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Advocating for a Contextual Approach: Integrating the Risk Governance Framework into deforestation mitigation strategies in Africa

Chinwe P. Oramah
Department of Technology and Safety, The Arctic University of Norway (UiT), Norway. chinwe.p.oramah@uit.no

Tochukwu A. Ngwu
Department of Mining and Petroleum Engineering; Chiang Mai University, Thailand;
tochukwuambrose_n@cmu.ac.th

Chinwe N. Odimegwu
Department of Estate Management; Chukwuemeka Odumegwu Ojukwu University, Nigeria;
cn.odimegwu@coou.edu.ng

Abstract
Deforestation in Africa poses significant environmental, socio-economic, and political challenges, necessitating a structured approach to risk management. This paper explores the integration of the Risk Governance Framework, developed by the International Risk Governance Council (IRGC), into deforestation mitigation strategies across the continent. The framework's emphasis on adaptive management and inclusive decision-making provides a comprehensive methodology for addressing the complex risks associated with deforestation. Key processes such as pre-assessment, risk appraisal, characterization and evaluation, management, and communication are examined in the context of socio-political factors driving deforestation and mitigation strategies in Benin, Burundi, Zambia, and Sudan. By systematically applying these processes, the study highlights the importance of stakeholder engagement, transparent communication, and context-specific strategies in developing sustainable solutions to deforestation. The findings offer valuable insights for policymakers, environmental organizations, and local communities, contributing to more equitable and resilient deforestation mitigation strategies in Africa.

Keywords: Deforestation Mitigation, Risk Governance, Socio-Political Factors, Sustainable Practices, Stakeholder Engagement, Africa

1. Introduction

Deforestation remains a critical global challenge as approximately 5 million hectares are lost annually, with Africa accounting for 95% of the total global forest loss (Ritchie, 2021). The continent's forests, which cover approximately 21% of its land area, are vital carbon sinks and home to a rich diversity of flora and fauna (FAO, 2022). However, these diverse forests, ranging from the tropical rainforests of the Congo Basin to the Guinean Forests of West Africa and the Coastal Forests of East Africa, are undergoing significant degradation (Igamba, 2021). The current deforestation rates could lead to the disappearance of more than a quarter of Africa's rainforests by 2050 (Chirwa & Adeyemi, 2020). Deforestation in Africa is a result of a combination of socio-economic, political, and environmental pressures. The socioeconomic dimension of deforestation is profound, as millions of Africans depend on forests for their livelihood. Agricultural expansion, legal and illegal logging, infrastructure development, and fuelwood collection are primary drivers of deforestation (FAO, 2016), exacerbated by poverty and population increase, which increase the demand for land resources (Aquilas et al. 2022). The continent's rich timber resources are exploited for both domestic use and export, often without adequate regulations or sustainable management practices (Sitoe et al., 2010). Additionally, the collection of fuelwood and charcoal production are critical drivers, particularly in rural areas where alternative energy sources are limited (Malimbwi et al., 2010). These activities not only result in biodiversity loss and ecosystem disruption but also contribute to greenhouse gas emissions and accelerate climate change (Prăvălie, 2018). Politically, deforestation is often linked to

governance challenges such as weak institutional structures, corruption, and land tenure conflicts further complicated by political instability hindering effective protection and management of forest resources (Holmberg, Rothstein, and Nasiritousi 2009; Opoku and Sommer 2023). Traditional approaches to forest management have often been reactive, failing to address the underlying contextual challenges driving deforestation in different regions (Igamba, 2021; Igini, 2022).

This paper advocates for a structured approach to deforestation mitigation in Africa. The question of the paper is: How can the Risk Governance Framework be integrated into deforestation mitigation strategies in Africa, considering the socio-political and environmental complexities? We selected Benin, Burundi, Zambia, and Sudan because they each represent one region in Africa and are among the ten most vulnerable countries to deforestation. Two of the countries are Anglophone, while the other two are Francophone. We will examine policy documents, reports, and scientific articles on the drivers of deforestation and mitigation strategies in the four African countries. The study seeks to provide actionable insights for policymakers and relevant stakeholders, highlighting the potential for risk governance to enhance the effectiveness and sustainability of deforestation mitigation efforts across Africa.

2. Theoretical framework: Risk Governance Framework in Deforestation Mitigation

The Risk Governance Framework, developed by the International Risk Governance Council (IRGC), offers a structured approach to managing systemic risks characterized by complexity, uncertainty, and ambiguity (Klinke and Renn 2019). This framework is particularly relevant for addressing environmental risks such as deforestation, where socio-economic, political, and environmental factors intertwine to create multifaceted challenges (Renn & Walker, 2008). Risk governance framework involves several key components: pre-assessment, appraisal, characterization, evaluation, and management (IRGC, 2005). It emphasizes the need for communication and stakeholder involvement in risk pre-assessment, appraisal, characterization, and inclusive decision-making (Renn, 2020). By emphasizing adaptive management and inclusive decision-making, the Risk Governance Framework provides a comprehensive methodology for understanding and mitigating deforestation risks in Africa.

2.1. *Pre-Assessment Phase*

The pre-assessment phase involves identifying and framing the risk within its specific context, considering socio-economic, political, and environmental factors. This phase is crucial for capturing the diverse issues stakeholders associate with a risk and achieving a common understanding of the activity generating it (IRGC, 2005). By framing deforestation as a multifaceted risk, stakeholders can develop a nuanced understanding of the challenges and opportunities in different regions (Klinke & Renn, 2019). The process involves identifying key drivers such as agricultural expansion, logging, and socio-political instability.

2.2. *Risk Appraisal Phase*

The risk appraisal phase encompasses both risk assessment and concern assessment. Risk assessment involves linking potential hazards to their likely consequences, providing a scientific evaluation of the risk and its social and economic implications (IRGC, 2005). Concern assessment complements risk assessment by incorporating insights from risk perception and analyzing the social and economic implications of the risk. In deforestation mitigation, this phase integrates scientific research with local knowledge to assess ecological impacts, such as deforestation rates and biodiversity loss, as well as socio-economic impacts on local communities (Renn & Walker, 2008). Stakeholder engagement is crucial at this phase to understanding public concerns and ensuring that mitigation strategies align with community needs and priorities (Boholm et al., 2012).

2.3. *Risk Characterization and Evaluation*

Risk characterization and evaluation determine whether a risk is acceptable or tolerable. An acceptable risk has limited negative consequences and requires no mitigation, while a tolerable risk involves activities that need measures to reduce adverse effects (IRGC, 2005). This phase involves balancing the ecological impacts of deforestation with socio-economic needs, such as economic development and environmental conservation. By identifying acceptable levels of risk, policymakers can prioritize interventions that maximize benefits while minimizing adverse impacts (Renn, 2020).

2.4. *Risk Management Phase*

The risk management phase involves designing and implementing actions to avoid, reduce, transfer, or retain risks (IRGC, 2005). Risk management strategies are context-specific, considering the dominant characteristics of the risks involved. Complex risks are addressed with risk-informed and robustness-focused strategies to reduce system vulnerability. Uncertain risks are managed with precaution-based and resilience-focused strategies to ensure decision reversibility and enhance coping capacity. Ambiguous risks are handled with discourse-based strategies to foster understanding and reconcile conflicting views. In the context of deforestation, adaptive strategies that can respond to changing conditions and uncertainties are essential. This includes promoting sustainable land use practices, reforestation, and community-based forest management. Inclusive approaches that engage local communities and stakeholders are crucial for ensuring the effectiveness and sustainability of mitigation efforts (Hanssen et al., 2018).

2.5. *Risk Communication Phase*

Risk communication is crucial throughout the risk handling process, enabling informed decision-making by balancing factual risk knowledge with personal interests and concerns (IRGC, 2005). Effective risk communication involves exchanging information among experts and with at-risk groups to foster tolerance for differing viewpoints, build trust in institutions, and enhance societal preparedness for coping with risks. In deforestation mitigation, transparent communication is vital for building trust and facilitating collaboration among stakeholders. The process involves disseminating information about deforestation risks and mitigation strategies, as well as fostering dialogue and feedback. By engaging diverse stakeholders, including government agencies, NGOs, and local communities, risk communication can enhance the legitimacy and acceptance of deforestation mitigation efforts (Boholm et al., 2012).

2.6. *Integrating Risk Governance in Deforestation Mitigation*

Integrating the Risk Governance Framework into deforestation mitigation strategies involves a comprehensive analysis of the socio-economic and political context in which the risk is defined. This means taking a close look at how stakeholders interact, the power dynamics at play, the governance structures, and the broader economic and political environment that influence risk decision-making (Boholm et al., 2012).

By systematically applying the framework's processes—like identifying and framing risks, appraising them comprehensively, balancing the risks and benefits, developing adaptive and inclusive management strategies, and effective communication and stakeholder engagement in fostering trust and ensuring a shared understanding—policymakers and stakeholders can craft solutions that are not only effective but also sustainable for mitigating deforestation in Africa.

3. Discussion: Integrating Risk Governance Framework Processes in Deforestation Mitigation Strategies

The socio-political factors driving deforestation in Benin, Burundi, Zambia, and Sudan present complex challenges that require a structured approach to risk management. We will apply the Risk Governance Framework to systematically address these challenges through its key processes: Pre-Assessment, Appraisal, Characterization and Evaluation, Management, and Communication.

3.1. *The pre-assessment phase*

The pre-assessment phase is pivotal in understanding the multifaceted risks associated with deforestation in Benin, Burundi, Zambia, and Sudan.

Benin and Burundi: In Benin, the widespread poverty and unemployment compel communities to depend heavily on forest resources for their livelihoods. This reliance is further exacerbated by rapid population growth and the increasing demand for agricultural land, which intensifies pressure on forested areas (Ayenikafo & Wang, 2021). The situation in Burundi is similarly complex, where socio-political instability since 1993 has led to intensified agricultural activities and increased firewood usage, particularly around displacement camps. These activities have significantly impacted natural vegetation and biodiversity, highlighting the intricate relationship between socio-political factors and environmental degradation (Havyarimana et al., 2015).

The pre-assessment phase in these countries involves identifying and framing deforestation as a risk that is deeply intertwined with socio-economic and political drivers such as poverty, land shortages, and governance challenges. By understanding these interconnections, policymakers can begin to address the root causes of deforestation, rather than merely treating its symptoms. This phase sets the stage for targeted interventions that consider the socio-economic realities of communities and the political landscape that influences resource management (Megerle, 2020).

Zambia and Sudan: In Zambia, deforestation is driven by weak governance, insecure land tenure, and inadequate policy implementation. These governance issues have facilitated illicit logging and agricultural expansion, further degrading forest resources (Kalaba, 2016). Sudan faces similar challenges, where mechanized agriculture and the charcoal sector are major contributors to deforestation. The situation is compounded by ongoing civil unrest, which disrupts governance and exacerbates resource conflicts (Sulieman, 2018; Gorsevski et al., 2013).

The pre-assessment phase in Zambia and Sudan involves a comprehensive analysis of governance issues and socio-political instability, recognizing the unique challenges each nation faces. This phase is crucial for identifying the specific risks associated with deforestation and understanding how they are shaped by broader socio-political dynamics. By contextualizing deforestation within these frameworks, stakeholders can develop more effective governance policies and resource allocation strategies that address both environmental and socio-political challenges.

3.2. *The risk appraisal phase*

One of the strengths of the appraisal phase is its ability to combine rigorous scientific analysis with insights from local communities. This dual approach ensures that the assessment of deforestation risks is both accurate and contextually relevant. Scientific research provides data on ecological impacts, such as biodiversity loss and ecosystem degradation, while local knowledge offers a nuanced understanding of socio-economic factors and cultural dynamics that influence deforestation.

Benin and Burundi: In Benin, deforestation is particularly pronounced in protected regions due to agriculture, livestock farming, and urbanization (Ahononga et al., 2021). Similarly, Burundi grapples with significant soil erosion and forest degradation, exacerbated by inadequate soil conservation methods and socio-political instability (Ndabaneze, 1988). These activities threaten biodiversity and compromise the ecological integrity of forested areas.

The appraisal phase in Benin would involve assessing these ecological impacts, such as the 2.84% deforestation rate in Alibori and substantial forest loss in Tchaourou Classified

Forest (Fassale et al., 2020). In Burundi, the focus will be on understanding the extent of soil erosion and its implications for forest health. The appraisal phase for Benin and Burundi should emphasize the importance of integrating scientific insights with local knowledge to develop strategies that are both effective and contextually appropriate. If an appraisal is done right, it will enable targeted interventions to preserve biodiversity and ecosystem services in both countries.

Zambia and Sudan: Zambia's deforestation is driven by agricultural expansion and shifting cultivation, resulting in socio-ecological trade-offs that affect biodiversity (Masikati et al., 2021). In Sudan, the brick-making industry's demand for fuelwood leads to significant forestland loss, exacerbated by drought events (Alam & Starr, 2009; Mohamed et al., 2022). In the appraisal phase, these ecological and socio-economic impacts will be evaluated to ensure that mitigation strategies are informed by scientific data and stakeholder perceptions.

3.3. *The characterization and evaluation phase*

In the characterization and evaluation phase, the focus will be on balancing ecological conservation with socio-economic development to ensure that interventions are both effective and sustainable.

Benin and Burundi: In Benin, the emphasis is on prioritizing interventions that address urgent socio-economic challenges, such as poverty and unemployment, while promoting sustainable agricultural practices and environmental conservation. This dual focus aims to secure long-term ecological viability and improve community livelihoods through agroforestry initiatives (Decalo, 1981; Oloukoi, 2013). Implementing agroforestry systems that integrate trees with crops can enhance biodiversity, improve soil health, and provide additional income sources for farmers. In Burundi, the challenge involves balancing agricultural demands with the critical goal of biodiversity conservation. Such an endeavor requires development strategies that are both ecologically sound and economically viable, ensuring that growth does not come at the expense of environmental conservation.

Zambia and Sudan: Zambia faces the task of aligning the need for increased agricultural production with forest preservation. This necessitates promoting sustainable land use practices and strengthening governance structures to effectively manage the tension between economic growth and environmental protection (Kalaba, 2016). These steps can include enhancing policy frameworks and enforcement mechanisms to reduce illegal logging and promote sustainable practices. Developing land use plans that prioritize conservation areas to regulate agricultural expansion can help balance development with preservation. In Sudan, strategies must be responsive to the socio-political environment, addressing deforestation while supporting local livelihoods and fostering community engagement. This process involves creating interventions that are sensitive to the unique socio-political dynamics and capable of alleviating deforestation pressures (Gorsevski et al., 2013). For instance, promoting the use of renewable energy sources like solar and wind can reduce reliance on fuelwood and alleviate deforestation pressures. By carefully balancing environmental sustainability and socio-economic benefits, policymakers can develop strategies that are equitable and effective, benefiting all stakeholders involved.

3.4. *The risk management phase*

The risk management phase of the Risk Governance Framework is all about crafting strategies that are both adaptive and inclusive in tackling the uncertainties and changing conditions associated with deforestation risks.

Benin and Burundi: In Benin, the focus should be on promoting sustainable agricultural practices, reforestation, and community-based forest management. By engaging local communities, these strategies can become more effective and sustainable. It's about empowering people to take an active role in managing their environment, ensuring that interventions are not only beneficial but also embraced by those who are directly impacted (Aboubakari, 2017). In Burundi, adaptive strategies are key to addressing soil conservation and forest management. By involving communities in these efforts, environmental sustainability and resilience can be

enhanced. For instance, creating a collaborative approach where everyone has a stake in preserving the natural landscape will be vital for combating soil erosion and forest degradation (Ndabaneze, 1988).
Zambia and Sudan: In Zambia, the emphasis should be on intersectoral collaboration and effective policy implementation to address deforestation drivers. This means bringing together different sectors and stakeholders to ensure that policies are not only well-crafted but also effectively enforced (Masikati et al., 2021). Meanwhile, in Sudan, promoting integrated land-use practices and community participation can enhance forest protection and support sustainable livelihoods. It's about creating a holistic approach that considers both environmental and socio-economic factors, fostering a sense of ownership and responsibility among local communities (Sulieman, 2018).

The risk management phase provides a structured framework for identifying and assessing potential risks to forest ecosystems. This phase equips decision-makers with the tools needed to implement effective measures for reducing deforestation risk and equitable management of forest resources. This phase encourages stakeholder engagement—whether they're local communities, government agencies, or NGOs—to ensure that mitigation efforts are comprehensive and contextually relevant. This collaboration strengthens governance and promotes a unified approach to tackling deforestation.

3.5. *Communication and Stakeholder Engagement phase*

Transparent communication is vital for deforestation mitigation as it builds trust and facilitates collaboration among stakeholders.
Benin and Burundi: In Benin, disseminating information about deforestation risks and mitigation strategies is crucial for fostering dialogue and feedback. By openly sharing data and insights about the impacts of deforestation and the benefits of proposed interventions, stakeholders can enhance the legitimacy and acceptance of their efforts. This transparency helps align the interests of various parties, including government agencies, local communities, NGOs, and private sector actors, thereby creating a unified approach to tackling deforestation (Platteau, 2023). In Burundi, engaging a diverse range of stakeholders is essential for effective communication and collaboration. The list includes government agencies, local communities, international organizations, and NGOs. By involving these groups in the conversation, policymakers can ensure that mitigation strategies are culturally appropriate and responsive to the needs and priorities of local populations. Effective communication in Burundi should focus on raising awareness about the socio-political and environmental impacts of deforestation, as well as the potential benefits of sustainable practices. This involves disseminating information and actively listening to and incorporating feedback from stakeholders, thereby fostering a sense of ownership and commitment to the mitigation efforts (Polygenis et al., 2015).

Zambia and Sudan: In Zambia, effective communication involves disseminating information about the socio-ecological trade-offs of deforestation and the importance of sustainable land management practices. By fostering dialogue among stakeholders, including farmers, government officials, and conservation organizations, Zambia can enhance the acceptance and implementation of deforestation mitigation strategies (Kalaba, 2016). In Sudan, communication efforts should focus on addressing the socio-political factors that exacerbate deforestation, such as civil unrest and resource conflicts. By engaging local communities and stakeholders in the development and execution of mitigation strategies, Sudan can build consensus and support for sustainable forest management practices (Gorsevski et al., 2013).

To achieve this, communication strategies in Benin, Burundi, Zambia, and Sudan should leverage various platforms and channels, including community meetings, workshops, and media campaigns, to facilitate the exchange of information and ideas. These activities will also enable stakeholders to collaborate more

effectively in developing innovative solutions to deforestation.

4. Conclusion

The integration of the Risk Governance Framework into deforestation mitigation strategies in Benin, Burundi, Zambia, and Sudan provides a comprehensive approach to managing the complex sociopolitical factors driving deforestation. By systematically applying the framework's processes—risk identification and framing, risk and concern appraisal, balancing risks and benefits, adaptive and inclusive management strategies, and transparent communication and stakeholder engagement—policymakers and stakeholders can develop more effective and sustainable solutions to deforestation.

The case studies highlight the importance of understanding the unique socio-economic, political, and environmental contexts of each country. By recognizing the diverse drivers of deforestation and engaging relevant stakeholders in the development and implementation of mitigation strategies, these countries can enhance the resilience of their forest ecosystems and support sustainable development.

Ultimately, the application of the Risk Governance Framework offers valuable insights for developing contextually relevant and integrated approaches to deforestation mitigation in Africa. By fostering collaboration and building trust among stakeholders, this approach can contribute to more effective and equitable forest management, promoting both environmental conservation and socio-economic well-being across the continent.

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