



## Identifying and Addressing the Right to Burn for Indigenous-Led Fire Stewardship Practices

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### ABSTRACT

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*indigenous fire stewardship, cultural burning, wildfire, indigenous ecological knowledge (IEK), Canada, Indonesia*

In Canada, Indigenous peoples have been managing fires for generations. Challenges and alternatives related to power, jurisdiction, legislation, accreditation, liabilities, and resources exist in identifying and protecting forests from wildfires. Cultural burning can benefit community welfare, biodiversity, and wildfire risk reduction. This study compares Indigenous fire stewardship (IFS) in Canada with cultural burning practices in Indonesia, using literature and comparative research methodologies. Both countries face challenges to this issue. Canada allows cultural burning on reserves with supervision, while Indonesia permits local communities to burn up to two hectares without supervision. Community empowerment, Indigenous Ecological Knowledge (IEK), and fire management are crucial in both nations. Comparative analysis informs future cultural burning policies, emphasizing local expertise in risk reduction.

### 1. INTRODUCTION

Large wildfires are wreaking havoc in many parts of the world, and as a direct result of human-caused climate change, these blazes are becoming more destructive and extensive in their impact [1, 2]. In the context of the management of natural hazards and resources, settler governments have in recent years begun to significantly interact with the fire and other ecological expertise held by Indigenous peoples. This interaction has been prompted by the realization that Indigenous peoples have been managing natural hazards and resources for generations. Indigenous peoples' ecological knowledge is currently playing an increasingly essential role in the fight against natural and socially induced threats such as wildfires, floods, and storms in a number of different countries. These threats can be caused either by nature or by human activity [3].

The United States of America, Canada, Brazil, Russia, and Australia have all been devastated by catastrophic and unprecedented wildfires in the previous three years. These flames have caused the loss of human lives, as well as the destruction of property and the disruption of ecological systems. In the context of what some climate scientists indicate is a shift towards a permanently heightened fire danger, indigenous peoples within some of these nations have persuasively argued that the traditional management of fire can augment, or perhaps even completely replace, existing land management approaches. This occurs in the context of what some climate scientists describe as a shift towards a permanently heightened fire danger. This is occurring in the context of what some climate scientists think is a transition toward a permanently increased risk of wildfire [4].

The indigenous people's capacity to contribute to the preservation of the natural world through the knowledge that they have gained from their centuries-old burning practices is the primary focus of the effort that is being led by indigenous people.

Indigenous fire stewardship is significant for a number of reasons, including the fact that it helps with the management of complex resources, that it promotes the biodiversity of ecosystems, and that it reduces the risk of wildfires by lowering the quantity of fuel that is present in an area. Even though Indigenous Peoples have been the custodians of fire knowledge for millennia and continue to practice fire stewardship practices, there are significant barriers that prevent them from re-engaging in cultural burning [5].

Cultural burning is defined as deliberate and controlled burning methods used by indigenous people as part of their traditional land management and stewardship practices. It comprises a wide range of strategies aiming at attaining a variety of ecological, cultural, and social goals, including biodiversity promotion, fuel load reduction, ecosystem revitalization, and cultural heritage preservation. Burning cultural artifacts is an example of a specific behavior that needs to be addressed in order to improve the general welfare of society. According to the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), indigenous peoples have the right to keep, control, protect, and further develop their cultural inheritance [6].

Cultural burning can have a number of particular effects on biodiversity outcomes. Habitat Restoration: Cultural burning techniques, which are frequently based on traditional ecological knowledge, can simulate natural fire regimes and aid in the restoration of ecosystems to their historical state.

Cultural burning, when done at specific periods and intensities, can create unique habitat structures and circumstances that sustain a variety of plant and animal species. Cultural burning can promote the growth and regeneration of fire-adapted native plant species. These species frequently provide critical habitat and food sources for a wide range of wildlife, including birds, mammals, and insects. Cultural burning can assist restrict the spread of invasive plant species by lowering their abundance and providing chances for local species.

According to Jane Addison et al. (2019), First Nation peoples from all over the world are actively attempting to reawaken their traditions and knowledge in relation to fire. The phrase “cultural fire” has come to be used to describe to a wide number of distinct types of fire uses, some of which are also known to as “cultural burning”, “indigenous fire management”, or “traditional burning”, respectively. These uses involve burning on both a small and a big scale to accomplish a number of aims, including the protection of key species, the eradication of weeds, the observance of cultural events, the reduction of hazardous fuels, and other objectives [7].

Rawluk et al. [8] explained that such burning practices have been disturbed in Australia as a result of social, legal, and political concerns; nevertheless, these same issues are now playing a part in the resuscitation of cultural fire on country or ancestral territories. Hoffman et al. [9] thought that Indigenous communities in Canada have unique vulnerabilities to big and high-intensity wildfires. This is due to the fact that Indigenous communities are predominantly located in rural, forested locations, and they lack financial support at both the federal and provincial levels to decrease the risk of wildfires. As a result, it is essential to preserve the expertise of indigenous peoples in order to ensure effective and socially just fire stewardship [9].

Indigenous knowledge is increasingly being turned to by land managers and researchers as a primary source of information for the goal of allowing the resilience of fire-dependent social-ecological systems (SES), as indicated by Copes-Gerbitz et al. [10]. This is due to the fact that the problem of addressing the existing risk of fire is becoming more challenging as time goes on. A critique that is prevalent throughout SES resilience research as a whole is reflected in the current state of knowledge as it relates to SES research in fire scenarios. Copes-Gerbitz et al. [10] further argues that, despite the fact that this is a significant step ahead in acknowledging the contribution of Indigenous peoples to fire-dependent ecosystems, current SES research in fire contexts regards knowledge as detached from power. This is despite the fact that this is a major step forward in recognizing the contribution of Indigenous peoples to fire-dependent ecosystems. Integrating indigenous knowledge into mainstream colonial management paradigms, such as ‘command and control’ fire management, will lead to inequitable solutions to the problems posed by modern wildfires unless these power inequalities are addressed first.

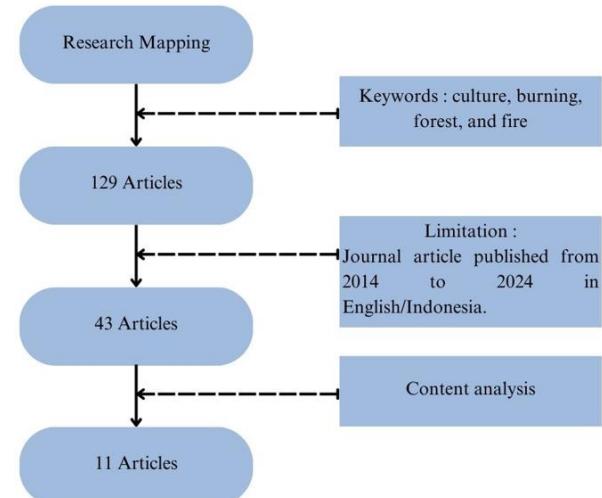
There is an immediate and pressing need to assure the sustained competence of indigenous leadership in the area of wildfire prevention, detection, and extinguishment in a way that is both efficient and socially equitable. This is a necessity that cannot be avoided. Indigenous fire management not only aids in the management of natural resources and lowers the risk of catastrophic wildfires, but it also helps promote the biodiversity of ecosystems, which in turn leads to an increase in the overall richness of ecosystems [5].

Indigenous Ecological Knowledge, often known as IEK, is routinely neglected by the authorities in charge of wildfire control. This occurs despite the fact that fire scientists trained in the Western tradition are either unfamiliar with IEK or skeptical of it. In addition to this, the ecological knowledge possessed by indigenous peoples has been continually undervalued and discarded [11]. Indigenous Ecological Knowledge (IEK) is viewed with skepticism by fire scientists trained in the Western tradition, and wildfire management organizations have largely disregarded it. Burning for cultural purposes is permitted on reserve grounds in Canada; however, firefighting agencies are required to provide supervision. This is of the utmost importance because an increasing number of indigenous communities are declining to participate in essential emergency evacuations due to a lack of trust in governmental organizations, poor communication, an absence of safe areas to lodge evacuees, and the fear of being separated from their relatives [12].

Regarding Indigenous-led fire stewardship, the work by Hoffman et al. [5] is the one that compares favorably to others in terms of its level of detail. This article concentrates on five different aspects: power, jurisdiction, regulations, accreditation, and obligations, as well as resources. If put into practice in Indonesia, it would be of great benefit. The practice of cultural burning in Indonesia is really intriguing. To be more specific, when the dry season approaches, it will be followed by forest fires since land is being opened up for cultivation, which can trigger wildfires [13].

The cultural sacrificial fire is interpreted in a variety of ways depending on how it is carried out. In order to protect forests from wildfires, there are a lot of issues and opportunities that need to be thought through, including power, jurisdiction, regulations, accreditation, liabilities, and resources. These aspects all need to be taken into consideration. This article’s objective is to present a comparison between Indigenous-led fire management in Canada and the cultural burning instance that occurred in Indonesia in terms of the climate communication approach that is intended to be implemented.

## 2. METHOD



**Figure 1.** Research review process

This paper makes use of secondary data that was compiled from reputable sources, Scopus, so that it can present a more in-depth account of the topic as mentioned in Figure 1. The

analysis of suitable content strength using VoS Viewers to find out the clear position of this research. the process chosen regarding to find the suitable content for presenting result clearer.

Bibliometric analysis using Vos Viewers indicated that the major topic done by researcher focus on the impact and cases of fire itself as shown in Figure 2. This finding show that the topic of cultural burning has not provided appropriately. After the content analysis, this article identified eleven papers regarding Indigenous-led fire in Canada, Australia, and the United Kingdom from the years 2020 to 2023 based on an analysis of the search results performed by Scopus. The United States of America has one article, compared to six articles for Canada and four items for Australia. One of the six articles that we found in Canada that elaborated on indigenous-led fire stewardship focused on the five characteristics that we found to be most complete in the article that we found.

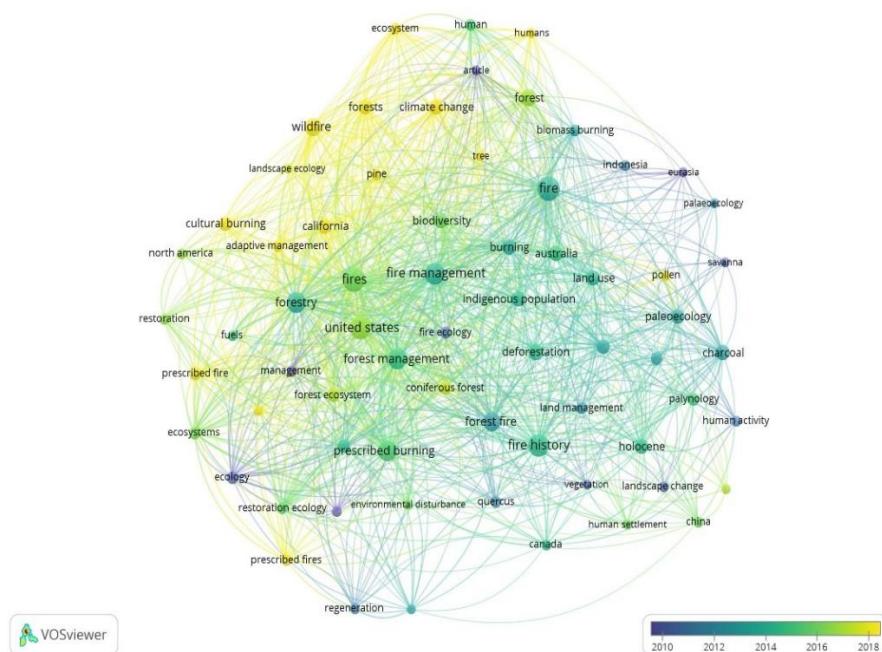
In the research paper titled “Identifying and Addressing the Right to Burn for Indigenous Led Fire Stewardship: A Comparative Perspective of Canada and Indonesia”, the author Hoffman’s article titled “The Right to Burn: Obstacles and Opportunities for Indigenous-Led Fire Stewardship in Canada” was dissected and examined [5]. Hoffman’s article was cited as the primary source. The comparison between Canada and Indonesia served as the primary topic of the paper. This article, in contrast to preceding ones, which focused on only a few relatively narrow issues, investigates a wide variety of aspects of wildfires using a total of five different approaches. These approaches each have their own unique purpose. Because of this, its scope is substantially broader than that of those other entries. Making comparisons to Indonesia

and applying the knowledge that has been gained would be pretty intriguing endeavors. There is an extremely scant quantity of documented material on fires that were started by indigenous people.

This essay examines cultural burning in Indonesia and compares it to fire management practices established by indigenous communities in Canada. The history of cultural burning, how it has been done in the past, the barriers and challenges that it faces on the ground, and how it will be implemented in the future are all covered in relation to these themes.

According to what was discussed, it is feasible to get useful ideas for the development of future cultural practices in Indonesia by comparing the laws and practices of these two countries. These ideas can then be used to the creation of future cultural practices in Indonesia. Both an analysis of the previously published material and a review of the relevant comparative data are the two primary research approaches that were utilized in this investigation [14].

In order to do critical analysis, an academic need to seek for papers in a methodical manner that meet the conditions that have been established. The articles are thoroughly reviewed, and the findings of the study are arranged into distinct categories, all in preparation for the subsequent stage. The results of each article will be analyzed and compared to the information that has been compiled in order to provide a summary conclusion at the very end of the process. The primary focus of this section is to present an analysis of the article that was used as a reference that is both unique and informative [15].



**Figure 2.** Bibliometric analysis of articles

### 3. RESULTS

#### 3.1 Indigenous-fire control in Canada

Megafires that occurred in British Columbia (BC), Canada, during the summer of 2017 were responsible for the devastation of a staggering 1.2 million hectares of land, setting

a new record in the process. These fires were triggered by a mix of climate change and the consequences of fire suppression and forest management practices that have been carried out over the past century. This fire caused a huge number of people to be forced to evacuate their homes, and it continues to have an impact on the health of humans as well as the ecosystems in the area [16, 17].

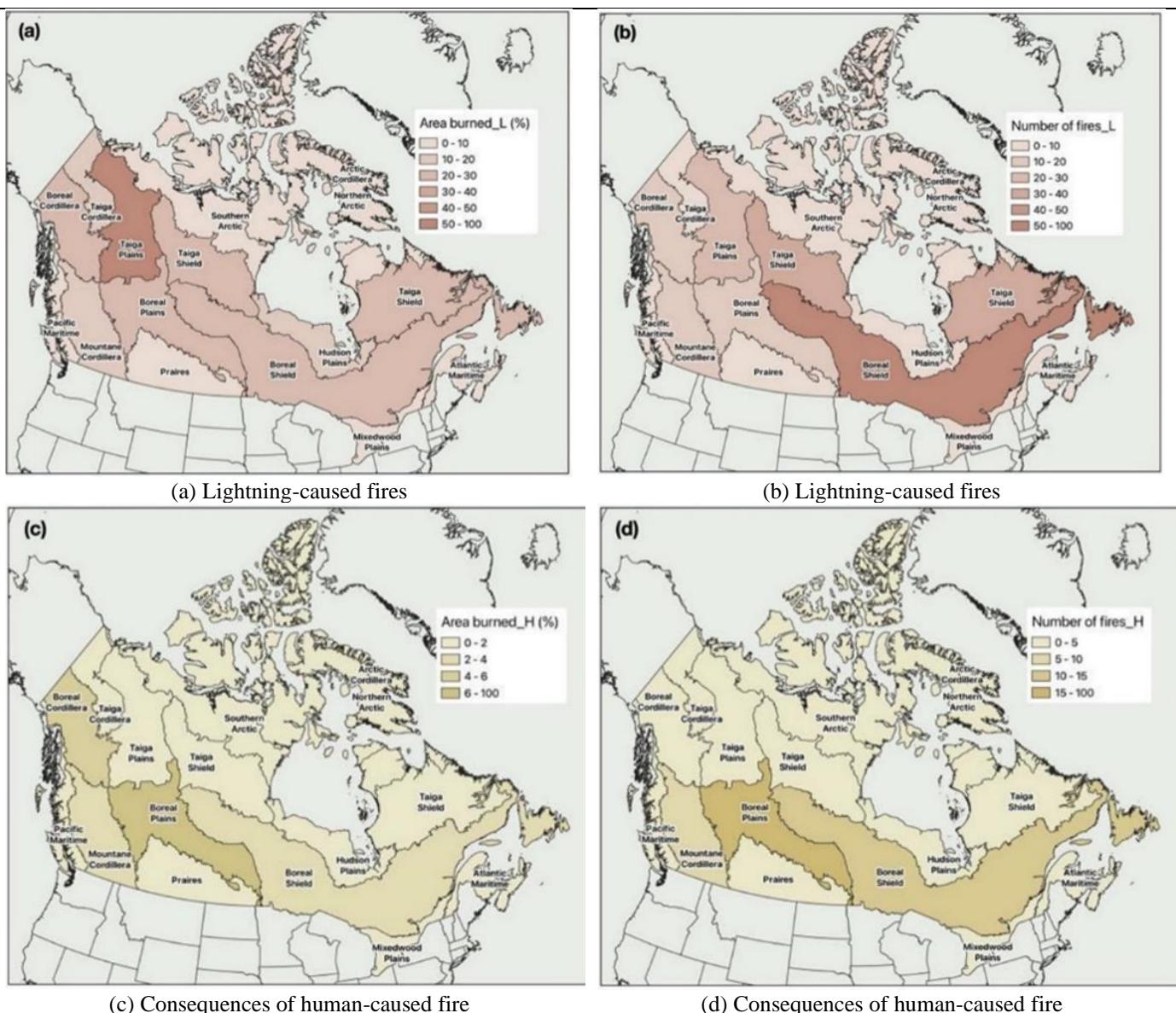
As a result of the fact that British Columbia has recently gone through three of the worst wildfire seasons in its history in 2017, 2018, and 2021, and as a result of the fact that more severe impacts are anticipated in the future, one of the most important priorities for carbon research is to develop reliable models in order to explore options and learn more about a portfolio of solutions that are tailored to specific geographic areas for the management of wildfires and other forms of extreme weather. This will allow researchers to better understand how to manage wildfires and other [18].

Before a traditional burn plan may be submitted to a provincial or territorial government in Canada, it is necessary to fulfill a number of prerequisites, including getting the consent of a land manager from the local government in the area in which the cultural burning is to take place. Indigenous Peoples are required to be able to provide evidence that they own expensive personal safety equipment, as well as heavy equipment, pumps, and hoses.

It is frequently needed of indigenous fire practitioners to have liability insurance for pre-scribed fires and to present paperwork that they have the necessary accreditation to conduct prescribed fires in order for them to be permitted to

do so. Additionally, in order for them to be allowed to do so, they must produce documentation that they have the necessary accreditation to conduct prescribed fires. It is generally accepted that indigenous nations and groups are accountable for performing all of the responsibilities that are related with cultural burning. Indigenous peoples are understandably nervous about the possibility that they could be held personally liable for any damages made to private property or land that is owned by the Crown in the event that a fire gets out of control [19].

It is essential to do an analysis of the obstacles that stand in the way of revitalizing Indigenous fire management in Canada. At the same time, it is essential to provide room for a diversity of information, viewpoints, and experiences. There are five challenges, including perception, authority, and jurisdiction; legislation, management, and governance; access, accreditation, and training; liabilities and insurance; and capability and resources. Each of these challenges is unique. It is essential to continue utilizing the knowledge and experience of indigenous people in order to achieve successful and socially just fire management [5].



**Figure 3.** From 1950 to 2019, the average yearly number of fires and the average percentage of annual land burned in Canada's various ecozones are presented

Incorporating indigenous knowledge into colonial management paradigms without addressing power imbalances might perpetuate unequal approaches to wildfire management. Indigenous communities may encounter challenges in gaining access to resources, making decisions, and being recognized for their expertise. Failure to address power inequities and dynamics might result in the exploitation or theft of indigenous knowledge. It can also lead to inefficient wildfire management plans that ignore local context and community requirements. The power imbalance tilts the scales, making it difficult to effectively integrate indigenous understanding into wildfire management strategies. This colonial environment prevented expertise from being passed along location-based and over generations, which led to disrespectful forest management [10].

The question of whether or not a cultural burning program that is developed within the bureaucracy of a government can provide significant help for the landscape fires that are set by indigenous peoples is an important one. In particular, it offers information regarding the manner in which Indigenous and non-Indigenous individuals came into touch with, evaluated, and prioritized the influence of wildfire science, ecological research, and Indigenous expert knowledge groups [13]. Indigenous fire practitioners are expected to put out wildfires in a manner that is stringent and legally enforceable, despite the fact that this goes against the cultural norms and duties that they are expected to respect. This is because indigenous fire practitioners are expected to put out wildfires in a manner that is stringent and legally enforceable. This is due to the fact that there are only so many opportunities for training on wildfires [20]. Wang et al. [21] explained that it is very important to mitigate the wildfire to prevent it from happening again, as happened from 1950 to 2019, as explained in Figure 3.

Wildfire agencies that are subject to provincial jurisdiction, including those that are subject to historical and existing treaties, have not completely realized shared governance and the right to burn across territorial lines. The historical and contemporary applications of cultural burning have been largely disregarded in strategic land-use planning, approaches to wildfire mitigation, and community risk assessments [17, 22].

Indigenous peoples have relied on fire as a tool for managing their environments for as long as recorded history goes, and today they are emphasizing the significance of cultural burning as an essential part of this strategy. Traditional tribal practitioners have a propensity to burn relatively small territories in their entirety all at once, but government institutions are pushed to treat larger and wider areas to lessen the risk of wildfires [5].

Indigenous groups in the Pacific West have traditionally used cultural burning to protect their environment, with an emphasis on ecological and social repair. While government agencies prioritize large-scale treatments to reduce fire danger, tribal practitioners argue for smaller, more frequent burns to improve resilience, conserve biodiversity, preserve traditional knowledge, and provide cultural riches. Research on the impacts of cultural burning is scarce, with most studies focused on solitary burns and short-term outcomes. While certain benefits, such as enhanced plant quality, are evident, the effects on biodiversity and resource quality remain complex. Long-term tribal collaborations and designated cultural management areas may offer insight into attaining ecocultural restoration goals [23].

Furthermore, wildfire seasons are getting longer as a direct

result of climate change, which makes it more difficult, complex, and expensive to put out these fires. The research capability of Canada needs to be increased in order for the country to be ready for a more complex relationship with wildfires. It will be far easier for Canada to recover from the devastation caused by wildfires if the country's policies and practices are both adaptable and based on evidence. It is impossible for Canada to provide an appropriate response to these ongoing and growing challenges [24].

Relationships with places are extremely important due to the fact that they serve as the foundation for the belief systems, identities, bodies of knowledge, and modes of subsistence that support the mechanisms that enable environmental change to be experienced, understood, rejected, and responded to. This highlights how important it is to have connections to certain locations. The continuation of indigenous knowledge systems and the health of indigenous institutions are both jeopardized as a result of land dispossession, relocation, and landscape fragmentation, which affect a significant number of indigenous people and cause them to suffer from significant vulnerabilities. The speed with which environmental conditions are moving makes it that much more challenging to find a solution to the problem. The tight connection that exists between these deficiencies and the processes of colonialism, globalization, and pattern formation provides more support for the vital necessity of finding a solution to these pervasive structural difficulties [25].

### 3.2 Cultural burning practices in Indonesia

Cultural burning has long been a feature of Indonesian traditional land management methods, particularly among indigenous tribes. It is strongly founded in indigenous knowledge systems, rituals, and beliefs, demonstrating the close relationship between people, land, and spirituality. Cultural burning rites are frequently held to honour ancestral customs, seek blessings for a bountiful harvest, and preserve ecological equilibrium. Cultural burning in Indonesia represents the complex interplay of tradition, nature, and livelihoods. Indonesia may use cultural burning to promote ecological resilience, social fairness, and cultural vitality in the twenty-first century provided it recognizes its cultural value and addresses accompanying concerns holistically and inclusively. It is essential, in light of the lack of available land, to clear land that is covered with forest in order to make it available to farmers. It is a violation of the law to clear land in a forest preserve by cutting down trees and setting fire to them [13].

The igniting of forest and land, whether by natural causes or as a direct result of the activities of humans, is referred to as an event of forest and land fire. This leads to the destruction of the environment, which in turn leads to losses on various fronts, including ecological, economic, sociocultural, and political dimensions. Consequently, this leads to a vicious cycle. In 2015, the total area of forest and land fires in Indonesia reached 2,611,411 hectares; the area that was most severely affected was the region that was damaged by forest fires in 2015. Forest fires have the direct effect of producing pollution in the form of smoke and haze, as well as an increase in the amount of carbon emissions. Other negative effects include forest product deterioration as well as deforestation, the loss of flood control capabilities as well as forest products, the loss of biodiversity, and the loss of both forest products and the services they provide. An approach that

is both successful and efficient in reducing the negative impacts that fires have is the prevention of forest and land fires. This helps to cut down on the damage that can be caused by fires [26].

The overall rule that each family is only allowed to torch a maximum of two hectares of land is subject to a handful of narrowly circumscribed exemptions. In order to stop the fire from spreading to other areas, the land that is currently being consumed by flames should be fortified with firebreaks and planted with native plant species. It is essential for indigenous communities to have understanding about land clearance operations that involve burning in the context of efforts to put out forest and grassland fires. It was hypothesized that constitutional recognition of indigenous knowledge could help in the avoidance of major forest fires and could be put to use in the fight against forest fires [13]. Between the years 1982 and 1983, Indonesia was devastated by devastating forest and land fires. On three separate occasions (in 2007, 2012, and 2015), these fires caused smoke pollution that extended across international borders. These fires have been raging for the past three decades [27].

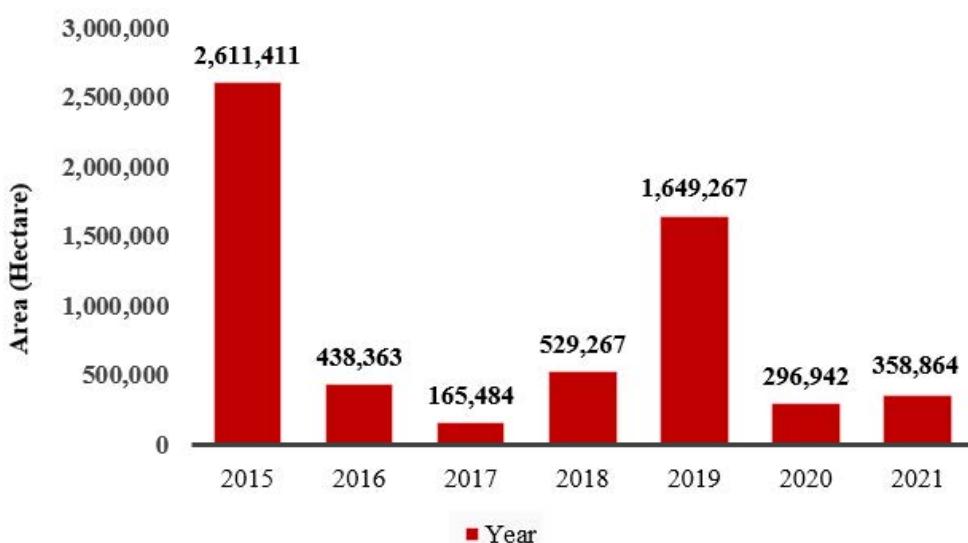
Cultural burning is the purposeful lighting fire to small parts of land to clear vegetation for crops, usually during the dry season. Several techniques are used, including “slash and burn”, where vegetation is cut and burned, and the “Nataki technique” in West Kalimantan, where controlled burning is used to clear land for rice production. Cultural burning is usually done during the dry season, when the vegetation is dry and easy to burn. This frequently coincides with the agricultural cycle, when communities prepare land to plant crops including rice, maize, cassava, and vegetables. Cultural burning is firmly ingrained in the traditional rituals and beliefs of indigenous people throughout Indonesia. It depicts a deep connection between people, land, and spirituality.

The amendment of Presidential Instruction No. 15 in 2015 to No. 3 in 2020 demonstrates a responsive approach to Indonesia’s critical issue of forest and land fires. The forest fire area totaled 2.6 million hectares. The severity of the 2015 fires and international criticism prompted the government to conduct a complete examination of its fire control policy, taking into account lessons gained, stakeholder comments, and technology improvements. This resulted in a revised directive that attempted to address the fundamental causes of fires more

effectively while remaining consistent with broader policy frameworks and national development ambitions. This changing pattern represents a commitment to strengthening forest and land fire administration and response, with a focus on enhancing resilience and preventing future catastrophes through data-driven and evidence-based approaches [28]. Figure 4 depicts the encouraging upward trend in the amount of land that was burned in Indonesia.

This law lays the legal groundwork for efficient coordination and cooperation between Indonesia’s national, sub-national, and regional levels of government. Programs designed to empower communities are implemented in order to raise community members’ awareness of and participation in fire prevention efforts, as well as to improve communities’ capabilities and capabilities to control fires, reduce the effects of climate change, and adapt to its effects. The program includes contributions from a wide variety of stakeholders. Companies that are engaged in forestry and plantations are required by law to comply with regulations that mandate the use of zero-burning techniques for the preparation of land. Fire-care communities and fire-care farmer groups are also given the opportunity to learn about zero-burning systems through a variety of programs, including fire-free villages, alternative livelihoods, and training [28].

The Indonesian government has implemented Empowerment and Collaboration by prioritizing partnerships with indigenous people, involving them in decision-making and resource distribution. Recognize and respect indigenous knowledge and customs, embracing them as equal partners in wildfire management. In addition, in Indonesia, understanding power dynamics is crucial for effectively incorporating indigenous knowledge. For example, Community-Based Forest Management enables indigenous communities to manage forests sustainably. The use of indigenous fire management practices into wildfire prevention efforts can help to lessen dangers. Advocating for the recognition of indigenous land rights and secure tenure, such as through Indigenous Land Rights and Community Forests, helps communities protect their lands and traditions. These examples highlight the importance of empowering indigenous people and addressing power disparities in order to properly integrate their knowledge into Indonesian society.



**Figure 4.** Total burnt area in Indonesia from 2015-2021 [28]

In order to protect forests from wildfires, it is essential to do a comparative analysis of the potential and challenges presented by both Canada and Indonesia. The results of a study that compared the cultural burning practices of Canada and Indonesia have yielded insights that have the potential to be helpful for the cultural burning policy in Indonesia as mentioned in Table 1. An explanation is given of the difficulties and opportunities that must be examined in terms of authority, jurisdiction, regulations, accreditation, liabilities, and resources in order to achieve forest protection against wildfires in Canada as opposed to Indonesia. Burning of cultural artifacts is a problem that merits investigation and discussion, both in Canada and Indonesia. Their distinctive traditional practices including burning set them unique. Indigenous Ecological Knowledge (IEK) is commonly disregarded by wildfire control authorities in Canada, despite the fact that Western-trained fire scientists are typically ignorant of or disdainful of IEK. This is the case despite the fact that IEK is widely used in other parts of the world. There is still a power imbalance despite the fact that organizations have stated their wish to collaborate with Indigenous Peoples in Canada in order to mitigate wildfires. It is mandatory for indigenous Canadian tribes that conduct traditional burning on Crown land to provide a customary burning plan to the government agency that is in charge of regulating wildfires in their region. The submission of permit applications prevents

the practice of traditional burning. Because it is dependent on the power structure that is currently in place, cultural burning will be challenging to accept as a long-term best practice [5].

It is illegal in Indonesia to clear land by felling and burning trees in protected forest areas. There are only a few exceptions to the general rule that each family is only permitted to burn two hectares of land. The land that is being burned must be covered with native plant species and protected by firebreaks in order to prevent the fire from spreading.

Indigenous people are allowed to burn the land without a permit. To govern it, Law No. 32/2019 and Law No. 11/2020 on Job Creation are in effect. Because of this condition, great risk communication is essential to forecast wildfires. The Indonesian government has formed Community Concerned Fire (MPA), a network of trained communities dedicated to fighting forest and land fires [26].

On the other hand, the public campaign advocates for a policy of not burning anything, which is different from the regulation. Another potential weak spot is the inability to adequately control the cultural burning that occurs on-site. An adequate regulatory structure for cultural burning ought to be put in place by the government in order to ensure that it is governed in the appropriate manner. It is of the utmost importance to promote not just a no-burn policy but also cultural burning that is conducted in accordance with all applicable safety regulations.

**Table 1.** Canada and Indonesia in comparison

Barriers	Canada	Indonesia
Perceptions, authority, and jurisdiction	Cultural burning requires understanding when to use fire, enhancing fire-reliant ecosystems and supporting indigenous traditions and lifestyles [9, 28, 29].	An annual tradition during the dry season involves forest fires to clear land for agriculture. This practice, known locally as slash and burn in Riau, Nataki technique in West Kalimantan, and Kekas technique in South Sumatra, varies in perception and implementation [13].
Governance, laws, and management	Cultural burning signifies environmental and community protection. Indigenous tribes in Canada must submit a burn plan for Crown property, but face hindrances due to permit applications [29].	Families in Indonesia can burn up to two hectares of land, using native plants and firebreaks to prevent spread. Indigenous peoples may burn land without permits, governed by laws no. 32/2009 and no. 11/2020 on Job Creation [26, 28].
Access, accreditation, and training	Accreditation mandates indigenous individuals with firefighting experience to join government or private wildfire control groups. Limited wildfire training opportunities may conflict with indigenous cultural norms [20, 30].	The government conducts training for the Fire Awareness Community (MPA), providing necessary firefighting equipment and full support. The MPA can also collaborate with the corporate sector to synchronize fire prevention efforts [31].
Liabilities and insurance	Indigenous fire professionals must have liability insurance and be skilled in regulated fires. This group is responsible for traditional burning tasks and could be liable for damages if a fire gets out of control [32]. Cultural fire is crucial for community defense in Canada, as many Indigenous reserves lack Fire Departments. Unpaid volunteers often use personal vehicles and hand pumps to respond to fires, with dependency on distant officials for assistance [33].	Law No. 41 of 1999 prohibits burning wood, except for plots under two hectares, with liabilities for offenders. However, no insurance is required in practice [13].
Capacity and resources	The diverse and complicated policy framework governing land use, forest management, and fire prevention, incorporating national laws, regulations, and customary practices [30].	Integrated Fire Management involves collaboration to prevent and fight forest fires, with operational equipment financed by stakeholders. Modification of Weather Technology creates artificial rain for fire prevention. Multiple parties work together to address fire risks [27].
Policy environment	While there are restrictions in place to control land burning, traditional burning techniques are frequently permitted or tolerated, particularly in small-scale agriculture, under certain conditions [9, 28].	Cultural burning traditions are subject to government laws and permission requirements, which are frequently overseen by wildfire control authorities [23].
Policy barriers	The flexibility of Indonesia's policy environment can help to enable on-the-ground cultural burning practices by giving indigenous people more authority and freedom in land management. However, issues arise when traditional practices collide with conservation goals or when land-use policies change, causing conflicts and uncertainties for communities [9, 28, 29].	Due to wildfire concerns, indigenous groups may encounter impediments such as bureaucratic red tape, lengthy permitting processes, and limitations on burning methods [25, 27].
Impacts on practices	These policy impediments can impede on-the-ground cultural burning activities by causing delays, administrative burdens, and uncertainty for indigenous people. As a result, communities may struggle to sustain traditional burning regimes, resulting in diminishing cultural continuity and environmental benefits [13].	

The indigenous fire stewardship (IFS) program is currently undergoing a revitalization effort in order to illustrate the value of employing controlled fire on a regular basis in order to adapt to changing environments, promote preferred landscapes, ecosystems, species, livelihoods, and practices of subsistence, and ensure that these practices are maintained. It is possible for the documentation of the effects of IFS on global patterns of ecological variability and biodiversity to assist in the promotion of policies that favour the cultural use of fire [9].

Indigenous fire stewardship has significant environmental and social benefits. Cultural burning strategies contribute to biodiversity conservation by keeping various habitat structures and sustaining native fire-adapted plant and animal species. Indigenous fire stewardship restores ecosystems to their historical state by replicating natural fire regimes, which improves ecosystem health and resilience. Cultural burning can help limit the spread of invasive species by lowering their abundance while allowing native species to thrive. Controlled fires assist to recycle nutrients, regenerate soil, and produce nutrient-rich ash, all of which contribute to healthy soil ecosystems. Indigenous fire stewardship approaches are deeply rooted in cultural customs and heritage, preserving cultural identity while strengthening community relationships. Cultural burning activities help elders pass along traditional ecological knowledge.

In other case, the COVID-19 pandemic has created unique hurdles for indigenous fire stewardship methods, affecting their implementation and effectiveness. Social distancing tactics, travel limitations, and health concerns have disturbed traditional burning activities, limiting indigenous tribes' capacity to hold prescribed burns and cultural fire ceremonies. In many situations, the pandemic has resulted in the postponing or cancellation of planned burning activities, as community meetings and collaborative efforts are limited to prevent the virus from spreading. This disruption has thrown off the seasonal timing of cultural burning practices, potentially impacting ecosystem management and biodiversity results. The economic consequences of the epidemic have strained resources and funding for indigenous fire stewardship projects, aggravating existing issues encountered by indigenous communities in acquiring critical equipment, training, and support.

In an effort to increase community members' level of comprehension and participation, numerous projects aimed at empowering the community have been initiated. The purpose of these programs is to increase community awareness in the hopes of enticing people to actively participate in efforts to extinguish forest and land fires and to stop them from occurring again in the future. It investigates the background of cultural burning, how it was carried out, the obstacles and difficulties that were experienced on the ground, and the potential future applications of the practice. The likelihood of catastrophic wildfires can be reduced with proper preparation. It is quite interesting to look into ways of improving the effectiveness of risk communication in order to meet the goals of wildfire prevention. The use of fire in a predetermined territory under specific climatic circumstances at the time, intensity, and rate of spread required to accomplish planned resource management objectives [33, 34]. It is possible to refer to this as a well-managed cultural burning in order to reduce the likelihood of spontaneous wildfires. The community will be able to reduce the risk of fire if they continue to practice cultural burning rituals that are environmentally responsible [35]. On the other hand, increasing forest fires in the future

will create opportunities for salvage logging and replanting operations, both of which have the potential to cut greenhouse gas emissions (GHG) in comparison to a scenario in which nothing is done and natural regeneration is relied on. This is a positive development [36].

Integrating indigenous knowledge into wildfire control strategies necessitates a careful and respectful strategy that promotes indigenous data sovereignty while avoiding exploitation of indigenous knowledge. The recognition and respect for indigenous peoples' rights to control and administer their own data, information, and knowledge systems is central to this process. One important concept is free, prior, and informed consent (FPIC), which involves genuine consultation and participation with indigenous communities before carrying out any activity that may impact their knowledge, resources, or territory. This entails forming alliances and collaborative frameworks that promote indigenous peoples' agency and self-determination in wildfire decision-making processes. It is critical to acknowledge and respect the cultural protocols, values, and procedures linked with indigenous knowledge systems.

Moreover, the proposed solution for Canada is to (1) streamline permitting processes by simplifying and expediting the permitting procedure for cultural burning operations on indigenous territory in order to decrease administrative burdens and delays. (2) Support Capacity Building by providing indigenous communities with tools and training programs to help them improve their fire control capabilities, such as prescribed burning practices and wildfire prevention tactics. (3) Encourage collaboration by facilitating partnerships and collaboration among indigenous communities, government agencies, and non-governmental organizations to build co-management frameworks for fire stewardship. Indonesia could explore implementing (1) Strengthen Recognition of Indigenous Rights by enhancing legal recognition and protection of indigenous land rights and customary land management practices to empower people to properly manage their lands (2) Integrate Traditional Knowledge including indigenous fire management strategies.

The precise policy impediments or enablers in Canada and Indonesia have serious consequences for on-the-ground cultural burning behaviors. In Canada, bureaucratic roadblocks and legal restraints can stymie traditional burning activities, whereas in Indonesia, the mix of regulation and flexibility determines the amount to which communities can maintain their cultural practices. Understanding these policy dynamics is critical to promoting indigenous rights, cultural heritage, and sustainable land management methods in both countries.

#### 4. CONCLUSIONS

Cultural burning poses challenges in Canada and Indonesia due to disparities in governance, training availability, liability issues, and resources. In Canada, indigenous communities face difficulties acquiring burn permits and accessing firefighting training, while liability insurance is mandatory. Many localities do not have adequate fire departments and must rely on distant authorities for assistance. Cultural burning in Indonesia is governed by legislation that allow for controlled burning without a permit, as well as official training and equipment. Both countries promote collaborative fire management among stakeholders. Authority, jurisdiction,

legislation, accreditation, and liability are the five categories of difficulties and opportunities in wildfire forest protection. Cultural burning activities in Canada and Indonesia highlight issues with community empowerment, indigenous knowledge, and fire protection. Solutions could include the elimination of wildfire gatekeeping in Canada and Indonesia.

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