

## CHAPTER 20

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### **PAST, PRESENT AND FUTURE OF ECOCIDE: A BIBLIOMETRIC ANALYSIS**

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#### **ABSTRACT**

Every day, new evidence of significant environmental degradation occurs around the world, affecting the lives of millions of people, according to research studies. Ecocide is a term used to describe environmental deterioration that includes both naturally occurring mechanisms of environmental or ecosystem degradation and ecological damage caused by anthropogenic actions. While there is no shortage of papers on ecocide research, there is a distinct lack of bibliometric analysis of works dedicated to understanding and investigating the domain. While the majority of literature in the field of environmental degradation focuses on the negative consequences of ecocide, few studies use bibliometric analysis to examine the history, present, and future of existing material. By examining research publications published between 1990 and 2022, this study employs a bibliometric approach to derive significant information on advancements in this field. The paper attempts to classify extant Ecocide literature using bibliometric criteria such as year, area, author, institution, and source. A bibliometric study of keyword co-occurrence was also undertaken to better understand the major themes that underpin the Ecocide literature. The article also examines legal frameworks and suggests future research subjects in the field of ecocide.

**Keywords:** Ecocide, Environmental degradation, VOSviewer, Biblioshiny, Bibliometric analysis, Genocide Introduction

International law researcher Richard Falk, 1973 confirmed that humans had begun to recognize the magnitude of the harm caused by anthropogenic activities. The use of dangerous weapons in armed conflicts, as well as the repercussions of resource extracting corporations such as mineral and fossil fuel extraction, farming, and logging, were noted to be progressively destroying the environment and, with it, humankind's well-being (Falk, 1973). Forty-Nine years later, this work is a bibliometric investigation of if this predicament has changed for good or worsened in fact.

Every single day, research reports testify to new evidence of substantial environmental degradation occurring around the world, impacting the lives of millions of people. The disastrous environmental and societal impact of the industry extracting palm oil is one of the most recent environmental concerns. A huge area of tropical forests has been cleared to establish industrial palm oil plantation farms causing contamination of air, water, and soil, soil degradation, the ruination of indigenous plant and animal species habitats, and promoting social squabbles amongst local communities whose living standards are being simply disregarded (Meijaard, Brooks, Carlson, Slade, Garcia-Ulloa, Gaveau & Sheil, 2020; Muhammad, Sharaai, Ismail, Harun, & Yien, 2019). Worryingly, this is just one of the numerous examples. Environmental destruction is occurring at a rate faster than initially assumed (UNEP, 2016). The use of massively destructive armaments during times of war, as well as considering and using the earth as a consumer good to drive economic expansion in both conflict and non-conflict settings, has resulted in an increase in the violations of human rights and also environmental degradation. Due to their chronicity and severity, the disastrous effects of these actions have earned their name- Ecocide. Ecocide is easily interpreted as pervasive and protracted damage and degradation of the natural environment and ecosystems. Committed again and again over generations, Ecocide is a root reason for the current environmental and ecological crisis.

'Killing our home' (i.e., 'killing our environment') is a classic way of defining ecocide. However, ecocide not only degrades the environment but also seriously violates human rights. Human rights and environmental conservation are inextricably linked; a safe and healthy environment is crucial for individuals and social groups to exercise their most essential

underlying human rights. In general, incidents of massive ecological destruction hurt human well-being, as well as the well-being of all other living and non-living ecosystem elements, which is harmful to humanity's survival.

Ecocide is a term that refers to "a variety of human or natural actions and processes that all have one thing in common: they harm and decimate the ecosystems around the world to the detriment of flora and fauna" (Fried 1972). Ecocide, as a notion, pertains to both naturally existing mechanisms of environmental or ecosystem degradation and ecological destruction due to anthropogenic activities (White and Heckenberg, 2014). As per a legal definition coined by Stop Ecocide International (2021), "Ecocide means unlawful or wanton acts committed with the knowledge that there is a substantial likelihood of severe and either widespread or long-term damage to the environment being caused by those acts." (Minkova, 2021). It is especially important to understand the components of this definition as discussed below in Table I:

**Table I- Components of Ecocide Definition**

Sr. No	Component	Explanation
1	Wanton	"Wanton" implies careless indifference towards the degradation that is visibly excessive in context to the expected socio-economic benefits;
2	Severe	"Severe" denotes environmental degradation with excessively negative changes, disturbances, or damage to any component of the natural environment, as well as severe consequences for human or natural life, society, or economic resources;
3	Widespread	"Widespread" refers to the destruction that stretches beyond a specific geographic area, traverses states, or affects an ecosphere, organisms, or a huge amount of people;
4	Long-term	"Long-term" damage is defined as the devastation that is irreversible or cannot be rectified within a reasonable period through nature's recovery process;
5	Environment	"Environment" refers to biodiversity, frozen parts of the earth, solid, outer part of the Earth, water that is on the surface of the planet, underground, and in the air, atmosphere including the outer space.

(Source: Stop Ecocide International, 2021)

However, there is no dearth of studies on ecocide research, and a lacuna of bibliometric analysis of studies dedicated to understanding and investigating the domain is quite evident. While the majority of literature in the area of ecocide revolves around the detrimental impacts of ecocide, there is a dearth of studies exploring the extant literature using bibliometric analysis. This study thus takes up a bibliometric approach to extract valuable information on what developments in the area have been studied so far from research publications published between 1990 to 2022.

The purpose of this study is to conduct a literature review to answer the following research

questions:

**RQ 1:** Categorization of existing literature on Ecocide founded on bibliometric parameters such as year, region, author, institution, and source

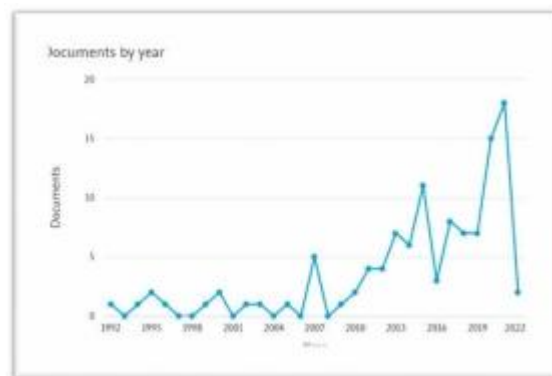
**RQ 2:** A bibliometric analysis of keyword co-occurrence to understand the mainstream themes underpinning the Ecocide literature

**RQ 3:** A review of legal frameworks in the area of ecocide

**RQ 4:** A review of future areas of research in the domain of ecocide

## 2.0. METHODOLOGY

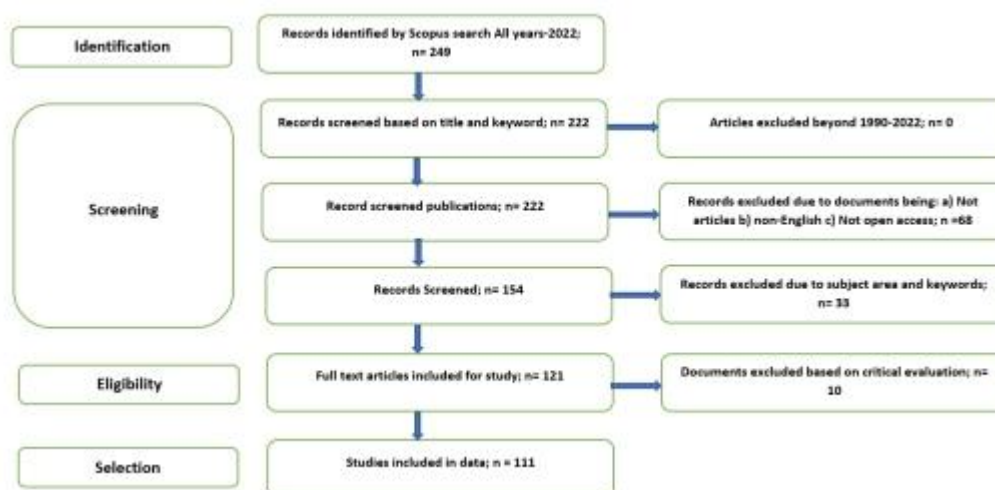
To respond to the research questions raised above, a bibliometric assessment of research papers published between 1990 and 2022 was conducted. This entailed retrieving relevant articles from the Scopus database. Scopus was chosen as a source of bibliometric data because it is one of the largest cataloged abstract and citing sources databases, with worldwide coverage of scientific publications, conference papers, and texts that use a very rigorous content evaluation, selection, and re-evaluation by an unbiased content selection and advisory committee to ensure only the highest quality papers are properly documented. Furthermore, Scopus' stringent quality control methodologies are constantly evaluating and improving all data items. Scopus offers extensive authorship and institutional profiles derived from powerful categorizing algorithms and expert curation, ensuring the highest precision and recall. Because of its dependability, Scopus has been used as a high-quality bibliometric data source for large-scale assessment in research evaluations, research ecosystem studies, scientific policy assessments, and university rankings. The Scopus search term "Ecocide" was used to find and select relevant articles. Figure-I depicts the publications in the field of Ecocide from 1990 to 2020.



**Figure I:** Year-wise publications on Ecocide

Based on the abstract, title, and relevant keywords, 249 publications were extracted. Because

the study focused on ecocide, only studies that could help achieve the stated research objectives were chosen. In this regard, the PRISMA framework was used to select relevant studies (Moher et al., 2015). The PRISMA framework has four stages: identifying and recording studies using database searches, screening the recorded studies, proofreading and determining study eligibility, and final study selection. A schema of the PRISMA methodology followed for article selection is presented below in Figure-II:



**Figure-II:** PRISMA Schema

The activity resulted in the final selection of 111 articles, which were then analyzed to achieve the research's stated objectives. The 111 publications' author keywords, citations, and bibliographical data were exported to the VOSviewer program. The bibliometric maps in this study were created using VOSviewer, a tool. VOSviewer is a piece of software that allows you to create, visualize, and analyze bibliometric networks. Authors, journals, organizations, and individual publications comprise the networks in VOSviewer. With VOSviewer, these networks can be viewed at speeds and scales that are impossible to achieve with manual methods or other software. VOSviewer's text mining features enable it to generate network mappings of co-occurring keywords based on abstracts and body text of research publications.

### 3.0. ANALYSIS AND DISCUSSION OF RESULTS

**3.1. RQ1:** Categorization of existing literature on Ecocide founded on bibliometric parameters such as year, region, author, institution, and source.

#### COUNTRIES AND ACADEMIC INSTITUTIONS

**Table-II:** Most Productive Nations/Countries

Country	No of publications	Citations
United States	30	189
United Kingdom	21	226
Australia	14	55

Norway	7	18
Netherlands	3	34

As visible from Table II, approximately 27 percent of publications aiming at deciphering the various aspects of Ecocide were published in the United States. Approximately 18% of the publications were contributed by the United Kingdom. Australia, Norway, and the Netherlands contributed approximately 12%, 6%, and 2% of the total publications in the domain of Ecocide. Therefore, the United States, United Kingdom, Australia, Norway, and the Netherlands were some of the most productive nations publishing the research work in the area of Ecocide.

Surprisingly, there were few to no publications contributed from countries usually cited as the most severe victims of Ecocide. However, the Niger delta has been disfigured by oil extraction for the past fifty years, there was not a single publication from Nigeria. For decades, oil corporations have been operating here with little ecological oversight, and the delta, which is notoriously plagued by dispute and extreme poverty, has been consistently pushed towards environmental catastrophe. Inhabitants struggle to survive on land and water contaminated by decades of oil spillage, and agriculture failure due to acid rain caused by gas plumes (The Guardian, 2010). Linfen in China is commonly cited as the most polluted city on earth. The city is situated in the center of a 12-mile industrial zone of iron casting foundries, pyrometallurgical plants, and cement plants which are fuelled by the 50 million tonnes of coal extracted annually, unrestricted due to rapid development (The Guardian, 2010). Ironically, the database did not mention a single publication from China. The database was found to be devoid of publications from countries that are some of the biggest victims of Ecocide.

**Table-III:** Most Productive Academic Institutions

<b>Affiliate Institution</b>	<b>No of publications</b>
University of London	7
University of Oslo	7
University of Tasmania	7
Medawar Institute of Medical and Environmental Research	4
University of Essex	4

As evident from Table III, the University of London (Approximately 6% of total publications), University of Oslo (Approximately 6% of total publications), and University of Tasmania (Approximately 6% of total publications) were found to be the most productive academic and research institutions contributing the greatest number of publications towards the domain. This was followed by the Medawar Institute of Medical and Environmental Research

and the University of Essex with the academic institutions contributing four publications each (Approximately 3% of the total publications) towards Ecocide.

### 3.1.1. FOREMOST RESEARCHERS IN THE DOMAIN OF ECOCIDE

The results of the bibliometric analysis showed the five most authoritative writers with publications on various aspects of Ecocide. These most prolific writers were identified to be from 3 nations namely the United Kingdom, Australia, and Norway (based upon several publications and citations). There was a total of 15 unique publications (4 publications shared between authors as co-author) by these writers. These top five writers' 15 unique publications were cited 307 times. Table-IV lists the writers, Publication title, affiliation, citations, and H-index of the author.

**Table-IV:** Foremost researchers in the domain of Ecocide

Author	Publication Title	Affiliation	Citations	H-index	
White R.	Critical Criminology and the Struggle Against Climate Change Ecocide	University of Tasmania, Australia	22	40	53
	Climate change, ecocide and crimes of the powerful		9		
	Criminological Perspectives on Climate Change, Violence and Ecocide		5		
	The ecocide-genocide nexus: A green criminology perspective		1		
	Imagining the unthinkable: Climate change, ecocide and children		1		
	Carbon economics and transnational resistance to ecocide		1		
Short D.	Ecocide		1		
	Protecting the planet: A proposal for a law of ecocide	School of Advanced Study, University of London, London, United Kingdom	80	150	23
	Marx, Lemkin and the genocide-ecocide nexus		37		
	Ecocide, genocide, capitalism and colonialism: Consequences for indigenous peoples and global ecosystems environments		32		
Developmentalism and the Genocide-Ecocide Nexus	1				
South N.	Protecting the planet: A proposal for a law of ecocide	University of Essex, United Kingdom	80	117	47
	Ecocide, genocide, capitalism and colonialism: Consequences for indigenous peoples and global ecosystems environments		32		
	Genocide and ecocide in four Colombian Indigenous Communities: The Erosion of a way of life and memory		3		
	Eco-Crimes and Ecocide at Sea: Toward a New Blue Criminology		2		
Crook M.	Marx, Lemkin and the genocide-ecocide nexus	Department of Social Sciences, University of Roehampton, London, United	37	70	2
	Ecocide, genocide, capitalism and colonialism: Consequences for indigenous peoples and global ecosystems environments		32		
	Developmentalism and the Genocide-Ecocide Nexus		1		
Dunlap A.	The 'solution' is now the 'problem:' wind energy, colonisation and the 'genocide-ecocide nexus' in the Isthmus of Tehuantepec, Oaxaca	Centre for Development and the Environment, University of Oslo,	33	39	17
	The Politics of Ecocide, Genocide and Megaprojects: Interrogating Natural Resource Extraction, Identity and the Normalization of Erasure		6		

Rob White, in his research on Ecocide, focuses on reviewing recent criminological writings on climate change and its implications for violence. His work examines climate change-related criminal activities through a criminological lens. His work accomplishes this by investigating the association between global warming and social interactions, climate change, and social stressors, and reimagining potent crimes as ecocide because they damage the environment. Related issues such as contrarianism and natural resource securitization, both of which safeguard and preserve particular segmental interests rather than the interest of the public, are

also addressed in his mainstream work.

Damien Short's work revolves around explaining how Ecocide is another form of Genocide. His essays discuss various instances of how crimes that damage the climate, as well as human and other living species, as well as distinctive styles of reactions that have asked for more efficient and suitable frameworks of justice and law than those presently in place.

Nigel South in his work envisages that international law can resolve some egregious illustrations of colonialism's wrongdoings and damages through the conceptually and legally defining genocide, but the closely related concept of ecocide, which pertains to ecological sustainability, has not yet been officially accepted within the system of law. His idea argues that the notion of ecocide represents a robust tool in the perspective of this special issue mirroring the implementation of environmental criminology. To demonstrate this, his work investigates the links between genocide, capitalism, and colonialism, as well as the effects on indigenous communities and local and global ecological systems.

Martin Crook's work aims to contribute to an evolving "ecological turn" in genocide research by putting the material "extra-human environment" at the heart of the biological and social integrity of communities like indigenous people and territorially reliant place-based communities.

Alexander Dunlap believes that continuous and systematic processes of resource exploration and exploitation are at the heart of techno-capitalist advancement marketed as "modernity," "progress," or "development." His mainstream work examines wind energy progress in Mexico, coal exploration in Germany, and copper extraction in Peru to help bolster the post-liberal or institutional approach to genocide research. These ethnically and geographically diverse case studies lay the groundwork for conversations about the complexities of conflicting fault lines in the context of extractive development. The key premise of his work is that both "green" and traditional natural resource extraction contribute significantly to the degradation of human and biological diversity, thereby contributing to broad trends of social and ecological ruination, extinction, and the possibility of human and nonhuman annihilation.

### **3.1.2. FOREMOST JOURNALS AND PUBLISHERS**

Table V presents the top 4 journals and publishers that contributed to the majority of publications in ecocide literature. As can be seen clearly, the International Journal of Human Rights published 6 documents with 219 citations followed by Critical Criminology, Journal of Genocide Research and Environmental Ethics with 2, 5, and 2 documents with 73, 37, and 2 citations respectively. Table V also shows the pertinent details of publishers associated with the selected journals.

**Table V-** Most productive Journals



Journals	No of publications	Publisher	H-Index	Total Citations
International Journal of Human Rights	6	Routledge	21	219
Critical Criminology	2	Springer Netherlands	26	73
Journal of Genocide research	5	Carfax Publishing Ltd.	26	37
Environmental Ethics	2	Environmental Philosophy Inc.	29	2

### 3.2 RQ2: A BIBLIOMETRIC ANALYSIS OF KEYWORD CO-OCCURRENCE TO UNDERSTAND THE MAINSTREAM THEMES UNDERPINNING THE ECOCIDE LITERATURE

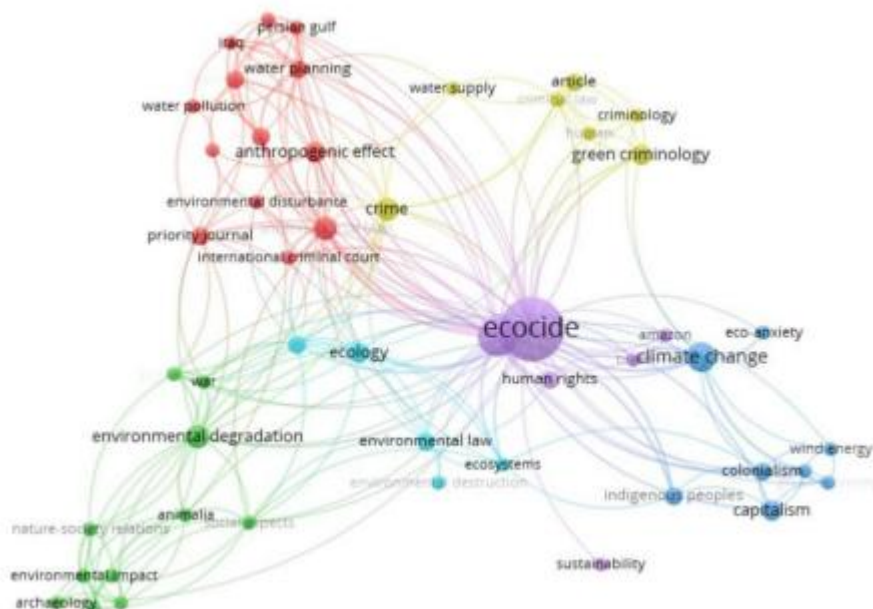
Based on the concept that keywords provide a sound rationale-based explanation for the content of papers, keyword analysis is an excellent analytical technique for exploring particular themes in marketing or any literature, and it has recently gained prominence (Wang & Chai, 2018). Bibliometrics employs four analysis methods: co-word association, co-word cluster, co-word frequency, and burst word monitoring. Keyword co-occurrence assessment was also used in this study since it was judged as an effective way of addressing research trends in the ecocide domain by examining current papers.

Significantly, a co-word assessment is performed by examining keywords that occur together. The strength of the link between two keywords is expressed in terms of value that shows their association (Goyal & Kumar, 2021; Saha et al., 2020). Link strength reflects the number of times two specific keywords happened to occur in the same publication. The entire number of times any two keywords have been used in a search is represented by the number of these links. In this study, the author keywords co-occurrence evaluation included 143 keywords. However, many of these keywords were used only once. 93 of the 143 keywords were used only once. To achieve the best outcomes, it was decided to rename the keywords as per the broad theme. After this approach, the number of keywords was reduced to 50. The modified 50 keywords were then loaded into VOSviewer, which used 2 as the minimum frequency of occurrence to map the collected literature. The keywords, their frequency of occurrence, and link strength are mentioned below in Table VI. Network visualization of the same is presented in Figure III.

**Table VI:** Keyword Co-occurrence Analysis

Keyword	Frequency
Genocide	35

Climate change	14
Crime	8
Environmental degradation	5
International Law	5



**Figure-III:** Network visualization of Keyword Co-occurrence

As discussed before and evident from the keyword co-occurrence analysis, Ecocide has come up as a propitious and ever-growing field with enormous and broad implications globally. The next section, based on the keyword co-occurrence analysis, deliberates upon major keywords most frequently discussed in the ecocide-centric literature. A brief discussion on the most commonly repeated keywords in ecocide literature is being used has been produced below:

### 3.2.1 **ECOCIDE AS GENOCIDE**

One of the most commonly recurring words in the Ecocide literature was found to be perceiving Ecocide and a Genocide. Ecocide, or the damaging of ecosystems, can be referred to as a method of mass slaughter commonly known as Genocide if, for instance, ecological degradation leads to living conditions that profoundly endanger the cultural or physical survival of a social community. Given the impending threat of catastrophic climate degradation, the resulting rapid mass extinction, loss of habitat, ecosystem collapse, and reliance of the human race on the biosphere, ecocide (both "organic" and "human-made") will be a key cause of genocide (Dunlap, 2021). The long history of colonialism includes ongoing inequities and rejection of indigenous communities' rights. In connection to nonhuman organisms and aspects of the natural environment, concurrent procedures of exploitation and

unfairness can be recognized (Crook, Short, and South, 2018). International law can resolve some egregious instances of colonialism's offenses and damages through the conceptual and legal definition of genocide, but the closely related concept of ecocide, which pertains to humanity and nature, has yet to be lawfully acknowledged within the legal system of international law (Lindgren, 2018).

### **3.2.2 ECOCIDE AND CLIMATE CHANGE**

Yet another commonly recurring keyword in the literature suggested the gravity of the concern raised by various researchers towards climate change due to ecocide. The current geological epoch is known as the Anthropocene because anthropogenic activities (anthropoid) are affecting the Earth's original environment in unprecedented ways (White, 2015). The most visible example is the transformation of the atmosphere caused by the emissions of gases from using fossil fuels, such as carbon dioxide, methane, and CFCs. Researchers argue that this is a side effect of capitalism's ever-increasing customer needs, coupled with almost utter disrespect for the protracted destruction, global warming, and sea-level rise, induced by these greenhouse gases (White, Kramer, 2015). Patrick Hossay (2006), an environmental thinker and activist contend that the human species is perpetrating ecocide through the effects of modern industrialized society on the global ecosystem.

### **3.2.3 ECOCIDE AS AN INTERNATIONAL CRIME**

In recent times, criminologists are increasingly focusing on the dangers of global warming, as well as the political and economic systems and daily activities of industrial capitalism that nurture and solidify the circumstances for extreme weather events (Lynch and Stretesky 2010). It was conceived in 1970 by Professor Arthur W. Galston to identify the impact of the United States' use of Agent Orange in Vietnam. At the time, Galston posited a global consensus to prohibit ecocide. It was later taken into account as an unlawful act in early editions of the Rome Statute of the International Criminal Court (ICC), along with the criminal offenses put on trial at the Nuremberg trials (war crimes, genocide, and crimes against humanity), but was finally exempted (Galston, 2001). The first world convention on ecological concerns, known as the UN Stockholm Conference, was held in 1972 to address concerns about environmental destruction (UN, 1972). Expert reports such as the International Energy Agency's "Net Zero by 2050" (IEA, 2021) serve as a warning that the clock is running faster towards the Paris Agreement's objectives, as does the IPCC's "Special Report on Global Warming of 1.5°C" (IPCC, 2021). The world leaders will emphasize the legally enforceable principles and rules for considering ecocide as a crime at the ICC at the UN Conference on Sustainable Development

to be held in Stockholm in June 2022 (Ministry of Environment Affairs, Sweden, 2022).

### 3.2.4 ECOCIDE AND ENVIRONMENTAL DEGRADATION

No other faded away human civilization has elicited as much consternation, skepticism, and speculation as to the Pacific Island of Rapa Nui (Easter Island). European explorers encountered this small segment of land almost three centuries ago in the middle of the enormous South Pacific Ocean. Its human civilization developed to a degree of social sophistication that resulted in one of the most developed societies and technical feats of Neolithic communities anywhere else on the planet. Easter Island's stone-working abilities and competency were far better compared to those of any other Polynesian culture, as was its distinct system of writing. This exceptional society grew, prospered, and persevered for possibly more than a thousand years – before collapsing and becoming extinct (Peiser, 2005). Easter Island's natives were thought to have damaged their woods, deteriorated the island's soils, obliterated their vegetation, and driven their livestock to extinction. As a result of its self-inflicted ecological destruction, its successful society crumbled, devolving into civil conflict and self-destruction (Peiser, 2005). Not surprisingly, how ecocide is another name for natural or human-caused environmental degradation was yet another most frequently used word in the academic literature on Ecocide. Table-VII provided below contains some of the key activities reported in Ecocide literature, causing environmental degradation:

<b>Ocean Damage</b>	<b>Industrial fishing</b>	One of the ways people are causing irreparable damage to seas and life under oceans is by deep-sea bottom trawling, which destroys entire ecosystems by dredging the ocean's bottom; and overharvesting of fish, which results in the extinction of several species.
	<b>Oil spills</b>	There have been numerous incidents, the greatest of which being the Deepwater Horizon oil spill in 2010, which resulted in a slick stretching more than 57,500 square miles (149,000 square kilometres) and fouling an estimated 1,100 miles (1,770 kilometres) of shoreline.
	<b>Plastic Pollution</b>	Plastic garbage makes for 80 percent of all marine litter discovered from surface water to deep-ocean sediments, and at least 14 million tonnes of plastic waste end up in the oceans every year. Marine life ingests plastic waste or becomes entangled in it, resulting in serious harm and death.
	<b>Deep sea mining</b>	This nascent mining and processing sector is sparking calls for a complete prohibition due to the effects of physical disruption and pollution in the Pacific.

<b>Deforestation</b>	<b>Industrial livestock farming</b>	Cattle ranching for beef production, as well as soy cultivation for animal feed, are the two most significant causes of Amazon deforestation.
	<b>Mineral extraction</b>	Copper, iron ore, and gold mining, as well as oil drilling, all contribute to deforestation and cause further harm to land and river systems by contaminating them.
	<b>Palm oil &amp; wood production</b>	In Indonesia and Malaysia, these are the primary causes of deforestation. In Indonesia, palm oil has pushed orangutans and other wildlife species to the verge of extinction. Palm oil plantations on a large scale have resulted in widespread worker exploitation, human rights breaches, and evictions of Indigenous and rural populations.
<b>Land &amp; water contamination</b>	<b>Oil spills</b>	Over many decades of oil exploitation, the Niger Delta has been plagued by oil spills, and it is still one of the most contaminated areas on the planet.
	<b>Mining</b>	Mining has a long history of contaminating land and water, from gold mining to mountaintop removal.
	<b>Tar sands</b>	The Athabasca tar sands in Alberta, Canada, are the largest of these activities, destroying animals, indigenous territory, and leaving scars that can be seen from space.
	<b>Fracking</b>	The toxicity of unconventional oil and gas production has been well recognised-and the impacts are cumulative. Countless Pennsylvanians who live near fracking wells experience explosions only feet from their homes, are compelled to drink contaminated tap water that is dangerous to their health, and inhale toxic vapours in the air.
	<b>Textile chemicals</b>	Wastewater from dyeing and tanning, for example, has a large contaminating impact on the textile sector.
	<b>Agricultural pollution</b>	Industrial agriculture chemicals and monocrop techniques have a significant impact on soils, river systems, and insect populations.
<b>Air pollution</b>	<b>Chemical disasters &amp; weapons</b>	There are numerous examples, the worst of which is the Bhopal gas disaster. The use of the chemical weapon Agent Orange was the first time the term "ecocide" was used.
	<b>Radioactive contamination</b>	Nuclear disasters like Chernobyl and Fukushima, as well as contamination from nuclear testing and the deployment of nuclear weapons, are prominent examples, but the oil business has recently been found to be involved as well.
	<b>Industrial emissions</b>	Our climatic system, which serves as the umbrella environment for all others, can only remain stable within certain planetary bounds, therefore the fossil fuel, agriculture, and cement sectors are all involved in the production stage.

### 3.2.5 ECOCIDE AND THE NEED FOR INTERNATIONAL LAW

Humanity and the climate are inextricably linked and mutually constitutive. The deterioration of the environment has had a considerable influence on the present generation and presents a threat to succeeding generations as well. The global health status and healthcare costs imply the need for legislative proposals to save the climate to avoid the majority of health problems. The existing national scale laws for environmental sustainability have authority over a limited geographical boundary (Mwanza, 2018). Therefore, the majority of work in the discipline puts forth the establishment of international law to protect the entire planet. Researchers believe that international law must make environmental damage a crime while also encouraging its sustainable use of resources paving way for sustainable development. The sustainable use of the environmental resources is one thing but restoring the environment to its original state is quite another (Higgins, Short, South, 2013). The need of the hour as per many studies is to make such advancements

that aid in economic growth as well as the sustainability of the environment (Lytton, 2000, Prakasa, 2021). The recognition of ecocide as an international crime was deemed as the single most potent measure because of the increased loss of biodiversity globally and the lack of reversal procedures to help make up for systemic failures, which help to emphasize that the safety of the planet must be assured on a global scale (Dunlap, 2021)

### 3.3 RQ3: A REVIEW OF LEGAL FRAMEWORKS IN THE AREA OF ECOCIDE

Environmental protection is primarily a civil matter, and where environmental offenses are described, they are typically quite precise (e.g., a certain degree of pollution in a certain context). Because the majority of the world lacks a legal plan to cope with mass widespread destruction, corporate actions tend to take the path of least opposition, able to operate most destructively in areas with the least safeguarding and merely budgeting for civil litigation. Ecocide establishes a new ethical benchmark, making anything that causes mass destruction of natural ecosystems unacceptable.

Country	Article	Ecocide Law
Georgia 1999	Article 409	Ecocide, defined as the polluting of the environment, land, and water resources, massive destruction of plants and animals, or any other activity that could have resulted in an environmental collapse, is punishable by prison ranging from eight to twenty years.
Armenia 2003	Article 394	Mass degradation of plants and animals, contaminating the climate, soils, or water supplies, and other actions that cause an ecological disaster are punishable with imprisonment for 10 to 15 years.
Ukraine 2001	Article 441	Mass degradation of plants and animals, contaminating the climate, soils, or water supplies, and other actions that cause an ecological disaster are punishable with imprisonment for 10 to 15 years.
Belarus 1999	Article 131	Deliberate mass degradation of plants or animals, or contaminating of earth's atmosphere (air, soil and water), or pursual of other conscious choices likely to cause an ecological disaster (ecocide), shall be punishable by prison for ten to fifteen years.
Ecuador 2008 (Constitutional), and 2014 (Criminal Code)	Article 71	While Ecuador doesn't really lawfully use the term "ecocide," any deliberate destruction to the climate during war or peace is a punishable crime, and the nation is the first in the world to make Environment a subject of powerful constitutional protections and assurances. "Nature or Mother Earth, where life takes place and propagates, has the right of comprehensive respect of her existence, as well as the upkeep and renewal of her vital cycles," according to Article 71 of the Law.
Kazakhstan 1997	Article 161	Global extinction of plants and animals, pollution of the environment, land, or water, and other actions that have induced or may cause an ecological disaster will be penalised by deprivation of freedom for a time frame of ten to fifteen years.
Kyrgyzstan 1997	Article 374	Massive destruction of animal or plant kingdoms, polluting of the environment or water supplies, as well as the committing of other acts likely to cause an environmental catastrophe, shall be guilty by a 12- to 20-year sentence of deprivation of freedom.
Republic of Moldova 2002	Article 136	Deliberate mass degradation of plants or animals, or contaminating of earth's atmosphere (air, soil and water), or pursual of other conscious choices likely to cause an ecological disaster (ecocide), shall be punishable by prison for ten to fifteen years.
Russian Federation 1996	Article 358	Massive destruction of animal or plant kingdoms, polluting of the environment or water supplies, as well as the committing of other acts likely to cause an environmental catastrophe, shall be guilty by a 12- to 20-year sentence of deprivation of freedom.
Tajikistan 1998	Article 400	Mass degradation of plants and animals, contaminating the climate, soils, or water supplies, and other actions that cause an ecological disaster are punishable with imprisonment for 10 to 15 years.
Vietnam 1990	Article 342	Those who engage in acts of widespread annihilation in a particular area, decimate their means of income, undermine a country's culture and traditions, fundamentally alter the foundations of a society with the intent of subverting it, as well as other mass atrocities or ecocide or ruining the ecological landscape, shall be convicted to between ten and twenty years in prison, life in prison, or death penalty.

### 3.4 RQ4: IDENTIFICATION OF FUTURE AREAS OF RESEARCH IN THE DOMAIN OF ECOCIDE

To achieve this outcome, Biblioshiny was used as a bibliometric tool. Biblioshiny is an open and free tool for conducting quantitative research in scientometrics and bibliometrics.

It supports all major bibliometric analytical techniques. In terms of the conceptual model, Biblioshiny employs the thematic map to denote the study's conceptual framework. This latter method employs a word co-occurrence matrix analysis to describe what existing literature is discussing in a given field, as well as key themes and patterns.

Thematic map (Caust and Vecco, 2017) enables the visualization of four distinct thematic classifications, as illustrated in Figure 3 based on high and low density and centrality. While high density represents the themes depicting the depth of literature dedicated to a specific domain of study (low density depicting lesser focused themes), high centrality represents themes most pertinent to the field of study (low centrality depicting less relevant themes). Further, thematic maps make use of the 'KeyWords Plus' field as an analytical unit. Scopus editorial specialists equate these keywords with the assistance of a semi-automated algorithm. They review the titles of all references and highlight additional pertinent but unmentioned keywords that the authors did not include. The Keywords Plus field, in contrast to the authors' keywords, is normalized. Keywords Plus terms are more capable of capturing the depth, intensity, and variety of a content of a publication. The motor concepts are depicted in the upper-right quadrant. They are defined by a high degree of centrality and density. One of the evolved "motor themes" in the literature, it was discovered that the significant area of focus in the extant literature is ecocide and climate change, as well as eco-anxiety.

Naturally, the analysis's central theme was found to be climate change due to ecocide. This theme was associated with a variety of concepts, including environmental degradation and eco-anxiety to name a few. The term "Environmental degradation" refers to environmental damage that occurs when natural resources such as air, water, and soil are depleted; ecosystems are destroyed; habitats are eviscerated; wildlife is extirpated, and pollution increases unexpectedly. It is described as any alteration or disruption to the climate that is deemed detrimental or unacceptable. Environmental destruction and climate change have risen to the top of global concerns, with findings of Emissions of CO<sub>2</sub> reaching historic levels in 2020, 178 million hectares of forests – as big as about the size of Libya – being compromised since 1990, and oil wells erupting, seeping into the sea, and wreaking havoc on coastal cities (while beneath, 70% of the planet's coral reefs are threatened). More topsoil erosion, drought, wildfires, and flooding are all anticipated – at least according to the sizable percentage of the 1.2 million survey participants surveyed by the United Nations Development Program who believe climate change is a worldwide crisis. And this is only pollution during the peace.

Apart from the apparent destruction caused by dispute, War Junk – weapons and ammunition materials such as minefields, cluster bombs, and chemical and radioactive armaments – also leaves environmental traces post-conflict, limiting farmland use and contaminating water and soil sources with explosives and lethal contaminants such as TNT, adamite and mustard gas, to name a few (Opiniojuris.org, 2021). An associated theme represents a plethora of literature focusing upon climate change in Amazon due to ecocide. The scientists claim that forest and habitat destruction and climate change have wreaked havoc

on the forest in the Amazon's southeast area. Temperatures in this region have risen by 3.07C in the two warmest months of the year – equivalent to the rise witnessed in the Arctic region and thrice the global average (bbc.com, 2021). A closely related concept found as a central theme was eco-anxiety. Eco-anxiety is a concern about environmental degradation or ecosystem collapse. This anxiety is motivated primarily by the state of the environment in the present and anticipated future, as well as a human activity, caused by climate change. According to a 2018 national survey, 70% of Americans were concerned about climate change, and approximately 51% feel anxious about their future (medicalnewstoday.com, 2021).

Concerning the upper-left quadrant, it shows high-density themes but unimportant external links and so are of only limited importance for the field (low centrality). In this quadrant, no pertinent themes were deciphered.

In the lower-left quadrant are the emerging or declining themes. The theme of the need for establishing ‘Environmental law’ that sets the premise for criminalizing the ecocide was witnessed as a major theme. It is interesting to notice that one of the most emerging themes in Ecocide literature currently getting the most traction is the work revolving around having an international environmental law that criminalizes the people/organizations responsible for Ecocide. The deterioration of the environment has had a considerable influence on the present generation and presents a threat to succeeding generations as well. The global health status and healthcare costs imply the need for legislative proposals to save the climate to avoid the majority of health problems. The existing national scale laws for environmental sustainability have authority over a limited geographical boundary (Mwanza, 2018). Therefore, the majority of work in the discipline puts forth the establishment of international law to protect the entire planet. Researchers believe that international law must make environmental damage a crime while also encouraging its sustainable use of resources paving way for sustainable development. This area is one of the most emerging themes in ecocide literature.

At last, the lower-right quadrant highlights fundamental and transversal themes. These themes address broad issues that populate the fields of scholarly interests. The capitalist system and colonialism as a cause of ecocide, ecocide as a form of genocide, and green criminology were prominent themes in this area, to name a few.

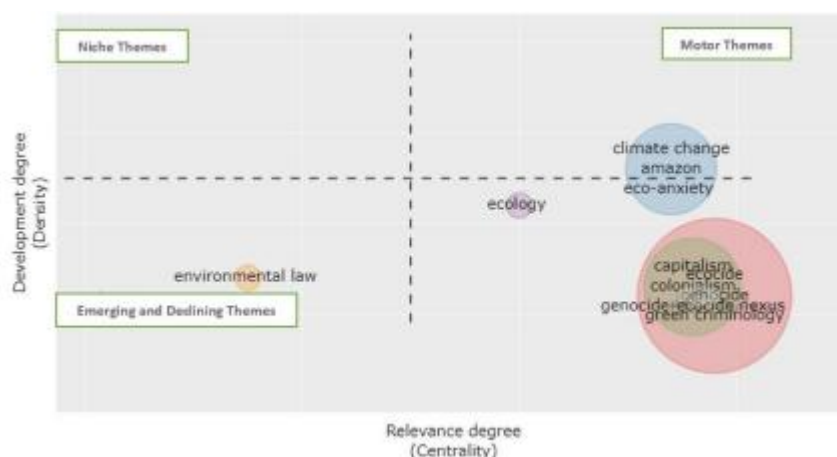


Figure 4: Thematic Map (Source: Biblioshiny)



Bibliometric analysis of 111 publications published between 1990 to 2022 and focusing upon the extant literature revealed that the University of London, University of Oslo, University of Tasmania, Medawar Institute of Medical and Environmental Research, and University of Essex were some of the universities associated with the highest number of publications (26 percent) highlighting various aspects of Ecocide. United States (with 30 publications and 189 citations) and the United Kingdom (with 21 publications and 226 citations) were the two most productive nations followed by Australia (14 publications, 55 citations), Norway (7 publications and 18 citations), and Netherlands (3 publications and 18 citations) in ecocide literature.

Most prolific writers namely Rob White, Damien Short, Nigel South, Martin Crook, and Alexander Dunlap were identified to be from 3 nations namely the United Kingdom, Australia, and Norway (based on several publications and citations). There was a total of 15 unique publications (4 publications shared between authors as co-author) by these writers. These top five writers' 15 unique publications were cited 307 times. Rob White, in his research on Ecocide, examines climate change-related criminal activities through a criminological lens. Damien Short's work revolves around explaining how Ecocide is another form of Genocide. Nigel South's idea argues that the notion of ecocide represents a robust tool in the perspective of this special issue mirroring the implementation of environmental criminology. Martin Crook's work aims to contribute to an evolving "ecological turn" in genocide research by putting the material "extra-human environment" at the heart of the biological and social integrity of communities like indigenous people and territorially reliant place-based communities. Alexander Dunlap's mainstream work examines wind energy progress in Mexico, coal exploration in Germany, and copper extraction in Peru to help bolster the post-liberal or institutional approach to ecocide-driven genocide research.

The bibliometric analysis also showed that the International Journal of Human Rights published 6 documents with 219 citations followed by Critical Criminology, Journal of Genocide Research and Environmental Ethics with 2, 5, and 2 documents with 73, 37, and 2 citations respectively. Keyword co-occurrence analysis revealed the most commonly occurring themes in the selected 111 publications. This allowed an understanding of various aspects of ecocide covered in extant literature so far. Ecocide paving the way for genocide, ecocide as a key driver of climate change and environmental degradation, Criminalizing Ecocide, and international law governing Ecocide were some of the major themes identified in the keyword occurrence

#### **4.0. CONCLUSION**

Bibliometric analysis of 111 publications published between 1990 to 2021 and focusing upon the extant literature revealed that the University of London, University of Oslo, University of Tasmania, Medawar Institute of Medical and Environmental Research, and University of Essex were some of the

universities associated with the highest number of publications (26 percent) highlighting various aspects of Ecocide. United States (with 30 publications and 189 citations) and the United Kingdom (with 21 publications and 226 citations) were the two most productive nations followed by Australia (14 publications, 55 citations), Norway (7 publications and 18 citations), and the Netherlands (3 publications and 18 citations) in ecocide literature.

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constitutive. The deterioration of the environment has had a considerable influence on the present generation and presents a threat to succeeding generations as well. The global health status and healthcare costs imply the need for legislative proposals to save the climate to avoid the majority of health problems. The existing national scale laws for environmental sustainability have authority over a limited geographical boundary (Mwanza, 2018). Therefore, the majority of work in the discipline puts forth the establishment of international law to protect the entire planet. Researchers believe that international law must make environmental damage a crime while also encouraging its sustainable use of resources paving way for sustainable development.

The study also deciphered future research areas using thematic maps in Biblioshiny (a bibliometric tool). The theme of the need for establishing 'Environmental law' that sets the premise for criminalizing the ecocide was witnessed as a major theme. It is interesting to notice that one of the most emerging themes in Ecocide literature currently getting the most traction is the work revolving around having an international environmental law that criminalizes the people/organizations responsible for Ecocide.

## **5.0. LIMITATIONS OF THE STUDY**

The research attempted to minimize the shortcomings in its approach, yet this work has limitations that provide opportunities for future research. The study concentrates on obtaining papers from the Scopus that were published from 1990 to 2021 that ignored books, chapters, conference proceedings, and notes making this study not completely bias-free. Moreover, there are other databases such as WOS that include rich content on ecocide. Future studies might involve bibliometric analysis from such databases along with Scopus to increase the depth and coverage of extant literature.

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