasten recovery".

2.4 Mainstreaming Mental Health at Policy and Programmatic Levels

2.4.1 Global Context

The government of Kenya has ratified some international frameworks to deal with the underlying problem of climate change and enhance community resilience e.g. the United Nations Framework Convention on Climate Change (Government of Kenya, 2018) and the Kyoto Protocol of 1997, framework by which projects in low and middle countries committed to meet targets to prevent and limit their GHG emissions (UNISDR, 2005; UNISDR, 2009). Also the frameworks allowed for abatement projects to concentrate on environmental sustainability

priorities; in this regard health care among non-Annex I Parties are to amend and update their environmental legislation to include global concerns such as climate change (UNFCCC, 2014).

The UNFCCC processes are enriched by World Health Organization (WHO) in technical and programmatic expertize. WHO is facilitating modifications of current systems practices to reduce climate related epidemics and build resilience of countries health systems. Under the UNFCCC, countries are promoting cross-sectoral National Adaptation Plans (NAPs) where the health sector is identified routinely as a priority sector (WHO, 2014a). National Adaptation Programmes of Action (NAPA) are missing in least developed countries (GOK, 2018) to counter vulnerability to adverse effects of climate change due to low adaptive capacity. Although the scope and complexity of climate change challenges are unprecedented, the WHO operational framework for building climate-resilient health systems draws on long-standing public health thinking (WHO, 2007a; IPCC, 2014). This is by providing specific guidance to the health sector on the development of the health components of National Adaptation Plans. Also, WHO supports development of technical tools for vulnerability and adaptation assessment and estimation of health adaptation costs (WHO, 2007b; Wolf *et al*., 2013; Dogra *et al*., 2019).

2.4.2 National Context

The capacity of national systems of government are core to deal with the challenges of observed and projected trends related to extreme climate events (Aldunce, 2012). The systems coordination is not elaborate hence need to be assessed to get the roles they play among national and county systems. The incorporation of the health sector in the climate change discourse is vital because extreme climate events are endangering people's health and ecosystems. There are policies and regulatory frameworks enacted by Kenya government to address these types of

issues. These are aimed to enhance awareness on climate change impacts, effecting adaptation practices, and building institutional structures and capacities at national and local levels.

Kenya National Adaptation Plan (KNAP): 2015-2030. This prioritizes adaptation actions to address the countries climate change vulnerability and enhance resilience towards attainment of vision 2030 and beyond (KNAP, 2016). The KNAP is in line with the global UNFCCC climate change agenda to support least-developed countries (LDCs) to identify priority actions to respond to their urgent and immediate adaptation needs (WHO, 2014b; UNFCCC, 2014). The NAPs are expected to reduce heightened floods and drought vulnerability by building adaptive capacity and resilience (LDC Expert Group, 2012).

National Climate Change Response Strategy (NCCRS) 2010. This framework recognizes the socio-economic challenges due to extreme climate events. The framework notes the need to develop strategies and action to combat such impacts (Ministry of Environment and Mineral Resources, 2010). The strategy puts emphasis on strengthening planning and capacity development of institutions in charge of Disaster Risk Management to strengthen disaster preparedness. Besides, adaptation and mitigation measures, research and development in key sectors of health, energy, transport, fisheries forestry, agriculture and livestock, wildlife and tourism are enshrined. The complementary approaches suggested are science first (top-down) and policy-first (bottom-up) assessment approaches to ensure the sustainability of programmes towards specific needs and concerns (LDC Expert Group, 2012). The construction of large number of Nomadic Clinics (the public health systems) in service sector is a strategy cited to benefit ASAL regions, site. Also, the strategy aims at heightening surveillance of new outbreak of diseases with subsequent rapid response with mention of mental health and health education campaign. This is in line with the need for Health National Action Plans (HNAP) to build health

resilience to climate variability and extreme climate events. A coordination function for overall adaptation efforts within the Ministry of Health is critical on the national context to enable environmental related challenges to be addressed. Mainstreaming climate adaptation policies and programmes into public health programmes at operational national and county levels is necessary (WHO, 2014b).

National Climate Change Action Plan (NCCAP) 2013. The NCCAP spells out how to enhance resilience to cope with climate related impacts such as frequent drought, and extreme flooding. The priority health actions are to improve surveillance, strengthen existing early warning, improve dissemination of information on health risks such as climate–related diseases and improve community-level health care. Also, it stipulates that adaptation and mitigation response options need to be implemented by a variety of actors and stakeholders from international, national, county and sub county levels. The Climate Change Action Plan facilitates country owned processes to harness and build national level capacity to ensure effective adaptation and development. The NCCAP strongly acknowledges national health sector systems and practices as strong component to implement (NCCAP, 2013; Dakubo, 2010).

National Climate Change Act (NCCA) 2016. The act operationalized the National Climate Change Council to spearhead sectoral mainstreaming of climate change strategies and to speed up adaptation and resilience to climate change programmes implementation. It also established Climate Change Directorate to spearhead coordination of integration and mainstreaming of climate change component. All the functions and budgets plans of Department of State Corporation and other national/county government entities are required to be incorporated. The NCCA stipulates a specific public safety component on prevention of climate change induced disasters, and management of emergency responses at all levels of government (NCCA, 2016).

Kenya Mental Health Policy (KMHP) 2015. This policy is a major step forward for a better mental health system that is strong, coordinated and regulated to strengthen and promote accountability in both private and public sectors. The policy framework promotes mental health programme interventions in Kenya. This follows the blueprint of Constitution of Kenya 2010, Vision 2030, the Kenya Health Policy (2014-2030) and the global commitments on mental health service provisions (Government of Kenya, 2007; Government of Kenya, 2010; Kiima and Jenkins, 2010). The Constitution of Kenya 2010, in article 43(1a) provides that "every person has the right to the highest attainable standard of health, which includes the right to healthcare services". The outlined mental health policy interventions to be implemented are multi-disciplinary and inter-sectoral. The enlisted inclusive sectors are education, labour, security, correctional services, children services, planning, finance, legal justice system, industrialization, and agriculture. The inter-agency framework for partnership is yet to be established to coordinate all state and non-state actors whose policies have implications on mental health (KMHP, 2015; Ministry of Health, 2015). The Kenya health policy 2014-2030 advocates for mutual consultation and cooperation between the governments MDA's. According to 2019 mental health conference, the MOH accelerate development long term strategies and adopt all-inclusive integrated mental health services at all levels of health system. The MOH is set to establish a national coordination committee to enable implementation of quality mental health initiatives.

Institutions: There are a number of established institutions to execute climate change policies and programme interventions in Kenya. The National Environment Management Authority (NEMA) is entrusted to execute the climate change environmental policies and activities, especially in promoting sustainable development (NEMA, 2014). The National Drought Management Authority (MDMA) is mandated to prevent and sufficiently mitigate drought

occurrences before it is an emergency situation. The establishment and strengthening of Kenya Meteorological Department, and University of Nairobi (Department of Meteorology and Institute for Climate Change Adaptation) were a comprehensive step forward to address climate change challenges through participatory research and practice.

Primary Health Services (PHS). The PHS framework for planning and implementing public health interventions is useful for addressing mental health problems related to natural disasters. An integrated approach in primary health care will increase community capacity to manage disaster risks and eventually reduce susceptibility of the society and increase opportunities for sustainable development. The mental wellbeing of families is central to healthy societies, but it's exacerbated by climate risks at community level. Inclusion of primary health care is critical for holistic health (Kirton, 2019; WHO, 2016a; Watt *et al.*, 2015; Government of Kenya, 2014). The international community is agitating for universal health coverage which promotes inclusive governance with meaningful community engagement and strengthened professionalism of community health workers (Kirton, 2019).

2.4.3 Assessment of the Current State

This review shows that the national governments have put in place policy and institutional frameworks to address the issue of drought, floods and other climate change risks. However, insufficient financing and low prioritization has hampered effective implementation of these policies and institutional performances. The situation is at a crossroad too because the county government of Isiolo has not put in place policies and institutional frameworks to tackle climate change risks, particularly in relation to mental health. Managing extremes climatic hazards requires multisector approach backed with supportive legislations and cross-sectoral coordinating body (Lal *et al.*, 2012). This is essential to handle national, regional and local

disaster risk management systems. The global opinion is moving swiftly towards recognizing the need to mainstream climate-related Disaster Risk Management into sustainable development policies and programmes in all core sectors (Hyogo Framework for Action) (CDKN Guide, 2014; UNDP, 2002). The mainstreaming of climate disaster risk management into all MDAs will enable stakeholders coordinate and implement programmes to halt climate-related disaster risks on mental health (NDOC, 2013).

The mental health and psychosocial support programmes during emergencies will support sustainable behaviour and reduce harm of climate disaster risks (Tol *et al.*, 2011). For instance, establishment of shelter in safe areas or higher altitude is likely to mitigate social dilemma on displaced people during floods. The top-down preparedness, prevention, response and recovery programmes ignore the potential of local resources and capacities, fail to address specific local needs of vulnerable communities, and may in some cases even increase people's vulnerability (Asian Disaster Preparedness Centre-ADPC, 2006). Participatory process of determining the nature, scope and magnitude of negative effects of hazards to community and its households is necessary (ADPC, 2006; ADPC, 2017). This is depicted in the 47 Counties in Kenya and Isiolo County is still struggling with governance issues due to inadequate by-laws (policies) on climate change and disasters related impacts.

2.5 Summary

The chapter details the previous studies on climate change related extreme events and the impacts they have on mental health. The global and national occurrence of flood and drought hazards are explained to show the known relationships they have on mental health. The hazard risk governance policies and programmatic interventions on climate change, extreme climate

disaster risks and mental health were explored. The research gaps were identified and advised on the objectives of this thesis.

Elucidation of the link between extreme climate events and/or disasters, associated environmental factors, and mental disorders, and implementation of appropriate policy, legislative and management regimes is important, as has been illustrated in this literature review. This study examines these issues in line with the stated research objective (see section 1.5.1) with a focus on Isiolo County, Kenya. Further detailed accounts of the study area, and the approach and methods that were used in this research, are outlined in the next chapter.

CHAPTER THREE: STUDY AREA AND METHODS

3.1 The Study Area

3.1.1 Biophysical Setting

3.1.1.1 Climate

The County has three climatic zones: semi-arid Isiolo Central and Kinna, arid Oldonyiro region to Archers Post and Garbatula area and very arid Merti and Sericho Sub-Counties (Herlocker *et al*., 1993). Most of the county experiences long dry spell and short rains in January-March and long rains in July to October (USAID 2011a; ICIDP, 2018). The rainfall patterns are becoming unpredictable and extreme events (drought and floods) more frequent. Surface water sources are drying up, and underground water yielding little water, especially river Ewaso-Nyiro. Borehole, sand and subsurface dams (SSDs), galleries and shallow well, trapezoidal bunds and triangular micro-catchment sources also yield low amount of water (ICIDP, 2018). During drought the river cannot sustain pastoralism because it gradually dries up for months. There is increased exposure of humans, livestock and loss of biodiversity among others, uncertainties of climate related disaster such as drought, unreliable rainfall, floods, and flash floods (ICIDP, 2018). The knowledge on the correlation between extreme climate events and mental health is a bases to strengthen mainstreaming and enhance synergies in holistic adaptation strategy implementation (Wandiga *et al*., 2010). The contribution to psychological science knowledge gap Kenya climate change can offer useful solution to climate change social dilemma (Paul *et al*., 2018).

3.2.1.2 Relief and drainage

The County is characterized by quite flat terrain; especially at the lower Ewaso Ngiro basin. The low lying terrain height ranges between 200m to 900m above ground level with some elevated areas of Nyambene hills and other minor scarps. The County has many valleys and gullies as

illustrated by the physiographical map shown in Figure. 3.1. These handle large volumes of flash floods and floods caused by heavy rains, but storm surge may occur during dry seasons due to neighbouring Mount Kenya area rainfall.

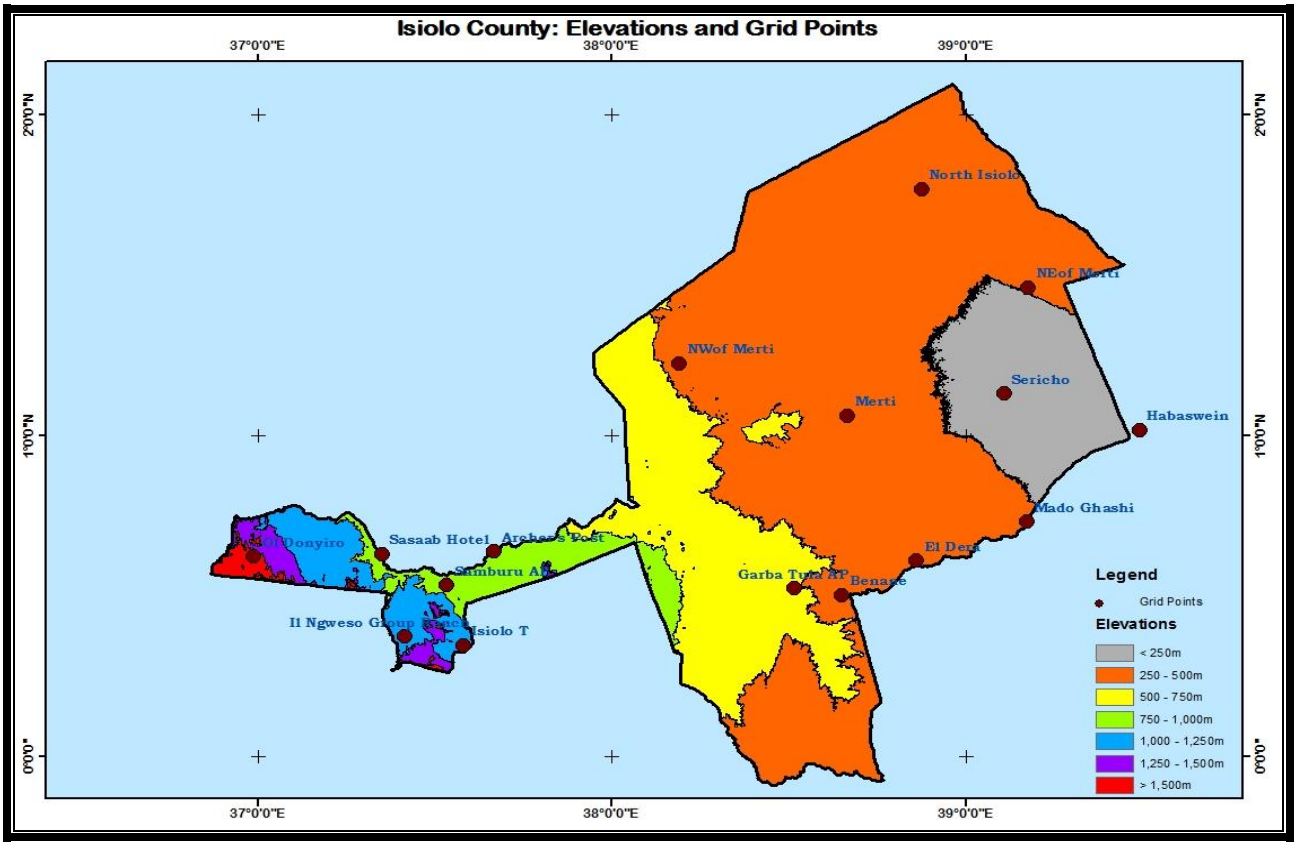


Figure 3.1: Physiographic appearance of Isiolo County, (@ Peninah, 2020)

The river sources are Aberdare ranges and Mount Kenya, and the main rivers are Ewaso Ngiro North, Isiolo, Kinna, Bisanadi, Likiundu and Liliaba rivers (ICIDP, 2015). The rural areas are deficient of piped/tap water, usually drawn from boreholes, which account for most of the developed water facilities. The prolonged dry spells strain pastoral communities as they have to seek for drinking and livestock water located 2 km away, in areas such as Merti, Garbatulla and Sericho The walking distance from 4.8% in 2017 to 13.45% in 2018 due to a prolonged dry spell that left water pans and rivers dry forcing people to walk for long distances and queue for almost

an hour in search for water with at least over 45% access gap to water sources by 2013 (Integrated Smart Survey Report Isiolo County, Kenya-February 2018; KNBS & SID, 2013; Herlocker *et al*., 1993). Such situations often induce population migrations that create conflicts and also such distant water sources are associated with physical and mental stresses related to water access.

3.2.1.3 Vegetation

The landscape is mostly covered by dry land vegetation (NDMA, 2019; Herlocker *et al*., 1993). The main vegetation types include *Acacia* trees and the savannah grasslands. The county is currently experiencing severe vegetation deficit due to erratic unreliable rainfall and prolonged drought (NDMA, 2019).

3.1.2 Socio-Economic Setting

3.1.2.1 Characteristics of the population

The population density was projected to be 27 persons per Km^2 (Isiolo CIDP, 2018) comprising a mixture of mostly Borana, Somali, Turkana, Meru and other ethnic groups. These ethnic groups engage in various economic activities; the Borana, Somali, Turkana, Samburu and Rendille are traditional pastoralists and the Meru are involved in agro-business. Controversial social-cultural issues such as polygamy, domestic violence and female genital mutilation are prevalent in the County (Oxfam International, 2005). Christianity and Islam religions are the dominant religions but there are some few traditionalists as well. Other social-economic concerns are losing livestock to climate-related diseases, drought and bandits.

3.1.2.2 Education

The primary and secondary education has continued to decline and tertiary institutions are inadequate. The County continues to send a paltry number of students to national colleges and universities. Literacy levels have remained low among adults who have no formal education (45.6%), though enrolment of girls to boys increased by 87.7% from 2017 to 2018 (Integrated Smart Survey Report Isiolo County, Kenya-February 2018). The literacy is low with 51% of the population having not completed primary education and about a half of men and two-thirds of women are illiterate because pastoralist livelihoods interfere with education (ICIDP, 2018).

3.1.2.3 Health

The 70 percent of rural communities' face the challenge of inadequate, inaccessible, and unaffordable health facilities (ICIDP, 2018). This has become more challenging since extreme climate events pose a major public health threat to environment and people due to inadequate expertise and lack of adaptive capacity (Roser-Renouf *et al.*, 2016). The County has low capacity to respond to any public health crisis.

The risk of childhood malnutrition, wasting (3%) and stunting (18.6%) is associated with frequent drought and famines among the communities of Isiolo (USAID, 2011b; ICIDP, 2018). The use of interagency and regional efforts to supplement local resources need to be encouraged to plan for anticipated increase of population in various parts of the County. The County has inadequate health records on the number of people with mental disorders. Therefore, integration of substance abuse awareness creation, prevention and treatment competencies into the mental health programme is necessary for it may be a major gap in the present existing system (Vijayalakshmi *et al.*, 2012).

3.1.2.4 Land uses and resources

Isiolo County is endowed with a vast land resource that is viable for both crop and livestock production but for a long time this has remained untapped due to low level of resources for development, forcing the County land resources to be classified as "low potential" (ICIDP, 2018). There is so much competition for land and water resources driven by the Vision 2030 and migration by pastoralist communities. Resource use conflict has created many fears along Meru-Isiolo and Isiolo-Garissa borders causing displacement of households (NDMA, 2019). To enhance food security for the communities of Isiolo, the County government has put in place robust programmes to expand crop production and subsistence farming in the County (ICIDP, 2018; ICIDP, 2013). The rain-fed agriculture is unsustainable due to low rainfall, but favours livestock production. Pastoral livelihood of about 80% is predominant, agro-pastoralism is practiced in Kinna area and others include small business and tourism (USAID 2011a; FAO, 2017).

The extent of road network is approximately 975.5 km, where the bituminized roads is only 34 km. There is a lot of upgrading of transport systems because all the earth surface roads are impassable during the rainy season (ICIDP, 2018; Wall et al., 2014) in order to spur development, social transformation and community prosperity. Climate and environment related challenges and stresses have aggravated the socio-economic systems of communities, making them vulnerable to natural and anthropogenic disasters. The County infrastructure developments and strengthened community-based natural resources management are expected to change the livelihood of Isiolo communities and probably enhance their adaptive or coping mechanisms to climate related and social risks (Shah *et al.,* 2011).

3.1.2.5 Vulnerabilities

The health status of poor people in developing countries is worrying and exposes them to other risks. The unpredictable weather-related hazards will increase existing vulnerability (Brooks, 2003) and widen the gap in the handling of challenges like mental health disorders. Research on natural disasters risks and the harm to humans are necessary to evaluate potential hazards, estimate the level of socio-economic damage and human fatalities and set priorities on mitigation measures to minimize mental health risks. Isiolo County is vulnerable to major shocks caused solely by climate related influences (Shah *et al.*, 2011) which are yet to be quantified, and aggravate problems they experience.

The socio-economic damage and human fatalities to natural and anthropogenic disasters is determined by natural hazard mitigation measures to reduce the risks (Olu *et al*., 2016; Walker and Alan, 2008). These adverse hazardous impacts make people hopeless and helpless in case of devastating consequences of catastrophic hazards. Climate related fatalities can also disrupt inter-generational linkages, indigenous knowledge transmissions and rich intangible community heritage resources (Shah *et al.*, 2011; Olu *et al*., 2016). Without healthy populations, economic and human developments are at stake. Coping is a distinct component of vulnerability and understanding of coping mechanisms dynamics and vulnerability is critical to developing adaptation measures that support people (Kenya National Bureau of Statistics and Society for International Development, 2013; Olu *et al*., 2016).

3.1.2.6 Political and administrative aspects

The County has three sub-counties: Isiolo (3,269 km^2 consisting of Wabera, Bulla Pesa, Burat, Ngaremara and Oldonyiro wards), Merti (12,612 km^2 consisting Chari and Cherab wards) and Garbatulla (9,819 km^2 comprising of Kinna, Garbatulla and Sericho wards); ten wards, 22

locations and 43 sub locations (ICIDP, 2013). The wards by constituencies and corresponding ward population are illustrated in Table 3.1 and Figure 3.2.

Table 3.1: Population distribution per wards in Isiolo County, (Source: Kenya National Bureau of Statistics, 2010)

Constituency	Wards	Total Ward Population (2009)
Isiolo North	Wabera	17,431
	Bulla Pesa	22,722
	Chari	4,781
	Cherab	15,560
	Ngare Mara	5,520
	Burat	18,774
	Oldonyiro	15,388
Sub Total		**100,176**
Isiolo South	Garbatulla	16,401
	Kinna	14,618
	Sericho	12,099
	Sub Total	**43,118**
	Grand Total	**143,294**

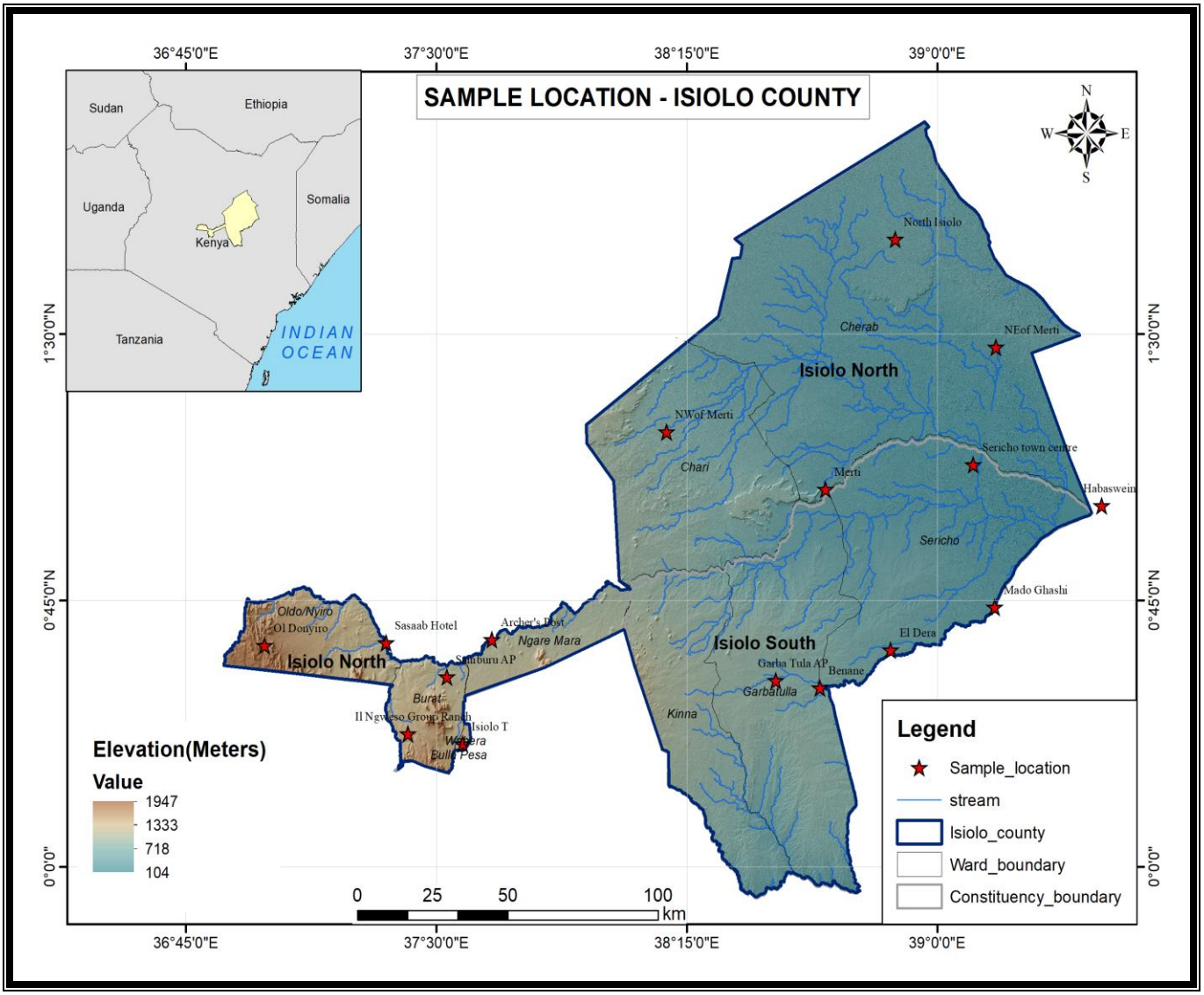


Figure 3.2: The Political and Administrative divisions of Isiolo County (@ Peninah, 2020)

3.2 Conceptual Framework

Global warming has led to development of global and national policies to manage it (Doherty and Clayton, 2011). The IPCC Special Report 2018 on the impacts of global warming of 1.5ºC temperature rise, results to climate-induced hazard and disaster risks. These pose a major challenge to achieving good health and wellbeing (Figure 3.3). Mental health challenges are common to people impacted by humanitarian crises as a result of extreme climate events. Mental health and psychosocial support is a humanitarian agenda during natural disaster risks which is

minimally taken into consideration in Kenya. Situational analysis by trans-disciplinary experts of national frameworks and assessment reports on climate induced disasters and mental health are necessary to aid embedment into Health National Action Plans (H-NAP). Environmental health actions and strategies can help to create enabling policies, strategies and programmes for mental health adaptation to climate change responses during emergencies and disasters to increase resilience.

Figure 3.2: Conceptual framework (©Peninah, 2017)

The research study discusses the international and national policy frameworks and programmes of people exposed to natural hazards. The most recent integrative approach to address climate change disaster risks are Sendai Framework (2015-2030), Sustainable Development goals (2015-2030) and UNFCCC Paris Agreement on Climate Change (2015). These give priority actions to strengthen integrative adaptation to enhance resilience to climate change and disaster risk management at policy and programmatic level. However, these have not been as effective as desired in stemming climate change related disasters manifested in part by the recurrence of extreme climate events such as droughts and flood (CDKN, 2012) at national and county level in Kenya. Such extreme events often result in disasters in un-prepared countries or regions. Climate assessment is important to generate empirical evidence from different datasets and present ways to build disaster resilience on the strategic plans and programmes in the health sector. There are existing gaps to build resilience to emergencies as a result of extreme climate events. These are often traumatic because they could result in loss of lives, properties and livelihoods (Quarantelli, 2003; Gifford E and Gifford R, 2016), which may in turn affect the mental health of affected individuals, expressing as primary or secondary mental disorders.

The research study looks at adaptive and survival skills of community in disaster risks and impacts of climate change as well as socio-economic characteristics which may increase or reduce their vulnerability (Figure 3.3). Vulnerability interplay with disasters may yield lingering trauma and mental wounds that might otherwise go unrecognized. This may also increase or reduce mental health of the people experiencing natural disasters. How climate change extreme events could have effects on mental health is discussed. The hazards and vulnerability are analysed in relation to mental health disorders as depicted in the conceptual framework (Figure 3.3). The study aims at strengthening multi-sectoral and multi-disciplinary approaches (Olu *et*

al., 2016) and coordination mechanisms for crosscutting issues (climate change, natural disaster management and mental health) in the health sector in Isiolo County, which can be up scaled to national level.

A comprehensive strategy requires an approach for managing disaster risks that incorporates prevention, preparedness and response actions in areas of humanitarian assistance, crisis management, climate change adaptation and disaster resilience. A framework integrating mental health issues into governance structures is developed to enable governance structures to work holistically and implement strategies using trans-disciplinary approaches. This is in line with UNFCCC efforts and other policy frameworks set to facilitate implementation of strategies and programme interventions globally and nationally. Evaluation of the proposed and existing policies and programme interventions to incorporate mental health are focused to yield sound mental health in the community of Isiolo County.

3.3 Methods

3.3.1 Study Design and Scope of the Study

The research study adopted a mixed-methods approach to examine mental disorder prevalent among the pastoral population in Isiolo County who are affected by extreme climate disaster risks related incidents, and socio-economic vulnerability. The main variables assessed were: climate (total annual rainfall and temperatures) as independent variables and total annual mental disorders as dependent variables. The sample population groups included the community, as well as policy makers and implementers (Annex 1, 2 and 3) mainly from health, environment, and special programs. The materials used were: Personal Observation guide, Photography, Key Informants Checklist, Household Interview guide, and a number of statistical and mapping software (Excel, Statistical Package for Social Sciences [SPSS], ArcGIS Software, and R-

software [version 3.21]). A retrospective cohort study was mainly used to investigate possible association of the outcome (mental disorders) and exposure to climatic extreme disasters through interviews for participants to recall exposures, administrative databases and retrieval of medical mental disorder records. The 121 participants (prospective cohort) was enrolled and baseline exposure information was collected. Retrospective cohort composed of 60 clients with mental illness were identified and enrolled for the study. The information collected from various sectors was treated as private and confidential. Table 3.3 below outlines the research design and scope, showing sources and categories of data.

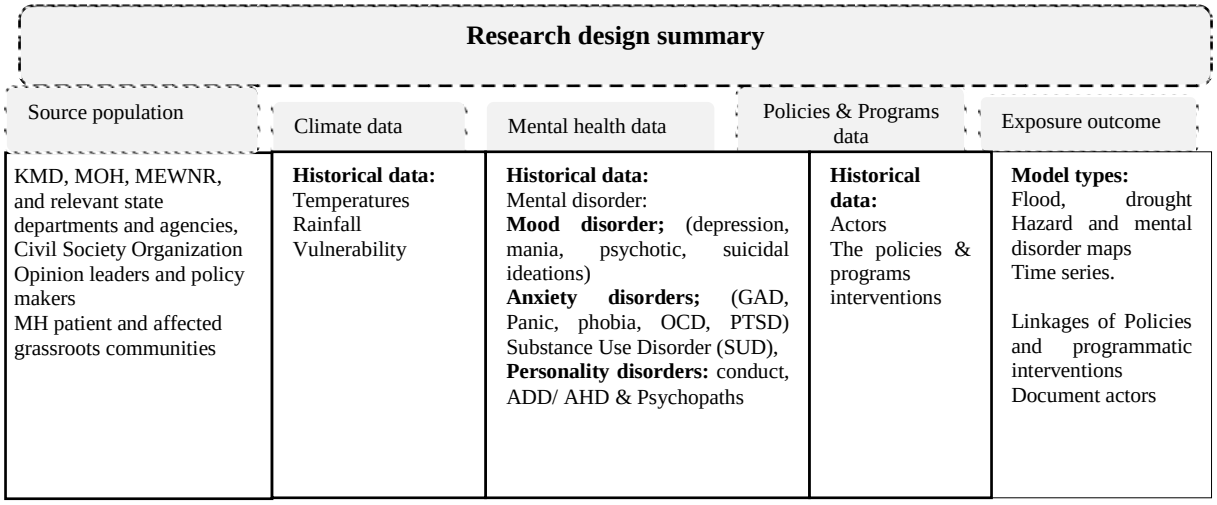


Figure 3.3: Sources and categories of research data

The data was analysed using various statistical tools as indicated above. The GIS mapping technique was utilized to analysis drought and flood risks and mental disorders. Conventional content analysis coding categories were derived from existing polices text data and meaningful emergent themes or codes used to define cluster categories and sub-categories. The coded qualitative data categories were then described using key words used in summative content analysis and statistical methods.

3.3.2 Objective 1: Disasters Related to Climate Change Extremes Events (Floods and Drought)

3.3.2.1 Climate data collection and analysis

Data on atmospheric hydrological disasters processes was obtained from literature review of case studies and content analysis. The maximum and minimum monthly temperature and rainfall data for Isiolo for the period 1984-2013 were obtained from the Kenya Meteorological Department headquarters, Nairobi (Table 3.2).

Table 3.2: Locations of rainfall and temperature satellite stations in the study area

Geographical location in Isiolo	Latitude	Longitude
Isiolo Town	0.346040º	37.58007º
Archer's Post	0.639048º	37.66747º
Samburu AP	0.534052º	37.53198º
Il Ngweso Group Ranch	0.373517º	37.41532º
Oldonyiro	0.622637º	36.98671º
Sasaab Hotel	0.631024º	37.35038º
Modogashi	0.731044º	39.17241º
El Dera	0.610022º	38.86130º
Benane	0.503602º	38.64888º
Garba Tula AP	0.523576º	38.51702º
Merti	1.062556º	38.66630º
North Isiolo	1.767120º	38.87543º
NW of Merti	1.224621º	38.19032º
Sericho town centre	1.131159º	39.10836º
NE of Merti	1.462232º	39.17584º
Habaswein	1.016774º	39.49299º

This rainfall and temperature data were used to derive climate hazard zones in the region. The annual total temperatures and rainfall data and averages were calculated to obtained trends and extreme weather variability. The detailed examination of magnitude of the risk, hazards and (or) disasters already documented in secondary sources were collated and correlated to determine verifiable final results (Hsieh and Shannon, 2005).

3.3.2.2 Field work

a) Household Survey

The household survey sample size of 288 with 95% confidence level household respondents was selected using probability and non-probability sampling design. The sample size of 340 households was distributed proportionately using probability proportional to size sampling method (Bombe *et al.,* 2020). Probability sampling design deployed stratified sampling where entities were select from various distinct Gender (M=154 and F=134) and Education level (None=93, Primary=103, Secondary=54, College=26 and University=11). The standard formula used is as follows (Berg, 1988; Snijders, 1992; Heckathorn, 1997).

Where

N = Population size which was 340

Z = z-score being 2.58

e = margin of error as 0.05

p = standard of deviation as 0.5

$$\text{Sample size} = \frac{\frac{z^2 \times p(1-p)}{e^2}}{[1+z^2 \times p(1-p)e^2 \times N]}$$

$$\textbf{Sample size} = \frac{\frac{2.58^2 \times 0.5(1-0.5)}{0.05^2}}{[1+2.58^2 \times 0.5(1-0.5)0.05^2 \times 340]} = 225.048$$

A total of 288 households (Annex 13: Longitudinal and cross sectional spatial distribution of sample locations and sample size) were selected for the household survey which was administered using a household social-economic survey tools (Annex 9 and 10).

The participants were drawn from Bullapesa, Wabera, Burat, Cherab, Oldonyiro and Ngaremara in Isiolo North Sub-county and Garbatulla and Sericho wards in Isiolo South Sub-county. The

survey was targeting the eight (8) wards in the two sub-counties and fifteen (15) locations for a period of two years from January 2014 to January 2016 as per different season to get dynamic interactions of processes in the same spatial and temporal scale (Robert, 1978; Rebecca and Eugene, 2007). The participants were informed of the consent Informed consent was obtained from all the participants. The participant's gender is summarized in table 3.3 below.

Table 3.3: The participant's by gender and age

Gender	Frequency	Percent	Cumulative Percent
Male	154	53.5	53.5
Female	134	46.5	100.0
Total	**288**	**100.0**	

The data on the following themes were collected: climate change extreme events, mental health, disasters at four major zones in Isiolo for two consecutive years. The community-selected leaders aided administration of questionnaires using household Interview guide (Annex 10). Interview sessions during household survey were conducted and data keyed in the questionnaires.

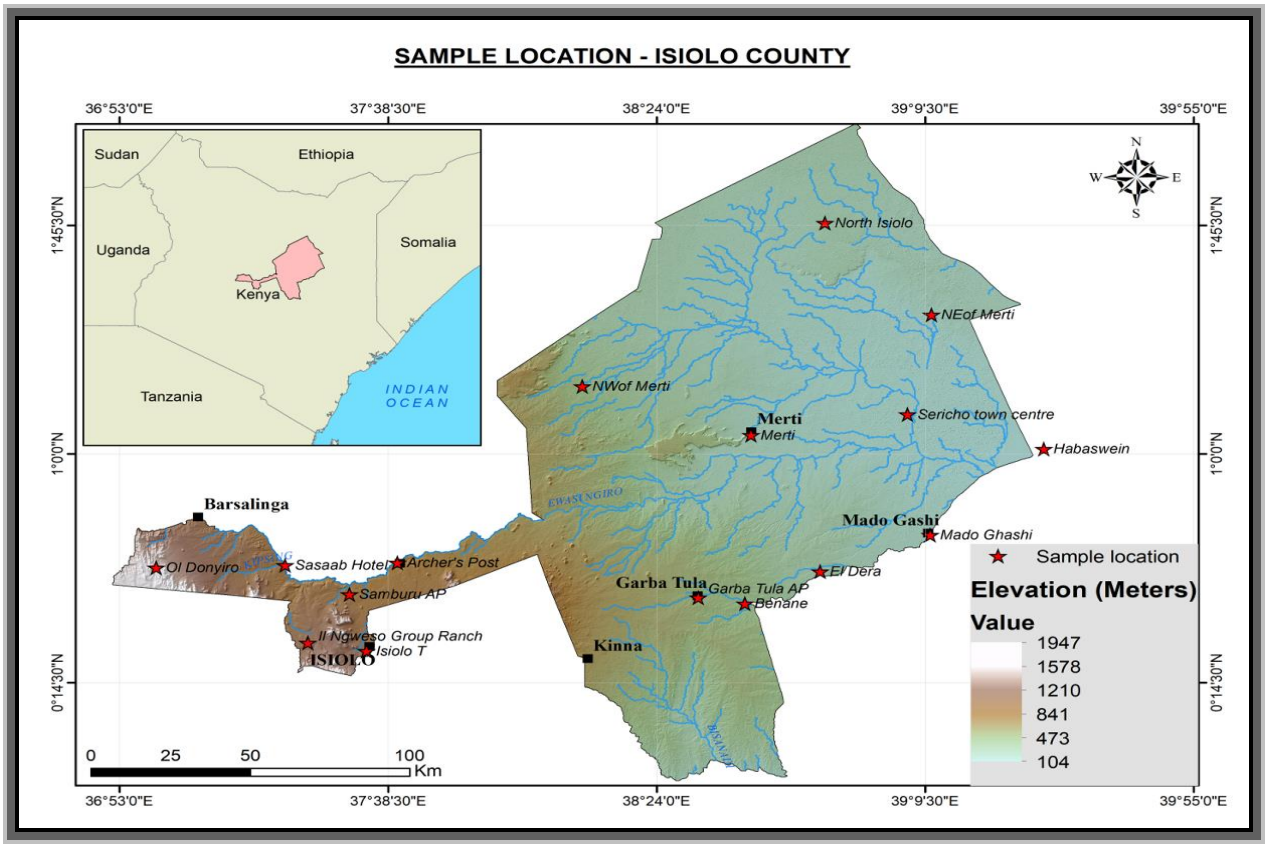


Figure 3.4: Sixteen locations of socio-economic household survey in Isiolo County

b) Focused groups discussions

Focused Group Discussion were conducted using interview schedule (Annex 11). The plates below depict some FGD's in progress.

Plate 3.1: The WRA Officers during the FGD on 17.12.2015: Including sub-regional manager, water right management officer and conservation of water manager

The opinions and views were sought among different parties either in three (3) small groups of 3-5 above and (two) 2 large groups of 11 to 20 participants from 2015 to 2016. The two (2) large groups of FGD were held on August 19th 2015 and April 28th 2016 during dry and wet months, respectively, to be able to get varied responses on drought and floods.

Plate 3.2: The FGD discussion in one of the sessions: a) Peninah (researcher) b) Ezekiel (MET, Isiolo) and John (MOH) facilitating/moderating respectively.

c) Key Informants Interview

The sessions were facilitated by different moderators to enable get most out of the expertise of the participants. The key informants were from major ministries, departments and agencies of national and county governments, including the major civil society organisations on climate change and natural disasters. The enabled get detailed information on progression of hazard risks to disasters and codes developed.

Plate 3.3: Developing coding and themes for each parameter in the FGD guide

3.3.2.3 Data analysis

a) Climate data

Qualitative rainfall and temperature data was analysed through content analysis technique on chronological extreme climate events in Kenya and background information used to derive trends in Isiolo County. Generalized Pareto Distribution was used to generate mean excess for extreme temperatures and rainfall Peak Over Thresholds (POT). Flood Hazard Index Sensitivity Analysis (FHIS index) was eventually done by analysing 1984-2013 rainfall data by use of modified method-FIGUSED-S method (Aven and Krohn, 2014; Aven, 2011). This was done in raster (grid) and vector (network) analyses derived from regression model: independent variable (annual total rainfall) and dependent variable (annual total mental disorders). Also, Palmer drought severity index used temperatures and Standard Precipitation Index (SPI) were calculated to estimate relative dryness and quantify long-term drought in Isiolo County. GIS methods were used to assess various climate disaster risks in Isiolo: infer the distribution of climate variables, select extremes value and calculate linear trend of time series.

b) Household Survey

The interview notes at household level were taken during the sessions and later filled in against the interview guide to facilitate analysis on fatalities and socio-economic damages.

c) Case Studies

Case studies by (Keith, 2013; Aven and Renn, 2014) cited that hazards and disasters are ranked according to the impacts and the probability of a hazardous event placed on scale 0-1; where 0 indicates no fatality and 1 fatality. The risk assessment evaluated the probability or likelihood of flood and drought events occurring. Also, fatalities and socio-economic damages were gauged to exam environment disaster risks using IPCC risk assessment on severity of uncertainties of climate change related disasters (IPCC, 2014). The uncertainties, on the other hand, used five

qualifiers for analysis: very high - 9; high - 8; medium - 5; low - 2; very low - 1, on a scale of 1 to 10. The probability model statistical analysis parameters are based on estimations of confidence level, hence qualitative risk analysis is expressed as; Q - uncertainty, C - consequences (damages or loss) or events and K - knowledge of occurrence of specified C of the activity and associated measure of Q outcomes. The risk analysis is based on stakeholder's perspective on what knowledge they hold about natural disaster events and uncertainty (Aven and Renn, 2014).

d) Key Informants Interviews

The codes and themes were developed by the focused group discussions participants on disaster risks assessment and borrowed a lot from datasets from key informant interviews.

3.3.3 Objective 2: Climate Change–Related Disasters and Mental Health

3.3.3.1 Desktop studies

Climate change - related extreme events (floods and drought) and disaster impact over the years on population mental health was determined from literature review and existing datasets. The qualitative data on disasters, vulnerabilities and mental disorders theme codes were developed from the survey tools to select empirical evidence from the wards and locations (Table 3.1). The data supervisor based at Isiolo Referral Hospital spearheaded retrieval of archival client's mental health data and major types of mental disorders documented from May 2006 to September 2015. Rainfall and temperature data were obtained as indicated in section 3.3.2.1 above and were used together with the mental health data to determine the relationship between climate and mental health.

3.3.3.2 Field work

a) In-depth Observation

Mental health survey was conducted to diagnose mental disorders and vulnerabilities prevalent in the study area. The individual or group therapies were conducted to identify the main mental health disorders, disasters and vulnerabilities zones for eventual mapping using standardized questionnaires (Annex 6) and eventually rank fatalities to disasters and mental health. There were two group therapies conducted in 2016 on 28/4/2016 and 3/5/2016. The tools used to gather information from in and out-patient respondents included enhanced mental health assessment (annex 6) and in-depth observation guide (Annex 7). This went beyond merely gathering data on variables and their relationships, and attempted to explain attitudes and behaviour on the basis of the data gathered. This was done by research assistants who met inclusion and exclusion criteria in order to ensure reliability of the data collected. The psychiatric nurses had individual therapeutic sessions of 60 clients since April 2015 to November 2016. A systematic process of gathering information during intake and screening by psychiatric nurses was done. The flow chart (Annex 8) specific to the mental health therapy was used to diagnose mental disorders. The dynamics standard tools (Annex 12) was used as standard operation procedure by research assistants to observe the clients who were attending mental health unit or referred at the height of extreme climate change disasters risks. Oral interviews among 60 in-patients and 121 out-patients (Annex 11) in mental units were used to gain in-depth information on

A hypothetical case study in psychotherapy

Mr. M is a Para-medic who was required to carry the bodies of people who were carried by flash flood waters for a decade which were risk to himself. After several incidences Mr. M reported to a volunteer site with symptoms of severe stress reaction and post-traumatic stress disorder (PTSD): symptoms of dissociation, reduced functioning, intense recollections of traumatic events, sleep disturbances, and somatic complaints such as vomiting. The issues are derived from theoretical conceptualization of treatment and therapy process.

respondents' experiences on hydro-meteorological related disasters (Annex 6). The purposive systematic sampling was used to significantly represent different wards in Isiolo, certain age, gender balance and other demographics to be linked to impacts of interest. Panel studies (individuals' survey) were done biannually to collect data concerning family history and the data ranked using criteria for DSM 5 (Annex 4) and ICD 11(Annex 5) diagnoses with possible present or past symptomatology (Jane *et al*., 2014; John, 2011; Ronald and Mark, 1999).

b) Focused Group Discussions

Focused Group Discussions (Annex 4) and photography were utilized to collect data to map the spatial distribution of mental illness and interacting risk factors. The observation of sensitive factors was crucial to reflect complex relationships between natural and social phenomena. The discussions were based on how climate vulnerability and disaster risks assessment impacts on human health. Screen shots of some locations of climate sensitive economies such as agriculture and water are illustrated in Plate 3.4 below.

Plate 3.4: Drought indicators at a) Bulabao, b) Kulamawe and c) Bulapesa in Isiolo County 2015-2017

3.3.3.3 Data analysis

The text data coding categories were derived directly during conventional content analysis. Initial codes guided the analysis to get the findings from relevant past research.

a) Correlation

Relationship between disasters (flood and drought) and mental disorders (anxiety, adjustment, dissociative, Substance Use) variables was determined by use of Pearson correlation. The assumption is that there was a strong relationship existing between cause (disasters) and effect (mental disorders). The vulnerability factors were also examined to explain relationships or to predict outcomes. The correlation coefficient values sought significance high Hi/Hi and (or) Lo/Lo (coeff. +r) no Hi/Lo and Lo/Hi (-r) and partial correlation. Correlation coefficient, r, and plot (r is -1 to +1, and the closer to plus or minus 1, the stronger the relationship). This was connected to linear regression analysis to model association of variables.

b) Measurement

Experimental research was used to establish causes-independent variable or experimental variable (IV) - disasters, comparing to see a dependent variable or outcome variable (DV)-effect (mental health disorders). Data analysis was done by comparing (causal comparisons) means of groups; with use of crosstabs (cross break tables) to compare percentages by groups using rainfall and mental disorders data. Also, the individual in-depth counselling sessions took into consideration clients experiencing disasters and those not experiencing disasters (control group). The parameters examined were socio-economic status, sex and age, occupation, geographical location and tools (different data collectors and/ or biases).

c) Case study

The method explored multiple cases for a period of time through detailed, in-depth data collection involving various sources of information and rich in context. This approach is used by social scientists because of its popularity in psychology (Freud) 1856, medicine (case analysis of a problem), law (case law), or political science (case reports). The mental health wellness (health or illness) was examined at ascertain climate sensitive diseases disaster risks. The level of psycho-

social functioning or productivity and prevalence of mental disorder comorbid recurrence was assessed. Multiple sources of information including in-depth observations, oral interviews, audio-visual material, and archival retrieval from past records, were then synthesised to sum up psychosocial malfunctioning. Case vignettes (Reyes and Jacob, 2006; Ronald, 2009) were analysed from individual clients who exhibited at least five or more symptoms for a month (Annex 6). Psychotherapy procedure (Annex 8) and DSM-1V TR diagnostic coding were used to categorize mental disorders (Annex 4 & 5). Correlation methods analysis was done to determine the strength of (two variables) sets of data using bivariate data as a quantitative measure. Non-robust Pearson's Correlation analysis coefficient and more robust version Spearman were used to get the variance.

3.3.4 Objective 3: Policies and Programmatic Interventions for Mental Health Management

3.3.4.1 Desktop studies

Proposed and existing policies and strategic interventions were examined from already published and unpublished sources. These included; expert opinion, previous findings of other researchers in articles, reports and journal papers to check on keywords: climate change, extreme climate events, disasters risks, mental health, related policies and interventions. A summative content analysis involved counting and comparisons, usually of key words, then followed by the interpretation of the underlying context (Barbara, 2009).

3.3.4.2 Field work

a) Key Informants Interview

The policy makers and implementers in the area of health, environment, agriculture and special programs were an aspect of special sample population group. Key Informants Checklist (Annex 3) was utilized among 35 KI using Think Aloud Protocols (David *et al*., 2018; Bryan, 2017; O'Brien, 2013) or expertise research for policy makers to be able to identify policy gaps and the

necessity to link them up for the holistic approach of dealing with health and environment issues. The sample key informants were probed using KI checklist to gain insight on current policies, programme interventions using interview administered questionnaires.

b) Household survey

The questionnaires from socio-economic household survey (Annex 10) were reconstituted into categories, patterns, themes, concepts and propositions to derive meaningful conclusions to induce cognitive explanation on policies and programmatic (David *et al*., 2018; Patton and Sawiski, 1986). The method is commonly used in psychology to understand others and social environment to identify the problem and interventions in complex situations. This is meant to derive insights from cognitive thoughts captured from emotions and action plans captured from a discussion.

3.3.4.3 Data analysis

a) Content analysis

This was done to evaluate the existing policies and programs interventions in the area of study. This enabled get the existing gaps and practical application by psychologists and other related professionals. Keywords were utilized to count and compare data, then interpreted in reference to underlying context (Barbara, 2009).

b) Correlation

A comparison was employed to study a group exposed to the programme interventions (experimental group) and one not exposed (control group). The participants were chosen from areas where programs interventions have been initiated and where there are none. Policies and programs interventions were correlated to identify the linkages and gaps existing to be able to mainstream mental health caused by extreme climate events.

The relationship between disasters (floods and drought) and mental health (anxiety, adjustment, dissociative, sleeping, eating and substance use disorders) was sought to either validate the hypothesis negatively or positively by use of simple bivariate (Pearson theory). A new principle or theory was created from established facts through abductive process. Relevant evidence was explained from observations made and logical conclusions drawn.

3.3.5 Objective 4: Strategies for Mental Health Mainstreaming

3.3.5.1 Desktop studies

The gaps existing in Kenya's policies and programmatic interventions were evaluated using secondary data such as peer review journals, text books and policy documents. The ways other countries have incorporated mental health in the policies and programmatic interventions were assessed to advice on areas of mainstreaming and integration.

3.3.5.2 Field work

a) Key Informant Interviews

As outlined in objective 3 Key Informant Interviews provided information on policies and interventions. The target areas: households, any state emergency management, Ministry of Special Programs, NDOC, NDMA and health sector employs in mental related institutions. This consisted of 24 participants who constituted the stakeholders in above institutions and CSOs implementing mental health and disaster related programs.

b) Focused Group Discussion

The researcher worked alongside the participants to seek new directions and ideas using various group dynamics methods (Charles, 2012). The method tapped into the many diverse modes of communication such as jokes, anecdotes, teasing, and brainstorming to derive appropriate information. The process involved: formulating research questions, solicited participants, and arranged venues for the workshop.

a) b)

Plate 3.5: A multi-disciplinary team incorporating researchers and practitioners with varied backgrounds in a FGD

a) b)

Plate 3.6: Researchers and practitioners with varied backgrounds FGD

c) The workshop

The workshop was conducted for the main stakeholders in area of study. Participants for the forums included the government and private, civil society organizations (in the area of health and environment) and religious institutions. The workshop was participatory, allowing presentation by the researcher of the guide questions and preliminary desktop findings. The panel method and mini-lecture-didactics were used for technical inputs, then write shops or independent writing to gather information. The participants were strategically selected from academic/research institutes, technical staff from government ministries and agencies, Water Resource Users

Association (WRUAs) and Civil Society Organizations (CSOs). The collaboration was intended to identify programmatic gaps and eventually craft evidence-based policies and programmes intervention.

a) b)

Plate 3.7: The WRUAs and NDMA field community workers and other workshop participants consolidating evidence-based decision making

c) d)

Plate 3.8: WRA, MOH, NEMA and MOA personnel evaluating final problem solving issues during the April 2016 workshop.

d) Social learning and shared research agenda

The participatory assessments of health and environment priorities were used to advice policy process need to input in prevention, response and recovery on mental health related to extreme climate events (Delbert and Neil, 2002). The focus of shared agenda was information to change conditions in a particular situation through various mitigation action plans.

The learning process was enhanced through accounts of what happened in such a way that meaning may be derived. The multi-sectoral project team was put together to assess vulnerability, needs and priorities at community level. The participatory approach risk ranking/scoring was used to identify risk-prone areas (climate extremes) and hazard/risk mapping of disasters. The disaster risk assessment was obtained by specifying the events/consequences 'C', and measure of uncertainty 'Q' and K denoting knowledge that Q and C' exists (IPCC, 2014b; Aven and Krohn, 2014). This enabled development of a trans-disciplinary model of inter-linkages which was used to illustrate practical ways of integrating relevant policies and programmatic interventions to mainstream mental health in crises related to extreme climate event situations.

3.3.5.3 Data analysis

a) Policy analysis

The analysis of substantive policies in health, mental health, climate change and disasters is meant to shape practice or programmes in mental health. The basis of analysis is responsive to policy problems or gaps through extensive collating of existing information and data, sufficient triangulation of data sets and offer subject oriented alternative solution (Greet, 2014). The connection between the policies with respect to effectiveness and efficiency across Ministries Departments and Agencies (MDA's) was assessed to mainstream mental health practices related to extreme climate events. The aim was to eventually cascade mental health programme interventions to all relevant actors. The evaluation of the role policies for participating stakeholders in integration of programme activities to articulate what they intend to do was conducted. This approach was used to establish the link between disasters and how they affect mental health. These were codified through routine exploration and accepted standard of

scientific behaviour. The policy or structure model was assessed to come up with a framework to be used to manage complex multiple evaluation policies and their relationship to practice.

b) Reflective Monitoring and Responsive Evaluation

A reflexive monitoring and responsive evaluation identified gaps and omissions to come up with comprehensive policies and programs interventions that include mental health component. The rationalist model involved thorough research to gather valid empirical data relating to existing policies to identify gaps. The possible outcomes of policy issues were rated to come up with best policy decisions to provide desired final effective and functional solution. The steps stipulated in the model included seeking intelligence; identification of the problem, assessment of all options and relating consequences to values, and selecting the preferred option in the pool of problems and opportunities gathered. The end result was to come up with a policy hierarchical structure to deal with mental health programmes precipitated by extreme climate disaster risks (Greet, 2014).

3.3.6 Data Analysis Tools

Software packages were used to manage the data analysis within Microsoft Excel; by copying and pasting text from one file to another and creating folders. Specialized Qualitative Data Analysis (QDA) as Computer Assisted Qualitative Data Analysis (CAQDAS) Package was used to manipulate text. The quantitative data was analysed using statistical tools namely Statistical Package for Social Sciences which has Analysis of Variance (ANOVA) for correlations of bivariate statistical data and descriptive data on cross tabulation of frequencies and T-test. The qualitative data was analyzed using non-numerical Unstructured Data Indexing, Search and Theorizing (NUDIST) software and excel sheet. R software version 3.21 was used for computing rainfall and temperature statistical data, show spatial correlation and generate graphs showing trace plots. DSM 5 and ICD 11 clinical diagnostic coding were utilized to categorize mental

health disorders prevalent among the study population. Also spatial analyst ArcGIS software was used to develop and generate maps and others were acquired from United States Geological Survey website.

3.3.7 Ethical Considerations

The study involved human subjects, hence followed laid down relevant protocols. The Institute of Climate Change and Adaptation letter of introduction enabled me access permission from Kenya Methodist University (Ref. No. KeMU/SERC/EXT/24/2019), the Ministry of Health, Isiolo County and National Commission for Science, Technology and Innovation (Ref. No. NACOSTI/P/17/5233/16099). The processes adhered to Declarations of Helsinki guidelines on the conducting biomedical research by the Council of International Organization of Medical sciences (CIOMS) and that of the International Conference on Harmonization-Good Clinical Practice (ICH-GCP). In view of the above, the researcher sought informed consent from the major institution's Chief Executive Officers where the objectives were spelt out and confidentiality to use the information for academic research purposes was reassured.

CHAPTER FOUR: IDENTIFICATION AND ASSESSMENT OF FLOOD AND DROUGHT DISASTERS RELATED TO CLIMATE CHANGE

4.1 Introduction

This chapter presents results and discussions on the identified and assessed climate change-related disasters caused by extreme events (floods and drought) in Isiolo County. The study addresses risks and disasters that are associated with climate change extreme events.

4.2 Results

4.2.1 The Sample Population Characteristics

4.2.1.1 Primary sampling location

The respondents interviewed during the study were evenly distributed in the following wards Bullapesa, Burat, Cherab, Garbatulla, Ngaremara, Wabera, Sericho and Oldonyiro of Isiolo County (Table 4.1). The Wabera and Oldonyiro wards provided the control population.

Table 4.1: Location of primary sampling sites

Ward	No. of respondents	Percent	Cumulative Percent
Bullapesa	23	8.0	8.0
Burat	30	10.4	18.4
Cherab	29	10.1	28.5
Garbatulla	57	19.8	48.3
Ngaremara	27	9.4	57.6
Oldonyiro	71	24.7	82.3
Wabera	51	17.7	100.0
Total	**288**	**100.0**	

4.2.1.2 The respondent age group range

The respondents ages ranged from 16 to 70 years, with the highest percentage being (29.2%) between 31-40 years followed by 28.8% who were 21-30 years while 21.5% were aged 41-50 years as indicated in Table 4.2.

Table 4.2: Respondents age group range

Age group ranges	No. of respondent	Percent	Cumulative Percent
16 - 20	10	3.5	3.5
21 - 30	83	28.8	32.3
31 - 40	84	29.2	61.5
41 - 50	62	21.5	83.0
51 - 70	45	15.6	98.6
Over 70	4	1.4	100.0
Total	**288**	**100.0**	

4.2.1.3 Education level of the respondents

Most of the respondents studied revealed that they had primary education (35.3%), followed by those who had no education at all (32.8%). Only 3.8% of the respondents had university education. The findings are as presented in Table 4.3.

Table 4.3: Education level of the respondents

Education Level	No. of Respondents	Percent	Cumulative Percent
None	93	32.3	32.4
Primary	103	35.8	68.3
Secondary	54	18.8	87.1
College	26	9.0	96.2
University graduate	11	3.8	100.0
Total	**288**	**99.7**	

4.2.1.4 Occupation of the respondents

The study established that main economic activities carried out in Isiolo County are agro-pastoralism and pastoralism as indicated by 57.6% respondents. It was found that majority of the interviewees were pastoralist (30.2%), followed by agro-pastoralists (27.7%), then house wives. The respondents who participated in the study, the findings show that among them, 27.4% were agro-pastoralists while 30.2% were pastoralists. Other respondents were casual workers and the people employed in informal settings as shown Table 4.4.

Table 4.4: Respondents occupations

Occupation	No. of Respondents	Percent	Cumulative Percent
Agro-pastoralist	79	27.4	27.4
Pastoralist	87	30.2	57.6
Casual worker	24	8.3	65. 9
Employed	33	11.5	77.4
House help	1	0.3	77.7
Student	14	4.9	82.6
Unemployed	5	1.7	84.3
Housewives	37	12.8	97.1
No response	8	2.8	100
Total	**288**	**100.0**	

4.2.1.5 Types of settlement

Among the 288 respondents interviewed in Isiolo County, 80.6% reside in rural areas and 19.4% reside in urban areas (Table 4.5 and Figure 4.1).

Table 4.5: Types of Settlement

Types of settlement	No of Respondents	Percent	Cumulative Percent
Rural	232	80.6	80.6
Urban	56	19.4	100.0
Total	**288**	**100.0**	

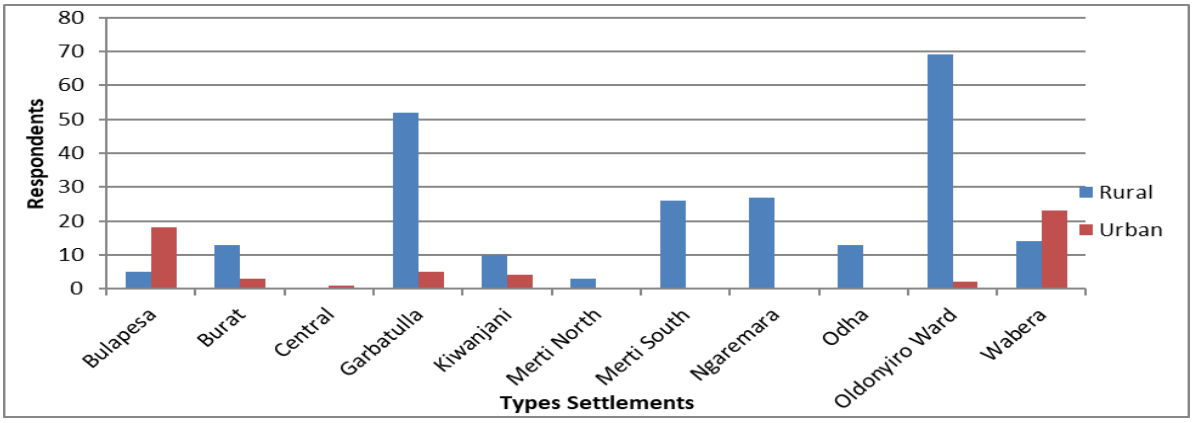


Figure 4.1: The distribution of respondents in urban and rural settlements

The study findings show that in Isiolo County, 35.8% of residents live in clustered settlements, while 39.2% live in scattered settlements. Less than 24.3% of the respondents live in linear settlements (Table 4.6).

Table 4.6: Settlement patterns

Settlement Patterns	No. of Respondents	Percent
Clustered	103	35.8
Scattered	113	39.2
Linear	70	24.3
Total	286	99.3
Total	**288**	**100.0**

4.2.1.6 Types of homestead

The results show that 16.3% of the respondents live in permanent homes, 60% live in semi-permanent homes while 23.6% live in temporary homes (Table 4.7).

Table 4.7: Types of homestead

Homestead Types	No. of Respondents	Percent	Cumulative Percent
Permanent	47	16.3	16.3
Semi-permanent	173	60.1	76.4
Temporary	68	23.6	100.0
Total	**288**	**100.0**	

4.2.2 Climate Change Scenarios

The three decades' records of rainfall and temperature from 1984 to 2013 for all stations in Isiolo County were used to track variability and trends of extreme events related to climate change. The nature, occurrence and strength of the events were estimated to derive the susceptibility of the physical and human environment to climate hazards uncertainty.

4.2.2.1 Rainfall trend analysis

The trend of the mean annual precipitation from 1984-2013, was tested using a non-parametric Spearman test for trend. The results showed no significant trend ($p = 0.9214$). The highest mean annual rainfall is 2100.7 mm in the year 2006 and the lowest is 185.5 mm in the year 2000 for all selected sites in Isiolo County. The average rainfall was 515 mm, consistent with the semi-arid environment of much of Isiolo County. The wet years were 1990, 1994, 1996, 2002, 2006 and 2011 with the wettest years being 1997 and 2006. The driest year was 2000, while other dry years occurred in 1987, 1991, 1996, 2000, 2005 and 2007. The findings show that the overall trend of the rainfall data is increasing per decade, with interludes of driest months observed during the whole period. The results drawn are shown on Figure 4.2 below.

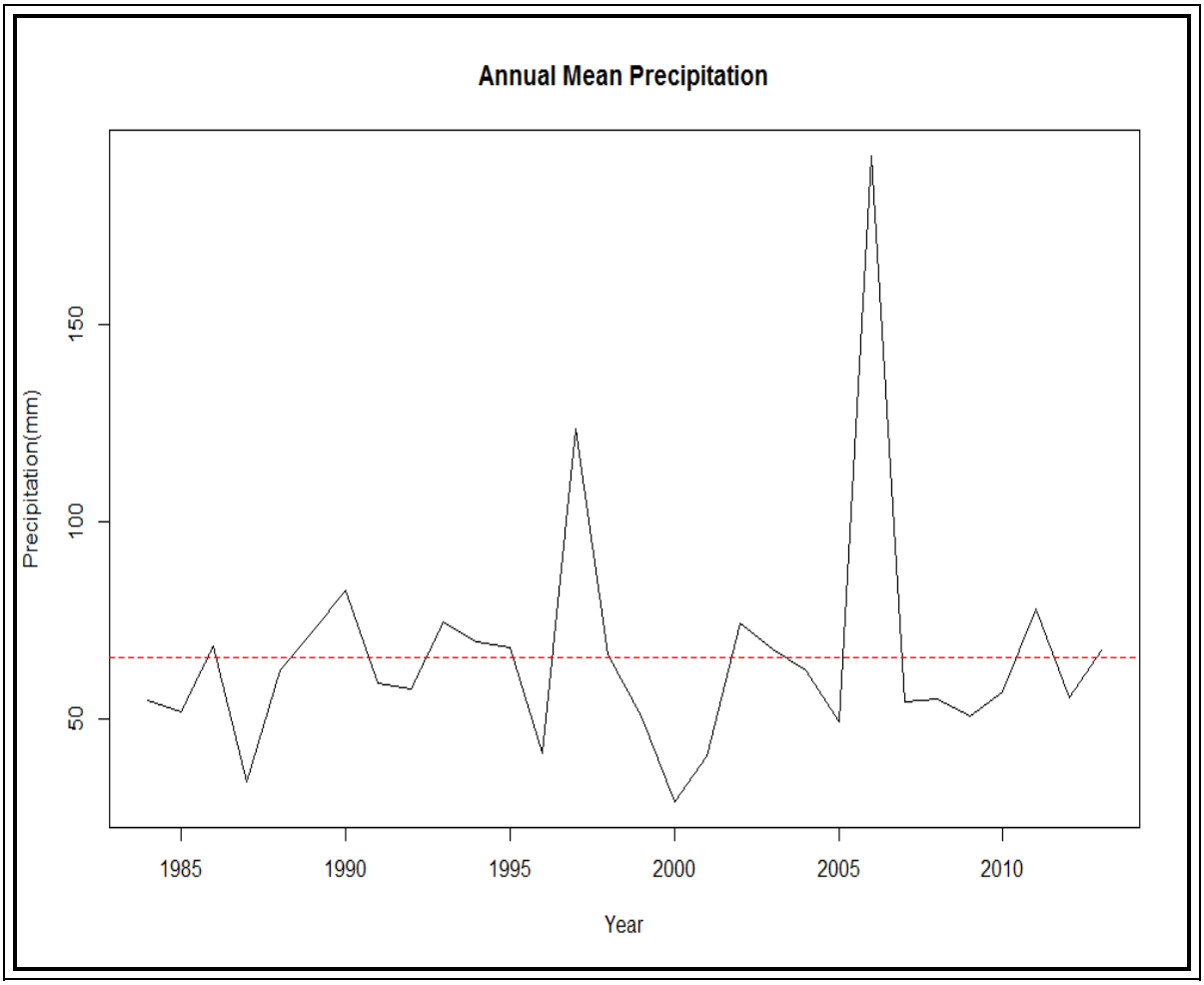


Figure 4.2: Mean annual rainfall (mm) trend for the towns in the study area from 1984-2013 (©Peninah, 2017)

The spatial analysis of the rainfall for over 30 years from 1984 to 2013 is depicted in Figure 4.3. The analysis depicts increases in the level of extreme precipitation in observational and modified generated data.

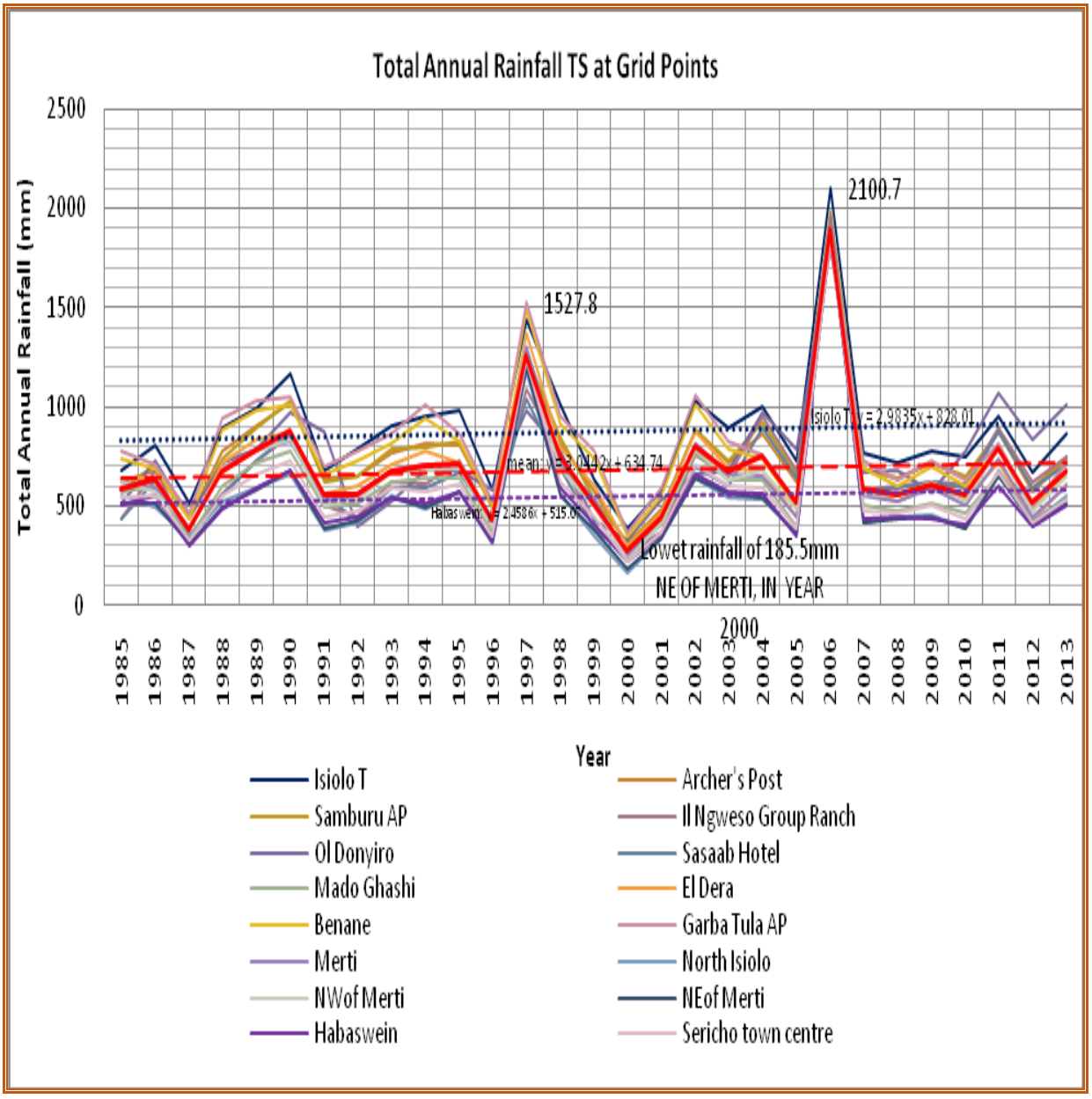


Figure 4.3: Total annual rainfall (mm) trends for the sixteen satellite locations in the study area from 1984 to 2013 (©Peninah, 2017)

The graphs below have utilized threshold method to determine whether an observation is extreme i.e. all observations have greater than some high value (threshold). The time series plot shows the wet, very wet, dry and very dry years shown by dashed lines. Also highest and lowest amount of rainfall are shown in Figure 4.3.

The distributions of threshold excesses have been graphically presented on Figure 4.4. The Generalized Pareto Distribution (GPD) was fitted on the maximum precipitation for various exceedance thresholds. Thereafter, a Mean Excess (ME) plot was generated to identify the possible threshold of the maximum precipitation with 95% confidence intervals. Based on recommendations by Coles *et al.* (2001), Peaks-Over-Threshold (POT) of the exceedance threshold of $\mu = 340\ mm$ was chosen.

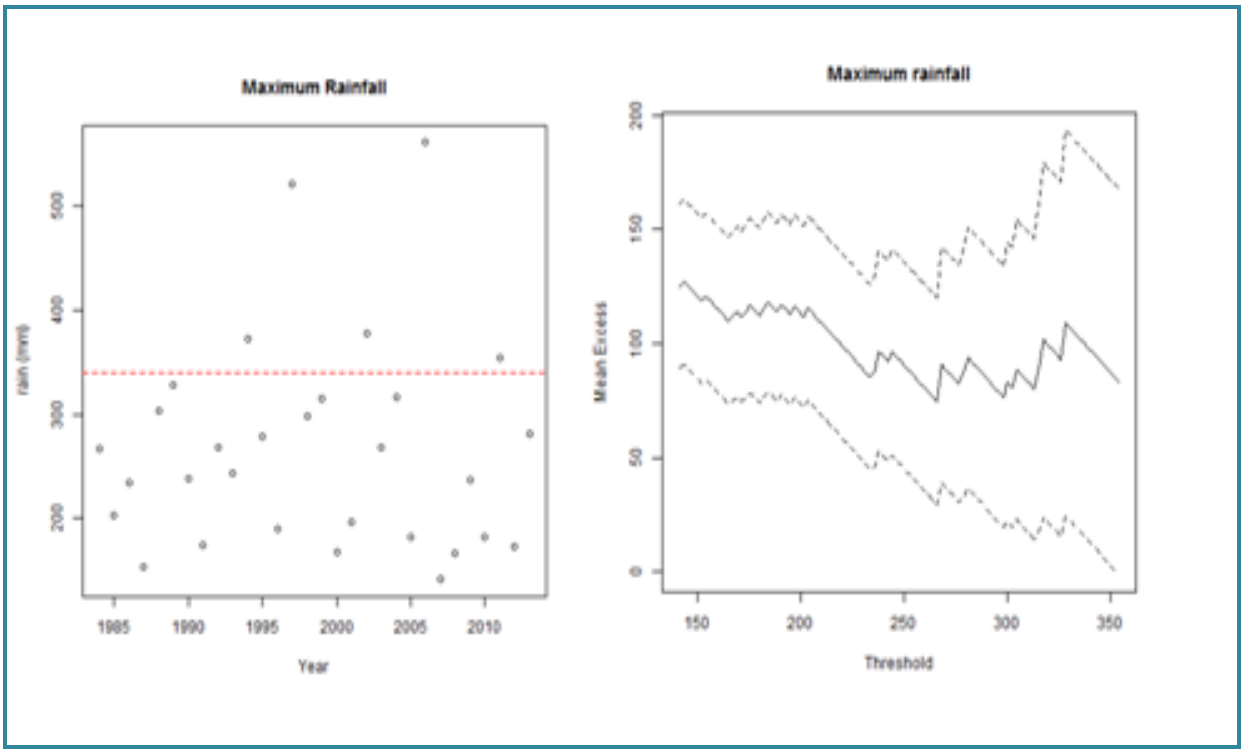


Figure 4.4: Mean Excess (ME) plot and General Pareto Distribution (GPD) showing Peak-Over-Threshold (POT) for extreme rainfall data (©Peninah, 2017)

The Mean Excess of 340 mm is lower compared to the semi-arid region which is usually above 500 mm per annum. The graph plot (Figure 4.4) depicts climate change variability and extreme events. The threshold Mean Excess (ME) plot and General Pareto Distribution (GPD) were used to show the points above the overall significant increase (Davison and Smith, 1990). According to rainfall data analysis ME plot was heavy-tailed and showed extreme-valued data exceedances over a sufficiently high threshold. The peak-over-threshold (POT) method was used to seclude

extreme values and model the tail of all values that exceed threshold from the mean (Ghosh and Resnick 2010). The threshold was set to estimate exceedances in deviation, above or below extreme value GPD distributions. The plots show confidence bound, hence substantive hypothesis are accepted. This is summarized in the graph below to show down crossing and up crossing of the annual maximum and minimum rainfall extent of annual exceedances (1984-2013). The annual rainfall deviation from the mean analyses the extreme events projections of wet and dry years (Figure 4.5). This pattern of rainfall deficit has negatively impacted food, water, health, social systems, peace and security of the county.

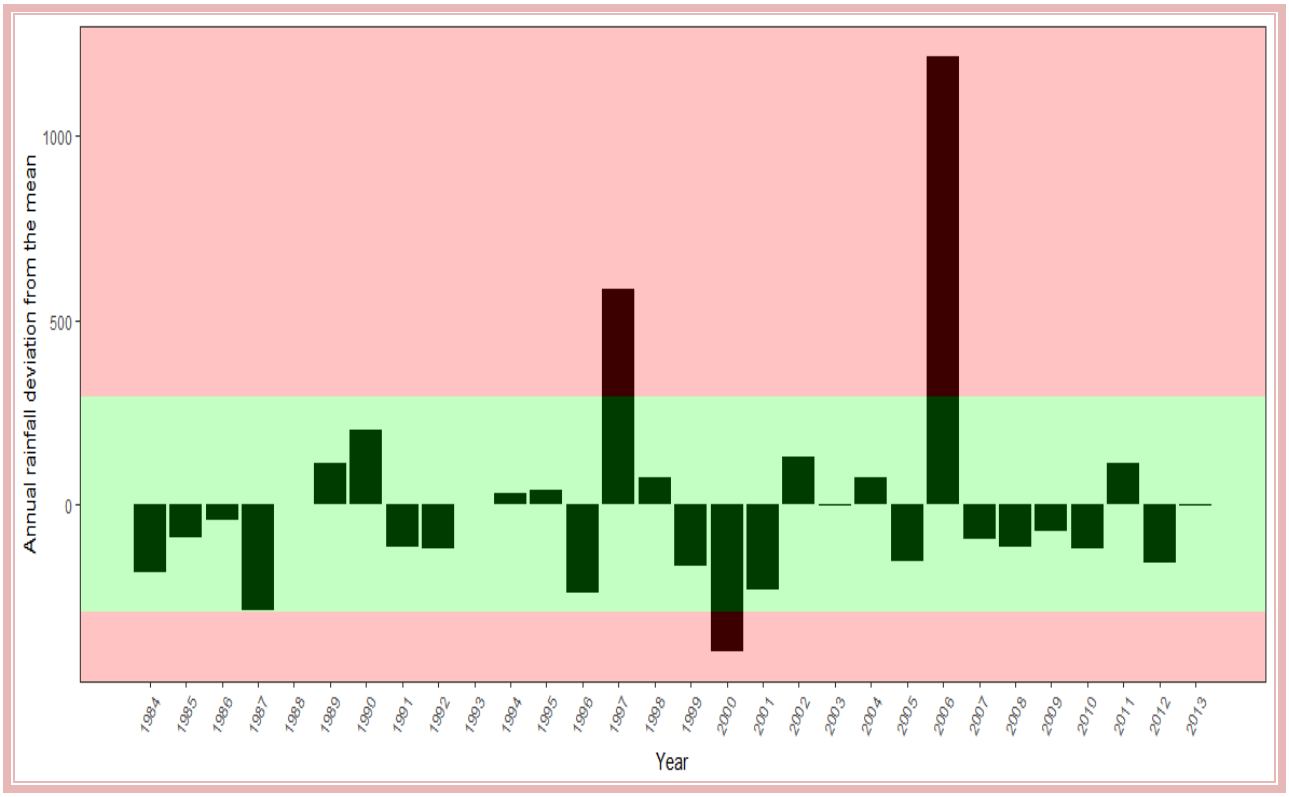


Figure 4.5: Standardized minimum and maximum annual rainfall exceeded averaged for sixteen satellite stations in the study area (©Peninah, 2017)

4.2.2.3 Temperature trend analysis

The findings show that the temperatures are high throughout the year, with highest mean annual temperatures experienced during the driest spell in year 2000 and other years mentioned above.

The annual mean of the minimum temperature is 19ºC and the annual mean of the maximum temperatures is 34ºC. These reflect large annual diurnal temperature range that is characteristic of the equatorial tropics.

Thresholds for temperatures extremes analysis for annual maximum and minimum temperatures series result are represented in Figure 4.6. The variability of the temperatures for each year estimate extreme spread is very large - approximately 25ºC. The generalized Pareto distribution was fitted on the maximum and minimum temperatures for various exceedance thresholds. Thereafter, a mean excess plot was generated to identify the possible threshold of the maximum precipitation with 95% confidence intervals. Hence, the mean exceedance threshold is $\mu = 36.5^0C$ and $\mu = 11.38^0C$ for minimum and maximum temperatures, respectively.

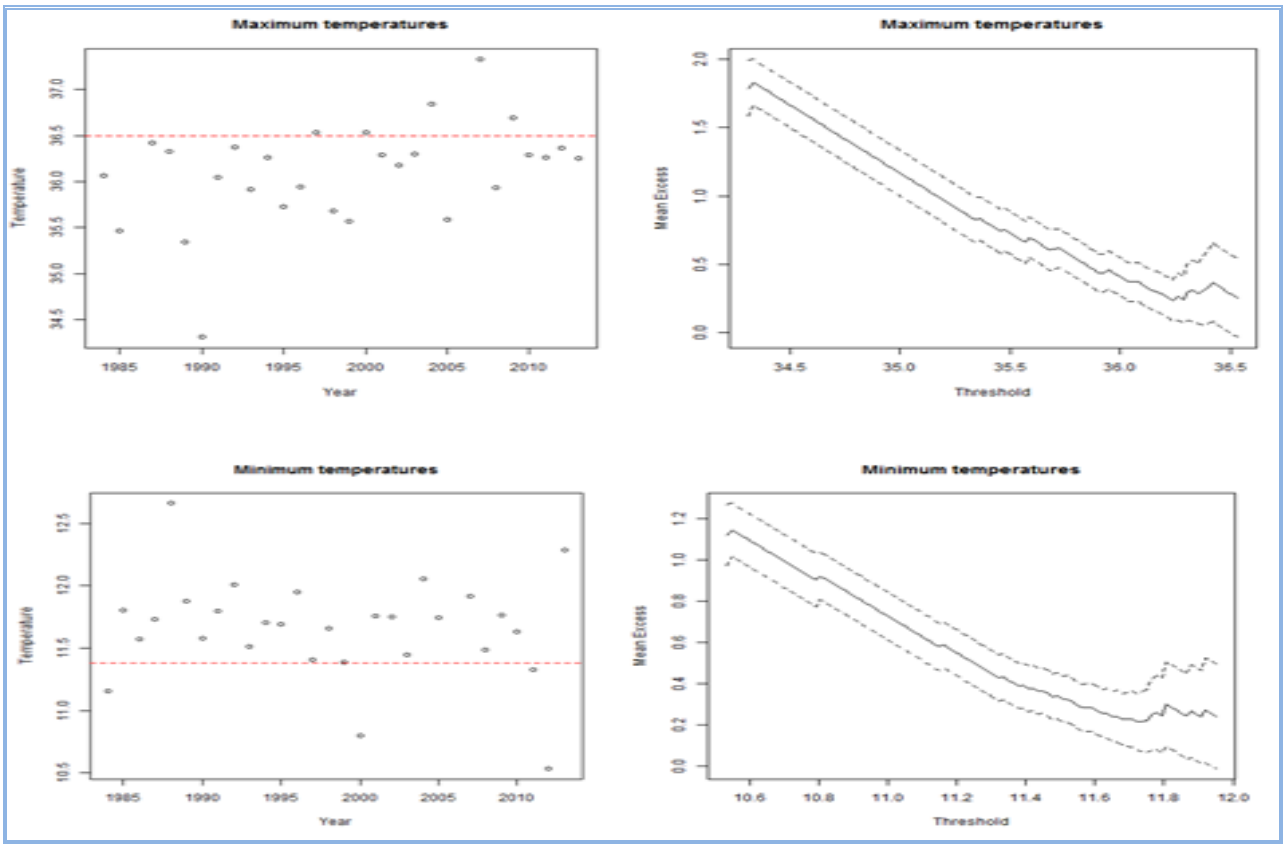


Figure 4.6: Mean Excess (ME) plot and General Pareto Distribution (GPD) showing Peak-Over-Threshold (POT) for extreme maximum and minimum temperature data (©Peninah, 2017).

The maximum and minimum temperatures variation illustrates extreme climate in the scatter graphs above. The heat and cold waves are experienced during some days (months) exceeding various temperature thresholds. Palmer drought severity index used temperatures and standard precipitation index (SPI) values to estimate relative dryness and quantified long-term drought as shown in the drought hazard map (see Figure 4.11).

4.2.2.4 Community perception on changing climate

According to the study finding majority of respondents (63.9%) had lived in the area for over 30 years while 14% have lived in the area between 10 and 30 years. Those who had lived there for less than 10 years were 21% (Table 4.8).

Table 4.8: Number of years the respondents have lived in area of study

Years	No. of Respondents	Percent	Cumulative Percent
Over 30	184	63.9	63.9
Between 10 and 30	41	14.2	78.1
Between 5 and 10	17	5.9	84.0
Below 5	46	16	95.1
Total	**288**	**100.0**	

The study showed that 58% of natives confirmed to have witnessed changes in the weather and climate patterns within the 30 years they have lived in Isiolo County.

4.2.3 Floods and Drought Disaster Risks Assessment

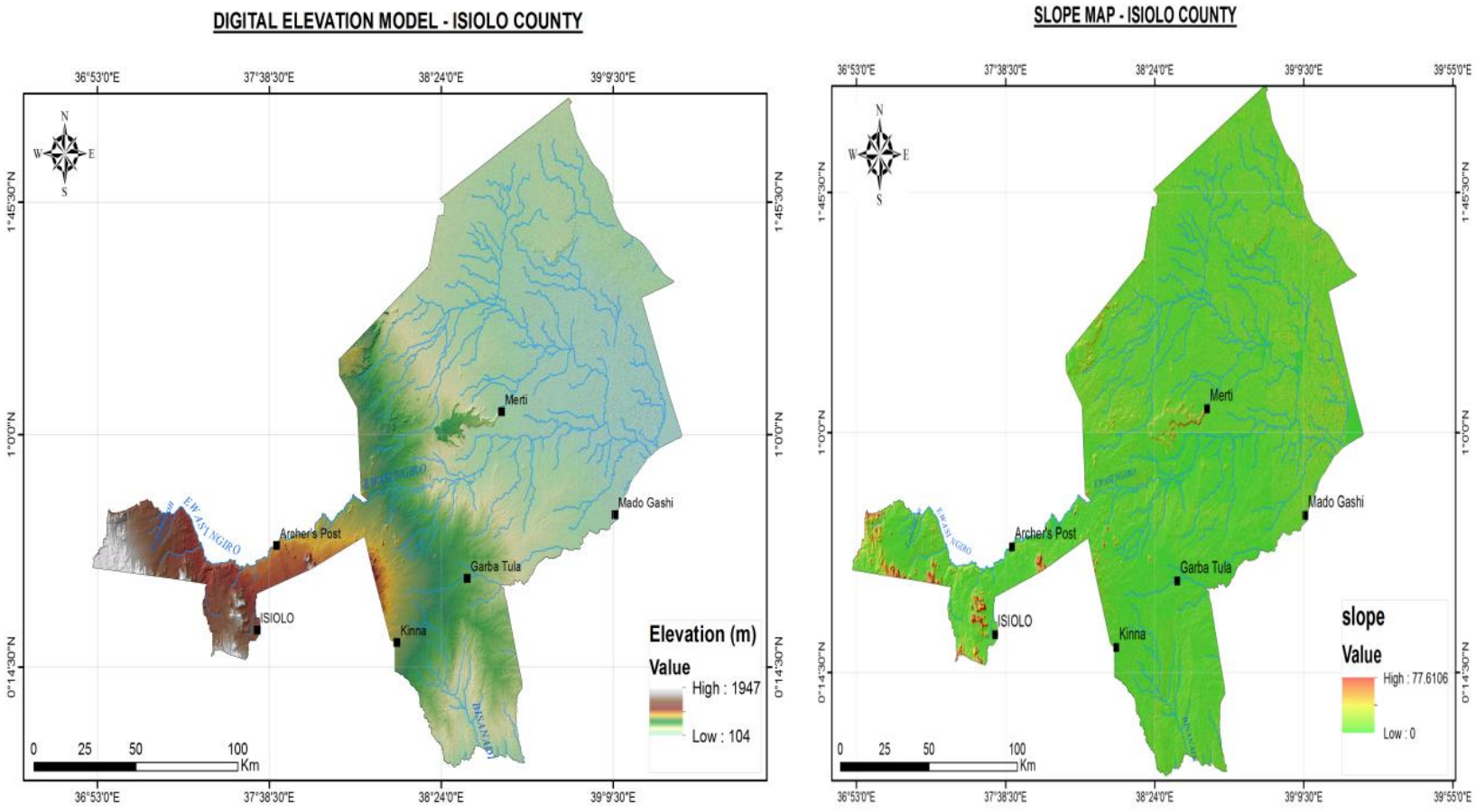
4.2.3.1 Flood disaster risk assessment

Table 4.9 tabulates the flood occurrences in Kenya since 1982 to 2017 which is also indicative of probable flood incidents in Isiolo County. The exposure to potentially dangerous setting is summarized as follows.

Table 4.9: Floods occurrences in Kenya 1982-2018 (Source: UNISDR AF and CIMA, 2018)

Year	**Types of floods**	**Area of coverage**
1982	Moderate	Arid and semi-arid regions
1985	Severe	Widespread
1997/1998	El Niño-most severe	Widespread
2002	Severe	Widespread
2006	El Niño	Widespread
2008/2009	Severe	Widespread
2015/2016	Severe	Widespread
2018	El Niño-very severe	Widespread

GIS parameters - digital elevation model and slope, flood susceptibility from river bank and flow accumulation, land cover, and geological maps - were used to identify key flood prone areas in Isiolo sub-catchment. Flash and river floods are quite common along Merille River and Isiolo town. The maps shown in Figure 4.7 represent the slope (DEM) which is a major factor in flooding.



a) b)

Figure 4.7: Digital elevation model and slope maps of Isiolo County (©Peninah, 2017)

The slope determines the direction and the amount of surface runoff and the infiltration rate. The steep slopes are more susceptible to surface runoff, hence slow to flooding. The undulating slopes are susceptible to water logging where water usually accumulates in depressions depending on soil type and land cover (Figure 4.7). The even slopes are highly susceptible to floods in Isiolo and occupy large geographical areas. The excess water from River Merille always gathers in areas where the slope has low gradient. Low elevation and gentle slopes are a combination of factors that have been used to predict floods and subsequently used in emergency preparedness and management. Isiolo County has a saucepan type of topography which leads to accumulation of water in low areas.

The DEM and slope raster are represented in Figure 4.7. Although most of Ewaso Nyiro North Catchment area is defined as arid sub counties, severe flood damages have been reported in the various parts of the catchment area. Drainage density is a vital factor controlling the flood hazard. Where the density is high the rate of soil erosion is high and the alluvial deposits occur at downstream zones (Figure 4.8).

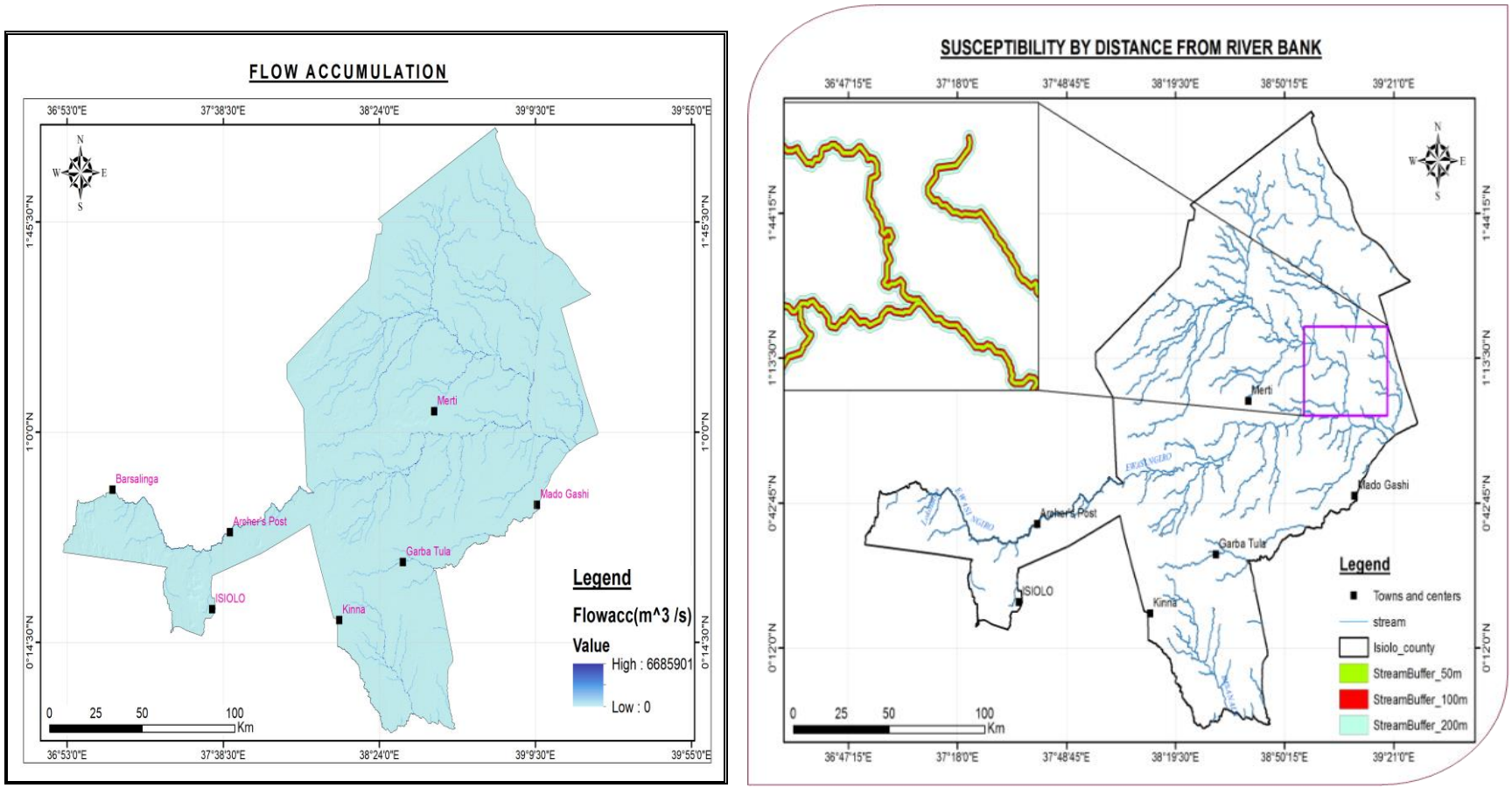
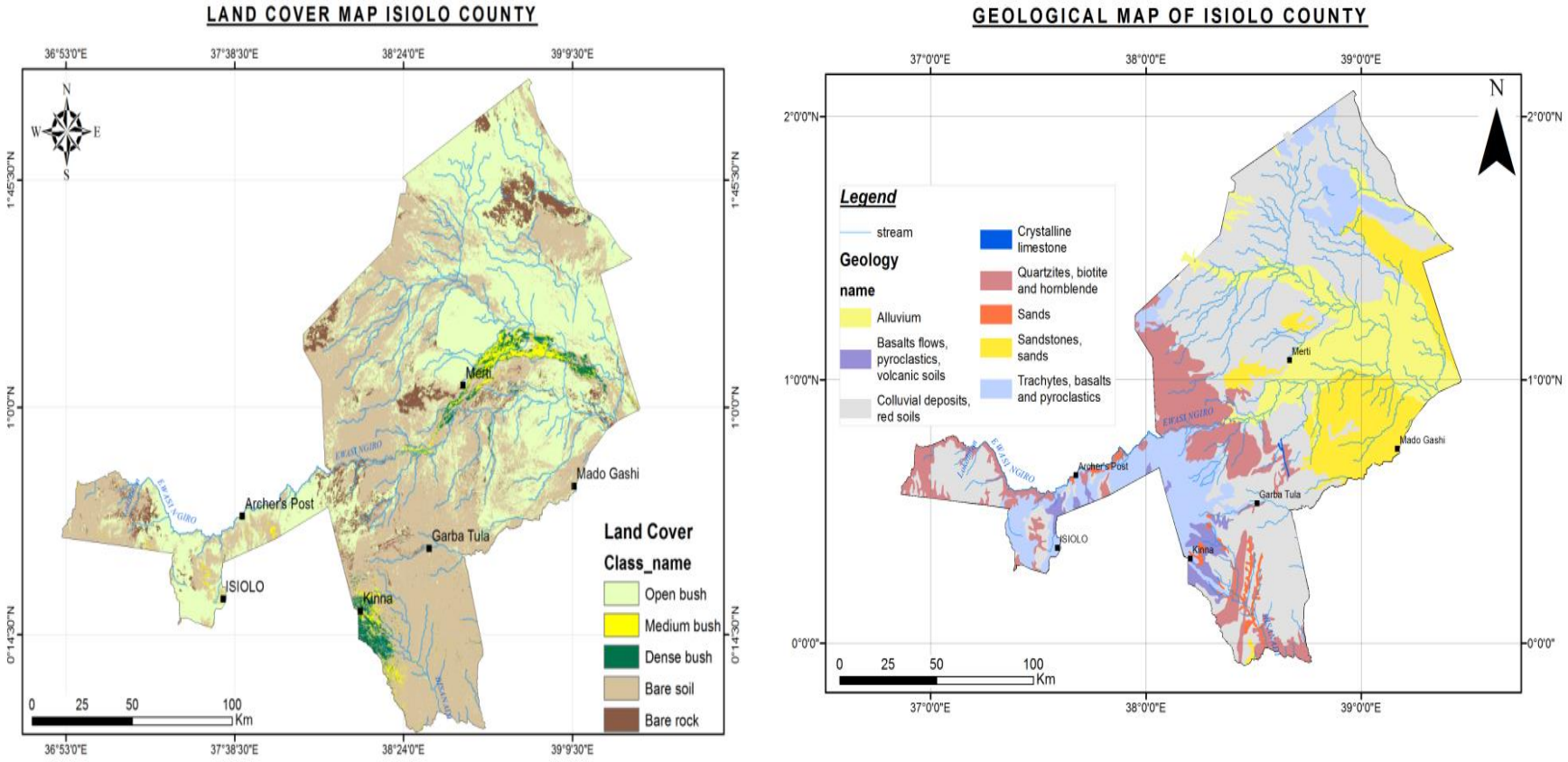


Figure 4.8: Flow accumulation (left) and floods susceptibility maps (right) by distance from river bank in Isiolo County (©Peninah, 2017)

The river floods are gradual in occurrence and mostly predictable because they build up slowly till the river channel is full and overflowing, yet still it is seasonal. The flash floods occur without warning as a result of accelerated surface runoff due to short heavy rainfall. The surface runoff is more due to bare sandy soil and bare rocks that are prevalent in the area. The flow accumulation map show that the flood water depth increases immensely due to sporadic intense rainfall with medium to very high flood hazard. Besides, flash floods of river Merille are also very common (Figure 4.8). The land cover and geology of the area provide information on how past hazardous events exposes the human and physical environment to disaster risks (Figure 4.9).



a) b)

Figure 4.9: Land cover and geological map depicting vulnerability of landscape to floods in Isiolo County (©Peninah, 2017)

The study established that the degree of damage to elements at risk depends on the speed of flood water mostly in the areas affected by riverbank erosion. The uncertainties of flood exposure and vulnerability are mainly confined along the Isiolo Township and the riverbanks which is attributed to heavy erratic rainfall (Figure 4.10).

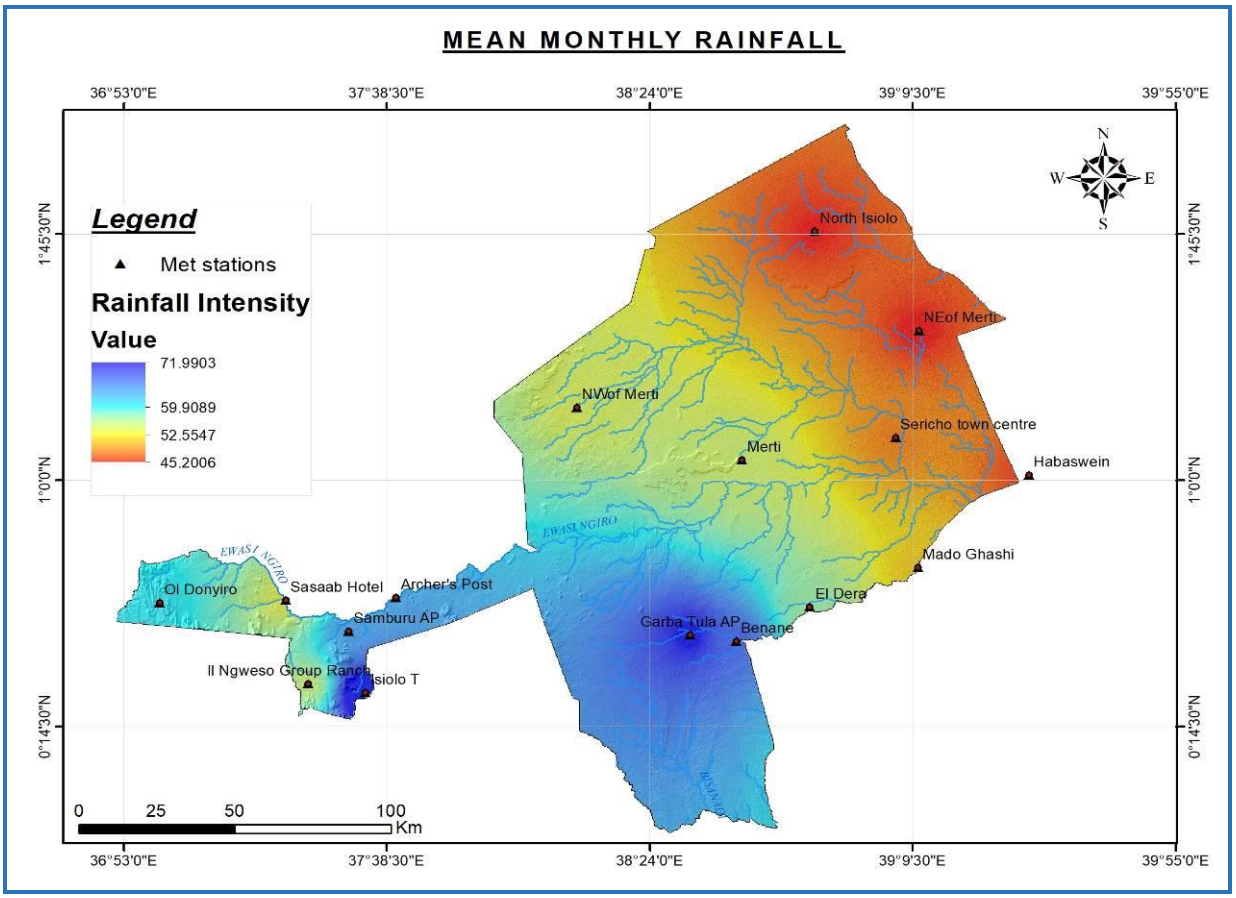


Figure 4.10: Mean monthly Rainfall (mm) in Isiolo County for the 1884-2013 period (©Peninah, 2017)

4.2.3.2 Drought disaster risk assessment

As reported by respondents' drought is and has been a major hazard in Isiolo County for any years. It was rated a recurrent phenomenon, with the latest occurrences happening in 2005, 2006, 2008, 2011 and 2017 as indicated in Table 4.10 due to the high level of environmental degradation activities, deforestation, soil erosion and charcoal burning among others.

Table 4.10: Drought Incidents in Kenya from 1992 to 2017 (Source: UNISDR AF and CIMA, 2018)

Years	No. of people affected	Types of drought	Area of coverage
1983/1984	200,000	Moderate	Arid and semi-arid regions
1991/1992	1.5 million	Moderate	ASAL regions
1995/1996	1.41 million	Severe	Widespread
1997	2 million	Severe	Widespread
1999/2000	4.4 million	Severe	Widespread
2004	2.3 million	Severe	Widespread
2005	4 million	Severe	Widespread
2008/2009	4 million	Severe	Widespread
2010/2011	13.3million	Very severe	Widespread
2016/2017	3.4 million	Severe	Widespread

The problem associated with drought was reported by 165 (57.3%) respondents who observed that drought has been seasonal; 30.2% of the respondents noted that drought is experienced yearly, and the rest observed that the drought phenomenon was monthly or rare. These results are summarised in Table 4.11.

Table 4.11: Frequency of drought occurrences per ward in Isiolo County for the Jan 2014-Dec 2015 period

Occurrences	No. of respondents	Percent	Cumulative Percent
Monthly	28	9.7	9.8
Seasonal	165	57.3	67.5
Yearly	87	30.2	97.9
Rarely	6	2.1	100.0
Total	286	99.3	
Total	**288**	**100.0**	

Most respondents stated that the drought occurrence per ward varied temporally (seasonally and annually) and spatially. A stakeholder noted that drought which is precipitation deficiency over

extended period of time is prevalent and leads to failure of crops and livestock production. These events and uncertainty spread over all areas in arid region. Drought was reported to be the most common natural hazard severely affecting two major study locations of Oldonyiro and Yamicha where it recurs after every 6 to 7 years. A major drought event in 2008/2009 was reported to have had severe impact in Isiolo County. Analysis of the weather in 7 (seven) specific study points show that there were severe rainfall deficits for the years depicted in Table 4.12.

Table 4.12: Number of household survey respondents citing the frequency of drought occurrence, Jan 2014-Dec 2015 in Isiolo County

		Monthly	**Seasonal**	**Yearly**	**Rarely**	**Total**
Ward	Bullapesa	6	8	8	1	23
	Burat	2	18	9	1	30
	Cherab	1	27	0	0	28
	Garbatulla	3	16	34	3	56
	Ngaremara	6	15	6	0	27
	Oldonyiro	6	56	9	0	71
	Wabera	4	25	21	1	51
Total		**28**	**165**	**87**	**6**	**286**

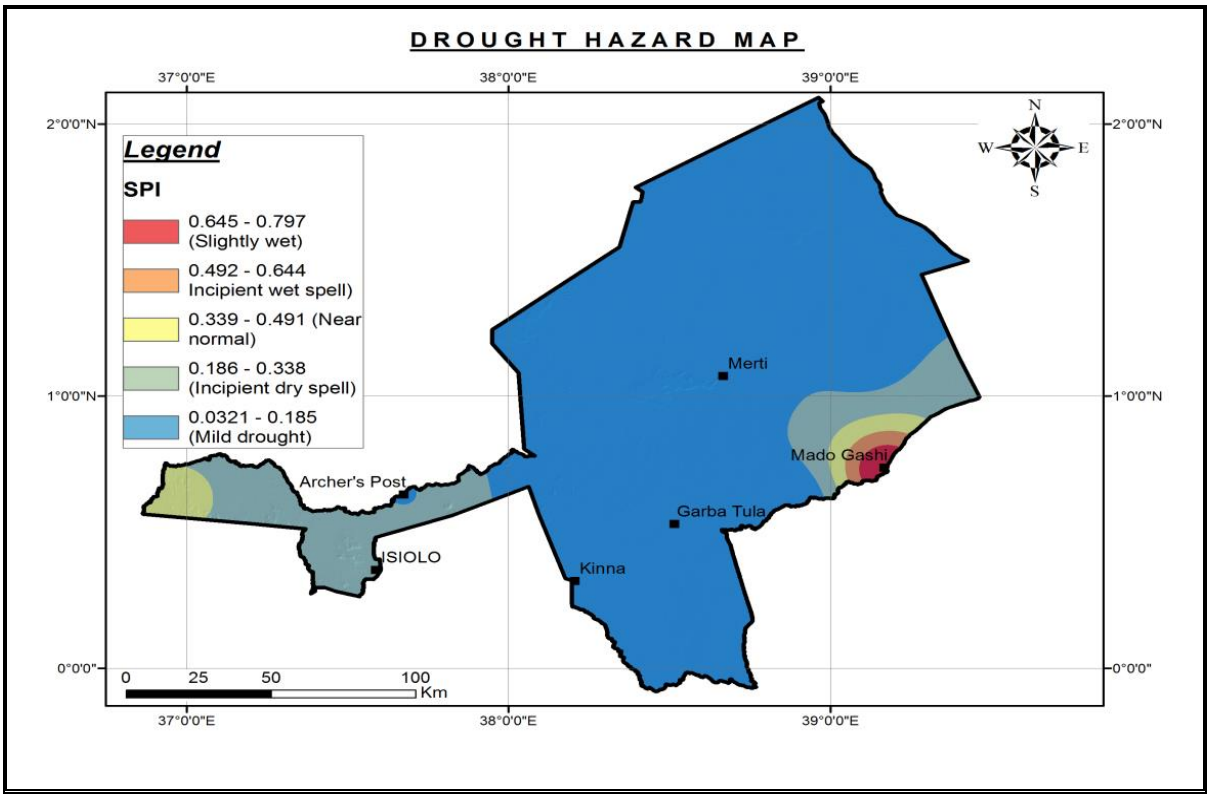


Figure 4.11: Hazards drought map of Isiolo County (Source: ©Peninah, 2017)

The topography of Isiolo County is high from Mount Kenya and lower in Sericho region. This was established by the 123 (43.9%) respondents who agreed that floods occur seasonally and 86 (30.7%) of the respondents agreed that floods are witnessed yearly with Garbatulla ranking highest with 27 (31.4%) of respondents as illustrated in Table 4.13. Oldonyiro settlement recorded the highest number of respondents who asserted that floods occur rarely because it's located on the higher grounds near Mount Kenya shown in Figure 4.12.

Table 4.13: Household survey on flood risk assessment: Jan 2014-Dec 2015 in Isiolo County

		Monthly	Seasonal	Yearly	Rarely
Ward	Bullapesa	0	14	9	0
	Burat	0	18	8	4
	Cherab	1	14	5	8
	Garbatulla	1	12	27	10
	Ngaremara	1	12	11	3
	Oldonyiro	1	25	8	37
	Wabera	1	28	18	4
Total		**5**	**123**	**86**	**66**

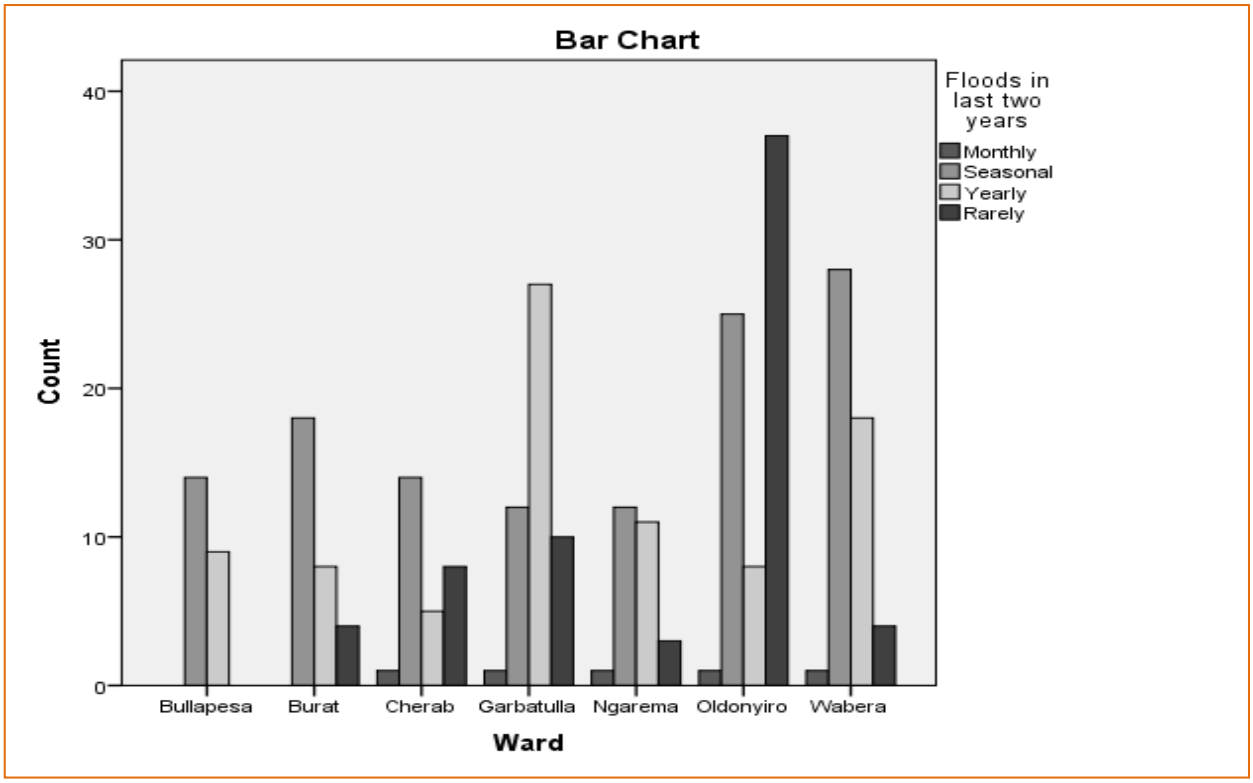


Figure 4.12: Household survey on floods disaster risk assessments: Jan 2014-Dec 2015 in Isiolo County (Source: ©Peninah, 2017)

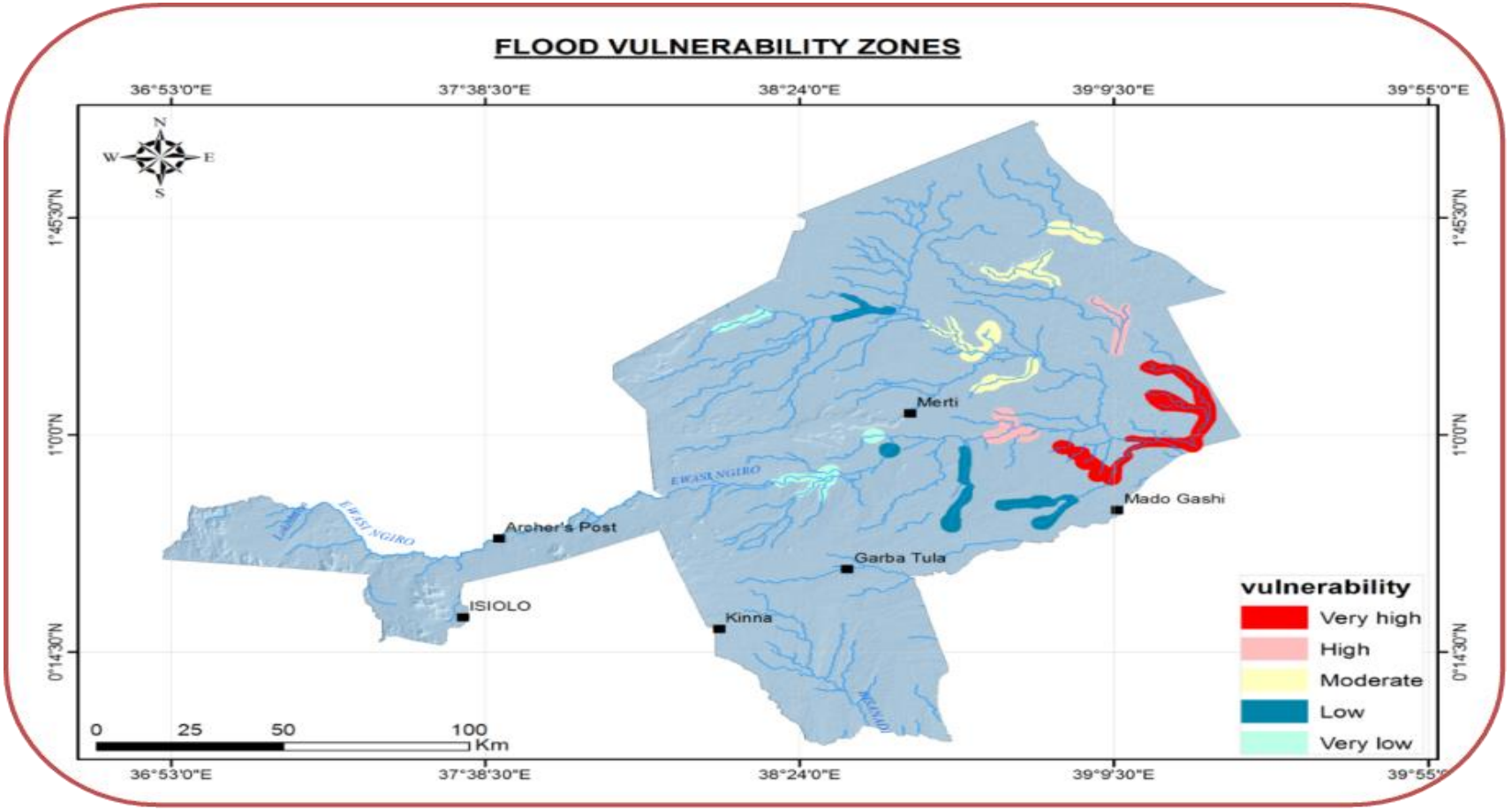


Figure 4.13: Floods Vulnerability Zones Map (Source: ©Peninah, 2017)

The degree of damage to elements at risk depends on the speed of flood water and the areas affected by riverbank erosion. The flood vulnerability and risks are mainly confined along the Isiolo Township and the riverbanks depicted in Figure 4.13. The disaster-prone areas as per household data analysis categories are: potential risk (45%), high risk (33%), low risk (16%), and no risk (4%) (Figure 4.14).

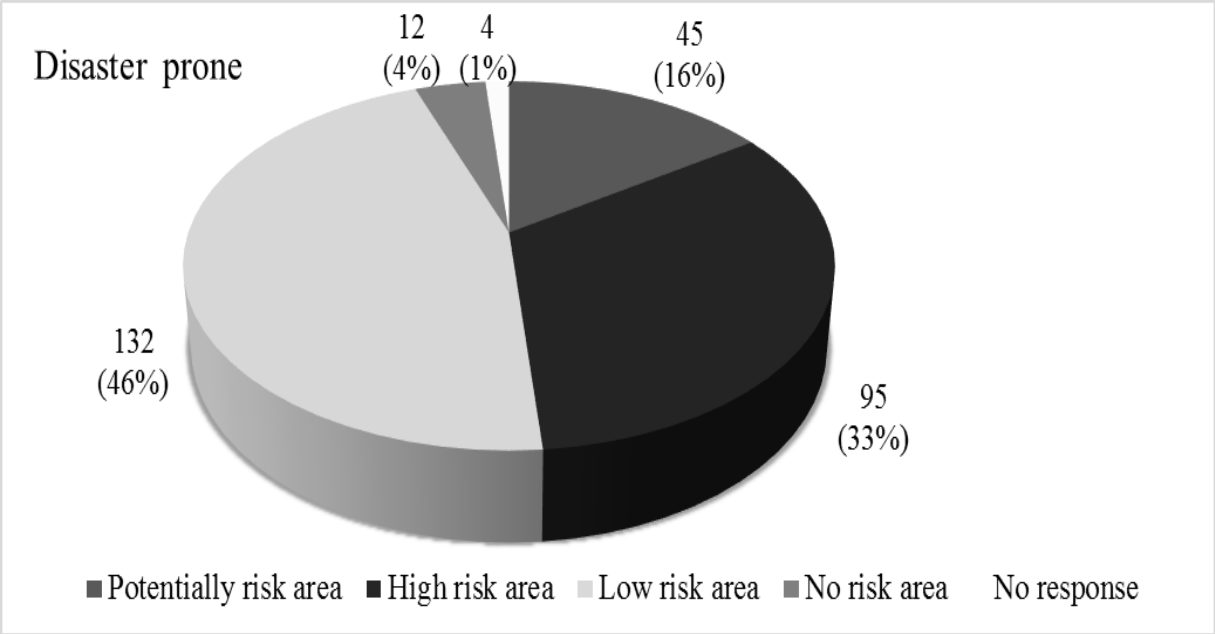


Figure 4.14: Ranking in percentages on the level of disaster risks based on settlement patterns in Isiolo County (Source: ©Peninah, 2017)

4.2.3.3 Community perception on flood and drought disaster risks

The study found that greater proportions of the population in Isiolo County are being impacted by climate change related disasters. The results show that 60% of the respondents asserted that floods disasters affected them while 33% mentioned that drought was a challenge to their livelihood and health (Figure 4.15).

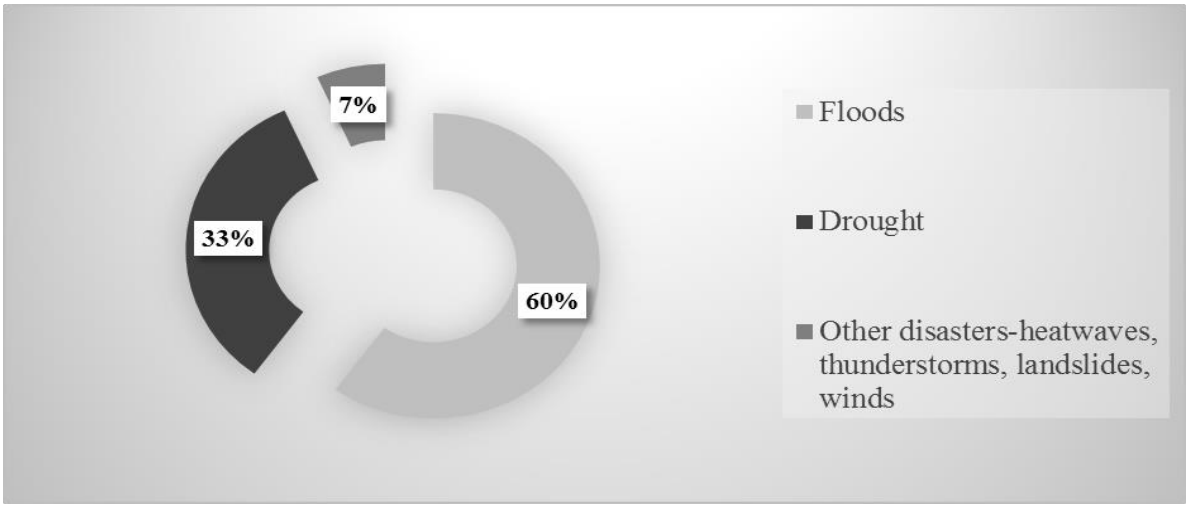


Figure 4.15: Identified disaster risks in Household survey, Isiolo County (Source: ©Peninah, 2017)

The FGDs and household interviews respondents considered the likelihood and associated impacts of disaster risks scenarios. The risk assessment provides a comprehensive view of hazards, exposure and vulnerability the fatalities of floods and drought events on social-economic aspects and physical environment damages for two years. The participatory community risk assessment ranking of the disaster risks, in terms of severity and duration was high (Table 4.14).

Table 4.14: Ranking in percentages of disaster risks on community perception, Jan 2014-Dec 2015

Stakeholders institution	Flood severity	duration	Drought severity	duration
Ewaso Nyiro North Development Authority	60%	yearly	70%	2 years
Met. Department.	70%	5 years	90%	2 years
NEMA	80%	2 years	90%	2 years
Food for the Hungry	20%	yearly	70%	yearly
MOW	30%	yearly	70%	yearly
MOH	30%	5 years	60%	yearly
MOA	40%	yearly	70%	yearly
WRA	60%	yearly	90%	yearly

The stakeholders who participated in the study noted that although floods are viewed as a low risk hazard, their impacts are of high importance while drought is a high risk hazard and the impacts are of high importance. The participants noted that Isiolo County is a high risk area for drought and floods. The stakeholders' analyses are summarized and presented in Table 4.15.

Table 4.15: Assessment of disaster risks: magnitude and level of importance

Category	**Risk Magnitude**	**Importance level**
Floods	Low risk	High importance
Drought	High risk	High importance

The events outlined (Figure 4.15) were analysed and uncertainties gauged on potential outcomes: which are large or severe as depicted by above descriptions. Knowledge-based probabilities (with the above interpretation) and judgments of the strength of knowledge supporting probabilities of occurrences were used to analyse the risks (IPCC, 2014b; Aven and Krohn, 2014). The precise probability confidence level is expressed by probability interval of 60-90% which is closely linked to likelihood dimensions.

4.2.4 Vulnerability of Isiolo Residents to Floods and Droughts

The characteristics of the vulnerability/risks to floods and drought disasters are presented in terms of settlement patterns and disease prevalence in this section (Table 4.16).

Table 4.16: Household survey respondent's categorization of disaster risks depending on settlement patterns in Isiolo County

Settlement Patterns	No. of Respondents categorizing disasters risks in the area				
	Potentially risk area	**High risk area**	**Low risk area**	**No risk area**	**Grand Total**
Clustered	9	24	62	5	100
Scattered	22	38	47	5	112
Linear	14	32	22	2	70
Total	**45**	**94**	**131**	**12**	**282**

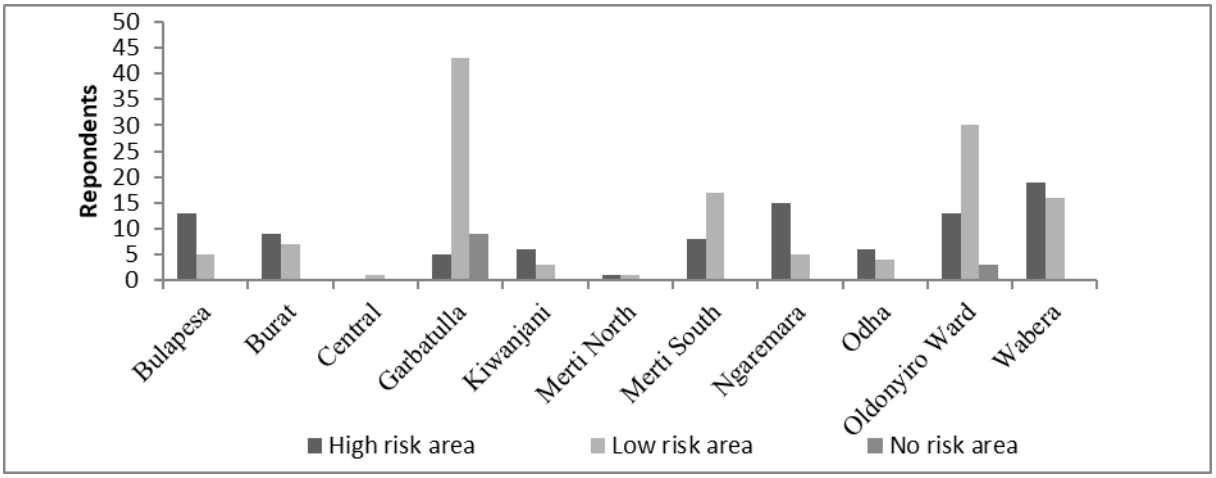


Figure 4.16: Locations of various disaster risks areas in Isiolo County (Source: ©Peninah, 2017)

The disaster-prone areas as per household data analysis categories are: potential risk 45 (16%), high risk 94 (33%), low risk 131 (46.5%), and no risk 12 (4.2%) (Figure 4.16). The findings show that majority of settlements are temporary and semi-permanent. It was found that in Odha (100%) of the settlements are temporary, in Merti North (33%) are temporary and (77%) semi-permanent, in Kiwanjani (85%) are semi-permanent, in Ngaremara where (85%) are semi-permanent and in Garbatulla where (63%) are semi-permanent.

This is an indication that floods and flash floods can impact these settlements adversely. The findings also revealed that (100%) of Central Isiolo has permanent homes which are equally susceptible to floods. Most of temporary and semi temporary settlements are near the riparian

areas of River Merille whose drainage basin is characterised by numerous gullies (Figure 4.17). These housing types are located either in plains and rugged terrain physical landscape, ranging from small rural to urban types of settlement, but are not climate resilient.

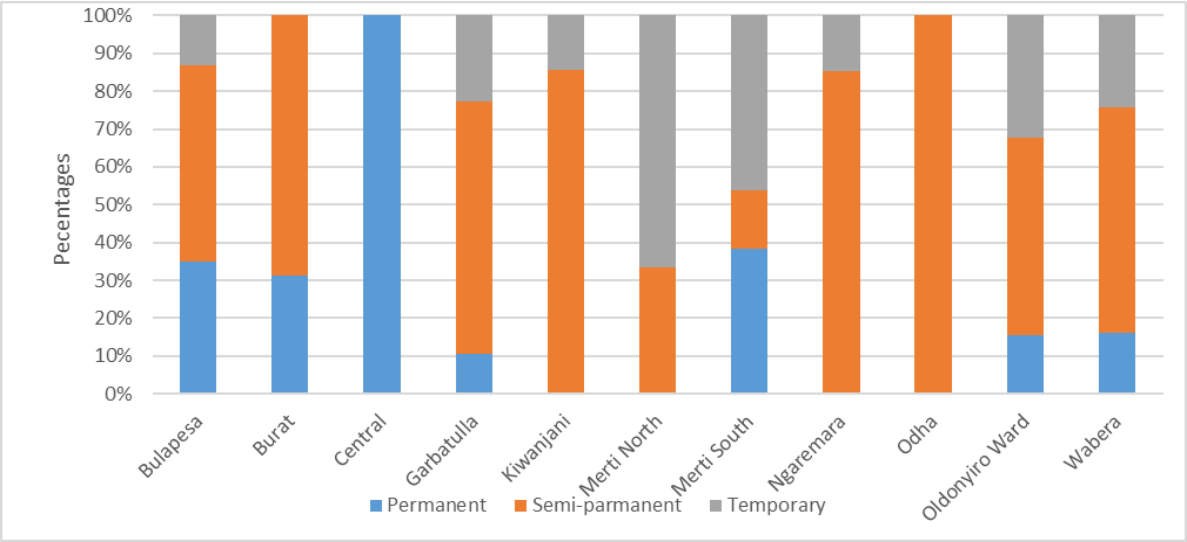


Figure 4.17: Household social economic survey: Percentages of spatial and structural house-type characteristic of human settlements (Source: ©Peninah, 2017)

The respondents reported that physical diseases such as respiratory, pneumonia, malaria, diarrheal and typhoid fever have increased since 2006 and were now more prevalent during the study period (2014-2015). The results as presented in Table 4.17 showed that 105 (43.6%) respondents said the epidemics occur seasonally while 51 (21.2%) said that they occur monthly. 28 (11.6%) respondents noted that the diseases occur yearly while 57 (23.7%) respondents said the epidemics occur rarely.

Table 4.17: Physical (respiratory, pneumonia, malaria, diarrhoea and typhoid fever) diseases, Jan 2014-Dec 2015

Physical diseases in last two years		**No. of respondents**				
		Monthly	**Seasonally**	**Yearly**	**Rarely**	**Grand Total**
Ward	Bullapesa	8	11	2	2	23
	Burat	6	12	4	8	30
	Cherab	1	14	0	6	21
	Garbatulla	0	4	5	12	21
	Ngaremara	13	11	2	1	27
	Oldonyiro	2	35	10	22	69
	Wabera	21	18	5	6	50
Total		**51**	**105**	**28**	**57**	**241**

The results in Table 4.17 show the vulnerability of pastoral communities to disaster risks due to repeated exposures to drought and floods. It was found that human beings, livestock and assets suffer adverse effects when impacted by prolonged natural hazardous events. The respondents stated that strong winds were common at Merti, Cherab, and Duma Yamicha. Also, they noted that in Merti, the winds were stronger in 2016 leading to sand dunes and also attributed that to subsequent human respiratory diseases and kalaazar for animals. The psychological functioning of the Isiolo residents who lived in Isiolo was investigated in view of climate changes over time and adaptation rated from low to very high (Table 4.18).

Table 4.18: HH survey of respondents ranking of the prevalence of mental health living in Isiolo County

Native of the area	No. of respondents	Percent	Cumulative Percent
Low	167	58.0	58.0
Moderate	72	25.0	83.0
High	15	5.2	88.2
Very high	19	6.6	94.8
None	5	1.7	96.5
Don’t know	6	2.1	98.6
No answer	4	1.4	100.0
Total	288	100.0	

During floods waterborne diseases are common while during drought periods airborne illness are prevalent, FGD stakeholders asserted.

4.3 Discussion

4.3.1 Physical Predisposition to Hazards and Human Vulnerability

4.3.1.1 Physical predisposition to hazards

The flood and drought hazard data retrieved from secondary sources indicated that they are frequent and widespread in Kenya. Retrospectively, the data analysed from HH survey indicate that the probability of hazards reoccurrence is high. The floods were of high intensity, though the frequency was low. The data analysis shows the trend of wet and dry years. Also Isiolo County is relatively low-lying and prone to flooding with advance effect on the quantity and quality of vegetation of the county. Thus, analysing extreme rainfall data in terms of river flood defence systems has been used to identify high threshold for modelling extremes. The severity of floods is influenced by the conditions of the catchments, the infrastructure and the vulnerability of people. The disaster risk assessment used simple dynamic expression that risk equals occurrence of potential hazard multiplied by the vulnerability of the society.

Human sensitivity to floods and drought was assessed in terms of physical predisposition of communities and systems to potentially damaging extreme climate events and resilience to such events. The severity of the impact threats ranged from low risk-high security to high risk-low security (Figure 4.18).

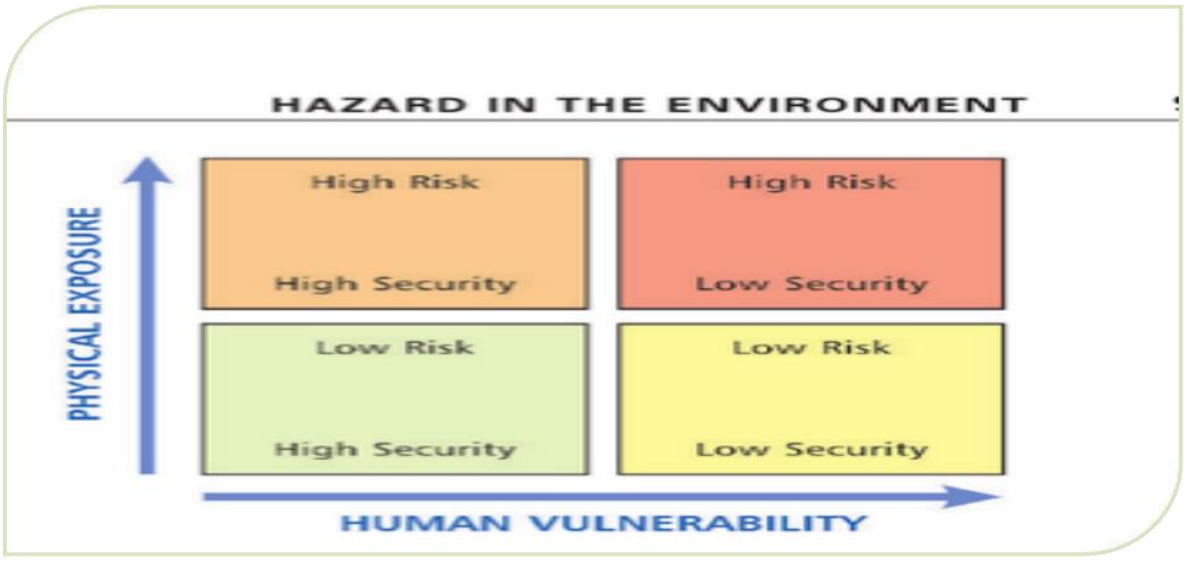


Figure 4.18: Environmental fragility matrix to natural hazard and human predisposition in relation to risk and security (Source: adopted and modified from Keith Smith, 2013)

The rainfall and temperatures parameters are beneficial to ecosystems up to a certain point. At the critical threshold beyond the 'normal' band of tolerance, the weather elements become a hazard (upper and lower damage threshold) (Smith *et al.*, 2014; Das *et al.*, 2013; Ghosh *et al.*, 2010; Davidson and Smith, 1990). Very high or very low rainfall band is deemed to create floods and drought disasters as illustrated in Figure 4.19.

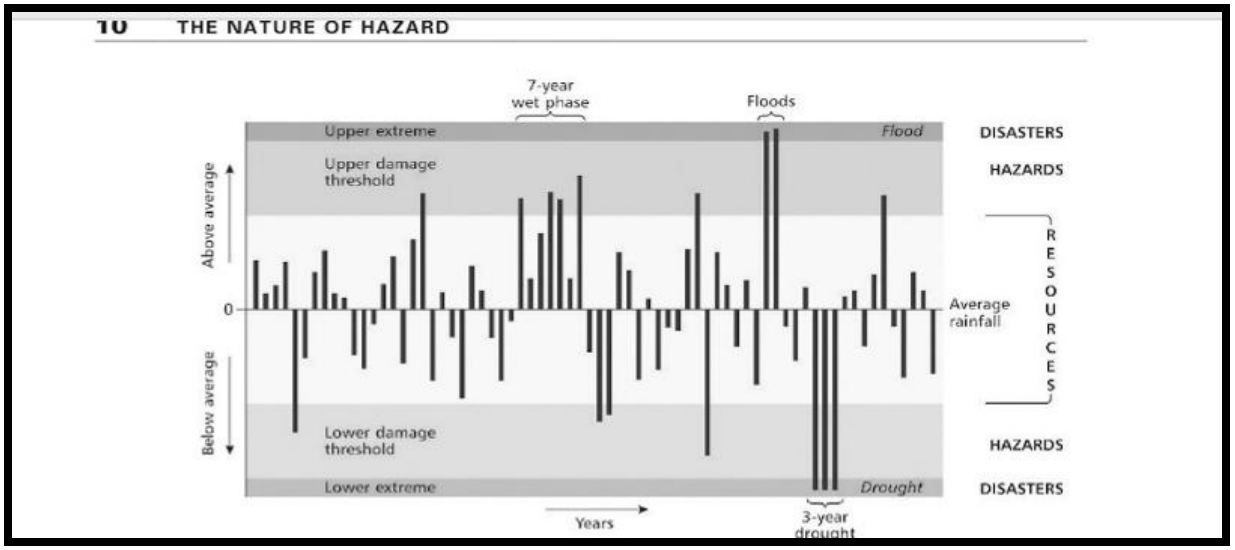


Figure 4.19: Sensitivity to environmental hazard and societal tolerance thresholds, (Sources: adopted and modified from Hewitt, 1983; Burton *et al.*, 1993).

The hazard magnitude is evaluated (Figure 4.19) depending on losses expected risk; probability of occurrence of potential damage hazard; serious disruption of normal societal functioning disaster; percentage of damage vulnerability threshold on vertical scale and the many years the vulnerability to disasters threshold is exceeded on horizontal scale. Over duration of time, frequent/intense but unpredictable weather variability and events around critical threshold may have much significance. The data analyzed shows the extreme events prevalence in Isiolo County by use of the sensitivity to environment hazards and society tolerance thresholds (Figure 4.19).

4.3.1.2 Progression of hazards to disaster risks

The flood and drought events were a threat to Isiolo residents due to the observed harm to humans. Majority of the respondents had lived in the Isiolo County for over 30 years (63.9%), hence experienced the changes in weather patterns and variability. Several attested to staying in potentially risky, high risk and low risk areas. The household survey respondents observed that their occupations are directly impacted by water related hazards contributed to by changing climate and variability. They noted changes in precipitation patterns leading to either increased floods in some seasons or prolonged drought in others which precipitated adverse effects of the disaster risks.

Keith (2013) asserts that the progression of risks hazards to disasters gauge uses two parameters: fatalities and socio-economic damage. Floods and drought disaster risks cause adverse effects to the community's physical and human health either in small to catastrophic scale (Steffen *et al*., 2013). Most of the sample population in different wards experienced floods and drought hazards. This is clearly illustrated in Table 4.1, where Oldonyiro is rated by respondents to be the highest

in disaster risks prevalence. The fatalities and socio-economic damage are used in this study for scaling hazard impacts into disasters as illustrated in Figure 4.20.

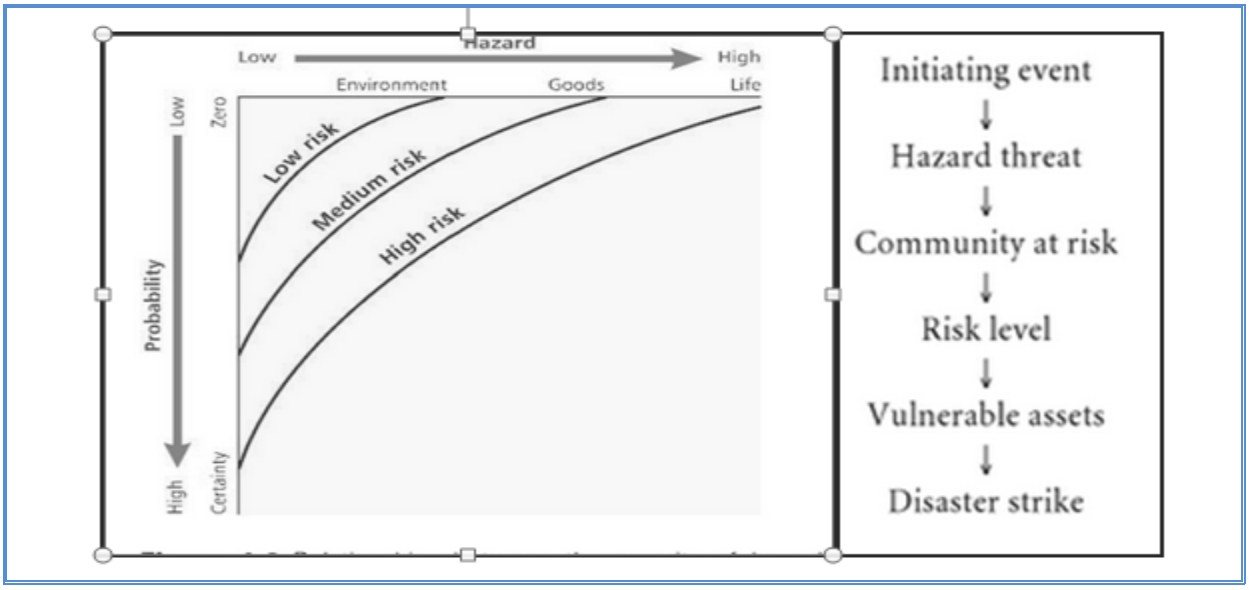


Figure 4.20: Evaluation of disaster risks socio-economic and fatalities in the community, (Source: Adopted and modified from Moore, 1983)

Most extreme climate events, such as severe floods and drought were monitored and recorded in Isiolo County from 1984-2013 and have a known probability of occurrence (ref. Figure 4.9). The level of disaster risk was high from the climate related extreme events; floods, flash floods, extreme heat and drought.

4.3.1.3 Human fragility to disaster risks

Possible impacts were recorded to quantify probability of loss and damage. Several factors analysed to evaluate vulnerability to the extreme climate events. The effects or outcomes of the disasters were one of the considerations. The vulnerability indicators analyzed were the age of the participants, the education level, occupation and types and patterns of settlements. The likelihood of several people left dead and injured and destruction from the disaster risks was rated 1 (IAC, 2010).

The adverse climate events pose psychological susceptibility to human environment because the disaster risks involved were greater than those with which the systems coped and adapted. For instance, crops were not able to withstand some drought situation, and below 250mm of rain seasonally, certainly all failed. The farming societies cope with different degrees of drought situations, but severe and repeated drought overwhelmed them due to famine. Flood events on the other hand, are seasonal, but come with roaring ravages on humans and the physical environment. The major erratic heavy rainfall, flash floods and floods occurrences are hard to foresee but residents of Isiolo County are tremendously affected for they are left homeless and destitute. This implies that most of the residents in pastoral communities were in constant movement to search for water and pasture for their livestock. It was established that movement from one place is an adaptation strategy to withstand extreme climate events impacts.

4.3.2 Floods Disaster Risks

Floods experienced in the Isiolo County are as a result of heavy rainfall or flash floods. Heavy rainfall causes flooding when watercourses do not have capacity to retain the water in the channel, hence overflows above the banks as runoff. The deluge is also caused by high rainfall on the upstream catchment areas around Mount Kenya and the Aberdares ranges. The main floods zones delineated in the workshop included Merti, Malkadaka, Garfasa, Isiolo Township, Modagashi, and Merille River. These areas have been reported as the most affected areas by floods in the county according to WRA flood monitoring over the year (WRUA who prepared the map during the JICA project, 2014). The flood problem was mentioned several times by communities during the FGD with the WRA monitoring team.

The slope stability is determined by type of rocks and land cover as indicated by Figure 4.27. Absence of vegetation cover (bare soil and open bush) in most of Isiolo County, makes the area prone to flooding, which leads to land degradation. The hills on either side of undulating ground make the area susceptible to flood. The hilly catchments accelerate flash floods downstream of River Merelli, and the hazard increases with decreased percolation, which causes increase in overland and river floods as reported by an earlier study (Ouma and Tateishi, 2014).

Flash floods are mainly experienced in Isiolo Central and Merti areas and also happen along the Ewaso Nyiro drainage though this is a blessing in disguise because they carry alluvial soils to the lower parts of Sericho. There is absence of flow control structures in the basin which has rendered the basin vulnerable to floods. The flash flood is a disaster risk which harms the human environment, especially temporary structures where there are channels paths for water passage or through inundation. Vegetation is overwhelmed by inundation when it occurs. Gully erosion is common, enhancing risks of landslides and threatening agricultural land, settlements and the environment.

4.3.3 Drought Disaster Risks

Significantly, droughts have been recorded in the County. The risk description covered the following dimensions: assigned probability of the event, consequences which were marked to be high and measure of the strength of knowledge that the probability was based on3.3.2.3 Data analysis pg. 55). The outcomes and scenarios were analyzed based on information gathered from household interviewees, focused group discussions and content analysis.

Drought and unpredictable rainfall were recorded as some of the climatic factors that underlying other key community vulnerabilities which are related to extreme climate events. Merti and

Sericho are the county's ASAL areas that are most impacted by severe famine. The temperatures recorded are high throughout the year, but vary in higher altitude areas in the county. Devastating drought and famine were experienced in 2017 in Isiolo County. The County is one of the most drought affected in Kenya, where drought experienced usually varies from moderate to extreme in intensity. The consecutive low rains experienced for three years sequentially resulted in high moisture deficits and degraded soils.

The local communities have little they can do to avert meteorological drought (Dai, 2011; Zhao *et al*., 2014; Nicholls *et al*., 2005). The drought events are escalated by drying up of surface and underground water mainly the shallow wells, boreholes, sub-surface dams and water pans due to the increased frequency of drought events in Isiolo County. Increased drought cycles have significantly contributed to the decline in the quality of life in study area. The frequent, intense and severe droughts damage the economic and social sectors affect (decrease) the adaptive capacity of the pastoral communities. This was supported in this research by the results of the Standard Precipitation Index analysis which revealed prolonged deficit in precipitation, high temperatures, and increased rate of evapotranspiration.

4.3.4 Disasters due to Climate Change Extreme Events in Isiolo County

The analysis outcome 1 indicates fatality of extreme climate events, and denotes a high degree of uncertainty distribution (3.3.2.3 Data analysis, pg. 55). The analyses are subjective to a measure of unpredictability conditions of some background knowledge K (the Bayesian perspective, people's perspective). The Inter Tropical Convergence Zone, El Niño southern oscillations and tropical cyclones Indian Ocean dipole are escalating climate emergencies in interior of East Africa (Graham *et al*., 2012; Graham *et al*., 2011). These have increased disaster risks, which

carries extreme impact to communities' socio-economic at large. Using qualitative confidence system IPCC expressed risk analysis the disaster risks range from medium, high and very high" (IPCC, 2014b). These concepts are utilized to interpret climate change scenarios and disaster risk. The conclusion therefore is that, there is high level of uncertainty in socio- economic settings and fatality and qualified the extreme climate events as high to very high.

Using IPCC guidance on risk analysis, the number of events during the study period were frequent and severe, for there were more months in a year experiencing drought. The habitats were destroyed leading to loss of biodiversity due to minimal water supply and subsequent impact to the economies: low crop yields and livestock production which interrupted businesses and livelihoods. In extreme situations, malnutrition, starvation and disease affected the pastoral communities.

The drought frequency, severity and duration models for long term forecasting needs to be improved in Kenya as a basis for efficient and effective drought management. Also, there is need for user-friendly comprehensive standardized qualitative and quantitative data, reports, and publication of updates of drought impacts on environment and socio-economic sectors to support policies, programmes and action plans.

4.3.5 Extreme Climate Events and Disaster Risks

The warming will continue to increase tropical cyclones which have been projected to alter Kenya's mean weather conditions, including the climate extreme events pattern (AEA Group, 2008a). Kenya projections shows that a general decrease in mean annual precipitation will occur during long rains of March to May causing drying out (ref. Table 4.10). On the other hand,

wetter conditions are likely during the short rains of October to December bringing inland heavy rainfall increased flooding (ref. Table 4.9).

The observed records in the time series indicate droughts are a recurrent feature in Isiolo County. Permanent change in variability and mean weather conditions have a possibility of triggering different types, frequent and severe extreme weather events. Increasing temperatures of about $1^{o}C$ will occur by the 2020s, and $4^{o}C$ by 2100 globally (AEA Group, 2008a; AEA Group, 2008b). The alternate drying and wetting in the country will increase in intensity floods, drought and severe high temperatures. Kenya is significantly vulnerable to extreme climatic events which have posed a significant risk and most disaster-prone countries in the world. Floods and droughts, are major concern with major droughts occurring about every 10 years, and moderate droughts or floods every three to four years (AEA Group, 2008a).

The research has shown that Isiolo County is clearly impacted by rainfall extremes and variability (ref. Figure 4.3). The losses arising from alternate floods and drought over many decades are enormous, amounting to colossal sums of money. There is compelling evidence that climate induced shocks have affected the pastoral communities, and droughts (sometimes severe) are the most frequent of climate incidents in most parts of the county. Other hydro-meteorological events are occasional heavy rainfall, floods and flash floods which pose significant risks to humans and the physical environment. These results are consistent with observed trends in the world (US Global Change Research Programme, 2014; Munich Re, 2013).

The pastoral households in Isiolo County are vulnerable in a number of ways as seen in the results chapters of this thesis since the natural resources relied upon by the poor are severely impacted (ref. Figure 4.9). The natural disasters consequences include crop failure, reduced

yields, low food intake and decline in level of nutrition. The livestock livelihood also suffers from low milk and meat production, depressing the purchasing power of pastoralists and increasing vulnerability to food insecurity.

The hard hit sectors of the economy are crop farming and livestock keeping among the pastoralist creating a ripple effect to other sectors. The scarcity of, or a lot of water and pasture increases inter-communal conflicts which in turn disrupt social structures and traditional coping mechanisms as a result of displacements. This is compounded by high poverty being experienced in the ASAL region which aggravates vulnerability and subsequently mental-related disorders. The identified climate related disasters with significant impact on health, drawn from the past records in Isiolo County, are summarized in Table 4.19.

Table 4.19: Disaster impacts Matrix and its implications

Disaster event	Impacts on land	Impacts on community	Human Implications
Drought / Extreme heat	Drying of vegetation, soil erosion accelerating environmental degradation, species extinction, sand dunes	Affects agriculture, endangering food security, constant movement, human wildlife conflicts-all are life threatening	Somatic diseases: Kalaazar, respiratory diseases, malaria, malnutrition, growth stagnation, heat rash, fainting, trachoma, scabies. Mental diseases: stressful traumatic experiences; grief, anxiety, adjustment, mood, dissociative disorders
Heavy rainfall / Floods / Flash floods	gully erosion, submerged terrain by excess water in gentle undulating slope areas	destroyed farmland, damage of homes and property, displacement of people	Somatic diseases: diarrhoea, typhoid, bacteria dispersion, malnutrition. Mental diseases: GAD, depression, paranoid feelings, social dysfunction, PSTD, ADA and other bipolar disorders

4.4 Conclusion

The analysis of risk scenarios in Isiolo County show that there are pronounced natural disasters such as heat waves, drought, heavy rains, floods, and strong winds. The harsh weather conditions

render communities vulnerable to natural hazards. The disaster risks lead to harm and loss of livelihood due to unpreparedness at local level. The capacities available such as livelihoods (crops, livestock, jobs, facilities (schools, hospital, temporally houses especially) and people's health and lives are ravaged by the disasters. The recurrent extreme events have increased hydro-meteorological hazards and the resultant scenario of disaster risks. Excess rainfall, floods, high temperatures and drought lead to adverse health impacts on human and animal populations. The disruptions to communities includes: displacement of people from homes, deaths, injuries, and destruction of properties and infrastructures. The pastures and water for humans and livestock use are also adversely affected leading to resource use conflict between different communities. Pollution of water sources is common in the study area, which was blamed for causing waterborne diseases. More findings show that weather changes are a triggering factor for waterborne and non-communicable disease outbreaks.

The alternate severe flooding and drought events impact on mental health and increase psychological traumatic situations. The worsening environmental situations lead to loss of homes and jobs, disrupting daily lives devoid of basic needs. The stability of pastoral communities is shaken by natural shocks, and pre-existing vulnerability profoundly impacts mental health wellbeing (Francois and Ashlee, 2014; Bourgue and Cunsolo, 2014). Disasters risks make communities to be predisposed to extreme climate events which they are susceptible to.

The extreme events sometimes lead to injury and devastating effects such as deaths and untold suffering due to incurred loss of property and livelihoods. The social cost due to internal displacement tears down the very fabric of community security. This eventually may lead to political instability and conflicts. The tribal and internal conflicts in Isiolo County may be threat

multipliers to climate-related emergency situations. The emergence of extreme climate events culminates to health risks such as cholera epidemic or malnutrition. These effects usually overwhelm the capacity of the communities due to unpreparedness and inadequate resources to offer the ever-needed support systems (Wisner and Adams, 2003). The sudden or gradual devastating conditions due to vagaries of weather and climate change increase technical and financial needs of the communities. A climate change related disaster risks database is necessary to advice policy.

CHAPTER FIVE: THE IMPACT OF CLIMATE CHANGE RELATED DISASTERS ON MENTAL HEALTH

5.1 Introduction

This chapter examines the impact of climate change related disasters on mental health. Mental disorders are health problems that significantly affect mood, thinking, behaviour and human interactions. The 2017 research study states that global burden of mental disorder estimates stands at 792 million people approximately one to ten (10.7%) (Hanna Ritchie and Max Roser, 2020) and the majority suffer from depression (WHO, 2014b). Mental health conditions cause 1 in 5 people yearly to live with disability worldwide (WHO, 2019). The chapter explores major psychopathology effects associated with climate risks and disasters. Some of these effects may include major generalized anxiety disorders, Alcohol and Substance Use/Abuse, Major Depressive Disorder (MDD), and Prolonged Grief Disorder (PGD).

Qualitative and quantitative study in the referral hospital in Isiolo County was conducted in order to explore the perception and experiences of the patient with mental illness and those who are not mentally ill. An in-depth understanding of complex processes of how people understand mental illness, recovery processes and social participation among people living with mental illness was examined (Karin *et al*., 2017). The summaries of the epidemiological evidence of how climate change related extreme event disasters affects mental health was analyzed. The findings correlate and collate mental disorders and climate change extreme event disasters. This is because disasters can lead to mental illness or exacerbate the degree of existing disorders for disaster survivors.

5.2 Results

5.2.1 Location and Characterization of Respondents

5.2.1.1 Age and sex characterization

The observations and in-depth interviews were conducted among 60 patients visiting clinics and hospitals to assess mental disorders related to extreme climate events. The males were 56.7% and the rest (43.3%) were females (Table 5.1).

Table 5.1: Respondent's characterization by age and sex in percentages

Sex	Respondents	Percent	Cumulative total
Male	34	56.7	56.7
Female	26	43.3	100.0
Total	**60**	**100.0**	

5.2.1.2 Cohort categories

The research study got responses from a wide spectrum of the cohorts from age 21-30 years and those aged 31-50 years, a very productive age. The younger and older age groups representation was approximately 2% each (Table 5.2 and Figure 5.1). The ages 21-50 are most likely to seek mental health services compared to adolescents and people with more than 51 years. The category of the cohort is further summarised above in Figure 5.2 to elaborate the details of the sample population.

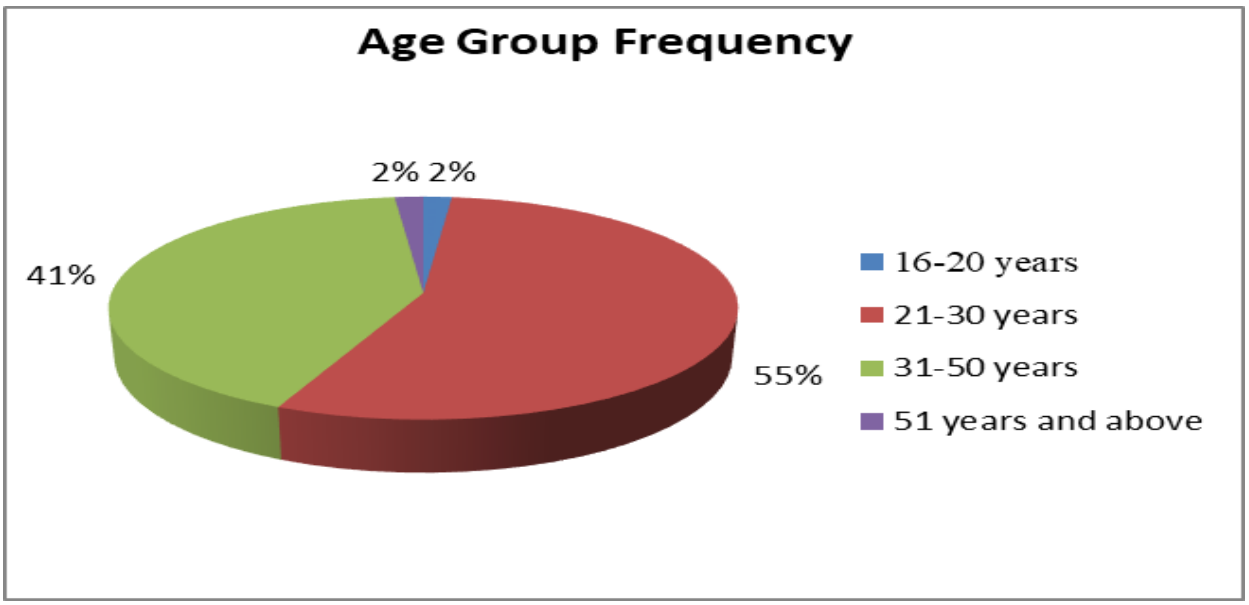


Figure 5.1: Percentages of age group cohorts' characterization (Source: ©Peninah, 2017)

5.2.1.3 Education level of sample population

The study found that the education level of the respondents was 1.7% with university, 31.7% had secondary, 50% with primary while 16.7% had no formal education (Table 5.4).

Table 5.2: Level of education

Education	Frequency	Percent	Cumulative Percent
None	10	16.7	16.7
Primary	30	50.0	66.7
Secondary	19	31.7	98.3
University	1	1.7	100.0
Total	**60**	**100.0**	

This finding is presented in simple bar graph in Figure 5.2.

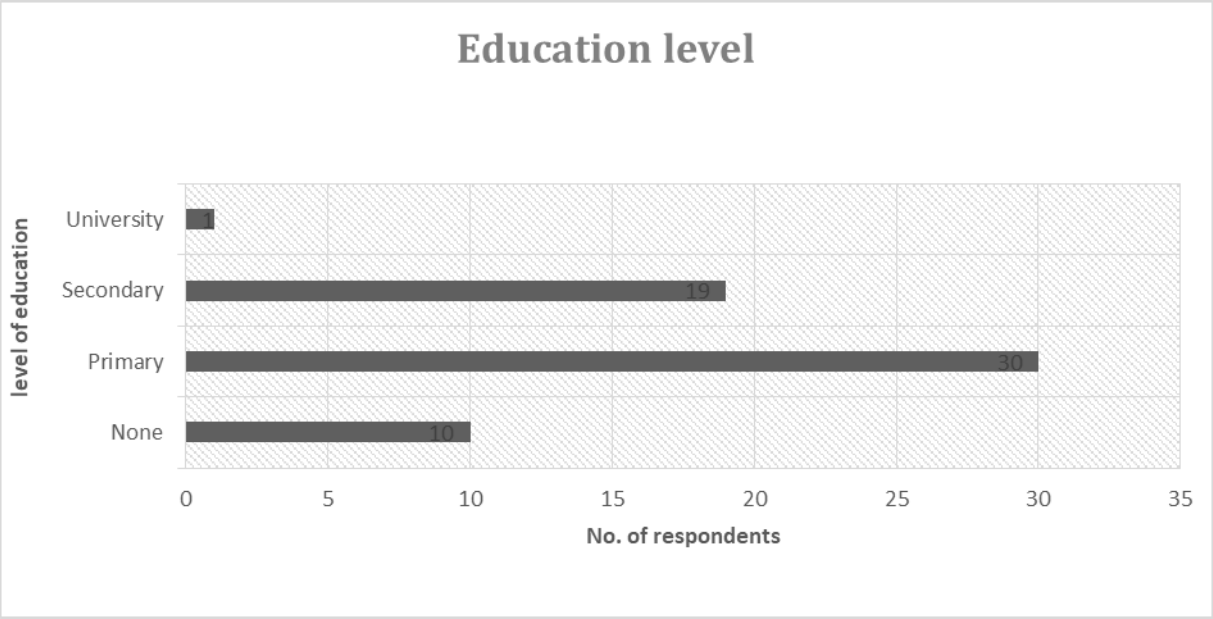


Figure 5.2: Respondents level of education (Source: ©Peninah, 2017)

5.2.1.4 Distribution of individual clients' mental disorder

The study findings show that majority of the 60 clients who were involved in individual counselling to assess and diagnose mental disorders were from Bulla Pesa (28.3%), Wabera (25.0%), and Burat (18.3%). The Cherab and Garbatulla wards had 10% and 5% respectively, with Kinna and Kulamawe each having 2% of the clients (Table 5.3).

Table 5.3: Distribution of individual clients' mental disorder in Isiolo Wards

Ward	Respondents	Percent	Cumulative Percent
Bulla Pesa	17	28.3	28.3
Burat	11	18.3	46.7
Cherab	6	10.0	56.7
Garbatulla	3	5.0	61.7
Kinna	2	3.3	65.0
Kulamawe	2	3.3	68.3
Ngaremara	4	6.7	75.0
Wabera	15	25.0	100.0
Total	60	100.0	

5.2.1.5 The location of the respondents

Most of the respondents lived in topographically depression areas which are affected severely by flood and drought risks (Figure 5.4).

Table 5.4: Characteristic of the physical landscape influencing exposure of respondents in Isiolo County

Landscape	Respondents	Percent	Cumulative Percent
Hilly	17	28.3	28.3
Plain land	34	56.7	85.0
Undulating	9	15.0	100.0
Total	60	100.0	

The populations living along the Merelli river valleys are vulnerable to floods due to the terrain (Figure 5.3). The area also largely experiences occasional flash flood, for it is surrounded by rugged topography of Mt. Kenya, Aberdare ranges, and Nyambene Hills, making the area enclosed, with a saucer pan topography.

Figure 5.3: Isiolo saucer pan landscape-derived from Google map and modified @ Peninah 2020

5.2.1.6 Usage of mental health clinics

The study results show that among the respondents who had visited mental health clinics, 53.3% were local residents while 43.3% were non-locals but who have been staying in Isiolo County for approximately ten years and above (Table 5.5).

Table 5.5: Clinic Services usage by the respondents

Users	Respondents	**Percent**	**Cumulative Percent**
Locals	32	53.3	55.2
Non-locals	26	43.3	100.0
Total	58	96.7	
No response	2	3.3	
Total	**60**	**100.0**	

The study revealed that among the residents who visited mental health clinics, majority were children (45%), adult male (28.3%) followed by adult females (26.7%) (Table 5.6).

Table 5.6: The categories of residents using mental health clinics

Type of clients	**Respondents**	**Percent**	**Cumulative Percent**
Adult females	16	26.7	26.7
Adult males	17	28.3	55.0
Children	27	45.0	100.0
Total	**60**	**100.0**	

5.2.2 Climate Change Related Extreme Event Disasters and Mental Disorders

The disaster risk impacts to human health are represented as disease at 11% and loss of human life at 3% (Figure 5.4).

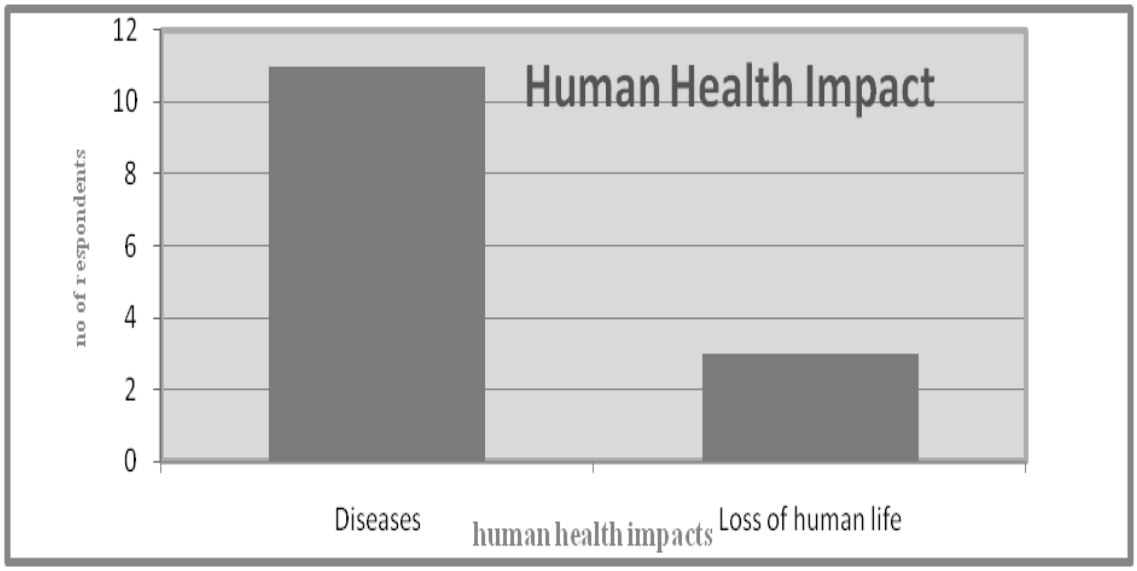


Figure 5.4: Impacts of floods and drought disaster risks to human health (Source: ©Peninah, 2017)

5.2.1.1 Major mental disorders categories

Interviews with the nurse psychiatrists revealed that they had in-depth counselling sessions with the 60 clients who manifested mental disorders incidents. Among them, 54% had anxiety, 32% had dissociative, eating and adjustment disorder and 39% had sleeping and substance use disorder co-morbidities or cryptic expressions as summarized in Table 5.7.

Table 5.7: Incidents of mental disorders among sample population from psychiatric observation in Isiolo County

Clients	**Disorders**	**Anxiety**	**Dissociative**	**Eating**	**Sleeping**	**Substance**	**Adjustment**
No.	60	54	32	32	39	39	32
Not indicative	0	6	28	28	21	21	28

Each disorder among the respondents was observed by psychiatric nurses where 45% respondents strongly agreed and 16.7% agreed that they had symptoms of Anxiety Disorder (AD). The generalized anxiety disorders observed among the clients were panic attacks, Posttraumatic Stress Disorder, Social phobia and Obsessive Compulsive Disorder (OCD) (Table 5.8). The psychiatric nurses concluded that anxiety disorder was the most common.

Table 5.8: Presence of symptom on anxiety disorders (Panic, PTSD, Phobias, OCD, and GAD) among the clients in Isiolo County

Client responses	Responses	Percent	Cumulative Percent
Strongly agree	27	45.0	50.0
Agree	10	16.7	68.5
Disagree	17	28.3	100.0
Total	54	90.0	
No response	6	10.0	
Total	**60**	**100.0**	

The anxiety disorders cryptic expressions and comorbidities are summarized in Table 5.9 below. The other most common comorbidities linked to anxiety with similar symptoms were Major Depressive Disorder (MDD), Substance Use Disorder (SUD) and Bipolar Disorder (BD). The psychiatric nurses and the researcher noted that anxiety spectrum disorders such as panic attacks, phobia, PTSD and OCD can subside over a period of time with rehabilitations and (or) treatment, which reduced worries and socio-economic burden.

Table 5.9: The comorbidities and symptoms of anxiety disorders among respondents

Types of anxiety disorder	Cryptic and behavioural expressions
DSM 5-300.02 or CD-(F40–F48)	Hyper vigilance, excessive fear repetitive
Obsessive-Compulsive Disorders	Behavioural disturbances
Panic disorders	Irrational or unreasonable fear thought
Phobias	Impulsive images
Post-Traumatic Stress Disorder	Intense fear and discomfort
Generalised Anxiety Disorder	Stress related disorder, substance use

The study findings in Table 5.10 revealed that about 7% of the respondents strongly agreed and 18% agreed that they were experiencin*g* signs and symptoms of dissociative disorder which are closely linked to historical traumas they have been dealing with especially during drought and floods. The pastoral communities in Isiolo are involved in frequent conflicts, and banditry behaviour. The researcher attributed this to high incidents of drought and high temperatures in

Isiolo County. The aggressive behaviour escalates the rate of criminology related to dissociative illness.

Table 5.10: Client responses to the presence of symptoms on dissociative disorders in Isiolo County

Client responses		**Frequency**	**Percent**	**Cumulative Percent**
	Strongly agree	7	11.7	21.9
	Agree	18	30.0	78.1
	Disagree	7	11.7	100.0
	Total	32	53.3	
No	Response	28	46.7	
Total		**60**	**100.0**	

The dissociative disorder is associated with increased rates of suicides and homicides, especially violence perpetrated by cattle rustlers who kill the pastoral communities mercilessly due to reduced resources, opportunities and fear of hunger, poverty and social shame as observed by the state respondents. Cattle rustlers aim to achieve restocking after loss of their animals to drought, diseases and losses to other rustlers. The summaries of the types and cryptic and behavioural expressions associated with traumatic effects of extreme climate events and variability are described in Table 5.11.

Table 5.11: The comorbidities and cryptic expressions of sample population with dissociative disorder in Isiolo County

Types of dissociative disorders	**Cryptic and behavioural expressions**
300.6-Depersonalization disorder 300.12- Dissociative amnesia 300.14-Dissociative identity disorder	Feeling of detachment-delusions from actions feelings, thoughts and sensations, unreal (de-realization), amnesia. Multiple episodes throughout, confused wandering Hallucinations and delusions, and men especially exhibit violent behaviours (Psychotic Disorders)

The low quality of life leads to poor low food consumption. The study found that 5% of the respondents strongly agreed and 13.3% agreed that they have eating disorder, as presented in Table 5.12.

Table 5.12: Eating disorders among the client respondents in Isiolo County

Client responses		**Responses**	**Percent**	**Cumulative Percent**
	Strongly agree	3	5.0	9.4
	Agree	8	13.3	34.4
	Disagree	21	35.0	100.0
	Total	32	53.3	
No	Responses	28	46.7	
Total		**60**	**100.0**	

The clients attested that families and children experiencing severe traumatic natural events have eating dysfunctionalities due to elevated levels of anxiety caused by migration and food scarcity. The other coexisting conditions were depression, substance abuse and anxiety disorders (Table 5.13).

Table 5.13: Eating disorder conditions and symptoms among the clients sample population

Eating Disorder	**Cryptic and Behavioural Expressions**
307.1 Anorexia nervosa	Poor appetite
307.51 Bulimia nervosa	Binge eating behaviour
307.50 Eating disorder not otherwise specified	

The study results presented in Table 5.13 show that 21.7% of the respondents strongly agreed and 31.7% agreed as having sleeping disorder. The therapists/ researcher attributed this to low quality of life associated with adverse climate related conditions which makes the respondents have hopeless and meaningless lives. The care givers associated sleeping disorders with poor nutrition, low socio-economic status and adverse health effects on the population. The sleeping disorders and co-morbidity are outlined in the Table 5.14.

Table 5.14: Sleeping disorder and associated cryptic expressions among the clients

Sleeping disorders	Cryptic and behavioural expressions
307.44 Primary hypersomnia 307.42 Primary insomnia 347.43 Narcolepsy 780.59 Breathing-related sleep disorder 307.45 Circadian rhythm sleep disorder 307.47 Dyssomnia NOS 327.03 Insomnia Related to Mood Disorder(ICD 9)	Uncontrolled need to sleep or not to sleep, lack of concentration, depressed mood and cognitive impairment

The survey among 39 clients as shown on Table 5.15 revealed that 21.7% strongly agreed and 5% agreed that they have issues with alcohol and other drugs related signs and symptoms as a result of floods and drought related disaster impact which threaten crops and livestock production systems.

Table 5.15: Substance–related disorders among the clients sample population in Isiolo County

Client Responses		Responses	Percent	Cumulative Percent
	Strongly agree	13	21.7	33.3
	Agree	3	5.0	41.0
	Disagree	23	38.3	100.0
	Total	39	65.0	
No	Reponses	21	35.0	
Total		**60**	**100.0**	

The survey revealed that 26.7% of respondents had polysubstance abuse (abuse of two or more drugs) of licit and illicit substances. Majority disagreed (38.3%) than those who agreed, though the study area has pronounced alcohol and drug abuse like Miraa chewing. These have precipitated clinically maladaptation addiction tendencies culminating to substance induced mood disorders-psychotic and major depression. Some drugs and substance abuse is illegal in

Kenya, hence most clients conceal the usage, hence most clients did not respond to the question on drug usage. This scenario is summarised in ICD F11-F19 Table 5.16.

Table 5.16: Mental illness and comorbidities of substance related disorder

(F10–F19) Mental and behavioural disorders due to psychoactive substance use	**Cryptic and behavioural expressions**
F1x.0) acute intoxication	Behavioural problems-craving for substance
(F1x.1) harmful use	Mental illness or perception dysfunction-addiction
(F1x.2) dependence syndrome	Physical illness from chronic use due to dependence
(F1x.3) withdrawal state	which result to nervousness, mood swings (euphoria or
(F1x.4) withdrawal state with delirium	depression) manic or hypomanic episode sleeping and
(F1x.5) psychotic disorder	eating disorders
(F1x.6) amnesic syndrome	
(F1x.7) Residual and late-onset psychotic disorder	
(F1x.8) other mental and behavioural disorder	
(F1x.9) unspecified mental and behavioural disorder	

The results presented in Tables 5.17 and 5.18 show that about 20% of clients agreed that adjustment disorders are related to flood and drought disasters. These can mimic other disorders such as depression, anxiety, personality and substance abuse as such few clients did respond to the illness.

Table 5.17: Adjustment /Developmental illness among clients in Isiolo County, Kenya

Client responses	**Responses**	**Percent**	**Cumulative Percent**
Agree	12	20.0	37.5
Disagree	20	33.3	100.0
Total	32	53.3	
No Responses	28	46.7	
Total	**60**	**100.0**	

Altered general wellbeing and subsequent seasonal affective disorder (type of depression) become common during rainy seasons. These are categorised and the comorbidities summarised (Table 5.18).

Table 5.18: Adjustment disorders comorbidities and symptoms among the client sample population

Situational Disorders	Cryptic And Behavioural Expressions
309.9 Unspecified	Reckless behaviour associated with high risk of suicide and suicidal behaviour
309.24 With anxiety	
309.0 With depressed mood	Agitation and impaired functioning
309.3 With disturbance of conduct	Misconduct; truancy, vandalism, fighting
309.28 With mixed anxiety and depressed mood	Withdrawal or social isolation
309.4 With mixed disturbance of emotions and conduct	Somatic complaints: general aches and pains, trembling and twitching due to excess worry

5.2.2.2 Vulnerability to flood and drought disasters

The primary assessment survey targeted 121 clients who attended outpatient section before segregating the inpatient mentally ill clients. The main triangulated responses among these clients are that, families are not able to meet basic needs and had no additional income from food and water thus exacerbating underlying vulnerability. When food and water prices increase, the livestock market also deteriorates due to the impacts of flood and drought. Besides, focused group discussion and key informant observed and highlighted that major climate change extreme events disaster impacts mental health as summarized in Table 5.19.

The water availability during drought eventually lead to meteorological, agricultural or hydrological drought. Isiolo County has major rustling prone areas of Attan, Nakuprat, and Kipsing 300 cattle stolen during drought and famine disaster 2016 -2017. The analysis was derived from NDMA, Isiolo bulletin summaries for three years shown in Table 5.20.

Table 5.19: Triangulated indirect impacts of floods and droughts disaster risks on Respondents (HH, KII, FGD) and client's mental health in Isiolo County

Floods	Droughts
• **Bio-physical** • Injuries, illness or death to people and animals • Soil erosion lead to development of deep gullies • Dangerous location especially near river valleys • Land is covered with boulders, debris and sand • Destruction of natural and planted vegetation • Protracted flooding destroys farmland • Disrupt supply of clean water and mostly water is contaminated. • **Socio-economic** • Marginalised community • Damage of livelihoods • Low income levels • Damage of infrastructure: homes and property, hospitals, schools, roads, bridges and electricity supply • Population displacement • Triggers epidemics especially water borne diseases	• **Bio-physical** • Illness, death of people and animals • Vegetation: some species are endangered, forest land is impaired and loss of biodiversity, decline in crop production, scarcity of fodder crops, • Drainage: reduction of surface water flow and depletion of underground water, scarcity of drinking, domestic and irrigation water, drying of water sources • Soil erosion and degeneration, gullies formation and eventually land degradation • **Socio-economic** • Loss of livelihood: death of livestock and widespread crop failure • Food shortage: some instances starvation, low nutritional nutrients, deaths and suicides • Socially, constant migration leads to family and community breakups, subsequently increases resource conflicts • Reduced school attendance by children

Table 5.20: Summary of livelihoods and drought situation analysis (Source: NDMA, 2016)

Early Warning Phase Classification for purposely random samples of selected months				
Livelihoods zones	EW phase	2014 Trend	2015 Trend	2016 trend
Pastoral all species	ALERT	worsening	worsening	worsening
Agro pastoral	ALERT	worsening	worsening	worsening
Casual waged labour	ALERT	worsening	worsening	no change
Firewood/charcoal	ALERT	worsening	worsening	worsening

5.2.3 Severity of Natural Disasters in Relation to Mental Disorders

Epidemiological methods were used to measure disaster related impacts on affected population and demands for health care delivery. The types and severity of post disaster injuries, illness and

death among outpatient and inpatient clients in Isiolo referral hospital for the period of 2 years (2014-2016) revealed the level of severity as summarized in Table 5.21.

Table 5.21: Assessment of vulnerability of clients to the disaster risks in Isiolo County

Age groups	Severe	Mild	Not so severe	Total
15years and below	3	6	3	12
16-20 years	6	7	2	15
21-30 years	20	7	6	33
31-40 years	16	4	9	29
41-50 years	11	3	5	19
51 years and above	7	3	3	13
Subtotal	**63**	**30**	**28**	**121**

The study found that among the sampled 121 direct patients attending psychiatric unit, 63 patients had severe mental disorders, 30 had mild mental disorders and 28 were not severe (ref. Figure 5.3). More than half of the clients (63) had experienced threatening disaster situations which impaired the quality of life and could not adjust without treatment.

Data in the Ministry of Health information for Isiolo County depicts that out of 3841 clients in the year 2014, 1169 had mental illness, while in the year 2013 among 2105 patients, 1156 patients had mental illness and in the year 2012 among 2591 patients, 2011 among 864 patients were mentally ill. The officer dealing with health systems information asserted that people suffering from mental illness were so many in towns and villages since not many of them get opportunity to access healthcare facilities. The summary of the above data for the clients who were investigated shows that somatic illness and mental health prevalence was very high in the County throughout the years. The most frequent physical illness and mental disorders reported

by psychiatric nurse's key informants during client profiling and summaries are shown in Table 5.22.

Table 5.22: Common physical and mental illness among the 121 clients sample population in Isiolo County

Physical	**Mental**
Respiratory infections especially Pneumonia	Mixed anxiety and depression
Diarrhoeal and typhoid fever	Panic disorders
Skin diseases	Manic depressive psychosis
UTI	Depressive episodes
Dental disorders	Drug induced psychosis
Ear and eye infections	
Road traffic accidents	

5.2.4 Trends on Annual Mental Cases in Relation to Total Annual Rainfall

The exposure to floods, drought and heat or cold waves extreme weather events directly or indirect pathways affects population adversely. The indirect pathways such as insufficient food may lead to retarded growth and development which can lead to serious mental health problems such as mental retardation and somatoform disorders, including increased suicidal tendencies. The correlation collated rainfall data and inpatient and outpatient facility data Isiolo psychiatric unit (Annex 15: April 2006-September 2015) enabled further deduction of the hypothesis. The time series in the Figure 5.5 show a bearing on mental disorder cases in relation to trauma exposure.

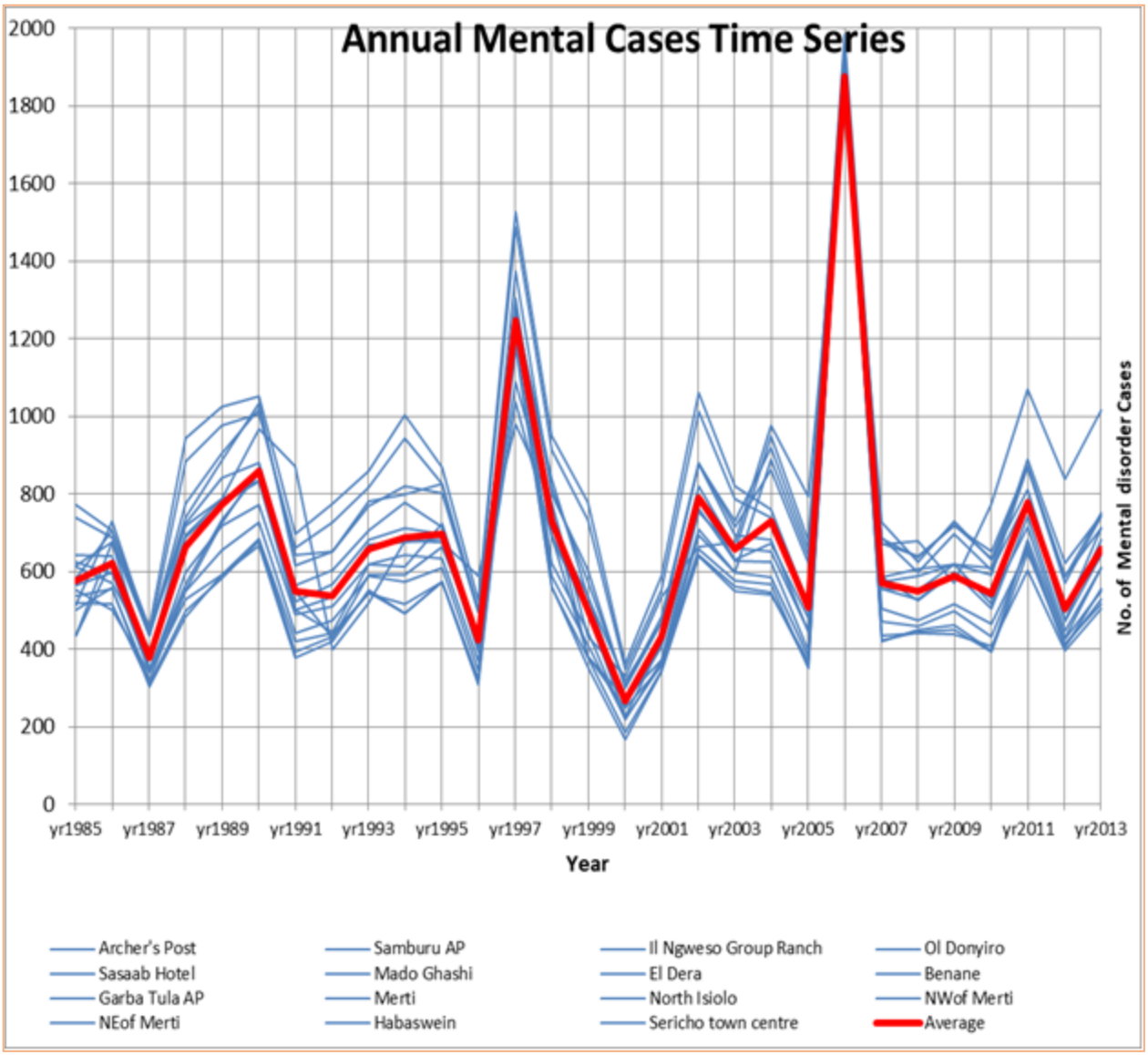


Figure 5.5: Trends analysis on annual mental cases in relation to annual total rainfall (mm) in the year 1984-2013 period (Source: ©Peninah, 2017)

The correlation coefficient for number of health cases and annual rainfall in Isiolo is very high (r = 0.99, Figure 5.6), providing robust evidence that climate, and rainfall in particular, is a major factor influencing mental health status of the Isiolo County residents.

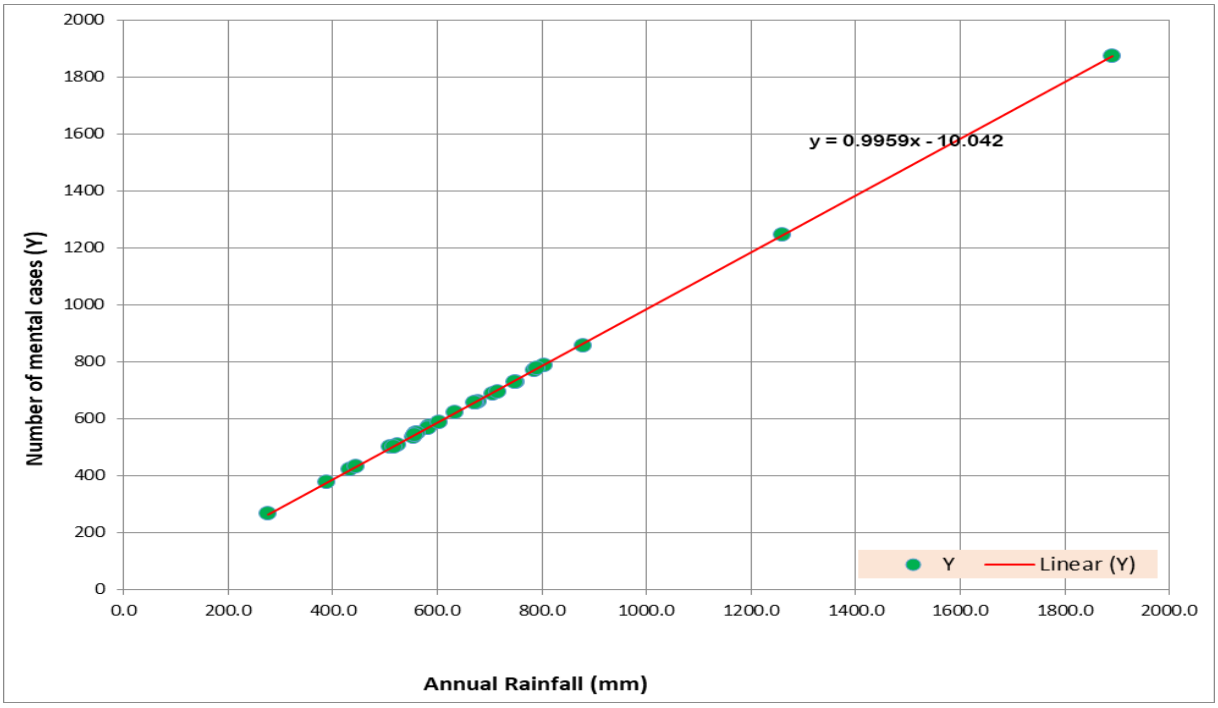


Figure 5.6: Regression of number of total mental disorder cases against total annual rainfall in Isiolo County (Source: ©Peninah, 2017)

5.2.5 Mental Health Mapping in Isiolo County

The Focused Group Discussion, Key Informants and public health dataset summary of mental health incidents of population at risk within the zones. The spatial cluster distribution was based on the scale rating 1-10 depending on main areas where individual clients resided and depicted by FGDs as shown in Table 5.24.

Table 5.24: Mental Health Incidents Summary

Areas affected	**Rating**
Isiolo town; Bulla Pesa, Burat and Wabera	10
Kinna/Garbatulla	5
Merti	5
Oldonyiro	3

The psychiatric/psychotherapy diagnoses analysis from 121 out-patients, 60 in-patients and Ministry of Health Information System-derived mental disorders data was synthesized by FGD participants who consented on all disaster risks psychosocial impacts on individuals and communities. Clusters ranking was agreed upon and single score given by the participants. Geographic Information System was used to map mental disorders incidents where flood and drought disaster impacts latent variable technique to represent the ratings. The weighted centroid (centre of mass) was joined to county shape to reflect the spatial distribution of mental cases (Figure 5.7).

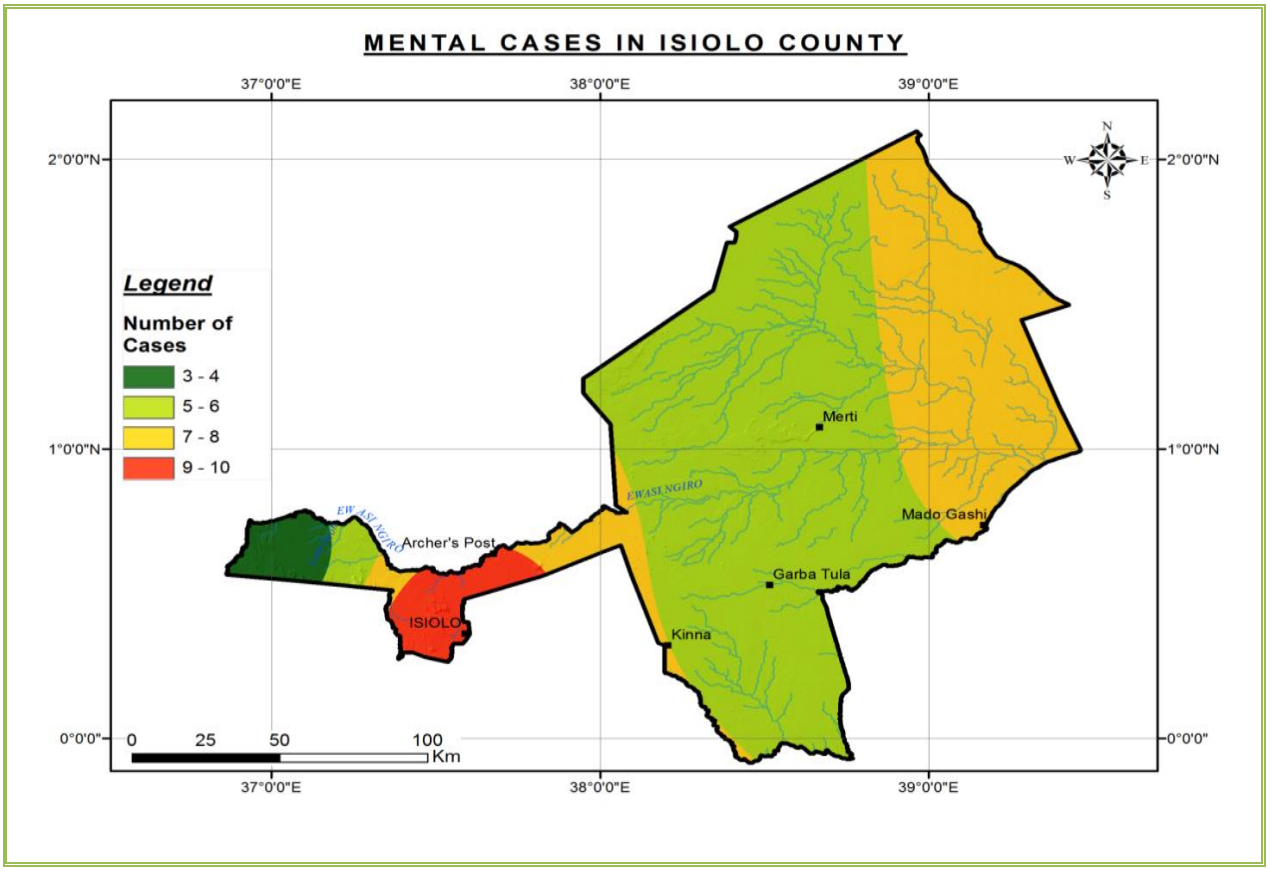


Figure 5.7: Spatial mental disorder cases mapping in Isiolo County (Source: ©Peninah, 2017)

There was no differential spread of diagnoses because they were closely related disorders and so they were more likely to occur. A structured process in the field community mental health

concept mapping involves analysis of qualitative information from quantitative data (Trochim, 1989; Trochim *et al*., 1995).

5.*3* Discussion

5.3.1 Characteristic of Sample Population

The study looked into details of the ability to survive events during time of a disaster. Most in-patient clients live on plain land (Bulla Pesa, Burat and Wabera), around Isiolo town see Table 5.3, pg.109). The male clients were more affected by extreme climate events than female clients, most of whom where between ages 21 to 50 years. The client responses were mainly from primary and secondary schools, meaning that they were more willing to seek for help in the health centre. The mental health clinics were used by locals and non-locals, where children and adults sought mental health services (see Table 5.5, pg. 110). The meta-analysis derived projections of mental epidemiology in the referral hospital from other clinics. The 121 out-patients mental health data was significant in giving the preliminary information of the users of the referral hospital. The out-patient, in-patient data and archival mental disorder data (2006-2015) was collated to get total annual mental disorder cases data and correlated to total annual rainfall data (1984-2013). Climate sensitive disease burden was measured against exposures to disaster risks (Henderson *et al.,* 2015). The physical health outcomes were very explicit and well understood in context of changing climate (Cunsolo *et al.,* 2018). Most of the respondents were not aware of mental or psychological illnesses. The impact of extreme climate events on mental health are minimally known by marginalised pastoral communities (Hayes *et al*., 2018; Obradovich *et al*., 2018), though a vulnerable group. The vulnerability of individuals to extreme weather events depended on the level of exposure and personal characteristics (Funk *et al.,* 2011).

5.3.2 Correlation of Disaster Risks and Mental Health

The research study assessed the severity of extreme climate events impacts on mental health. The extreme climate events are increasing vulnerability significantly in the area of study. The rainfall trends show increased or decreased magnitude, frequency and severity of extremes events. The disasters have damaged the livelihood and severely degraded the ecosystem vulnerability. The study established that the severity depends not only on the extreme risks themselves but also on predisposition and associated vulnerability (Clayton *et al*., 2014; Berry, 2010). It was noted that there is an increase in covariance (environment and health) risks due to ongoing and future climate change and the adverse impacts of such disaster risks which have increased in the 21st century (Paavola, 2017). A continuum of different factors may result to human health vulnerabilities. Hence, it was challenging to attribute mental disorders to extreme climate disaster risks due to pre-existing socio-economic vulnerabilities. The unsafe adverse effects of extreme weather have negative ripple effects on health outcomes.

The research indicates intensity and increasing frequency of drought and floods in Kenya. This is also a replica in Isiolo County where challenges are more pronounced and aggravated by persistent poverty and degradation of environment by alternate flood/flash floods inundations and recurrent drought. The study established that the severity depends not only on the extreme climate risks themselves but also on predisposition and associated vulnerability such as poverty levels. This was determined in chapter 4 where two frequent progressive extreme weather events were assessed.

a) Very low and high temperatures and rainfall derived from simple weather statistics computations.

b) Drought and floods hazardous events are more complex because they culminate to widespread famines, outbreak of diseases and eventual disasters.

Greater proportions of the human population in Isiolo County are being impacted by the climate related disasters as illustrated in Table 5.25. There were short term to severe prolonged droughts and floods and subsequent socio-economic vulnerabilities. The natural disasters progressively increase environmental stressors and eventually lead to psychological impacts when extreme event eventually becomes catastrophic disastrous event (Table 5.25).

Table 5.25: Mechanisms by which above average rainfall can affect health (Source: Adopted from WHO, 1999)

Type	Description	Potential health impacts
Meteorological	Extreme event: heavy rainfall, flash floods and floods	Increased mosquito abundance or decreased if breeding sites are washed away
Hydrological	River overflows its banks	Contamination of surface water
Social	Property including crops are damaged	Contamination of surface and ground water with faecal matter
Catastrophic floods/disasters	Floods leading to >10 killed and (or) 200 affected and government call for external assistance	Increasing risk of respiratory, allergies, cholera and diarrheal diseases, drowning deaths, injuries, psychological impacts and associated displacement of population

The construction styles with mud bricks and old house buildings are less structurally resilient, but vulnerable to heavy rains and floods (see Table 4.7: Types of homestead). The frequent flooding makes sewage systems and pipes design capacities to withstand inundation of storm deluge. The compounded risks escalate bacterial infections for household sanitation (disposal of hazardous, inorganic and organic solid or liquid waste) becomes unhygienic. When the semi-permanent and temporary structures provide insufficient protection from intrusion of flood water to affected population, this may generate cryptic expressions such as depressed mood and cognitive impairment, maniac and hypomanic episodes, misconducts and reckless behaviour and somatic complaints.

The progression of drought hazard to disaster is compared to WHO (1999) where psychological disturbances were cited as potential health consequences (Table 5.26). This is in tandem with the study which links the mental health consequences to a changing global climate such as drought (Morganstein *et al.,* 2017). The stipulated range of mental health are stress and distress, high risk coping behaviour such as alcohol use and other mental illnesses: depression and related mood, mixed anxiety drug induced, grief and stress disorders (Morganstein *et al.,* 2017).

Table 5.26: Mechanisms by which below average rainfall can affect health (Source: adopted from WHO, 1999)

Event	Type	Description	Potential health impacts
Drought	Meteorological	Precipitation is unusually low and unreliable	Increased mosquito or decreased breeding sites when washed away
Drought	Agricultural	Drier than normal, soil moisture is no longer sufficient for growth of plants	This depends on socio-economic e.g. supportive systems and structures
Drought	Hydrological	Reduction of underground and surface water supplies, food supply and income	Food shortage, malnutrition, illness (increased risk of infection and disease) associated with inadequate water supply for sanitation and hygiene
Famine	Catastrophic: socioeconomic capacity of people to survive is adversely affected	Floods leading to >10 killed and (or) 200 affected and government call for external assistance	Death due to starvation and malnutrition Psychological disturbances associated with displaced population

The study established that health impacts of drought was worsened by disease caused by malnutrition, climate triggers of famine, environmental degradation and conflicts due to related major emergencies. Also, heat stresses, indoor and outdoor air pollution from sand storms in Isiolo are stress related concerns. The prolonged dry conditions lead to shortage of water used for cooking and hygiene. Subsequently this increases risks of faecal contamination (diarrheal diseases); water washed (trachoma, scabies); vector breeding sites (malaria) and malnutrition related diseases (Table 5.23).

During drought, for instance, crop failure is inevitable due to low precipitation which prompt economic hardships. The individuals and communities were exposed to life threatening circumstances which lead to development of posttraumatic stress disorders. Stress exacerbated by loss of homes and property, ecosystems and loved ones make individuals develop psychological health problems such as grief or bereavement reactions or depression. This is indicated by increased rate of admission with people who have dementia, adjustment disorder, anxiety related disorders, mood disorders to mention a few (Table 5.19). Prolonged heat waves and cold waves can result to increase health problems aggravating pre-existing psychiatric pathologies.

The capacities of some pastoral communities to bounce back to resilience was another response to hazardous situations. Not all people affected by drought and floods developed mental disorders. Some section of the community could adapt by stealing animals during drought or move to parts of Meru County which is not affected severely by the extreme events. The people who were able to detect disasters prior to the events and adopt precautionary measures were able to withstand natural hazards. The psychosocial stressors can be minimised through raising awareness on effects of extreme climate events on mental health prior to catastrophic events.

5.3.3 Disaster Predisposition and Mental Health

The study assessed predisposition and vulnerabilities of sample population to disaster risks. The increased temperatures and precipitation were identified as exposure pathways to extreme weather events (Figure 5.8).

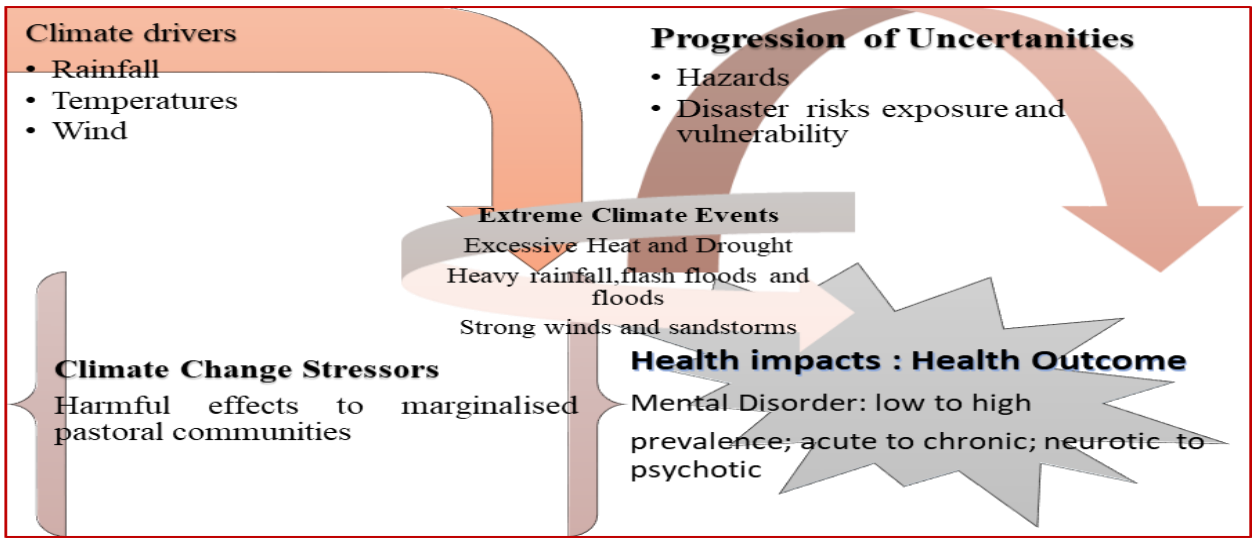


Figure 5.8: Assessment of climate change disaster risks impacts on mental health (Source: ©Peninah, 2017)

The level of exposure and vulnerability to hazards and (or) disaster determine mental disorders. These are Anxiety, Mood and (or) Personality Related Disorders (Figure 5.9) (Daniel *et al*., 2016).

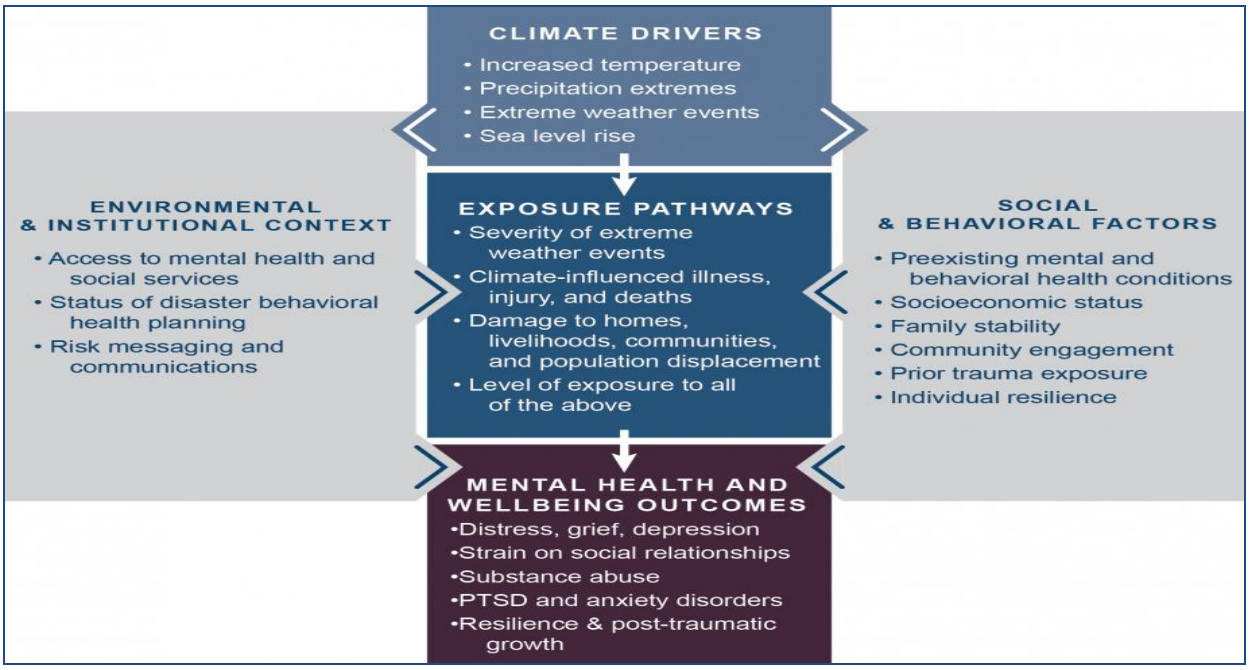


Figure 5.9: Impacts of hazards and disaster risks to mental health (Source: adopted from Daniel *et al.*, 2016; Crimmins *et al*., 2016).

A wide spectrum of impact of climate change includes physical, mental and community health (Figure 5.10). The exposure to the individual clients included the observed threats, the effects of the damages and the uncertainty brought by the extremities of the extreme climate events. These are summarised in three levels of psychological impacts: direct acute or traumatic effects of extreme climate events and environmental changes; indirect threats to emotional wellbeing based on observation of impacts and uncertainty of the risks and psychosocial effects such as migrations, conflicts as a result of scarcity of basic needs (Doherty and Clayton, 2011; O'Brien *et al.*, 2014). Susanta et al. (2015) asserts that, increased temperatures are likely to aggravate rates of agitations, recklessness, suicidal ideations and suicides and migration can lead to acculturation stress. The temperature rise increases physical illnesses, which secondarily is associated to psychological distress.

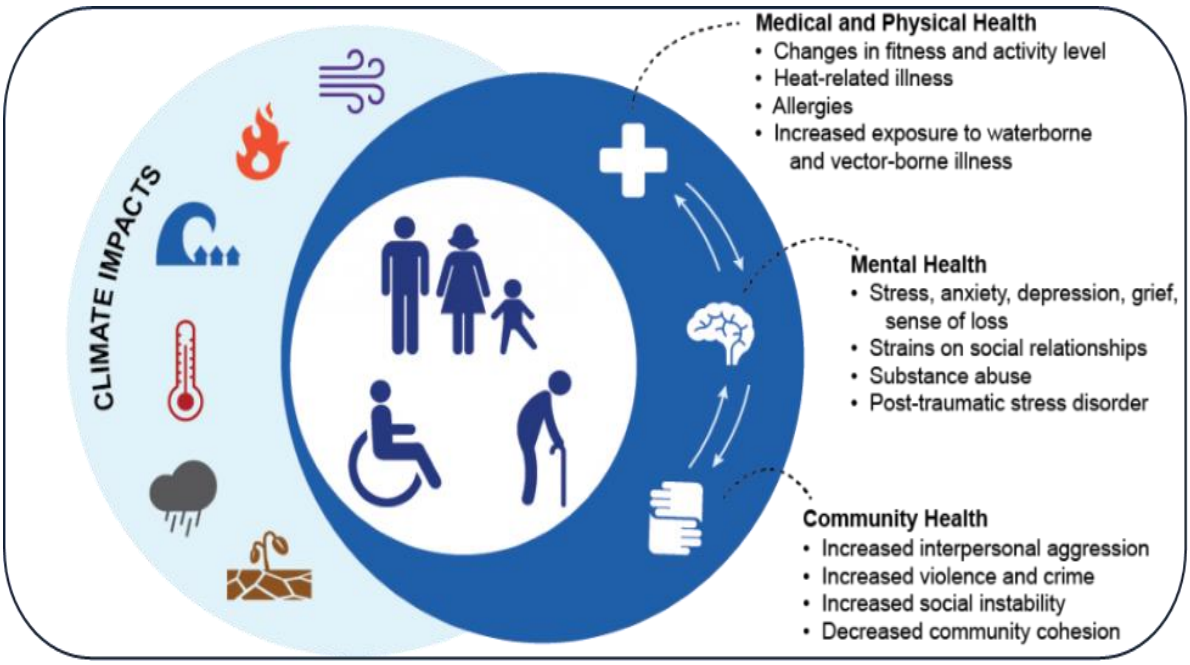


Figure 5.10: Illustration on how climate change impact physical, mental and community health in USA: A scientific Assessment (Source: adopted from Crimmins *et al.*, 2016)

The extreme climate events in Isiolo County ultimately led to rise in expenses of food and inability to purchase adequate food. Consequently, this leads to malnutrition and psychosomatic issues especially acculturation stress. “Migration of individuals and communities is related to acculturation stress is the genesis of psychiatric disorder” (client verbatim, 2015). Household vulnerability in Isiolo County has been exacerbated by flash and rain floods. The volume of water generated exceeds the streams capacity and causes high flow velocities damaging crops and properties. The communities living along Merelli River and undulating depression are susceptible to floods. The plain land and undulating area is prone to floods and occasional flash floods (see Figure 5.3: Isiolo saucer pan landscape-derived from Google map pg.110). The closer the water way the higher the vulnerability to floods because extra volume of water leads to overflow inundation and consequently disaster risks. The future is bleak due to projected likely increases in the frequency of extreme climate events e scenarios such raging flash floods and floods (Greenough *et al.,* 2001). Drought on the other hand is a complex creeping phenomenon and a major climatic hazard. Drought events recur often and in recent times prolongs to the extent that devastating impacts are felt among rural communities in Kenya (Anastacia, 2014).

Extreme environmental conditions cause disasters occurring in varied duration and spatial geographical location except drought which is slow-onset or creeping disasters (Tsegaye, 2016). These overwhelm the impacted communities for the immediate effects are intense and overstretch their capabilities to cope with extreme weather events.

The research evidence indicates that extreme climate events have affected human physical and psychological health in Isiolo County. The natural disasters, alternate floods and drought over prolonged periods, have negatively impacted societal and economic structures that underpin

mental health. The short and long term weather variability and extreme events increase predisposition and fragility of people and resources to disasters (Visser *et al*., 2014). The emergency situations as a result of disasters are characterized by chronic livelihood insecurity and long-term vulnerabilities. Significant increases in extreme climate events are linked directly and indirectly to detrimental human health (Glaser *et al.*, 2016). The progression of floods and drought risks and hazards to disasters were gauged using fatalities and socio-economic damage. The accumulated stress levels from adverse weather and climate events made the pre-existing psychiatric vulnerability become even worse in Isiolo County.

Epidemiological studies of prevalence and incidents of mental illness (generalised anxiety mood and ADA) have been inadequately undertaken in developing countries (WHO, 2017a). According to World Health Organization (WHO, 2000) the mental disorders related to climate change are estimated at 150,000, causing more deaths per annum globally. The prolonged stressors of climate change, especially environmental threats due to heat and drought, torrential heavy rainfall of high intensity, flash floods and floods have led to chronic mental health disorders in Isiolo County.

5.3.4 Mental Disorders and Comorbidities

According to the above summaries, mental disorders increase with increase in heat waves during dry seasons (Susanta *et al.,* 2015; Hanigan *et al*., 2012). Psychological distress is aggravated not only by drought but also by floods. The prolonged alternate psychosomatic effects of the extreme climate events take toll on communities at large. There is a high relation between high temperatures and aggressive behaviour, which also escalates the rate of criminology. This is also associated to rates of suicides and homicides, especially violence perpetrated by cattle rustlers

who kill the pastoral communities mercilessly (Focused Group Discussions verbatim, 2014). The family separation and breakdown due to displacements makes the situations more complex respondents. The stakeholders noted a range of disorders which are common among the community, from acute and transient psychosis to relapse of bipolar disorder.

The study determined other prevalent co-morbidity conditions among the clients with the following disorders: generalized anxiety disorders (GAD), alcohol and other drugs (AOD's), developmental or adjustments disorder, sleeping disorder (Insomnia), eating disorders (Anorexia and Bulimia nervosa) and Dissociative disorders (see Tables 5.11 and 5.12).

GAD is as a result of debilitating fear of natural disasters or life-threatening events. An earlier study reported that PTSD clients experiencing disasters impacts not only affects rescue workers (10% - 20%) but is prevalent among the clients (30%- 40%) (Javidi and Yadolahie, 2012). The behavioural and cryptic expression analyses were summarized as: flash back of the events, increased arousal, acute stress reactions, and avoidance of cues to the memory of the event (DeSalvo *et al.,* 2007; McMillen *et al.,* 2002). The view of respondents in the study acknowledged the existence of the correlation between the challenges of extreme climate events and mental disorders.

Post-traumatic stress disorder may have co-morbid problems such as: alcohol and substance use; feeling of shame, despair and hopelessness; somatoform disorders or physical symptoms (Maj, 2011; Maria *et al*., 2005). These may contribute to development of other disorders such as panic, social or agoraphobia, major depressive and various types of bipolar disorders (manias and hypomania). The New Orleans workforce, experiencing hurricane Katrina and floods disaster

risks respectively developed impairment in the quality of life and significant distress associated with PTSD (Susanta *et al.,* 2015; Tan *et al*., 2004).

The other major disorders which manifested themselves in Isiolo were behavioural illness such as: attention deficit and hyperactivity disorder, defiant behaviours, conduct disorder and criminal activity. The threshold of diagnoses depended on the intensity of trauma events in their lifetime and the support systems in the community (Javidi and Yadollahie, 2012). These were manifested in clients who were in age groups 20 years and below among the 121 clients investigated (See pg.118).

Situational depression was exhibited by abnormal and excessive reaction to an identifiable life stressor especially floods and drought in Isiolo County. These were notable due to more severe than normal impairment or maladaptive reactions in social, occupation and academic functioning (Obradovinch *et al.,* 2018; Hayes *et al.,* 2018). Persons had difficulty in coping with major life challenges or sources of stress such as natural events. The loss or grief leads to stress response syndrome or maladjustment*(technical term used in 2013 mental health diagnostic system) (DSM 5, 2013).

The feelings of stress, anxiety, grief, numbness, disbelief and worry during and after disaster are prevalent in Isiolo. Consequently, some individuals in the community have manifested increased anxiety, hostility and other maladaptive thinking, feeling, attitudes/behaviours. The signs and symptoms summaries are shown in Table 5.27.

Table 5.27: Common somatic and mental disorders signs and symptoms exhibited synthesis during natural disaster among sample population

Somatic signs and symptoms	Emotional signs and symptoms
• Physical reactions: headache, body pains, stomach problems, skin rashes • Worsening chronic health problems; diabetes, hypertension • Difficulty in concentration	• Feeling of numbness, disbelief, guilty, sadness, anxiety or fear • Changes of appetite • Low or no level of energy and activity • Difficulty in sleeping or nightmares, upsetting thoughts and images • Helplessness and hopelessness • Anger, short temper fares and Isolation • Increase use of substance use • suicidal ideations and suicides • Increased conflicts and aggression

The research finding established that clients had high level of symptomatology as indicated in Table 5.26. They exhibited several diagnostic categories of mental disorders. The most common psychiatric co-morbidity in Isiolo County included: distress, grief, anxiety and depression disorders. Other self-harming disorders are alcohol and substance abuse which mask as mood and anxiety disorders. The cohorts meet the criteria of "serious emotional disturbance". These disturbances are directly linked to immediate trauma from exposure to climate change related disasters (Jeffry *et al.,* 1999). Additionally, climate change impacts on social dimensions takes toll on the local community due to inequalities (Oxfam, 2018).

5.4 Conclusion

The rising global temperatures are worsening environmental conditions which are immediate and catastrophic. The extreme climate events such as cyclones in East African coast have increased climate disasters, which are a threat to human health. The stability of individuals and communities are shaken by climate shocks. Consequently, climate-sensitive health risks such as

food and water shortages, and vector-borne diseases, are worsening. Extreme climate events distress communities through disruptions such as loss of homes, properties and other types of livelihood. This contributes to anxiety disorders and increased use of alcohol and drug abuse to cope with stress.

The research indicates that there is scarcity of information on mental health risks as a consequence of increased hydro-meteorological related disasters in Kenya and more specifically, Isiolo County. There are existing natural hazards that can affect mental health namely; drought, heat waves, sandy storms, heavy erratic rainfall, floods and flash floods. These have profound long term effects on psychological wellbeing of the communities in ASAL area. The weather-related disasters have increased the vulnerability of already disadvantaged pastoral communities to future disasters. The pain, loss, worry, fear, confusion, distress and grief are symptoms of psychological mental problems exhibited by people exposed to extreme natural events in the community.

Severe and prolonged drought have serious effect on psychological ill health. The rise of temperature, increase heat waves and sand dunes which affect the population adversely. The harsh weather aggravates mental health: suicidal and homicide in Isiolo County. The aftermath of extreme events commonly affects adults who suffer from increased mental disorders such as adjustment, traumatic stress disorders, dissociative, prolonged grief and other co-occurring mood disorders. In turn, children may show anxiety, aggression, and behaviour problems (Simpson e*t al.,* 2011).

On the other hand, flood and flash flood experienced in Isiolo lead to flooded houses, affect individual semi-permanent and temporary settlements, disrupt domestic utilities, and force the

population to abandon their homesteads to higher grounds. These sudden weather events disrupt school, businesses and daily routines of pastoral households. The escalated anxiety especially panic attacks due to sounds of water, injury and death witnessed, impairs cognition, and leaves permanent emotional wounds that last longer than other impacts on health. The flood hazard vulnerability may incapacitate pastoral communities. The communities are thrown into crises emergency situations due to dangers of disasters leading to mental disorder.

It is imperative to invest in preparedness and the immediate aftermath of tragedies to marginalized and vulnerable communities who have been devastated by natural disasters. The integration of direct and indirect pathways is critical in mainstreaming mental health issues in all policies, legislations and action plans. These will assist in developing mental health and disaster management to improve programmes research and education. Other causes to mental health such as hereditary need to be assessed and isolated.

There is need to develop robust environmental health procedures to diagnose mental disorders and quantify prevalence of epidemiology through Health Information Systems. The mental disorder epidemiology data is critical information to plan and deliver effective climate change related health adaptation- mental health intervention to enhance adaptive capacity. The identification and assessment of adverse extreme events is amenable to greater preparation for, as well as mitigation and adaptation to disasters.

CHAPTER SIX: A STRATEGY TO MAINSTREAM MENTAL HEALTH INTO DISASTER-RELATED POLICIES AND PROGRAMMES

6.1 Introduction

The chapter examines the cognate between climate, natural disaster and mental health and assesses the efficacy of the existing and proposed policies and strategic actions during crisis situations. The role and effectiveness in management of mental health challenges in the light of climate change are also evaluated in this chapter. Systematic review of data and meta-analysis of attestation on the efficiency and effectiveness of programme intermediation was done during the key informant interviews, focused group discussions and household survey. On this basis, a context-specific and practical framework for actions that would lead to the intended outcome of this research (sound mental health in the Isiolo community - cf. diagram in Chapter 3) is presented.

On this basis, the chapter provides a schema for augmentation of eclectic, blended and end-user services requiring high skilled personnel. It presents for interconnected systems model of networking between national and county planners aims to provide linkages between disaster reduction, adaptation and mitigation, environmental management policies and programmatic interventions to deal with extreme climate change related disasters impacting mental health (Sunkel, 2012) of the vulnerable communities.

6.2 Results

6.2.1 Policy, Legal and Institutional Frameworks

Natural disasters related to extreme climate events are a recent challenge resulting to human suffering. The response to effect of climate related extreme events on mental health is rare and

preparedness is neglected. The national institutions are developing a solid base to tackle mental health to align with the comprehensive mental health action plan 2013-2020 (WHO, 2013). There are international, national and local 'systems thinking' to influence policy and research aimed at promoting mental wellbeing and motivate action on climate change related extreme events. Policy is necessary to direct mental health services on how psychological factor and social environment function through adaptation and mitigation measures. Effective and efficient institutionalized mechanisms for psychosocial interventions to deal with mental disorders arising from adverse climate change related extremes are a priority to affected communities.

6.2.1.1 The Kenya Health Policy (KHP) 2014-2030

The Kenyan Constitution spells out the need to cater for vulnerable populations within the society so that they enjoy the rights to health as per national and international obligations and commitments. The emergency treatment of the mentally ill is an essential and undeniable right. To this end, the Kenya Health Policy 2014-2030 contributes immensely towards achieving universal health standards (KHP, 2014) in line with global commitments of SDGs, Africa Union Agenda 2063, the Constitution of Kenya 2010 (article 43,1a) and Kenya Vision 2030 (see pg. 33).

6.2.1.2 The Kenya Mental Health Policy (KMHP) 2015-2030

The need to strengthen mental health systems in Kenya is critical in this policy. The policy and strategic plan direction are consonant with this research study objective which has highlighted priority actions as follows (KMHP, 2015):

i. The organization of Mental Health Services is vested in National Government.
ii. The Kenya Board of Mental Health shall provide overall oversight in mental health (established under the Mental Health Act Cap 248).

iii. The Directorate of Mental Health shall provide overall institutional leadership and coordination of mental health in the country in conformity with the Constitution (KMHP, 2015).

The policy recognizes and appreciates the global initiatives targeting non-communicable diseases including the emerging mental health concern. The disaster prone ASAL environments are said to be facing a unique health risk such as nutrition deficiency which contributes to unacceptably high levels of stunting (35%). Examination of the Ministry of Health Mental Health Policy indicates that there is need for awareness creation, capacity building and collaborative partnership in order to achieve its implementation at county and national level.

6.2.1.3 Disaster related policies

The 2010 Final Draft Policy for Disaster Management in Kenya institutionalizes and provides mechanisms for addressing disasters. This is in pursuit of reducing vulnerabilities to risks by establishing and strengthening disaster management institutions, partnerships, and networks. It also assists in mainstreaming disaster risk reduction efforts to help communities' cope with potential disasters associated with climate change by enhancing resilience, knowledge, skills and experience (Final draft NDMP, 2010). Therefore, Kenya urgently requires enactment and implementation of Disaster Management Policy, law, guidelines and plan so that emerging challenges and opportunities in relation to climate change and mental health can be tapped into at all levels. A functioning disaster management system will always have expanded opportunities in the following areas in order to benefit the mental health sector:

i. Psychological first aid at the health clinics and community level to people experiencing acute stress reactions after susceptibility to trauma of climate change.

ii. Psychotherapy and referral to psychiatric intervention of clients through the primary health care system to community establishments.
iii. Essential psychiatric medications consistent with drug lists at primary care facilities.
iv. Basic needs of patients in custodial psychiatric hospitals.
v. Comprehensive range of community-based psychological plans and programmes initiated in case of protracted disaster.
vi. Identify and register individuals with chronic illness for ongoing management.
vii. Designate to specific agency (ies) to coordinate programmes for individuals with chronic diseases (NDMU, 2014).

The National Disaster Management Centre, under the auspices of the Ministry of Interior and Co-ordination of National Government, was established by a Presidential Directive Letter ref. no.CAB/NSC/14/2/32 on 8th August 2013. Consequently, the Centre together with the stakeholders formulated a Draft National Emergency/Disaster Plan and Standard Operating Procedures (SOPs) that were adopted on 17th June 2014. These are anchored in the Medium Term Plan (MTP) Phase two of Vision 2030 to promote safety, security and protection of Kenyan lives and assets from the adverse impacts of hazards and disasters. The Centre offers leadership, command, control, and coordinated approaches to disaster mitigation, prevention, preparedness, response and recovery with other government agencies and private partners during any incidents in the country. There is need to strengthen the Centre operation by fully enacting the Draft Policy and Act in order to make an all-inclusive disaster management agency. The enactment will enable inclusion in strategic plans for mental health activities, provide a common basket for emergency funds, and invest in disaster research and sustainable mechanisms for effective risk mitigation and management.

The County Mental Health Council shall provide overall oversight to mental patients at County level. The National Disaster Management Centre coordinates national disasters and emergencies as per the Disaster Management Policy and related legislation. The Disaster Risk Management is ingrained with emphasis on emergency preparedness to ensure access to emergency care service by the affected persons (Final draft NDMP, 2010). This is remarkably a gap within the health and particularly disaster management policy. National health and disaster management frameworks are focused on monitoring of performance rather than development of the services at local level.

6.2.1.4 Climate change policies and strategies

The Climate Change Act 2016 was passed to address the adverse effects of climate change and concretize steps to domesticate the SDGs and the Paris Accord (WHO, 2019). The Act provides mechanisms and measures to reduce vulnerability and improve resilience by adopting environment and risk management practices. The Act provides for creation of a Climate Change Council, headed by the President, which gives policy direction on research and training. Also, the Climate Change Directorate is responsible for stakeholder's collaborations, mainstreaming and documentation of climate change initiatives as per the Climate Change Action Plan (Government of Kenya, 2018). The directorate should incorporate disaster prevention strategies and public health aspects that deal with mental health to enhance climate resilience and adaptive capacity.

The Green Economy Strategy and Implementation Plan (GESIP) 2016-2030 is a tool to enhance social inclusion, sustainable livelihood for all disadvantaged groups and reduce health risks. The resilience building embedded in GESIP aims to reduce vulnerability by integrating and

mainstreaming disaster risk management and climate change actions into sectoral development strategies (GESIP, 2016). The document recognises the big challenge of coordination of the environment and health activities and gives guidelines for intra- and inter-governmental policy coordination to build synergy and avoid duplication. The National Climate Change Response Strategy of 2010 has a component of climate change and health, but is weak in the disasters management and mental health aspects (Government of Kenya, 2010). The actions of mainstreaming climate change response mechanisms are yet to be integrated to tackle extreme climate events affecting mental health at county level. The National Drought Management Authority implements social related mitigation and adaptation activities related to drought while flood mitigation activities are solely implemented by the Water Resources Authority. The County Department of Environment and the National Environment Management Authority are in charge of implementing adaptation and mitigation action plans. Mental Health Action Plans are necessary to be mainstreamed across a number of line Ministries, Departments and Agencies (MDAs (WHO, 2019).

Also, details of the 2018-2022 National Climate Change Action Plan (NCCAP, 2018) are slowly being disseminated to counties due to the two-tier government setting requirements. The policies, the strategic actions and the related by-laws have to be aligned to each other. Isiolo County is undergoing reenergised strengthening and mainstreaming climate change into the County Integrated Development Plan (Policy Brief, Issue 2018, 2). This will enable practical and sustainable effective mainstreaming of climate change and eventual enactment and establishment of the County Climate Change Fund Mechanism.

6.2.2 Programmatic Interventions

6.2.2.1 State and non-state actors

During the consultative workshops and focused group discussions held on 17th December 2015, the following were identified as vital stakeholders at the National and County levels:

i. Directorate of National Disaster Operation Centre (NDOC), under the Ministry of Interior and Coordination of National government
ii. Directorate of National Disaster Management Unit (NDMU), under State Department of Special Programmes, the Ministry of Devolution and Planning
iii. The Principal Secretary of the Ministry of Health
iv. The Principal Secretary of the Ministry of Agriculture, Livestock and Fisheries
v. The Principal Secretary of the Ministry of Environment, Water and Natural Resources
vi. The Principal Secretary of the Ministry of Lands, Housing and Urban Development
vii. Other ministries that may be co-opted on need basis
viii. Kenya Red Cross Society and other agencies on invitation
ix. UN-OCHA and other UN agencies on invitation

The National Disaster Operation Centre (NDOC, 1998) is the national focal point for coordinating responses to disasters in the country. The Centre operations are supported by expertise drawn from different Ministries, Departments, Agencies and Civil Society Organizations who are not committal for there is no binding legal structure. The main State and Non-State Actors (NSAs) which need to be devolved according to the key informants and FGD are as follows:

i. Ministry of Interior and Co-ordination of National Government: directly executed by NDOC, then to the County Commissioner, Kenya Army and other personnel.

ii. Ministry of Devolution and Planning, State Department for Special Programmes, directly executed under NDMU, yet to be devolved
iii. National Drought Management Authority (NDMA)
iv. Water Resources Authority (WRA)
v. Ministry of Health
vi. Ministry of Education
vii. Kenya Meteorological Department (KMD)
viii. National Environment Management Authority (NEMA)
ix. Ewaso Nyiro North Development Authority (ENNDA)
x. Japan International Cooperation Agency (JICA)
xi. Civil Society Organisations: Red Cross Society, World Vision, Food for the Hungry and Action Aid

There is urgency to build climate resilient health systems strategic plans to protect communities from extreme climate events. This is hindered by inadequate progress in multi sectoral collaboration (WHO, 2019). The climate adaptation action which is shared by ministries has not been domiciled in relevant ministries policies such as health and national disaster management policies. There is no memorandum of agreement in place specifying roles and responsibilities to aid implementation of health and climate adaptation programmes (KNAP, 2016). This is further hampered by inaccessibility of climate finance for health due to lack of information on opportunities and connection by health actors to climate change processes and lack of capacity to prepare country proposals (WHO, 2019).

6.2.2.2 Programmatic interventions for droughts and floods

The major intervention prevalent in Isiolo County is mostly limited humanitarian aid. The State and Non-State Actors normally offer short term interventions to save life and alleviate human suffering during and shortly after natural disasters have occurred. The adaptation interventions (advocacy, extension programmes) are implemented by a number of agencies, with the major player being the national government through the National Disaster Management Authority, Kenya Meteorological Department and National Environment Management Authority. These agencies are helping the vulnerable population to adjust to actual or expected climate change effects. The actions across the Ministries Departments and Agencies (MDAs) are meant to enhance socio-economic adaptive capacity of households and communities to increase resilience and reduce vulnerability. The mechanisms facilitating linkages, integration or mainstreaming of climate change information and data within the county planning processes across all sectors is needed. The simple bar graph below (Figure 6.1) illustrates how the (35) policy and decision makers interviewed responded to the question on whether or not policies and programmatic interventions with respect to psychosocial issues existed nationally and at the local level. The review indicates that policies and programmes exist, but have not integrated psychological intervention aspects.

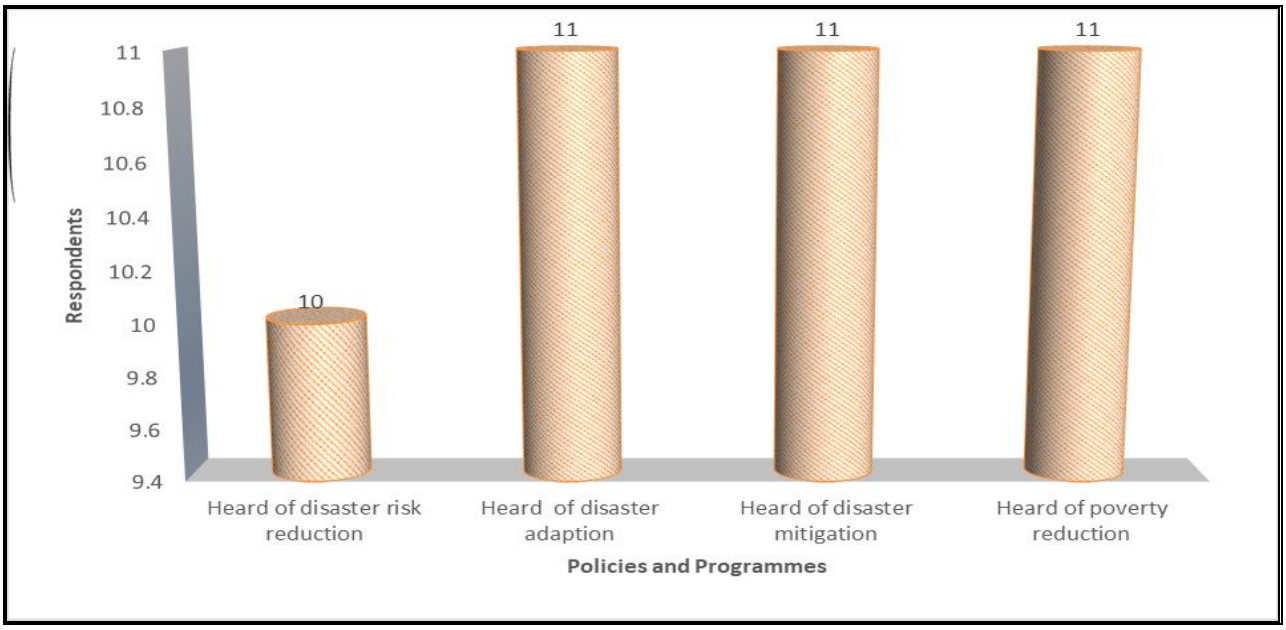


Figure 6.1: Policies and programmatic interventions with respect to psychological or mental health aspects. Total Number KIs= 35 (Source: ©Peninah, 2017)

6.2.2.3 Social programmatic interventions for climate related disasters

Most Isiolo County communities live with climate-related hardships and chronic poverty in an emergencies-oriented environment. The study indicated that loss of livelihoods due to climate-related disasters are common and have the potential to cause a greater risk of development of mental illness and other social problems at both family and community levels due to its effects of sliding the communities back to poverty. There are, however, various drought and flood related interventions in place as presented in Annex 14 and Table 6.1.

The social support (see Table 6.1) was evident from National/County governments and the Civil Society Organizations. During the field observations, it was noted that in remote areas of the county that experienced periodic acute drought, water trucking (e.g. in Odonyiro), shallow wells (e.g. in Garbatulla), and water harvesting (e.g. Kipsing water rock catchment) were adopted to ameliorate water shortages (Plate 6.1). On the other hand, some flood related programme

activities were also recorded in the area, such as opening of the channels, gabion and high bridge constructions (Plate 6.1, 6.2 & 6.3).

Table 6.1: Social and humanitarian programmatic interventions in Isiolo County (source: ©Peninah, 2015)

Type of intervention	Implementer
• Food Interventions • Provision of timely food aid to vulnerable households • Expansion of Cash Transfers/Food to those who are Food Insecure • Food assistance to conflict affected areas • Enhanced livestock market subsidy	• Currently supported by Kenya Red Cross Society and ACFs • County and national Government
• Non-food interventions • Livestock off take-slaughter / destocking • Repairs of the broken water pumps during drought • Drilled reserve boreholes in Sericho, Iresaboru, Dogogicha • Pre-positioning of fast moving spares in strategic boreholes and fuel subsidy to strategic boreholes • Peace building and conflict resolution intervention in Belgesh, Hawaye, Kinna, Garbatulla, Delbeq, Kom, Barchuma, Sabarwawa and Bassa • Purchase of livestock feeds to the core breeding herds Mass screening and medical outreaches	• County Government and National Partners/LVIA/NDMA/County Government • Peace Committees and Forums, County • National Governments/NDMA/ FAO/ Caritas Isiolo • County Government, ACFs, AAK, KRCS, Government • Doctors of the World, UNICEF and NDMA

a) Kipsing water catchment **b) Odonyiro Water Supply Trucks** **c) Water search at shallow well at Garba-tulla**

Plate 6.1: Drought programmatic interventions in Isiolo County

a) Bridge being constructed along Merille River b) Gabions put up as diversion of floods at the airport

Opening up of flood channels along airport fence by Isiolo; d) Gabions built to reinforce the fence at Isiolo Girls Secondary school.

Plate 6.2: Floods programmatic interventions in Isiolo County

Plate 6.3: a) Left: Residents repairing gabions along Merille River; b) Right: Residents scooping mud from affected houses along Merille River.

6.2.3 Floods Programmatic Interventions in Isiolo County

The humanitarian organizations such as Red Cross, Food for the Hungry (FH) and Action Aid deal directly with vulnerable populations to support them in terms of awareness creation, improvements of infrastructure, and resource management capacity when exposed to the risk of climate change. Conversely, clarity about all of these may provide a unifying focus for practices which can take into account food, health and water needs. From the data analysis of household survey, FGDs and workshops, psychological interventions as part of adaptation responses during

drought or floods related crises are very limited (see Table 6.10 pg. 159). The study community, therefore, recommends consideration of the same for improved future planning and interventions.

6.2.4 Policy and Programmatic Gaps: Results from the Field Study

6.2.4.1 Level of awareness of policies and programs

The Key Informants (KIs) stated that vulnerability to disasters is caused by wider environmental, social and economic factors that affect communities' health systems in the study area. However, only 42.3% of the KIs acknowledged the existence of policies and programmatic interventions related to health and disaster management but noted that they were fragmented due to failure to mainstream the aspects of climate change, disaster management and mental health. A paltry 19.2% of the KIs reported that there were no such policies and interventions in existence, while 30.8% said that they were not aware of them as depicted below in Table 6.2. Most of the KIs surveyed retaliated the need for an effective policies and intervention opportunities at the grassroots level. The tracking process of human health and climate survey report asserts that most countries are not prioritizing nor fully implementing national health and climate strategic plans (WHO 2019).

Table 6.2: KI awareness of policies and programmatic interventions to address mental health

Are there any policies and programmatic interventions to address mental health?	No of KI	Percent	Cumulative Percent
Yes	11	42.3	42.3
No	5	19.2	61.5
Not aware	8	30.8	92.3
Total	24	92.3	100.0
No Response	2	7.7	
Total	**26**	**100.0**	

The researcher ascertained that there are only two psychiatric nurses serving the whole County. The WHO GHO data (2011) painted a grim picture of 0.19 psychiatrists, no nurses, 0.01 social workers, and no psychologists working in the mental health sector per 100,000 people in Kenya. According to WHO GHO (2011) on mental health, there are existing governance tools such as legislation and plan of action (WHO, 2018c) but implementation of mental health policy is still lagging behind. Minas (2009) in his journal, International Observatory on Mental Health System (IOMHS) cites capacity of partner organizations and networks as being crucial in provision of evidence based planning, implementation and monitoring of mental health activities and upscaling. All stakeholder forum participants who were engaged during the field work period had limited knowledge of mental disorders due to the challenge of low awareness and capacity. 34.4% of the KI respondents reported that there are specific policies and programmatic interventions on mental health, disasters and climate change. In addition, 15.6% of the KIs noted there is no integration of mental health in other sectors (Table 6.2) while 22.8% supported the need to establish urgent linkages between health and environment issues for holistic management approaches (Table 6.3).

Table 6.3: The number of respondents agreeable to integrated policies and programmatic interventions

Are there any policies and programmatic interventions to address mental health**?**		**No of KIs**	**Percent**	**Cumulative Percent**
	Yes	11	34.4	34.4
	No	5	15.6	50
	Not aware	8	25	75
	No response	8	25	100
Total		**32**	**100.0**	

6.2.4.2 Inclusivity of policies

Inclusive processes for policy and action plans are fundamental to blend views in order to achieve a consensual strategy that upholds scientific evidence as a basis for action. The inclusivity of the policies and programmes were reviewed, where 31.4% of the respondents asserted that they were not inclusive and 25.7% said they were inclusive. However, 20% did not understand the inclusivity rationale, hence omitted the question from their responses (Table 6.4). The need for inclusion of mental health in policies across the sectors was evident in cross analysis of the outcome in HH survey, FGDs, and KIIs.

Table 6.4: Inclusivity of policies and programs

The no. of Respondents	**Specific policies and programmatic interventions**	**Inclusivity of policies and programmatic interventions**	**Link to holistic approach to mental health illness**	**No response**
Total No.	9	11	8	7
Percentage	25.7	31.4	22.8	20

6.2.4.3 Gender mainstreaming and social stigma

Gender involvements require for 30% women participants in actions dealing with preparedness, planning and response during emergencies and disaster periods in all the policies (see pg. 139-140 on 6.2.1 Policy, Legal and Institutional Frameworks). This is not the case because, men are forced to migrate in search for water and pasture with livestock, while women walk for long distances to look for water and wait for rare humanitarian relief. 126 males and 143 females out of 280 HH surveyed (Table 6.5) agreed that gender roles are affected by natural disaster induced emergencies. The emergencies due to drought cause migration and floods cause displacement to communities coupled with food shortage and disease outbreak.

Table 6.5: Gender differentiated aspects of hydro-meteorological disasters from HH survey

		Gender		
	Responses	**Male**	**Female**	**Total**
Do hydro-meteorological disasters affect gender roles?	Yes	126	143	269
	No	5	6	11
Total		**131**	**149**	**280**

Another major challenge reported by the Key Informants is stigma and social exclusion of people living with mental disabilities. Self or societal stigma and discrimination is a huge barrier which deters residents of Isiolo County to seek mental health services as noted by 269 respondents (see Table 6.6). Cultural beliefs and perceptions also influenced the communities to conceal the details of their mentally ill persons. Such has indeed made mental disorders a silent epidemic in the County with potential to delay the start of appropriate treatment and recovery process.

6.2.4.4 Poverty and mental health care considerations

Poverty and low-paying informal employment were cited as hindrances to accessing mental health services as it made them miss out on essential prevention and the care services continuum. Inaccessibility of mental health services was made more complex by multiple costs of health care.

An overwhelming majority of the pastoralists (28.3%) and agro-pastoralists (30.9%) (Table 6.6) noted that the disasters affect the resources that they are reliant upon. They also stated that mental health services need to be included in the health care system and should be devolved to the local communities. Further, 269 of the 280 household survey respondents asserted that mental health is a very vital primary service (Table 6.6).

Table 6.6: Number of household survey respondents, classified by occupation, who responded that disasters do or do not affect the resources which they dependent on for their livelihoods.

		Occupation									
		Business	**Agro-pastoralist**	**Pastoralist**	**Casual worker**	**Employed**	**House-help**	**House wife**	**Student**	**Unemployed**	
Disasters affect resources	Yes	8	76	83	21	29	1	36	11	4	269
	%	2.9	28.3	30.9	7.8	10.8	0.4	14.5	4.09	1.49	100
	No	0	1	3	2	2	0	0	3	0	11
Total		**8**	**77**	**86**	**23**	**31**	**1**	**36**	**14**	**4**	**280**

6.2.5 Management of Mental Health during Disasters

6.2.5.1 Regional and international obligations

The 71st WHO World Health Assembly (WHA) adopted resolution WHA72.1 on the global burden of Non-Communicable Diseases and Mental Health (NMH) cluster emphasised on comprehensive approach across health and environment priorities (71st WHO WHA, NCD Alliance, 2018). The WHA asserts that multi-sectoral comprehensive coordinated response is necessary to address Non-Communicable Diseases (NCDs) from the health and social sectors at country level.

6.2.5.2 Co-ordination of mental health care during disasters

The study showed that among 24 institutions where KIs represented, 45.8% agreed there are policies that address mental health, though fragmented, 20.8% asserted there are none and 33.4% noted that they are not aware (Table 6.7).

Table 6.7: Institutional categories on existence of policies and programmatic interventions that address mental health

Institutional category *		**Any policies and programmatic interventions to address mental health**			
		Yes	**No**	**Not aware**	**Total**
Institutional category	CSOs	2	1	1	4
	Public	9	4	7	20
Total		**11**	**5**	**8**	**24**
Percentage		45.8	20.8	33.4	100

The study further found that mental health interventions have not been wholly identified in Kenya as a major health problem, either in urban or rural populations, hence targeted interventions are few. The major programmatic (health and non-health) interventions identified during HH survey disasters included: provision of food and medicines (50.9% responses), support by Council of Elders (27.1% responses mainly in rural settings), restocking (10.2% responses, rural settings only) and minimal rehabilitation services (11.9% responses, mainly urban setting) (Table 6.8). The humanitarian interventions in rural areas is higher than in urban areas because the biggest risks of weather-related extremes lie in rural areas of which is expected to be pragmatic in future. The quality of care during emergency periods is compromised more in rural areas like Garbatulla, Ngaremara and Oldonyiro due to remoteness and overcrowding.

Table 6.8: HH survey: programmatic interventions in rural and urban settlement

Programmatic Intervention		**Category of settlement**		**Total**	**percentages**
		Rural	**Urban**		
Interventions	Provision of food and medicine	16	14	30	50.9%
	Rehabilitation centre	5	2	7	11.9%
	Council of elders	15	1	16	27.1%
	Other interventions (restocking)	6	0	6	10.1%
Total		**42**	**17**	**59**	**100**

The household survey respondents were aware of programmes and existing relevant policies that included: Mental Health Policy (27.3%), Poverty Reduction Policy (18.2%), Climate Change Policy (9.1%) and Malaria awareness programme (9.1%) (Table 6.9). The researcher noted the need for Mental Health Action Plan to enable align the processes of implementation in regard to the relevant existing policies and programme interventions.

Table 6.9: Policies and programmatic interventions

Specific policies and programme	**Frequency**	**Percent**	**Cumulative Percent**
Mental Health Policy	3	27.3	27.3
Poverty reduction/alleviation strategy	2	18.2	45.5
National level legislations	1	9.1	54.6
Climate change policy	1	9.1	63.7
Malaria awareness and empowerments-trainings	2	18.2	81.9
		81. 9	
Total	**9**	**100.0**	

The Mental Health Unit is the only government institution offering mental health services in the whole of Isiolo County. The other government institutions that deal with climate change adaptation programme activities include: Ministry of Agriculture, Livestock and Fisheries; Ministry of Environment and Forestry; Ministry of Water and Sanitation; National Drought Management Authority; and other agencies. Their activities are sector-oriented with some weak collaborative links between relevant stakeholders. The local institutions, such as the Mental Health Unit, have little autonomy, and simply implement the policies of their parent Ministry. The Isiolo County government is developing policies to help in the implementation of County Integrated Development Plan. These are great opportunities that need to be explored since health services have been devolved.

6.2.5.3 Mental health interventions and cultural sensitivity

The efforts made by various Ministries, Departments, and Agencies (MDAs) highlights those communities at-risk due to natural disasters. There has been keen interest and capacity to partner with Government to reduce the disaster risk and help communities adapt to climate change challenges. This can be enabled by psychiatric and counselling psychologists working hand-in-hand with other health professionals. Psychological interventions to reduce distress for the mentally ill are scanty or there are no implementers as shown in Table 6.10. The stigma associated with mental illnesses is high, with only Isiolo Referral Hospital offering limited services.

Table 6.10: Psychological and psychiatric interventions in Isiolo County

Psychological/psychiatric interventions	**Implementer**
a) Treatment and or rehabilitation	• MOH, Isiolo Referral hospital
• psychotherapy: counselling and (or) bio-psychiatric approach	• Minimally provided
• psycho-education	• No psychiatrists, psychologists,
• provision of social support	doctors, social workers
• rehabilitation activities	• None
• survival skills, occupational and vocational training	• Provided by council of elders
• sheltered employment activities	• Minimally provided
	• Minimally provided
	• None
b) Advocacy	• None
• Public education: coordinate sensitization and awareness programmes	• Minimally provided
by use of various tools;- media and Information Education	• None
Communication (IEC) materials	

Provision of mental health and related services is necessary to stabilize individuals during times of duress. The study found that the services are being offered at different levels and small scale. The services at national level are at Kenyatta National Hospital, Mathari Hospital. Other level

five hospitals in the counties, Chiromo Lane Hospital and rehabilitation for Alcohol and Drug Abuse (ADA). These mainly specialize with ADA-related interventions, but other mental disorders and psychosocial support related to natural disasters are yet to be factored in programme interventions at county level. The co-ordination is a big challenge due to the number of services which need integration (see Table 6.10). This was very explicit in the household socio-economic survey where only 23.2% respondents agreed that there are mental health services available while 74.7% said there are none.

The study found that 54.5% KI respondents asserted that programmes were not integrating mental health services and 18.2% suggested the need to provide services directly to mentally ill persons in the communities (see Table 6.11). The responses to the question on the integration of mental health services (54.5%) was due to long distance the communities walk to reach the Isiolo Referral Hospital and the need to localise health services.

Table 6.11: Linkages to provide holistic approach of mental health services

		No. of responses	Percent	Cumulative Percent
	Directly provide for mentally ill persons	2	18.2	18.2
	Integrate the services	6	54.5	72.7
	Total	8	72.7	100.0
	No response	3	27.3	
Total		19	100.0	

6.2.5.4 Risk and emergency management based on Isiolo County Study findings

The study result showed that 67.1% of HH respondents ascertained that there is an urgent need for a risk and emergency management model to deal with emergencies of natural disasters as

shown in Table 6.12. The multi-disciplinary approach entails chain prevention and care services programmes are delivered by various para-professionals (community health workers) and professionals (psychiatrists, psychologists). Case managers are coordinators of integrated mental health and psychosocial risk management programmes to reduce costs, enhance holistic patient care, and improve outcomes.

Table 6.12: Number of household respondents who agreed on a risk and emergency model

		No of responses	Percent	Cumulative Percent
	Yes	194	67.1	67.1
	No	88	30.4	97.5
	Total	282	97.5	100
	No response	7	2.4	
Total		**289**	**100.0**	

6.3 Discussion

The research study considered the new policy environment and explored both threats and opportunities for integration of mental health services especially during emergencies and disaster-related interventions to extreme climate events driven by global warming. There is need to focus on mental health which has been given priority in policy at global and national level and provide a nexus to health and environmental issues. Interconnected partnerships can address the areas of health and social prevention and care services for the mentally ill and vulnerable. Appropriate mental health interventions during disasters are non-existent in Isiolo County. Most often mental health interventions are implemented to reduce traumatic stress as a one-off psychological debriefing and trauma focused treatment. These are not there in the country and also in the study area. Bio-psychiatric/psychological services in Isiolo County are also rare where social interventions and care for people with pre-existing mental disorders are considered.

6.3.1 Challenges in Implementing Mental Health Related Policies and Programmes

The WHO mental health policies and action plans have been embraced in Middle and Low Income Countries (MLICs), especially the concept of community-oriented policies. For instance, South Africa and Uganda are ahead of Kenya because they have comprehensive mental health policies covering all domains. The challenges noted in MLICs are that implementation of mental health is being hampered by limited budgetary allocation, low technical know-how, surveillance and research. These underlying problems apply to and have slowed the implementation of the new national mental health policy in Isiolo County. The community mental health prevention and care are dismal in Isiolo County. There is therefore need for more integrated community-based mental health services (de-institutionalized) to help the very needy pastoral communities in Isiolo. This will improve accessibility, availability and prompt response during emergency and disasters. The mental health policy can help speed up formation of new structures and modes of governance for mental health programmes and services.

The provision of mental health services is inadequate not only because of financial resources constraints but also insufficient appropriately trained skilled staff. The research study established that there are scanty psychiatric or psychologist personnel in Isiolo County; the whole population is being served by two psychiatric nurses. Limited access to mental health services is driving the need to develop different approaches to deliver services through community based mental health prevention and care (psychosocial-pharmacological interventions).

There is limited coordination of natural disaster at national and county level. This is attributed to shared roles between the two levels of government. The resource allocation to disaster management programmes in devolved government is not yet being utilized for the purpose due to

late disbursement and capacity challenges. There are loosely created multi-sectoral mechanisms on disaster preparedness, response and recovery at national level. The mechanisms rarely include psychological/mental health aspect as precautionary measures and assistance to people who are affected by natural disasters especially at the county level. Besides, disaster management plans are devoid of mental health aspects that can be applied to alleviate the suffering of people with mental disorders.

The major policies for MDAs (interior and coordination, special programmes and initiatives, health, environment and natural resources) overlap in services delivery hence the necessity for mainstreaming. Globally, almost all countries are undergoing policy making processes and transitioning to initial implementation stages of integrating mental health, climate change and disaster policies, action plans and programmatic interventions. WHO internationally leads on the inclusion components on health policies, including mental health policy which describes the major themes and actions (WHO, 2007). Also, WHO recommends the coordination mechanisms for mental health systems and programmes for state and non-state actors among the member states.

The National Disaster Operation Centre; Ministry of Interior and Coordination of National Government; and the National Disaster Management Unit, Ministry of Devolution and Planning work independently for there is no concrete operational action plan. This has sometimes paralysed operations of emergency and disaster management because the two ministries and agencies coordination is difficult. There is absence of a forward looking approach, which is necessary to fully integrate and action effective interventions, due to confusing roles. The NDOC and NDMU have been omitted in the structure of government making the situation more

complex in implementing policies and programs related to climate change, natural disasters and mental health, all of which are cross-cutting issues. The devolved system of governance is a huge challenge with established new and merged ministries, who have different responsibilities. The humanitarian activities carried out by county commissioners during disasters as directed by NDOC need to amalgamate the roles of NDMU at devolved lev el. Besides, devolution structures need to establish an enabling environment, to come up with legislations and policies to enhance implementation various upcoming programme interventions.

Mental health, disaster risks and climate change are multi-sectoral and require a multi-stakeholder participation. From the study, it was observed that few stakeholders are actively engaged in mental health initiatives and also, to a limited extent but this is expected to change as more players come on board. The County government of Isiolo recognises that few or lack of trained therapeutic personnel, limited rehabilitation centres and community outreaches have hampered mental health service delivery (Ndetei *et al.,* 2017; Kiima, 2010; Ndetei *et al.,* 2009).

The interviews conducted in six zones (Oldonyiro, Garfasa, Garbatulla, Merti, Kinna, and Isiolo town) (Table 4.1: Location of primary sampling sites) and field studies in other forums identified that the State and Non-State Actors in Isiolo County are not integrating and mainstreaming resilience and adaptation programmes to climate change related disasters affecting mental health across the County. The strategy, structures and actions of execution of the above are not yet well spelt out due to inadequate awareness at the grassroots levels. Isiolo County has not yet developed its own disaster, mental health and other related policies and strategic plans or cascaded the existing ones from the national level, to enable service delivery to grassroots groups. The FGDs noted that there were no integrated and holistic policies and practical

interventions. Patel *et al.* (2016) assert that global mental health is the 'most neglected of all human health conditions' and a 'failure to humanity'. The co-ordination is a big challenge due to the number of services which need integration.

Climate change concerns appear to be one of the drivers behind the changes in intervention approaches, such as resilience, disaster risk reduction and adaptation, which are gaining momentum among humanitarian actors (Mosberg *et al*., 2017). Few and random reactions to disasters are common practice, especially by the National and County Governments. These existing power structures determine who and where the resources are channelled to benefit the vulnerable groups and communities. Mosberg *et al.* (2017) asserts that power and politics play major roles in social interventions. The new funding opportunities for adaptation processes at devolved structures are not sufficient to fully implement interventions to address all disaster risks.

The glaring challenges noted by the stakeholders during Focused Group Discussions (see page 47, Plate 3.2) were evidence of violation of human rights (stigmatization, discrimination, maltreatment and marginalization) of people with mental and other social disabilities, and poor access to mental health services at local government facilities. The causes and types of mental disorders were not known to most of the key informants and the stakeholders who participated in the FGDs. Further, the public health system had only two practicing nurse psychiatrists in the whole of Isiolo County who were able to grasp the nature of mental disorders associated with climate change. A meta-analysis of available evidence showed that mental health diagnosis tools were not available to differentiate disorders from transient states of demoralization or grief, or from various physical illnesses. Besides, cultural taboos alienated the mentally ill; hence many of

them were confined in their homesteads. The mentally ill are perceived as a curse, hence ostracized and most of them are mistreated in their homes, community and health centres.

6.3.2 A Framework for Mainstreaming Mental Health Issues into Policies

According to the WHO World Health Assembly, 2018, the member states embrace mental health action plan to achieve universal health coverage and stressed on prevention, care and treatment needs of most the vulnerable population - the displaced persons. The global epidemic NMHs are increasing in areas affected by humanitarian crises as a result of natural triggered emergency situations (Ruby *et al*., 2015; US Department of Health and Human Services, 2002). The psychosocial morbidity has become apparent and hence the health professionals have to add mental health and psychosocial support component to the health services (Ruby *et al*., 2015; Tol *et al.*, 2011). The study established that there are four main areas stipulated by WHO: more effective leadership and governance for mental health; provision of eclectic, coordinated mental health and psychosocial services at community level; promote prevention, mitigation, response and recovery implementation strategies, and; strengthen information systems, evidence and research. This is in line with the World Bank and the UN Partnership Framework Agreement signed in May 2018 that shifts from crisis response and recovery to risk reduction and prevention.

The partnership framework further aligns countries in implementing the Sustainable Development Goals (climate change, goal 13) and post crisis humanitarian responses (UNISDR AF and CIMA, 2018). The UN Secretary General, António Guterres, remarked in 2018, *'Climate Change is an existential threat, with tools to make our actions effective, but still lack the leadership and ambition needed to combat the urgent crisis'*. Ingenious solutions to reduce

diseases and global poverty through engagement strategies to advance universal health coverage, and the response to emergency health crises and mental health (UNISDR AF and CIMA, 2018) is highly needed. Besides, UN encourages all stakeholders to take action to strengthen and clarify the legal and institutional frameworks that have roles for state and non-state actors through policy and strategic action plan documents. By laws and regulations that directly link climate change and mental health issues in Isiolo County are non-existent. Mental health response to climate change disaster events is in need of strong links for multiple deliveries of services. Support is essential from international, national, regional and local level to enhance disaster precautionary and response capacity during emergencies.

Mental health interventions are therefore in two tiers:

i. Inclusion in primary health care: the specialized professionals; the psychiatrics, doctors and nurses, and mental health psychologists can handle complex mental health cases.

ii. Community Based Mental Health Care: basic mental health interventions can be handled by first level providers (non-specialist health workers - NSHWs) who have general mental health training: teachers, counsellors, Community Health Workers and other para-professionals. The second level is professionals with health roles (PHRs): teachers and community level workers who play a significant role in promotion and detection of mental disorders. The use of non-specialist interventions is cost effective and has high impact outcomes (Lesley, 2016; Van *et al*., 2013).

Table 6.13: Programme interventions in the aftermath of disasters, (Source: Ryan *et al.,* 2014)

	Programme Interventions	**Target group**	**Need assessment**	**Professionals**
1	Psychological first aid (PFA)	Most of the people who are affected	Restoring immediate contact with loved ones	All responders and aid workers
2	Community development	Communities after large-scale events	Schools, sports, meetings, newsletters to unite groups of people	All responders and aid workers
3	Skills for psychosocial recovery (SPR)	People whose distress is sustained by bereavement or secondary stressors	Brief needs assessment Problem-solving Social support	Healthcare practitioners and workers trained in the skills
4	Psychosocial interventions for medium- and long-term problems	People whose distress is sustained and associated with functional impairment	Trauma-focused cognitive behaviour therapy	Staff of mental healthcare facilities

To reduce the mental disorders, effective and efficient community model programmes ensure multi-stakeholders stewardship. Also, capacity and professionalism strengthening of community health workers is key to deliver mental health outcomes as part of Universal Health Coverage-UHC (Table 6.13). This also calls for frequent inventory of services provided and their accessibility to the poor, disadvantaged and vulnerable during disaster. A database on empirical research for climate change related extreme event impact on mental health relationships is necessary to inform strategic interventions to reduce environmental risks. Equitable access to UHC includes mental health services which have meaningful community engagement in humanitarian settings. During tragic emergencies due to adverse natural disasters, not everyone is reached with mental health services. This is either because of remoteness, stigma, limited services, little data on MH and lack of screening or reluctance of attending the available referral hospital. This has led to a huge gap in data on the burden of mental disorders which is critical information for the delivery of effective interventions.

The study established the limited nature of multi-disciplinary linkages among the main cross-cutting issues warranting mainstreaming of climate change, hydro-meteorological disasters and mental health. The major policies, action plans and programmes have to be aligned to be able to develop effective precautionary and support services for the mentally ill affected by natural disasters.

According to Poljanšek *et al*. (2017), if societies make a choice to co-exist with a hazardous environment, they must translate the policy outcomes into action to effectively mitigate or reduce the risks and facilitate their ability to cope with, adapt to, recover from, and learn from disaster experiences. Disaster risk management conceptualizes how constituent policies, strategies and practices intended to manage risks arising from interactions between people, environment and natural systems hazards including climate (Twig, 2015). The risk management cannot be handled by a single discipline, but rather multi-disciplinary and holistic scientific approach mechanism is needed to moderate the impacts of natural hazard risks; speed recovery and reconstruction (Poljanšek *et al.,* 2017).

The Kenya Mental Health Policy 2015-2030 is a blue print on mental health services which have been neglected for many years. The integrated policies and action plan provide a framework for planning action and development with explicit reference to managing the impacts using DRR and climate change adaptation. Mental health mechanisms relating to floods and drought are not yet devolved from national to county level in Kenya. The study has revealed the need to have in place a national disaster management policy so that vulnerable communities under climate change risks can be shielded from exposure risks. Further, both national and county governments should develop and mainstream Mental Health and the draft Disaster Management Policy and

practices for public and private sectors. The Disaster Management Action Plan provides an important step towards ensuring that the actions outlined in the Policies are addressed systematically and effectively. This will ensure rapid progress towards implementing mental health precautionary and supportive services at community level (ADPC, 2017; ADPC, 2006).

In order to implement robust mental health services during natural disasters, it must initially be mainstreamed in policy planning and budgeting processes both at the national and county level. A good example of such entails embedding mental health policies and initiatives in County Integrated Development Plans (CIDPs) as well as Sector Plans linked to the annual budget process. The national government has been implementing the multi-year medium term expenditure framework (MTEF) since 2000/01. This provides the framework for linking the mental health and disasters related to climate change into strategy, planning, policies and the budget process, in order to make them effective in the management of mental health and its delivery to affected persons and communities, down to the local level.

The establishment of an inter-ministerial, a multi-stakeholder or a multi-sectoral committee that will bring together relevant mental health and environment actors is also essential to ensure establishment and implementation of the mental health services to the communities at national and county levels. The two tier governments need to negotiate the establishment and coordination of an interagency partnership and collaboration that would bring together public and private agencies whose policies have implications on mental health.

The above will assist overcome barriers such as centralization of mental health services in urban centres as well as insufficient technical and financial requirements directed to mental health services provision. The uneven spread of the mental health facilities in Isiolo needs to be

addressed as integration of mental health services remains a high priority. This has hampered development of mental health programmes and therefore the provision of services is very low. The climate change hazards and disaster risk are handled reactively. Since the disaster risks are cyclic, incorporating mental health services is necessary to broaden the mandate of the health institutions. The health institution need to be strengthened and coordinated at national and county level as stipulated in schedule 5 of the 2010 constitution.

6.3.3 A Framework for Mainstreaming of Mental Health Initiatives into Programmatic Interventions

Planned adaptive psycho-social strategies for individuals and communities are needed to address climate change–related impacts. Responses should include providing mental health interventions during acute impacts of extreme events to reduce the vulnerabilities contributing to the severity of mental health conditions in the community. This will promote building of resilience and empower the communities to deal with indirect impacts, and act on systems and policy levels to address broad psychosocial impacts. There is also need to establish an MTEF Sector Working Group to assist in the mainstreaming of the mental health initiatives in sector plans. This is echoed in Sendai Agreement (United Nations, 2015) where adaptive and transformative processes in reconstructing developmental levels of psycho-social, economic and environmental capital are enshrined to build resilience (Norris *et al.,* 2009; O'Brien *et al.,* 2012).

The major tools used by counsellor psychologists and psychiatrics to measure interventions is flow chart to record presenting problems and action taken (Annex 8) and dynamic analysis of disaster interventions (Annex 12). The World Health Organization through its Mental Health Gap Action Programme (MH GAP) recommends psychological and pharmacological

interventions to community care providers for people exposed to adversity. The manual on Problem Management Plus (PM+) recommends effective delivery low version Cognitive Behavioural Therapy (CBT) and Interpersonal Psychotherapy (IPT) interventions. These will help people with mental disorders: depression, anxiety, adjustment and other disorders related to exposure to adversity (WHO, 2016b; Patel *et al.*, 2016). This true for emerging evidence of psychological impacts from any form of disaster exceeds physical injuries by 40:1 (Links, 2017).

The County Health Department is responsible for County health facilities, promotion and provision of Comprehensive Mental Health Care Services including emergency services and effective mental health referral system. This will alleviate the violence and drug abuse rated high in Isiolo County MOH Strategic Plan 2017/2018. The main programmes to amalgamate are disaster risk reduction, adaptation and mitigation strategies to avert emergencies and disasters impacts on mental health. This can enable mainstreaming of three major cross-cutting components; climate change, disasters and mental health in MDA. The multi-sectoral approaches to mainstream prevention, preparation and response at community level will ensure rapid and fast provision of the services to a very vulnerable population. Gender interventions are necessary to achieve resilience of pastoral communities. The migration of pastoralists due to floods and drought disorient gender roles escalating mental disorders. The vulnerability mainly to women and People with Disability (PWDs) needs to be integrated in disaster management.

A paradigm shift has emerged as a key priority in disaster management. The Community-Based Disaster Risk Management (CBDRM) (Shohid, 2016; Olu *et al.*, 2016; Emmanuel, 2012) is taking prominence from a response-oriented reactive management approach. The implementation of strategy is expected to include comprehensive approaches with prevention, preparedness,

mitigation and response components climate change adaptation in health sector. The community centred approach was endorsed by an international forum constituting of 168 countries dubbed "Hyogo Framework for Action 2005-2015" who emphasized on building the resilience of nations and communities to disasters". This was superseded by the Sendai Framework (SF) 2015-2030 which also places emphasis on "building the resilience of nations and communities to disasters". The SF provides comprehensive action-oriented policy guidance based on holistic understanding of disasters, as induced by human vulnerability to natural hazards (Tsegaye, 2016). Thus, the local community needs to be at the centre of disaster management and in achieving progressively higher levels of resilience to disasters (Douglas *et al*., 2017; IASC, 2007). The India government has embraced CBDRM in community participation in service delivery, a model which exists loosely in Kenya.

The Division of Diseases Surveillance and Epidemic Response Unit under the Ministry of Health provide leadership on preparedness for human disease outbreaks and the Division of Health Emergencies and Disaster Risk Management is responsible for responses. There is need to strengthen both departments at all levels since health is a devolved function. A multi-disciplinary team, under the Ministry of Interior and Coordination of National Government is able to execute mainstreamed components of mental health and disasters. The natural disaster risks are impacting all ministries, departments and agencies of the government and private sector, hence the importance of drawing officers from public and private sector.

The National Disaster Operation Centre role is to coordinate emergencies and disaster management, under the Ministry of Interior and National Coordination of National Government. The Centre initiatives tend to be *ad hoc*, uncoordinated and mostly on short term basis (Mwandi,

2014). This is because the Ministry of Devolution and Planning coordinates targeted policy priorities and initiatives as per the constitution imperatives. The emergencies and disaster management coordination at devolved level is a prerogative of the Ministry of Devolution and Planning. Also, the National Disaster Management Unit (NDMU) under the State Department of Special Programmes and initiatives in the Ministry of Devolution and Planning has a big role to play in emergency and disaster management. NDMU is the executive arm established to coordinate the strategic plan for emergency and disaster interventions in consultation with other organs of the government. A systematic structure towards a comprehensive holistic national and county response strategy can be adopted in the Policy/ National Emergency/Disaster Plan draft, 2014, spearheaded by the President of the Republic of Kenya. This will give a clear command structure to be able to implement natural disaster and mental health related programme interventions.

6.3.4 Effectiveness of Policies and Programmatic Interventions in Management of Mental Health

The coordination and strategic approach is essential to align policies and support interventions at the grassroots levels. Thus, the inability of the County communities to access mental health services is a real problem that requires policy attention. A devolved disaster prevention and response operation to counties is necessary to be able to support the communities throughout the continuum of disaster management since environmental and social risks associated with climate change are increasing. According to the research study, Isiolo County mental health practices are under-established. The mental health policy is yet to be devolved and its mainstreaming in other sectors especially during disasters related to climate change is limited. There are insignificant achievements in implementation because mental health concerns have not been embedded in the

County Integrated Development Plan. Also, there is no policy at county level to enhance community care and improve integration. Besides, there is lack of knowledge and awareness of national legislation and policy frameworks (Doku *et al*., 2011).

Mental health interventions are cross-cutting issues that call for multi-disciplinary and inter-sectoral approaches in policy implementation by relevant State and Non-State Actors under stewardship of the Ministry of Interior and Coordination of National Government. The mental health, climate change and disaster policy issues cut across different sectors hence, the need to integrate and mainstream in all health and climate change response policies and action plans. This is in line with implementation of strategic plans on mental health taking shape internationally e.g. Guyana 2015-2020 and New South Wales 2014-2020. Further, there is increasing attention globally and nationally for long term resilience and adaptation strategies to reduce vulnerabilities of communities affected by climate change risks. However, humanitarian approaches to strengthen resilience and deal with reduction of shocks and stressors are minimal at local levels. The Kenya Disaster Management Bill, March 2018, a supplementary Senate bill, establishes the Disaster Risk Management Authority (DRMA) and County Disaster Committees who will provide the coordination framework. The bill needs to envision removal of grey areas in disaster prevention and response initiatives which the DRMA at national level coordinates the National Disaster Management Committee (NDMEC) which will design emergency and disaster interventions under direct leadership of the President and Cabinet Minister in the Ministry of Interior and Coordination of National Government. Also, under NDMEC is the National Disaster Coordination Committee chaired by the Permanent Secretary, Special Programmes that is devolved up to the communities' level with Sub-County Disaster Management Committee headed by Sub-County Administrators. This will ease the process of coordination of natural

disaster and resilience programme intervention at all levels (Douglas *et al.*, 2017; Page *et al.*, 2010; Pelling, 2011).

The committees comprise international and national trans-disciplinary network of state and non-state actors to be able to link and coordinate systems and processes of disaster risk management. The national team institutions actively involved in disaster prevention and response initiatives are Kenya Red Cross, St. John's Ambulance and AMREF. The United Nations agencies are spearheaded by United Nations Environment Programme which is responsible for coordinating emergency and disaster interventions. The role is executed under the umbrella of the United Nations Disaster Management Team (UNDMT). The team comprises of World Health Organization, UN Office for Coordination of Humanitarian Affair (UNOCHA), United Nations Children Fund (UNICEF), and the World Food Programme (WFP) among others.

The WHO has developed a comprehensive mental health action plan in line with the global comprehensive Mental Health Action 2013-2020 guidelines (Nacaise *et al.,* 2014). There are three WHO recommendations that are important for development of policies and strategic plans:

i. To de-institutionalize mental health care
ii. To integrate mental health into general health care
iii. To develop community mental health services

In reference to WHO guidelines, the Kenya Mental Health Policy stipulates that there is need to coordinate mechanisms of mental health during the three phases of disasters (preparation, responding and recovery). The policy states that the national government in conjunction with county governments shall provide mental health services. The structural provisions for mental health services include:

i. Establishment and integration of mental health disaster management teams
ii. Protection of vulnerable groups against disasters - those with mental disorders and in conflict, children, elderly and women
iii. Establish, in nearest health facility, inpatient and outpatient facilities for all cadres of the population.

The main approaches to be embraced included reduction of stigma and discrimination, and reintegration of patients into workplace and society.

6.3.5 Sustainability of Linkages

Mechanisms to ensure sustainability need to be incorporated in the governance structures in the national and county government to successfully manage the collaborations. The capacity building component is necessary to equip the County personnel with skills and knowledge to identify climate change threats and how they are impacting mental health. This will equip the communities in their localities and help them come up with interventions that help improve climate change strategic interventions to address socio-economic and health risks. The multi-sectorial coordination is being hampered by insufficient involvement and coordination of the stakeholders.

The National Mental Health Policy notes that the Kenya government has a positive trend in establishment or reform of institutional frameworks and governance, but lags behind in legislative and policy frameworks to enable mainstreaming. This is hampered by planning and implementation of the nitty-gritty complex effects of climate change which is not resilient to political dynamics. Besides, with devolved government in place, it's a backbone to provide effective structures for multi-level DRM. The impediments are compounded by insufficient

resources to engage the communities at risk and implement local initiatives. The inclusivity of all stakeholders will enable achievement of success due to multidisciplinary synergies of diverse roles as depicted in the structure and relationship between policy and strategic plan (Figure 6.2).

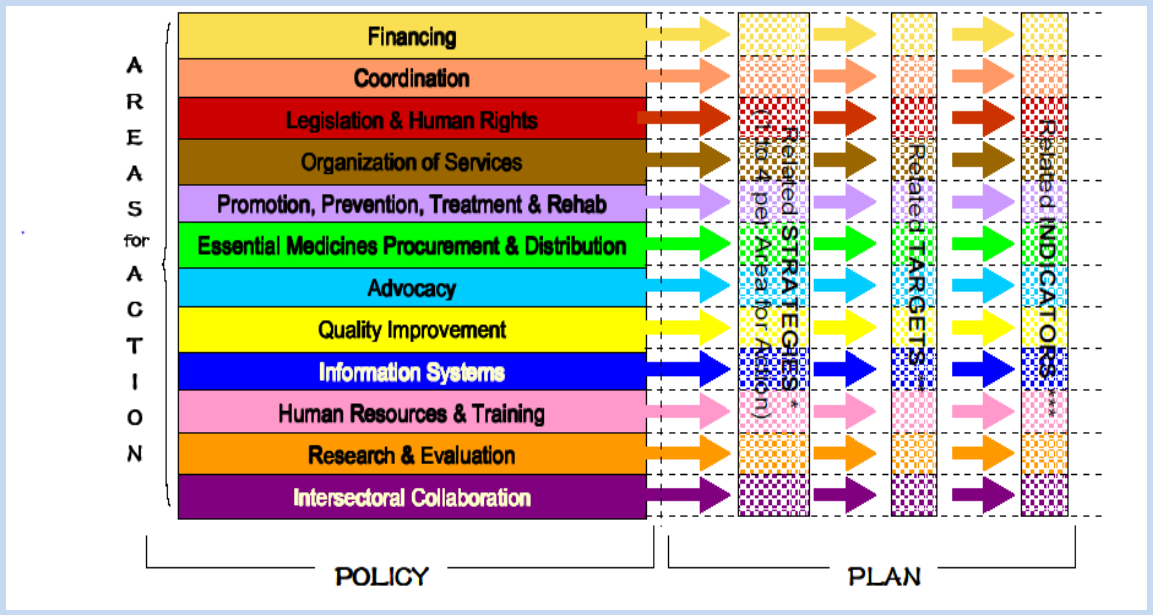


Figure 6.2: Structure and relationship between Mental Health Policy and Action Plan (Source: WHO, 2007a)

The county should be the key implementation body for actions under the mental health policy through national stipulated guidelines. Synergies among intra- and inter-governmental policy coordination are advocated for to rid of duplication that leads to wastage of technical and financial resources. A key aspect of implementation going forward should be the integration of climate change, mental health and disaster actions into annual budget processes linked to the County Integrated Development Plans and sector plans. The opportunities for climate change, mental health and disaster management need effective coordination between all levels of government to support implementation of actions at the county level.

The designed programmatic interventions by the National Disaster Management Executive Committee have to cascade to all levels of government. The designed strategic plan may improve

the quality and effectiveness of mental health services in the whole continuum of prevention, response and recovery pre, post and after natural disaster (Preet, 2006). However, the new health policy should include environment issues to broaden interpretation of the concept of health and a focus that goes far beyond the traditional 'reach' of the MOH and social services (see Figure 6.3). This is still a gap because emergency services are in want regardless of escalated disaster risks which are a source of violence and high ADA prevalence as indicated in Isiolo MOH Strategic Plan 2017/2018.

A case specific research is necessary to advise on adaptation and mitigation roadmaps at national and sector specific levels for innovative responses to mainstreaming of climate hazards (Tan *et al.,* 2015). The mainstreaming of mental health and disasters implementation must take into account other relevant policy initiatives that are being implemented. The State Department of Interior is the focal department hosting disaster management policy through NDMU. The major relevant ministries that need to mainstream DRM and mental health aspects into their policies given in Table 6.14.

Table 6.14: Key Ministries, Agencies and Departments to mainstream mental health and disaster-related programmes

Disaster/Hazard	**Focal- Ministry of special programmes**	**Department/state agency**
Natural Disasters	Ministry of Interior and Coordination of National Government: State Department of Interior and State Department of correctional and rehabilitation services	National Disaster Management Authority National Disaster Operation Centre The State Department of Interior- National Disaster Management Unit
Natural Hazards	Ministry of Devolution and Arid and Semi-Arid Lands	State Department of Devolution
Natural Hazards	Ministry of Environment and Forestry	Climate Change Council-CCC Climate change Directorate Ecosystem vulnerability-DSRS
Natural Hazards	Ministry of Water and Sanitation	NDMA- Drought WRA- Floods
Biological hazards	Ministry of Health	Division of health emergencies and disaster risk management- **Mental Health**

The complementarity is essential for success of the policy initiatives and processes outlined in this chapter and meant to work devoid of conflict or duplication. Synergies among MDAs and communities will make implementation easier, diminish conflict potential, and yield effectiveness and efficiencies. There are numerous MDAs at national and county level that will be involved in the planning and implementation of the programme interventions that have been identified in this mode of networking. The leadership and coordination of different layers of government and other stakeholders includes private sector and civil society organizations. The national government will play a prominent role in giving direction through policy amendments and legislation enactment to guide on the county level documentations. The model of networking between various national and county planners will provide a guide on how to prepare, respond and recover from climate change disaster risks and challenges of the community experiencing mental health. The model is depicted in Annex 15.

The research established various gaps in provision of services in Isiolo County. There are inadequate services offered not only because of financial resources constraints but also insufficient appropriately trained and skilled staff. Limited access to mental health services is driving the need to develop different approaches to deliver services through local community based mental health precautionary strategies and care during disasters. The organizations and agencies in the country and county are operating semi-independently without elaborate coordination. This has led to wastage of valuable resources at the National and County levels.

The service interventions are possible when they are integrated in legislations, policies and strategic plans. The disaster risk management can be effective through coordination across governance structures from international, to regional, national and sub-national levels. This is

emphasized by other international processes: Hyogo Framework for Action, 2005-2015; the Sendai Framework for Disaster Risk Reduction 2015-2030 and the Africa Risk Capacity (ARC) The ARC is specialised agency of African Union established by African governments to improve their capacities to extreme weather events and natural disasters (ARC, 2016). To enhance adaptation action in African continent, the Head of states focus is to enhance climate information services and actions and strengthen policies and institutions (UN Climate Action Summit, 2019). Further research on related policies and systems to integrate effective management of mental health programmes to increase access of services is a priority in Isiolo County.

Non-communicable (mental disorders) diseases are critical priorities in community and health facilities should increase treatment coverage. National and county programmes or management plans for mental health are essential preparation for any operation to be effective. The interventions available now remain far from being sufficient, hence a need for a generic model. This is because choices of intervention vary with phases and types of disaster emergencies. For instance, severe mental disorders require psychotropic medicine for each therapeutic category (antipsychotic, antidepressant, mood stabilizer, anxiolytic and antiepileptic). The coverage of disasters during floods and drought, the resources and mental health services requirement estimate will enhance planning and design of interventions. The qualitative and quantitative assessment of the range of broad needs is paramount as categorized in Figure 6.4 (WHO, 2013).

A model of networking between various national planners is developed to guide on how to prevent and respond to mental health disorders (Figure 6.4). Empirical data on hazards mapping, vulnerability and impacts on mental health are presented. Sustainable pre- and post-mental health care services framework are developed. This will enable the actors to develop a society-driven

dynamic to deal with mental disorders that arise from climate change related extreme events and/or disasters through trans-disciplinary solution-finding processes. The model will significantly strengthen collaboration to facilitate multi-community dialogue and learning in a bid to reduce mental illness.

Categories of problems	Problems to address
Pre-existing social problems	Extreme poverty, marginalized community, political barriers
Emergency induced social problems	Family separation, social network disruptions, gender based violence
Emergency based distress	Grief, non-pathological acute stress, PTSD, mild depression etc.
Emergency induced mental disorders	Major depression, Anxiety, SUD, Personality Disorders
Humanitarian induced social problems	Undermining community structures or traditional support mechanisms
Pre-existing psychiatric problems	Severe mental disorders

Programme Interventions	Climate Change Example
1. Monitor health status to identify and solve community health problems.	Tracking of diseases and trends related to climate change
2. Diagnose and investigate health problems and health hazards in the community.	Investigation of infectious water-, food-, and vector-borne disease outbreaks and mental illnesses
3. Inform, educate, and empower people about health issues (Advocacy).	Informing the public and policymakers about health impacts of climate change
4. Mobilize community partnerships and action to identify and solve health problems.	Partnerships with professional and community groups implement innovative solutions
5. Develop and implement policies and plans that prevent and support individual and community health efforts during natural disaster	Integrate and mainstream climate change, hydro-meteorological disasters and mental health
6. Enforce laws and regulations that protect health and ensure safety.	All policies and programmes interventions incorporate climate change, disaster and mental health components
7. Link people to needed personal health services and ensure the provision of health care when otherwise unavailable.	Disasters prevention and mitigate service alleviate mental illness and other disease outbreaks.
8. Ensure competent public and personal health care workforce.	Training of health care providers on mental health aspects of climate change
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services.	Program assessment of preparedness efforts such as heat-wave floods and drought plans
10. Research for new insights and innovative solutions to health problems.	Research on health effects of climate change, including innovative techniques such as modeling, and research on optimal adaptation strategies

Figure 6.3: Climate change disasters related mental health interventions (adopted and modified from Public Health Function Steering Committee, WHO 2013)

The summaries of categories of problems and needs to be addressed (Table 6.3) target people affected natural disaster. To enhance resilience of pastoral communities, institutions have to be strengthened during disasters and emergencies events. The key stakeholders such as NDMA, MOH and MEF have to strengthen coordination mechanisms of climate change events (drought and floods), and mental health. The Climate Change Disaster Adaptation Model (CCDAM) recognizes that climate change and disasters are emerging issues to be mainstreamed and integrated in all MDAs.

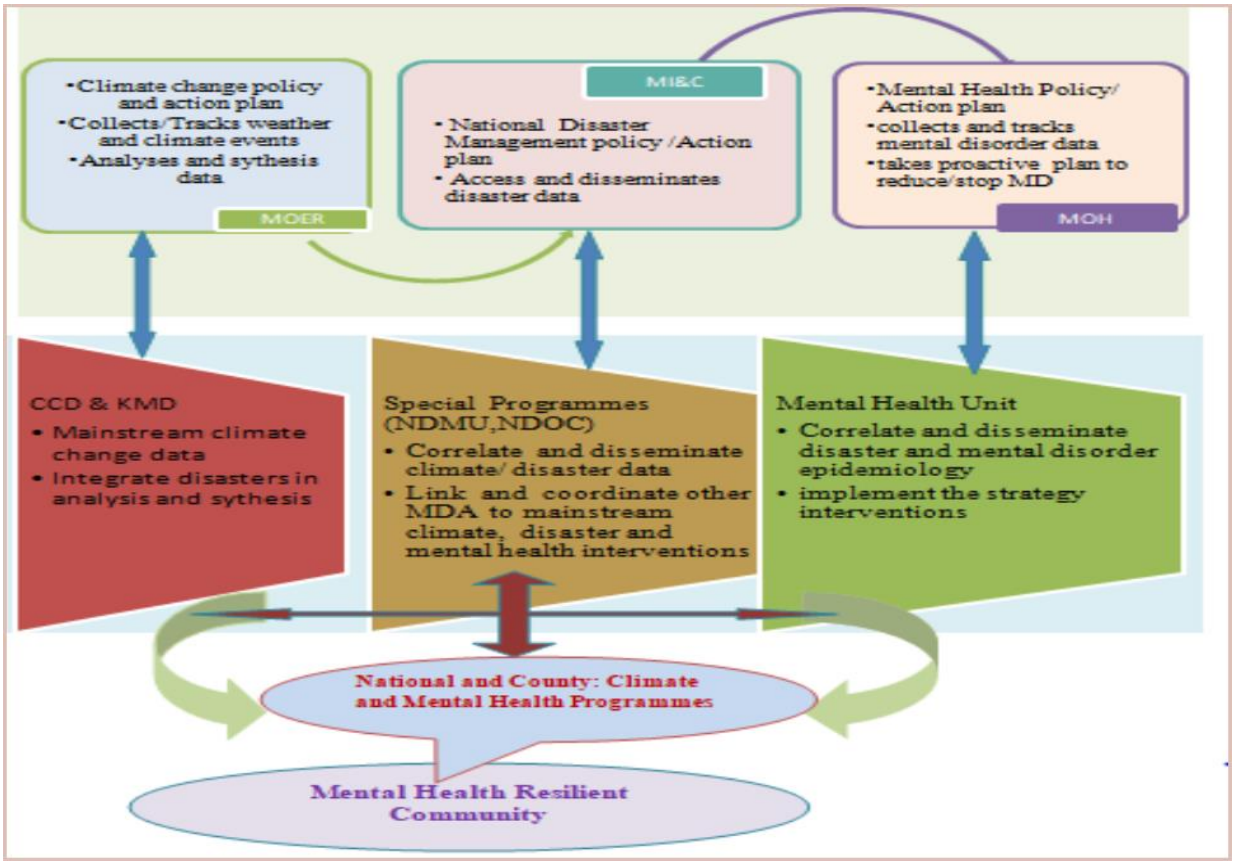


Figure 6.4: CCDAM model to help pastoralist communities' deal with mental health and gain resilience (©Peninah, 2017)

Meticulous approaches or strategies are critical to address the mental health threat related to climate change (Figure 6.4). All-inclusive preparedness plans include early warnings for severe weather events and related disasters, and health surveillance for communicable and non-

communicable illness. Besides, there is need to identify the vulnerable groups early for psychological first aid, psycho-education for professionals and community care givers, identify shelter facilities, evacuation plans and available transport and provision of alternative sources of e.g. energy and water. Also, it is necessary to equip health facilities to deal with surge capacity and other humanitarian basic provisions. These action points will enable health professionals and mental health community care givers to contribute to climate change related disaster effects and work to reduce the vulnerability.

There is an avenue to integrate and mainstream mental health services with culturally acceptable models (Figure 6.4: CCDAM model to help pastoralist communities' deal with mental health and gain resilience) of interventions during crisis situations in resource limited settings like Isiolo County. This study recommends establishment of community-based health champions, who will be trained in non-specialist health prevention and care settings to provide assessment and management of people with Mental, Neurological and Substance Use (MNS) disorders as per the Mental Health Gap Action Programme (mhGAP) (WHO Manual, 2017a; Drake *et al.*, 2014).

The coordination of the climate change, disasters and mental health have to be strengthened at national and county level of the government as per 2010 schedule 5 of the Kenya constitution. The National Drought Management Authority acts on drought only, hence the need to intertwine all natural disasters together to end emergencies of drought and floods. The Ministry of Interior and Coordination, with close collaboration with relevant ministries will come in handy to deliver vital mental health services to pastoralists.

6.4 Conclusion

There is need for comprehensive mental health approaches that connect climate impact to practical solutions which encourage action to build mental health resiliency. Strengthening institutional and legal frameworks will enhance preparedness for effective response and recovery programmes. Emergency and disaster preparedness will significantly be improved through scaling up funding and broadening the stakeholders' base. This can be achieved when nations significantly and markedly increase the ambition to fulfil their obligation to attain their nationally determined contribution as per the Paris Agreement and the 2030 agenda for sustainable development. This is essential to help developing nations to avoid crisis from climate change and vulnerability thereof to the most vulnerable population. There is need for urgent action on climate change coupled with all-inclusive approaches at all levels and sectors coordination to provide safer, healthier and more resilience for future generations (UN Climate Action Summit, 2019).

Besides, the executive roles of the coordinating agency, NDMU has to be strengthened because the respondents were not aware of its existence. The concise roles of the actors need to be linked up to their contingency plans (preparations) to ensure continuous monitoring, evaluation and learning. The strategic plans and mechanisms in all MDAs need to link climate change related disasters and mental health. Action is imperative to reduce the burden of mental health which is on rise. Strategies should include interventions dealing with both psychological problems (e.g. stress, fear, feelings of helplessness) and, where possible, practical problems (e.g. livelihood problems, conflict in the family) can be addressed.

Integration of mental health in primary health care for instance will make prevention and care more accessible and affordable, along with training of community health workers to deliver mental health services at community level (Chishholm *et al.,* 2007). Psycho-social resilience building has to be driven locally, hence "community based" approaches having a strong relevance for Disaster Risk Reduction (DRR) and Climate Change Adaptation (Shohid, 2016). Mental health service delivery models should incorporate inclusivity and integration in the DRM continuum of preparedness, response, and recovery. The disaster management needs to operationalize localized action for resilience building and vulnerability reduction. This can be achieved if only there is mainstreaming and meticulous coordination of services. Climate change and health programmatic interventions require a nexus approach, consisting of trans-disciplinary approaches (GOK, 2014; GOK, 2012).

CHAPTER SEVEN: CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

This chapter presents conclusions and recommendations of the study and further highlights recommendations for future research.

7.2 Conclusions

The study ascertained the parameters of progression to risks, hazards and disasters and their socio-economic and mental health impacts. The study established that floods and drought in Isiolo County are intense and frequent. The other cited disasters were heat waves, strong winds and landslides. This was counter checked by historical chronological data analysis of drought and floods in Kenya since 1982 to 2017 which showed that the floods and drought are frequent and severe natural calamities. The floods and flash floods incidents mostly affected people living in the environs of Isiolo town, Sericho, Garbatulla and along Merelli River. FHI analysis of DEM, low slope gradient, geological structure and land cover shows that the area along the banks was susceptible to floods and flash floods. The Palmer Drought index rated incidences of drought as severe to extreme. The household survey sample population stated that drought occurrence was the most common natural hazard affecting mainly Oldonyiro and Yamicha. The study established that there are increased risks from floods, droughts and other natural disasters that have threatened the lives and livelihoods of pastoralist communities in Isiolo County. The exposure and vulnerability to extreme climate events and/or disasters have been compounded by human induced or biological shocks such pest infestation, vector-borne diseases and mental disorders.

A statistically significant and positive correlation was noted between mental disorder cases and total annual rainfall. The synthesis of mental comorbidity revealed that the association was

attributed to disaster risks. The disaster risks were found to increase psychosomatic disorders leading to other mental illnesses. Thus, exposure and stress to environmental hazards was a major contributing factor to mental disorders. Other factors contributing to mental illness included socio-economic vulnerabilities especially insufficient nutrition requirements. The study further established high social inequalities as risk factors which were heavily associated with pre-existing common mental disorders and that exposure to extreme stressors such as extreme climate events have impaired the mental wellness of Isiolo communities. This cuts across the county wards where household vulnerability was clarified not only by household socio-economic survey, FGDs and KIIs but also by NDMA and Isiolo County reports. The cumulative effects of the stressors beyond some threshold levels make systems (ecosystems and household) sustain irreversible losses and damages (UNDP, 2002). These bring feelings of overwhelming and disturbing tensions; fear and sadness that people have making it difficult for several pastoral communities in Isiolo County to cope with day to day activities. The capacity to cope is not static because adjustments and precautions to avoid damage are relative and ability to recover from losses was/is time bound.

The study also found that the prevalence rate of mental disorders among pastoral communities was high and their resilience was low. Mental illnesses diagnosed were characterized by combination of abnormal thoughts, perceptions, emotions, behaviour and relationships with others. The highlighted major types of mental disorders are depression, anxiety, adjustment, conduct (aggression), oppositional defiant disorders, alcohol & drugs abuse and personality disorders. The less common mental disorders are bipolar mood disorder where people experience acute episodes and lose touch with reality and perceive the world differently from normal.

Psychotic episodes were diagnosed among the clients who were delusional (false belief of persecution, guilt and grandeur).

The study found out that mental health is critical for overall wellbeing, functioning, and resilience of individuals and societies experiencing natural hydro-meteorological hazards and disasters. Thus, the plight of people with mental disorders during disasters requires special consideration. There is serious concern among senior government leaders and communities revolving around psychological responses to stressors. Resilience building is long term and dynamic. According to a recent report examining the social determinants of mental health, published by WHO and the Calouste Gulbenkian Foundation (2014), action needs to be universal and appropriate to particular groups in the society. Besides, the Commission notes that the responsibility of the mental health agenda requires collaboration and cooperation across many public and private sectors, academia and CSOs. Also, the governments should reorient health systems to universal health coverage in policies and plans to cater for mental health in prevention and control services.

The study established that there are some levels of inter-sectoral collaborations at national level, which is a little but inadequate at County level. The gaps, however, still remain in realization of comprehensive, community-based mental health prevention and care. There is limited integration of mental health services in primary health care with only one facility (Isiolo referral hospital mental unit) offering the service. It was also a challenge to coordinate psychosocial support for agencies and actors are providing scanty services. More globally, this situation is evidenced by WHO, (2017a) statistics which show that 76% to 84% of people with mental disorders receive no

treatment in low and middle income countries and that the poor quality of primary health care compounds the grim situation.

The participants of the FGD and the workshops agreed that various MDAs should be involved in programme interventions such as: special programmes, health, environment, transport and communication, justice, welfare and housing. The inter sector collaboration and integrated programming was found to be necessary to ensure effective and efficient coordination mechanisms to support the delivery of mental health services. This is in line with WHO Mental Health Action Plan 2013-2020. Disaster Risk Management is a multifaceted process which involves identification, analysis, treatment, monitoring and evaluation of disaster risks. CBDM can only be implemented if there are local institutions to sustain community initiatives, and integrate community actions with government policies and practices. This is in order to reduce their vulnerabilities and enhance their capacities to build community resilience.

In order to address the glaring gaps, a CCDAM model has been proposed through this research. Further, alternative coordination mechanisms have to be sought to operationalize the nexus between environment and psychology to concretize solutions in mental health service delivery during disasters. High level advocacy at all levels can only be achieved through strong multi-sectoral leadership. Women participation in this equation is critical because they are powerful agents of change to help address climate action ambitions. Drought, to a large extent, is well coordinated by the National Disaster Management Authority (NDMA) at county level. Floods, which should be under Water Resources Authority (WRA), are less well coordinated. The diseases arising from both are not well documented and sporadic services are given in the community. There are multiple coordination avenues across MDAs. The legislation, polices and

strategic actions need to be actualized to give strong linkages to enable multi-stakeholders approach. This will ensure defined roles and ultimately reduce duplication of services and enhance accountability. The role of NDMA as per the new draft NDM policy 2018 by the senate and other related strategies and plans need to be harmonized to provide well needed synergy to provide prevention and supportive mental health services.

The psychopathology data among the pastoralist communities doesn't exist. The results of the research study show higher rates of mental disorders among the patient pastoral communities. There are a lot of unmet service deliveries to people who are affected by drought and flood disasters. Even so, those with psychiatric diagnoses and functional impairments are the most hit in Isiolo County and this is likely the situation nationally. An institution mandated to integrate information about mental health services needs and the main agencies and organizations that provide the services inventory are critical in service delivery.

There is clearly need for effective, coordinated approaches in the country to deal with delivery of primary health services. To reduce the mental disorders, effective and efficient programmatic interventions require elaborate communication strategies to link up the players in all Ministries, Departments and Agencies (MDAs) using the CCDAM model. This also calls for frequent inventory of services provided and their accessibility to the vulnerable during disasters. This will enable synergistic management and monitoring of the disasters to improve adaptation and resilience building approaches. An empirical research data base is necessary to provide informed strategic interventions to reduce extreme climate event disaster risks impacting on mental health. This is given emphasis in international and national governance structures and processes such as the Sendai Framework for Disaster Risk Reduction, Africa Risk Capacity, WHO Comprehensive

Mental Health Action Plan, Kenya National Mental Health Policy, and the Kenya Disaster Management Bill to mention a few.

Timely and innovative adaptation approaches or actions plan for extreme events are essential to enhance decision making based on research evaluations of disaster risk. This will provide more robust and acceptable mental health prevention, mitigation, response and recovery measures in public and private emergency management institutions rollout and upscaling of effective adaptation strategies at community level. Improved models of hazard risk, vulnerability and mental well-being mapping will accelerate programme intervention.

7.3 Recommendations

Based on the findings of this research the following actions are recommended to build resilience to the impacts of climate change related extreme events/disasters on mental health and improve on the related framework for delivery of mental health services:

i. Extreme climate hazard risk and vulnerability mapping in a GIS environment is necessary to provide users with comprehensive, site-specific assessments to advise policy actions that are user friendly at the community level.

ii. There is need to develop robust environmental health procedures to diagnose mental disorders during natural disasters and quantify prevalence epidemiology through Health Information Systems. The study recommends mapping of mental disorder epidemiology and make it user friendly to advise policy on adaptation and resilience mental health interventions.

iii. The study recommends establishment of crisis stabilization facilities or centres to provide respite and alternative to hospitalization at community level for people who have been discharged. Besides, case managers need to be engaged as coordinators for better management of health systems regarding natural hazard-disaster periods. These will help link up the multi-sectoral teams and multi-disciplinary experts who are serving the communities.

iv. Strengthen integrated and mainstream community based disaster risk management. De-institutionalization of mental health services such as psychopharmacological management by use of supportive community-based programmes.

v. In order for nexus environmental-psychological issues implementation to be successful, the study recommends that they need to be mainstreamed in policy planning and budgeting processes both at the national and county level. This entails embedding climate change, disasters and mental health policies and action plans in the County Integrated Development Plans (CIDPs) as well as sector plans linked to the annual budget process.

vi. The study recommends aligning of policies, strategic plans and programmes on prevention and mitigation, response and recovery using comprehensive approaches. The integrated approach ensures multi-sectoral and inter-sectoral coordination to reduce duplication up to community level. This is advised by the inclusive process by private, public, academia and CSOs to coordinate actions rooted in the SDG and Paris Agreement.

vii. The model of inclusivity and integration suggests overlapping and complementary practices of preparedness, response, and recovery. This is possible when an MDA team is

formed under the proposed National Disaster Management Authority to design and coordinate disaster and mental health programme interventions using the CCDAM model. The newly launched Kenya Mental Health Policy implementation needs to be cascaded to county level.

viii. The study also recommends inclusion of the improved climate adaptation planning and sectoral integration in relevant new and existing policies and adaptation action plan to focus on development of planning processes and strategies that apply to environmental psychology.

ix. The stakeholders in Isiolo County need to concretize actions at all levels to adequately increase adaptation strategies and improve resilience to climate change to reduce mental disorders. Advocacy initiatives are crucial to increase awareness in the communities and help increase the resources to tackle rising disasters impacting mental health not only in Isiolo County but at national level.

The research study suggests several areas for further research based on the outcomes.

i. Computer simulations to understand the extent of climate change related disaster risk to aid adaptation strategies of people with mental health.

ii. Proper and efficient diagnoses for mental disorders during complex natural disaster situations: preparing communities during natural disaster to alleviate crisis.

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ANNEXES

Annex i: List of Research Assistants

No	Name of the Research Assistant	Seconding Institution	Sampling sites
1.	Abraham Gitonga (coordinator)	WRMA	Isiolo County
2.	Mercy Mbaya (Coordinator)	WRMA	Wabera, Burat
3.	Daudi Golicha	WRUA	Gafarsa
4.	Somo Jirmo	WRUA	Garfasa, Sericho
5.	Wario Dabaso	WRUA	Merti, Kinna
6.	Addrah manshane**	WRUA	Merti
7.	Isaack Same	WRUA	Garbatulla
8.	Nasir Mohammed	WRUA	Garbatulla, Modagashi
9.	Ken Gituma	WRUA, Volunteer	Central Isiolo: Bulla Pesa, Wabera, Burat, Ngaremara, Cherab& Chari
10.	David Mwiti (Coordinator)	WRUA	Isiolo Central-Isiolo Township &Merille
11.	Felix Karimba (Coordinator)	WRUA	Isiolo Central
12.	Mary Wanjiku (Coordinator)	NDMA	Isiolo County
13.	Francis Letimolo (Coordinator)	NDMA	Oldonyiro
14.	Muika Peter	NDMA	Oldonyiro
15.	Veronica Naanyu	NDMA,Volunteer	Oldonyiro
16.	Gitonga Mugambi	MOH, Psychiatric Nurse	Isiolo Referral Hospital
17	Lawi Minyori	MOH, Psychiatric Nurse	Isiolo Referral Hospital
18.	Sahara Ugas	MOH, Psychiatric Nurse	Isiolo Referral Hospital
19.	Willis Aketch	Data Supervisor	Isiolo Referral Hospital

Annex ii: Key Informant Interview Checklist

No.	Name	Institution Designation	Location
1.	Dr Kahuho*	Director	MET, Nairobi
2.	Mr. Maina	Hydro-Meteorologist	MET, Nairobi
3.	Christine Mahonga	Personal Assistant	MET, Nairobi
4.	Mr. Ezekiel Muigai	County director, MET	MET Isiolo
5.	Jackson Muturo	County director, NEMA	NEMA, Isiolo
6.	Salama	Psycho-social services and disaster management	Kenya Red Cross Society
7.	Mary Wangui	Field officer	NDMA, Isiolo
8.	Timothy Ranja*	Programmes, Social Services	United Nations Development Programmes
9.	Dr. Kiluva Steven*	Chief Executive Officer	MoH Isiolo
10.	Prof. Geoffrey Wahungu*	Director General	NEMA, Headquarter
11.	Dr. Ayub. Macharia	Director, Environmental Education, Information & Public Participation	NEMA, Headquarter
12.	Fatuma Mohammed Hussein	Chief Climate Change Negotiator/Director Climate Change	Ministry of Environment, Water and Natural Resources (MENR)
13.	David K. Rono	Deputy Director, Policy formulation, Interpretation and Implementation	State Department of Environment & Natural Resources
14.	David Mutonga	SADMS/Head of Disease Surveillance & Response	MoH Afya House
15.	Peter M. Kilonzo	Project Coordinator	Action Aid, Isiolo
16.	Josephine Thuranira	Chief Education Officer	MOEST, Isiolo
17.	Murithi Mbogori	Water Rights Officer	WRMA,Isiolo
18.	Mercy Mbaya	Flood Management Officer	WRMA, Isiolo
20.	Florence Mwangangi	Deputy Director of Agriculture	MoA, Isiolo County
21.		Administrator	Tana and Athi River Development Authority
22.	Lordman Lekalkuli	County Drought Coordinator	National Drought Management Authority
23.		FFA.T.O	Action Aid, Kenya
24.		Head Teacher	Gafarsa Primary school, Garbatulla
25.		Community Health Volunteer	Muchuro Dispensary, Garbatulla
26.		Rangelands Coordinator	OldoNyiro Conservancy, Oldonyiro
27.		Deputy Principal	Oldonyiro Secondary School
28.		Chief	Oldonyiro Location
29.	Col. Nelson Kagotho	Director	Kenya National Disaster Operation Centre
30.	Ganda Nollascus	Program Officer Outbreak and Disaster Management	World Health Organization (WHO)
31.	Kimani Githongo	Chairperson	Kenya Counsellors and Psychologist Association
32.		Policy Analyst	KIPPRA, Kenya
33.			KIPPRA,Kenya
34.	Willis Aketch*	Data Supervisor/Records Officer	MOH, Isiolo County

Annex iii: Participants of Workshops/Focused Group Discussion/Shared Agenda

No.	Participants	Institution/Organization	Geographical Location Represented
1.	Abraham Gitonga	WRMA	Isiolo County
2.	Mercy Mbaya	WRMA	Wabera, Burat
3.	Daudi Golicha	WRUA	Gafarsa
4.	SomoJirmo	WRUA	Garfasa, Sericho
5.	WarioDabaso	WRUA	Merti, Kinna
6.	Addrah manshane**	WRUA	Merti
7.	Isaack Same	WRUA	Garbatulla
8.	Nasir Mohammed	WRUA	Garbatulla, Modagashi
9.	Ken Gituma	WRUA, Volunteer	Central Isiolo: Bulla pesa, Wabera, Burat, Ngaremara, Cherab& Chari
10.	David Mwiti	WRUA	Isiolo Central-Isiolo Township &Merille
11.	Felix Karimba	WRUA	Isiolo Central
12.	Mary Wanjiku	NDMA	Isiolo County
13.	Francis Letimolo	NDMA	Oldonyiro
14.	Muika Peter	NDMA	Oldonyiro
15.	Veronica Naanyu	NDMA,Volunteer	Oldonyiro
16.	Gitonga Mugambi	MOH, Psychiatric Nurse	Isiolo Referral Hospital
17.	Mr. Ezekiel Muigai	County director, MET	MET Isiolo
19.	Florence Mwangangi	Deputy Director of Agriculture	MoA, Isiolo County
20.	Lordman* lekalkuli	County Drought Coordinator	National Drought Management Authority
21.		FFA.T.O	Action Aid, Kenya
22.	Peter M. Kilonzo	Project Coordinator	Action Aid, Isiolo
23.	Josephine Thuranira	Chief Education Officer	MOEST, Isiolo
24.	Murithi Mbogori	Water Rights Officer	WRMA,Isiolo

Annex iv: DSM 5 Categories and Coding of Mental Health Disorders

1	Disorders usually first diagnosed in infancy, childhood, or adolescence	1.1 Mental Retardation	317 Mild mental retardation 318.0 Moderate mental retardation 318.1 Severe mental retardation 318.2 Profound mental retardation 319 Mental retardation; severity unspecified	
		1.2 Learning disorders	315.00 Reading disorder 315.1 Mathematics disorder 315.2 Disorder of written expression 315.9 Learning disorder NOS	
		1.3 Motor skills disorders	315.4 Developmental coordination disorder	
		1.4 Communication disorders	315.31 Expressive language disorder 315.32 Mixed receptive-expressive language disorder 315.39 Phonological disorder 307.0 Stuttering 307.9 Communication disorder NOS	
		1.5 Pervasive developmental disorders	299.00 Autistic Disorder 299.80 Rett's Disorder 299.10 Childhood Disintegrative Disorder 299.80 Asperger's Disorder 299.80 Pervasive Developmental Disorder NOS	
		1.6 Attention-deficit and disruptive behaviour disorders	Attention-Deficit Hyperactivity Disorder	314.01 Combined subtype 314.01 Predominantly hyperactive-impulsive subtype 314.00 Predominantly inattentive subtype 314.9 Attention-Deficit Hyperactivity Disorder NOS
			313.81 Oppositional Defiant Disorder	
			312.9 Disruptive Behaviour Disorder NOS	
		1.7 Feeding and eating disorders of infancy or early childhood	307.52 Pica 307.53 Rumination disorder 307.59 Feeding disorder of infancy or early childhood	
		1.8 Tic disorders	307.23 Tourette's Disorder 307.22 Chronic motor or vocal tic disorder	

			307.21 Transient tic disorder 307.20 Tic disorder NOS	
		1.9 Elimination disorders	307.6 Enuresis (not due to a general medical condition) 307.7 Encopresis, without constipation and overflow incontinence 787.6 Encopresis, with constipation and overflow incontinence	
		1.10 Other disorders of infancy, childhood, or adolescence	309.21 Separation anxiety disorder 313.23 Selective mutism 313.89 Reactive attachment disorder of infancy or early childhood 307.3 Stereotypic movement disorder 313.9 Disorder of infancy, childhood, or adolescence NOS	
2	Delirium, dementia, and amnestic and other cognitive disorders	2.1 Delirium	293.0 Delirium due to... [indicate the general medical condition] 780.09 Delirium NOS	
		2.2 Dementia	Dementia of the Alzheimer's Type, with early onset	294.10 Without behavioural disturbance 294.11 With behavioural disturbance
			Dementia of the Alzheimer's Type, with late onset	294.10 Without behavioral disturbance 294.11 With behavioural disturbance
			Vascular dementia	290.40 Uncomplicated 290.41 With delirium 290.42 With delusions 290.43 With depressed mood
			Dementia due to HIV disease	294.10 Without behavioral disturbance 294.11 With behavioral disturbance
			Dementia due to Parkinson's disease	294.10 Without behavioral disturbance 294.11 With behavioral
			Dementia due to head trauma	
			Dementia due to Huntington's disease	294.10 Without behavioral disturbance 294.11 With behavioral disturbance
			Dementia due to Creutzfeldt-Jakob Disease	294.10 Without behavioral disturbance 294.11 With behavioral disturbance
			Dementia due to Pick's disease	294.10 Without behavioral disturbance

				294.11 With behavioral disturbance
			Dementia due to... [indicate other general medical condition]	294.10 Without behavioral disturbance 294.11 With behavioral disturbance
			294.8 Dementia NOS	
		2.3 Amnestic disorders	294.0 Amnestic disorder due to... [indicate the general medical condition] 294.8 Amnestic disorder NOS	
		2.4 Other cognitive disorders	294.9 Cognitive disorder NOS	
3	Mental disorders due to a general medical condition not elsewhere classified	293.89 Catatonic disorder due to... [indicate the general medical condition] 310.1 Personality change due to... [indicate the general medical condition] (Subtypes: Labile, Disinhibited, Aggressive, Apathetic, Paranoid, Other, Combined, Unspecified) 293.9 Mental disorder NOS due to... [indicate the general medical condition]		
	Substance-related disorders	4.1 Alcohol-related disorders	305.00 Abuse 303.90 Dependence 291.89 -Induced anxiety disorder 291.89 -Induced mood disorder 291.1 -Induced persisting amnestic disorder 291.2 -Induced persisting dementia 291.5 -Induced psychotic disorder, with delusions 291.3 -Induced psychotic disorder, with hallucinations 291.89 -Induced sexual dysfunction 291.89 -Induced sleep disorder 303.00 Intoxication 291.0 Intoxication delirium 291.9 -Related disorder NOS 291.81 Withdrawal 291.0 Withdrawal delirium	
		4.2 Amphetamine (or amphetamine-like) related disorders	305.70 Abuse 304.40 Dependence 292.89 -Induced anxiety disorder 292.84 -Induced mood disorder 292.11 -Induced psychotic disorder, with delusions 292.12 -Induced psychotic disorder, with hallucinations 292.89 -Induced sexual dysfunction 292.89 -Induced sleep disorder 292.89 Intoxication 292.81 Intoxication delirium 292.9 -Related disorder NOS	

			292.0 Withdrawal
		4.3 Caffeine-related disorders	292.89 -Induced anxiety disorder 292.89 -Induced sleep disorder 305.90 Intoxication 292.9 -Related disorder NOS
		4.4 Cannabis-related disorders	305.20 Abuse 304.30 Dependence 292.89 -Induced anxiety disorder 292.11 -Induced psychotic disorder, with delusions 292.12 -Induced psychotic disorder, with hallucinations 292.89 Intoxication 292.81 Intoxication delirium 292.9 -Related disorder NOS
		4.5 Cocaine-related disorders	305.60 Abuse 304.20 Dependence 292.89 -Induced anxiety disorder 292.84 -Induced mood disorder 292.11 -Induced psychotic disorder, with delusions 292.12 -Induced psychotic disorder, with hallucinations 292.89 -Induced sexual dysfunction 292.89 -Induced sleep disorder 292.89 Intoxication 292.81 Intoxication delirium 292.9 -Related disorder NOS 292.0 Withdrawal
		4.6 Hallucinogen-related disorders	305.30 Abuse 304.50 Dependence 292.89 -Induced anxiety disorder 292.84 -Induced mood disorder 292.11 -Induced psychotic disorder, with delusions 292.12 -Induced psychotic disorder, with hallucinations 292.89 Intoxication 292.81 Intoxication delirium 292.89 -persisting perception disorder 292.9 -Related disorder NOS
		4.7 Inhalant-related disorders	305.90 Abuse 304.60 Dependence 292.89 -Induced anxiety disorder

			292.84 -Induced mood disorder 292.82 -Induced persisting dementia 292.11 -Induced psychotic disorder, with delusions 292.12 -Induced psychotic disorder, with hallucinations 292.89 Intoxication 292.81 Intoxication delirium 292.9 -Related disorder NOS
		4.8 Nicotine-related disorders	305.1 Dependence 292.9 -Related disorder NOS 292.0 Withdrawal
		4.9 Opioid-related disorders	305.50 Abuse 304.00 Dependence 292.84 -Induced mood disorder 292.11 -Induced psychotic disorder, with delusions 292.12 -Induced psychotic disorder, with hallucinations 292.89 -Induced sexual dysfunction 292.89 -Induced sleep disorder 292.89 Intoxication 292.81 Intoxication delirium 292.9 -Related disorder NOS 292.0 Withdrawal
		4.10 Phencyclidine (or phencyclidine-like) related disorders	305.90 Abuse 304.60 Dependence 292.89 -Induced anxiety disorder 292.84 -Induced mood disorder 292.11 -Induced psychotic disorder, with delusions 292.12 -Induced psychotic disorder, with hallucinations 292.89 Intoxication 292.81 Intoxication delirium 292.9 -Related disorder NOS
		4.11 Sedative-, hypnotic-, or anxiolytic-related disorders	Sedative, hypnotic, or anxiolytic 305.40 Abuse 304.10 Dependence 292.89 -Induced anxiety disorder 292.84 -Induced mood disorder 292.83 -Induced persisting amnestic disorder 292.82 -Induced persisting dementia

			292.11 -Induced psychotic disorder, with delusions 292.12 -Induced psychotic disorder, with hallucinations 292.89 -Induced sexual dysfunction 292.89 -Induced sleep disorder 292.89 Intoxication 292.81 Intoxication delirium 292.9 -Related disorder NOS 292.0 Withdrawal 292.81 Withdrawal delirium
		4.12 Polysubstance-related disorder	304.80 Polysubstance dependence
		Other (or unknown) substance	305.90 Abuse 304.90 Dependence 292.89 -Induced anxiety disorder 292.81 -Induced delirium 292.84 -Induced mood disorder 292.83 -Induced persisting amnestic disorder 292.82 -Induced persisting dementia 292.11 -Induced psychotic disorder, with delusions 292.12 -Induced psychotic disorder, with hallucinations 292.89 -Induced sexual dysfunction 292.89 -Induced sleep disorder 292.89 Intoxication 292.9 -Related disorder NOS 292.0 Withdrawal 293.0 Delirium Due to ... [Indicate the General Medical Condition]
4	Schizophrenia and other psychotic disorders	Schizophrenia	295.20 Catatonic type 295.10 Disorganized type 295.30 Paranoid type 295.60 Residual type 295.90 Undifferentiated type 295.40 Schizophreniform disorder 295.70 Schizoaffective disorder 297.1 Delusional disorder Erotomanic subtype Grandiose subtype Jealous subtype Persecutory subtype Somatic subtype

			Mixed type
		Psychotic disorder due to... [indicate the general medical condition]	298.8 Brief psychotic disorder 297.3 Shared psychotic disorder 293.81 With delusions 293.82 With hallucinations 298.9 Psychotic disorder NOS
5.	Mood disorders		This section is empty, addition to be by (March 2014)
6.	Depressive disorders		300.4 Dysthymic disorder
		Major depressive disorder	Major depressive disorder, recurrent 296.36 In full remission 296.35 In partial remission 296.31 Mild 296.32 Moderate 296.33 Severe without psychotic features 296.34 Severe with psychotic features 296.30 Unspecified
		Major depressive disorder, single episode	296.26 In full remission 296.25 In partial remission 296.21 Mild 296.22 Moderate 296.23 Severe without psychotic features 296.24 Severe with psychotic features 296.20 Unspecified
			311 Depressive disorder NOS
	Bipolar disorders	Bipolar disorders	296.80 Bipolar disorder NOS
		Bipolar I disorder, most recent episode depressed	296.56 In full remission 296.55 In partial remission 296.51 Mild 296.52 Moderate 296.53 Severe without psychotic features 296.54 Severe with psychotic features 296.50 Unspecified
		296.40 Bipolar I disorder, most recent episode hypomanic	

		Bipolar I disorder, most recent episode manic	296.46 In full remission 296.45 In partial remission 296.41 Mild 296.42 Moderate 296.43 Severe without psychotic features 296.44 Severe with psychotic features 296.40 Unspecified
		Bipolar I disorder, most recent episode mixed	296.66 In full remission 296.65 In partial remission 296.61 Mild 296.62 Moderate 296.63 Severe without psychotic features 296.64 Severe with psychotic features 296.60 Unspecified
	Anxiety disorders	300.02 Generalized anxiety disorder Panic disorder 300.21 With agoraphobia 300.01 Without agoraphobia 300.22 Agoraphobia without history of panic disorder 300.29 Specific phobia 300.23 Social phobia 300.3 Obsessive-compulsive disorder 309.81 Posttraumatic stress disorder 308.3 Acute stress disorder 293.84 Anxiety disorder due to a general medical condition 293.89 Anxiety disorder due to... [indicate the general medical condition] 300.00 Anxiety disorder NOS	
	Somatoform disorders	300.81 Somatization disorder 300.82 Undifferentiated somatoform disorder 300.11 Conversion disorder Pain disorder 307.89 Associated with both psychological factors and a general medical condition 307.80 Associated with psychological factors 300.7 Hypochondriasis 300.7 Body dysmorphic disorder 300.82 Somatoform disorder NOS	
	Factitious disorders	300.19 With combined psychological and physical signs and symptoms 300.19 With predominantly physical signs and symptoms 300.16 With predominantly psychological signs and symptoms	

		300.19 Factitious disorder NOS	
	Dissociative disorders	300.6 Depersonalization disorder 300.12 Dissociative amnesia 300.14 Dissociative identity disorder 300.15 Dissociative disorder not otherwise specified	
11	Sexual and gender identity disorders	6.1 Sexual dysfunctions	625.8 Female hypoactive sexual desire disorder due to... [indicate the general medical condition] 608.89 Male hypoactive sexual desire disorder due to... [indicate the general medical condition] 302.71 Hypoactive sexual desire disorder 302.79 Sexual aversion disorder 302.72 Female sexual arousal disorder 302.72 Male erectile disorder 607.84 Male erectile disorder due to... [indicate the general medical condition] 302.73 Female orgasmic disorder 302.74 Male orgasmic disorder 302.75 Premature ejaculation 302.76 Dyspareunia (not due to a general medical condition) 625.0 Female dyspareunia due to... [indicate the general medical condition] 608.89 Male dyspareunia due to... [indicate the general medical condition] 306.51 Vaginismus (not due to a general medical condition) 625.8 Other female sexual dysfunction due to... [indicate the general medical condition] 608.89 Other male sexual dysfunction due to... [indicate the general medical condition] 302.70 Sexual dysfunction NOS
		6.2 Paraphilias	302.4 Exhibitionism 302.81 Fetishism 302.89 Frotteurism 302.2 Pedophilia 302.83 Sexual masochism 302.84 Sexual sadism 302.3 Transvestic fetishism

			302.82 Voyeurism 302.9 Paraphilia NOS (not otherwise specified
		6.3 Gender identity disorders	302.85 In adolescents or adults 302.6 In children 302.6 Gender identity disorder NOS 302.9 Sexual disorder NOS
12.	Eating disorders	307.1 Anorexia nervosa 307.51 Bulimia nervosa 307.50 Eating disorder not otherwise specified (EDNOS)	
13.	Sleep disorders	15.1 Primary sleep disorders	307.44 Primary hypersomnia 307.42 Primary insomnia 347 Narcolepsy 780.59 Breathing-related sleep disorder 307.45 Circadian rhythm sleep disorder 307.47 Dyssomnia NOS 327.03 Insomnia Related to Mood Disorder (ICD 9)
		15.2 Parasomnias	307.47 Nightmare disorder 307.46 Sleep terror disorder 307.46 Sleepwalking disorder 307.47 Parasomnia NOS
		15.3 Other sleep disorders	Sleep disorder due to... [indicate the general medical condition] 780.54 Hypersomnia type 780.52 Insomnia type 780.59 Mixed type 780.59 Parasomnia type 307.42 Insomnia related to... [indicate the Axis I or Axis II disorder] 307.44 Hypersomnia related to... [indicate the Axis I or Axis II disorders
16.	Impulse-Control Disorders Not Elsewhere Classified	312.34 Intermittent Explosive Disorder 312.32 Kleptomania 312.31 Pathological Gambling 312.33 Pyromania 312.39 Trichotillomania 312.30 Impulse-Control Disorder NOS	
17	Adjustment disorders	309.9 Unspecified 309.24 With anxiety 309.0 With depressed mood 309.3 With disturbance of conduct	

		309.28 With mixed anxiety and depressed mood 309.4 With mixed disturbance of emotions and conduct	
18	Personality disorders (Axis II)	Cluster A (odd or eccentric)	301.0 Paranoid personality disorder 301.20 Schizoid personality disorder 301.22 Schizotypal personality disorder
		Cluster B (dramatic, emotional, or erratic)	301.7 Antisocial personality disorder 301.83 Borderline personality disorder 301.50 Histrionic personality disorder 301.81 Narcissistic personality disorder
		Cluster C (anxious or fearful)	301.82 Avoidant personality disorder 301.6 Dependent personality disorder 301.4 Obsessive-compulsive personality disorder 301.9 Personality disorder not otherwise specified
	Additional codes		V62.3 Academic problem V62.4 Acculturation problem 995.2 Adverse effects of medication NOS 780.9 Age-related cognitive decline
		Antisocial behaviour	V71.01 Adult antisocial behaviour V71.02 Child or adolescent antisocial behaviour
			V62.82 Bereavement V62.89 Borderline intellectual functioning 313.82 Identity problem
		Medication-induced	
		Movement disorder	333.90 Movement disorder NOS 333.1 Postural tremor
		Neglect of child	V61.21 Neglect of child 995.5 Neglect of child (if focus of attention is on victim)
		Neuroleptic-induced	333.99 Acute akathisia 333.7 Acute dystonia 332.1 Parkinsonism 333.82 Tardive dyskinesia 333.92 Neuroleptic malignant syndrome
			V71.09 No diagnosis on Axis II V71.09 No diagnosis or condition on Axis I V15.81 Noncompliance with treatment V62.2 Occupational problem V61.20 Parent-child relational problem V61.10 Partner relational problem

			V62.89 Phase of life problem
		Physical abuse	V61.1 Physical abuse of adult 995.81 Physical abuse of adult (if focus of attention is on victim) V61.21 Physical abuse of child 995.5 Physical abuse of child (if focus of attention is on victim)
		316 Psychological factors affecting medical condition	Relational problem V62.81 Relational problem NOS V61.9 Relational problem related to a mental disorder or general medical condition V62.89 Religious or spiritual problem V61.1 Sexual abuse of adult V61.21 Sexual abuse of child V61.8 Sibling relational problem 300.9 Unspecified mental disorder (nonpsychotic) 799.9 Diagnosis deferred on Axis II 799.9 Diagnosis or condition deferred on Axis I V65.2 Malingering

The Diagnostic and Statistical Manual of Mental Disorders (DSM), published by the American Psychiatric Association (APA, via archive.org) Modified may, 2014).

Annex v: ICD-11 Mental and Behavioural Disorders

ICD-11 is a coding of diseases and signs, symptoms, abnormal findings, complaints, social circumstances and external causes of injury or diseases, as classified by the World Health Organization (WHO, 2018).

F00–F99 – Mental And Behavioural Disorders		
1.1	(F00–F09) Organic, including symptomatic, mental disorders	(F00) Dementia in Alzheimer's disease (F01) Vascular dementia (F01.1) Multi-infarct dementia (F02) Dementia in other diseases classified elsewhere (F02.0) Dementia in Pick's disease (F02.1) Dementia in Creutzfeldt-Jakob disease (F02.2) Dementia in Huntington's disease (F02.3) Dementia in Parkinson's disease (F02.4) Dementia in human immunodeficiency virus (HIV) disease (F03) Unspecified dementia (F04) Organic amnesic syndrome, not induced by alcohol and other psychoactive substances (F05) Delirium, not induced by alcohol and other psychoactive substances (F06) Other mental disorders due to brain damage and dysfunction and to physical disease (F06.0) Organic hallucinosis (F06.1) Organic catatonic disorder (F06.2) Organic delusional (schizophrenia-like) disorder (F06.3) Organic mood (affective) disorders (F06.4) Organic anxiety disorder (F06.5) Organic dissociative disorder (F06.6) Organic emotionally labile (asthenic) disorder (F06.7) Mild cognitive disorder (F06.8) Other specified mental disorders due to brain damage and dysfunction and to physical disease (F06.9) Unspecified mental disorder due to brain damage and dysfunction and to physical disease (F07) Organic brain syndrome NOS (F08) Personality and behavioural disorders due to brain disease, damage and dysfunction (F08.0) Organic personality disorder (F08.1) Post encephalitic syndrome

		(F08.2) Post-concussional syndrome (F08.3) Other organic personality and behavioural disorders due to brain disease, damage and dysfunction (F08.4) Unspecified organic personality and behavioural disorder due to brain disease, damage and dysfunction (F09) Unspecified organic or symptomatic mental disorder
1.2	(F10–F19) Mental and behavioural disorders due to psychoactive substance use	Note: the following conditions are subtypes of each code from F10–19: (F1x.0) acute intoxication (F1x.1) harmful use (F1x.2) dependence syndrome (F1x.3) withdrawal state (F1x.4) withdrawal state with delirium (F1x.5) psychotic disorder (F1x.6) amnesic syndrome (F1x.7) Residual and late-onset psychotic disorder (F1x.8) other mental and behavioural disorder (F1x.9) unspecified mental and behavioural disorder
1.3	(F20–F29) Schizophrenia, schizotypal and delusional disorders	(F20) Schizophrenia (F20.0) Paranoid schizophrenia (F20.1) Hebephrenic schizophrenia (Disorganized schizophrenia) (F20.2) Catatonic schizophrenia (F20.3) Undifferentiated schizophrenia (F20.4) Post-schizophrenic depression (F20.5) Residual schizophrenia (F20.6) Simple schizophrenia (F20.7) Other schizophrenia Cenesthopathic schizophrenia Schizophreniform disorder NOS Schizophreniform psychosis NOS (F20.8) Schizophrenia, unspecified (F21) Schizotypal disorder (F22) Persistent delusional disorders (F22.0) Delusional disorder (F22.1) Other persistent delusional disorders Delusional dysmorphophobia Involutional paranoid state Paranoia querulans (F22.9) Persistent delusional disorder, unspecified

		(F23) Acute and transient psychotic disorders (F23.0) Acute polymorphic psychotic disorder without symptoms of schizophrenia (F23.1) Acute polymorphic psychotic disorder with symptoms of schizophrenia (F23.2) Acute schizophrenia-like psychotic disorder (F23.3) Other acute predominantly delusional psychotic disorders (F23.8) Other acute and transient psychotic disorders (F23.9) Acute and transient psychotic disorder, unspecified (F24) Induced delusional disorder Folie à deux Induced paranoid disorder Induced psychotic disorder (F25) Schizoaffective disorders (F25.0) Schizoaffective disorder, manic type (F25.1) Schizoaffective disorder, depressive type (F25.2) Schizoaffective disorder, mixed type (F25.8) Other schizoaffective disorders (F25.9) Schizoaffective disorder, unspecified (F28) Other nonorganic psychotic disorders Chronic hallucinatory psychosis (F29) Unspecified nonorganic psychosis
1.4	(F30–F39) Mood (affective) disorders	F30) Manic episode (F30.0) Hypomania (F30.1) Mania without psychotic symptoms (F30.2) Mania with psychotic symptoms (F30.8) Other manic episodes (F30.9) Manic episode, unspecified (F31) Bipolar affective disorder (F31.0) Bipolar affective disorder, current episode hypomanic (F31.1) Bipolar affective disorder, current episode manic without psychotic symptoms (F31.2) Bipolar affective disorder, current episode manic with psychotic symptoms (F31.3) Bipolar affective disorder, current episode mild or moderate depression (F31.4) Bipolar affective disorder, current episode severe depression without psychotic symptoms (F31.5) Bipolar affective disorder, current episode severe depression with psychotic symptoms (F31.6) Bipolar affective disorder, current episode mixed (F31.7) Bipolar affective disorder, currently in remission (F31.8) Other bipolar affective disorders

		(F31.9) Bipolar affective disorder, unspecified Bipolar II disorder Recurrent manic episodes NOS (F31.9) Bipolar affective disorder, unspecified (F32) Depressive episode (F32.0) Mild depressive episode (F32.1) Moderate depressive episode (F32.2) Severe depressive episode without psychotic symptoms (F32.3) Severe depressive episode with psychotic symptoms (F32.8) Other depressive episodes Atypical depression Single episodes of "masked" depression NOS (F32.9) Depressive episode, unspecified (F33) Recurrent depressive disorder (F33.0) Recurrent depressive disorder, current episode mild (F33.1) Recurrent depressive disorder, current episode moderate (F33.2) Recurrent depressive disorder, current episode severe without psychotic symptoms (F33.3) Recurrent depressive disorder, current episode severe with psychotic symptoms (F33.4) Recurrent depressive disorder, currently in remission (F33.8) Other recurrent depressive disorders (F33.9) Recurrent depressive disorder, unspecified (F34) Persistent mood (affective) disorders (F34.0) Cyclothymia (F34.1) Dysthymia (F34.8) Other persistent mood (affective) disorders (F34.9) Persistent mood (affective) disorder, unspecified (F38) Other mood (affective) disorders (F38.0) Other single mood (affective) disorders Mixed affective episode (F38.1) Other recurrent mood (affective) disorders Recurrent brief depressive episodes (F38.8) Other specified mood (affective) disorders (F39) Unspecified mood (affective) disorder
1.5	(F40–F48) Neurotic, stress-related and somatoform disorders	(F40) Phobic anxiety disorders (F40.0) Agoraphobia (F40.1) Social phobias Anthropophobia

		Social neurosis (F40.2) Specific (isolated) phobias Acrophobia Animal phobias Claustrophobia Simple phobia (F40.8) Other phobic anxiety disorders (F40.9) Phobic anxiety disorder, unspecified Phobia NOS Phobic state NOS (F41) Other anxiety disorders (F41.0) Panic disorder (episodic paroxysmal anxiety) (F41.1) Generalized anxiety disorder (F42) Obsessive-compulsive disorder (F43) Reaction to severe stress, and adjustment disorders (F43.0) Acute stress reaction (F43.1) Post-traumatic stress disorder (F43.2) Adjustment disorder (F44) Dissociative (conversion) disorders (F44.0) Dissociative amnesia (F44.1) Dissociative fugue (F44.2) Dissociative stupor (F44.3) Trance and possession disorders (F44.4) Dissociative motor disorders (F44.5) Dissociative convulsions (F44.6) Dissociative anaesthesia and sensory loss (F44.7) Mixed dissociative (conversion) disorders (F44.8) Other dissociative (conversion) disorders Ganser's syndrome Multiple personality (F44.9) Dissociative (conversion) disorders, unspecified (F45) Somatoform disorders (F45.0) Somatization disorder Briquet's disorder Multiple psychosomatic disorder (F45.1) Undifferentiated somatoform disorder (F45.2) Hypochondriacal disorder Body dysmorphic disorder Dysmorphophobia (nondelusional)

		Hypochondriacal neurosis Hypochondriasis Nosophobia (F45.3) Somatoform autonomic dysfunction Cardiac neurosis Da Costa's syndrome Gastric neurosis Neurocirculatory asthenia (F45.4) Persistent somatoform pain disorder Psychalgia (F45.8) Other somatoform disorders (F45.9) Somatoform disorder, unspecified (F48) Other neurotic disorders (F48.0) Neurasthenia (F48.1) Depersonalization-derealization syndrome (F48.8) Other specified neurotic disorders Dhat syndrome Occupational neurosis, including writer's cramp Psychasthenia Psychasthenic neurosis Psychogenic syncope (F48.9) Neurotic disorder, unspecified Neurosis NOS
1.6	(F50–F59) Behavioural syndromes associated with physiological disturbances and physical factors	(F50) Eating disorders (F50.0) Anorexia nervosa (F50.1) Atypical anorexia nervosa (F50.2) Bulimia nervosa (F50.3) Atypical bulimia nervosa (F50.4) Overeating associated with other psychological disturbances (F50.5) Vomiting associated with other psychological disturbances (F50.8) Other eating disorders Pica in adults (F50.9) Eating disorder, unspecified (F51) Nonorganic sleep disorders (F51.0) Nonorganic insomnia (F51.1) Nonorganic hypersomnia (F51.2) Nonorganic disorder of the sleep-wake schedule (F51.3) Sleepwalking (somnambulism) (F51.4) Sleep terrors (night terrors)

		(F51.5) Nightmares (F52) Sexual dysfunction, not caused by organic disorder or disease (F52.0) Lack or loss of sexual desire Frigidity Hypoactive sexual desire disorder (F52.1) Sexual aversion and lack of sexual enjoyment Anhedonia (sexual) (F52.2) Failure of genital response Female sexual arousal disorder Male erectile disorder Psychogenic impotence (F52.3) Orgasmic dysfunction Inhibited orgasm (male)(female) Psychogenic anorgasmy (F52.4) Premature ejaculation (F52.5) Nonorganic vaginismus (F52.6) Nonorganic dyspareunia (F52.7) Excessive sexual drive (F52.8) Other sexual dysfunction, not caused by organic disorder or disease (F52.9) Unspecified sexual dysfunction, not caused by organic disorder or disease (F53) Mental and behavioural disorders associated with the puerperium, not elsewhere classified (F53.0) Mild mental and behavioural disorders associated with the puerperium, not elsewhere classified Postnatal depression NOS Postpartum depression NOS (F53.1) Severe mental and behavioural disorders associated with the puerperium, not elsewhere classified Puerperal psychosis NOS (F54) Psychological and behavioural factors associated with disorders or diseases classified elsewhere (F55) Abuse of non-dependence-producing substances (F59) Unspecified behavioural syndromes associated with physiological disturbances and physical factors
1.7	(F60–F69) Disorders of adult personality and behaviour	(F60) Specific personality disorders (F60.0) Paranoid personality disorder (F60.1) Schizoid personality disorder (F60.2) Dissocial personality disorder Antisocial personality disorder

		(F60.3) Emotionally unstable personality disorder Borderline personality disorder (F60.4) Histrionic personality disorder (F60.5) Anankastic personality disorder Obsessive-compulsive personality disorder (F60.6) Anxious (avoidant) personality disorder (F60.7) Dependent personality disorder (F60.8) Other specific personality disorders Eccentric personality disorder Haltlose personality disorder Immature personality disorder Narcissistic personality disorder Passive-aggressive personality disorder Psychoneurotic personality disorder (F60.9) Personality disorder not otherwise specified Personality disorder unspecified (F61) Mixed and other personality disorders (F62) Enduring personality changes, not attributable to brain damage and disease (F63) Habit and impulse disorders (F63.0) Pathological gambling (F63.1) Pathological fire-setting (pyromania) (F63.2) Pathological stealing (kleptomania) (F63.3) Trichotillomania (F63.8) Other habit and impulse disorders Intermittent Explosive Disorder (F64) Gender identity disorders (F64.0) Transsexualism (F64.1) Dual-role transvestism (F64.2) Gender identity disorder of childhood (F65) Disorders of sexual preference (F65.0) Sexual fetishism (F65.1) Fetishist transvestism (F65.2) Exhibitionism (F65.3) Voyeurism (F65.4) Paedophilia (F65.5) Sadomasochism (F65.6) Multiple disorders of sexual preference (F65.8) Other disorders of sexual preference Frotteurism

		Necrophilia Zoophilia (F66) Psychological and behavioural disorders associated with sexual development and orientation (F66.0) Sexual maturation disorder (F66.1) Ego-dystonic sexual orientation (F66.2) Sexual relationship disorder (F66.8) Other psychosexual development disorders (F66.9) Psychosexual development disorder, unspecified (F68) Other disorders of adult personality and behaviour (F68.0) Elaboration of physical symptoms for psychological reasons (F68.1) Intentional production or feigning of symptoms or disabilities, either physical or psychological (factitious disorder) Munchausen syndrome (F68.8) Other specified disorders of adult personality and behaviour (F69) Unspecified disorder of adult personality and behaviour
1.8	(F70–F79) Mental retardation	(F70) Mild mental retardation (F71) Moderate mental retardation (F72) Severe mental retardation (F73) Profound mental retardation (F78) Other mental retardation (F79) Unspecified mental retardation
1.9	(F80–F89) Disorders of psychological development	(F80) Specific developmental disorders of speech and language (F80.0) Specific speech articulation disorder (F80.1) Expressive language disorder (F80.2) Receptive language disorder Receptive aphasia (F80.3) Acquired aphasia with epilepsy (Landau-Kleffner) (F80.8) Other developmental disorders of speech and language Lisping (F80.9) Developmental disorder of speech and language, unspecified (F81) Specific developmental disorders of scholastic skills (F81.0) Specific reading disorder Developmental dyslexia (F81.1) Specific spelling disorder (F81.2) Specific disorder of arithmetical skills Developmental acalculia Gerstmann syndrome (F81.3) Mixed disorder of scholastic skills

		(F81.8) Other developmental disorders of scholastic skills (F81.9) Developmental disorder of scholastic skills, unspecified (F82) Specific developmental disorder of motor function Developmental coordination disorder (F83) Mixed specific developmental disorders (F84) Pervasive developmental disorders (F84.0) Childhood autism (F84.1) Atypical autism (F84.2) Rett's syndrome (F84.3) Other childhood disintegrative disorder (F84.4) Overactive disorder associated with mental retardation and stereotyped movements (F84.5) Asperger syndrome (F88) Other disorders of psychological development (F89) Unspecified disorder of psychological development
1.10	(F90–F98) Behavioural and emotional disorders with onset usually occurring in childhood and adolescence	(F90.0) Disturbance of activity and attention Attention-deficit hyperactivity disorder Attention deficit syndrome with hyperactivity (F90.1) Hyperkinetic conduct disorder (F90.8) Other hyperkinetic disorders (F90.9) Hyperkinetic disorder, unspecified (F91) Conduct disorders (F91.0) Conduct disorder confined to the family context (F91.1) Unsocialized conduct disorder (F91.2) Socialized conduct disorder (F91.3) Oppositional defiant disorder (F91.8) Other conduct disorders (F91.9) Conduct disorder, unspecified (F92) Mixed disorders of conduct and emotions (F92.0) Depressive conduct disorder (F92.8) Other mixed disorders of conduct and emotions (F92.9) Mixed disorder of conduct and emotions, unspecified (F93) Emotional disorders with onset specific to childhood (F93.0) Separation anxiety disorder of childhood (F93.1) Phobic anxiety disorder of childhood (F93.2) Social anxiety disorder of childhood (F93.3) Sibling rivalry disorder (F93.8) Other childhood emotional disorders Identity disorder

		Overanxious disorder (F93.9) Childhood emotional disorder, unspecified (F94) Disorders of social functioning with onset specific to childhood and adolescence (F94.0) Elective mutism (F94.1) Reactive attachment disorder of childhood (F94.2) Disinhibited attachment disorder of childhood (F94.8) Other childhood disorders of social functioning (F94.9) Childhood disorder of social functioning, unspecified (F95) Tic disorders (F95.0) Transient tic disorder (F95.1) Chronic motor or vocal tic disorder (F95.2) Combined vocal and multiple motor tic disorder (de la Tourette) (F95.8) Other tic disorders (F95.9) Tic disorder, unspecified (F98) Other behavioural and emotional disorders with onset usually occurring in childhood and adolescence (F98.0) Nonorganic enuresis (F98.1) Nonorganic encopresis (F98.2) Feeding disorder of infancy and childhood (F98.3) Pica of infancy and childhood (F98.4) Stereotyped movement disorders (F98.5) Stuttering (stammering) (F98.6) Cluttering (F98.8) Other specified behavioural and emotional disorders with onset usually occurring in childhood and adolescence Attention deficit disorder without hyperactivity Excessive masturbation Nail-biting Nose-picking Thumb-sucking (F98.9) Unspecified behavioural and emotional disorders with onset usually occurring in childhood and adolescence
1.11		F99) Mental disorder, not otherwise specified

Annex vi: In-Depth Observation Questionnaire during Focused Group Discussion

Appearance; are the patients dress and general appearance appropriate?

Behaviour; is anything remarkably strange about the patients speech, facial tics, involuntary movements, difficulties in co-ordination or gait?

Orientation; knowledge of the patients-who he/she is, where she is, what time, the year, month and the day it is?

Memory; how is the patients' memory for recent and long- disaster past events

Sensorium; are there any problems related to the five senses?

Psychomotor Activity; appearance of abnormal retardation or quickening of motor activity

State of Consciousness; does consciousness appear clear, or is the patient bewildered, confused, or stupors.

Affect; is the patient's emotional expression appropriate? -in appropriate laugh while discussing the death of an immediate family member?

Mood; all the way through the interview, has the patient generally been angry? Depressed? Anxious? Apprehensive? What?

Personality; how can the patient be described? Sensitive? Stubborn? Apprehensive? What?

Thought Content; is the patient hallucinating-seeing, hearing, or otherwise experiencing things that aren't really there? Are the patient delusional - expressing untrue, unfounded beliefs (such as the delusion that someone follows him or her everywhere)? Does the patient appear to be obsessive does the patients appear to think the same over and over again?

Thought Processes; is there under- or over productivity of ideas? Does the idea seem to be the patients abnormally slowly or quickly? Is there evidence of loosening of association? Are the patient's verbal productions rambling or disconnected?

Intellectual Resources; what is the estimated intelligence of the respondent?

Insight; Does the patient realistically appreciate his or her situation and the necessity for professional assistance if such is necessary?

Judgment; how appropriate has the patients' decision making been with regard to the past and the future plans?

Annex vii: Enhanced Mental Health Checklist

Depressed Mood		
Over the last month a persistent low mood	Yes	No
Over the last month a loss of interest in pleasurable activities	Yes	No
Anxiety		
Over the last month, a persisting feeling of being anxious, nervous or on edge	Yes	No
Over the last month an inability to stop or control worrying thoughts	Yes	No
Post-Traumatic Stress Symptoms		
In the past month had nightmares about or had thoughts about unpleasant incident which were not wanted	Yes	No
In the past month tried hard not to think about unpleasant incident or tried to avoid situations that remind them of it/them	Yes	No
In the past month has felt numb or detached from others, activities or surroundings	Yes	No
In the past month has been constantly on guard or watchful or easily startled	Yes	No
Anger/Irritability		
In the last month has got angry with someone and yelled at them or threatened physical violence	Yes	No
Sleep		
In the last month had difficulty getting off the sleep or staying asleep	Yes	No
In the last month quality of sleep has interfered with day to day life(prompt for day to day fatigue ,ability to function at work/daily chores, concentration, memory, mood et.al	Yes	No

Drugs and Alcohol use					
How often does the person have a drink /abuse drugs containing alcohol? (score)	Never	Monthly or less (1)	2-4 times per month (2)	2-3 times per week (3)	4+ times per week (4)
How many units of alcohol do you drink on a typical day when drinking(score)	1-2 (0)	3-4 (1)	5-6 (2)	7-9 (3)	10+ (4)
How often had 6 or more units if female, or 8 or more if male, on a single occasion in the last year(score)	Never (0)	less than a Month (1)	monthly (2)	Week (3)	Daily or almost daily (4)

Notes on results: depression ½ yes=possible depression, 2/2 yes=probable depression; anxiety ½ yes=possible anxiety disorder-investigate cause; PTSD: 2/4 yes possible,3/4 Yes=probable PTSD: Sleep; if sleep is interfering with daily activity, investigate further for depression and anxiety or anxiety or other for sleep disturbance; Anger: if positive investigate patient's concern about this; Alcohol if scored items add to more than 5,investigate whether person drinking harmfully or dependently and assess person's concerns about drinking.

Outcome	
No evidence of mental health problems	
Some concerns, and patients offered advice and or assurance	
Patients requires follows up and PC management	
Patients require DCMH referral and or GP	
Patients declined DCMH referral	
Patients is already referred or being managed by DCMH	

Annex viii: Missouri Model Flow Chart for Mental Health Response and Recovery

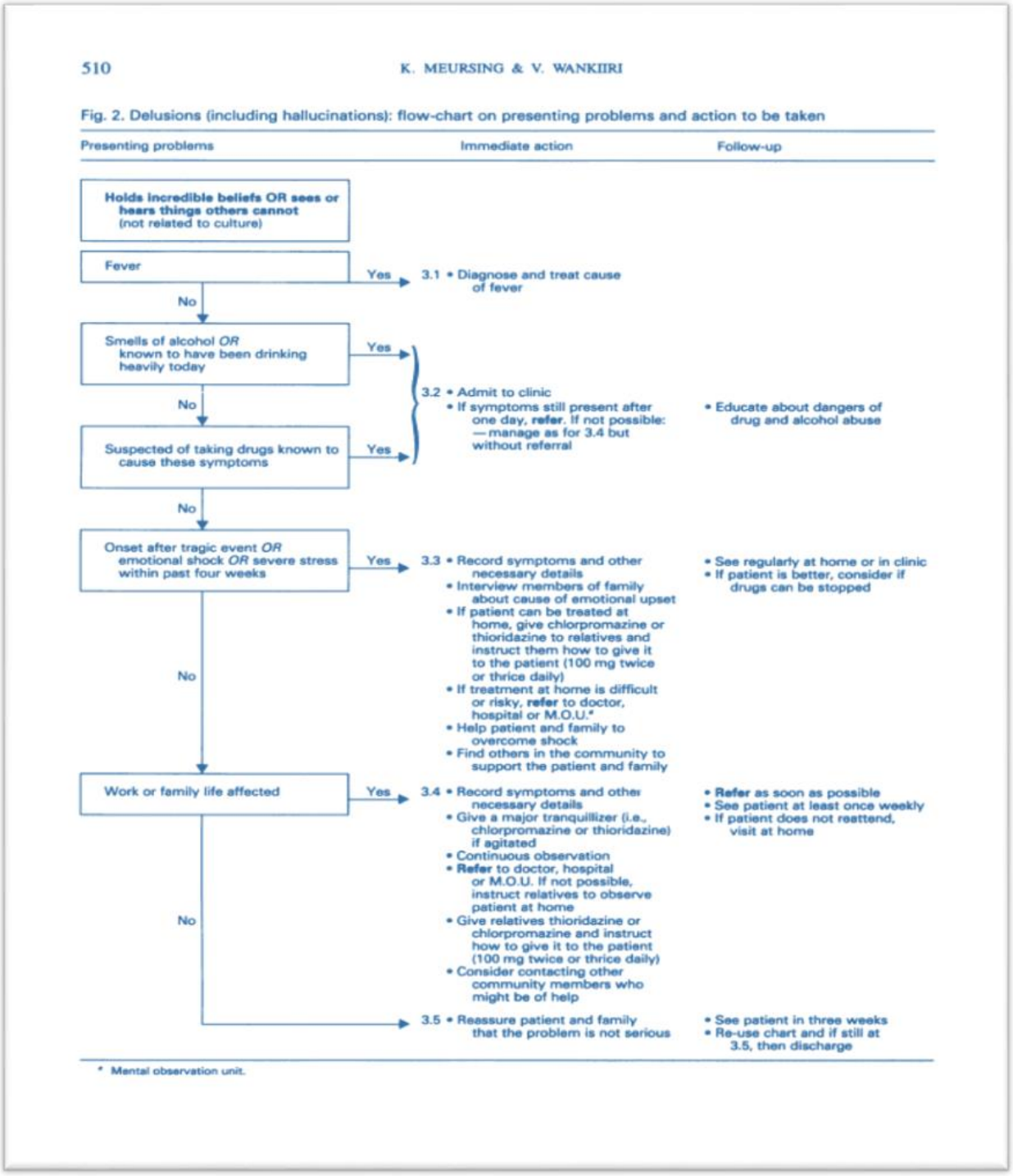

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Fig. 2. Delusions (including hallucinations): flow-chart on presenting problems and action to be taken

Presenting problems	Immediate action	Follow-up
Holds incredible beliefs OR sees or hears things others cannot (not related to culture)		
Fever — Yes	3.1 • Diagnose and treat cause of fever	
Fever — No → Smells of alcohol *OR* known to have been drinking heavily today — Yes	3.2 • Admit to clinic • If symptoms still present after one day, **refer**. If not possible: — manage as for 3.4 but without referral	• Educate about dangers of drug and alcohol abuse
Smells of alcohol *OR* known to have been drinking heavily today — No → Suspected of taking drugs known to cause these symptoms — Yes	3.2 • Admit to clinic • If symptoms still present after one day, **refer**. If not possible: — manage as for 3.4 but without referral	• Educate about dangers of drug and alcohol abuse
Suspected of taking drugs known to cause these symptoms — No → Onset after tragic event *OR* emotional shock *OR* severe stress within past four weeks — Yes	3.3 • Record symptoms and other necessary details • Interview members of family about cause of emotional upset • If patient can be treated at home, give chlorpromazine or thioridazine to relatives and instruct them how to give it to the patient (100 mg twice or thrice daily) • If treatment at home is difficult or risky, **refer** to doctor, hospital or M.O.U.* • Help patient and family to overcome shock • Find others in the community to support the patient and family	• See regularly at home or in clinic • If patient is better, consider if drugs can be stopped
Onset after tragic event *OR* emotional shock *OR* severe stress within past four weeks — No → Work or family life affected — Yes	3.4 • Record symptoms and other necessary details • Give a major tranquillizer (i.e., chlorpromazine or thioridazine) if agitated • Continuous observation • **Refer** to doctor, hospital or M.O.U. If not possible, instruct relatives to observe patient at home • Give relatives thioridazine or chlorpromazine and instruct how to give it to the patient (100 mg twice or thrice daily) • Consider contacting other community members who might be of help	• **Refer** as soon as possible • See patient at least once weekly • If patient does not reattend, visit at home
Work or family life affected — No	3.5 • Reassure patient and family that the problem is not serious	• See patient in three weeks • Re-use chart and if still at 3.5, then discharge

* Mental observation unit.

Annex ix: Household Survey Questionnaire on Mental Health Disorders

This questionnaire consists of three parts. You are requested to fill in all the sections taking into the account the instructions given. The information provided will be treated private and confidential.

PATIENT-PROFILING QUESTIONNAIRE

Date	D	D	M	M	Y	Y	Y	Y
Name of interviewer								
Name of supervisor								
Name of county								
Name of the ward								
Name of the village								
Respondent contacts	Phone							
	Email/							
	fax:							
Location coordinates	Latitude:							
	Longitude							

Section A: Identification

Respondent identification

1. Type of relief the area (tick where applicable)
   - ☐ Hilly
   - ☐ Plain land
   - ☐ Undulating
   - ☐ Other (specify)…….

2. Gender of respondent (tick where applicable)
   - Male
   - Female

3. Age or respondent (tick one)
   - 15 years and below
   - 16-20 years
   - 21-30 years
   - 31-50 years
   - 51 years and above

4. Educational level of respondent (tick one)
   - None
   - Primary
   - Secondary
   - College
   - University

Section B: Mental Health Survey

5. Who utilizes the services of the clinic often? (tick where applicable)
   - ☐ Locals
   - ☐ Non-local

6. Who is the most frequent visitor to the healthy facility
   - ☐ Adult females
   - ☐ Adult males
   - ☐ Children
   - ☐ Infants
   - ☐ Other (specify) ……

7. What are the most frequent diseases in this household/community?

---

8. What are the most frequent mental disorders in the household/community?

---

9. Do you think these mental health disorders are related to the disasters drought experienced by residents (tick where applicable)?

Yes ☐
No ☐

10. Do you think these mental health disorders are related to the disasters floods experienced by residents (tick where applicable)?

Yes ☐
No ☐

Observation (tick where applicable)

QUESTION	**STRONGLY AGREE**	**AGREE**	**DISAGREE**
Anxiety disorders: panic, PTSD			
Dissociative disorders			
Eating disorders			
Sleeping disorders			
Substance–related disorders			
Adjustment /developmental			

11. Do you know of any incapacitated individuals suffering from mental disorders? If yes, how many and which areas have they inhabited?

_____

_____

12. How would you gauge the severity of mental disorders among these age groups? (tick these mental health disorders are related to the disasters floods experienced by residents where applicable)

Age groups	**Severe**	**Not so severe**	**Mild**	**Normal**
15years and below				
16-20 years				
21-30 years				
31-40 years				
41-50 years				
51 years and above				

13. How would you rate the prevalence of mental disorders based on these durations? (tick where applicable)

Months	**Very high**	**High**	**Moderate**	**Low**	**None**
January to March					
April to June					
July to September					
October to December					
During heavy rains					
During dry spell					

14. What is the health activities related to mental disorders? (Tick where applicable)

- ☐ Training
- ☐ Awareness and sensitization
- ☐ Psychological support
- ☐ Other, please explain_____

What is the perception of people toward people with mental illness?

_____
_____
_____
_____

15. Have you suffered from any ailments that you believe was contributed by disasters caused by drought and (or) floods?

Yes ☐ No ☐

If yes, what kind of ailments? (Tick one)

QUESTION	**Tick One**
Skin	
Respiratory	
Mental/ Psychological	
Any other (Specify)	

Annex x: Socio–Economic and Hydro-Meteorological Disaster Household Questionnaire

Social-Economic and Disaster Household Questionnaire

Section A: Identification

Date	D	D	M	M	Y	Y	Y	Y
Name of interviewer								
Name of supervisor								
Name of county								
Name of the ward								
Name of the village								
Location coordinates	Latitude:							
	Longitude:							

A. Respondent Identification

1.Respondent gender (tick where applicable)

- ☐ Male
- ☐ Female
- ☐ Rather not say

2. Respondent age (tick where applicable)

- ☐ Less than 15
- ☐ 16 – 20
- ☐ 21 – 30
- ☐ 31 – 40
- ☐ 41 – 50
- ☐ 51 – 70
- ☐ Above 71

3. Respondent education level (tick where applicable)

- ☐ None
- ☐ Primary
- ☐ Secondary
- ☐ College
- ☐ University graduate
- ☐ Post graduate

4. What is your occupation? ----------

Section B: Settlement

5. What is the Category of settlement? (Tick where applicable)

- ☐ Rural
- ☐ Urban

6. Give the settlement types? (Tick where applicable)

- ☐ Clustered
- ☐ scattered
- ☐ linear

7. How do you characterize your homestead? (Tick where applicable)

- ☐ Permanent
- ☐ Semi-permanent
- ☐ Temporary

How long have you lived in this area? (Tick where applicable)

- ☐ Over 20 years
- ☐ Between 10 and 20 years
- ☐ Between 10 and 20 years
- ☐ Between 5 and 10 years

☐ less than 5 years

8. Give reasons why you moved into this area (Tick where applicable, you can have more than one reason)

☐ Native of the area
☐ Family and friend
☐ Farming
☐ Livestock grazing
☐ Fishing
☐ Other (specify) ……..

Section C: Source of income

9. How do you classify yourself? (Tick where applicable)

☐ Employed
☐ Never employed
☐ Businessman
☐ Retired/retrenched
☐ Other, please explain_____

10. What are your main sources of income? (Tick where applicable, you can have more than one income source)

☐ Agriculture
☐ Hunting
☐ Fishing
☐ Charcoal production
☐ Livestock
☐ Trading
☐ Other (please explain_____

11. What is your monthly income level? (Tick where applicable)

☐ less than 10,000
☐ Between 10,001 and 20,000
☐ Between 20,001 and 80,000
☐ Between 80,001 and 200,000
☐ Above 200,000

Section D: Exposure based index to vulnerability of hydro-meteorological disasters

12. Where do you get your water from and what do you use it for? (tick where applicable)

☐ Well
○ *Cooking Drinking* ○ *Washing* *Irrigation* ○ *Animals* ○
☐ Stream (part of Ewaso Nyiro River)
○ *Cooking Drinking* ○ *Washing* *Irrigation* ○ *Animals* ○
☐ Bore hole
○ *Cooking Drinking* ○ *Washing* *Irrigation* ○ *Animals* ○
☐ Rain water
○ *Cooking Drinking* ○ *Washing* *Irrigation* ○ *Animals* ○
☐ Other (specify) _____
○ *Cooking Drinking* ○ *Washing* *Irrigation* ○ *Animals* ○

13. Do you think there is enough water in your area for livestock or irrigation (tick where applicable)?

☐ Yes
☐ No
☐ Fair enough

Section E: Sources of food

14. From which sources do you get your food? (tick where applicable)

☐ Grains
○ *Self-grown* ○ *from local farmers* ○ *from the market and shops*
☐ Vegetables
○ *Self-grown* ○ *from local farmers* ○ *from the market and shops*
☐ Animal products
○ *Self-grown* ○ *from local farmers* ○ *from the market and shops*
☐ Fish
○ *Self-grown* ○ *from local farmers* ○ *from the market and shops*

☐ ◯*Self-grown* ◯*from local farmers* ◯ *from the market and shops*

Other (specify----------

15. How do you process your livestock products? (tick where applicable)

☐Drying
☐Salting
☐Smoking
☐Other, specify _____

16. Where do you sell your livestock product? (Tick where applicable)

☐Don't sell
☐Local market
☐To traders outside the community
☐Other, specify _____

Section F: Extreme Event and Hydro-Meteorological Disasters

17. How have temperatures and rainfall varied from 1961 to 1990 (from Isiolo Met)

18. How have temperatures and rainfall varied from 1990 to present (from Isiolo Met)

19. In the last three (2) years, how often have you witnessed the following Disasters (Tick where applicable, *interviewer should evaluate this carefully*)

	monthly	**Seasonally**	**yearly**	**rarely**
Drought				
Floods				
Biological (epidemic diseases)				
Geological(earthquakes, volcanicity)				

20. How do you categorize the area in reference to disasters? (Tick where applicable)

☐ Potentially risk area
☐High risk area
☐ Low risk area
☐No risk area

21. Highlight the magnitude of the disasters (Tick where applicable)

☐ Crippling
☐ Recurrent event
☐ Low intensity
☐No intensity

22. What are the impacts of the disasters in the neighbourhood? (Tick where applicable)

	Yes	**No**	**Not sure**
Psychological/emotional			
Famine			
Blockage of drainage system			
Loss of life			
Property loss			
Loss of income			
Scarcity of basic needs			

Section G: Policies and Programmatic Interventions

23. Are there any Disaster related organizations or government work in your community? (Tick where applicable)

☐Yes
☐No
☐If yes, what do they do? _____

24. Have you attended any training forum on disaster related issues? (tick where applicable)

☐Yes
☐No

25. Have you heard about disaster risk reduction, adaptation, mitigation and poverty reduction programmes interventions (tick where applicable)?

☐ Yes, if yes indicate where……..

☐ No

How do you think they address climate extremes and variability?

……

26. Are climate change hydro-meteorological disasters affecting resources? (tick where applicable)

☐ Yes

☐ No

27. How long do you think climate change hydro-meteorological disasters have been going on in your community? (tick where applicable)

☐ More than 30 years

☐ More than 10 years but less than 30 years

☐ Less than 10 years

☐ I don't know

28. Did you know that climate change hydro-meteorological disasters affect mental health? (tick where applicable)

☐ Yes

☐ No

29. Are there any efforts that have been made to help people with mental disorders? (tick where applicable)

☐ Yes, if yes indicate which activities and by who…….

……..

☐ No

Annex xi: Assessment of Climate Change: Hydro-Meteorological Disaster Impacts on Mental Health, Policies and Strategic Interventions in Isiolo County in Kenya.

TARGET RESPONDENTS: CEOS AND MANAGEMENT TEAM OF CIVIL SOCIETY ORGANIZATIONS AND PUBLIC INSTITUTIONS

KEY INFORMANT INTERVIEW GUIDE

QUESTIONS		RESPONSES	INSTRUCTION
1.0	INTRODUCTION		
1.1	INTERVIEW DATE		
1.2	INSTITUTION NAME		*indicate in full*
1.3	CATEGORY	CSOs_____1 Private_____2 Public_____3	*Circle the most appropriate*
1.4	GENDER	Male_____1 Female _____2 Mixed_____3	*Circle the most appropriate*
1.5	DESIGNATION		*Indicate in full*
1.7	MOBILE CONTACT	_____	*indicate for need of further clarification*
1.6	COUNTY WARD	_____ _____	
2.0	**Climate Change Hydro-Meteorological disasters**		
2.1	Are climate change hydro-meteorological disasters affecting resources?- (Water, agriculture, vegetation)	Yes _____ No_____	tick where applicable
2.2	How long do you think climate change hydro-meteorological disasters have been going on in your community?	More than 30 years_____1 More than 10 years but less than 30 years_____2 Less than 10 years_____3 I don't know_____4	tick where applicable
2.3	Does floods and drought contribute to mental disorders	Yes, if yes mention how_____1 No_____2	Specify appropriately
2.4	Are there any efforts that have been made to help people with mental disorders?	Yes, if yes indicate which activities and by how---------1 No_____2	tick where applicable

3.0	**Hydro-Meteorological Disasters Impacting Mental Health**		
3.1	Do you experience disaster related mental health disorders	Yes_____1 No_____2	*If yes, answer the next Question*
3.2	If yes: name the Hydro-meteorological Disasters	Hydro-meteorological disasters _____ _____ _____	Specify appropriately
3.3	What are the main impacts of these to human health	_____ _____ _____ _____	Specify appropriately
3.4	What are specific impact of Flood related disasters to human health	If any please_specify	Specify appropriately
3.6	What are impacts of drought related disasters to human health	If any please_specify	Specify appropriately
3.7	Are there effects on mental health?	Yes No Not aware _____	If yes indicate below
3.5	Specify the mental health illness	_____	Fill in appropriately
3.6	Drawing from experience what are other factors leading to mental health disorder?	_____ _	Fill in appropriately
4.0	**Policy and programmes interventions**		
4.1	Are there policies and programmes interventions put in place to address mental health	Yes_____ No_____ Not aware_____	if yes, indicate below
4.2	Specify the policies and programme interventions at community level (Where?)	_____ _____	Fill in appropriately
4.5	Have you heard about disaster risk reduction, adaptation, mitigation and poverty reduction programmes interventions	disaster risk reduction_____1 adaptation_____2 mitigation_____3 poverty reduction_____4	tick where applicable

4.6	How inclusive are the above programmes interventions where they exist?	Inclusivity _____1 Non –inclusivity_____2	tick where applicable
4.7	What are the gaps being addressed in policies and programme interventions in relation to mental health	_____ _____ _____	Fill in appropriately
4.8	How do you think they address climate extremes and variability	_____ _____	Fill in appropriately
4.9	How are they linked to offer holistic approach to mental health illness	_____ _____	Fill in appropriately

Annex xii: Dynamic Analysis of Disaster Interventions "Trans-Disciplinary Approach Interventions Blue Print Model"

PHASE	PRE-INCIDENT	IMPACT AND RESCUE (0-48 HOURS) (0-2 WEEKS)		RECOVERY (2 WEEKS TO 1 YEAR)
COMMUNITY MENTAL HEALTH ROLE (CONTINUED)	▪ Train responders in evidence-based mental health response skills consistent with assigned responsibilities ○ Mental health professionals ○ Crisis counselors ○ Outreach workers ○ Substance abuse counselors ○ Interpreters ○ Health workforce ○ Natural helpers ▪ Promote stress management & self-care **Public Education** ▪ Preparedness campaigns & materials that address mental health needs ▪ Mental health promotion & prevention efforts to: ○ Build emotional resilience ○ Increase protective factors ○ Target prevention efforts to at-risk groups, including special populations ○ Integrate substance abuse & relapse prevention efforts ▪ Cultivate relationships with & educate media **Community Development** ▪ Partner to address needs of disability & other at-risk groups	normalize reactions, predict positive outcomes & promote adaptive coping ▪ Foster communication ▪ Protect survivors from further harm ▪ Reduce physiological arousal ▪ Discourage use of stimulants, alcohol or other substances **Monitor environment** ▪ Observe and listen to those most affected ▪ Monitor environment for stressors **Technical assistance, consultation & training** ▪ Improve capacity of organizations & caregivers to provide what is needed to re-establish community structure, foster family recovery & resilience, and safeguard community ▪ Provide to: ○ relevant organizations ○ other caregivers and responders ○ leaders	**Outreach & information dissemination** ▪ Make contact with and identify people who have not requested services (i.e. "walk-around mental health") ▪ Inform people about different services, coping, recovery process, etc. (e.g., by using established community structures, fliers, websites) ▪ Use outreach workers who are indigenous, bilingual & culturally competent **Fostering resilience & recovery** ▪ Facilitate social interactions ▪ Offer coping skills & training ▪ Educate about stress response, traumatic reminders, coping, normal vs. abnormal functioning, risk factors, services ▪ Facilitate group and family support ▪ Foster natural social support ▪ Address grief & bereavement ▪ As needed, repair community & organizational fabric ▪ When possible, participate in local collaboration efforts including involvement in Community Organizations Active in Disaster (COAD).	▪ Recognize need for spiritual support & refer as needed ▪ Encourage continued practice of relapse prevention, participation in treatment and self-help recovery groups **Community Development** ▪ Promote use of community ritual & commemorative activities to strengthen & re-unify community ▪ Partner to address needs of disability & other at-risk groups ▪ When possible, participate in local collaboration efforts including involvement in Community Organizations Active in Disaster (COAD). ▪ Develop resources & partnerships with diverse cultures within communities **Public Education** ▪ Predict & stress positive outcomes & typical emotional reactions in recovery phase ▪ Anticipate & prepare for anniversary responses & other triggers ▪ Disseminate stress management & coping materials ▪ Through media and outreach, conduct mental health promotion & prevention efforts

Annex xiii: Longitudinal and Cross-Sectional Spatial Distribution of Sample Locations and Sample Size in the Study Area.

County/Constituency/Wards	App. Population	App .Area in km^2	Purposive sample site (locations)	Purposive sample size		
Isiolo North Constituency	100, 176	15,517.20		So-eco	MhD	KII
1. Bulla Pesa	22,722	7.70	Bulla-Pesa	23		
2. Wabera	18,774	13.00	Kiwajani and wabera	51		
3. Burat	17,431	778.00	Burat and Odha	30		
4. Cherab	15,560	8,761	Merti north and Merti south	29		
5. Oldonyiro	15,388	1,161	Oldo-nyiro and Kipsing	71		
6. Ngaremara	5,520	963.90	Ngaremara	27		
7. Chari	4,781	3.761.20	Bula-Pesa	00		
Isiolo South Constituency 1.Garba Tula	*43,118* 16,401	*9,818.90* 3,821	Garfasa, Garbatulla North and Garbatulla South	34		
2. Kinna	14,618	2,181	Kulamawe	00		
3. Sericho	12,099	3,816	Modagashi North and Modagashi South	23		
Total	143,294	16,506.10		289	60	29
				Grand sample size 378		

Annex xiv: The Selected Counter Measures to Mitigate Floods in Isiolo River Basin

Counter Measures	Action Taken	Remarks
Flood Early Warning	The installations have been functional till the recent Flash floods which damaged some of the installations 16th April 2015.The WRMA SRO has made arrangements to have the installations repaired.	More community sensitization trainings required to raise awareness and avail funds to repair the flood weather station and water level recorder on Eastern Marania River
Flood Hazard Map	WRUA Prepared the map during the JICA project	WRUA Needs to improve and update the Map.
Communication and collaboration amongst upstream and downstream water users	Both WRUA and WRMA are involving other stakeholders in sharing of the information by use of mobile phones	Regular stakeholders meetings to enhance community participation through WRUA establishment.
Flood Education Programme	None	
Education and Disaster Management	KRC- Isiolo conducted trainings during implementation of JICA Project for WRUA members, Isiolo Girls sec school and Ntirimiti Day sec. school	More trainings required to promote community awareness and participation
Drainage Network	Isiolo county implemented some activities to improve drainage Network within the township unlike in past rainy seasons	Activities are on -going and much has been done to address flood issues within the township and Isiolo Airport area. caveats, gabions and drainage channels to ensure floods from the upper catchment doesn't directly enter into the Airport directly
Sand bags	Being used by plot developers and county government as short Measures to divert flood water	Communities even at household level have embraced the approach to manage floods.
Forestation activity	Isiolo WRUA, Forest Department. and County Government have plans	Funding is the challenge
Excavation Merille River	Reasonable portions have excavation by Isiolo county Government	The activities were carried out prior to the expected el'nino rains.
Widening of Merille river	carried in small portions in small scale	County Government needs through works to ascertain actual boundaries /planning by the developers along the Merille river
Restriction of land use	No activity	-
Cleaning river campaigns	NGOs in Collaboration with Isiolo County Government have initiated some clean up on Merille River which are on going	Isiolo WRUA requires funding to enhance and set live examples to the community on their roles in cleaning up Isiolo river and its tributaries
Dams/check dams	No activity so far	
Drainage canals	within the Isiolo township the county Government is carrying out activities to improve drainage canals though to a minimal	County Government needs to improve on existing works However unlike in the past they constructed reasonable canals

	scale	to divert flood water entering the Airport. They have constructed a diversion canal a stretch of more than 5km leading flood water to a seasonal river
Culvert under the road	No action taken	-
Retarding basins/ponds	No action taken	-
Contingency Plans	None	-
Reconstruction and recovery	None	-
River Bank protection and spur dykes	To strengthen the river bank protection the community with assistance from Isiolo WRMA planted some seedlings.	The completed piloted JICA project is in good condition. WRUAs need to approach both Isiolo and Meru county to fund similar activities in enhancing hydrological activities in the entire Isiolo

Annex xv: Comprehensive Mental Health Services Coordination Framework