**Field: Environment Science**

**Improving Disaster Resilience in Turkana County,Kenya.**

Turkana is a County in the former Rift Valley Province of Kenya. It lies in the northwestern Kenya bordered by Ethiopia, Sudan and Uganda. It is the largest County by Land area of 98,597.8Km². Turkana is an Arid and semi Arid (ASALs) area. It is characterized by warm and hot climate. Their main source of livelihood is based on pastoralism characterized by livestock rearing. They also engange in farming of drought resistant crops, that is also agro-pastoralism. This county is also characterized by poor socio-economic conditions such as high poverty levels, limited access to basic needs and low literacy rate.

Turkana being one of the Arid and semi Arid Lands (ASALs) in Kenya suffers high vulnerability of natural and man made disasters such as drought, floods, diseases outbreak, conflict, changing land use and management and political unrest. Due to it's high frequency, severity and intensity of their occurrence and increase in level of vulnerability among affected communities, this intensify the impact of these disasters causing their livelihoods to increase under threat.

Turkana County has a long history of development interventions and remains one of the poorest counties in Kenya. Drought are normal occurence in Turkana. During the colonial period ,severe droughts occurred in 1924, 1932, 1933, 1952 and 1960, necessitating femine relief(Oba 1992).

**Disaster**

Disasters are recurring events and is majorly a result of climate change. Disaster are not only emotionally devastating but also incredibly costly to both individuals, communities, local and national government, and organizations.

Disaster events comes in four phases and this phases are used as a guide for preventing a disaster's impact. This helps reduce the damage and costs disasters cause. Here is a breakdown of the phases.

**Mitigation**

This is the first stage of disaster management. It involves preventing the potential effects of a disaster before it happens. It's aim is to identify potential risks and hazards that could lead to a disaster, analyzing and assessing vulnerabilities and risks then developing, preparing and implementing measures that reduce the hazard risk. This can benefit all stages of disaster management. Example is infrastructure resilience, that is building and maintaining critical infrastructure with resilience in mind. This can help in withstanding natural disasters like using materials and designs that are resistant to earthquakes, floods, and other hazards.

**Preparedness**

Preparedness refers to developing strategies, plans, and procedures to effectively deal with potential hazards. It involves creating creating emergency plans, exercises, and training to ensure that people, equipments, and systems are ready to respond to a disaster.

Examples of preparedness measures is fire drills, this intends to ensure everyone in a building have procedures to follow in a fire event, including where to exit and where to assemble.

 Redundancy and Back-Up systems is another example, this intends to maintain essential services during disasters, including backup power generation and communication systems in critical infrastructure. Early warning is another example that equips communities and critical infrastructure operators with essential time required for thorough preparation and effective response to various natural disasters.

Insurance services is another example which involves linking properties to insurance services, livestock insurance for those that lose animals in drought and banditry.

**Response**

Response involves immediate actions in response to hazards. The action includes search and rescue operations, providing emergency medical assistance and emergency shelters. The response team work to stabilize the situation.

Example of response is deploying emergency workers and social workers to help guide the affected people towards evacuation to a safer place and moving emergency supplies to where it will be easily and safely accessible.

**Recovery**

Recovery focuses on restoring the affected community to a state of nomalcy. It involves provind medical assistance, social services, rebuilding infrastructure, and helping families and individuals recover financially.

Example of a recovery plan is having a support group for those who suffered emotional trauma during the disaster and a continuing medical assistance such as physical therapy for the injured people.

**Disaster Resilience**

Resilience implies the ability to bounce back and even grow in the face of threats to survival (Reich,J.W. 2006). Thus disaster resilience is the ability to prevent, withstand, and recover from the harmful impacts of natural disasters.

To improve disaster resilience in this county there is need for the community members, the local government and the national government to merge together as one people for a smooth positive change of the community. This change may come in several ways but here is a breakdown of some of it.

* Equipping the community to recover their livelihoods

The community experience; low capacity to engange in non-farm livelihoods which is brought about by limited access to financial services and poor access to technology.

Lack of skills, individuals and the community at large lack skills such as educating the people about disaster response and management.

* Increasing and strengthening the government's capacity and focus at the county level to manage disaster risk and enhance preparedness and active response to the hazard risk.

National focus on disaster resilience is yet promising. The National government mostly emphasis on resolving near term disasters rather than the far off disaster caused by Natural hazards and climate change that could potentially have high negative impacts on people, properties and the community.

* Investing in animal's health service

Investing in animal's health is crucial for ensuring food safety and security. It also tend to improve resistance of animals to diseases outbreak and drought and can also lead to more efficient production and higher quality products. Getting animals protected against certain diseases by getting them immunized and dip washing and also investing in animals such as camels since they can sustain drought.

* Co-ordination between stakeholders

Through warning systems, communities will get equipped with essential time required for preparation and response to hazard risks. Lack of co-ordination leads to huge losses of properties and lives.

* Increase market for animals and their products

Making markets available for the communities so as to allow them get a chance to engange in selling and buying of animals and their products and to also expose them to trade.

Communities can enhance the resilience of animal markets and their products to various disasters, ultimately safeguarding livelihoods and ensuring food security using the strategies below.

Early Warning Systems: Establishing early warning systems for disasters can help farmers and traders have adequate time to plan and prepare to take action to protect their animals and products. This involve using technology such as weather forecasting, utilizing community-based alert systems and monitoring seismic activities.

Education and Training: Education and Training is essential in disaster preparedness and response measures. This could be done by training farmers and traders on evacuation procedures, securing infrastructure and managing livestock during emergencies and crisis.

Infrastructure Development: This means investing in infrastructure that can withstand disasters and it includes implementing flood protection measures, creating backup systems for water and feed supplies and constructing sturdy shelters for animals.

Collaboration and Coordination: Foster collaboration and coordination among government agencies, non-governmental organizations and community groups to develop comprehensive disaster resilience plans for animal markets. This involves sharing resources, expertise and best practices.

Insurance and Risk Management: Providing access to insurance and risk management mechanisms to the affected individual or community, can help mitigate the financial impact of disasters on animal markets and related businesses. This helps lift a huge burden of finance off the victims shoulders. This could include livestock insurance, crop insurance and business interruption coverage.

Diversification of Livelihoods: Encouraging diversification of livelihoods which includes agro-pastoralism and even enterpreneurship can reduce dependence on animal markets and products hence making communities more resilient to market disruptions caused by disasters.

Promotion of Sustainable Practices: Encouraging sustainable farming and trading practices can help mitigate the long-term impacts of disasters on animal markets and their products. This includes promoting agroecological methods, reducing reliance on chemical inputs and preserving biodiversity.

* Urban development and land use planning

Proper land planning is essential and can help avoid construction in high risk areas prone to natural disasters thus reducing the exposure of critical infrastructure. This includes construction of resilient infrastructure which can withstand earthquakes and construction of flood barriers. In land use planning proper risk assessment is done to zone out the areas with high risk of natural disasters. This helps in promoting a safer land use.

* Diversification of livelihood sources

This allows exposure of different sources of livelihood which will in turn favour both genders. This will also enhance a sustainable gender sensitivity in livelihoods and economies.

Increasing capacity of women and youths who are more impacted by disasters through trainings which will aim at improving their skills in different ventures such as enterpreneurship skills.

Creation of alternative livelihoods for the communities. Alternative livelihoods such as farming, fish rearing, and trading. This will help the community not to depend only on one livelihood and to major in different livelihoods so that incase of a disaster their livelihoods will not be majorly affected so as their lives.

* Improving food security

Food security involves storing food aside in silos or granaries for future use incase of droughts, this is mostly done in communities prone to drought.

Irrigation schemes is also another way to secure food by enhancing and engaging the community in irrigation schemes.

Green houses, doing farming in green houses

Farmers training, educating and training farmers on matters farming

* Access to water

Improving access to clean water is important in building disaster resilience at community, society and individual level. Access to clean water improves disaster resilience in many different ways some include:

Hygiene and sanitation: Hygiene and sanitation is crucial for living a good and healthy life. Clean water helps prevent diseases caused by dirty water such as waterborne diseases like cholera and bilharzia.

Reliable access to water encourages economic stability. Reliable water supply is essential for economic development of an individual or the community. This water is used in industrial companies as raw materials for processing, manufacturing and even production of energy and other goods. It is essential to have Reliable access of water to mitigate impact of disasters.

Food security: Water is essential for agriculture and food production, especially using it for irrigation during crisis. Availability of water decreases the impact of disaster. It also reduces the dependency rate of external aid and increases the local food supplies.

Emergency Response: During disasters such as earthquakes, hurricanes or floods access to clean and reliable water becomes critical for survival. Having readily available water sources and infrastructure helps responders to provide immediate aid to the affected people or community.

Community Resilience: Access to water can enhance community resilience by enabling individuals and communities to better withstand and recover from disasters. Water storage facilities such as dam construction, boreholes digging, harvesting rainwater and decentralized water treatment solutions can all contribute to resilience by providing alternative water sources during times of crisis.

* Social and environmental guidelines

This is the use of environmental and climate risk assessment tools to evaluate existing vulnerabilities to prevent future hazards. This is usually done by banks and it's focus is to evaluate several disaster risks during project lending assessment and making sure that environmental factors that could rise the existing risks or create new risks are eliminated.

* Public awareness and education

Educating the public about disaster measures and response is crucial especially the people who are likely to be affected by disaster. This could be done through physical trainings of people, social media platforms, and even broadcast.

* Improving and investing in disaster risk reduction (DRR)

Management and climate change adaptation at national and county levels needs to be improved. The government should invest more on disaster risk reduction far off disaster instead of just a near term disaster.

* Construction of leeves

Construction of leeves is necessary especially in a flooding event. A leeve is a natural or artificial wall that blocks water from going where we do not want it to go. Construction of leeves can be used to make available some extra land for habitation or for the fertile soil of a flooding area to be used for agriculture.

* Post disaster recovery and reconstruction finance

Post-disaster recovery and reconstruction finance plays a vital role in enhancing disaster resilience by providing the necessary funds for rebuilding infrastructure, restoring livelihoods and implementing measures to mitigate future risks.

Financiers of post recovery and reconstruction like banks promote a better community. This financiers dwells in projects like building the capacity of engineers and masons who takes the responsibilities of building infrastructures so that they can be able to establish a culture of resilient building practices. Financiers can also start a project of offering technical assistance and education to the homeowners about resilient construction methods.

Effective post-disaster recovery and reconstruction finance is essential for building resilience to future disasters by enabling timely and comprehensive rebuilding efforts, implementing risk reduction measures and fostering sustainable development practices.

Here is a full breakdown of how post-disaster recovery and reconstruction finance helps in disaster resilience.

Capacity Building: Financial resources can be allocated towards capacity-building initiatives, including training programs, community outreach, and education campaigns, to enhance awareness and preparedness for future disasters.

Rebuilding Infrastructure: This finance enables the repair and rebuilding of critical infrastructure such as roads, bridges, hospitals and schools damaged by a disaster. This is essential for community resilience and quick recovery after a disaster.

Risk Reduction Measures: Investing in disaster risk reduction measures such as early warning systems, flood barriers and land-use planning helps in mitigating the impact of future disasters hence making communities more resilient to occurence of similar events in the future.

Shelter: Funding supports the reconstruction of housing and shelters for the displaced communities and individuals thus ensuring that communities have safe and secure places to live hence reducing vulnerability to future disasters.

Insurance and Risk Transfer: Financing mechanisms such as insurance and risk transfer instruments or companies help distribute the financial burden of disasters among various stakeholders thereby reducing the economic impact on individuals, businesses and governments.

Inclusive Recovery: Adequate finance ensures that marginalized and vulnerable populations, including women, children, elderly, and persons with disabilities are included in recovery efforts and get adequate social protection thereby promoting inclusive and sustainable resilience in the community.

Long-Term Sustainability: Investments in resilient infrastructure and disaster risk reduction measures contribute to the long-term sustainability of communities, reducing the likelihood of future disasters and their associated costs.

* Planting trees

Trees plays an important role in reducing flooding by slowing down the flow of rain water especially into the rivers, surface and streams thus reducing the risk of a disaster caused by flooding. The slowing down of water flow is mainly done by water absorption. Trees takes the major role of absorbing water through their roots, which in turn helps reduce the amount of rain water flowing during heavy rainfalls.

Infiltration: Trees help in increasing infiltration of water into the soil. This is done by the roots. The roots create channels in the soil allowing water to penetrate deeper into the ground rather than running off the surface. This helps to reduce the amount of surface water that contributes to flooding.

Reducing soil erosion: Rains hits the ground at higher speed and impact where there is a lack of tree cover. This canopy consist of leaves, trunks and branches. This canopies reduces soil erosion by reducing the impact of rain onto the ground or slowing down the rain before it hits the ground.

Trees enables soil Stability: The soil stability is instigated by the roots of a tree. This roots bind soil particles together hence reducing erosion and soil runoff during heavy rainfall. This means that soil is less likely to be washed away hence preventing flooding.

Shade and Evapotranspiration: Trees reduces the air temperature in two ways: by preventing solar radiation from heating up surfaces below the canopy (shading) and by coverting energy to latent heat flux through the transpiration of water released through the stomata of leaves (in the following termed cooling; Rahman et al. 2020a).

Evapotranspiration helps in improving air quality and enhancing the local rain driven water cycle, this local rain driven water is made possible by the water vapor released by the trees through a process called transpiration. Trees shade helps in regulating soil temperature and reduces the rate of water evaporation.

Natural Floodplains: Floodplains are areas along rivers, lakes, oceans and ponds that floods at some different points in time of heavy rainfalls. Planting trees along riverbanks and in floodplain areas can help create natural zones that absorb excess water during floods. These natural floodplains can help slow down and store floodwaters, reducing the severity of flooding downstream.

* Creating a peaceful, cohesive and better organized communities

Having a cohesive, peaceful and organized community create a foundation for resilience that enables individuals to withstand and recover from disasters more effectively. This can be made possible using the following.

Effective Communication: A community that sticks together often engange in an open communication among community members, this enables timely sharing and passing of critical information such as potential threats, evacuation plans and emergency procedures.

Sharing of Resources: In times of disaster, a community with togetherness is more likely to share resources such as shelter, food, water, and medical supplies this will ensure that everyone's needs are met.

Psychological Resilience: A sense of belonging and support within the community which is also brought about by mutual support can moderate against the psychological impacts of disasters hence helping individuals and communities cope with stress, trauma and loss more effectively.

 Effective Response: An organized leadership in both local and national government creates a clear and effective communication channels, this enables the community members to respond more efficiently to disasters, coordinating activities such as medical assistance, search and rescue efforts, and damage assessment.

Collaborative Planning: A community can work together to develop and implement disaster preparedness and response plans tailored to their specific needs and vulnerabilities.

Mutual Support: Mutual support is about creating a culture of support within our communities and society. Mutual support helps build resilience in community. It also enables encouragement and assistance especially during times of crisis or disaster. It also means building inclusive and supportive communities where everyone has the opportunity to participate and contribute. A community with a strong network of supportive relationships are able to cope with crisis when it arise.