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## TACKLING ILLEGAL LOGGING: PROBLEMS AND CHALLENGES

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**ABSTRACT:** Illegal logging poses significant environmental, economic, and social challenges worldwide. This research explores the problems associated with illegal logging in the present and future, shedding light on the multifaceted nature of this issue and the accompanying challenges faced by governments, organizations, and communities. The study employs a comprehensive literature review to analyze the current state of illegal logging, its causes, and its consequences. It examines the environmental impact of deforestation, including biodiversity loss, habitat degradation, and climate change. The researchers identify the challenges faced in combating illegal logging in the present and anticipate future obstacles. It considers illegal logging networks' complex and elusive nature, the limited enforcement capacity, and the need for international cooperation and coordination. The study also examines the adoption and effectiveness of policies, regulations, and technological advancements in curbing illegal logging practices in Davao City.

**Keywords** -Problems and Challenges, Cultural Disruptions, Anticipate future problems.

### I. INTRODUCTION

Illegal logging is a worldwide issue with severe environmental and economic repercussions. It frequently results in forest degradation and deforestation, endangering not only the essential ecological functions of forests and biodiversity but also the well-being of individuals who rely on forest resources for their livelihoods (Bosch, 2021). Illegal logging is the cutting, processing, and trafficking of wood and forest products, violating national and international laws. Illegal logging causes significant environmental destruction, diminishes biodiversity, contributes to societal conflicts, and interferes with initiatives to promote sustainable development (Hoare & Uehara, 2022).

Illegal logging has become a significant global problem due to its adverse impacts on the environment, businesses, and communities. This illegal practice includes the illicit gathering, processing, and selling of wood, which leads to mass deforestation, degradation of biodiversity, and habitat destruction. Furthermore, it frequently raises social tensions, especially in areas where forests are essential to indigenous groups' livelihoods. In addition, the proceeds generated by illegal logging may promote corruption and organized crime. Illegal logging endangers our ecosystems and undermines initiatives toward equitable development, leading to an essential problem requiring immediate action and efficient solutions (Noor et al., 2020).

Environmentally, illegal logging leads to extensive deforestation, threatening biodiversity, disrupting ecosystems, and contributing significantly to climate change. Socially, it often leads to the displacement of indigenous communities, fuels social conflicts, and undermines the livelihoods of local populations reliant on forests. Economically, the practice results in substantial revenue losses for governments, damages legitimate forestry businesses, and perpetuates poverty by depriving communities of sustainable economic opportunities. Moreover, illegal logging fosters corruption, weakens the rule of law, and exacerbates inequality (Butler, 2020).

The rise in sophisticated technology, globalized illegal timber trade, corruption, expansion into untouched areas, and climate change impacts are alarming trends in illegal logging. With the advancement of technology, illegal loggers are becoming more sophisticated, utilizing tools like drones and GPS systems to exploit remote forests efficiently (Vasile & Iordăchescu, 2022). The globalization of the illegal timber trade has created a complex network fueled by demand in international markets. Corruption and weak governance further exacerbate the issue, enabling illegal activities to persist. Additionally, the expansion of frontier logging into

previously untouched areas and the impacts of climate change, such as wildfires, further threaten our forests (Work et al., 2022).

Bosch (2021) stated that various aspects of inadequate institutional quality or governance can result in an increase in illegal logging within a country. Firstly, it suggested that nations with weak government institutions experience higher levels of illegal logging. This is particularly true when the government needs more capacity or willingness to create and enforce laws and regulations related to wood harvesting. The situation can worsen when there is a lack of clarity and overlapping responsibilities between central and local governments, often stemming from poorly executed decentralization processes. Secondly, an inconsistent legislative and regulatory framework contributes to illegal logging. Many countries need help with environmental and forestry laws described as vague, outdated, subject to frequent changes, or playing a minor role. Consequently, such laws can be interpreted individually and manipulated more efficiently, providing incentives for illegal wood harvesting.

This study is anchored by the neo-Malthusian theory, which suggests that the expansion of the population results in an increased need for land and natural resources, potentially leading to a rise in illegal logging. Furthermore, a growing population is believed to indirectly impact illegal logging by influencing labor markets, as it generates a surplus of available workers and exerts downward pressure on wage rates.

The primary objective of this study was focused on tackling the problem and challenges of illegal logging. Specifically, it endeavors to provide and achieve answers to the ensuring ends. First, provide an in-depth understanding of the current state of illegal logging, including its environmental and cultural impacts on affected communities. Second, assess the effectiveness of the existing policies, laws, and enforcement mechanisms that effectively combated illegal logging. Lastly, know the socioeconomic consequences of illegal logging in local communities.

The study was conducted to offer crucial insights and understanding regarding the chosen topic, tackling illegal logging: problems and challenges. The community can benefit from the study in several ways. It can help raise awareness about the environmental and social consequences of illegal logging, such as deforestation and habitat destruction, which directly impact the community's well-being. It may also foster community engagement and advocacy for stricter anti-illegal logging policies and more excellent protection of forests, ensuring a healthier and more sustainable environment for all. Policymakers can also derive valuable insights from the study, such as it can provide them with a comprehensive understanding of the problems and challenges associated with illegal logging, offering a basis for evidence-based policymaking. It can help them identify gaps and weaknesses in existing legislation and regulations related to forestry and environmental protection, enabling them to craft more effective and targeted policies. Also, the study can offer potential solutions and best practices for addressing illegal logging, aiding in developing new policies and strategies to combat this issue.

## METHOD

This section provides the methods used in the study, such as the study participants, instruments, design, and procedure to be utilized in gathering data.

### *Research Participants*

According to Tashakkori Teddlie (2021), research participants are the people, organizations, or groups who participate in a study and provide data or information. Participants could be chosen based on established requirements or randomly, and they were required to complete surveys, take part in interviews, or carry out other research-related tasks. The study participants were the six residents of 2 Barangays in Calinan, Davao City. The participants were the members of Indigenous People, Barangay Officials, and Local Residents at least 23 years old and above; this study will gather data from the 6 participants. Following that, interviews, conversations with participants, and analysis of individual texts were carried out on every volunteer who responded to the study. The respondents of the study were the residents of Barangay Calinan. Out of all the barangays in Davao City, Calinan is one of the most populated and affected areas in terms of environmental issues. The estimated population of Calinan is 24,218. Formerly Poblacion, it is a barangay in Davao City. Its population, as determined by the 2020 Census, was 24,218. This represented 1.36% of the total population of Davao City (National Statistics Office of the Philippines, 2020).

The researchers selected six respondents through the purposive sampling method. Purposive sampling was strategically chosen to select participants based on specific characteristics or criteria deemed essential to address the research question or objectives. In this method, the researchers deliberately targeted individuals with unique insights, experiences, or attributes relevant to the study. The selection process involved the researcher's judgment and expertise, ensuring that the chosen participants could provide in-depth information and perspectives crucial for a comprehensive understanding of the research topic. Purposive sampling allowed for a focused and intentional approach to participant selection, aligning with the qualitative research goals and

facilitating the collection of rich and meaningful data (Frost, 2022). The sampling method provided an excellent sampling technique for the study because the respondents selected focused on the barangay Calinan of Davao City residents.

### ***Materials and Instrument***

This study utilized the Interview Guide Questionnaire to interview the participants. This study used a questionnaire to gather data and information from the participants. The researchers conducted a face-to-face, in-depth interview with the chosen participants as part of this phenomenological study, and the researchers recorded or otherwise documented the participants' responses to the provided questions. The participants asked questions highlighting the purpose of the study, which is to know the experiences, challenges, and problems of illegal logging in the present and future.

### ***Design and Procedure***

The study employed a qualitative design, utilizing a multiple case-study approach. This methodology facilitated a thorough exploration and examination of specific events or phenomena within a confined geographical location or through a narrow subject focus. This design allowed the researcher to delve deeply into the intricacies of the chosen cases for a comprehensive investigation (Barroga & Matanguihan, 2022). The multiple case-study method is particularly apt when the study's primary objective involves comparisons or the replication of findings. In instances where researchers aim to draw parallels or contrasts between different cases or seek to validate and reproduce study outcomes across various contexts, the multiple case-study design offers a robust framework. This method enables researchers to explore patterns, variations, and commonalities among cases, providing a comprehensive understanding of the phenomena under investigation. The study gains depth and breadth by employing multiple cases, allowing for a more nuanced analysis of the research question or problem (Halkias et al., 2022).

The qualitative data collected through Interviews and reduced through writing will be analyzed through the thematic analysis method. The thematic analysis method scrutinized patterns and extracted meanings from qualitative data. In this approach, researchers systematically identified recurring themes and patterns within the dataset, utilizing a methodical process of coding, categorizing, and interpreting qualitative information. This method allowed for a detailed examination of the underlying structures and meanings embedded in the data, providing a comprehensive understanding of the diverse perspectives captured within the narratives, interviews, or other qualitative sources (Caulfield, 2023).

In furtherance, the researchers follow a systematic procedure during the study. The first was to confirm the validity and reliability of the guide questions through the approval of an expert and research adviser. Second, a letter was addressed to the Barangay Chairman of Calinan District, Davao City, asking permission for the researchers to conduct a study in the locality. The letter also includes the approval of the Dean of the College of Criminal Justice Education. After the approval, a letter of agreement to participate in the study was distributed to the selected research respondents. This includes permission and terms of agreement of confidentiality.

Next, an interview was conducted to collect information, and through a tape recorder, the whole conversation was recorded if the participant agreed. After the interview, the respondents were given monetary incentives or grocery packs as tokens of gratitude. The span of conducting an interview shall span four (4) days. After this, the recorded conversation was reduced to written text for data analysis, subscribing to the service of a data analyst. Lastly, the data will be interpreted in further sections of this dissertation.

Prior to surveying the study, the researchers sought the approval of the panels for the validity of questionnaires Joner Villaluz Ph. D. and Stella Karen Branzuela Ph. after which the researchers asked for the approval of the adviser Mechelle C. Gempesao, MSCJ, and the Dean Carmelita B. Chavez, Ph.D. A letter to conduct the study addressed to and executed by the Barangay Chairman of Barangay Calinan to conduct the study in the locality. Participants of the researchers were asked for their voluntary participation in the interview. The letter of consent was recited and explained to the participants. After their consent, the researchers proceeded to conduct the survey.

## **RESULTS AND DISCUSSION**

In this part, the results and discussion are presented. In the span of September 5 to October 1, the interview was conducted. The participants were interviewed face-to-face in their respective homes. The study has 6 participants, all Indigenous people, residents, and Barangay workers of Barangay Calinan, Davao City. This section will provide an in-depth analysis of the data collected from the study sought to understand the underlying causes, impacts, and potential solutions to combat illegal logging effectively. Moreover, this chapter explains the study results, including the participants' information, the verbatim transcripts of the participants based on the research questions, the categorization of data with the emerging themes and core ideas for each central theme, and the chapter summary.

### ***The Illegal Logging Challenges***

The participants were asked about the significant challenges associated with illegal logging in the present. During the interviews conducted with various respondents, several challenges associated with illegal logging were identified and discussed. Many respondents highlighted the *lack of effective law enforcement* as a significant challenge. They expressed concerns about inadequate resources, corruption, and the limited capacity of authorities to combat illegal logging activities effectively. They noted that poverty and limited alternative livelihood options drive local communities to engage in illegal logging activities as a means of survival. Steemit, R. (2020) emphasizes that the cause of illegal logging is weak governance. Weaknesses in forest governance in producer countries are typically the direct cause. However, consumer countries contribute to these problems by importing timber and timber products without ensuring they are legally sourced. Governance problems include weak institutions and limited resources, resulting in a lack of law enforcement and limited capacity for land use planning. In many countries, the legal framework needs to be clearer and more consistent, making it difficult, if not impossible, to operate legally. In some situations, the law is not accepted, for example, where the government is considered illegitimate or where customary law holds sway, and the formal legal system conflicts with this.

*“Ahm, kuan siya ang pinaka dakong challenge with regards sa illegal logging is actually man gud is naa naman juy mga balaod implementation osa prevention naa naman gud tay mga balaod, so in terms nalang siguro sa implementation osa prevention gani sa mga loggers jud kay siguro ba tungod pod samao ng area kana ganing mura nag gina naturalize lang na sya kay diri man gud dili kayo sya worse na logging situation. murag neglected nana nilaba kay tungod naa biya mi sa bukid. Diri sa baranggay, naga follow mi og balaod. Pero mangod, sa ka dako samong baranggay, dili na man gud mi ma-aware na ang ilang punuan, ila na diay geputol. So, maghulat lang pud mi na nay motug an lang pod, Mao ng usually, kay little by little, wala na may nakabantay na nangaopaw na diay ang palibot.” (11)*

[The most significant challenge regarding illegal logging is the implementation and prevention aspects because we have laws in place. However, loggers are the central issue in terms of implementation and prevention. Perhaps it is because, in these areas, it appears as if it is just a natural occurrence since they do not take logging regulations seriously. It is like they neglect it because we live in a rural area. In our barangay (community), we do follow the laws. However, unfortunately, in the larger barangay area, we may not be aware that they are cutting down their trees. So, we just must wait for someone to report it. That is why usually, little by little, no one notices that the surroundings are being gradually denuded.]

*“Ang ano sya ma’am like ano sya ma’am like ig ano first jud ma’am kay natural phenomena ma’am na mahitabo. For example, kanang grabe nanga pagbaha, tapos ang mag-change nasad ang climate ma’am, which is na-apektuhanna po ng daily basis or daily life sa mga tao. Second is ang area or space napuy-an satao maam. Which is every annually nag-a-decrease tungod sa illegal logging.” (12, 13, 14)*

[The natural phenomena that occur, for example, are severe flooding and the changing climate, which already affects people's daily lives. Second, the areas or spaces where people live are experiencing an annual decrease due to illegal logging.]

### ***The current situation of illegal logging***

The respondents were asked to identify current situations and struggles of illegal logging happening in society; these are how they responded. The respondents highlighted that illegal logging activities are widespread in various areas, including Barangay Calinan. They expressed concerns about the extent of deforestation and the associated environmental degradation caused by these illicit practices. Respondents discussed the socioeconomic consequences of illegal logging in Calinan and other places. They pointed out that local communities dependent on forest resources for their livelihoods suffer from losing income and economic opportunities due to illegal logging. This exacerbates poverty and hampers sustainable development in these areas. In many parts of the world, the eradication of forests is causing a shortage of ownership rights to forest communities. As a result, a tremendous amount of pressure is being settled on native populations, forcing them to shift to more densely populated areas. It is a fact that the conflict between wood industry interests and local communities is multiplied due to highly uncertain land ownership relations. Several areas in the world are practicing illegal logging and destroying forests. (Babar, Taj 2019)

*“So ano maam, tungod sa illegal logging sa among area ma’am kay murag na opaw nagyud ang among area ma’am. Puros na mga buildings among makita. Instead na ka ng fresh na oxygen namong ma-inhale. Kay kanang kuan na ma’am polluted na baho nasiya.” (12)*

[Due to illegal logging in our area, our place has become a barren wasteland. All we see now are buildings; instead of breathing in fresh oxygen, we are inhaling polluted air.]

*“Base sakong na ma-observe is naa gyuy kanang mga trucks na naga agi, naga hakot ganig kanag mga kahoy. Tapos kung base naman pa pud sa kanang mga pangitabo or situation didto nakanang makaingun jud ka na kada tuig is naa najuy difference, ahhh for example, last year dili kayo gabaha pero ngano karon ang tubig is nagataas naman pag mag-baha.” (I3, I4)*

[As I have observed, some trucks pass by, carrying many logs. Then, based on the events or situations, you can tell that there is a difference every year. For example, there was not much flooding last year, but now the water level rises when it floods.]

### **Factors contributing to widespread illegal logging**

The respondents were interviewed this time about the reasons behind the prevalence of illegal logging, which they experienced in their immediate surroundings, farmlands, or areas. Respondents identified weak governance and enforcement as a significant factor contributing to illegal logging. They mentioned the critical challenges of ineffective policies, inconsistent regulations, and inadequate law enforcement measures. The lack of viable alternative livelihood options pushes them into engaging in unsustainable and illicit activities. Others explained that in specific contexts, cultural norms or historical practices may support or tolerate illegal logging. These factors can make it challenging to address the issue effectively.

Greenpeace (2020) reveals that Illegal logging is a global problem that can have severe negative environmental, social, and economic impacts, such as deforestation, degradation of biodiversity, and loss of government revenues. This is a significant issue because, for example, a company may have the permits to harvest timber but might need to comply with a regulation guiding timber harvest. This is an infringement that may need to be corrected or penalized. However, there is a significant difference in the impacts on the environment arising from illegal harvest outside the authorized boundary or even in protected areas and the breaking of some aspects of a harvesting regulation that may lead to limited or no environmental impact. Infringements of regulations can undoubtedly lead to adverse environmental impacts, but the point is that those impacts cannot be presumed.

*“Kuan ahhh first siguro is lack of education sa community, pero kanang kuan kanang siguro karon is na-realize naman siguro nila. Kung mostorya ka sa mga katigulangan, moingon man jud sila nalahi na ang panahon, init na, basta kanang alimuot na, di pariah kaniadto, so siguro lack of education lang gyud.” (I1)*

[First, there might have been a lack of education in the community, but they have realized it now. When you talk to the elders, they often say that times have changed, it is getting hotter, and things are not the same as before, so maybe it is just a lack of education.]

*“Para saako ang main reason gyud aning illegal logging kay business maam. Tungod sa gyud sa business maam kay ang kanang mga gina-illegal logging, gina-baligya nila sa mga pa-housing. Kuan pud over population pod, kuan pod wala nay ma puy an ang mga tao.” (I2)*

[I believe the main reason for illegal logging is business-related, ma'am. Those involved in illegal logging often do it for profit, selling the illegally harvested wood to housing projects. Additionally, the issue of overpopulation also plays a role, as the demand for housing increases due to a growing population, and sometimes, there are not enough legal sources of timber to meet this demand. As a result, some people turn to illegal logging to make a living.]

*“Ang main reason dira sir is poverty, pangwarta, laxity. Kulang ug pagtagad sa wala kabalo basin naa puy ginahatag ilalom sa lamesa.” (I3, I5)*

[The main reasons are poverty, lack of resources, and government negligence. There may be hidden agendas we are unaware of, which might be happening behind the scenes.]

### **The effects of illegal timber exploitation on the environment**

The majority of the respondents answered that the struggles in the environment can affect them. Forests play a crucial role in regulating water systems and maintaining healthy watersheds. Illegal logging can disrupt these functions, negatively impacting water quality and quantity. The interviews with respondents revealed that illegal timber exploitation has significant environmental effects.

Berry and Kitchen (2020) investigated various causes of illegal logging. However, it is often a symptom of broader governance problems, such as inappropriate legislation, weak institutions, unclear forest tenure, corruption, and a lack of law enforcement. In addition, simple economic considerations also contribute to illegal logging. Illegally harvested timber is usually cheaper than legal timber but also difficult to differentiate from legal timber. This makes legal timber and timber products less competitive.

*“Ahhm, larawan nako na siya ma'am nga kanang maka ingon ko nga dili na okay ang lugar, last year is kanang okay pa pero karon kay maka ingon ko nga dili na kay tungod kay ang panginabuhi pud sa mga tao diri samoang lugar ma'am is maka apekto kayo.” (I2, I3)*

[Let me describe, ma'am, someone I can say reflects that our place is no longer okay. Last year, it was still okay, but now I can say it is not okay anymore because people's livelihoods in our area are also being affected.]

*“Ano sir ahhh, syempre kung effect niya noh pugson sa baha. Pero ang baha di gyud mapugngan, muagi jud na siya. Pero ang baha, kung daghan kahoy dili kayo na siya mo diretso. Pag wala na ang roots ma weaken na ang yuta. Ang gamut mag deepin na sa yuta musubay na sila sa bato ug mag close na siya.” (I4)*

[Resilience against floods. However, floods cannot be prevented; they will always find a way. However, the water flow could be more straightforward with many trees. Once the roots are gone, the ground becomes weaker.]

*“Kuan kanang ano jod, sama sa geingon ni ate ka ganina. Grabe najud ang baha dri saamoa, pero annag kuan lang siya pag bundak sa ulan which is before is never jud me naka experience anang matanggong ang mga motorista. Pero karon man gud kay grabe najud ang bulhog sa tubig. Especially sa mga kanang kuan pinyahan na mga areas. Isa pUd sa dahilan diris amoa kay lack of flood measures ug kulang sa supply.” (I5)*

[You know, it is just like what our sister mentioned earlier. The flooding here in our area is severe. We've never experienced motorists being stranded like this before. However, now, the water level is high, especially in the areas where there are pineapple crops.]

*“Ah sguro labi na sa among bukid kay grabe jud sya kay pati among mga kahoy maputol mao lang.” (I6)*

[Ah, currently, due to illegal logging, typhoons have inevitable unavoidable consequences, such as causing floods, landslides, and damaging families' homes in our community.]

### **The social and economic impacts of Illegal logging**

The respondents were interviewed about their ideas and knowledge of the social and economic impacts on the environment. Respondents emphasized that it disrupts the livelihoods of communities dependent on forests by depleting valuable resources. The loss of income and employment opportunities leads to increased poverty and economic instability in affected areas. Respondents emphasized the social impacts of illegal logging on environmental awareness and cultural heritage. They mentioned that the connection between local communities and their natural surroundings weakens as forests are depleted. Traditional ecological knowledge and cultural practices associated with forests may diminish, leading to cultural heritage and community identity loss.

Anon (2020) found that the major causes of Illegal logging are serious environmental problems such as global deforestation leading to reductions in carbon stocks, degradation of biodiversity, lowering water quality, and discouraging sustainable logging practices and forest management, thus undermining the competitiveness of the legitimate forestry industry. It also destroys the protective function of the forest's natural disasters, such as the massive landslides and flooding after heavy monsoon rain was observed in the Philippines. Moreover, the poorest populations in several countries live in and around remote forested areas, and most of them depend to some extent upon forests and non-wood forest products for food, medicine, and fibers. These populations are increasingly being subjected to changes brought on by globalization, economic growth, and demographic shifts. Thus, illegal logging hurts the resources that forests provide.

*“Same sakoang giingon ganina ma'am, Ma apektuhan jud siya, especially kadtong mga taong naga puyo diay kayo sa bundok. Amoa is duol lang naman siya syudad dito ma'am. So makita na jud namo nga naa nay part sa bundok na which is kanang dako na siyag kuha o nahanaw na siya. So ang mga taong nasa ubos maoy maka experience ato, especially like landslide. Mao nang maglisod na pud sila maka pangitag bag ong lugar na mapoy an.” (I1)*

[Same as I mentioned earlier, ma'am. It will affect them, especially those in the mountains, ma'am. Our area is, in fact, close to the mountains, so we can see, ma'am, that there is already a part of the mountain that has been eroded or has collapsed. So, the people living below, ma'am, will be the ones to experience it, especially things like landslides. That's why it will be difficult for them to find a new place to live]

*“Ahhhhm, ang ilegal nga pagpamutol og kahoy maoy usa ka puwersa sa pagduso sa ubay-ubay nga mga isyu sa kinaiyahan sama sa deforestation, pagkawala sa yuta ug pagkawala sa biodiversity nga makaduso sa dagkong mga krisis sa kinaiyahan sama sa pagbag-o sa klima ug uban pang matang sa pagkadaot sa kinaiyahan.” (I2)*

[Illegal logging drives several environmental issues such as deforestation, soil erosion, and biodiversity loss, which can drive larger-scale environmental crises such as climate change and other environmental degradation.]

*“Ah, siguro sa economic consequences kay di ba diria farming man ang among pinaka kanang primary source of livelihood. Then ang among mga farmers is na feel na gyud nila na siguro contributing factors man gud ang illegal logging into climate change. Na feel na gyud nila ang kausaban in terms sa mga tanom. Pati sa mga harvest, lahi na gyud kayo siya kay wala na siya nag season. Maski ang mga prutas diri di na siya naga follow sa sa season. Before gud pag august, July, grabe gud ka bounty among harvest diri sa sirib.” (I3)*

[Ah, in terms of economic consequences. You see, here, farming is our primary source of livelihood. Our farmers feel that it might contribute to illegal logging and climate change. They feel that there have been changes in terms of the crops. The harvests are different now because they no longer follow a distinct season. Even the fruits here no longer adhere to their traditional seasons. Before, during August and July, we used to have a bountiful harvest here in Sirib.]

*“Ang consequences ana kay tungod sa walay kahoy ang amoang yuta kay walay shade sa init ug among mga tanom din a kaayu mutubo kay dry na ang yuta tungod sa init.” (I5, I6)*

[The consequences of deforestation on our land are manifold, as we fall short of the shade required for the sown seeds, thus rendering the soil arid and incapable of nurturing growth due to excessive heat.]

### **Actions to enhance enforcement of logging regulations**

The respondents were interviewed about their ideas or knowledge of the laws set by the government to protect the environment. Their answers commonly refer to the law on the illegal cutting of trees, especially those considered good lumber, which the DENR strictly prohibits. Respondents highlighted the importance of reviewing and strengthening existing legal frameworks related to logging regulations. This includes enacting stricter penalties for illegal logging offenses, increasing fines, and imposing stronger sanctions on violators. Clear and enforceable regulations can act as a deterrent and help ensure compliance. Respondents emphasized the role of public awareness and education in strengthening enforcement efforts. They mentioned the importance of raising awareness among local communities, timber industry stakeholders, and the public about the environmental, social, and economic impacts of illegal logging.

Governance problems include weak institutions and limited resources, resulting in a lack of law enforcement and limited capacity for land use planning. In many countries, the legal framework is unclear or contradictory, making it difficult, if not impossible, to operate legally. In some situations, the law is not accepted, for example, where the government is considered illegitimate or where customary law holds sway, and the formal legal system conflicts with this.

*“Ano ma’am I banned jud dapat ang illegal logging maam, not just kuan to Maximize maam but to minimize but prevent and stop jud ma’am di jud dapat.” (I1)*

[Illegal logging should be banned, ma’am, not just to minimize it, but to prevent and stop it.]

*“So, samoa ma’am is naa jud siyay na conduct usahay among barangay area or kanang duol na station sa sundalo ma’am, auxiliary ug kanang check point unya naga check sila ma’am if kanang mga trucks kay naa bay permit ma’am or kanang legal ba ang mga trucks nan aga hakot ug kahoy ma’am.” (I2)*

[Ma’am, in our area, there is indeed a conducted activity within our barangay vicinity. There is a nearby military station, an auxiliary post, and a checkpoint where they inspect whether the trucks carrying lumber have the necessary permits or if the trucks are legally transporting the wood.]

*“Sa kani nga pangutana kung kabalo lang mo sa pamamalakad sa mga authority pag kakaron nga si Duterte na, dapat stricto gyud gipatuman ang balaod. So, hope lang pud nato na ila pud ng ipatuman ug hipitan nila ang balaod para raman na satoang kaayuhan ug sa future generation.” (I3)*

[As of now, with Duterte as the leader, the law should be strictly enforced. We can only hope they will also implement and tighten the law for our benefit and future generations.]

*“Ahhh kanang among committee on environment in partnership sa SK, diraa mandated man mi na mag buhat mi ug mga lakang no, to prevent ka ng disaster. At the same time, upat man na siya ka factor, preparedness, mitigation, unsa patong duha naka limot ko. So, didto sa among mitigation kay na conduct mi karong mga tree planting activities gud. Unya not tree planting but tree growing, kay gina monitor man namo ang plants every year.” (I4, I5, I6)*

[Our committee on the environment, in partnership with our S.K. (Sangguniang Kabataan or Youth Council, is mandated to take steps to prevent disasters. Additionally, there are four key factors we need to consider: preparedness, mitigation, and I forgot the other two. Regarding our mitigation efforts, we recently conducted tree planting activities, but it's more about tree growing since we monitor the plants yearly.]

### ***Future factors driving illegal logging***

Many respondents said that they emphasized that urbanization expands as populations grow. Economies develop, the demand for timber for construction, furniture, and other purposes is likely to rise. This growing demand can create lucrative incentives for illegal loggers to meet the market needs. The respondents have mixed responses; others said that Respondents identified the persistence of weak governance and enforcement as a future factor driving illegal logging. They mentioned that illegal loggers can continue to operate without effective policies, regulations, and law enforcement measures with reduced risk of detection and punishment. Respondents highlighted the potential impact of climate change and natural disasters on future illegal logging. They explained that as climate change affects forest ecosystems, including increased frequency and intensity of wildfires and extreme weather events, illegal loggers may exploit the resulting vulnerabilities and chaos. This poses a significant risk for increased illegal logging activities.

Mahyoob (2020) asserts that law enforcement requires resources. The economics of the global markets equally play a role in promoting illegal logging. This is because illegal timber is usually cheaper than legal timber in black markets, denying legal operators a competitive advantage. Limited resources, weak institutions, and lax laws have contributed to inadequate law enforcement and the lack of proper land use management. Furthermore, many countries have uncleared and poor legal frameworks. Some are even contradictory. In this case, institutional and community views of what constitutes a crime and considerations associated with the costs and benefits of law enforcement influence whether and how the law is enforced. Lack of or limited law enforcement may also be due to perceived negative impacts of the law on livelihoods, and law enforcement officers may avoid enforcing it. In these cases, lack of law enforcement is not a cause of illegal logging.

*"First, ma'am, kay poverty. Tungod sa poverty, ma'am, kay push ang mga tao, ma'am, namo engage ani nga activity, ma'am." (I1)*

First, ma'am, let us talk about poverty. Because of poverty, ma'am, people are pushed to engage in these kinds of activities.

*"Siguro kung moingon kag umaabot, wala naman ta pud ta nag kulang ug educate sailaha kay daghan naman kaayog gina gamitan medium diba, para lang jud i educate sila na kailangan e save ang mga kahoy, siguro ang main factors nalang jud kay negligence nalang gyud on our part kay kabalo naman gud ta na mali pero ginabuhat gihapon nato." (I2)*

[If you were to say, in the future, we have not really been lacking in educating them because many mediums are being used for that, right? It is just that the main factor now is negligence on our part because we know it is wrong, but we continue to do it.]

*"Ah sakoa siguro ma'am kay ang kamang mangan nila sa law, nga kung muingon ug dili pwede ug di dapat buhaton kay buhaton jud nila. Isa ang poverty nganong maka buhat silag maka daot sailaha tungod kay lack of education ang uban." (I3)*

[For me, ma'am, because they will eat the law, that if they say it cannot and should not be done, they will do it. Poverty is one reason they can do terrible things because others lack education.]

### ***Future environmental impact of illegal logging***

Respondents expressed concerns about the future deforestation and habitat loss from illegal logging. They emphasized that if illegal logging practices persist, more forests will be cleared, leading to the destruction of valuable ecosystems and the loss of diverse plant and animal species. This can disrupt ecological balance and reduce biodiversity. In addition, some respondents also highlighted the potential future contribution of illegal logging to climate change. They explained that forests are crucial in absorbing carbon dioxide from the atmosphere as part of the carbon sequestration process. Respondents highlighted the potential future impacts of illegal logging on indigenous and local communities. They explained that many communities rely on forests for their livelihoods, cultural practices, and traditional knowledge. Continued illegal logging can disrupt these communities' way of life.

Rinkesh (2020) investigated that the lives of indigenous communities and villagers close to the forests are usually destroyed in countless ways because of illegal logging. Illegal logging takes away their traditional



way of life and livelihoods. Notably, their tribal cultures are lost if the forest goes away, making it difficult for them to forage, threatening their survival. Some also depend on the forest resources for income; illegal logging then ends up their only source of income, which makes them modern-day slaves and shadows of their authentic cultures. At a vast catastrophic level, illegal logging activity is taking place, which is converting the forests into grasslands, and a considerable decline in plant and animal species is also observed. In protected areas, illegal logging practices can threaten rare plant and animal species. Destructive floods, damaged landscapes, polluted air, and drinking water can result due to deforestation. And the area will become more exposed to climate change. Deforestation has a wide range of impacts concerning biodiversity, which also leads to species extinction due to the decrease in the tree count.

*“So same sakong giingon ganina ma’am, ang impact jud sa illegal logging in future is dili jud siya mayo and murag mag result lang gihapon siyag kanang disruption of destruction sapa muyo sa mga tao ma’am.” (11)*

[As I mentioned earlier, the impact of illegal logging in the future is not good at all, and it seems like it will still lead to disruptions or destruction of people's homes.]

*“Ang illegal logging makaguba sa mga kahoy nga nagsilbing carbon sinks ug climate regulators, nga adunay dakong papel sa global warming ug climate change. Ang ilegal nga pagpamutol og kahoy maoy usa ka puwersa sa pagduso sa ubay-ubay nga mga isyu sa kinaiyahan sama sa deforestation, pagkaguba sa yuta ug pagkawala sa biodiversity nga makaduso sa dagkong mga krisis sa kinaiyahan sama sa pagbag-o sa klima ug uban pang matang sa pagkadaot sa kinaiyahan.” (12)*

[Illegal logging destroys trees that function as carbon sinks and climate regulators, which play a significant role in global warming and climate change. Illegal logging is a driving force for several environmental issues, such as deforestation, soil erosion, and biodiversity loss, which can drive larger-scale environmental crises such as climate change and other forms of environmental degradation.]

*“Hmm kato lagi kanang flash flood diria, common kaayo sa pagkakaran kay dili na muagi ang tubig sa kay didtoa na sa kalsada. Mangita silag sementado nga maagian. Pwede mo samot kung dili mapa undang ang illegal logging.” (13)*

[During a flash flood, it is standard for the water not to flow through the river anymore but instead go onto the road. They are now looking for a concrete passage. It could worsen if illegal logging is not stopped.]

*“So, sa impact sa kahoy so syempre mawala ang kahoy ang mga livestock pud namo mangawala pud ang mga hayop na originally na naa na diri mamalhin ug mangamatay so wala najuy mabuhì ani.” (14)*

[The impact of illegal logging is far-reaching; it threatens the loss of trees and endangers livestock and other animals that depend on the trees for shelter and sustenance. This situation undermines the livelihoods of the families who rely on these resources to survive.]

### ***The role of government in preventing illegal logging***

The respondents were interviewed to emphasize the crucial role of the government in establishing and enforcing comprehensive policies and regulations to prevent illegal logging. They also emphasized the importance of government support in strengthening law enforcement agencies responsible for combating illegal logging. This includes providing adequate resources, such as personnel, training, equipment, and technology, to effectively enhance their capacity to detect, investigate, and prosecute illegal logging activities. Respondents highlighted the role of the government in raising public awareness and education about the environmental, social, and economic impacts of illegal logging. This can involve public campaigns, educational programs, and community engagement initiatives to foster a sense of responsibility and promote the value of sustainable forest management among the public.

Listyani (2020) asserts that illegal logging is a severe problem at the global level, which can lead to environmental degradation, biodiversity suppression, and a deterioration in residents' quality of life. This point implies that if the lack of support by the government is intentional, external attempts at strengthening those agencies will not lead to tangible outcomes. This is a familiar picture to many development projects in the forest sector. In other words, capacity-building projects to stop illegal logging will not lead to substantial change unless the recipient government is committed to reducing illegal logging.

*“First jud kay ma’am sila jud ang dapat mangusog ani maam, pangusgan nila para I ban ni nga mga activity. Kay Dili lang man gud sila ang maapektuhan, ma’am. Tanan ta. Labi natong mga nagpuyo sa mismong lugar, ma’am. Ug kinsa jud tung nakasala put in jail jud ma’am ipriso ang dapat I priso ma’am.” (11)*

[They really should take the lead in this, ma'am, to push for a ban on these activities. It's not just them who will be affected, ma'am, but all of us, especially those who live in the same area.]

*“So, ang role na dapat nga lihukon sa government anu ma'am is strengthening nila ang ilang action para ma stop na ning mga naga buhat ug di dapat.” (I2)*

[The role that the government should take and perform in this matter, ma'am, is to strengthen their actions to stop activities like this, ma'am.]

*“Dako, dako kaayo kay pag muingon man kag government, diba tanan gyud na apil na ang tao ang kita, diba pero pag muingon man gud ta didtoa na creation of environmental laws, daghan naman gyud kaayo, enforcement na lang gyud ang kulang. Siguro ang dapat e priority sa gobyerno kay ang pagbutang ug ngipon sa mga balaod nga naa saatoa karon. When it terms of environmental protection and conservation.” (I3)*

[Huge, big. Because when you say government, everyone is involved, right? The people, the income, isn't it? But when we talk about the creation of environmental laws, there are so many; it is just the enforcement that's lacking. The government should prioritize putting teeth into the laws that we currently have when it comes to environmental protection and conservation.]

*“Ahmmm, possible dli sila I allow kay illegal mana Higpitan ang pagpa kuhaog permit, dapat e monitor sa gobyerno ang pagpakuhaog permit.” (I4)*

[Strictly regulate the issuance of permits; the government should closely monitor the permit application process]

*“Ahhh sa karon kay wala pa kaayu kuy mahuna huna pero akua lang is kanang ma preserve nila ang bukid, magement silag law ug bantayan nila or I fence out nila.” (I5, I6)*

[Ah, I have not yet given much thought to it, but in my opinion, it would be best if they preserved the mountains. They could enforce laws and implement measures to protect and safeguard them. Alternatively, they could also set up a fence to keep intruders out.]

### **Effective measures to combat future illegal logging**

The respondents were asked whether there are awareness programs, campaigns, or information given by agencies such as the government and other organizations about their rights to a clean and safe environment; these are their responses: Respondents highlighted the importance of promoting sustainable forest management practices to combat illegal logging. This includes developing and implementing comprehensive forest management plans that prioritize conservation, restoration, and responsible logging practices. Respondents highlighted the need for improved governance and transparency in the forestry sector. This includes establishing clear policies and regulations, strengthening institutional capacity, and promoting transparency in logging permits, timber trade, and supply chains.

We know deforestation is a real problem in the world today. Apart from damaging the environment, deforestation also brings social problems. According to Cashore (2019), the politics and economics of biodiversity conservation are other factors with a bearing on the future of illegal logging and the forest. Illegal logging in protected areas may seem to be the most obvious target of law enforcement. Our society is overconsuming. We're demanding too much from our planet and having an unsustainable ecological footprint.

*“Siguro ma'am kay If ever maam na naay kuan nahibal an na nag illegal logging, kaning ipakulong jud na sila maam.” (I1)*

[If someone is found to be engaged in illegal logging, they should be arrested and prosecuted, ma'am.]

*“For example, ani ma'am ang pinaka-effective jud na-measure ani ma'am na para ma stop kung sa karon ma- lessen lang sa nga buhaton ma'am is ang tao jud mismo na naa ana nga lugar ma'am bali e support na lang jud ang government.” (I2)*

[The most effective measure to stop or reduce certain activities right now is for the people themselves in that area to actively support it, and the government should just provide assistance.]

*“Political power to stop it and there is an alternative na livelihood satao. Bigyan din sila ng kabuhayan din nila. Magtanom pod og fruit trees.” (I3)*

[To have the political power to stop it, and there is an alternative livelihood for the people. They should also be given their means of livelihood. Plant fruit trees as well.]

*“Kuan ma’am, apprehension lang jud siguro, e strengthened lang jud siya, kanang murag butngan lang siyag action.” (14)*

[It's probably just apprehension; it just needs to be strengthened, like adding some action to it.]

*“Bawalan ug pakuhaon jud silage permit, naa man guy patago gud para ma minimize ang illegal logging na pagpamutol sa kahoy.” (15)*

[They will be required to obtain a permit to minimize illegal tree cutting]

*“Ahhhh so para sa ako di na sya ma totally stop but we can ano lessen or slow lang ang progress sa pagputol sa kahoy by sample ahhh magputol kag kahoy tanum napud isa, mao rana akung only way para ma sustain.” (16)*

[Ah, I understand. We cannot completely stop the practice of illegal logging, but we can certainly reduce it or slow down its progression. For instance, we could consider planting a new tree for everyone that is cut down. This is the only way that we can ensure the sustainability of our resources.]

### **Public awareness efforts and education influence future unlawful logging.**

The respondents were asked about the effectiveness of public awareness and public campaigns. Respondents emphasized that public campaigns and education initiatives play a crucial role in raising awareness about the negative impacts of illegal logging and promoting a sense of responsibility toward forest conservation. Respondents stressed that public campaigns and education initiatives can empower local communities living in or near forested areas. By providing knowledge and resources, these initiatives can help communities understand their rights, promote sustainable livelihood alternatives, and actively participate in forest conservation efforts.

Degradation of the world's forest resources is one of the most pressing human development challenges facing the planet today. Forest degradation impacts the daily lives of hundreds of millions of people around the world. Increasing insecurity of access to forest goods and services impacts the poorest most severely because they rely on such goods and services for their subsistence. According to Andres (2020), the environmental communication skills of stakeholders at the national and local levels were significantly enhanced, contributing not only to the impact of this campaign but also to the capacity to undertake future environmental campaigns.

*“Yes, ma’am para matagad sa mga tao nga bawal ang illegal logging ma’am.” (11)*

[Yes, ma'am, so that people can learn about the effects of illegal logging, ma'am.]

*“Gamit siya, that is knowledge about sa tao. Naa lang sa isa ka tao kung mo tuman sila tapos naa pud nay tendency na mo supa. Pero, sa giingon nako ganina nga ang number one jud ang political power” (12, 13)*

[It is functional; that is knowledge; it's up to him if he'll follow it, and there's also a tendency to oppose it. But, as I said earlier, political power is number one.]

*“Oo, mutuo gyud ko kana gyud siya at least sa napulo, naay isa nga kanang murag ma inclined na pud siya ba. At least isa, maski ganing one hundred kahoy nga imong itanom, pila raman gani ang mutuo diba so same satoa. At least pag mag educate kang napulo bahalag nay isa nga nakasabot.” (14)*

[Yes, I agree. Yes, at least one out of ten. It's like they're inclined that way. At least one. Even if you plant a hundred trees, how many will grow, right? So, it is the same with people. At least when you educate ten, even if there is just one.]

*“So sa ing ana, kuan depende na mana sa kuan so if mu follow sila sa ilang mga platforms muangay jud na sailaha kay daku nana nga tabang para samoa.” (16)*

[In that case, it all depends on the individuals themselves. If they adhere to the prescribed methods and protocols, it will surely be of great help to all concerned.]

### **Individual actions to prevent future illegal logging activities**

Upon answering the question, most of the respondents said that they can make a difference by being responsible individuals. Other participants said that individuals can educate themselves about the issue of illegal logging. By understanding the environmental, social, and economic impacts of illegal logging, individuals can raise awareness among their peers, communities, and networks. Individuals can report any suspicious activities related to illegal logging to the appropriate authorities. By reporting such activities, individuals can contribute to the detection and prevention of illegal logging operations.

Ending deforestation is our best chance to conserve wildlife and defend the rights of forest communities. On top of that, it's one of the quickest and most cost-effective ways to curb global warming. According to Mustafa (2019), companies should set ambitious targets to maximize the use of recycled wood, pulp, paper, and fiber in their products. For the non-recycled products they buy, they should ensure that any virgin fiber used has transparent, credible assurances that it was sourced legally and respects principles of environmental and social responsibility. Working to end deforestation and forest degradation while helping to restore lost forests is our best chance to solve the climate emergency, protect wildlife, and defend the rights of Indigenous Peoples and traditional local communities.

*"As a link individual ma'am, if ever ma'am na naa koy mahibal an or madunggan ma'am na illegal logging, i-report dayun nako samga official's para mabuhatan dayun og legal action."* (11)

[As a responsible citizen, if I ever come across information or hear about illegal logging activities, I will promptly report it to the relevant authorities so that appropriate legal actions can be taken.]

*"Ahhhhm, ang gina recruit or gina kuan jud ani na trabaho ma'am is kana man jung mga walang wala ma'am. So as an individual nga mangita ug trabaho, kadto nalang pud unta nga marangal nga trabaho ma'am dili pareha nang illegal logging kung kabao ta nga mali na."* (12)

[Those who are being recruited or hired for this job, ma'am, are those who do not have anything, ma'am. So, as an individual looking for a job, it should be an honorable job, ma'am, different from illegal logging if we know it's wrong.]

*"Full understanding, maka dungog ta na that is bad, mo tuman jud ta ana. Kung naka sabot ka nay tendency na mabutang ka for example, maka kita ka nga may namutol ug kahoy, dili nimo siya tabunan, the more maka sabot ta anang butanga gamay nalang ang mo supak ana."* (13)

[Full understanding, when we hear that something is terrible, we should avoid it. If you understand that there is a tendency for you to help, for example, if you see someone cutting down a tree and you do not cover it up, the more you understand that thing, the less likely you are to go against it.]

*"Siguro kay kanang kailangan lang jud nato e put into action ang atong mga pag love satong environment. Kay kanang naa nata, available nagud na sato, naay balaod, ang pag play as a steward nalang jud, as steward sa environment."* (14)

[What we really need to do is to put our love for the environment into action. Since everything is already there, available to us, and we have laws in place, we should just play the role of a steward, as a steward to the environment.]

*"Maghimo ta og dissemination campaign na dili na pamutlon ang mga kahoy, isa pa maghimo usab ta og ordinance."* (15)

[Let us conduct a dissemination campaign to discourage tree cutting, and let's also create an ordinance.]

*"Kuan first is be educated ahhh unta makabalo ta sa mga consequences sa pagkuha sa atung mga gusto ug para I enforce natu atung mga sarili nga tama jud ni sya ihhh kuan nato na way as sustainable na ano way nga ma prevent aning future mga events such as kanang pag putol ug kahoy ug mga resulta ana so on and so forthhh....."* (16)

[Ideally, we should educate ourselves on the consequences of our actions to reinforce the importance of acting responsibly and sustainably in achieving our goals. We need to ensure that we do not engage in activities such as illegal logging, which can lead to undesirable results such as deforestation and its associated consequences. Thus, preventing such future events requires an initiative-taking approach and a long-term vision for a more sustainable future.]

### CONCLUSION AND RECOMMENDATION

The study on illegal logging brings attention to critical challenges in enforcement, revealing obstacles like resource limitations, corruption, and neglect in rural areas that impede the implementation of existing laws. Poverty drives communities towards illegal logging, necessitating interventions that provide alternative livelihoods. Educational campaigns are deemed essential to shift the perception of illegal logging as a natural occurrence and increase awareness of its environmental impact. Environmental degradation, exacerbated by floods and climate change, highlights the urgent need for preventive measures. Limited awareness and reporting mechanisms further complicate the issue, prompting a call for community engagement and accessible reporting systems.

The study sheds light on severe environmental degradation and socioeconomic hardships, linking rampant deforestation and pollution to adverse impacts on community health and economic stability. Weak governance, inadequate regulations, and poverty-driven motivations contribute to the crisis, emphasizing the need for alternative livelihoods. Respondents stressed the importance of robust governance, poverty alleviation, education, and sustainable economic options to effectively combat the far-reaching impacts of illegal logging. The study underscores the need for more robust legal frameworks, stricter penalties, and heightened sanctions to minimize or halt illegal logging. Emphasizing the role of public awareness and education, the study highlights the importance of informing communities, stakeholders, and the public about the ecological, social, and economic repercussions of illegal logging.

Future factors driving illegal logging, such as poverty, lack of education, urbanization, and rising timber demand, are anticipated, raising concerns about severe deforestation, habitat loss, ecosystem disruption, biodiversity decline, and potential contributions to climate change. Urgent actions are required to fortify regulations, educate communities, and mitigate future threats to preserve ecosystems and safeguard local livelihoods. The study underscores the government's pivotal role in curbing illegal logging through robust policies, effective enforcement, and public awareness campaigns. Strategies for combating future illegal logging include empowering communities, implementing transparent forestry governance, and prioritizing conservation efforts. Individual activities indicate that individuals can educate themselves and others, report suspicious activities, and engage in responsible environmental stewardship to prevent the devastating consequences of illegal logging. Collective efforts at both governmental and individual levels are vital to protect forests and mitigate the impacts of illegal logging on ecosystems and communities.

The challenges identified in the study on illegal logging offer significant implications for future research and related investigations. In particular, understanding and enhancing the effectiveness of law enforcement against illegal logging, exploring socioeconomic drivers, assessing environmental impact, monitoring links to climate change, promoting community awareness and reporting mechanisms, evaluating economic consequences on affected communities, and addressing societal health impacts are critical areas for further exploration. Future research should adopt interdisciplinary approaches, considering the interconnected nature of these challenges, and engage with communities to develop targeted interventions and sustainable solutions. These findings provide a valuable foundation for comprehensive studies that aim to address the complex issues surrounding illegal logging and contribute to informed policymaking and conservation efforts.

The researcher gleaned insightful findings from the study on illegal logging, identifying significant challenges such as the pervasive issue of ineffective law enforcement driven by concerns about resource constraints, corruption, and limited authorities' capacity. Poverty emerged as a significant driver for engagement in illegal logging activities, leading to profound socioeconomic consequences for local communities dependent on forest resources. The study shed light on the intricate interplay between environmental degradation and economic instability, exacerbating poverty and hindering sustainable development. Future challenges, including weak governance, climate change impacts, and the potential contribution to climate change, were explored, emphasizing the need for adaptive strategies. The crucial role of the government in enforcing comprehensive policies, supporting law enforcement agencies, and raising public awareness was underscored.

The researcher gleaned lessons on the importance of holistic approaches, public awareness, and future preparedness, realizing the power of individual agency and the necessity for sustainable forest management and community engagement. These insights, lessons learned, and realizations contribute to a nuanced understanding of illegal logging, guiding the formulation of effective strategies for mitigation and prevention.

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