Leveraging Technology for Anti-Corruption Strategies in Forestry Services: Insights from Bhutan

Abstract-Corruption in forestry services poses serious threats to sustainable forest management and biodiversity conservation, particularly in developing nations like Bhutan, where forests are vital to the environment and the economy. This paper explores how technological interventions, including the Online Forestry System (OFS) and the Spatial Monitoring and Reporting Tool (SMART), have been utilized in Bhutan to prevent and combat corruption by increasing transparency and accountability in the forestry sector. Drawing on qualitative assessments, case studies, and Bhutan's initiatives, the paper highlights the impact of digital platforms on reducing corruption risks by minimizing face-to-face interactions and improving data accuracy. While these technologies show promise, challenges such as the digital divide between rural and urban areas, insufficient training, and resistance to change must be addressed. The paper concludes by recommending enhanced capacity building, improved technological access in remote areas, and exploring emerging technologies like blockchain and artificial intelligence to strengthen anti-corruption strategies in forestry services. This study provides crucial insights into the intersection of technology and governance in forestry, with implications for Bhutan and other developing countries facing similar challenges.

Keywords*:* Forestry services, Corruption, Transparency, Accountability, Online Forestry System (OFS), Spatial Monitoring and Reporting Tool (SMART)

1. Introduction

Forests cover 69.71% of Bhutan's land area, providing critical ecological services, sustaining biodiversity, and contributing significantly to the nation's economy (Department of Forests and Park Services, 2023). Bhutan's forests are central to its Gross National Happiness (GNH) philosophy, which emphasizes ecological sustainability and economic well-being (Tshering et al., 2012). However, corruption in forestry services is a challenge that undermines environmental governance and equitable resource allocation. It is a pervasive issue that affects both developed and developing nations. Scholars like Tacconi et al. (2009) argue that illegal logging, bribery, and fraudulent documentation are widespread due to weak institutional frameworks and enforcement gaps and can lead to significant environmental degradation and economic losses (Koyuncu & Yilmaz, 2009). A study by McDermott et al. (2012) also highlights how corruption exacerbates ecological degradation by allowing the overexploitation of forests, negatively

affecting biodiversity and ecosystem services. In developing countries like Bhutan, where forests are integral to livelihoods and national development, the impact of corruption can be particularly detrimental (World Bank, 2022). Corruption exacerbates inequalities, as local communities often suffer the consequences of illegal resource extraction (Forest Declaration Assessment Partners [FDAP], 2023).

According to Soreide (2007), corruption in forestry services is driven by a combination of factors, including weak institutional frameworks, lack of transparency in decision-making processes, and inadequate enforcement of existing laws. These conditions create opportunities for rent-seeking behaviors and the exploitation of regulatory loopholes, leading to widespread illegal activities in forest management. Similar findings have been noted in Southeast Asia, where poor governance and resource dependency heighten the risk of corruption in forestry services (Tacconi et al., 2009). Through several studies and assessments, the Anti-Corruption Commission (ACC) of Bhutan has identified forestry services as one of the sectors most vulnerable to corrupt practices (ACC, 2023). Accordingly, the ACC conducted the integrity assessment of forestry services in 2024 using a qualitative method and highlighted the corruption vulnerabilities, adequacy of anti-corruption measures, issues, and challenges. The study has also recommended measures to prevent and combat corruption in Bhutan's forestry services (ACC, 2024).

Bhutan faces challenges in ensuring accountability and transparency within its forestry sector with its vast forest cover and commitment to environmental conservation. To address these issues, Bhutan has implemented technological tools such as the OFS and SMART to monitor and regulate forestry services more effectively and reduce opportunities for corrupt practices by streamlining service delivery and minimizing direct human interaction. Digital platforms, such as e-government systems, have been identified as a promising solution to combat corruption in public services, including forestry (Bouchard et al., 2021). However, as noted by Alam et al. (2023), the effectiveness of such systems depends on their implementation, cultural adaptation, and the availability of adequate resources to support their operation. This paper examines the role of technology in mitigating corruption in forestry services, with particular emphasis on Bhutan's experiences. It reviews the study conducted by the ACC and existing literature on digital interventions in forest governance and assesses their effectiveness in enhancing transparency and accountability.

2. Literature Review

2.1 Leveraging Technology as an Anti-Corruption Strategy in Forestry Services

One of the key benefits of technology is its ability to enhance transparency and accountability, thus serving as a vital tool in the fight against corruption across various sectors, including forestry. Geographic Information Systems (GIS) and remote sensing technologies can monitor forest resources and track logging activities, making it harder for corrupt officials to conceal illegal actions (Xu et al., 2018). Furthermore, online platforms can share information regarding

forest management practices, regulations, and permits, empowering citizens to hold government officials accountable (Chaudhary et al., 2020). The digitalization of government services, known as e-governance, has proven particularly effective in mitigating corruption risks by improving transparency, streamlining processes, and restricting human discretion in decision-making. Numerous studies have shown that technology can be crucial in enhancing accountability and reducing opportunities for corrupt practices within the forestry sector (Alam et al., 2023; Ceschel et al., 2022).

Transparency International (2020) emphasizes that digital platforms significantly limit face-to-face interactions, reducing bribery opportunities. Alam et al. (2023) also argue that the shift to digital platforms diminishes direct interactions and restricts opportunities for bribery and favoritism, which are key challenges in the forestry sector. Similarly, Heeks (2021) found that electronic monitoring systems can enhance data accuracy and decision-making in public sector services. Gupta & Siebert (2008) state that electronic systems minimize time and optimize the reliability of services in the forestry sector. Damaševičius et al. (2024) similarly articulate that digital technology in forestry monitoring enables faster and more precise real-time analysis of extensive forest-related data. Hrynyk & Biletskyi (2023) assert that the forestry sector has found productive approaches to combat corruption when introducing digital systems. Aarvik (2017) points out that trafficking and the poaching of endangered plant and animal species are significant issues. To combat this problem, the Elephant Action League developed Wild Leaks, an anonymized reporting tool for forest and wildlife crimes, significantly reducing the illegal poaching and trafficking of endangered species.

2.2 Case Studies of Digital Anti-Corruption Tools

The use of technology to combat corruption in forestry services has increasingly gained attention in recent years. Several international case studies indicate that e-governance tools, such as electronic permit systems, digital monitoring tools, and online public access to information, have effectively addressed corruption in forestry services (Robbins, 2000; FAO, 2020).

For instance, in Brazil, satellite imagery has helped curb illegal deforestation, particularly in the Amazon, resulting in an 80% reduction in deforestation from 2004 to 2012 (Assunção et al., 2015). The Real-Time Deforestation Detection System (DETER) uses satellite images to monitor illegal logging activity in the Amazon, dramatically lowering deforestation rates. This technology allows for continuous surveillance of forestry activities, enabling authorities to effectively oversee and address illegal practices (Transparency International, 2018; Ferreira et al., 2019). Similarly, in Cambodia, open-access digital platforms for timber licensing processes have significantly helped reduce corruption. These platforms enhance transparency in resource extraction by making critical information available to the public, thus curbing illegal activities and promoting greater accountability (Global Witness, 2017). Furthermore, to increase transparency, the use of Geographic Information Systems (GIS) and remote sensing technology

has been crucial in combating illegal logging. These tools provide real-time monitoring of forest activities, allowing authorities to track logging operations better and uncover illegal conduct. Combining these digital innovations has not only diminished illegal logging. Still, it has also led to significant improvements in forest sectors by enabling authorities to effectively enforce regulations and ensure sustainable resource management (He et al., 2017).

Similarly, in Indonesia, the implementation of electronic forest governance systems has played a crucial role in reducing illegal logging and strengthening the enforcement of forest protection laws. By digitizing forest monitoring and management, authorities can track forest activities more effectively and in real-time. These systems have increased transparency and accountability, making it more difficult for illegal logging operations to go unnoticed. Consequently, forest governance in Indonesia has improved, with fewer instances of corruption and illegal exploitation of resources (Soreide, 2007; Hansen et al., 2022). Furthermore, the country has also adopted blockchain technology to verify the legality of timber products through a unique system known as the timber legality verification system. This system allows stakeholders to trace the origins of timber products. These systems have drastically reduced illegal logging activities (Jakart, 2020).

Furthermore, the report on Kenya shows that mobile technologies have been implemented to facilitate reporting illicit logging and other forestry offenses. This innovation has enabled individuals to participate actively in anti-corruption activities, creating a more open and accountable system. Mobile technology has enhanced public participation in forest monitoring by providing a straightforward reporting platform. Consequently, Kenya has seen improved forest management and a decline in criminal activities (Muthee et al., 2022). Similarly, the National Forest and Wildlife Information System (SNIFFS) is a key tool for monitoring forest activities in Peru. It supports real-time data collection, which has been vital in combating illegal logging and wildlife trafficking. By digitizing forest governance, SNIFFS allows authorities to efficiently track and manage resources, ensuring that permits are verified and illegal activities are detected early. Kaimowitz et al. (2009) stress that by enhancing transparency and offering a user-friendly platform for monitoring, SNIFFS has diminished the potential for corrupt practices, such as bribery and document falsification, which were previously widespread in the forestry sector.

Similarly, in Tanzania, e-governance initiatives have significantly improved the transparency of timber licensing procedures, effectively curbing corrupt practices. By digitizing the licensing process, the government has reduced opportunities for bribery and fraud. Public access to real-time data on timber activities has also empowered communities to monitor compliance with forestry regulations, decreasing illegal logging and improving revenue collection from timber operations (Awana, 2023). These examples illustrate that while technology can play a transformative role in reducing corruption, its effectiveness depends on local contexts, including the level of technological literacy, infrastructure, and the political will to enforce anti-corruption measures.

3. Methodology

The data for this study is sourced from the report on the Integrity Assessment of Forestry Services in Bhutan, conducted by the Anti-Corruption Commission of Bhutan in July 2024. The report gathered qualitative data through focus group discussions (FGDs) and semi-structured interviews involving 145 forest officials and 68 service users from 14 forest division offices across Bhutan.

To contextualize these findings, relevant academic literature and case studies on digital governance and anti-corruption strategies in forestry management were reviewed. Sources such as Alam et al. (2023), Heeks (2021), and Transparency International (2020) informed the understanding of how e-governance systems enhance transparency and accountability. This dual approach positioned Bhutan's initiatives within broader global trends while addressing local challenges in adopting digital tools to combat corruption in forestry services in Bhutan.

4. Findings and Discussions

4.1 Leveraging Digital Solutions to Combat Corruption in Bhutan's Forestry Services: The Role of OFS and SMART Systems

With the growing role of technology in governance, many countries, including Bhutan, have adopted digital solutions to combat corruption in forestry services. The introduction of the OFS in Bhutan represents a significant advancement in mitigating the risks associated with corrupt practices within the forestry sector. By digitizing permit applications and monitoring forestry operations online, the OFS reduces opportunities for manipulation and favoritism (ACC, 2024). It facilitates real-time tracking of forestry-related activities, including the issuance of permits and timber allocations, substantially minimizing the chance for fraudulent practices. This system replaces traditional manual processes, which were susceptible to manipulation, with a transparent and streamlined digital framework that is harder to tamper with. Furthermore, integrating technology has enhanced decision-making quality by providing officials with accurate and timely data, fostering better oversight and governance (Alam et al., 2023).

Similarly, the SMART system has emerged as a powerful tool for tracking forestry activities. It ensures that forestry officials are accountable for their actions and movements, reducing the potential for corrupt interactions. SMART uses GPS technology to record the exact locations of trees and timber, guaranteeing that resource allocations are transparent and verifiable (ACC, 2004). By accurately documenting and monitoring field operations, SMART limits the chances for forestry officials to engage in illegal activities, such as falsifying timber markings or misreporting data. This digital transformation has made it increasingly difficult for corrupt practices to occur unnoticed and has significantly improved the accountability of forestry personnel (Amacher et al., 2007).

The shift from manual processes to digital platforms has also significantly reduced the prevalence of corrupt practices such as bribery, preferential treatment, and misallocation of resources due to the minimal need for face-to-face interactions (ACC, 2024). Technology integration has led to a more efficient service delivery process, as stakeholders can now access permits and track applications online, minimizing direct contact with relevant officials. Ceschel et al. (2022) highlighted that digital systems decrease discretionary decision-making and allow for greater oversight. This is particularly important in sectors like forestry, where resources are valuable and corruption risks are high. Public awareness of the rules governing forestry services has also improved, leading to a decline in corrupt practices. Service users are now more informed about their rights and are less likely to tolerate corruption (ACC, 2024).

4.2 Challenges and Recommendations of Leveraging Digital Solutions in Bhutan's Forestry Services

Despite the successes of digital tools in combating corruption, several challenges hinder their practical implementation, particularly in ensuring equitable access and adoption. One major issue is the technological divide between urban and rural areas, which limits access to e-governance tools in remote regions (Nkonde et al., 2017). For instance, in Bhutan, rural communities often lack the necessary infrastructure and digital literacy to utilize platforms like the Online Forest Service (OFS) and SMART systems (Transparency International, 2021). This disparity creates barriers to transparency, as many rural users struggle to access online services, making them vulnerable to corrupt practices (ACC, 2024). To address this, governments should invest in improving digital infrastructure, such as internet connectivity and mobile networks, while also launching public awareness campaigns to educate rural communities about the benefits of these platforms. Ensuring equal access to technology is crucial to prevent corruption from persisting in underserved areas.

Further, uneven public access to technology can lead to delays in service delivery and create opportunities for corrupt practices to persist in underserved regions (Transparency International, 2021). To address this, governments should focus on improving digital literacy and providing affordable access to technology for all citizens. Mobile-based solutions and offline functionalities can also be explored to ensure inclusivity for remote users. By tackling these access issues, digital platforms can become more effective tools for reducing corruption and enhancing transparency.

Another significant challenge is the lack of adequate training for forestry officials in effectively using digital systems. In some cases, cultural norms and resistance to change have prevented the full integration of tools like OFS and SMART into everyday operations (ACC, 2024). Additionally, the effectiveness of technology depends on the capacity of governments to implement and maintain these systems (World Bank, 2018). Moreover, without proper training, officials may revert to manual processes or fail to use the technology efficiently, undermining its potential to reduce corruption (Alam et al., 2023). To overcome this, comprehensive training

programs should be implemented to equip officials with the technical skills needed to operate these systems. These programs should also address cultural resistance by highlighting the long-term benefits of digital tools in enhancing transparency and accountability. Strengthening enforcement mechanisms for monitoring and verifying forestry activities can further ensure regulation compliance.

Resistance to change within the bureaucracy itself poses another obstacle. Some forestry officials resist adopting digital systems due to entrenched cultural norms or a lack of technical expertise, delaying full implementation and limiting the impact of these tools (ACC, 2024). To address this, governments should foster a culture of innovation and accountability within public institutions. Providing incentives for adopting digital tools and strong leadership support can encourage officials to embrace change. Additionally, integrating citizen feedback mechanisms into digital systems can involve the public in monitoring and accountability, reducing opportunities for corruption (Heeks, 2021).

5. Conclusion

Corruption in forestry services presents significant risks to sustainable forest management, biodiversity conservation, and equitable resource distribution, especially in developing nations like Bhutan. This study has examined how technological interventions, such as the Online Forestry System (OFS) and the Spatial Monitoring and Reporting Tool (SMART), enhance transparency and accountability within Bhutan's forestry sector. By minimizing face-to-face interactions, improving data accuracy, and streamlining regulatory processes, these digital platforms have demonstrated the potential to reduce corruption risks.

However, the effectiveness of these technological interventions is influenced by challenges such as gaps in digital literacy, infrastructure limitations in remote areas, and resistance to change among stakeholders. While adopting e-governance solutions in forestry services has been a step in the right direction, their full potential can only be realized through comprehensive capacity-building programs, improved technological access in rural regions, and strong institutional support.

This paper highlights the need to continuously evaluate and improve digital anti-corruption tools to address emerging threats and challenges. Future efforts should concentrate on integrating advanced technologies such as blockchain for secure transaction records and artificial intelligence for real-time monitoring and predictive analytics. Strengthening inter-agency collaboration, encouraging public participation, and fostering a culture of integrity among forestry personnel will be crucial for sustaining the gains achieved through digital governance.

The insights from Bhutan’s experience provide valuable lessons for other developing nations facing corruption in forestry services. By effectively leveraging technology, governments can

establish more resilient and transparent forest governance systems, ultimately ensuring the long-term sustainability of forest resources and the well-being of the communities that rely on them.

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