CGIAR FOCUS Climate Security

Alliance Bioversity & CIAT

CGIAR

CGIAR INITIATIVE ON Livestock and Climate

Integrating Livestock Climate Adaptation and Peacebuilding: The Climate Security Sensitivity Tool for Livestock Systems (CSSTxLS)

A framework and a safeguarding approach for conflict-sensitive and peace-responsive climate action: the Climate-Security Sensitivity Tool (CSST)

DECEMBER 2024

AUTHORS
Carolina SARZANA
Radhika SINGH
George MEDDINGS
Anna BELLI
Brenda CHEPNGETICH
Livia SAGLIOCCO
Mary MUTHEU
Grazia PACILLO

CITATION
Sarzana C, Singh R, Meddings G, Belli A, Chepngetich B, Sagliocco L, Mutheu M & Pacillo G. (2024). Integrating Livestock Climate Adaptation and Peacebuilding: The Climate Security Sensitivity Tool for Livestock Systems (CSSTxLS). CGIAR LCSR: CGIAR initiative on Livestock Climate Resilience.

COVER PHOTO: Kabir Dhanji/ILRI

WORKING PAPER 2023/01

CONTACT
CGIAR FOCUS Climate Security
climatesecurity@cgiar.org
https://climatesecurity.cgiar.org

CGIAR aims to address gaps in knowledge about climate change and food security for peace and security policies and operations through a unique multidisciplinary approach. Our main objective is to align evidence from the realms of climate, land, and food systems science with peacebuilding efforts already underway that address conflict through evidence-based environmental, political, and socio-economic solutions.

This report has not been peer-reviewed. The views expressed in this document cannot be taken to reflect the official position of the CGIAR or its donor agencies. The designations employed and the presentation of material in this report do not imply the expression of any opinion on the part of CGIAR concerning the legal status of any country, territory, area, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

ACKNOWLEDGEMENTS
We acknowledge the valuable contribution from all the stakeholders that participated in the Climate Security workshop in Nairobi, on the 29th of October 2024. We would like to thank them for their time, engagement, knowledge, and active support. This work was implemented as a part of the CGIAR Initiative on Livestock Resilience (LCSR).

Photo: Eric Fèvre/ILRI

ABSTRACT

Climate change presents profound challenges for livestock-dependent communities, particularly in fragile and conflict-affected regions where environmental, social, and political pressures intersect. The Climate Security Sensitivity Tool for Livestock Systems (CSSTxLS) builds upon the Climate Security Sensitivity Tool (CSST) framework to provide a specialized approach for designing conflict-sensitive and peace-responsive climate adaptation interventions tailored to livestock systems.

This working paper outlines the development and application of the CSSTxLS framework, which was shaped by the results of a collaborative workshop held in October 2024 at the International Livestock Research Institute (ILRI) campus in Nairobi, Kenya. The workshop brought together experts in climate adaptation, conflict resolution, and livestock systems to contextualize the CSST framework for livestock-based livelihoods.

Using case studies from Turkana and Mandera counties in Kenya, the paper explores the interactions between conflict drivers – such as weak infrastructure, socio-economic vulnerabilities, and human hazards – and climate-peace mechanisms, including economic development, institutional strengthening, resource sustainability, trust-building, and resilience enhancement. It highlights the importance of local context and expert validation in designing effective interventions.

Drawing on the workshop findings and broader literature on pastoralist livelihood transitions, this paper demonstrates how climate adaptation can mitigate conflict risks, enhance resilience, and foster peace. By integrating traditional knowledge, addressing power asymmetries, and prioritizing equitable resource distribution, the CSSTxLS provides a pathway for adaptive strategies that address climate challenges while contributing to sustainable peacebuilding in vulnerable regions.

CONTENTS

Photo: Geoffrey Njenga/ILRI

1. INTRODUCTION

Climate change is a complex and multifaceted challenge with far-reaching implications that extend beyond environmental transformations into socioeconomic and political domains. The intricate relationships between climate change, resource availability, human security, and potential conflict have increasingly drawn the attention of researchers and policymakers worldwide (Ide et al, 2021). Particularly within livestock systems, these intersections become critically pronounced, revealing complex dynamics that demand nuanced, interdisciplinary approaches to climate adaptation and conflict prevention. Livestock systems, especially in regions characterized by resource scarcity and environmental strategies (Naess et al, 2021). Water scarcity, reduced pastureland, vulnerability, are uniquely positioned at the nexus of climate change, livelihood security, and potential conflict. As climate variability intensifies, pastoral and livestock-dependent communities face unprecedented challenges in maintaining their traditional resource management and shifting environmental conditions contribute to heightened competition and potential conflict over increasingly limited resources.

Climate adaptation interventions, despite their well-intentioned objectives, often face significant challenges in preventing unintended negative consequences. The concept of maladaptation has emerged as a critical concern, highlighting how inadequately designed interventions can exacerbate existing social tensions and potentially trigger new conflict dynamics (Marino & Ribot, 2012). Maladaptation occurs when climate adaptation interventions inadvertently generate negative impacts on the vulnerability of other systems, sectors or social groups, potentially exacerbating existing social tensions or creating new conflict dynamics (Barnett & O'Neill, 2010; Schipper, 2020). These risks are particularly acute in fragile and conflict-affected contexts, where social resilience is already compromised. In these environments, climate adaptation interventions operate within already complex and volatile social landscapes. The potential for an intervention to become a catalyst for increased conflict is significant, especially when it fails to understand and address local conflict drivers (Krampe, 2020). One of the primary challenges lies in the inherent complexity of intervention design. Climate adaptation programs risk overlooking the intricate social, economic, and political contexts in which they are implemented. As Eriksen et al. (2021) argue, many interventions adopt a technocratic approach that fails to account for local power dynamics, existing social inequalities, and community-specific resource management strategies. In livestock systems, such maladaptation can manifest through unintended power asymmetries, marginalization of specific community groups (Nielsen & Reenberg, 2010), disruption of traditional adaptive strategies (Nakashima et al, 2012), economic displacement-related insecurity (Paavola & Adger, 2006), and intensification of resource-related conflicts and grievances (Schilling et al, 2012). Conversely, climate adaptation also presents significant opportunities for peacebuilding and cooperative resource management. Environmental peacebuilding theories suggest that shared environmental challenges

can serve as catalysts for collaboration, integration, and collective problem-solving (Ide, 2020). By reframing climate adaptation as a cooperative endeavor, interventions can potentially transform competitive resource dynamics into platforms for dialogue and mutual understanding.

Recognizing these challenges, there is an urgent need for more sophisticated, context-sensitive approaches to climate adaptation. The Climate Security Sensitivity Tool (CSST), developed by CGIAR FOCUS Climate Security, represents an innovative approach to addressing these complex challenges. By introducing the concept of "Climate-Peace Mechanisms," the tool provides a framework for assessing how climate adaptation interventions can simultaneously address environmental challenges and potential conflict drivers (Sarzana et al, 2023). This approach acknowledges the intrinsic connections between climate action, natural resource management, peacebuilding and social stability. This working paper seeks to extend this framework specifically to livestock systems, recognizing their unique characteristics and challenges. The proposed Climate Security Sensitivity Tool for Livestock Systems (CSSTxLS) is a specialized assessment and guidance platform that can help practitioners working with livestock production systems design more conflict-sensitive and peace-responsive climate adaptation interventions.

The CSSTxLS builds directly upon the existing CSST developed by CGIAR FOCUS Climate Security. While maintaining the core theoretical framework of the original tool, our approach seeks to specialize and refine the analysis specifically for livestock systems through a collaborative and evidence-based methodology. The foundational Climate-Peace Mechanisms (CPM) and conflict driver indicators from the original CSST framework serve as the starting point for our adaptation. These mechanisms provide a comprehensive approach to understanding the intricate relationships between climate change, resource management, and potential conflict (Sarzana et al, 2023). However, the unique characteristics of livestock systems necessitate a more nuanced and context-specific interpretation of these mechanisms. A dedicated workshop held on October 29th, 2024, at the International Livestock Research Institute (ILRI) campus in Nairobi, Kenya, played a pivotal role in reshaping the framework. This collaborative session brought together a diverse group of experts, including climate adaptation specialists, livestock systems researchers, conflict resolution experts and program and policy practitioners. Through structured discussions and collaborative exercises focused on two Kenyan case study areas, Turkana and Madera, the workshop participants examined the existing CPM and conflict drivers presented by the CSST and identified specific ways in which these mechanisms interact with conflict drivers uniquely within livestock systems. This expert-driven approach allowed for a contextualization of the framework, highlighting the distinctive challenges and opportunities presented by livestock-dependent communities.

By maintaining the core framework of the CSST while introducing livestock-specific refinements, the CSSTxLS represents a significant advancement in climate adaptation programming. This working paper aims to report the workshop results and outline the framework for the CSSTxLS tool. Our approach acknowledges that climate adaptation is fundamentally a context-specific social process, not merely a technical intervention. It requires deep engagement with local communities, understanding of existing social dynamics, and a commitment to inclusive, participatory design. The development of the Climate Security Sensitivity Tool for Livestock Systems represents a significant step towards more holistic, integrated approaches to climate adaptation. By explicitly addressing the risks of maladaptation and centering local community perspectives, we can develop interventions that support both climate resilience and peacebuilding.

Photo: Eric Fèvre/ILRI

2. LIVELIHOOD TRANSITIONS IN PASTORAL COMMUNITIES AND IMPLICATIONS FOR CLIMATE ACTION

Pastoralists are not stagnant; they continually adapt their livelihood strategies to evolving environmental, political, and economic conditions. They may change the way they access land and pasture, select livestock, reconstruct herds, and engage with markets. Throughout history, pastoralists have often not been solely reliant on livestock production. Given harsh and variable environments, they have also engaged in trade and agricultural production. Trade with farmers, of course, has long been a strategy to cope with droughts (Catley et al, 2013; Orindi et al, 2007; Kirui et al, 2022). However, political, economic and environmental forces in recent history have driven pastoralists faster than ever before to activities outside of livestock production (Scoones et al, 2020). While events such as droughts may narrow the range of livelihood options available to pastoralists, they must be understood in the larger context of more gradual drivers towards other livelihoods (Little, 2016). These include sedentarization, the adoption of agro-pastoralism, non-herding pastoralism, commercial pastoralism, and peri-urban pastoralism. Each new livelihood strategy is associated with distinct tenure regimes and resource utilization patterns (Catley et al, 2013).

Developments such as the expansion of transport routes and communication technologies, accompanied by increased urbanization and the establishment of schools and hospitals, have influenced choices around which new livelihood strategies to adopt. The size and economic activities of nearby towns have been pivotal in the creating new options for livelihood adaptation or diversification. Demographic shifts are also an important factor in trying to understand livelihood transitions. Although mobile pastoralism traditionally operates in areas with extensive land and low human population densities, the growth of populations in pastoral towns and settlements encroaches upon rangelands and challenges the sustainability of traditional pastoral practices. Among the Nigerian Fulani population, for example, local population growth, either due to migration or to natural population increases, has been blamed for causing competition over resources. Population growth has limited communities' ability to further expand or sub-divide plots, reducing the area available for grazing and watering livestock (Opitz-Stapleton et al, 2023). However, scholars have tended to neglect analysis of demographic trends in pastoral areas, either to avoid the Malthusian label or due to ignorance (Catley et al, 2013).

Decisions around livelihood strategies are also shaped by increased access to information through mobile phone technologies. In Kenya, for example, the spread of mobile phone technology has opened up different options for livelihoods, including both the intensification of livestock production or diversifying into new livelihood opportunities and abandoning pastoralism altogether (Little, 2016). Pastoralists are increasingly gaining access to information on local and global political developments and market trends, and are able to communicate more efficiently with relatives and traders. Mobile phone technology has also enabled remittances and informed migration pathways (Avis, 2018).

The categorization of long-term livelihood pathways helps identify trends and pressures in pastoralist communities. Pathways include “hanging in”, when people combine limited pastoralist production with other agricultural activities; “moving up”, when livestock production is commercialized and high returns can be earned; “moving out”, when people engage in activities not directly linked to pastoralism; and “dropping out”, or when pastoralism is abandoned altogether due to unsustainably low returns. Of course, households may engage in multiple pathways, or converge towards a single one. These pathways map onto resource and market access (see Figure 1) (Kirui et al, 2022; Catley et al, 2013). It is important to distinguish between survival-oriented and accumulation-oriented diversification, as well as between strategies supportive of pastoralism versus those that may undermine it (Catley et al, 2013). Livelihood diversification is seen as an important risk management strategy. However, it is important to recognize that diversification is often a means for pastoralists to remain in pastoralism, rather than escape from it (Achiba, 2018).

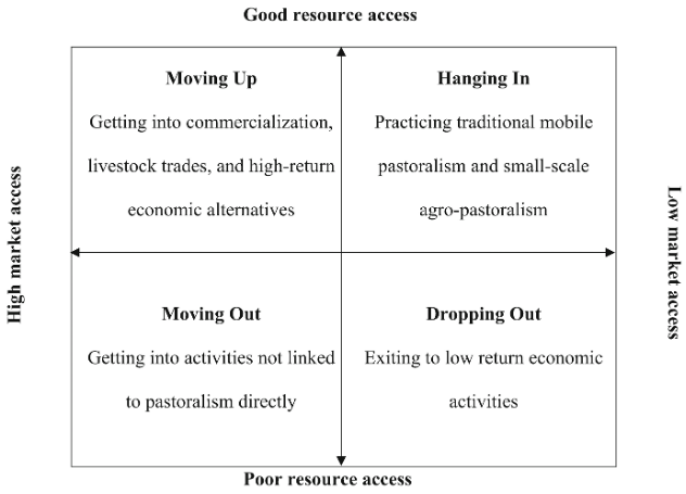


Figure 1 Resource and market access influences livelihood strategies (Source: Kirui et al, 2022)

However, continued political marginalization and general underdevelopment, coupled with underinvestment in dryland areas, means that diversification choices are relatively limited for pastoralists compared to other communities (Little, 2016). Yet emerging strategies do suggest a new kind of pastoralism which, while retaining some traditional elements of pastoralism, also involves novel activities. These include commercializing livestock production, reconfiguring livestock production strategies, intensifying agricultural production, engaging in petty trade, migrating to cities, entering the informal sector, or finding employment in ranches or tourism initiatives. More generally, changed mobility patterns, new social networks, and altering herd compositions are commonly used tactics (Adriansen, 2006; Avis, 2018; Akall, 2021). Some activities can cause environmental degradation, such as cutting down indigenous trees to make charcoal (Leshan and Standslause, 2013). Other activities may include crime, smuggling or terrorism (AU, 2013).

The commercialization of livestock production has emerged as an important adaptation strategy amongst pastoralists. In the Horn of Africa, livestock and meat trade was estimated at 1 billion USD in 2010– a figure that has no doubt increased since then. Both domestic consumption and exports are growing, driven by increased urbanization and market linkages (Abbink et al, 2014; Achiba, 2018). Commercialization has enabled pastoralists to continue their pastoral way of life, rather than having to “drop out” (Adriansen, 2006). While commercial opportunities are increasing at a rapid

pace and communities are benefiting from the increased trade across geopolitical boundaries, it has also driven new social and political dynamics in pastoral areas and introduced market-related vulnerabilities and risks (Catley et al, 2013). Livestock commercialization has also shaped herd composition. Beef cattle, which can be sold for slaughter, has replaced milking cattle, which is kept for subsistence (Adriansen, 2006). In many pastoral communities, such as the Maasai in East Africa, people have shifted their focus away from breeding and enlarging the herd to investing in improved breeds that can gain weight more quickly and can be sold at an earlier point in their development (Catley et al, 2013). Other value-added activities include meat processing, fodder production, and livestock transport enterprises (Little, 2016).

In some areas, such as in Nigeria, the commercialization of livestock has prompted a shift from traditional pastoralism to "neo-pastoralism", which is characterized by massive herds reaching up to a thousand livestock and the extensive use of arms and ammunition to protect herds and gain control of resources. Neo-pastoralists now operate like militias, and often control more weapons than state actors. In the Sahel, neo-pastoralism is generally understood as a way for politicians to conceal ill-gotten wealth. This has had a significant effect on traditional pastoralist communities, whose poverty has only increased and for whom working for large herd owners is often the only livelihood option. Neo-pastoralism has also altered relationships with other communities that pastoralists typically rely on. Since neo-pastoralists are not incentivized to maintain good relationships with farmers on migratory routes, and can simply threaten them with force, the once-symbiotic relationship between farmers and pastoralists has weakened tremendously (Ajala, 2020).

Pastoralist communities have also exhibited a tremendous ability to "hang in". In East Africa, for example, many pastoralist communities have transferred sheep to goats to cope with the intensity of drought events. Compared to grazers, browsers can digest dry matter pasturage more easily and can survive longer without water (Degen, 2011). Another example is the replacement of cattle with camels, who are more resilient to drought and fetch high prices due to growing demand from the Middle East. These changes come with their own challenges. Adopters with camel herds tend to experience more losses due to straying, as camels can travel long distances in search of mates. This exposes them to risks like predation and theft, forcing herders to allocate significant time and resources for their retrieval (Volpato and King, 2019). Pastoralists may also diversify the type of livestock that are in their herds to ensure that they will not be completely decimated during drought (Catley et al, 2013).

Raiding livestock belonging to other communities is part of strategies for both "moving up" and "hanging in". Raiding was a way to restock cattle after drought or disease outbreaks and increase access to pasture and water resources. Improved access to markets means that now many raids are not for restocking, but for selling livestock (Schilling et al, 2012; Orindi et al, 2007). Raids may also be a push factor for livelihood diversification, as household members may engage in illicit activities include extortion, kidnapping, smuggling, or human trafficking (Avis, 2018; Little, 2016). Herding cattle rather than migrating has been one of the main responses to raiding (Adriansen, 2006).

While engaging in both agriculture and pastoralism has long been an important risk minimization strategy for pastoralist communities, recent changes have deepened pastoral engagement with farming (Abbink et al, 2014; Schmidt and Pearson, 2016). For example, among the Turkana in Kenya, households have diversified from nomadic pastoralism, supplemented by flood cultivation, into irrigated horticultural farming in the drier periods of the year (Akall, 2021). The decision to engage in

cultivation among pastoral communities is influenced by various push and pull factors. Push factors include food insecurity and declines in livestock populations due to drought and disease. Pull factors include the desire to diversify livelihoods and avoid selling livestock. In many cases, agricultural production is used to supplement pastoral incomes and provide for members of the household that are sedentary (Achiba, 2018). Changing cultural practices, such as the incorporation of maize in diets among East African populations, are additional incentives for cultivation. Labor availability and gendered divisions of labor within the household is a key determinant in choosing whether to diversify into agriculture (Catley et al, 2013). Studies have demonstrated that agro-pastoralists are more resilient to climate change than "pure" pastoralists (Tsegaye et al, 2013; Omolo et al, 2017; Tofu et al, 2023). However, many pastoralists are reluctant to rely solely on crop farming due to market vagaries and wild animal depredation on their crops (Namgay et al, 2014).

When pastoralist or agro-pastoralist livelihoods become non-viable for households, members often "move out" or "drop out", engaging in other activities such as petty trade, beer brewing, beekeeping or selling charcoal or firewood. Such activities are often carried out by women. In some cases, income from forests may contribute the majority of household income. Forests (and its products) are less vulnerable to rainfall patterns compared to livestock or agriculture and therefore form a more regular source of income for pastoralists. Pastoralists have been shown to depend more on forest income generation activities than agro-pastoralists, because they are able to cover wider area of forests during migration; moreover, collecting and selling forest products is more compatible with the labor requirements in pastoralism than in agro-pastoralism (Worku et al, 2014; Akall, 2021).

Men may also engage in salaried work, such as in ranches or wildlife conservancies, to diversify livelihoods (Worku et al, 2014; Akall, 2021). In Laikipia, Kenya, for example, many pastoralists transitioned from traditional livestock-based livelihoods to employment in privately managed ranches. In contrast to the traditional pastoral way of life, these ranches operate as tightly controlled commercial enterprises with limited female involvement and specific employee roles. These hired herders provide minimal input in decision-making, and are therefore less able to pass on herding knowledge to future generations. Despite challenges, many employed herders prefer to remain on private ranches due to job stability amid risks stemming from climate variability (Yurco, 2017).

Remittances from other family or community members, as well as aid from governments or NGOs, are other important sources of income (Worku et al, 2014). In some cases, such as with the Turkana, communities may treat famine relief as a supplement to pastoral production. After drought events, communities may move to camps, gaining access to food distribution, cash transfers, and irrigation schemes. Livestock based relief can include destocking or restocking, feed supplementation for livestock, and veterinary access (Catley et al, 2013). Yet relief efforts may have unintended or negative consequences. The ways in which food aid can suppress the local production of food and distort livestock and food prices has been well documented. In some cases, relief is not used as intended; for example, in famine relief maize has been used to brew beer, and profits used to acquire livestock (Akall, 2021). Now, aid efforts have largely transitioned from relief camps and aid to implementing livelihood interventions. In these interventions, restocking and destocking programs, as well as livestock insurance programs, may have a better chance of improving the lives of those who remain committed to their pastoralist livelihoods, rather than the creation of completely new livelihood opportunities (Catley et al, 2013).

In interventions by humanitarian, development, or government entities seeking to improve the resilience of livestock systems, maladaptation can manifest through several critical pathways:

1. **Resource allocation conflicts:** Climate adaptation interventions often involve redistributing or managing critical resources such as water, pastureland, and veterinary support. When these allocations are not carefully negotiated or promote the unsustainable use of resources, they can create or intensify competition between different community groups, herder communities, or ethnic groups (Schilling et al, 2012). The unequal distribution of adaptation benefits can become a source of grievance and potential conflict.

2. **Marginalization of vulnerable groups:** Adaptation programs frequently inadvertently reinforce existing power asymmetries. Pastoralist communities, particularly those with limited political representation, may find themselves further marginalized by interventions that do not adequately consult or include them in decision-making processes (Nielsen & Reenberg, 2010). This exclusion can lead to increased social tension and reduced intervention effectiveness.

3. **Disruption of traditional adaptive strategies:** Indigenous and local communities have developed sophisticated, long-standing strategies for managing environmental variability. Climate adaptation interventions that fail to recognize and integrate these traditional approaches risk undermining existing resilience mechanisms (Nakashima et al, 2012). Such disruptions can not only reduce community adaptive capacity but also generate social friction and resistance to external interventions.

4. **Economic displacement and livelihood transformation:** Livestock systems are deeply interconnected with local economic, political, and social structures. Adaptation interventions that prioritize rapid technological or systemic changes can inadvertently displace traditional livelihoods and replace traditional governance mechanisms, creating economic insecurity and potential social conflict (Paavola & Adger, 2006). The economic vulnerability and governance vacuums generated by such interventions can become a significant driver of social tension.

Maladaptation is likely to occur when intervening organizations have a poor understanding of pastoralism and community dynamics. To limit the risk of maladaptation, intervening organizations should first ensure that they have a sound understanding of the prevalent types of livelihood strategies and outcomes that households engage in, and what factors influence household decision making around livelihoods. This includes assessment of historical livelihood strategies; whether households are currently moving up, hanging in, moving out, or dropping out; what combinations of livelihood strategies most households are presently engaging in; and what effect these new configurations of livelihood strategies have on environmental sustainability and social cohesion.

Second, organizations must develop sound understanding of the wider economic, political, socio-cultural, and environmental dynamics and trends, and the interactions between them, that influence livelihoods, environmental sustainability, and social cohesion in the area. For example, the development of input-output markets, land use ownership and management, drought planning and response, discrimination and marginalization by other communities, access to weapons, etc., are all influenced by developments across multiple economic, political, socio-cultural, and environmental dynamics at the local, national, regional, and international levels. The task of the intervening

organization should be to hone in on factors most relevant to the particular community and ensure that their planned intervention responds to challenges and opportunities created by these macro-level dynamics. Ignoring these dynamics will almost certainly lead to unexpected and undesired outcomes in the long run.

Third, organizations must put in place long-term monitoring and evaluation strategies to ensure that the interventions are not promulgating maladaptation. This is best carried out in partnership with community governance structures, so knowledge on how to adaptively manage and respond to emerging needs is held locally and can be sustained after intervening organizations leave. An attitude of working together to achieve goals that the community itself has articulated is essential for continued positive outcomes.

Photo: Alex Mamai/CIFOR-ICRAF

3. WORKSHOP EXERCISE 1 – CONTEXTUALIZING CONFLICT DRIVERS IN LIVESTOCK-DEPENDENT LIVELIHOODS

The first workshop exercise focused on validating and contextualizing risk factors that affect livestock systems in East Africa, building upon the risk assessment framework developed by the Joint Research Centre's (JRC) INFORM RISK database (Marin Ferrer et al, 2017). Participants worked in groups to evaluate six key risk factors: low infrastructural capacities, low institutional capacities, socio-economic vulnerabilities, vulnerable groups, natural hazards, and human hazards. Using a novel "thermometer" visualization approach, experts assessed these risks for specific counties in Kenya and the Horn of Africa's transboundary regions. The counties were selected based on participants' expertise on the field: Mandera and Turkana. Each group spent approximately 10 minutes per risk factor, placing post-it notes with concrete examples of challenges at corresponding risk levels on their thermometer charts, ranging from very low to very high. This participatory assessment was then compared with JRC's INFORM RISK scores, allowing experts to discuss discrepancies and similarities between local expertise and standardized risk metrics. The comparative analysis led to rich discussions about the contextual nuances of risk in different regions, with experts having the opportunity to adjust their initial assessments based on these insights. The exercise concluded with plenary presentations from each group, fostering knowledge exchange about risk variations across different geographical contexts and enabling a more nuanced understanding of how these risks specifically impact livestock-based livelihoods in East Africa.

Table 1 Overview of conflict drivers results for Turkana and Mandera counties - working groups and JRC scores.

Region	Infrastructural capacities	Institutional capacities	Socioeconomic vulnerabilities	Vulnerable groups	Natural Hazards	Human hazards
Turkana group	9.5	5.5	8	8.5	7.5	8.5
Turkana JRC risk	7	7.3	6	1.3	3	0.5
Mandera group	8	6	7.5	7	8.5	8
Mandera JRC risk	6.6	7.4	5.3	2.5	4	8

Turkana

- **Infrastructural capacities:**
  - Limited road infrastructure outside of Lodwar hinders access to market and trade.
  - Limited internet and network connectivity results in use of Ugandan networks, which also increases preference to sell livestock in Uganda.
  - Spare electricity outside of Lodwar especially in refugee areas, this hinders electronic payments and market operations.
  - Transboundary movement of diseases and lack of disease-free zones linked with absence of coordinated vaccination protocols or implementation.
- **Institutional capacities:**
  - Sub-county peace committees under the leadership of elders and government guidance provide a bridge to formal conflict resolution systems. However, absence of dedicated government budget limits efficacy of conflict prevention and governance efforts.
  - Conflicts linked to climate issues underscore need for more effective conflict-resolution mechanisms.
  - Governance issues of behalf of country government linked with water supply and sanitation issues, compounding challenges of water scarcity and malaria.
- **Socioeconomic vulnerabilities:**
  - Poverty in rural areas is in contrast with urban centers. A symptom of significant inequality compounded by limited access to healthcare and education.
  - Minimal opportunity for diversification away from resource-driven livelihoods, which are threatened by weather variability, climate change, land use change, degradation, poor land management, and pressure stemming from migration within Turkana.
  - External investments often hire staff from outside Turkana, limiting the benefits for the local population, whilst wealthy individuals spend money outside the county, missing an opportunity to increase local investment.
- **Vulnerable groups:**
  - Vulnerability in part underpinned by limited diversification of livelihoods, rendering pastoralists one of the most vulnerable groups.
  - Attempts to reduce refugee vulnerability through a new integration plan lacks resources for implementation.
  - Strong donor dependency and reliance on external funding undermines long term sustainable solutions.
  - Mobility towards urban centers stemming from seasonal displacement and conflict, oftentimes resulting in the emergence of slums.
  - Food insecurity in Turkana a risk for vulnerable populations, evidenced by high levels of malnutrition amongst fishing communities.

- **Natural hazards:**
    - Droughts and floods are frequent, although exposure varies across the county. Rising temperatures is a risk to human and livestock health, whilst rising water levels are a threat around the lake. Low adaptive capacity of Turkana's population compounds the risk of these natural hazards, especially for households with greater proximity to hazards.
    - Increased weather variability.
    - Contamination of water supplies by chemicals or salt is a long-standing issue in Turkana, whilst large-scale locust infestations, though less common that water contamination, is also a risk.
- **Human hazards:**
    - Cattle rustling stemming from organized gang activity, shrinking her sizes, and socio-cultural factors can drive conflict, including cross-border.
    - Cross-border conflict is amplified by proliferation of armed groups and political manipulation.
    - Inter-communal conflicts persist.
    - Security forces risk escalating conflicts, whilst conflict-resolution efforts hindered by poor enforcement, corruption and underfunding of justice systems.
    - Poor resource management practices amplify tensions over resources, compounded by a lack of sustainable governance structures and undermining of community-based resource governance structures.

There are discrepancies between the scores for the different drivers of conflict and insecurity as reported by the groups in exercise one and their corresponding scores according to the JRC. The greatest difference is between the scores for *Human hazards* – 8.5 according to the group participants, and 0.5 according to the JRC. This is followed by the scores for *Vulnerable groups* where once again the score according to the group participants is significantly greater than the JRC score – 8.5 and 1.3 respectively. The third largest discrepancy is for *Natural hazards,* which was scored 7.5 by the participants and 3 in the JRC. The Weak infrastructures driver of conflict and insecurity was scored 9.5 by group participants compared to 7 in the JRC, whilst these scores were 8 and 6 respectively for *Socioeconomic vulnerabilities.* Of all the drivers of conflict and insecurity, only *Weak institutions* was scored more highly in the JRC (7.3) than by the group participants (5.5).

Mandera

- **Infrastructural capacities:**
  - Water infrastructure faces significant challenges, including limited capacity to meet community needs, and issues such as water scarcity and saline intrusion that compromise water quality (8).
  - Insufficient facilities for controlling livestock diseases exacerbate livestock vulnerability, making herds more susceptible to outbreaks and reducing their overall productivity and resilience (9).
  - Poor road networks hinder access to essential services and markets, limiting opportunities for livestock trade, reducing incomes, and impeding economic development in affected communities (5).
  - A lack of adequate storage facilities for livestock feed and food heightens the risks of food insecurity, especially during periods of drought or scarcity, further endangering both human and livestock populations (9.5).
- **Institutional capacities:**
  - County Government capacity for emergency management is limited, including budgeting and prioritization for emergencies, and human resources for emergency response (9.5).
  - Community capacity for managing risks is generally rated as good, particularly in the area of livestock management. This indicates that communities demonstrate resilience and effective strategies when addressing challenges related to livestock, such as disease outbreaks, resource management, and mitigating risks during emergencies (2).
- **Socioeconomic vulnerabilities:**
  - Economic opportunities and employment are scarce, contributing to economic marginalization and limited community resilience (8.5).
  - High levels of illiteracy and limited access to education further restrict economic prospects, creating a cycle of poverty and marginalization that is difficult to escape (10).
  - Social protection mechanisms seems to work better at community level (1) than the ones at county level (3).
- **Vulnerable groups:**
  - Women, children, the elderly, and people with disabilities are particularly vulnerable, as they face heightened risks stemming from limited economic opportunities and restricted access to resources (8.3).
  - Individuals who leave pastoralism often struggle to secure alternative livelihoods, leaving them without reliable sources of income and increasing their economic insecurity (7.5).
- **Natural hazards:**
  - Flooding poses the greatest risk to communities, followed by drought (10).
  - Soil erosion further exacerbates environmental and livelihood challenges (8.5).

- The spread of invasive species, such as acacia, reduces the availability of grazing land and livestock feed, threatening pastoral livelihoods (8).

- **Human hazards:**
  - Trapped populations exposed to non-state armed groups that take advantage of these vulnerabilities to expand their influence and further destabilize affected regions (9.5).
  - Widespread unemployment among unskilled and uneducated youth leads to economic hardship, increases involvement in gang activity and drug abuse, and heightens susceptibility to recruitment by armed groups (5.5).
  - Ethnic and climate-driven conflicts, exacerbated by political instability and competition over scarce resources, are widespread and destabilizing (7.5).

As was the case in Turkana, there are differences between the scores for different drivers of conflict and insecurity as reported in the JRC and by group participants. A large discrepancy is found between the score for *Vulnerable groups,* which was scored at 7 by group participants and 2.5 in the JRC. *Natural Hazards* were scored at 8.5 by group participants and 4 in the JRC. *Socioeconomic vulnerabilities* (7.5 according to group participants and 5.3 in the JRC) and *Weak Infrastructures* (8 according to group participants and 6.6 in the JRC) also illustrate these differences. Similar to Turkana, only *Weak institutions* was scored higher in the JRC at 7.4, compared with the score provided by the group participants (6.6). Interestingly, whilst the scores for *Human hazards* displayed the largest difference in Turkana, in Mandera the scores according to group participants and the JRC are the same (8).

Photo: Alex Maina/CIFOR-ICRAF

4. WORKSHOP EXERCISE 2 – PEACEBUILDING ENTRY POINTS FOR LIVESTOCK SYSTEMS' CLIMATE ACTION PROGRAMMING

The second workshop exercise focused on establishing and validating connections between CPMs and conflict drivers within livestock systems, building upon the original CSST's literature-based linkages. Working in groups, participants engaged in a systematic mapping exercise to identify how different CPMs relate to previously assessed conflict drivers in livestock contexts. Using a visual mapping approach, experts drew solid lines to indicate essential relationships and dotted lines for somewhat relevant connections between mechanisms and drivers, while leaving no connections where relationships were deemed irrelevant. For each identified connection, participants drew from their field experience and technical expertise to provide concrete examples of adaptation strategies and their effects on specific conflict drivers within livestock systems. This detailed mapping process allocated approximately 15 minutes per climate-peace mechanism, during which experts explored and documented how different aspects of adaptation interventions could address various conflict drivers. The exercise was guided by critical questions about practical implementation, focusing on identifying specific adaptation strategies and modalities that have proven effective in addressing conflict drivers in livestock-dependent communities. The session concluded with plenary presentations from each group, facilitating rich discussions about the diverse ways in which climate adaptation interventions can contribute to peace and security in livestock systems, while also highlighting potential challenges and opportunities specific to different regional contexts.

Table 2 Overview of conflict drivers and Climate-Peace Mechanisms connections workshop results (1 referring to full line, and 0.5 referring to a dotted line).

Climate-Peace Mechanisms	Conflict Drivers - Mandera group	Conflict Drivers - Turkana group
Economic development	Weak infrastructural capacities (1) Weak institutional capacities (1) Socioeconomic vulnerability (1) Vulnerable groups (0.5) Human hazards (1)	Weak infrastructural capacities (1)
Building institutions	Weak infrastructural capacities (0.5) Weak institutional capacities (1) Socioeconomic vulnerability (1) Natural hazards (1) Human hazards (1)	Weak institutional capacities (1) Socioeconomic vulnerability (1) Vulnerable groups (0.5) Natural hazards (1) Human hazards (1)

Climate-Peace Mechanisms	Conflict Drivers - Mandera group	Conflict Drivers - Turkana group
Building trust and cooperation	Weak infrastructure capacities (1) Weak institutional capacities (1) Socioeconomic vulnerabilities (1) Vulnerable groups (0.5) Natural hazards (0.5) Human hazards (1)	Weak institutional capacities (1) Socioeconomic vulnerability (1) Vulnerable groups (1) Human hazards (1)
Resource sustainability	Weak infrastructure capacities (0.5) Weak institutional capacities (1) Socioeconomic vulnerability (1) Vulnerable groups (0.5) Natural hazards (1) Human hazards (1)	Weak institutional capacities (0.5) Socioeconomic vulnerability (1) Vulnerable groups (1) Natural hazards (1) Human hazards (1)
Enhancing knowledge	Weak infrastructure capacities (1) Weak institutional capacities (1) Socioeconomic vulnerability (1) Vulnerable groups (1) Natural hazards (1) Human hazards (1)	Weak infrastructural capacities (1) Socioeconomic vulnerability (1) Vulnerable groups (1)
Building capacity and resilience	Weak infrastructure capacities (1) Weak institutional capacities (1) Socioeconomic vulnerability (1) Vulnerable groups (1) Natural hazards (1) Human hazards (1)	Socioeconomic vulnerability (1) Vulnerable groups (0.5) Human hazards (1)

Turkana

- **Economic development**
  - (1) Weak infrastructural capacities: Economic development in Turkana is key to improving infrastructural capacity. A positive cycle, this would improve access to markets and thus promote greater economic development, paving the way for expanded infrastructural development. Bridges and water ponds were presented as examples.
- **Building institutions**
  - (1) Weak institutional capacities: Strengthening institutions creates frameworks for better governance, decision-making, and resource allocation. This boosts local governments' capacity to prioritize projects and respond to emergencies effectively, improving overall development outcomes. Strengthening of rangeland committees and councils were presented as one example.
  - (1) Socioeconomic vulnerability: Institutions reduce socio-economic vulnerability by implementing social safety nets, public services, and economic programs that support marginalized communities, increasing access to resources and opportunities to enhance resilience.

- (0.5) Vulnerable groups: Fostering inclusive community networks and ensuring representation of vulnerable groups in decision-making processes important for stronger support and advocacy. This will protect against marginalized groups being left behind in development efforts and have access to essential resources.
- (1) Natural hazards: Institutions manage and reduce the impact of natural hazards by implementing disaster preparedness, early warning systems, and sustainable land management practices, improving resilience to floods, droughts, and other environmental risks.
- (1) Human hazards: Institutions mitigate human hazards like conflict and crime by enforcing laws, promoting public safety, and establishing emergency response systems, fostering social cohesion and safety within communities. Composition of peacebuilding committees an important consideration here.

- **Building trust and cooperation**
  - (1) Weak institutional capacities: Building trust and cooperation can strengthen institutional capacities. It fosters transparency between the county government, community groups, and stakeholders. This trust ensures that governance and service delivery are accountable. It also helps allocate resources effectively for key projects like water management, disease control, and road construction. These efforts can address the region's weak institutional frameworks. Representative community-based organizations with sufficient agency presented as important.
  - (1) Socioeconomic vulnerability: Marginalized communities, including women, youth, and people with disabilities, face significant socio-economic challenges in Turkana. By fostering trust and cooperation, local communities can establish social safety nets, such as cooperative groups or community-based support systems, to reduce vulnerability. Collaborating on shared issues like water scarcity and food insecurity strengthens resilience, ensuring that resources and support reach those most in need. Joint education facilities could play an important role.
  - (1) Vulnerable groups: Trust-building initiatives in Turkana can support vulnerable groups by fostering inclusive community networks. Although structural barriers to full inclusion remain, cultivating trust within these networks enables stronger support and advocacy, ensuring that marginalized groups are not left behind in development efforts and have access to essential resources. As with reducing socioeconomic vulnerabilities, joint educational programmes could promote inclusivity of vulnerable groups.
  - (1) Human hazards: Building trust and cooperation within communities can reduce the likelihood of conflict, as collective problem-solving and shared solutions help address issues like resource competition, social unrest, and violence. Trust between community members, local leaders, and law enforcement also enhances security and facilitates more effective management of human-related hazards. Trust and cooperation could be built through spaces for dialogue and interaction, such using sports for peace, cultural festivals, and intercommunal education facilities.

- **Resource sustainability**
  - (0.5) Weak institutional capacities: Turkana's institutional capacities can be strengthened by strengthening sustainable resource management practices. With support from the national government, local institutions can develop policies, plans, and frameworks that guide the responsible use of natural resources (such as water, land, and livestock). This ensures equitable distribution and conservation of resources, improves governance, and prevents overexploitation or environmental degradation.
  - (1) Socioeconomic vulnerability: Resource sustainability indirectly reduces socio-economic vulnerability by ensuring continued access to essential resources. While it may not immediately boost income or provide direct social services, sustainable resource management helps protect livelihoods by securing vital resources for the future.
  - (1) Vulnerable groups: Vulnerable groups stand to benefit from sustainable resource management as it protects the critical resources they rely on for survival. For example, sustainable water management ensures a consistent supply of clean water for domestic, and livestock use, safeguarding the well-being of these communities.
  - (1) Natural hazards: Sustainable resource management plays a key role in mitigating the impact of natural hazards. By preserving ecosystems such as forests and wetlands, which act as natural buffers, the region can better withstand floods, landslides, and soil erosion. Healthy ecosystems enhance resilience to environmental shocks, reducing the frequency and severity of these disasters.
  - (1) Human hazards: Sustainable resource management also helps mitigate human hazards, such as resource-based conflicts and competition. In Turkana where land degradation, coupled with water scarcity issues, the sustainable use of resources can ease tensions between communities, reducing the potential for violence and conflict over access to land, water, and other vital resources. This contributes to a more stable and peaceful society.
- **Enhancing knowledge**
  - (1) Weak infrastructural capacities: Enhancing knowledge is an important step to improving infrastructural capacities. Trainings and interactive activities can raise awareness, lead to better-maintained infrastructure, thus reducing the need for frequent repairs and improving the overall functionality of existing and new infrastructure, ultimately benefiting communities over the long term. Community radios were presented as an additional required implementation to improve resource management.
  - (1) Socioeconomic vulnerability: Enhancing knowledge on, for example, programmes related to resource management or infrastructure development, if done in a highly participatory, inclusive manner can reduce socioeconomic vulnerability and support the establishment of income generation opportunities.
  - (1) Vulnerable groups: Enhancing knowledge can help protect livelihoods and open up new opportunities for vulnerable groups and lessen socioeconomic vulnerabilities, as outlined above.

- **Building capacities and resilience**
  - (1) Socioeconomic vulnerabilities: Resilience and capacity building through, for example, skills training, can create livelihood opportunities and foster sustainable practices that reduce socioeconomic vulnerabilities.
  - (0.5) vulnerable groups: Vulnerable groups may benefit from capacity and resilience building, protecting them from threats linked to environmental degradation.
  - (1) Human hazards: Building capacities and resilience can help to reduce human hazards, such as resource-based competition. Building resilience against challenges such as environmental degradation through programming or livelihood diversification can mitigate underlying tension and reduce the potential for violence and conflict.

Mandera

- **Economic development**
  - (1) Weak infrastructural capacities: Economic development is crucial for improving infrastructure in Mandera, tackling pressing issues such as water scarcity, disease control, road access, and food storage. Expanding the water supply by adding more boreholes would alleviate pressure on natural resources while supporting livestock and pastureland. Strengthening disease control systems, road networks, and food storage facilities would enhance market access, promote livestock trade, and improve food security, particularly during droughts and other climate-related challenges.
  - (1) Weak institutional capacities: Economic development bolsters institutional capacities by providing essential funding, resources, and staff training, thereby improving governance and service delivery. In Mandera, the county government's ability to respond effectively to shocks, such as climate events, is hindered by inadequate budgeting, poor resource allocation, and a shortage of skilled personnel. Strengthening these institutions through improved financial management and capacity-building would enhance project prioritization, emergency response, and policy implementation for both local and cross-border challenges. Additionally, economic growth would support the establishment of early warning systems and disaster preparedness programs, significantly boosting overall resilience.
  - (1) Socio-economic vulnerability: strengthening economic development helps address socio-economic vulnerabilities by creating job opportunities, increasing income levels, and improving access to essential services, all of which reduce poverty and enhance quality of life.
  - (0.5) Vulnerable groups: Economic development indirectly benefits vulnerable groups by creating broader opportunities that can reach marginalized populations. However, to achieve true inclusivity, targeted support is essential to ensure that groups such as women, children, the elderly, and people with disabilities are not left behind.
  - (1) Human hazards: Economic development in Mandera can help reduce social instability by creating job opportunities, especially for youth, and offering vocational training to prevent radicalization and involvement in armed groups. It can also ease resource competition, a key driver of conflict, while improving public health through enhanced infrastructure and sanitation, addressing health risks associated with water scarcity.

- **Building institutions**
  - (0.5) Weak infrastructure capacities: Economic development is supported through robust institutions that enable effective planning, construction, and maintenance of critical infrastructure. These institutions play a key role in overseeing projects to ensure they align with community needs and promote sustainability. By enhancing the management of essential infrastructure, such as water supply systems and road networks, they create a foundation for long-term economic growth and resilience.
  - (1) Weak institutional capacities: Strengthening institutions creates frameworks for better governance, decision-making, and resource allocation. This boosts local governments' capacity to prioritize projects and respond to emergencies effectively, improving overall development outcomes.
  - (1) Socioeconomic vulnerability: Institutions reduce socio-economic vulnerability by implementing social safety nets, public services, and economic programs that support marginalized communities, increasing access to resources and opportunities to enhance resilience.
  - (1) Natural hazards: Institutions manage and reduce the impact of natural hazards by implementing disaster preparedness, early warning systems, and sustainable land management practices, improving resilience to floods, droughts, and other environmental risks.
  - (1) Human hazards: Institutions mitigate human hazards like conflict and crime by enforcing laws, promoting public safety, and establishing emergency response systems, fostering social cohesion and safety within communities.
- **Building trust and cooperation**
  - (1) Weak infrastructure capacities: In Mandera, infrastructure development is often constrained by limited resources and inadequate planning. However, building trust and fostering cooperation can indirectly enhance infrastructure progress by boosting public support for such projects. When communities have confidence in the institutions responsible for initiatives like road construction or water access, they are more likely to support and advocate for sustainable, community-driven infrastructure solutions.
  - (1) Weak institutional capacities: Building trust and cooperation can strengthen institutional capacities. It fosters transparency between the county government, community groups, and stakeholders. This trust ensures that governance and service delivery are accountable. It also helps allocate resources effectively for key projects like water management, disease control, and road construction. These efforts can address the region's weak institutional frameworks.
  - (1) Socio-economic vulnerability: Mandera's marginalized communities, including women, youth, and people with disabilities, face significant socio-economic challenges. By fostering trust and cooperation, local communities can establish social safety nets, such as cooperative groups or community-based support systems, to reduce vulnerability. Collaborating on shared issues like water scarcity and food insecurity strengthens resilience, ensuring that resources and support reach those most in need.
  - (0.5) Vulnerable groups: Trust-building initiatives in Mandera can support vulnerable groups by fostering inclusive community networks. Although structural barriers to full inclusion

remain, cultivating trust within these networks enables stronger support and advocacy, ensuring that marginalized groups are not left behind in development efforts and have access to essential resources.

- (0.5) Natural hazards: Mandera is frequently affected by natural hazards such as floods, droughts, and soil erosion. Building trust and cooperation within the community enhances collaboration in disaster preparedness and response. This unity promotes better resource-sharing, collective decision-making, and mutual aid during emergencies, ultimately strengthening the community's resilience to natural hazards like floods and droughts.
- (1) Human hazards: Building trust and cooperation within communities can reduce the likelihood of conflict, as collective problem-solving and shared solutions help address issues like resource competition, social unrest, and violence. Trust between community members, local leaders, and law enforcement also enhances security and facilitates more effective management of human-related hazards.

- **Resource sustainability**
  - (0.5) Weak infrastructure capacities: Sustainable resource management enhances the longevity and effectiveness of infrastructure by ensuring the responsible use of resources such as water, land, and energy. This approach leads to better-maintained infrastructure, reducing the need for frequent repairs and improving the overall functionality of existing systems, ultimately benefiting communities over the long term.
  - (1) Weak institutional capacities: Mandera's institutional capacities can be strengthened by promoting sustainable resource management practices. With support from the national government, local institutions can develop policies and frameworks that guide the responsible use of natural resources (such as water, land, and livestock). This ensures equitable distribution and conservation of resources, improves governance, and prevents overexploitation or environmental degradation.
  - (1) Socioeconomic vulnerability: Resource sustainability indirectly reduces socio-economic vulnerability by ensuring continued access to essential resources. While it may not immediately boost income or provide direct social services, sustainable resource management helps protect livelihoods by securing vital resources for the future.
  - (0.5) Vulnerable groups: Vulnerable groups stand to benefit from sustainable resource management as it protects the critical resources they rely on for survival. For example, sustainable water management ensures a consistent supply of clean water for domestic and livestock use, safeguarding the well-being of these communities.
  - (1) Natural hazards: Sustainable resource management plays a key role in mitigating the impact of natural hazards. By preserving ecosystems such as forests and wetlands, which act as natural buffers, the region can better withstand floods, landslides, and soil erosion. Healthy ecosystems enhance resilience to environmental shocks, reducing the frequency and severity of these disasters.
  - (1) Human hazards: Sustainable resource management also helps mitigate human hazards, such as resource-based conflicts and competition. In Mandera, where water scarcity and pasture depletion are major issues, the sustainable use of resources can ease tensions between communities, reducing the potential for violence and conflict over access to land, water, and other vital resources. This contributes to a more stable and peaceful society.

- **Enhancing knowledge and building capacity and resilience** are critical strategies for addressing all the conflict drivers. These efforts are interconnected and can help bridge existing gaps in governance, resource management, and community resilience. By enhancing the skills and knowledge of local communities and institutions, these initiatives contribute to resolving underlying tensions, improving decision-making, and fostering sustainable practices that reduce the risk of conflict. As cross-cutting approaches, they have the potential to influence various aspects of conflict, from resource management to social cohesion, ultimately building a more resilient society – all (1).

Results – Peacebuilding entry points

The exercise shows notable differences in how CPM are perceived to address the different drivers of conflict and insecurity in Turkana and Mandera. For Mandera, participants anticipated broader effectiveness for the *Economic development* climate-peace mechanism, scoring it 1 in addressing the *weak infrastructural capacities, weak institutional capacities, socioeconomic vulnerability,* and *human hazards* drivers of conflict and insecurity, and with moderate effectiveness (0.5) for addressing the vulnerable groups driver of conflict and insecurity. In contrast, Turkana's participants only foresaw its effectiveness in addressing *weak infrastructural capacities,* rating it 1.

Building Institutions was perceived as an effective climate-peace mechanism (1) across both counties for several conflict drivers, but with some differences. The assessment for Turkana considered it moderately effective (0.5) for *vulnerable groups*, while in Mandera it was considered to be moderately effective (0.5) for addressing the *weak infrastructure capacities* driver of conflict and insecurity.

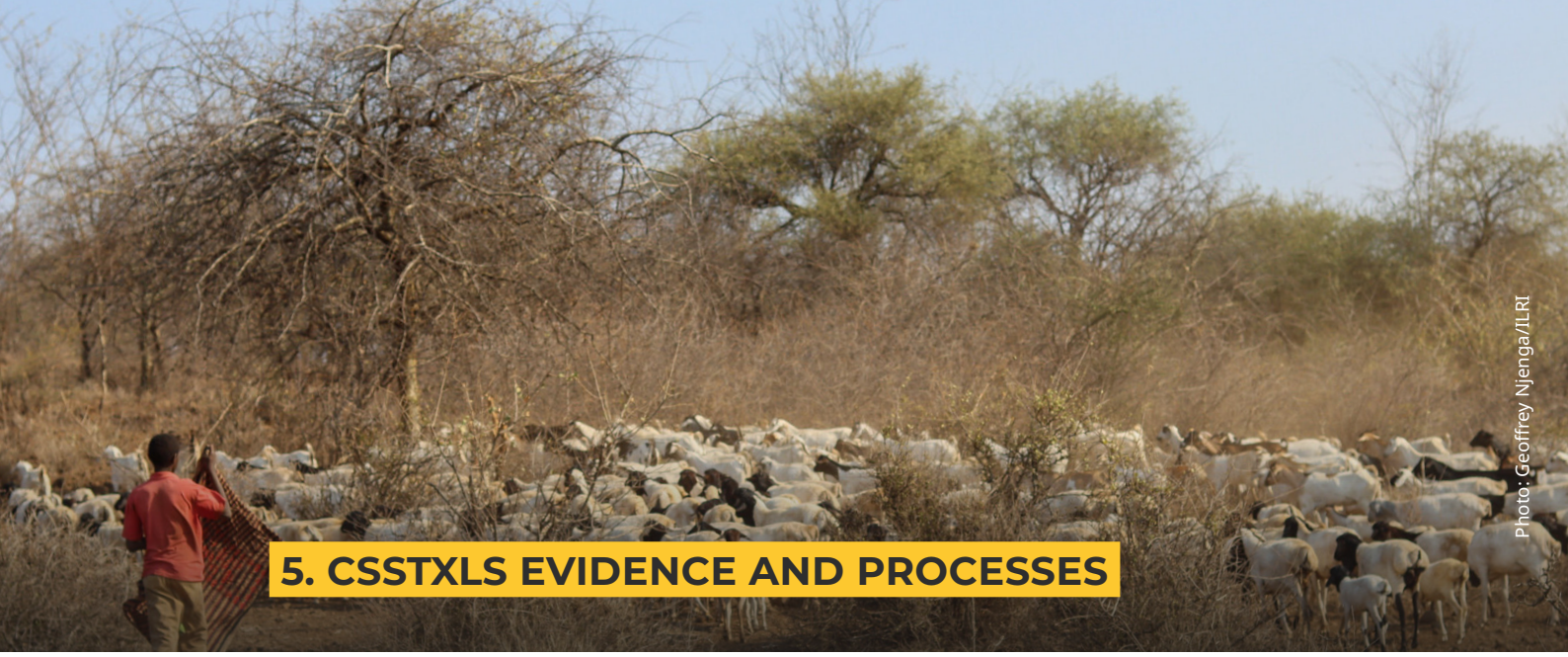
For *Building Trust and Cooperation,* both regions see it as effective (1) for addressing the *Weak institutional capacities, Socioeconomic vulnerability,* and *Human hazards* drivers of conflict and insecurity. However, in Mandera it was additionally considered to be effective for addressing the *weak infrastructural capacities* driver of conflict and insecurity (1) and with a more moderate impact on the *Natural hazards* driver of conflict and insecurity (0.5), while in the case of Turkana participants emphasized its efficacy in addressing the *Vulnerable groups* driver of conflict and insecurity.

The perceived efficacy of the *Resource Sustainability* climate-peace mechanism shows similar patterns across both counties, with high effectiveness (1) for *Socioeconomic vulnerability, Natural hazards,* and *Human hazards*. In both counties it is rated as less effective (0.5) for addressing the *Weak institutional capacities* driver of conflict and instability, though for Mandera participants additionally indicated it was a moderately effective climate-peace mechanism (0.5) for the *Weak infrastructural capacities* and *Vulnerable groups* drivers of conflict and insecurity.

For the *Enhancing Knowledge and Building Capacities and Resilience* CPM participants indicated that in Mandera's both the CPM would likely be effective against each driver of conflict and insecurity. For Turkana their perceived efficacy was more varied, with the risks from Weak infrastructural capacities, socioeconomic vulnerability, and Vulnerable groups likely effectively addressed by enhancing knowledge, whilst *Socioeconomic vulnerability* and *Human hazards* were effectively addressed by *Building Capacities and Resilience,* followed by the risks stemming from the *Vulnerable groups* driver of conflict and insecurity (0.5).

Table 3 CSSTxLS connections between conflict drivers and Climate-Peace Mechanisms.

Climate-Peace Mechanisms	Conflict Drivers - Mandera group					
	Weak infrastructural capacities	Weak institutional capacities	Socio-economic vulnerability	Vulnerable groups	Natural Hazards	Human Hazards
Economic development	1	0.5	0.5	0.25	0	0.5
Building institutions	0.25	1	1	0.25	1	1
Building trust and cooperation	0.5	1	1	0.75	0.25	1
Resource sustainability	0.25	0.75	1	0.75	1	1
Enhancing knowledge	1	0.5	1	1	0.5	0.5
Building capacity and resilience	0.5	0.5	1	0.75	0.5	1



5. CSSTXLS EVIDENCE AND PROCESSES

The Climate-Peace Framework

The Climate-Peace Framework (Sarzana et al, 2023) is structured around six fundamental CPM that serve as pathways through which climate adaptation interventions can contribute to peace: Economic Development, Building Institutions, Building Trust and Cooperation, Resource Sustainability, Enhancing Knowledge and Building Capacity and Resilience. These mechanisms are designed to address conflict drivers through various sub-mechanisms and specific indicators. The framework's mechanisms operate on two key levels: peacebuilding approaches and risk assessment. Peacebuilding is distinguished through two levels: conflict sensitivity, referring to minimizing negative and maximizing positive impacts of programming on conflict, and peace responsiveness, meaning actively addressing contextual drivers of conflict and insecurity.

- **Economic development**

Natural resource management and climate adaptation are essential for promoting economic development and peacebuilding. Climate adaptation supports economic growth by increasing agricultural yields, diversifying livelihoods, preventing risks, and reducing losses, which conserves resources and enhances resilience. These efforts address basic human needs by securing food production, providing necessary inputs, and restoring infrastructure, helping to sustain and create livelihoods that reduce competition over resources and mitigate conflict. Climate action also fosters shared identities by creating neutral spaces for intergroup collaboration. For instance, shared infrastructure such as storage, processing, and transportation facilities can encourage dialogue and cooperation, helping communities perceive mutual interests. To ensure substantial integration, it is crucial that the economic benefits of climate action reach all groups, especially vulnerable populations. By strengthening public goods and services, improving resource allocation, and increasing government revenues, climate action programs promote economic development and contribute to long-term peacebuilding.

- **Building institutions**

Developing institutional capacity is a cornerstone of environmental peacebuilding, as it enhances natural resource governance and promotes the rule of law. Climate action programs contribute to institutional capacity by addressing the illicit use of resources, combating corruption, and fostering transparency. Strengthening governance structures, such as by involving local authorities in program administration, ensures that natural resource management institutions are more effective and inclusive. These programs also establish legal frameworks and resource

rights to resolve conflicts and build shared values. Securing property rights, clarifying resource tenure, and promoting dialogue among stakeholders foster a sense of interdependence and cooperation. Additionally, equitable resource distribution is a critical mechanism for peacebuilding. By creating inclusive policies and procedures, climate action programs empower marginalized groups, ensuring fairer distribution of resource benefits. By integrating formal and informal governance systems and enhancing transparency, climate-action initiatives build robust institutions, driving long-term peace through equitable and effective resource management.

- **Building trust and cooperation**
  Climate-smart agricultural practices and adaptation strategies offer valuable opportunities to build trust and cooperation, which are essential for peacebuilding. These initiatives support trust-building by addressing specific community needs, particularly in climate-vulnerable and conflict-affected contexts. By involving stakeholders at various levels in program planning and administration, climate-adaptation programs foster interdependence and mitigate conflict risks. Participatory Rural Appraisal Strategies exemplify this approach by incorporating the knowledge and needs of rural populations into development plans. In tolerant societies, fostering shared identities and enabling intergroup contact can strengthen trust. Climate action creates neutral spaces for dialogue and collaborative problem-solving, helping communities perceive climate challenges as shared concerns. Addressing intercommunal power imbalances and supporting equity-based approaches reduce power asymmetries and enhance mutual recognition of rights. Social cohesion and empowerment are crucial for building trust and cooperation. Climate-adaptation programs can increase social capital by enabling collective benefits through cooperatives, shared outputs, and inclusive decision-making processes. Empowering vulnerable groups, including women, youth, and marginalized populations, ensures broader participation and fairer outcomes. Integrating gender sensitivity, addressing discrimination, and implementing protocols against gender-based violence further reinforce trust-building efforts. By enhancing cooperation, equity, and social networks, climate action strengthens community resilience and lays the foundation for long-term peacebuilding.

- **Resource sustainability**
  Climate-smart agriculture (CSA) strengthens resource sustainability by supporting healthy ecosystems and productive landscapes. Practices like agroforestry, soil conservation, and ecosystem restoration enhance the availability and quality of vital resources such as water and arable land, reducing the risk of conflict over scarcity. These approaches are particularly crucial in post-conflict settings, where sustainable resource use helps avoid future relapses into violence. By integrating resource conservation and landscape restoration, CSA fosters stable livelihoods and limits overexploitation. Collaborative initiatives, such as bicommunal restoration projects, create opportunities for shared identities and cooperation among previously conflicting groups. Achieving resource sustainability also requires inclusive, community-driven approaches to conservation and resource management. Programs must involve marginalized groups, assess at-risk ecosystems, and ensure equitable resource access. Through sustainable practices, climate-action programs enhance environmental health, support human security, and build cooperation, making resource sustainability a cornerstone of peacebuilding efforts.

- **Enhancing knowledge**
  Education, environmental awareness, and recognition of diverse knowledge systems are key to fostering social inclusion and equity in peacebuilding. Climate action supports these goals

by promoting alternative worldviews and integrating traditional and cultural knowledge into program designs. Educational initiatives, particularly in divided societies, raise awareness about nature conservation and the implications of climate change on resource availability. This empowers communities, especially marginalized groups, to restore and preserve dwindling resources, strengthening their resilience. Knowledge-sharing and environmental education also create shared identities and acceptance of others as legitimate resource users, reducing the politicization of common-pool resources. Grassroots educational efforts can mitigate divisive narratives and foster a societal climate conducive to reconciliation. By co-designing programs with local communities and valuing indigenous and traditional knowledge, climate action enhances intergroup cooperation and social inclusion. These efforts build a foundation for sustainable peace by empowering communities and fostering mutual understanding.

- **Building capacity and resilience**
  Building capacity and resilience is central to peacebuilding as it equips communities with tools and strategies to address climate threats and sustain human security. Climate-smart agriculture (CSA) practices enhance resilience by increasing communities' abilities to withstand climate shocks and adapt to slow-onset impacts. Key resilience elements—perseverance, adaptability, and transformability—guide climate-action efforts in post-conflict settings to reduce vulnerability and prevent conflict over resources. Effective programs identify local assets and needs, implement social protection schemes, and strengthen production systems to cope with climate shocks. Strategies include diversifying crops, adjusting farming practices, improving storage, and promoting insurance-based mechanisms. Social adaptation is supported by strengthening social networks, enhancing financial resources, and securing land tenure. To achieve shared identities, climate-action programs help communities adapt livelihoods through improved production systems, mixed farming, and access to infrastructure. Transformational capacities address root causes of poverty and inequality by empowering marginalized groups, fostering long-term change, and supporting food sovereignty. Through these measures, climate action builds resilience and contributes to lasting peace.

The framework integrates data from INFORM RISK's six risk categories to provide a comprehensive assessment of security challenges and conflict drivers, namely Natural Hazards, Human Hazards, Socio-economic Vulnerabilities, Vulnerable Groups, Lack of Institutional Coping Capacity and Lack of Infrastructural Coping Capacity. This integration allows for quantifiable risk scoring at regional and sometimes municipal levels, making it particularly valuable for contextual analysis and intervention planning.

For the framework to integrate both CPM and conflict drivers, linkages were defined through setting direct connections between them, where CPM are essential for addressing specific conflict drivers. The current connections established by the Climate Peace Framework for the current CSST, as illustrated in figure 2, are detailed as the following:

- **Natural hazards**
  Natural hazards encompass various environmental risks, including earthquakes, tsunamis, floods, cyclones, and drought. These hazards can trigger resource scarcity and create imbalances in resource access, potentially leading to social tensions. The impact of natural hazards extends beyond immediate environmental damage, often creating secondary effects through unequal aid

distribution and livelihood disruption. To address these challenges, several CPM prove essential. Building institutions stands as a critical mechanism for enhancing adaptation to climate shocks and maintaining human security. Economic development plays a vital role in sustaining rural livelihoods and preventing displacement, while resource sustainability helps reduce future resource-based conflicts. Building capacity and resilience strengthens local communities' ability to respond to hazards without resorting to conflict.

- **Human hazards**
  Human hazards, both technological and sociological, include industrial accidents and civil conflicts. These hazards can significantly exacerbate existing social vulnerabilities and inequalities within communities. The risk of maladaptation in climate investments presents a particular concern, as poorly designed interventions can inadvertently create new sources of tension. The framework addresses human hazards through building institutions to ensure effective disaster response and maintain safety regulations. Building capacity and resilience supports community recovery without resorting to maladaptive strategies. Trust and cooperation mechanisms foster social cohesion, while economic development helps reduce inequalities between groups affected by hazards.

- **Socio-economic vulnerabilities**
  Socio-economic vulnerabilities reflect complex interactions between development, deprivation, inequality, and aid dependency. These vulnerabilities frequently interact with climate change to enhance conflict risks and increase community susceptibility to disasters. Their impact on human security can be particularly severe in areas with weak institutional support. The framework addresses these vulnerabilities through multiple mechanisms. Building capacity and resilience tackles root causes of vulnerability, while trust and cooperation mechanisms enhance social cohesion. Economic development prevents the deepening of inequalities, and resource sustainability helps mitigate pressures on scarce resources. Building institutions plays a crucial role in reducing negative coping strategies among vulnerable populations.

- **Vulnerable groups**
  Vulnerable groups, who often require humanitarian aid, face disproportionate risks during conflicts and frequently experience restricted access to basic services. Their high sensitivity to climate impacts makes them particularly susceptible to environmental changes and related social tensions. The framework addresses vulnerable groups' needs through knowledge enhancement, integrating multiple knowledge systems to improve resilience. Economic development creates sustainable livelihood opportunities, while resource sustainability increases group resilience. Building institutions ensures more equitable resource distribution among vulnerable populations.

- **Lack of infrastructural and institutional coping capacity**
  Both infrastructural and institutional coping capacities play crucial roles in community resilience. Infrastructural capacity encompasses communication networks and physical infrastructure, directly impacting resource access and distribution. Institutional capacity reflects governmental ability to respond to disasters and manage resources effectively. The framework addresses these capacity gaps primarily through economic development and institution building. These mechanisms ensure fair infrastructure distribution and improved resource governance. Additionally, trust-building mechanisms help reduce exclusion, while knowledge enhancement facilitates better environmental education and community preparedness.

DRIVERS OF CONFLICT & INSECURITY	CLIMATE-PEACE MECHANISMS					
	Economic Development	Building Institutions	Building trust and cooperation	Resource sustainability	Enhancing knowledge	Building capacity and resilience
Lack of infrastructural coping capacity	✓	✓				
Lack of institutional coping capacity		✓	✓		✓	✓
Human hazards	✓	✓	✓			✓
Natural hazards	✓	✓				✓
Vulnerable groups	✓	✓	✓	✓	✓	
Socio-economic vulnerabilities	✓	✓	✓	✓		✓

Figure 2 Theoretical relationships between climate-peace mechanisms and drivers of conflict and insecurity for the CSST (source: Sarzana et al, 2023).

Through this comprehensive approach, the framework enables practitioners to design interventions that effectively address both climate adaptation needs and conflict sensitivity concerns, creating more resilient and peaceful communities in the face of environmental challenges. The framework translates these theoretical connections into practical programming through assessing local risk factors using INFORM Risk indicators, identifying relevant CPM and development of specific adaptation strategies that address both climate resilience and peace-building objectives. The framework ultimately serves as a practical tool for designing climate interventions that prioritize peace-responsive mechanisms while addressing contextual drivers of insecurity.

Evidence from workshop results

CONFLICT DRIVERS ASSESSMENT

The results from the workshop exercise highlight significant discrepancies between locally-assessed conflict drivers and the standardized scores provided by the JRC's INFORM RISK database. These inconsistencies underscore the critical importance of validating risk assessments with local experts to ensure accuracy and context sensitivity in program scoring and design.

In Turkana, the most pronounced difference was in the scoring of **Human Hazards**, where participants rated the risk at 8.5, compared to the JRC's score of 0.5. A similar discrepancy was observed for **Vulnerable Groups**, with scores of 8.5 from participants and 1.3 from the JRC. These differences suggest that standardized metrics may fail to capture localized realities, particularly regarding human hazards and vulnerabilities within the community. For example, Turkana participants emphasized acute security challenges and the disproportionate impacts on vulnerable populations, which may be underestimated in generalized models.

Mandera showed similar patterns, with **Natural Hazards** scored at 8.5 by participants versus 4 in the JRC and **Vulnerable Groups** at 7 versus 2.5, indicating gaps in reflecting the lived experiences of local communities. Interestingly, Mandera's score for **Human Hazards** aligned between participants and the JRC at 8, illustrating that discrepancies are not uniform across all regions but highly context-dependent.

The need for expert validation is further supported by findings from other iterations of this validation experiment in Jirapa, Ghana, and Ségou, Mali (Sarzana, Samake & Jaquet, 2023; Sarzana, Mahama, & Jaquet, 2023). In both cases, the scores for **Human Hazards** and **Vulnerable Groups** consistently diverged significantly from local expert assessments, revealing a systemic challenge in how standardized metrics address these factors.

These findings underscore the importance of integrating local expertise into risk assessment processes. Reliance solely on standardized metrics risks overlooking critical nuances, potentially leading to misaligned program priorities and ineffective interventions. Integrating experts' validation in the CSST tool ensures that program designs are rooted in local realities, enhancing their relevance, accuracy, and impact.

CONNECTIONS BETWEEN CONFLICT DRIVERS AND CLIMATE-PEACE MECHANISMS

The workshop results illustrated in table 3 and accompanying literature highlight intricate linkages between conflict drivers in livestock systems and the mechanisms by which climate adaptation fosters peacebuilding. The contextual nuances of pastoral communities further emphasize the need for a nuanced and context-sensitive understanding of these connections. Below, the observed connections between conflict drivers and CPM are analysed, strengthened with insights from the literature on livelihood transitions in pastoral communities and their implications for climate action.

- **Economic development**
  The climate-peace mechanism of economic development addresses critical conflict drivers, including weak infrastructural capacities, socio-economic vulnerabilities, and human hazards. In Mandera, workshop participants identified this mechanism as broadly effective, particularly in reducing weak infrastructure and institutional gaps, while in Turkana, its applicability was seen as limited to infrastructure. These differences highlight the importance of tailoring interventions to specific contexts. Pastoral livelihood transitions underscore this mechanism's importance. As pastoralists adopt commercialized livestock production, engage in markets, and diversify into value-added activities like meat processing and fodder production (Catley et al., 2013; Achiba, 2018), economic opportunities expand, potentially alleviating socio-economic vulnerabilities. However, poorly designed interventions risk exacerbating inequalities and generating new grievances. For example, rapid commercialization can alter traditional herd compositions, favouring market-ready livestock over subsistence animals (Adriansen, 2006). Ensuring inclusive access to resources and markets is therefore essential to prevent economic displacement and conflict (Paavola & Adger, 2006). Infrastructure improvements can further bolster economic development. Expanding transport routes and communication technologies opens livelihood options, such as intensified livestock production or peri-urban livelihoods (Little, 2016). For example, in Kenya, mobile phone technologies have facilitated market access and enabled remittances, strengthening resilience in pastoral communities (Avis, 2018).

- **Building institutions**
  The workshop results affirm the importance of institutional strengthening as a cornerstone for addressing weak institutions, a prominent conflict driver in both Mandera and Turkana. This mechanism fosters governance, transparency, and inclusion, all vital for mitigating resource allocation conflicts and power asymmetries (Schilling et al., 2012). Insights from pastoralist transitions highlight the critical role of institutional capacities. For example, integrating customary governance structures with formal institutions enhances legitimacy and ensures

inclusive resource management (Johnson et al., 2021). This is particularly relevant in contexts like the Horn of Africa, where resource disputes often overlap with political marginalization (Nielsen & Reenberg, 2010). Programs that involve local actors and marginalized groups in decision-making processes can further enhance trust and cooperation, as seen in agro-pastoral adaptations. Among the Turkana, irrigated horticulture combined with traditional livestock systems has emerged as a resilience strategy, with institutional support enabling communities to manage resources effectively (Akall, 2021).

- **Building trust and cooperation**
  The mechanism of building trust and cooperation is pivotal for addressing weak institutions, socio-economic vulnerabilities, and human hazards. In Mandera, participants highlighted its relevance to weak infrastructure and natural hazards, while in Turkana, its efficacy was seen in addressing vulnerabilities among marginalized groups. Pastoralists' adaptive strategies exemplify the potential of trust-building initiatives. Cooperative grazing agreements and shared resource management foster interdependence and reduce tensions (Christ & Kauff, 2019). Moreover, traditional coping mechanisms, such as trade between farmers and pastoralists during droughts, demonstrate the value of long-standing cooperative relationships (Catley et al., 2013; Orindi et al., 2007). However, challenges arise when modernization disrupts these relationships. For instance, neo-pastoralism in Nigeria, characterized by militarized herding, has weakened the symbiotic ties between farmers and pastoralists, escalating conflicts (Ajala, 2020). Climate adaptation programs must therefore prioritize inclusive approaches that rebuild trust and mutual reliance.

- **Resource sustainability**
  Both Mandera and Turkana participants recognized resource sustainability as a highly effective mechanism for addressing natural hazards, socio-economic vulnerabilities, and human hazards. Sustainable practices, such as agroforestry and regenerative agriculture, reduce environmental degradation while stabilizing livelihoods (Partey et al., 2018). Pastoralist communities' reliance on natural resources makes this mechanism particularly relevant. Shifts toward drought-resilient livestock, such as camels, demonstrate pastoralists' capacity to enhance resource sustainability (Degen, 2011). However, interventions must avoid undermining traditional strategies. For instance, livestock raiding—a historical restocking strategy—has evolved into market-driven practices, introducing new risks of economic displacement and resource insecurity (Schilling et al., 2012). Programs must also address demographic pressures. Population growth in pastoral towns has strained rangelands, reducing grazing areas and intensifying competition (Opitz-Stapleton et al., 2023). Community-based conservation and equitable resource distribution can mitigate these challenges, fostering long-term peace (Burt & Keiru, 2011).

- **Enhancing knowledge**
  Knowledge-sharing and education empower communities to adapt effectively to climate change while addressing socio-economic vulnerabilities and resource tensions. Mandera participants rated this mechanism highly for all conflict drivers, while Turkana participants emphasized its relevance for infrastructure and vulnerable groups. Livelihood diversification highlights the importance of knowledge in climate adaptation. For instance, mobile phone technology has enabled pastoralists to access market trends, migration pathways, and political developments, enhancing adaptive capacity (Avis, 2018). Similarly, incorporating traditional ecological knowledge into adaptation programs ensures that interventions are culturally appropriate and effective (Nakashima et al., 2012). Education can also counter maladaptation risks. For example,

awareness campaigns about sustainable resource use and climate risks reduce overexploitation and foster resilience (Naoufal, 2014). Programs that integrate local expertise and participatory planning processes create a foundation for cooperative resource management (Catley et al., 2013).

- **Building capacity and resilience**
  This mechanism addresses socio-economic vulnerabilities and human hazards by enhancing communities' abilities to withstand climate shocks. Workshop participants noted its effectiveness in Turkana for vulnerable groups and in Mandera across all conflict drivers. Pastoralist transitions illustrate the need for resilience-building interventions. Diversifying production systems, such as combining livestock with agricultural activities, reduces vulnerability to climate variability (Achiba, 2018). Among the Turkana, irrigation-based horticulture during dry seasons exemplifies how adaptive capacities can sustain livelihoods (Akall, 2021). However, resilience-building must consider the risks of economic displacement and inequality. For example, the rise of neo-pastoralism has marginalized traditional herders while increasing resource-related tensions (Ajala, 2020). Empowering marginalized groups and fostering equitable access to resources are critical for preventing such outcomes (Paavola & Adger, 2006).

The connections between conflict drivers and CPM underscore the importance of context-specific, inclusive approaches to climate adaptation. Insights from pastoral livelihood transitions demonstrate how adaptive strategies can inform interventions that address local realities. By aligning economic development, institutional strengthening, and knowledge-sharing with community needs, climate adaptation can mitigate conflict risks while promoting resilience and stability. Through mechanisms like trust-building and resource sustainability, climate adaptation has the potential to transform competitive resource dynamics into platforms for peace and cooperation.

Photo: Alex Maina/CIFOR-ICRAF

6. CSSTXLS METHODOLOGY

The CSSTxLS is composed of two main steps: the context definition and the climate action scoring system. Implementing the first component results in the projection of the ideal set of CPM scores for the selected context, while the second component provides the set of mechanisms currently delivered by the proposed program design. Visually aligning these two sets enables practitioners to re-define their intervention to match the ideal mechanisms.

Step 1 - Conflict drivers assessment

In the context definition step, users can select the country, the region and the municipality in which the proposed climate adaptation program is planned on being implemented. Due to data availability limitations, only some countries will display data at the regional and municipal levels. The tool then automatically plots the indicators scores for each driver, retrieved from JRC's INFORM Risk databases. The cells containing indicator scores are automatically highlighted, either in red, yellow or green. Cells highlighted in green show drivers featuring very low and low-risk levels, cells highlighted in yellow show drivers featuring medium-risk levels, and cells highlighted in red show drivers featuring high and very high-risk levels. The color-codes provide users with a broad understanding of the worrisome risk factors in the context they plan on implementing their program. Where possible, in more in-depth uses of the tool, it is preferable that users perform a participatory expert validation of driver scores to ensure their validity at the local level. This can be achieved by conducting activities similar to those in workshop exercise 1.Figure 3 shows the interface of the CSSTxLS for step 1, with a context definition example for the Kenyan county Garissa.

Step 1: Context Definition

Country (select country below)	Region (select region below)	Drivers of conflict and insecurity					
		Low infrastructural capacities	Low Institutional capacities	Human hazards	Natural hazards	Vulnerable groups	Socio-economic vulnerabilities
Kenya	Garissa	6.596403652	7.40549877	6.69127	5.7075004	2.4917048	4.08530036
	Bomet						
	Kericho						
	Baringo						
	Makueni						
	Uasin Gishu						
	Machakos						
	Turkana						
	West Pokot						
	Garissa						
	Kwale						
	Kilifi						
	Mombasa						

Figure 3 Interface of the CSSTxLS context definition step (step 1).

Step 2 - Scoring of programs through the Climate-Peace framework

In the climate action scoring system step, users evaluate the proposed climate adaptation intervention against the various sub-mechanisms defined within the framework. To facilitate this process, the tool provides examples and proxies that illustrate the characteristics an intervention needs to include to fulfil each sub-mechanism.

Users assign scores to each sub-mechanism in the column labelled “Sub-mechanism scores” using a standardized three-point scale:

- A score of 1 indicates that the sub-mechanism is fully fulfilled.
- A score of 0.5 indicates partial or indirect fulfilment.
- A score of 0 indicates that the sub-mechanism is not fulfilled.

After assigning scores, users must justify their selections by providing concrete explanations in the “Notes” column. These justifications should detail how the intervention contributes—or does not contribute—to addressing the specific sub-mechanism. This step ensures transparency and encourages critical reflection on the program's design and its alignment with the framework's objectives.

Figure 4 presents the interface of the CSST for step 2, with an example illustrating the scoring process for two CPM: economic development and building institutions.

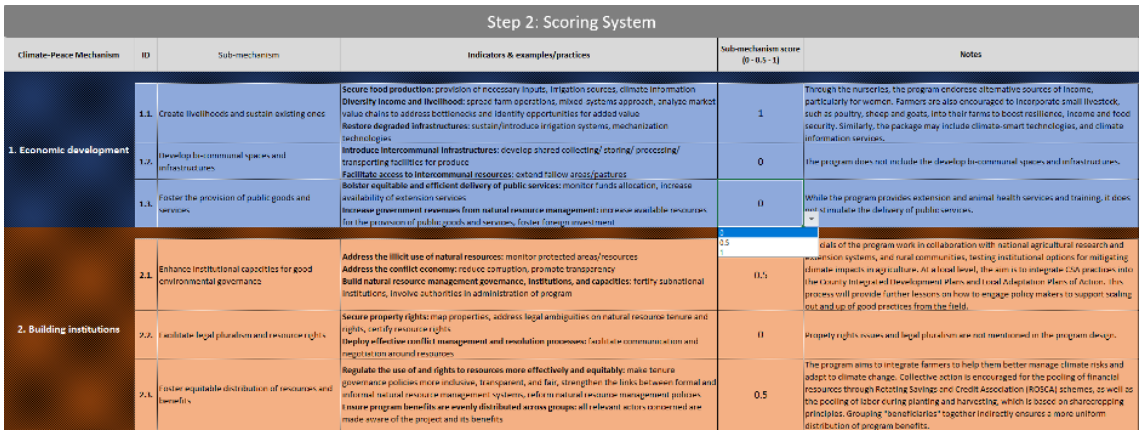


Figure 4 Interface of the CSST climate action scoring system step (step 2).

Results interpretation

The results interpretation step provides users with a comprehensive overview of the climate adaptation program’s alignment with context-specific needs. The tool generates a graphic representation comparing the ideal combination of mechanism scores for the selected region (Figure 5, left spider-chart) with the mechanism scores for the proposed climate action intervention (Figure 5, right spider-chart).

Users analyse these charts to determine whether the mechanisms emphasized in the proposed program adequately address those deemed most critical for the selected context. If scores for

context-specific mechanisms are low in the proposed intervention, users are encouraged to consider further integrating sub-mechanism features to improve alignment with local needs. For example, as shown in Figure 5, the ideal scores for Garissa, Kenya, indicate that mechanisms such as 'enhancing knowledge' and 'building capacity and resilience' and 'building institutions' are highly relevant to the context since they feature the highest scores. The proposed intervention aligns well with the 'building capacity and resilience', 'enhancing knowledge' and 'resource sustainability' mechanisms but insufficiently addresses the 'economic development', 'building trust and cooperation' and 'building institutions' ones. This suggests opportunities to strengthen the program design by incorporating features associated with these mechanisms.

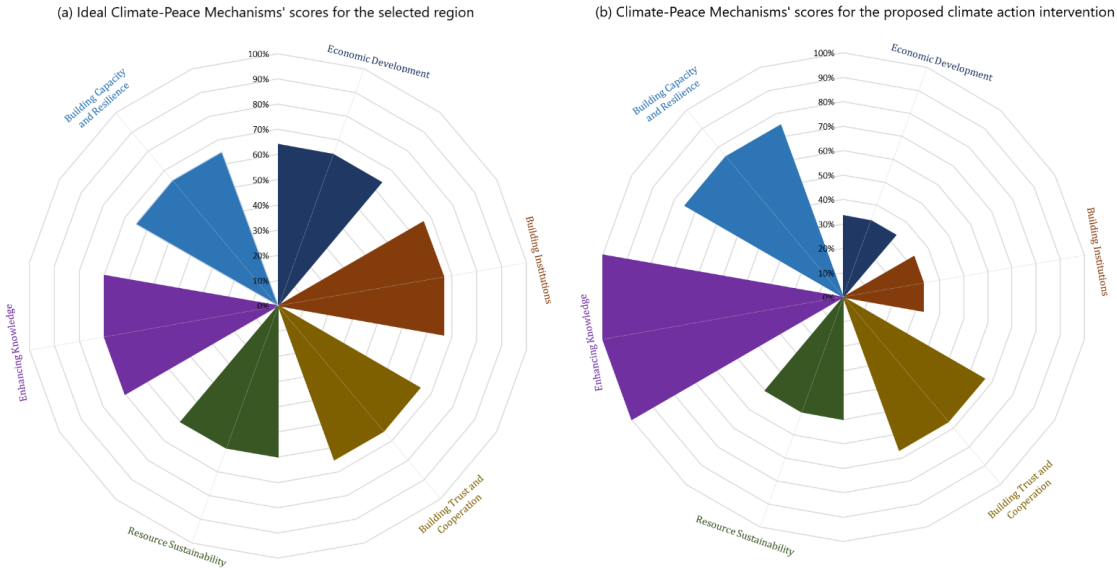


Figure 5 Interface of the CSSTxLS results: spider chart of the ideal climate-peace mechanisms scores for the selected context (left) and spider chart of the climate-peace mechanism scores for the proposed intervention (right).

The ideal CPM scores reflect the connections between conflict drivers and CPM within the Climate-Peace framework. Mechanisms are weighted based on the risk levels associated with conflict drivers in the selected region. Higher-risk drivers, as identified by JRC's INFORM Risk factors, result in higher scores for mechanisms linked to those drivers. For example, if a region features high risk levels for socio-economic vulnerabilities and weak institutions, mechanisms such as 'economic development' and 'building institutions' will score higher, indicating their critical importance for addressing these drivers. The CMP score thus highlights which mechanisms are most essential in mitigating context-specific risks, guiding users toward designing interventions that target the most pressing challenges.

It is important to note that the ideal mechanism scores (left chart) and the program's mechanism scores (right chart) derive from different methodologies. Ideal scores are calculated by combining weights and risk score indicators, while the program scores come from the user's scoring input in Step 2. Therefore, the two charts are not directly comparable, and interpretations should be approximate. The left chart reflects the importance of mechanisms based on context-specific conflict drivers, while the right chart shows the program's degree of incorporation of these mechanisms.

Photo: Axel Fassio/CIFOR-ICRAF

7. CONCLUSION

Pastoralist livelihoods are uniquely vulnerable to the intersecting challenges posed by climate variability, socio-political instability, and economic marginalization. Risks such as weak infrastructure and institutions, socio-economic vulnerabilities, human hazards, and natural hazards significantly impact the sustainability of pastoral systems and the security of communities reliant on them (Schilling et al., 2012; Krampe, 2020). The need for effective and context-sensitive climate adaptation programming is paramount to addressing these risks without exacerbating existing tensions or introducing new ones (Marino & Ribot, 2012). Pastoralists continuously adapt through strategies such as diversifying livelihoods, commercializing livestock production, adopting drought-resilient practices, and engaging with emerging technologies (Catley et al., 2013; Achiba, 2018). However, poorly designed development interventions can lead to maladaptation, including marginalization of vulnerable groups, disruption of traditional adaptive strategies, and economic displacement (Nakashima et al., 2012; Nielsen & Reenberg, 2010). Recognizing the diversity and fluidity of pastoral systems is therefore essential for designing interventions that build resilience while mitigating potential conflict.

This paper presents a climate peace framework tailored to livestock systems, building on environmental peacebuilding theories that suggest shared environmental challenges can catalyze collaboration and mutual understanding (Ide, 2020). The framework identifies connections between conflict drivers and climate-peace mechanisms, such as economic development, institutional strengthening, trust-building, resource sustainability, knowledge enhancement, and resilience-building. These mechanisms provide a foundation for designing interventions that not only address climate risks but also contribute to peacebuilding by fostering cooperation, equity, and sustainability (Jensen & Lonergan, 2012; Sarzana et al., 2023). The Climate Security Sensitivity Tool for Livestock Systems (CSSTxLS) operationalizes this framework. Developed through a collaborative workshop held in October 2024 at the International Livestock Research Institute (ILRI) campus in Nairobi, Kenya, the CSSTxLS provides a structured methodology for assessing and designing climate adaptation programs in livestock-dependent communities. By integrating participatory expert validation, context-specific scoring of sub-mechanisms, and comparative analysis of program designs, the tool ensures alignment with local realities (Schilling et al., 2012; Naoufal, 2014). The CSSTxLS builds on the original Climate Security Sensitivity Tool (CSST), refining its framework to address the specific dynamics of livestock systems. Its two-step process – context definition and climate action program scoring – enables users to identify critical conflict drivers, evaluate program contributions to climate-peace mechanisms, and refine designs based on context-specific

needs. Participatory validation, as demonstrated in the workshop's exercises, strengthens the tool by incorporating local experiences and expertise regarding affected communities (Catley et al., 2013; Krampe, 2016). By addressing the risks and complexities unique to pastoralist livelihoods, the CSSTxLS advances climate adaptation programming. Its emphasis on participatory design, integration of local knowledge, and equitable resource management aligns with recommendations from the literature on avoiding maladaptation and fostering resilience (Marino & Ribot, 2012; Nakashima et al., 2012). As climate variability intensifies, tools like the CSSTxLS offer a pathway for practitioners and policymakers to design interventions that promote both resilience and peacebuilding of vulnerable pastoralist communities in fragile contexts.

REFERENCES

Abbink, J., Askew, K., Feyissa, D., Fratkin, E., Gabbert, E.C., Galaty, J., LaTosky, S., Lydall, J., Mahmoud, H.A., Markakis, J. and Schlee, G. (2014). 'Lands of the future: Transforming pastoral lands and livelihoods in eastern Africa'. *Max Planck Institute for Social Anthropology Working Papers.*

Achiba, G.A. (2018) 'Managing livelihood risks: Income diversification and the livelihood strategies of households in pastoral settlements in Isiolo County, Kenya', *Pastoralism,* 8(1), p. 20. Available at: https://doi.org/10.1186/s13570-018-0120-x.

Adriansen, H.K. (2006) 'Continuity and Change in Pastoral Livelihoods of Senegalese Fulani', *Agriculture and Human Values,* 23(2), pp. 215–229. Available at: https://doi.org/10.1007/s10460-005-6108-3.

Ajala, O. (2020) 'New drivers of conflict in Nigeria: an analysis of the clashes between farmers and pastoralists', *Third World Quarterly,* 41(12), pp. 2048–2066. Available at: https://doi.org/10.1080/01436597.2020.1811662.

Akall, G. (2021) 'Effects of development interventions on pastoral livelihoods in Turkana County, Kenya', *Pastoralism,* 11(1), p. 23. Available at: https://doi.org/10.1186/s13570-021-00197-2.

Avis, W. (2018) 'Rebuilding pastoral livelihoods during and after conflict'. *Knowledge, evidence and learning for development.*

African Union (2013) 'Policy framework for pastoralism in Africa: Securing, protecting and improving the lives, livelihoods, and rights of pastoralist communities'. *Department of Rural Economy and Agriculture.*

Barnett, J., & O'Neill, S. (2010). Maladaptation. *Global Environmental Change,* 20(2), 211-213.

Catley, A., Lind, J. and Scoones, I. (2013) *Pastoralism and Development in Africa: Dynamic change at the margins.* 1st edn. London: Routledge. Available at: https://doi.org/10.4324/9780203105979.

Degen, A.A. (2011) 'Transformation of Borana from nomadic pastoralists to agropastoralists and shift of livestock from cattle to include more goats, camels and sheep in Southern Ethiopia', *International Journal of Business and Globalisation,* 6(3/4), p. 292. Available at: https://doi.org/10.1504/IJBG.2011.039389.

Eriksen, S. H., Nightingale, A. J., & Eakin, H. (2021). Reframing adaptation: The political nature of climate change adaptation. *Global Environmental Change,* 35, 523-533.

Ide, T. (2020). Does environmental peacemaking happen? An analysis of peace negotiations after environmental cooperation. *Cooperation and Conflict,* 55(3), 330-349.

Ide, T., Bruch, C., Carius, A., Conca, K., & Dabelko, G. D. (2021). The past and future(s) of environmental peacebuilding. *International Affairs,* 97(1), 1-16.

Kirui, L.K., Jensen, N.D., Obare, G.A., Kariuki, I.M., Chelanga, P.K., & Ikegami, M. (2022) 'Pastoral livelihood pathways transitions in northern Kenya: The process and impact of drought', *Pastoralism,* 12(1), p. 23. Available at: https://doi.org/10.1186/s13570-022-00240-w.

Krampe, F. (2020). Towards sustainable peace: A new research agenda for peace, climate change, and resilience. *Current Climate Change Reports,* 6(4), 102-109.

Leshan, M.T. and Standslause, O.E.O. (2013) 'Pastoralism: A livelihood system in conflict'. *Asian Journal of Mangement Sciences and Education,* 2(4), pp. 249-258.

Little, P.D. (2016) 'Overview: Recent trends in diversified and alternative livelihoods among pastoralists in Eastern Africa'. Resilience and risk in pastoral areas: Recent trends in diversified and alternative livelihoods'. *USAID/East Africa Resilience Learning Project.*

Marin Ferrer M., Vernaccini L., & Poljansek K. (2017). INFORM Index for Risk Management: Concept and Methodology, Version 2017\r\n\r\n. EUR 28655 EN. Luxembourg (Luxembourg): Publications Office of the European Union; 2017. JRC106949

Marino, E., & Ribot, J. (2012). Adding insult to injury: Climate change and the inequitable consequences of natural disasters. *Global Environmental Change,* 22(2), 537-539.

Naess, L. O., Newell, P., Newsham, A., Phillips, J., Quan, J., & Tanner, T. (2021). Climate adaptation and transformative change: A comparative analysis of Bangladesh, Ethiopia, Ghana, and India. *Climatic Change,* 167(3-4), 1-21.

Nakashima, D. J., Galloway McLean, K., Thulstrup, H. D., Ramos Castillo, A., & Rubis, J. T. (2012). Weathering uncertainty: Traditional knowledge for climate change assessment and adaptation. UNESCO, Paris and UNU, Darwin.

Namgay, K. Millar, J. E., Black, R. S., & Samdup, T. (2014) 'Changes in Transhumant Agro-pastoralism in Bhutan: A Disappearing Livelihood?', *Human Ecology,* 42(5), pp. 779–792. Available at: https://doi.org/10.1007/s10745-014-9684-2.

Nielsen, J. Ø., & Reenberg, A. (2010). Cultural barriers to climate change adaptation: A case study from Northern Burkina Faso. *Global Environmental Change,* 20(1), 142-152.

Omolo, N., Mafongoya, P. and Ngesa, O. (2017) 'Gender and Resilience to Climate Variability in Pastoralists Livelihoods System: Two Case Studies in Kenya', *Journal of Sustainable Development,* 10(2), p. 218. Available at: https://doi.org/10.5539/jsd.v10n2p218.

Opitz-Stapleton, S. Egemonye, O., Adamu, Z., Hassan, U., Jibo, A.A., Bayero, M.Y., Kuba, A., Mayhew, L., Alasia, I.J., and Nana, S. (2023) 'Nigeria: Some land tenure insecurity issues in Hayin Ade and Wuro Bappate'. *Supporting Pastoralism and Agriculture in Recurrent and Protracted Crises.*

Orindi, V.A., Nyong, A. and Herrero, M. (2007) 'Pastoral Livelihood Adaptation to Drought and Institutional Interventions in Kenya'. *UNDP Human Development Report 2007/2008.*

Paavola, J., & Adger, W. N. (2006). Fair adaptation to climate change. *Ecological Economics,* 56(4), 594-609.

Sarzana, C.; Mahama, G.; Jaquet, S. (2023) AICCRA validation report: Piloting and validating the Climate Security Sensitivity Scoring Tool (CSST): Evidence from the field on the climate security sensitivity of the climate smart village approach in Jirapa, Ghana. Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA). 34 p.

Sarzana C, Melgar A, Meddings G, Johnson V, Läderach P, Pacillo G. 2023. A tool for mainstreaming peacebuilding in climate-adaptation efforts: evidence and processes. A framework and a safeguarding approach for conflict-sensitive and peace-responsive climate action: the Climate-Security Sensitivity Tool (CSST). Working paper 2023/01. CGIAR FOCUS Climate Security.

Sarzana, C.; Samake, O.B.; Jaquet, S. (2023) AICCRA validation report: Piloting and validating the Climate Security Sensitivity Scoring Tool (CSST): Evidence from the field on the climate security sensitivity of the climate smart village approach in Cinzana, Mali. Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA). Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA). 33 p.

Schilling, J., Oomen, R., & Scheffran, J. (2012). Conflict and cooperation in the global water system. *Global Governance: A Review of Multilateralism and International Organizations,* 18(2), 243-257.

Schilling, J., Opiyo, F.E. and Scheffran, J. (2012) 'Raiding pastoral livelihoods: motives and effects of violent conflict in north-western Kenya', *Pastoralism: Research, Policy and Practice,* 2(1), p. 25. Available at: https://doi.org/10.1186/2041-7136-2-25.

Schipper, E. L. F. (2020). Maladaptation: when adaptation to climate change goes very wrong. *One Earth,* 3(4), 409-414.

Schmidt, M. and Pearson, O. (2016) 'Pastoral livelihoods under pressure: Ecological, political and socioeconomic transitions in Afar (Ethiopia)', *Journal of Arid Environments,* 124, pp. 22–30. Available at: https://doi.org/10.1016/j.jaridenv.2015.07.003.

Scoones, I., Lind, J., Maru, N., Nori, M., Pappagallo, L., Shariff, T., Simula, G., Swift, J., Taye, M. and Tsering, P. (2020). 'Pastoralism and development: Fifty years of dynamic change'. *IDS bulletin,* 51.

Tofu, D.A., Fana, C., Dilbato, T., Dirbaba, N. B., & Tesso, G. (2023) 'Pastoralists' and agro-pastoralists' livelihood resilience to climate change-induced risks in the Borana zone, south Ethiopia: Using resilience index measurement approach', *Pastoralism,* 13(1), p. 4. Available at: https://doi.org/10.1186/s13570-022-00263-3.

Tsegaye, D., Vedeld, P. and Moe, S.R. (2013) 'Pastoralists and livelihoods: A case study from northern Afar, Ethiopia', *Journal of Arid Environments,* 91, pp. 138–146. Available at: https://doi.org/10.1016/j.jaridenv.2013.01.002.

Volpato, G. and King, E.G. (2019) 'From cattle to camels: trajectories of livelihood adaptation and social-ecological resilience in a Kenyan pastoralist community', *Regional Environmental Change,* 19(3), pp. 849–865. Available at: https://doi.org/10.1007/s10113-018-1438-z.

Worku, A., Pretzsch, J., Kassa, H., & Auch, E. (2014) 'The significance of dry forest income for livelihood resilience: The case of the pastoralists and agro-pastoralists in the drylands of southeastern Ethiopia', *Forest Policy and Economics,* 41, pp. 51–59. Available at: https://doi.org/10.1016/j.forpol.2014.01.001.

Yurco, K. (2017) 'Herders and herdsmen: The remaking of pastoral livelihoods in Laikipia, Kenya', *Pastoralism,* 7(1), p. 15. Available at: https://doi.org/10.1186/s13570-017-0086-0.

APPENDIX – WORKSHOP PARTICIPANTS LIST

Name	Organization
Gamal Hassan	IGAD Centre of Excellence for Climate Adaptation and Environmental Protection
Alphonce Agola Mollo	IGAD Centre of Excellence for Climate Adaptation and Environmental Protection
Ambica Paliwal	ILRI
Baraza, Meshack	ILRI
Rupsha Banerjee	ILRI
David Muchiri Kimotho	International Crisis Group
Carmen Jaquez	Mercy Corps
Veronica Ndetu	CSA MSP - Ministry of Agriculture, and Livestock Development
Catherine Wankio	CSA MSP - Ministry of Agriculture, and Livestock Development
Paul Opio	FAO Kenya
Bettie Atyam	FAO Kenya
Michelle Nyandong	Life and Peace Institute
Irene Mukalo	Resource Conflict Institute (RECONCILE)
Heldana Tekeste	UNEP
Michael Thiauri	IRC
Lydia Kimani	CSA MSP - Ministry of Agriculture, and Livestock Development
Maurice Ouma	State Department of Livestock - Government of Kenya
Foerch, Nele	GIZ KE - Civil Peace Service program
Hassan Ismail	InterPeace