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GRASSROOTS JOURNALS

Volume 05 Issue 01
(April 2025)

Main Indexing:
SCOPUS, HEIN, EBSCO

Journal of ENVIRONMENTAL LAW & POLICY

Frequency: Tiannual Language: English DOI: 10.33002/jelp ISSN: 2564-016X



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The Grassroots Institute | Canada

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JOURNAL OF ENVIRONMENTAL LAW & POLICY
ISSN 2564-016X | 05(01) ● April 2025
www.grassrootsjournals.org/jelp

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Montreal, Quebec
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In Partnership with:
Asia Pacific Academy of Sciences Pte Ltd.
73 Upper Paya Lebar Road #07-02B
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ISSN 2564-016X | 05(01) ● April 2025
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TABLE OF CONTENTS

M-00531	**LITIGATING INDUSTRIAL AIR POLLUTION IN THE NETHERLANDS: THE IMPACT OF THE EUROPEAN COURT OF HUMAN RIGHTS** By *Jaike Josephine Louise Wolfkamp, Mia Swart*	**1-36**
M-00532	**ENVIRONMENTAL AND LEGAL FRAMEWORK FOR IMPLEMENTING THE CONCEPT OF SUSTAINABLE DEVELOPMENT IN THE POLICY OF THE EU AND UKRAINE** By *Yevhenii Suietnov, Viktoriia Bredikhina, Olena Lozo, Elbis Tulina, Olena Malokhlib*	**37-69**
M-00533	**NIAGARA-ON-THE-LAKE SUES QUARRY OWNER OVER ALLEGED ENVIRONMENTAL VIOLATIONS: POTENTIAL IMPACTS ON LOCAL PROPERTY OWNERS** By *Tony Sevelka*	**70-86**
M-00534	**THE RIGHTS OF NATURE MOVEMENT: LEGAL, CULTURAL, AND POLICY CHALLENGES IN IMPLEMENTING ECO-CENTRIC LAWS** By *Rawnak Miraj Ul Azam, Syeda Afroza Zerin, Fahim Faisal Khan Alabi*	**87-116**
M-00535	**TOWARDS AN EFFICIENT E-WASTE MANAGEMENT REGIME IN NIGERIA** By *Sylvanus Gbendazhi Barnabas*	**117-147**
M-00536	**GAS FLARING IN NIGERIA'S NIGER DELTA: LEGAL CHALLENGES AND LESSONS FROM NORWAY'S REGULATORY FRAMEWORK** By *Jenigho Philip Esavwede, Ufuoma Garvin Oyibodoro*	**148-166**
M-00537	**THE LEGAL ECOLOGY OF PANDEMIC PREVENTION: AN EXAMINATION OF ECO-CENTRIC ZONING AND WILDLIFE PRESERVATION STRATEGIES FOR REDUCING ZOONOTIC SPILLOVER RISK** By *Rawnak Miraj Ul Azam, Muzahidul Islam, Ashiqur Rahman*	**167-200**

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M-00538	**ADDRESSING THE IMPACT OF ENVIRONMENTAL DISPLACEMENTS OF PERSONS IN AFRICA BY OPERATIONALIZING SUSTAINABLE DEVELOPMENT GOALS AND AFRICAN AGENDA 2063** By *Ijeoma Anozie, Izuoma Egeruoh-Adindu, Fatima Bello*	**201-228**
M-00539	**CONTRACTUAL BASIS OF MINE ACTION AS A COMPONENT OF THE RESTORATION OF UKRAINE'S NATURAL RESOURCE POTENTIAL** By *Hanna Anisimova, Olha Donets, Anton Donets, Kyrylo Anisimov, Hasrat Arjjumend*	**229-257**
M-00540	**NORMS AND CHALLENGES IN THE GLOBAL MOVEMENT OF E-WASTE** By *Nivedita Chaudhary*	**258-289**
M-00541	**REVIEW OF LEGAL SUPPORT OF CLIMATE CHANGE ADAPTATION MECHANISMS** By *Anna Liubchych, Olena Savchuk, Oleksii Onishchenko*	**290-312**

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Main Indexing: SCOPUS, EBSCO, HEIN ONLINE

ISSN 2564-016X | April 2025

M – 00531 | Analytical Article | Open Access

LITIGATING INDUSTRIAL AIR POLLUTION IN THE NETHERLANDS: THE IMPACT OF THE EUROPEAN COURT OF HUMAN RIGHTS

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Received: 18 January 2025 | **Reviewed:** 24 February 2025 | **Revised:** 10 March 2025
Accepted: 13 March 2025 | **Published:** 14 April 2025

ABSTRACT

This article will focus on how the development of the European Human Rights Convention (ECHR) by the European Court of Human Rights (ECtHR) prompted Dutch environmental movements and citizens to rely on the ECHR to reduce industrial air pollution. It will further examine the decisive role of human rights in legal proceedings concerning industrial air pollution between environmental movements and affected individuals and the State and/or business entities. The impact of the developing case law by the ECtHR on Dutch cases such as the *Air Quality* cases, the *Urgenda* case and the *Shell* cases will be considered. This article will consider the effects of changing public opinion and scientific developments to understand the changing role of the ECHR in the Netherlands.

Keywords: Industrial air pollution; European Court of Human Rights; Public Opinion; The Netherlands; Health

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How to cite this paper: Jaike Josephine Louise Wolfkamp and Mia Swart, 'Litigating Industrial Air Pollution in the Netherlands: The Impact of the European Court of Human Rights' (2025) 05 (01) Journal of Environmental Law & Policy 1-36, <https://doi.org/10.33002/jelp050101>

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Litigating Industrial Air Pollution in the Netherlands: The Impact of the European Court of Human Rights

1. INTRODUCTION

Industrial air pollution is once again in the spotlight in the Netherlands. The graphite rains of 2018 and 2019 on the area surrounding Tata Steel Nederland (TSN), a steel plant in IJmuiden, have caused great unrest among local residents and caught continuous media attention.[1] TSN is the largest industrial air polluter in the Netherlands.[2] The media reported extensively on actions by local residents and environmental organizations, e.g., the installation of webcams recording pollution.[3] The media has further reported on incomplete permit applications by Chemours, a chemical plant in Dordrecht, and the current court case regarding penalty payments for polluting incidents.[4] As a result of these publications and public opinion, pressure on the government and industrial air polluters has increased.[5]

In recent decades, scientific developments have led to the establishment of a causal link between industrial air pollution and negative health problems.[6] As a result, many debates have taken place in the Dutch House of Representatives on the best strategies to reduce emissions and its negative consequences and how the costs of the measures should be balanced with other societal interests. Positioning advocacy against industrial air pollution within a human rights framework is not the obvious solution, as no human right to live in a clean and healthy environment is included in the wording of the ECHR, or the Dutch Constitution. Surprisingly, the use of legal proceedings to fight climate change is a new development in the Netherlands. The litigation route has been successful in the *Urgenda* case,[7] which was based on the ECHR and forced the Netherlands to reduce its CO_2 emissions by at least 25% by 2020. Since the *Urgenda* case, environmental movements and individuals have instigated other legal proceedings to fight climate change and to reduce industrial air pollution based on the ECHR. For example, in the *Shell I c*ase, environmental organizations and individuals

1 Veiligheid Ovd, "Industrie en omwonenden: Onderzoeksraad voor de Veiligheid", (2023); NOS, "Honderden klimaatactivisten op terrein Tata Steel in Velsen-Noord Hilversums: Nederlandse Omroep Stichting", (2023) <https://nos.nl/artikel/2476011-publiek-kan-zelf-uitstoot-tata-steel-in-de-gaten-houden-met-webcams>.

2 NEA, 'Emissiecijfers 2021-2022 Den Haag: Nederlandse Emissieautoriteit', (2024) <https://www.emissieautoriteit.nl/documenten/publicatie/2022/04/14/emissiecijfers-2021>.

3 NOS, 'Honderden klimaatactivisten op terrein Tata Steel in Velsen-Noord Hilversums: Nederlandse Omroep Stichting', (2023) <https://nos.nl/artikel/2476011-publiek-kan-zelf-uitstoot-tata-steel-in-de-gaten-houden-met-webcams>.

4 Economieredactie, 'Chemours doet weer incomplete vergunningsaanvraag voor meer pfas-uitstoot', (2024) NUnl.

5 Kraan, J., "Zaak over milieuboetes Tata Steel kan grote gevolgen hebben voor vergroening" (2024) NUnl.

6 See the report of the Dutch National Institute for Public Health and the Environment ("RIVM") of 2023 on the negative health effects of emissions: Geelen, L., Bogers, R., Elberse, J., Houthijs, D., Montforts, M., Schuijff, M., et al., "De bijdrage van Tata Steel Nederland aan de gezondheidsrisico's van omwonenden en de kwaliteit van hun leefomgeving." (The contribution of Tata Steel to the health risks of local residents and the quality of their surroundings), (2023) Rijksinstituut voor Volksgezondheid en Milieu RIVM.

7 *The State of the Netherlands v Stichting Urgenda*, 20 December 2019, ECLI:NL: HR:2019:2007 [English translation] ('Urgenda').

have tried to force Shell to reduce its CO_2 emissions by 45%.[8] The proceedings were based on the unwritten standard of care of Art. 6:162 of the Dutch Civil Code, which was interpreted by using Art. 2 and 8 ECHR and the UNGP amongst other international (soft) law instruments.

This article will focus on the extent to which the development of the European Convention on Human Rights (ECHR) by the European Court of Human Rights (ECtHR) prompted Dutch environmental movements and citizens to rely on the ECHR to reduce industrial air pollution. It will further examine the decisive role of human rights in legal proceedings concerning industrial air pollution. The article will consider the effects of changing public opinion and scientific developments to understand the changing role of the ECHR in the Netherlands. This article will focus on Art. 2 and 8 of the ECHR and the related case law of the ECtHR.

2. PUBLIC OPINION AND SCIENTIFIC DEVELOPMENTS AS PART OF THE ECHR

The articles of the ECHR have an open formulation and need interpretation before the ECHR can be applied.[9] The ECtHR has concluded that the ECHR is a living instrument and must be interpreted "in the light of present-day conditions".[10] This interpretation method includes new developments and developing standards under international law, the current European consensus within the majority of the member states, and emerging trends,[11] and is limited by the duty of the ECtHR to assess the values embodied in a disputed right in good faith and maintain consistency in its case law.[12] Despite recurring discussions concerning the perceived anti-democratic features of the living instrument doctrine, the member states of the ECHR ("Member States") have accepted this doctrine by agreeing to the text of Art. 46 of the ECHR after *Tyrer v. United Kingdom*.[13] Due to the living instrument doctrine, the open wording of the articles of the ECHR, and the fact that many Member States have used the ECHR as the cornerstone for their constitutional rights, the text of the substantive articles of the ECHR was not needed to be changed.[14] This doctrine brings the scope of the ECHR in

8 *Vereniging Milieudefensie and Others v. Shell*, ECLI: NL: RBDHA: 2021:5339 [English translation] ('*Shell 1*').

9 Theil, S., "Is the 'Living Instrument' Approach of the European Court of Human Rights Compatible with the ECHR and International Law?" (2017) 23 (3) European Public Law 587-614 at 493.

10 *Tyrer v. United Kingdom*, App. No. 5856/72, A/26, European Court of Human Rights, 25 April 1978, para 31.

11 ECtHR, "The Convention as a Living Instrument at 70". In: Judicial Seminar 2020 BD, editor. (Strassbourg: ECtHR, 2020).

12 Letsas, G., "The ECHR as a living instrument: its meaning and legitimacy". In: A. Føllesdal, B. Peters, G Ulfstein editors. *Constituting Europe: The European Court of Human Rights in a National, European and Global Context. Studies on Human Rights Conventions*. (Cambridge: Cambridge University Press, 2013 at 2).

13 Villiger, M. E., *Handbook on the European Convention on Human Rights*. (Brill, Nijhoff, 2022).

14 Ibid; Ibid, n.11.

line with the times.[15] Due to social and technological developments, these values embodied by the rights change over time.[16] These developments include changing public opinion toward industrial air pollution and scientific developments concerning industrial air pollution.

Even though the living instrument doctrine has widened the scope of the ECHR, the primary protection of fundamental rights lies within the Member States. The ECHR is the subsidiary layer of protection for individuals against the Member States.[17] The ECHR is the minimum standard, and if domestic law offers higher protection to the individual, this higher standard will be applied by the ECtHR.[18] Subsidiarity forms the basis of the concepts of 'margin of appreciation' and 'fair balance'. The margin of appreciation gives States the freedom to implement the ECHR in line with their legal requirements and domestic circumstances while considering the fair balance between the interests of the community and those of the individuals.[19] The ECtHR has not given the Member States a model along which a fair balance must be struck.[20] In the case of Art. 2(2) and Art. 8(2) of the ECHR, fair balance is included in the wording of the articles. Measures taken by the authorities to advance public interests must be proportionate to the restriction of the rights of the individuals.[21]

From the wording of Art. 2 and Art. 8 of the ECHR, negative obligations can be distilled, i.e., the Member States must not interfere with these rights or exercise restraint when interference is justifiable. The ECtHR has found that positive obligations exist where the Member States must guarantee negative obligations, or prevent breaches of ECHR rights between individuals, for instance by implementing legislation that regulates the situation between individuals.[22] Thus, these positive obligations can have an indirect third-party effect. The principles applied when determining whether an infringement is justified or when a positive obligation exists are broadly similar. The main question is whether the Member State has struck a fair balance between individual and community interests within its margin of appreciation.[23]

In the 1980s, cases were brought before the ECtHR regarding noise emissions and vibrations from airports in the United Kingdom. In *Powel and*

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15 Letsas, G., "ECHR as a living instrument: its meaning and legitimacy" in: Føllesdal A, Peters B, Ulfstein G, editors. *Constituting Europe: The European Court of Human Rights in a National, European and Global Context. Studies on Human Rights Conventions*. (Cambridge: Cambridge University Press, 2013), p. 106-41.

16 Theil, S., "Is the 'Living Instrument' Approach of the European Court of Human Rights Compatible with the ECHR and International Law?" (2017) 23 (3) European Public Law 587-614.

17 *X and Y v. the Netherlands*, App. no. 8978/80, European Court of Human Rights, 26 March 1985, para 29.

18 Ibid, n.13

19 *Sporrong and Lönnroth v. Sweden* para 69; Ibid n.13, pp. 193-194.

20 Çalı, B., "The Balancing Test: European Court of Human Rights", *Max Planck Encyclopedia of International Law*. (Oxford: Oxford Public International Law, 2018).

21 Ibid.

22 *X and Y v. The Netherlands*, 26 March 1985, para 23.

23 *Powell and Rayner v. The United Kingdom*, 21 February 1990, para 41; *Fadeyeva v. Russia*, 9 June 2005, para 94; Ibid, n.13.

Rayner v. The United Kingdom,[24] the ECtHR confirmed noise could constitute violations under Art. 8 of the ECHR, and positive obligations could rest on the Member State, which had to strike a fair balance and a certain margin of appreciation to ensure compliance with the ECHR. In this case both parties agreed that a negative impact on the environment cannot be avoided when running an international airport.[25] The ECtHR did not request proof of health detriments from the applicants, implying a violation does not need to be based on such proof in this case.[26]

This case and similar cases allowed individual applicants to defend their rights in cases of noise under Art. 8 of the ECHR and opened the possibility of defending their rights in cases of industrial air pollution and other environmental problems. Significantly, air pollution is not part of the text of the ECHR and there is no right to a clean and quiet environment.[27] The admissibility was based on the newly developed European consensus on environmental issues amongst the Member States, as the ECtHR concluded in *Fredin v. Sweden (No. 1)*: "In today's society the protection of the environment is an increasingly important consideration".[28] Since then, the responsibility of the Member States for environmental problems has been established by the ECtHR based on Art. 2 and 8 of the ECHR and takes many forms.[29]

3. SCIENTIFIC DEVELOPMENTS AND CONSENSUS IN PUBLIC OPINION

The judgments of the ECtHR interpreting protection against industrial air pollution in the text of Art. 2 and Art. 8 of the ECHR based on the living instrument doctrine reflect the increased scientific knowledge and changes in public opinion on this topic. The first cases occurred around the same time the Intergovernmental Panel on Climate Change (IPCC) presented its first report. Since then, environmental issues have remained firmly on the political agenda in The Netherlands. The development of standardization of measurements and methodologies made it possible to work with complex models concerning industrial air pollution. These models were the basis for legislation and European Union (EU) Directives containing clear standards for business entities causing industrial air pollution.[30] These form the basis

[24] Para 40-41.
[25] *Powel and Rayner v. The United Kingdom*, App no. 9310/81, European Court of Human Rights, 21 February 1990, para 42.
[26] Theil, S., *Towards the Environmental Minimum: Environmental Protection through Human Rights*. (Cambridge: Cambridge University Press, 2021 at 138).
[27] *Hatton and Others v. The United Kingdom* App no. 36022/97, European Court of Human Rights, 8 July 2003, para. 96.
[28] Ibid, para 48.
[29] Pedersen, O. W., "The European Court of Human Rights and International Environmental Law" In: J.H Knox, R. Pejan, editors. *The Human Right to a Healthy Environment*. (Cambridge UK: Cambridge University Press, 2018), p. 86-96 at 86.
[30] Miller, C. A., "Fifty years of EPA science for air quality management and control", (2021) 67 Environmental Management 1017-28.

of the minimum standard for the Member States under the ECHR. Further, global epidemiological research has proven the connection between health problems and industrial air pollution. For instance, it was shown that particulate matter (PM) caused high levels of mortality and morbidity, and there are no safe thresholds for PM.[31] This epidemiological research has influenced the case law of the ECtHR as set out below.

Scientific developments, in combination with Dutch and EU legislation, resulted in significantly improved air quality in the Netherlands by the 2000s[32] (see Figure 1). However, the overall problem of industrial air pollution was not solved and new problems, like PM, had been discovered. People in the Netherlands started to feel powerless due to the enormity and global scale of the problems, grew accustomed to their existence, and averted their attention to problems they found more pressing and solvable, resulting in temporary lapses in active interest in these problems.[33] Despite these reservations, a third of the Dutch population were members of an environmental organization by 1995, however, only 5% were willing to take part in demonstrations.[34] Since being sponsored by the public, environmental organizations became increasingly institutionalized and worked together intensively on the international level.[35]

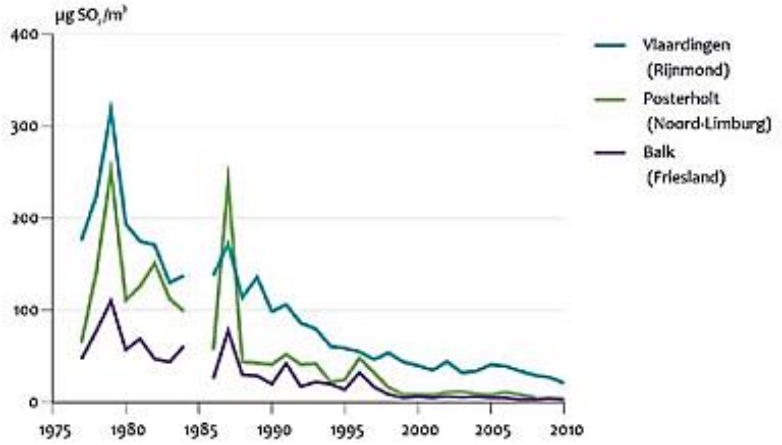


Figure 1: SO_2; 98-percentile of daily mean concentrations. This graphic shows the occurrence of peak concentrations of SO_2 (Buijsman, 2012, p. 27)[36]

[31] Kelly, F. J. & Buijsman, E., "Smog de maat genomen. Een terugblik op smog in Nederland, 1960-2010", (2012) 2 Lucht.

[32] Ibid.

[33] Nas, M., "Duurzaam milieu, vergankelijke aandacht: Een onderzoek naar meningen, media en milieu" (Den Haag: Sociaal en Cultureel Planbureau, 2000).

[34] Nas, M., Dekker, P. & Hemmers, C., "Maatschappelijke organisaties, publieke opinie en milieu 9Social organization, public opinion and the environment)" (Rijswijk: Sociaal en Cultureel Planbureau (SCP), 1997).

[35] Van der Heijden, H. A., "De milieubeweging in de twintigste eeuw. Belgisch Tijdschrift voor Nieuwste Gechiedenis (The environmental movement in the twentieth century)", (2004) 3 Belgian Journal of Contemporary History 445-83.

[36] Buijsman, E., 'Smog de maat genomen. Een terugblik op smog in Nederland, 1960-2010' (2012) 2 Lucht. <https://doi.org/10.13140/RG.2.2.28597.93922>.

As scientific knowledge of the complexity of the problems grew the public started detaching from these problems since it seemed one needed to have scientific expertise to understand and comment on the problems.[37] In the 2000s, the focus of environmental organizations and public opinion transferred to the responsibilities of business entities for the whole production chain. In 2007, the government and the business community entered into a covenant to reduce CO_2 emissions by 30% by 2020. There were high hopes for a third industrial revolution and a circular economy[38] which so far has not materialized. Additionally, pressure on business entities, like TSN, grew due to media efforts. The current affairs program 'Zembla' highlighted the negative effects of industrial air pollution by TSN. In response, the Rijksinstituut voor Volksgezondheid en Milieu (RIVM) (National Institute for Public Health and Environment) was commissioned by parliament to conduct research. However, the RIVM concluded that only negligible negative health effects of TSN's emissions were observed in its report in 2009.[39] This ambiguity by the public regarding environmental problems becomes clear in the very low number of cases addressing this issue and the low number of cases in the Netherlands that have applied Art. 2 and Art. 8 the ECHR.

4. THE RIGHT TO LIFE AND THE RIGHT TO RESPECT FOR PRIVATE AND FAMILY LIFE

The fast-paced scientific developments and the concerns in public opinion in Europe on industrial air pollution are reflected in the case law of the ECtHR. The ECtHR has determined industrial air pollution may infringe on Art. 2 of the ECHR and Art. 8 of the ECHR if the industrial air pollution interferes with the human rights of individuals. Industrial air pollution might interfere with substantive rights, e.g., life-threatening toxic emissions occur, or procedural rights, e.g. the right to information about such emissions is not adhered to.[40] The Member States are prohibited from interfering with the right to life based on Art. 2 (1) of the ECHR unless they can justify this interference based on Art. 2 (2) of the ECHR. Apart from this negative obligation, the ECtHR has determined that positive obligations to prevent infringements of the right to life rest on the Member States based on Art. 2

[37] Lintsen, H., & Veraart, F., "The Tensions between Well-Being and Sustainability. Well-being and Sustainability Around 2010" in: H. Lintsen, F. Veraart, J-P. Smits, J. Grin, editors. *Well-being, Sustainability and Social Development: The Netherlands* 1850–2050. (Cham: Springer International Publishing, 2018, p. 459-79).

[38] Ibid.

[39] Schols, E., "De invloed van Corus op de luchtkwaliteit in de leefomgeving". Deelrapport 1 in de reeks rapporten over de invloed van uitstoot van Corus op de omgeving (The impact of Corus on the air quality in the living environment. Part report 1 in the series of reports on the impact of Corus emissions on the environment). (Bilthoven: RIVM, 2009). <https://www.rivm.nl/bibliotheek/rapporten/609021079.pdf>.

[40] Council of Europe, *Guide to the case-law of the European Court of Human Rights*. Environment. (Strassbourg: Council of Europe, 2022).

(1) of the ECHR.[41] To invoke this article, individual applicants must prove that lives have been lost or a serious, immediate threat to life exists. This threshold is so high that there is limited case law on this topic. If this threshold cannot be met, Art. 8 of the ECHR might be applicable.[42] Based on Art. 8 (1) of the ECHR, Member States are prohibited from interfering with the right to respect for private and family life, the home, and correspondence unless this interference can be justified based on Art. 8 (2) of the ECHR. Similar to the situation with Art. 2 of the ECHR, positive obligations may rest on the Member States.[43] Not every occurrence of industrial air pollution leads to an infringement of Art. 8 of the ECHR. It depends on the specific circumstances of the case and the severity of the nuisance.

4.1 Interference with Art. 2 and 8 of the ECHR

The ECtHR will find an interference with Art. 2 of the ECHR in the event of loss of life, or the real and immediate risk to lives, caused by dangerous activities conducted by the state itself or third parties on its territory.[44] Industrial activities are qualified as dangerous activities, e.g. nuclear testing,[45] or the operation of a municipal waste site.[46] Potential radiation exposure was claimed to be a threat to life and thus an infringement on the right to life in *L.C.B. v. The United Kingdom*.[47] A methane explosion resulting in a landslide causing the deaths of the applicant's family was found to be a violation of Art. 2 of the ECHR in *Öneryıldız v. Turkey*.[48] Thus, the threshold for interference under Art. 2 of the ECHR is high, requiring a higher intensity of air pollution to be present. Scientific development influences what is considered intense air pollution.

When the threshold of Art. 2 of the ECHR cannot be met, Art. 8 of the ECHR can be invoked. The first successful case for Art. 8 of the ECHR based on industrial air pollution was *López Ostra v. Spain*.[49] An interference with Art. 8 of the ECHR requires a serious nuisance that impairs the quality of life or the enjoyment of the applicant's home. For Art. 8 of the ECHR to be invoked, it is not necessary to prove severe environmental pollution seriously endangered the health of the applicants, instead, it suffices that an individual's quality of life was significantly impacted.[50]A serious nuisance must exceed a minimum threshold of adverse effects based on the case's

41 *L.C.B. v. The United Kingdom* App no. 14/1997/798/1001, European Court of Human Rights, 9 June 1998, para 36.
42 Theil, S., *Towards the Environmental Minimum: Environmental Protection through Human Rights.* (Cambridge: Cambridge University Press, 2021 at 132).
43 *López Ostra v. Spain* App no. 16798/90, European Court of Human Rights, 9 December 1994, para 51.
44 *L.C.B. v. The United Kingdom* para 36; *Öneryıldız v. Turkey* App no. 48939/99, European Court of Human Rights, 30 November 2004, para 71.
45 *L.C.B. v. The United Kingdom* para 24.
46 *Öneryıldız v. Turkey* paras 60, 71.
47 *L.C.B. v. The United Kingdom* para 28.
48 *Öneryıldız v. Turkey* para 70.
49 *López Ostra v. Spain*, App. No. 16798/90, European Court of Human Rights. 9 December 1994.
50 *López Ostra v. Spain* para 51

specific circumstances, "the intensity and duration of the nuisance, and its physical or mental effects".[51] A serious nuisance can be caused by smells, noise, and emissions.[52] A physical breach of the home is not required, emissions suffice.[53] Due to scientific progress, e.g. on the effects of industrial air pollution, and societal change, e.g. acceptance of mental problems caused by industrial air pollution, the same constellation of facts might be seen as an infringement at a later date, making this a very dynamic area of the law.

Under Art. 8 of the ECHR, industrial activities are dangerous activities, however for an infringement to occur, the applicant's home, family, or private life must be directly affected.[54] An infringement might be justified by the Member States under Art. 8 (2) ECHR if the interference complied with the law, served a legitimate aim, e.g. the economic well-being of the country, or was necessary.[55]

4.2 Causality between Industrial Air Pollution and the Infringement on the Rights

Especially important is the answer to the question about the causality between industrial air pollution and the specific infringements on the rights of the applicants.[56] The ECtHR requires the applicants to prove the close link between the industrial air pollution and the infringement of rights beyond a reasonable doubt.[57] This proof of causality relies on trustworthy scientific evidence, the content of which may change due to new scientific developments or changing societal values. The ECtHR sets a minimum standard for such proof, requiring the link between industrial air pollution and its consequences to be objective.[58] In cases where industrial activities cause deaths, especially when well-known risks occur, the close link between the event and the action is seen as a given.[59] An example for Art. 2 of the ECHR is *Öneryıldız v. Turkey*,[60] where causality was based on the authorities' knowledge about the risk and their lack of preventive action. However, in *L.C.B. v. The United Kingdom*[61], it was held that the available knowledge at the time must be sufficient to prove the causal link. Thus, a similar new case might have a different outcome based on new scientific knowledge.

Scientific evidence and expert opinions are used to prove causality under Art. 8 of the ECHR.[62] Causality is based on the knowledge at the time.

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51 *Fadeyeva v. Russia* App no. 55723l0, European Court of Human Rights, 2005, para 69.
52 *López Ostra v. Spain* para 8, 34; *Taşkın and Others v. Turkey* para 13.
53 *Giacomelli v. Italy*, App no 59909/00, European Court of Human Rights, 2 November 2006, para 76.
54 *Fadeyeva v. Russia* para 66, 68
55 Ibid, n.13.
56 Ibid, n.39, p. 80.
57 *Fadeyeva v. Russia*, para 79.
58 Jasanoff, S., "Serviceable truths: Science for action in law and policy" (2015) 93 Texas Law Review 1723-49.
59 Stoyanova, V., "Causation between State Omission and Harm within the Framework of Positive Obligations under the ECHR" (2018) 18 Human Rights Law Review 309-46.
60 On*eryıldız v Turkey,* paras 100-102.
61 *L.C.B. v. The United Kingdom*, paras 39, 41.
62 Ibid, n.57 at 1741.

The ECtHR often relies on scientific evidence, which domestic courts have accepted.[63] In *López Ostra v. Spain,*[64] the ECtHR relied on the acceptance of the existence of nuisance caused by industrial activities in domestic judgments, as proof that the authorities knew or should have known of the interference. Similarly, the ECtHR relied on the acceptance of a sufficiently close link between the interference and industrial activities by domestic courts in *Lemke v. Turkey*[65] on the identification of a sufficiently close link in an Environmental Impact Assessment ("EIA") procedure in *Taşkın and Others v. Turkey*[66] and on the classification of a plant as very high risk by domestic authorities in *Guerra and Others v. Italy*.[67] The EIA-procedure has thus become a relevant factor within the procedural part of the positive obligations of the Member States, as it shifts the burden of proof of the applicant in those cases where the EIA-procedure has identified potential hazardous effects of a dangerous activity and established a clear and direct connection between the activity's dangers and the applicant's private and family life. The applicant does not have to independently provide such evidence in those cases. In *Gaicomelli v. Italy*, it became clear that the ECtHR views the EIA-procedure as an obligation resting on the Member States before permits for dangerous activities are issued and the delay of such procedure and the implementation of relevant measures does not hinder the court to find a violation up until that time.[68] In *Tătar v. Romania*, it was confirmed that the outcome of this procedure must be available to the public, as the public has a right to information.[69] In *Thibaut v. France*, the ECtHR determined that the EIA-procedure must already take place when the dangerous activity is still in its project stage.[70] The ECtHR thus makes use of a tool from international environment law, as this case law is similar with *Pulp Mills* Case of the International Court of Justice, where it was determined that "EIA-procedures are a requirement under general international law in international contexts, where there is a risk that the proposed industrial activity may have a significant adverse impact".[71]

Despite the required high standard of proof, the ECtHR remains flexible in the case of evidentiary difficulties, especially where access to decisive information is limited to the government. In *Fadeyeva v. Russia*, the ECtHR did not accept medical evidence but based causality on the

63 Shelton, D., "Complexities and Uncertainties in Matters of Human Rights and the Environment: Identifying the Judicial Role" In: J.H. Knox, R. Pejan, editors. *The Human Right to a Healthy Environment*. (Cambridge: Cambridge University Press, 2018), p. 97-121 at 111-112.

64 *López Ostra v. Spain*, paras 50, 52-53.

65 *Lemke v. Turkey*, App no. 17381/02, European Court of Human Rights, 5 June 2007, para 36.

66 *Taşkın and Others v. Turkey* para 113.

67 *Guerra and Others v Italy*, App no. 116/1996/735/932, European Court of Human Rights, 19 February 1998, para 57.

68 *Gaicomelli v. Italy*, App no. 59909/00, European Court of Human Rights, 2 November 2006, para 94-96.

69 *Tatar v Romania, App. No. 6702 1/01, European Court of Human Rights, 27 January 2009,* para 113.

70 *Thibaut v France*, App No. 41893/19, European Court of Human Rights, 14 June 2022, para 38.

71 Case Concerning Pulp Mills on the River *Uruguay*, *Argentina v Uruguay*, Judgment on the merits, ICGJ 425 (ICJ 2010), 20th April 2010, ("*Pulp Mills*") para 204.

exceedance of the domestic norms by emissions from the steel plant during the entire period.[72] This fact could have caused the health deterioration, at least made the applicant more vulnerable to illness, and negatively influenced the quality of her life at home. In addition, the interference was well-known and not unexpected.[73] The specific circumstances of the case inform whether a sufficient level of proof has been reached. No clear rule has been established. This shows again the influence of scientific developments and public opinion, to answer questions on when someone's home life is negatively influenced.

If it is difficult to separate the negative effects of serious industrial pollution from other negative factors in an individual's life, like age and profession.[74] Therefore, these factors need to be weighed. The ECtHR has relied on domestic courts to weigh these factors in *Ledyayeva and Others v. Russia*.[75] In cases of lacking scientific consensus, the precautionary principle may apply. The precautionary principle applies when there is a reasonable likelihood of severe harm. In that case, the chosen level of protection by the State must be consistent with the potentially dangerous effects.[76] The ECtHR applied the precautionary principle in *Tătar v. Romania*[77] where the medical proof was insufficient to prove the toxic pollutants caused health problems, as the quantity of these toxic pollutants could not be determined.

The precautionary principle is used by the ECtHR as the basis for its reasoning on positive obligations. These positive obligations vary from taking precautionary measures to informing the population of dangers.[78] However, the use of the precautionary principle is limited to cases concerning specific individuals and to specific geographical spaces, i.e. only children within the direct vicinity of extra-high-voltage power lines.[79] In *Tătar v. Romania*, the precautionary principle led to a shift of the burden of proof, but did not play a decisive role in determining a violation. As a result of the precautionary principal applicants can considered to be victims by the ECtHR in cases concerning Art. 8 of the ECHR, as long as they give sufficient evidence that the industrial air pollution is a plausible cause for their suffering.[80] Further, the precautionary principle does not lead to general rules for the Member States. The limitation of this principle to very specific instances where scientific proof is not certain about the impact of dangerous activities reflects the status of the international debate around the principle.

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72 *Fadeyeva v. Russia* paras 80, 87-88.
73 *Fadeyeva v. Russia* paras 90-91.
74 Barton, H. & Grant, M., "A health map for the local human habitat" (2006) 126 (6) Journal of the Royal Society for the Promotion of Health 252-3.
75 *Ledyayeva and Others v. Russia* App no.53158/99; 53247/99, European Court of Human Rights, 26 October 2006, para 97.
76 Ibid, n.57.
77 Paras 102-107.
78 Ibid, n.13, p. 453.
79 *Thibaut v. France* para 40 - 48.
80 Theil, S., "Is the 'Living Instrument' Approach of the European Court of Human Rights Compatible with the ECHR and International Law?" (2017) 23 (3) European Public Law 587-614, p. 161.

This debate concerns the fact that it is not clear what the scientific outcome will be, which causes uncertainty about the outcome of the use of the precautionary principle, as normative aspects play a significant role in the outcome of its application.[81]

Other aspects the ECtHR has addressed in its judgments are whether the applicants created the situation themselves or could have remedied or easily prevented the situation, for instance by obtaining information about the pollution beforehand or moving away after they knew this.[82] Further, there needs to be a sufficiently close link between the location of the applicant's home and the source of the pollution. Examples include *Guerra and Others v. Italy*,[83] where emissions were often channeled toward the applicants' homes due to their location, and *Fadeyeva v. Russia*, where the location of the home within a designated buffer zone was crucial.[84]

4.3 Positive Obligations to Protect the Right to Life and the Right to Private and Family Life

As briefly set out in section 2, the ECtHR has built up a system of positive obligations resting on the Member States, which can lead to an indirect third-party effect. For cases of industrial air pollution, the positive obligations for dangerous activities under Art. 2 and 8 of the ECHR mostly mirror each other.[85] The ECtHR grants the Member States a wide margin of appreciation due to the complicated technical and social sphere of environmental problems. Member States can choose the right means for their legal system and the circumstances of the case. However, they are obliged to do everything within their power to protect their inhabitants from immediate and known risks resulting from dangerous activities. They also have a legal obligation to deliver adequate protection and deterrence.[86] This confirms the subsidiarity of the ECtHR.[87] Subsidiarity also becomes clear when a finding of violations is based on the breach of or disregard for domestic rules and legislation by the Member States.[88]

The positive obligations under Art. 2 ECHR oblige the Member States to take all reasonable and necessary measures to ensure people's lives are not put at risk or lost on their territory.[89] An effective legislative and administrative framework addressing specific dangers and functioning as a deterrent is compulsory.[90] This framework must comprise preventive measures, an obligation to give information and access to the decision-

81 Ibid, p. 86.
82 *Ledyayeva and Others v Russia* para 90, 99.
83 *Guerra and Others v. Italy* para 57.
84 *Fadeyeva v. Russia* paras 10-11.
85 *López Ostra v. Spain* para. 51; *Powell and Rayner v. The United Kingdom* para 44.
86 *Öneryıldız v. Turkey* paras 107, 109, 118.
87 Pedersen, O.W., "The European Court of Human Rights and International Environmental Law" In: J.H. Knox, R. Pejan, editors. *The Human Right to a Healthy Environment.* (Cambridge UK: Cambridge University Press, 2018, p. 86-96).
88 *López Ostra v. Spain* paras 54-58.
89 *Öneryıldız v. Turkey* para 71.
90 Ibid, paras 89-90.

making process to the public, and a judicial framework meeting minimum effectiveness standards. Further, the relevant authorities must take practical measures, e.g. install procedures to identify faults in the system, *Öneryıldız v. Turkey*. If people are exposed to a mortal risk, the State must proactively provide all relevant information.[91]

The ECtHR assesses compliance with the positive obligations under Art. 8 of the ECHR on the substantive and the procedural merits of the government's decision.[92] The assessment of the substantive merits is based on the specific circumstances of the case, the proper use of the wide margin of appreciation, and the achievement of a fair balance. This was conformed in *Hatton and Others v. The United Kingdom,*[93] *Powell and Rayner*[94] as well as *Taşkın and Others v. Turkey.*[95] Further, Member States must set up an effective legislative and administrative framework, including the obligation to provide information. The Court confirmed this in *Hatton and Others v. The United Kingdom;*[96] *Guerra and Others v. Italy*[97] and *Giacomelli v. Italy*.[98] A fair balance might be based on a report showing economic interests.[99] If a domestic court has decided no fair balance has been struck, the ECtHR, in principle, does not review this decision.[100]

The procedural assessment is based on the specific circumstances of the case and requires a decision-making process to be in place. This process must include investigations and studies relevant to the specific problems, their disclosure and that of relevant information to the public, the views of individuals as part of the process, and procedural safeguards, e.g. the option to request information.[101] If such a system is in place but the authorities do not comply with a ruling or even continue the process, a violation has taken place.[102] The ECtHR determined the effective legislative and administrative framework necessary to fulfill the positive obligations of Art. 8 of the ECHR. Member states can also fulfil these positive obligations through their actual practice.[103] In *Kolyadenko and Others v. Russia*,[104] the ECtHR widened this rule to Art 2. Finally, if a Member State has delegated activities to a private agency, it remains responsible for the actions of the private agency as if it were the actions of the state.[105]

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91 *L.C.B. v. The United Kingdom* paras 38-41.
92 *Hatton and Others v. The United Kingdom* para 99.
93 Para 103.
94 *Powell and Rayner* para 44.
95 *Taşkın and Others v. Turkey* para 116
96 *Hatton and Others v. The United Kingdom* para 98.
97 *Guerra and Others v. Italy* paras 58-60.
98 *Giacomelli v. Italy* para 78; Ibid, n.13.
99 *Hatton and Others v. The United Kingdom* paras. 123 – 127.
100 *Taşkın and Others v. Turkey* para 117.
101 *Tătar v. Romania,* App. No. 67021/01, European Court of Human Rights, 5 July 2007.
102 *Taşkın and Others v. Turkey* paras 121-122, 125.
103 *Brincat and Others v. Malta*, App no. 60908/11; 62110/11; 62129/11; 62312/11 European Court of Human Rights, 24 July 2014, para 112.
104 Paras 212, 216.
105 *Di Sarno and Others v. Italy*, App no. 30765/08, European Court of Human Rights, 10 January 2012, para 111.

Thus, positive obligations for Art. 2 and Art. 8 of the ECHR have resulted in a framework that allows European citizens to fight industrial air pollution based on the minimum European standards as laid out in their domestic laws or resulting from European Directives and legislation and other clear international obligations.[106] An example is the case of *Brincat v. Ma*lta,[107] where a clear international obligation on the state to protect its citizens was derived from international scientific evidence about asbestos. This framework empowers European citizens to act in case of interference with their rights if such interference is caused by industrial air pollution.

5. THE ECtHR IN THE NETHERLANDS

By the end of the 1970s, the Netherlands had a good track record regarding compliance with the ECHR. It complied proactively and implemented judgments involving other countries in its legal system.[108] In 1980, ten years after lawyers in the UK started using the ECtHR,[109] Dutch lawyers actively turned to the ECHR. By this time, it was clear to the general population, legal experts, and the judiciary that the ECHR added an important layer of protection for individual applicants against the Dutch state. A general growing public interest in human rights led to the renewal of the Dutch Constitution in 1983. The renewal of the Dutch Constitution did not lead to enforceable obligations on the Dutch government but merely established the intentions of the government.[110] The Dutch Constitution includes a duty on the state regarding the environment, namely Art. 21: "It shall be the concern of the authorities to keep the country habitable and to protect and improve the environment". This article is part of the chapter on social rights of the Dutch Constitution. This limits the government's obligations to include environmental interests in its considerations and actions and ensure environmental legislation contains procedural rights for the population.[111] Additionally, the protection of the environment may not deteriorate. Jurisprudence based on this article confirms that Art. 21 of the Dutch constitution is not enforceable.[112] Therefore, the ECHR is the only human rights option for Dutch citizens to use in court wishing to attempt to protect themselves against the negative consequences of industrial air pollution.

The first case concerning the ECHR occurred in the Dutch courts in 1978, and the first environmental case based on Art. 2 of the ECHR was the

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106 Theil, S., *Towards the Environmental Minimum: Environmental Protection through Human Rights.* (Cambridge: Cambridge University Press, 2021).

107 *Brincat v Malta* (note 100) para 106.

108 Sap, J. W., "De verankering van mensenrechten in Europa en Nederland werd geïnspireerd door Amerika" (2009) *Groniek* (September 2009) 145-160. <https://research.vu.nl/en/publications/de-verankering-van-mensenrechten-in-europa-en-nederland-werd-ge%C3%AFn>.

109 Ibid, n.13 at 10.

110 Fleurke, F. M., *Commentaar op Artikel 21 van de Grondwet* (Tilburg: Tilburg University, 2014 at 1). <https://pure.uvt.nl/ws/portalfiles/portal/27007969/NLrechtsstaat_GWartikel21_1_.pdf>.

111 Verschuuren, J., "The Constitutional Right to the Protection of the Environment in the Netherlands" (1994) Revue Juridique de l'Environnement 82-83.

112 Ibid, n.109

Nuclear Missiles case in 1989. The contested issue was the placement of nuclear weapons in the Netherlands. One constituting element of the complaint was the substantial danger to the population's lives in case of accidents, Art. 2 of the ECHR. The Supreme Court of the Netherlands decided the mere possibility of accidents with life-threatening consequences does not constitute a violation of Art. 2 of the ECHR.

The Dutch parliament, other legislators, and the administration did not have an adequate policy or framework for implementing the ECHR norms. There was reluctance to implement the ECHR norms, as policy goals were considered to trump individual rights, and there was a lack of expertise on the topic. This lack of expertise was also visible in the courts resulting in insufficiently argued case law.[113] Until 2000, the ECHR was relied upon in isolated cases, and there were only a few cases related to environmental problems and Art 2. and Art. 8 of the ECHR. In its case law, the Supreme Court decided the possibility of reviewing Dutch legislation against the ECHR was restricted to the minimum standards the ECtHR established. The Supreme Court of the Netherlands and the Administrative Law Division of the Council of State interpreted the ECHR similarly, specifically as much as possible in line with national legislation and jurisprudence. Lower courts usually referred to the case law of the highest Dutch court instead of the ECtHR case law.[114]

Despite the increasing reluctance to use the ECHR, individuals started to use the ECHR more and more in legal proceedings, and legal proceedings regarding industrial air pollution including the ECHR began to occur. The constant concern about industrial air pollution among the public, and the new scientific developments seem to align with the willingness of individuals and NGOs to take legal action. At the start of the 2000s, several cases concerning pollution based on Art. 8 of the ECHR were decided. In these cases, the Dutch administrative courts either ignored Art. 8 of the ECHR in their judgments or determined that there was no violation of Art. 8 of the ECHR because the procedures of the specific legislation had been complied with, which negates serious nuisance. The courts did not underpin their conclusions regarding the correct use of the margin of appreciation or the fair balances that were supposedly struck.[115] In the *Schiphol Nuisance* case,[116] the Administrative Law Division of the Council of State determined that a fair balance had been struck without setting out their arguments. It merely referred to conducted studies that led to a restriction regarding the use of Schiphol but not to ECtHR case law, nor did it weigh the economic interest of the community against individual interests.[117]

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113 Barkhuysen, T., "Het EVRM als integraal onderdeel van het Nederlandse materiële bestuursrecht" (Den Haag: Boom Juridische uitgevers, 2004), p.7-113 at 94-96.

114 Gerards, J., "Grondrechten in de Nederlandse rechtspraak" (2013) 3 Rechtstreeks 17-39 at 26.

115 Verschuuren, J. M., "Invloed van het EVRM op het materiele omgevingsrecht in Nederland." In VAR-reeks 132. De betekenis van het EVRM voor het materiele bestuursrecht. (Boom Juridsiche Uitgevers, 2004), p.253-312 at 286-288.

116 Ibid, para. 2.35.1-2.35.2.

117 Ibid.

The case law of the civil courts is similar. In the *Chlorine Train* case, the District Court of Almelo ignored the fact that Art. 8 of the ECHR was invoked.[118] In the *Fireworks Tragedy Enschede* case, the District Court of The Hague determined that no violation of Art. 2 and 8 of the ECHR had taken place because the risk to the applicants was not known before the explosion happened.[119] This has been confirmed by the Court of Appeal of The Hague §16, which stated there was no immediate danger of an explosion that the State or the municipality could have foreseen. There is no further underpinning of this part of the decision.

The Dutch government complied with its obligations under the ECHR, although sometimes with significant delays. Thus, a greater reliance on the ECHR might not have changed the outcome of legal proceedings. However, cases concerning severe pollution might have benefitted if the fair balance had been explicitly argued.[120] Such argumentation could have resulted in a reinforcement of individual interests.[121] These instances of brief reasoning shows the reluctance to review Dutch legislation and the actions of authorities, and also by the lack of good arguments brought forward by the parties.[122] Despite this lack of argumentation, the ECHR was increasingly used in Dutch case law, according to Gerards this was due to the manageability of the substantive rights, the clear criteria in the ECHR articles, and the growing familiarity with these concepts, not the possibility to review legislation.[123]

Although the case law of the ECtHR has been very successful in Europe, it did not take off immediately in the Netherlands. The visible impact of the case law regarding Art. 2 and Art. 8 of the ECHR in the Netherlands was also limited due to the relatively good adherence of the Dutch government to European Directives. However, it did become an established part of Dutch case law by the 2000s. The compliance of the Dutch government can be seen as an expression of Dutch public opinion and the acceptance of scientific developments by the government so that legal proceedings were not often necessary.

An important difference between the ECHR and Dutch law is access to the court by non-governmental organizations (NGOs) in industrial air pollution cases, as the ECtHR does not accept an *actio popularis*, i.e. claims by unspecified numbers of persons. Claims must be directly relevant to individual applicants and specify how actions or omissions of the Member States have directly impacted them or might realistically impact them if

118 Ibid.
119 Para 27.3.
120 Ibid.
121 Ibid at 288-289.
122 Barkhuysen, T., *Het EVRM als integraal onderdeel van het Nederlandse materiële bestuursrecht*. (Den Haag: Boom Juridische uitgevers, 2004), p.7-113 at 48-49.
123 Gerards, J., "Grondrechten in de Nederlandse rechtspraak" (2013) 3 Rechtstreeks 17-39 at 30.

domestic legislation and regulations would realistically be expected to be carried out, which cannot be proven for NGOs.[124]

6. SCIENTIFIC DEVELOPMENTS AND A NEW FOCUS OF PUBLIC OPINION

The Netherlands have continued to prosper since 1960. Despite the more recent financial crises extreme poverty does not exist anymore in the Netherlands. This privileged position has ensured that the environment remained a topic in public opinion and is part of discussions about the future.[125] In comparison to other EU countries the Netherlands has a high dependency on energy, higher than average per capita greenhouse gas emissions, and a smaller share of renewable energy.[126] The goal for the Netherlands is to be climate-neutral in 2050.[127] The main focus of public opinion has changed, and scientific developments have had an impact on the case law of the ECtHR and on Dutch case law.

6.1 New Focus of Public Opinion on Climate Change

People are aware that prosperity comes at a cost. In Europe, in 2013, air-related health issues such as respiratory disorders, cardiovascular diseases, and asthma/allergies were viewed as serious problems by the majority of the public. Kelly and Fussel argue that if people had better information about the consequences of (industrial) air pollution on health, it would lead to behavioural changes. These would be reflected in politics and lead to policy and legislative changes.[128]

Between 2015 and 2019 the percentage of people naming the climate as a problem increased, simultaneously to media attention for the Paris Agreement in 2015 and the Climate Accord in the Netherlands in 2019. The environment is now strongly linked to discussions about climate change and sustainable development, and not to industrial air pollution. People are convinced they are the most willing, and industry is the least willing, to act in favor of the environment, although industry is expected to be able to make the most significant difference. A governance network is expected to provide

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[124] *Asselbourg and Others v. Luxembourg*, App no. 29121, European Court of Human Rights, 29 June 1999, p. 6; *Besseau and Others v. France*, App no. 73893/0, European Court of Human Rights, 7 February 2006, p. 9-10; *Greenpeace and Others v. Germany* App no. 18215/06, European Court of Human Rights, 12 May 2009, p. 4, *Yusufeli İlçesini Güzelleştirme Yaşatma Kültür Varlıklarını Koruma Derneği against Turkey* App no 37857/14, European Court of Human Rights, 7 December 2021, para 39-43; Ibid, n.13 at 177.

[125] Lintsen, H. & Smits, J. P., "The Long-Term Development: In Search of a Balance". In: H. Lintsen, F. Veraart, J. P. Smits, J. Grin, editors. *Well-being, Sustainability and Social Development*: *The Netherlands 1850–2050*. (Cham: Springer International Publishing, 2018), p. 483-508 at 485.

[126] Eurostat. *Key figures on Europe* 2024 edition. 2024.

[127] Verbeek-Oudijk, D., Hardus, S. Broek, A., & Reijnders, M., "Sociale en Culturele Ontwikkelingen" (2023) Stand van Nederland 90.

[128] Kelly, F. J. & Fussell, J. C., "Air pollution and public health: emerging hazards and improved understanding of risk" (2015) 37 (4) Environ Geochem Health 631-49 at 640.

the best ideas for sustainable development. This is seen as a shared responsibility between the government, businesses, and citizens.[129]

Industry was presumed to be the main threat to air quality in public opinion in the Netherlands in 2013.[130] According to public opinion, air quality deteriorated between 2013 and 2019 and improved between 2019 and 2022. Despite this improvement, people still felt that the air quality was poor compared to 2013.[131] This more negative perception of air quality might be linked to the loss of trust in the government and industry, as the amount of emissions in the Netherlands has decreased and been significantly lower than that of, for instance, Germany and the United Kingdom for NO_x, SO_2, CO, BC, NH_3, and NMVOC since 1945, see as examples figure 2 for nitrogen oxide and figure 3 for ammonia. Despite this, the Dutch public is the most dissatisfied with the efforts of public authorities and large industrial installations to promote air quality, which might lead to its strong preference for stricter pollution control and better enforcement of legislation.[132]

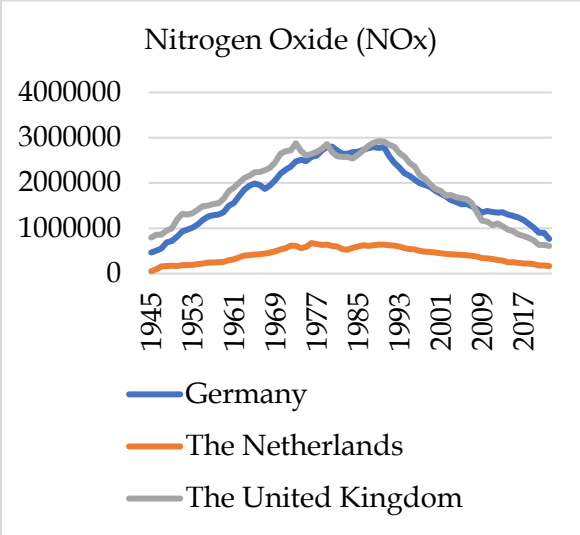


Figure 2: Created by Jaike Wolfkamp based on the Nitrogen Oxide (NOx) data set, extracted 13.06.2024 from https://ourworldindata.org/air-pollution (Community Emissions Data System, 2024)[133]

[129] den Ridder, J. & Dekker, P., "Publieke opinie". In: A. Wennekers, J Boelhouwer, C. Campen, J Kullberg, editors. *De sociale staat van Nederland* 2019. (Den Haag: Sociaal en Cultureel Planbureau, 2019 at 61-63).

[130] TNS, *Political & Social Attitudes of Europeans towards air quality* (2013).

[131] Kantar, "Attitudes of Europeans towards air quality" (2019); Kantar, "Attitudes of Europeans towards air quality" (2022).

[132] Ibid.

[133] https://ourworldindata.org/explorers/air-pollution

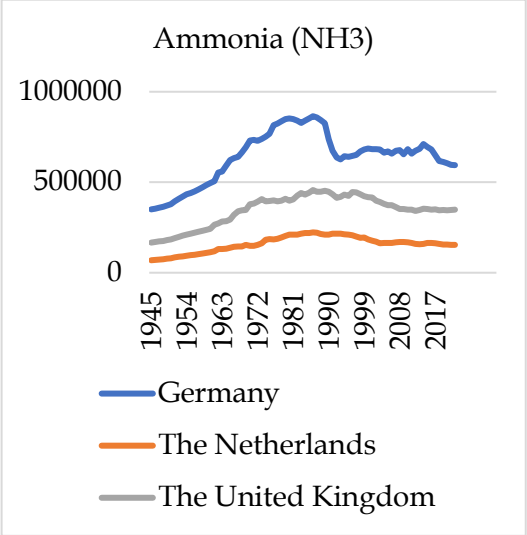


Figure 3: Created by Jaike Wolfkamp based on the Ammonia (NH_3) data set, extracted 13.06.2024 from https://ourworldindata.org/air-pollution (Community Emissions Data System, 2024)[134]

Most European air quality plans, including the Dutch one, are focused on the transport sector (70%), and only 8% of the plans are focused on the industry. For the Netherlands, this is logical because between 2014 and 2022 the limits placed on emissions were mostly exceeded in places with heavy traffic.[135] However, industry in the Netherlands contributed around 40% of the total emissions for SO_2, 30% of NMVOC, 35% of PM2.5, 15% of NO_X, and 2% of NH_3 from 2010 to 2021, and should not be ignored.[136] Dutch emissions, except for NMVOC, are below the European reduction commitments, but higher than the requirements of the new WHO Guidelines.[137] Due to the prioritization of climate change, local residents of industrial plants are at a disadvantage in improving their living environment.

6.2 Scientific Developments Regarding Industrial Air Pollution and Health

In 2015, new research showed that the WHO guidelines were not stringent enough, because there is no safe threshold for humans regarding $PM_{2.5}$ and PM_{10}. Higher levels of PM cause increased respiratory and cardiovascular health problems and negatively impact health issues ranging from diabetes to the reduction of cognitive functions. Air pollution was proven to be the most important environmental factor leading to premature mortality. The positive news is that any improvement of air quality directly

134 Ibid.
135 "Managing air quality in Europe" [press release]. Copenhagen: European Environment Agency, 2021.
136 EEAa, "Netherlands - air pollution country fact sheet" (2023).
137 EEAb, "Netherlands - air pollution country fact sheet" (2023).

leads to health improvements.[138] In Europe, air pollution is estimated to cause 400,000 premature deaths per year, especially in cities, and is mainly caused by exposure to PM and NO_2.[139] The WHO Guidelines were much stricter overall than the EU limits of air pollution concentrations between 2015 and 2017.[140] The WHO Guidelines of 2021 are even stricter.

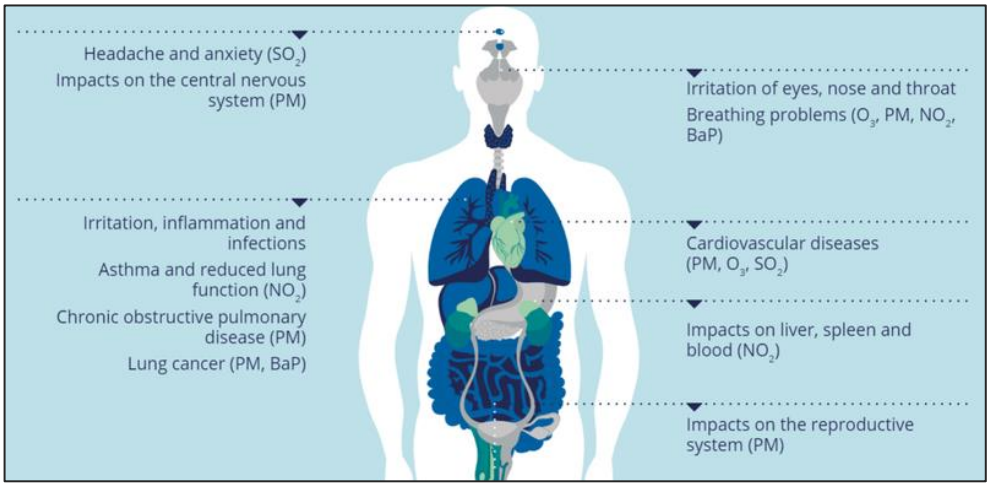


Figure 4: Researchers have observed the impact on health of air pollution and linked specific pollutants to various consequences (EEA, 2023a).

Climate change is a global problem with extensive consequences for human health and ecological systems. Policies aiming to reduce climate change will often also reduce industrial air pollution, especially those focused on reducing short-lived climate pollutants – methane, black carbon, and hydrofluorocarbon (in the atmosphere for less than 15 years). Methane and black carbon are also an important cause of premature death; e.g. methane emissions cause ground-level ozone (O_3), and black carbon (i.e. soot) is a component of $PM_{2.5}$.[141] An epidemiological study in the south-west of the Netherlands, a region with a lot of industrial air pollution and little pollution related to transport, concluded there was a strong correlation between high levels of pollutants and health problems in direct relation to the duration of the exposure.[142] See figure 5 for the connections between pollutants and various health problems.

Based on scientific proof and the outcome of the health problems caused by industrial air pollution Art. 2 or 8 of the ECHR might be violated.

[138] Kelly, F. J. & Fussell, J. C., "Air pollution and public health: emerging hazards and improved understanding of risk" (2015) 37 (4) Environ Geochem Health. 631-649 at 633-635.
[139] EEA, "Assessing air quality through citizen science" (Copenhagen: European Environmental Agency, 2019).
[140] Ibid.
[141] Fuller, R., Landrigan, P. J., Balakrishnan, K., Bathan, G., Bose-O'Reilly, S., Brauer, M., et al., "Pollution and health: a progress update", (2022) 6 (6) Lancet Planet Health e535-e47.
[142] Bergstra, A. D., Been, J. V., & Burdorf, A., "The association of specific industry-related air pollution with occurrence of chronic diseases: A register-based study" (2022) Environ Res. 209.

In *Brincat and Others v. Malta*[143], it was determined that Art. 2 of the ECHR was not applicable in the case of a diagnosis of malignant mesothelioma caused by the work with asbestos on a shipyard. The disease was not considered life-threatening, instead Art. 8 of the ECHR was applicable, confirming the similarities between Art. 2 and Art. 8 of the ECHR in cases concerning dangerous activities. A violation of Art. 2 of the ECHR was only found for the person who did die of the work with asbestos.[144]

The steel industry is one of the main sources of PM because of its use of coal combustion, which is necessary to reach the required temperatures for the melting of steel.[145] Steel is used for many products, from cars to wind turbines, and cannot easily be replaced by renewable materials. Since the 1970s, worldwide steel demand has increased more than threefold and is expected to continue to increase as emerging economies add to the existing demand. To mitigate the effects of this growth and reduce industrial air pollution, decarbonization of the steel industry is essential, and many roadmaps and plans for the circular use of steel have been published.[146] The Netherlands has provided its industry with a guide on industrial emission control techniques to help businesses improve air quality and public health in line with the Dutch rules, regulations, and agreements on the topic.[147] Scientific developments have thus impacted (soft) law in such a way that industrial air pollution should decrease further. The negative impact on health from industrial air pollution has also been more clearly proven.

7. THE ECHR IN DUTCH CASE LAW

Dutch courts have often dismissed claims based on the ECHR using standard phrases and giving limited judicial reviews. This seems to be due to the reliance of the courts on the wide margin of appreciation and the apparent preference for economic interests in combination with problems caused by the burden of proof resting on the applicant.[148] The judiciary would find the existing policies of the Dutch government adequate, and parties failed to convince the judges a higher level of protection is required under the ECHR. In the *Odor Nuisance Livestock Farm* case,[149] the Council of State decided the nuisance was permitted based on relevant legislation,

143 Paras 82-85.
144 *Brincat and Others v. Malta* (note 100) para 117.
145 Kelly, F. J. & Fussell, J.C., "Air pollution and public health: emerging hazards and improved understanding of risk" (2015) 37 (4) Environ Geochem Health 631-49 at 638.
146 Kim, J., Sovacool, B. K., Bazilian, M., Griffiths, S., Lee, J., Yang, M., et al., "Decarbonizing the iron and steel industry: A systematic review of sociotechnical systems, technological innovations, and policy options" (2022) Energy Research & Social Science 89.
147 van der Auweraert, R. & Brouwer. A., "Luchtemissiebeperkende technieken" (2022) Handreiking. TAUW.
148 Krommendijk, J., "Beyond Urgenda: The role of the ECHR and judgments of the ECtHR in Dutch environmental and climate litigation" (2021) 31 Review of European, Comparative & International Environmental Law 60-74.
149 *Applicant and others v. the municipal executive of Peel and Maas*, ECLI: NL:RVS:2012:BX7700, para 11.4.

which meant a fair balance had been struck, and the legislation fell within the margin of appreciation of the legislature. In the *Gas Extraction* I case,[150] the Council of State decided the legislation, while referring to Art. 2 and 8 of the ECHR, was within the wide margin of appreciation, and although, the balancing by the Minister was inadequate, this was nevertheless considered sufficient and to lay within the margin of appreciation. In both cases, there was no substantive argument laid out by the Council of *State for the fair balance*.[151]

7.1 The ECHR in Dutch Case Law Regarding the State

In the *Air Quality* case I, two NGOs, Milieudefensie and Stichting Adem, argued that the Dutch State had failed to adequately reduce NO_2 and PM_{10}, resulting in health damage and premature deaths in violation of Art. 2 and Art. 8 of the ECHR.[152] The Preliminary Injunction Judge in The Hague ordered the State to comply with air quality limits set by EU Directives, which the Dutch State did during the appeal from the proceedings on the merits.[153] Further, the court ordered that the State remain within its margin of appreciation by adhering to the EU Directives instead of the WHO Guidelines.[154] Currently, the Dutch State strives to meet the WHO Guidelines of 2005, not the more stringent ones of 2021.[155] Thus, the case benefitted the Dutch public, as during the appeal the State complied with the EU Directives. A new development is also the more extensive argumentation about the margin of appreciation, even though it does not include references to the ECtHR case law, which reflects the importance in the public opinion of this topic and the increased knowledge on this topic.

Increasingly, civil law is chosen over administrative law by potential victims of industrial air pollution. These procedures, or the threat of procedures, might influence the response of the Dutch State to environmental and health risks, as set out above.[156] The turn to human rights in domestic proceedings for environmental and climate protection started in 2016 in the Netherland.[157] Between the 1st of January 2016 and the 31st of December 2020, the number of cases either directly or indirectly relying on Art. 2 and Art. 8 of the ECHR grew significantly when one looks at substantive rights, see figure 5 for cases where parties rely on the ECtHR. In silent cases, the reliance is implicit.[158] The rights perspective has been used in different ways in the

[150] *Applicants v. Minister of Economic Affairs* ("*Gas Extraction I"*) ECLI:NL:RVS:2015: 3578, paras. 639-40.4.
[151] Ibid, n.145.
[152] *Vereniging Milieudefensie and Others v. The State of the Netherlands*, ECLI:NL:RBDHA:2017:10171 ("*Air Quality Case I"*)
[153] *Vereniging Milieudefensie and Others v. The State of the Netherlands*, ECLI:NL:GHDHA:2019:915 ("*Air Quality* case II") paras 4.17, 3.28.
[154] *Air Quality* case II para 3.23
[155] Veiligheid Ovd, "Industrie en omwonenden: Onderzoeksraad voor de Veiligheid" (2023).
[156] de Jong, E., "Rechterlijke risicoregulering en het EVRM: over drempels om de civiele rechter als risicoreguleerder te laten optreden" (2018) 43 (2) NTM-NJCMBull..
[157] Ibid, n.145.
[158] Ibid, p. 63.

Netherlands. First, the rights perspective is used as a sword, e.g. in the *Urgenda* case, to compel authorities to be proactive and increase environmental protection, see figure 6. Further, it is used as a defence against government measures protecting the environment and hybrid cases showing the tension between long and short-term climate and environmental goals and considerations. The first group will be discussed here.[159]

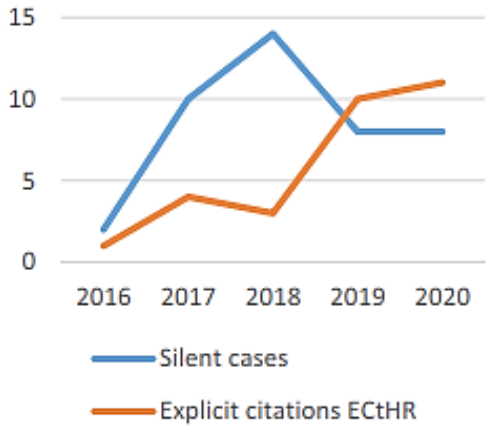


Figure 5: Cases where parties rely on the ECtHR. In silent cases, the reliance is implicit (Krommendijk, 2021, p. 63)

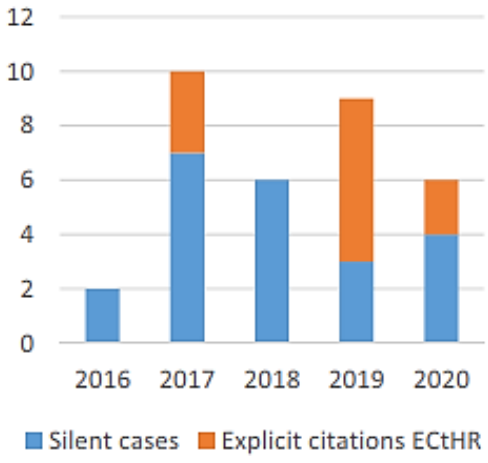


Figure 6: Sword cases (Krommendijk, 2021, p. 63).

The ECHR was used as a sword in the *Gas Extraction* case II,[160] the *Air Quality* case, and the *Urgenda* case. The District Court of Noord Nederland determined in the *Gas Extraction* case II that the State breached its duty of

[159] Ibid.

[160] *Applicants and Others v. Nederlandse Aardolie Maatschappij B.V. and the State of the Netherlands* (Ministry of Economic Affairs) ("Gas Extraction case II") ECLI:NL:RBNNE:2017:715.

care under Art. 6:162 of the Dutch Civil Code because it did not reduce gas extraction after the earthquake in Huizinge in 2012 and ignored the report of 2013 advising the State to reduce the gas extraction.[161] However, the remaining claims were rejected, and the Nederlandse Aardolie Maatschappij (NAM) was obliged to compensate the applicants. The *Urgenda* case concerned climate change. The Supreme Court determined, based on Art. 2 and Art. 8 of the ECHR, that the Dutch State must comply with the minimum target of 25% CO_2 reduction by 2020 in line with agreed targets and international consensus, while it is free to choose the means it will use to reach this target.[162]Art. 2 and Art. 8 of the ECHR could be applied because the concept of real and immediate danger was stretched to a period of a lifetime,[163] because climate change is a real threat, and the serious risk will most likely occur during the lifetime of younger Dutch nationals. The Supreme Court underpinned its decision with extensive argumentation.

The *Urgenda* case gave rise to many discussions about the competencies of the judiciary, similar to those relating to the *Verein Klimaseniorinnen Schweiz and Others v. Switzerland* case.[164] Part of the legal community sees the *Urgenda* case as part of the law-making role of the judiciary, another part as judges exceeding their competences by taking the place of the legislator, which some consider to be antidemocratic. Striking is the much more intense scrutinization of the actions of the State in the *Urgenda* case than in the *Air Quality* case II. This difference is attributed to the idea that air pollution is considered to be less threatening than climate change. The last one benefits from a broader scientific consensus established by the IPCC (60).[165]

7.2 The ECHR in Dutch Case Law Regarding Businesses

In a new development, businesses are seen as essential to achieving international justice for human rights.[166] This has led to action on the international, European, and local level. On the international level, in 2011, the OECD Guidelines inserted a new Chapter IV concerning human rights, and the United Nations published the UNGP, which is based on widely supported ideas about the responsibilities of businesses concerning sustainability.[167] The UNGP expects all business enterprises to have appropriate policies and processes in place to ensure they meet their responsibilities regarding human rights or remedy the situation if they don't,

[161] Ibid paras 4.1.4, 4.1.12.2, 5.3.1.
[162] *Urgenda* (note 7) paras 7.5.1, 8.2.7-8.3.5.
[163] *Urgenda* (note 7) para 4.7 and 5.6.2 – 5.6.4.
[164] *Verein Klimaseniorinnen Schweiz and Others v. Switzerland*, App No 53600/20, European Court of Human Rights, 9 April 2024.
[165] Ibid, n.154.
[166] Shelton, D., "Describing the elephant: international justice and environmental law". In: Ebbesson J, Okowa P, editors. *Environmental Law and Justice in Context.* (Cambridge: Cambridge University Press, 2009), p. 55-75.
[167] Limon, M., "The Politics of Human Rights, the Environment, and Climate Change at the Human Rights Council: Toward a Universal Right to a Healthy Environment?" In: J.H Knox, R. Pejan, editors *The Human Right to a Healthy Environment*. (Cambridge: Cambridge University Press, 2018). p. 189-214.

Chapter III, article 15. Although the UNGP is not legally binding, the European Commission has expected all businesses to comply with them since 2011.

On the European level, the Parliamentary Assembly of the Council of Europe finalized the Human Rights and Business Resolution in 2010. The Netherlands responded to these new developments by adopting the National Action Plan on Business and Human Rights (NL B&HR) 2014, in line with international minimum standards, and in line with the UNGP including explicit goals. The Netherlands is willing to instigate negotiations but not to have more stringent regulations than other European countries.[168] Although human rights and the environment are treated as separate issues, this new focus on business entities gave rise to new case law, where businesses are held responsible for obligations under Art. 2 and Art. 8 of the ECHR by interpreting these obligations into their duty of care under Art.6:162 of the Dutch Civil Code.

In the *Gas Extraction* case II the District Court of Noord Nederland held the NAM accountable for the damages caused by the earthquakes triggered by gas extractions. This accountability was based on the duty of care of Art. 6:162 of the Dutch Civil Code, interpreted with Art. 2 and Art. 8 of the ECHR. The scale of the gas extraction was so invasive and long-lasting that the inhabitants of part of the Groningerveld regularly felt earthquakes.[169] This situation infringed on their rights even though the State had approved the gas extraction.[170]

The *Shell I* case was based on climate change and brought before the court by several NGOs. The District Court of The Hague determined that Shell had to reduce its CO_2 emissions to meet its obligations.[171] The responsibility of Shell was based on the use of Art. 2 and 8 of the ECHR and Articles 6 and 17 of the ICCPR and the UNGP for the interpretation of the unwritten standard of care of Art. 6:162 of the Dutch Civil Code. Art. 2 and 8 of the ECHR were deemed essential given the intrinsic significance of human rights and their societal value, which also influence the relationship between the NGOs and Shell.[172] The Court found the UNGP applicable for all business entities regardless of their endorsement of the UNGP.[173] Companies are expected to respect human rights and take action to meet their responsibilities independent of States' responsibilities.[174] The extent of the obligations resting on a specific company depends on the 'influence and control' it can take over its emissions and the chain it is a part of.[175]

The Court found climate change is caused by many sources, and each reduction is crucial; therefore, reducing emissions takes precedence over

168 NL B&HR 2022, p.54.
169 *Gas Extraction* case II (note 180) paras 4.4.6-4.4.7
170 Ibid para 4.2.4.
171 *Shell I* (note 8) paras 4.5.6-4.5.7.
172 Ibid paras 4.4.9-4.4.10
173 Ibid para 4.4.11
174 Ibid paras. 4.4.14-4.4.15
175 Ibid paras 4.4.20-4.4.21

Shell's economic interests.[176] This seems to align with Dutch tort law, which holds each party fully liable for the harm to which they contribute. This makes it theoretically easier to win climate change or industrial air pollution cases in the Netherlands than in other jurisdictions.[177]

Like the *Urgenda* case, the *Shell* I case has led to extensive discussion in legal literature regarding the competencies of the judiciary. It has been argued that the legislature should create climate legislation, and the judiciary could only step in in case of regulatory failure.[178] It was argued that such regulatory failure existed and the Court addressed this.[179] Finally, the effectiveness of the judgment was questioned. It could lead to a more general norm for businesses that are responsible for a high percentage of emissions of greenhouse gases or to the activities of Shell being taken over by other companies, which will not develop green alternatives but solely focus on profit.[180]

Shell successfully appealed the judgment. In the *Shell* II case, the Court of Appeal stated that civil courts can rule on Shell's legal obligation, notwithstanding the granting of the margin of appreciation to the Member States by the ECtHR, and can be more flexible and less restrained in how they assess the legal case than the ECtHR.[181] The Court of Appeal also found that protection against the dangers of climate change is a human right.[182] It confirmed the horizontal effect of human rights and concluded that climate change will interfere with human rights under Art. 2 and 8 of the ECHR, and these rights partly determine the interpretation of the duty of care under Art. 6:162 of the Dutch Civil Code.[183] The Court of Appeal does not agree with Milieudefensie that Shell has a responsibility to achieve a specific result regarding the reduction of CO_2 emissions, nor does it agree with Shell that business entities have no further responsibilities than those required by law. Instead, the Member States have emphasized that business entities have their own responsibilities to reduce their CO2 emissions. Therefore, the duty of care might oblige individual business entities to reduce their CO2 emissions.[184]

The Court of Appeal found that Shell had concrete plans to reduce its scope 1 emissions (direct emissions) and scope 2 emissions (indirect emissions caused by the companies where the business entity purchases the electricity, steam or heat for its activities) with more than the requested goal by Milieudefensie, and an imminent violation of these goals could not be

176 Ibid paras 4.4.54 – 4.4.55

177 Howarth, D., "Environmental Law and Private Law" In: E. Lees, J.E Viñuales JE, editors. *The Oxford Handbook of Comparative Environmental Law*. (Oxford University Press, 2019), p.0.

178 Smeehuijzen, J. L., "De veroordeling van Shell tot 45% CO2-reductie in 2030" (2022) 8 Nederlands Juristenblad 540-548.

179 Ibid.

180 Ibid.

181 Vereniging Milieudefensie and Others v. Shell and Other, *("Shell II* case") ECLI:NL: GHDHA:2024:2099 (English translation) para 7.11.

182 Ibid.

183 Para 7.24-7.25

184 Para 7.53

found. Therefore, no further obligations rested on Shell. Concerning the scope 3 emissions (all other indirect emissions within the value-chain of the business entity) the scientific uncertainties and variations across sectors and countries are thus, that the requested claims cannot be granted, §7.111. In climate science, there is currently insufficient agreement on the exact percentage with which individual companies such as Shell have to reduce their emissions.

The question remains whether the right to clean air is also a human right and whether in analogy to the above reasoning, it would be possible to start legal proceedings against the negative health consequences caused by industrial air pollution against business entities, where the duty of care of Art. 6:162 of the Dutch Civil Code is interpreted with Art. 2 and Art. 8 of the ECHR, the UNGP and other soft law. Such questions might be answered in the coming years, as public opinion on climate change and industrial air pollution remains strong.

Milieudefensie has announced its next case, and people are invited to join a case against ING Bank and sign a petition against the major polluters.[185] Other legal proceedings have started, e.g. the public prosecutor's office has started a criminal case against TSN,[186] with a group of affected residents cooperating with Mobilisation for the Environment (MOB). The website of Frisse Wind. Nu! gives information about the criminal case. The goal is to charge TSN and/or its directors for polluting the living environment of local residents. More than 800 people and ten foundations filed a report with the public prosecutor's office. MOB has also started administrative proceedings against TSN to ensure its permit will be reviewed by the Province of Noord-Holland.[187]

On top of these criminal proceedings, a mass tort claim is being prepared by the foundation of Frisse Wind.nu on behalf of local residents. On the 23rd of August 2023, a notice of liability was delivered to TSN by the foundation on behalf of more than 1400 people. The underlying goal is not to make sure TSN closes, but to request damages on the one hand and ensure improvements on the other hand. The feeling exists that the Indian shareholders skim the company and refrain from investments in TSN. An example is that a pilot plant using innovative technology is pursued in India instead of in the Netherlands, although it was developed with Dutch and European subsidies.[188]

[185] Milieudefensie, "About Milieudefensie" (2024). <https://en.milieudefensie.nl/about-us>.

[186] OM, "OM eist geldboete van 150.000 euro tegen Tata Steel IJmuiden B.V.: Openbaar Ministerie (OM)" (2022) <https://www.om.nl/actueel/nieuws/2022/12/22/om-eist-geldboete-van-150.000-euro-tegen-tata-steel-ijmuiden-b.v#:~:text=Het%20Openbaar%20Ministerie%20(OM)%20eiste,2018%20tot%20en%20met%202021>.

[187] MOB, "Stand van zaken in dossier Tata Steel" (2023) <https://mobilisation.nl/index.php?id=65>.

[188] FrisseWind.Nu, "Frissewindnu: voor een gezonde IJmond", (2024) <https://www.frissewind.nu>.

8. CONCLUSION

The ECHR and the ECtHR case law have had a strong influence on Dutch case law, as well as on Dutch legislative activities relating to industrial air pollution. On the one hand, because the Dutch government complied with the ECHR on its own account, and because Dutch citizens have started to rely on the ECHR putting pressure on the government to comply with the ECHR at a later point in time. On the other hand, scientific developments and changes in public opinion have affected the case law of the ECtHR, and also the Dutch case law regarding the negative effects of industrial air pollution.

Even though air quality increased and emissions decreased, the Dutch public remained concerned about industrial air pollution. Criminal proceedings have been instigated, and legal proceedings on industrial air pollution are being prepared. The connection between industrial air pollution and human rights has become a firm part of the European consensus since 1991. Moreover, distrust of the government and industry among the general public is high due to government and industry's tendency to hide behind permits and technological solutions and denying problems regarding industrial air pollution. Together with the insufficiency of environmental legislation this has led to a high willingness to litigate and prompted Dutch citizens and NGOs to rely on the ECHR in their litigation to reduce climate change.

The ECtHR started to build up a system based on Art. 2 and Art. 8 of the ECHR in 1991, when it became clear that there was European consensus on this topic. The system was deemed to protect individuals from severe harm caused by industrial air pollution due to actions by the government or the lack of action by the government. It is a strong system, but the inadmissibility of NGOs as applicants except for climate cases will make it harder for a case concerning industrial air pollution to reach the ECtHR. Despite this system, which was also applicable in the Netherlands, Dutch case law has shown a long history of very little attention for the ECHR and the case law of the ECtHR.

The Dutch courts have broken with this tradition. In the *Air Quality* cases, the *Urgenda* case, and the *Shell* cases in cases concerning climate change the ECHR and ECtHR have been given extensive consideration by Dutch courts. Further, in the *Shell* cases, the ECHR is used to interpret the duty of care under Art. 6: 162 of the Dutch Civil Code, thus horizontalizing the rights of the ECHR and introducing these more strongly into the relationship between NGOs, individuals and business entities. These developments follow the strong ideas in public opinion and international, European, and Dutch (soft) law about businesses and their responsibility for human rights regarding climate change. However, it is not yet clear, whether the same results could be achieved in cases concerning the negative health effects of industrial air pollution. However, the latest ECtHR cases allow epidemiological proof in line with the latest scientific developments, which shows the use of the ECHR for industrial air pollution cases remains relevant

and continues to be developed alongside new scientific and technological developments.

The question of whether the recent judgments in the *Air Quality* cases, the *Urgenda* case and the *Shell* cases will be applied in cases concerning industrial air pollution is still open. Further, it is uncertain how much change can be based on the ECHR, as a minimum standard, as the impact of the ECHR is limited in the political sphere. Despite the judgment of the Court of Appeal being in favor of Shell, the judgement might lead to stricter responsibilities on business entities in the future based on the interpretation of the duty of care under Art. 6 of the Dutch Civil Code with Art. 2 and 8 of the ECHR, the UNGP, and other Dutch, international, and European (soft) law. Business entities might have to undertake more than drafting corporate responsibility statements; they might be held to their goals and might have to make financial sacrifices or undertake scientific efforts to reduce industrial air pollution caused by the processes from which they make their profits. If the Netherlands, as one of the wealthiest countries on earth, and multinational enterprises like Shell and Tata are forced to be part of this progress, this could have a significant impact on the reduction of industrial air pollution in The Netherlands and beyond.

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AUTHORS' DECLARATION AND ESSENTIAL ETHICAL COMPLIANCES

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	Author 1	Author 2
Conceived and designed the research or analysis	Yes	No
Collected the data	Yes	No
Contributed to data analysis and interpretation	Yes	Yes
Wrote the article/paper	Yes	Yes
Critical revision of the article/paper	Yes	Yes
Editing the article/paper	Yes	Yes
Supervision	Yes	Yes
Project administration	Yes	Yes
Funding acquisition	No	No
Overall contribution proportion (%)	55	45

Funding
No funding was available for the research conducted for and writing of this paper.

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The author(s) solemnly declare(s) that this research has not involved any human subject (body or organs) for experimentation. It was not a clinical research. The contexts of human population/participation were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of Helsinki Declaration does not apply in cases of this study or written work.

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JOURNAL OF ENVIRONMENTAL LAW & POLICY | 05(01) APRIL 2025
Published by The Grassroots Institute in partnership with Asia Pacific Academy of science Pte Ltd. Website: https://grassrootsjournals.org/jelp
Main Indexing: SCOPUS, EBSCO, HEIN ONLINE

ISSN 2564-016X | April 2025

M – 00532 | Analytical Article | Open Access

ENVIRONMENTAL AND LEGAL FRAMEWORK FOR IMPLEMENTING THE CONCEPT OF SUSTAINABLE DEVELOPMENT IN THE POLICY OF THE EU AND UKRAINE

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Received: 18 January 2025 | **Reviewed:** 24 February 2025 | **Revised:** 10 March 2025
Accepted: 13 March 2025 | **Published:** 14 April 2025

ABSTRACT

This study aimed to assess the state of integrating environmental legal provisions into sustainable development strategies and identify common and distinctive features in the policies applied in Ukraine and the EU. The focus was on analysing the environmental legal frameworks that influence the implementation of the concept of sustainable development in both regions. To this end, a comparative analysis of the EU and Ukraine's environmental legal standards was conducted, and a series of strategic documents were reviewed. The study employed the methods of documentary analysis, comparative study, and evaluation of implemented policies. It was found that the approaches to sustainable development in the EU and Ukraine have shared features, especially in the integration of environmental standards into

national regulations. However, the level of implementation of these standards in the EU is much greater than in Ukraine, which is conditioned by the existence of developed monitoring and control systems. Statistics show a gradual improvement in environmental performance in Ukraine due to the implementation of European standards. The findings of the study confirmed the effectiveness of the integration of environmental standards and legal norms into sustainable development policy, which positively affects the environment in both regions. However, marked differences in policy implementation suggest the need to strengthen cooperation between the EU and Ukraine to achieve common sustainable development goals. Further progress can be achieved through the exchange of practices and the expansion of joint projects.

Keywords: Environmental protection; Sustainable development; European Green Deal; Environmental policy; Environmental security; Eurointegration

Editor-in-Chief: Prof. Dr. Kamrul Hossain | *Deputy Editors-in-Chief:* Dr. Evgeniya Kopitsa, Prof. Dr. Ngozi Finette Unuigbe | *Executive Editor:* Dr. Hasrat Arjjumend

How to cite this paper: Yevhenii Suietnov, Viktoriia Bredikhina, Olena Lozo, Elbis Tulina and Olena Malokhlib, 'Environmental and Legal Framework for Implementing the Concept of Sustainable Development in the Policy of the EU and Ukraine' (2025) 05 (01) Journal of Environmental Law & Policy 37-69, <https://doi.org/10.33002/jelp050102>

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Environmental and Legal Framework for Implementing the Concept of Sustainable Development in the Policy of the EU and Ukraine

1. INTRODUCTION

In modern conditions of global environmental challenges, such as climate change, biodiversity loss, environmental pollution, and economic crises, sustainable development is becoming critical to ensure the long-term well-being of society. This concept not only refers to economic aspects but also includes social and environmental dimensions, which requires a comprehensive approach to its implementation. Effective environmental and legal frameworks for implementing the concept of sustainable development are key elements of both EU and Ukrainian policies. Notably, these frameworks should be adapted to the specific conditions of each country, considering its economic, social, and environmental features. Research in this field is becoming increasingly relevant, as existing legal and environmental policies are often unable to handle complex and fast-moving issues such as urbanisation, changes in the agricultural sector, and the impact of technological innovation. This underscores the need to develop new, integrated approaches to sustainable development that address all these challenges and ensure the efficient use of resources for future generations.

In the 21st century, a variety of shortcomings in the implementation of the concept of sustainable development have been identified in Ukraine and the EU. For example, in the EU, there are differences in compliance with environmental requirements among member states, which complicates the achievement of common goals[1]. In Ukraine, despite some advances in legal regulation, considerable difficulties arise in implementing the principles of sustainable development at the regional level due to insufficient coordination and lack of clear control mechanisms.

Current research in this field focuses on comprehensive analysis of regulations, comparative law, and assessment of the impact of environmental policies on socio-economic development. This approach allows researchers and practitioners to gain a deeper understanding of how legal frameworks can influence environmental policy and socio-economic outcomes. For example, Asghar et al.[2] discussed in detail how the interaction of economic, social, and environmental aspects can contribute to sustainable development, with a focus on integrating these elements into decision-making processes.

The researchers stressed the significance of a comprehensive approach to addressing contemporary social challenges, which requires interdisciplinary cooperation and the involvement of various stakeholders. They provided practical recommendations for policies aimed at achieving sustainable development in the international context, including proposals for improving legislation, developing innovative technologies, and raising

[1] Environmental compliance assurance (2024), <https://environment.ec.europa.eu/law-and-governance/environmental-compliance-assurance_en>.

[2] Asghar, M., Cheikh, N.B., Hunjra, A.I., & Khan, A., 'Assessing the impact of natural capital and innovation on sustainable development in developing countries', (2024) 460 Journal of Cleaner Production 142576, <https://doi.org/10.1016/j.jclepro.2024.142576>.

public awareness of environmental issues. These studies are important for the development of effective strategies that can strike a balance between economic growth and environmental protection.

Zhu et al.[3] focused on the impact of green cooperation within the EU on the sustainable development of member states. Their analysis identified the key factors contributing to environmental sustainability and emphasised the significance of integrating environmental aspects into policy. The findings can serve as a valuable reference point for Ukraine, suggesting ways to improve environmental policy and develop sustainable practices.

The problem of improving land relations in Ukraine to ensure sustainable development of rural areas is relevant, and in this context, Sharapova et al.[4] highlighted the need to adapt land legislation to the needs of sustainable development. The researchers emphasised the value of integrating environmental provisions into land relations, which would help improve resource management. Another major issue is the legislative regulation of climate protection. Getman et al.[5] emphasised that Ukrainian environmental policy laws should incorporate European practices to improve the environmental situation in the country. They emphasised the necessity of implementing international standards, which could become the basis for an effective response to climate challenges. Studies by Dhokpande et al.[6] and Bzainia et al.[7] highlighted the process of implementing the legal framework for sustainable development policy in the EU, with a focus on the environmental component.

Levstek et al.[8] investigated the use of immersive storytelling to change environmental behaviour through augmented reality. This study focused on the role of educational technologies in promoting sustainable development, which should be implemented in EU and Ukrainian policies. Ahmad et al.[9] examined the role of natural resources, economic growth, risks, and energy transitions in achieving environmental sustainability in the G7 countries,

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3 Zhu, Q., Xie, X., Li, Y., & Shao, X., 'Orchestrating network resources: How European Union green cooperation affects member states' sustainable development', (2024) 459 Journal of Cleaner Production 142499, <https://doi.org/10.1016/j.jclepro.2024.142499>.

4 Sharapova, S., Lisova, T., Bredikhina, V., & Lialiuk, O., 'Improvement of land relations in the context of sustainable development of rural areas in Ukraine', (2021) 12 Journal of Environmental Management and Tourism 1899-1905, <https://doi.org/10.14505/jemt.12.7(55).15>.

5 Getman, A.P., Getman, Y.A., & Lozo, V.I., 'Climate protection laws: European reality and Ukrainian prospects', (2019) 49 Environmental Policy and Law 190-195.

6 Dhokpande, S.R., Deshmukh, S.M., Khandekar, A., & Sankhe, A., 'A review outlook on methods for removal of heavy metal ions from wastewater', (2024) 350 Separation and Purification Technology 127868, <https://doi.org/10.1016/j.seppur.2024.127868>.

7 Bzainia, A., Igrejas, G., Pereira, M.J., Costa, M.R., & Dias, R.C., 'Purification of stilbenes from grape stems in a continuous process based on photo-molecularly imprinted adsorbents and hydroalcoholic solvents', (2024) 349 Separation and Purification Technology 127798, <https://doi.org/10.1016/j.seppur.2024.127798>.

8 Levstek, M., Papworth, S., Woods, A., Bennett, J., & Dalton, P., 'Immersive storytelling for pro-environmental behaviour change: The Green Planet augmented reality experience', (2024) 161 Computers in Human Behaviour 108379, <https://doi.org/10.1016/j.chb.2024.108379>.

9 Ahmad, M., Ahmed, Z., Khan, S.A., & Alvarado, R., 'Towards environmental sustainability in E-7 countries: Assessing the roles of natural resources, economic growth, country risk, and energy transition', (2023) 82 Resources Policy 103486, <https://doi.org/10.1016/j.resourpol.2023.103486>.

which provided valuable insights for comparative analysis of policies across countries. Animashaun et al.[10] focused on the implementation of environmental and legal technologies for sustainable development in developing countries, pointing out the importance of integrating environmental policies into strategic plans. On the other hand, Raman et al.[11] explored the Sustainable Development Goals, namely the 12 goals, and their interrelationships with other goals, which may help to develop more integrated approaches to sustainable development policy. However, existing studies often do not include an in-depth analysis of the implementation of these environmental legal provisions in the context of concrete countries or regions, and do not address dynamic processes in environmental and legal systems.

The principal issue addressed in this study was the identification of effective environmental and legal mechanisms aimed at improving the implementation of the concept of sustainable development in EU and Ukrainian policies. The purpose of this study was to identify and analyse the environmental and legal aspects of implementing the concept of sustainable development in the EU and Ukrainian political processes, as well as to provide recommendations for improving the existing approaches. Specifically, the study was aimed at assessing the effectiveness of existing legal mechanisms, identifying shortcomings, and developing proposals for improving legal regulation.

2. MATERIALS AND METHODS

2.1 Data Collection

The study employed a comprehensive approach consisting of several stages. At the initial stage, the key goals and objectives of the study were identified. A literature review and search for relevant sources of information were conducted. This included a review of scientific publications, regulations, and official documents related to sustainable development in the EU and Ukraine. The EU regulations included Directive of the European Parliament and of the Council No. 2008/50/EC "On Ambient Air Quality and Cleaner Air for Europe",[12] which regulates the state of the air and measures to improve it in the EU, and Directive of the European Parliament and the Council No. 2019/904 "On the Reduction of the Impact of Certain

[10] Animashaun, E.S., Familoni, B.T., & Onyebuchi, N.C., 'Implementing educational technology solutions for sustainable development in emerging markets', (2024) 12 International Journal of Science and Research Archive 2428-2434, <https://doi.org/10.30574/ijsra.2024.12.1.1045>.

[11] Raman, R., Lathabai, H., & Nedungadi, P., 'Sustainable development goal 12 and its synergies with other SDGs: Identification of key research contributions and policy insights', (2024) 5 Discover Sustainability 150, <https://doi.org/10.1007/s43621-024-00289-0>.

[12] Directive of the European Parliament and of the Council No. 2008/50/EC "On Ambient Air Quality and Cleaner Air for Europe". (2008), <https://eur-lex.europa.eu/legal-content/UK/TXT/?uri=CELEX%3A32008L0050>.

Plastic Products on the Environment",[13] which mandates the reduction of the adverse environmental impact of plastic products. The European Green Deal[14] is a strategic document for the transition to a green economy and climate neutrality. The Biodiversity Strategy for 2030[15] describes goals and measures for biodiversity conservation, while the Circular Economy Action Plan[16] sets out methods for transitioning to a closed cycle of resource use. Ukraine's legal framework included the Law of Ukraine No. 1264-XII "On Environmental Protection",[17] which defines the legal, economic, and social framework for the organisation of environmental protection in the country. The Law of Ukraine No. 2059-VIII "On Environmental Impact Assessment"[18] regulates the process of environmental assessment of planned activities, and the Law of Ukraine No. 2320-IX "On Waste Management"[19] sets out the rules for waste management. The Law of Ukraine No. 2697-VIII "On the Basic Principles (Strategy) of the State Environmental Policy of Ukraine for the Period up to 2030"[20] is a key strategic document for the progress of environmental policy. Official reports and documents include the European Commission's reports[21] covering the implementation of environmental strategies in the EU, the State Statistics Service of Ukraine (n.d.) reports on the environmental situation in the country, and the United Nations (n.d.) national reports on progress towards the Sustainable Development Goals in Ukraine.

2.2 Research Methods

The initial stage of data collection was performed in April-June 2024, which provided up-to-date information for further analysis. The next stage was the survey, which was conducted between July and September 2024, ensuring a comprehensive approach to the assessment of environmental policies. The following methods were employed to achieve the objectives:

1. Comparative analysis. This method involved a detailed comparison of environmental and legal frameworks and sustainable development policies implemented in Ukraine and the EU. This analysis revealed both

[13] Directive of the European Parliament and of the Council No. 2019/904 "On the Reduction of the Impact of Certain Plastic Products on the Environment". (2019), <https://eur-lex.europa.eu/legal-content/UK/TXT/?uri=CELEX%3A32019L0904>.

[14] European Green Deal (2019), <https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en>.

[15] Biodiversity Strategy for 2030 (2020), <https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en>.

[16] Circular Economy Action Plan (2020), <https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en>.

[17] Law of Ukraine No. 1264-XII "On Environmental Protection" (1991), https://zakon.rada.gov.ua/laws/show/1264-12#Text.

[18] Law of Ukraine No. 2059-VIII "On Environmental Impact Assessment". (2017), <https://zakon.rada.gov.ua/laws/show/2059-19#Text>.

[19] Law of Ukraine No. 2320-IX "On Waste Management" (2023), <https://zakon.rada.gov.ua/laws/show/2320-20#Text>.

[20] Law of Ukraine No. 2697-VIII "On the Basic Principles (Strategy) of the State Environmental Policy of Ukraine for the Period up to 2030". (2019), <https://zakon.rada.gov.ua/laws/show/2697-19#Text>.

[21] Waste and recycling. n.d. <https://environment.ec.europa.eu/topics/waste-and-recycling_en>.

common and distinctive features in the approaches to environmental policy, which contributed to the development of recommendations for improving the national strategy.

2. Assessment of the effectiveness of existing legal mechanisms. Based on the collected data, the effectiveness of existing legislative acts and regulations was assessed. This stage helped to identify the strengths and weaknesses of the existing mechanisms, as well as to identify opportunities for their improvement.

3. Content analysis. The content analysis method was applied to the analysis of regulatory documents, scientific articles, and reports. This allowed identifying key topics that require attention, as well as problem areas that need to be urgently addressed in the context of environmental policy.

4. Case study analysis. This method involved reviewing concrete cases of successful implementation of environmental policies in different EU countries, such as Sweden, Germany, the Netherlands, Italy, Greece, and Poland, as well as in Ukraine. The analysis of these examples revealed best practices that can be adapted and implemented in the Ukrainian context to improve the environmental situation in the country.

This comprehensive approach provided an in-depth understanding of the environmental challenges and opportunities that exist in both Ukraine and the EU and formed the basis for further recommendations for the development of effective environmental policies.

3. RESULTS

In the modern world, sustainable development issues are becoming increasingly important as countries face environmental, economic, and social challenges, particularly within the framework of European integration and Ukraine's policy. The study of the environmental and legal framework for the implementation of the concept of sustainable development in EU and Ukrainian policy is an essential step in exploring the mechanisms that can ensure a balance between environmental protection and economic progress.

Directive of the European Parliament and the Council No. 2008/50/EC[22] is the key document regulating air quality in the EU and is essential for ensuring environmental safety. This regulatory document was adopted to ensure comprehensive protection of public health and the environment from the harmful effects of air pollution. A key task of the Directive is to create an effective air quality monitoring and control system that enables prompt detection and response to exceedances of permissible levels of pollutants.

The Directive sets limit values for the major pollutants, such as nitrogen dioxide, ozone, and fine particles, which are critical for maintaining

[22] Directive of the European Parliament and of the Council No. 2008/50/EC "On Ambient Air Quality and Cleaner Air for Europe" (2008), <https://eur-lex.europa.eu/legal-content/UK/TXT/?uri=CELEX%3A32008L0050>.

public and ecosystem health. Table 1 shows the permissible levels of pollution that should not be exceeded to create a safe living environment. Notably, EU member states are obliged to implement measures to improve air quality and report on monitoring results, which underscores the shared responsibility for environmental safety in the region.

Table 1: Limit values for pollutants (under Directive No. 2008/50/EC)

Pollutant	*Limit value*	*Control method*
Nitrogen dioxide (NO_2)	40 µg/m^3 (annual average)	Qualimetric analysis
Ozone (O_3)	180 µg/m^3 (8-hour average)	Optical method
Particles PM10	50 µg/m^3 (daily average)	Filtration method

Source: Compiled by the authors of this study based on the Directive of the European Parliament and of the Council No. 2008/50/EC On ambient air quality and cleaner air for Europe,[23] Waste and recycling (n.d)[24]

This directive, which aims to ensure strict control of air pollution levels, sets out clear obligations for EU members, including requirements for monitoring, reporting, and taking measures to improve air quality. It foresees mechanisms to promote cooperation between countries and the exchange of best practices in environmental policy. The analysis of its implementation has shown considerable progress in reducing pollution in some countries (Germany, France), where effective programmes and initiatives aimed at reducing pollutant emissions have been implemented. However, the study found that there are problems with compliance in certain countries, which requires further efforts by the relevant authorities to improve the situation. This underscores the need for more active monitoring and support from the EU to ensure a level playing field and achieve common goals in the fight against air pollution.

Directive of the European Parliament and the Council No. 2019/904,[25] also known as the EU Plastic Waste Directive, aims to considerably reduce the harmful impact of plastic waste on the environment, which has become a major issue in the context of global environmental challenges. This directive prohibits the manufacture and distribution of certain types of plastic products, including single-use plastic containers such as plates, cutlery, and straws, which reduces the amount of waste that ends up in oceans and other ecosystems.

Importantly, the directive sets out clear requirements for EU members to reduce the use of plastic packaging and bottles. This includes the introduction of plastic waste recycling and collection systems and support

[23] Directive of the European Parliament and of the Council No. 2008/50/EC "On Ambient Air Quality and Cleaner Air for Europe". (2008), <https://eur-lex.europa.eu/legal-content/UK/TXT/?uri=CELEX%3A32008L0050>.

[24] Waste and recycling. n.d. <https://environment.ec.europa.eu/topics/waste-and-recycling_en>.

[25] Directive of the European Parliament and of the Council No. 2019/904 "On the Reduction of the Impact of Certain Plastic Products on the Environment" (2019), <https://eur-lex.europa.eu/legal-content/UK/TXT/?uri=CELEX%3A32019L0904>.

for initiatives that promote the transition to alternative, more environmentally friendly materials. These measures improve the environmental situation and promote the development of sustainable economic models that consider environmental aspects in production and consumption processes (Table 2).

Table 2: List of plastic products prohibited by Directive No. 2019/904

Product	*Prohibition*	*Alternatives*
Disposable plastic containers	Prohibited since 2021	Biodegradable materials
Plastic straws	Prohibited since 2021	Metal or paper straws
Plastic food containers	Prohibited since 2023	Durable paper packaging

Source: Compiled by the authors of this study based on the Directive of the European Parliament and of the Council No. 2019/904 "On the Reduction of the Impact of Certain Plastic Products on the Environment"[26]

The analysis performed within the framework of the impact assessment of the new environmental directive revealed that its implementation substantially affects both positive and negative aspects of the reduction of plastic waste. However, overall, it is improving the environment in the regions where the directive has been implemented. The following countries are vivid examples of positive changes: Sweden has achieved remarkable success in reducing plastic waste. The country has introduced strict limitations on plastic products and encouraged the use of alternative materials. The key reasons for this success include effective institutional control mechanisms, a prominent level of environmental awareness among the population, and a well-developed infrastructure for waste collection and recycling.[27]

Germany has been successful in reducing the use of disposable plastic products.[28,29,30] The country has introduced the widespread use of reusable

[26] Directive of the European Parliament and of the Council No. 2019/904 "On the Reduction of the Impact of Certain Plastic Products on the Environment" (2019), <https://eur-lex.europa.eu/legal-content/UK/TXT/?uri=CELEX%3A32019L0904>.

[27] Raman, R., Lathabai, H., & Nedungadi, P., 'Sustainable development goal 12 and its synergies with other SDGs: Identification of key research contributions and policy insights', (2024) 5 Discover Sustainability 150, <https://doi.org/10.1007/s43621-024-00289-0>.

[28] Koshkinbaeva, A.S., Shaigaliyev, M.G., Buribayev, Y.A., Khamzina, Z.A., & Khamzina, S.S., 'International legal regulation of environmental safety: In focus – Kazakhstan', (2019) 1 Rivista di Studi sulla Sostenibilita 121–142, <https://doi.org/10.3280/RISS2019-001008>.

[29] Lyubchik, S.B., Lyubchik, A.I., Lygina, E.S., Lyubchik, S.I., Makarova, T.L., Vital, J., Rego, A.M.B.D., Fonseca, I.M. 'Simultaneous removal of 3d transition metals from multi-component solutions by activated carbons from co-mingled wastes', (2008) 60 Separation and Purification Technology 264-271, <https://10.1016/j.seppur.2007.08.020>.

[30] Kubiczek, J., Hadasik, B., Krawczyńska, D., Przedworska, K., Madarász, E.Z., & Ryczko, A., 'Perspective of Created Value in Consumer Choice: Comparison of Economic and Ecological Dimensions', (2024) 14 SAGE Open, <https://doi.org/10.1177/21582440241238516>.

and biodegradable products, driven by a strong regulatory framework, an efficient recycling collection system, and public awareness efforts.[31,32]

The Netherlands is reducing plastic waste and promoting sustainable development through innovative recycling approaches.[33,34,35] The key to the successful implementation of these projects was innovation in recycling technologies and significant support from the government and NGOs.

Although the implementation of the Directive has yielded positive results, there have also been negative effects in some countries: Italy has faced problems in implementing the Directive, especially in the southern regions where the infrastructure for waste collection and recycling is underdeveloped. The primary reason for these difficulties was the lack of financial resources and uneven implementation of policies in different regions.

Greece has experienced obstacles due to economic and structural problems that have affected the efficiency of waste management. Economic hardships and weak enforcement of environmental standards were the major reasons for the obstacles. Poland has demonstrated slow progress in implementing the Directive due to problems with infrastructure modernisation and a lack of support from the government. The reasons for the problem were the lag in the introduction of modern recycling technologies and weak enforcement.

Directive of the European Parliament and the Council No. 2019/904[36] has had a substantial positive impact in countries with developed recycling infrastructure and a prominent level of environmental awareness. However, countries facing economic and structural challenges face negative impacts due to difficulties in the practical application of the Directive. For example, financial constraints and uneven infrastructure development often lead to uneven impacts of the Directive on different regions. Therefore, further measures at the national level, including educational campaigns and funding

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31 Animashaun, E.S., Familoni, B.T., & Onyebuchi, N.C., 'Implementing educational technology solutions for sustainable development in emerging markets', (2024) 12 International Journal of Science and Research Archive 2428-2434, <https://doi.org/10.30574/ijsra.2024.12.1.1045>.

32 Akhatov, U.A., Bekturova, A.G., Madaliyeva, A.A., Sharipov, S.M., & Tursynkulova, D.A., 'Harmonization of environmental legislation', (2018) 21 Journal of Legal, Ethical and Regulatory Issues, 1-6, <https://www.abacademies.org/articles/Harmonization-of-environmental-legislation-1544-0044-21-1-127.pdf>.

33 Lis, A., Oleksy-Gębczyk, A., Szeląg-Sikora, A., & Kowalska-Jarnot, K., 'On the Path to Sustainability: Seeking New Competences to Face Challenges of Implementing Sustainable Processes', (2024) 609 Polish Chemical Industry Case Study. Lecture Notes in Civil Engineering 254-261, <https://doi.org/10.1007/978-3-031-70955-5_28>.

34 Melnikova, L.N., 'Lean innovation in the textile industry, as a tool for solving problems in the field of waste disposal and recycling', (2021) 392 Izvestiya Vysshikh Uchebnykh Zavedenii, Seriya Teknologiya Tekstil'noi Promyshlennosti 17–21, <https://doi.org/10.47367/0021-3497_2021_2_17>.

35 Lyubchyk, A., Lygina, O., Lyubchyk, S., Fonseca, I., Tulepov, M., Mansurov, Z., & Lyubchik, S., 'Activated carbons from co-mingled liquid and solid organic wastes', (2015) 17 Eurasian Chemico-Technological Journal 47-65. <https://doi.org/10.18321/ectj339>.

36 Directive of the European Parliament and of the Council No. 2019/904 "On the Reduction of the Impact of Certain Plastic Products on the Environment". (2019), <https://eur-lex.europa.eu/legal-content/UK/TXT/?uri=CELEX%3A32019L0904>.

for environmental technologies, are necessary to ensure effective implementation of the Directive.

The European Green Deal[37] is an ambitious initiative that aims to make the EU the first continent to become climate-neutral by 2050 (Table 3). The key goal of the Deal is to achieve zero greenhouse gas emissions, reduce pollution, conserve natural resources, and improve public health through sustainable environmental practices.

Table 3: Key components, positive and negative outcomes of the European Green Deal

Category	*Components/Outcomes*
Key components	
Climate neutrality	Reduction of greenhouse gas emissions to zero by 2050
Clean energy	Shift to renewable energy resources and improvement of energy efficiency
Transportation	Development of carbon-free transport and infrastructure
Financing	Implementation of the Just Transition Mechanism to assist the regions most affected by the transition
Positive outcomes	
Environmental	Pollution reduction and improvement of water and air quality
Economic	Introduction of new employment opportunities in the field of innovation and green economy
Negative outcomes	
Economic	Prohibitive implementation costs, which can pose challenges for the less developed countries of the EU
Social	Possible social disparities resulting from the transition to new forms of employment

Source: Compiled by the authors of this study based on the European Green Deal[38]

In 2020, within the framework of the European Green Deal, the Biodiversity Strategy 2030 was presented, which aims to substantially improve the environmental situation in the EU. The primary goal of this Strategy is not only to stop the loss of biodiversity but also to actively restore natural ecosystems that have been negatively affected by human activity and climate change. This approach involves the integration of environmental principles into all spheres of the economy and social life, which is crucial for

[37] European Green Deal (2019), <https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en>.
[38] Ibid.

sustainable development. Specifically, table 4 shows the principal areas and measures planned to achieve these goals in all EU countries.

The Circular Economy Action Plan[39] is a key element of The European Green Deal, which aims to achieve sustainable development within the EU. The Plan intends to fundamentally change the way resources are managed, shifting from the conventional linear economy of production, use, and disposal to a more innovative circular economy. The circular economy focuses on the reuse, repair, recycling, and disposal of resources, which reduces the adverse environmental impact and cuts raw material costs.[40,41,42]A crucial aspect of this approach is the efficient use of resources, which includes the introduction of innovative technologies, the development of environmentally friendly products and services, and the active participation of all economic stakeholders, from producers to consumers. This will not only preserve natural resources, but will also contribute to economic growth, job creation, and a better quality of life. Table 5 provides a more detailed comparison between the linear and circular economies, illustrating the advantages of the new approach.

Table 4: Key components, positive and negative outcomes of the Biodiversity Strategy 2030

Category	*Components/Outcomes*
Key components	
Protection of territories	30% of EU territory is protected, including 10% in strict nature reserves
Restoration of ecosystems	Restoration of degraded ecosystems by 2030
Biodiversity integration	Integration of biodiversity principles into all policies and strategies, including agriculture and fisheries
Positive outcomes	
Environmental	Improvement of natural ecosystems and conservation of species
Economic	Long-term economic benefits from conservation of natural resources and ecosystem services
Negative outcomes	
Implementation challenges	Requirement of considerable efforts and financial resources to protect and restore natural environments

[39] Circular Economy Action Plan (2020), <https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en>.

[40] Ciuła, J., Sobiecka, E., Zacłona, T., Rydwańska, P., Oleksy-Gębczyk, A., Olejnik, T.P., & Jurkowski, S., 'Management of the Municipal Waste Stream: Waste into Energy in the Context of a Circular Economy—Economic and Technological Aspects for a Selected Region in Poland', (2024) 16 Sustainability (Switzerland) 6493, <https://doi.org/10.3390/su16156493>.

[41] Nunes, P., & Sytnychenko, K., 'Strategic forecasts for circular economy transition: Evaluation of the role of technology in economic development', (2024) 11 Economics, Entrepreneurship, Management 25-36, <https://doi.org/10.56318/eem2024.01.025>.

[42] Shebanin, V., Shebanina, O., & Kormyshkin, Y., 'Implementation of circular economy principles to promote the development of rural areas', (2024) 31 Ekonomika APK 51-59, <https://doi.org/10.32317/2221-1055.202402051>.

Source: Compiled by the authors of this study based on the Biodiversity Strategy for 2030[43]

The review of environmental regulations showed that all initiatives represent a comprehensive approach to environmental issues, but their implementation will require considerable financial and organisational efforts. Effective application and coordination of these policies are necessary to achieve the set objectives and reduce possible negative effects on the economic situation and social sphere.

Table 5: Key components, positive and negative outcomes of the Circular Economy Action Plan

Category	*Components/Outcomes*
Key components	
Product design	Development of products that are easier to repair, recycle, and reuse
Waste management	Improvement of the efficiency of the system of waste collection, recycling, and disposal
Recycled materials market	Use of recycled materials for industrial purposes
Education and innovations	Raising awareness and stimulating innovation in the circular economy
Positive outcomes	
Environmental	Reduction of waste and use of less raw materials
Economic	Reduction of raw material and waste costs, stimulation of innovation
Negative outcomes	
Implementation challenges	Requires considerable changes in production processes and consumer habits

Source: Compiled by the authors of this study based on the Circular Economy Action Plan[44]

The Law of Ukraine No. 1264-XII[45] is the principal legal act that governs environmental issues in the country and creates a legal framework for environmental protection. It defines the key principles of environmental policy at the national level, such as sustainable development, pollution prevention, and rational use of natural resources. The law also establishes the rights and obligations of individuals and organisations in the field of environmental protection, including the right to access environmental information and take part in decision-making, and obliges them to respect

[43] Biodiversity Strategy for 2030. (2020), <https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en>.

[44] Circular Economy Action Plan. (2020), <https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en>.

[45] Law of Ukraine No. 1264-XII "On Environmental Protection" (1991), <https://zakon.rada.gov.ua/laws/show/1264-12#Text>.

environmental standards. Furthermore, the document stipulates mechanisms for monitoring compliance with environmental requirements, which is critical to ensuring environmental safety and preserving natural resources for future generations (Table 6).

The analysis showed that legislation underlies the creation and implementation of environmental policy in Ukraine, but there are substantial problems with its implementation and monitoring of compliance with environmental and legal norms. Specifically, the low efficiency of control and monitoring mechanisms, as well as the lack of resources for their implementation, hinder the achievement of environmental goals. There is an urgent need to review existing approaches and develop new strategies to improve natural resource management and ensure sustainable development in Ukraine.

Table 6: Key provisions of the Law of Ukraine No. 1264-XII

Provision	*Description*
Principles of environmental policy	Fundamentals of pollution prevention and environmental restoration
Rights and obligations of citizens	The right to a safe environment for life and health, the obligation to follow environmental standards
Control and oversight	Bodies responsible for monitoring compliance with environmental standards

Source: Compiled by the authors of this study based on the Law of Ukraine No. 1264-XII "On Environmental Protection"[46]

The Law of Ukraine No. 2059-VIII[47] defines the legal framework for environmental impact assessments for projects that may substantially affect the environmental situation in Ukraine. This Law implements EU directives in this area (Table 7).

Table 7: Key provisions of the Law of Ukraine No. 2059-VIII

Category	*Description*
Impact assessment	Identification of potential negative impacts of planned activities on the environment at the early stages of planning
Procedure	Description of the procedure for conducting an environmental impact assessment, including public consultations and conclusions of authorised bodies
Documentation	Requirements for assessment documents, including environmental impact reports

[46] Law of Ukraine No. 1264-XII "On Environmental Protection" (1991), <https://zakon.rada.gov.ua/laws/show/1264-12#Text>.

[47] Law of Ukraine No. 2059-VIII "On Environmental Impact Assessment" (2017), <https://zakon.rada.gov.ua/laws/show/2059-19#Text>.

Purpose	Ensuring environmental safety through systematic assessment of possible negative impacts of planned activities

Source: Law of Ukraine No. 2059-VIII "On Environmental Impact Assessment"[48]

The Law of Ukraine No. 2320-IX[49] establishes the legal framework for integrated waste management in Ukraine. It covers all stages of waste management, from collection and transportation to treatment, recycling, and disposal. The Law also defines the fundamental principles of environmental safety that must be followed in waste management, including prevention of waste generation, reduction of adverse environmental impact, and ensuring the rational use of natural resources. A significant aspect of this Law is the regulation of the responsibility of business entities for proper waste management, as well as control over compliance with environmental standards (Table 8).

Table 8: Key provisions of the Law of Ukraine No. 2320-IX

Category	*Description*
Waste classification	Definition of waste classes: hazardous waste, non-hazardous waste
Management procedures	Procedures for waste collection and treatment, responsibilities of business entities
Environmental provisions	Requirements for waste disposal and treatment to minimise adverse environmental impacts
Financing	Financing mechanisms for waste management projects, including payments for recycling services
Purpose	Improvement of the environmental situation through effective waste management and resource efficiency

Source: Law of Ukraine No. 2320-IX "On Waste Management"[50]

The key areas of environmental policy for the coming years are detailed in the Law of Ukraine No. 2697-VIII "On the Basic Principles (Strategy) of the State Environmental Policy of Ukraine for the Period up to 2030".[51] This strategic document, developed to ensure the country's sustainable development, includes crucial tasks related to improving air and water quality, effective waste management, and preserving biodiversity. Specifically, the document states that improving air quality involves the introduction of

[48] Law of Ukraine No. 2059-VIII "On Environmental Impact Assessment" (2017), <https://zakon.rada.gov.ua/laws/show/2059-19#Text>.

[49] Law of Ukraine No. 2320-IX "On Waste Management" (2023), <https://zakon.rada.gov.ua/laws/show/2320-20#Text>.

[50] Law of Ukraine No. 2320-IX "On Waste Management" (2023), <https://zakon.rada.gov.ua/laws/show/2320-20#Text>.

[51] Law of Ukraine No. 2697-VIII "On the Basic Principles (Strategy) of the State Environmental Policy of Ukraine for the Period up to 2030" (2019), <https://zakon.rada.gov.ua/laws/show/2697-19#Text>.

advanced emission treatment technologies and reducing air pollution from industrial emissions and road transport. In terms of water resources, the document emphasises the necessity of modernising water supply and sewage systems and preserving natural aquatic ecosystems. Waste management focuses on implementing the principles of waste-free production and recycling secondary raw materials, which will aid in reducing the volume of waste sent to landfills. Furthermore, the preservation of biodiversity involves the development and implementation of programmes to protect natural areas, as well as support for environmental initiatives aimed at preserving rare species of flora and fauna. Table 9 details the concrete objectives and measures to be implemented under this strategy, which underlines the comprehensive approach to addressing environmental issues in Ukraine.

Table 9: Principal goals of the Strategy of State Environmental Policy of Ukraine until 2030

Goal	*Description*	*Deadline*
Air quality improvement	Reduction of pollution levels	Until 2030
Water quality improvement	Treatment of water resources	Until 2030
Waste management	Transition to a circular economy	Until 2030
Biodiversity preservation	Protection and restoration of natural ecosystems	Until 2030

Source: Compiled by the authors of this study based on the Law of Ukraine No. 2697-VIII "On the Basic Principles (Strategy) of the State Environmental Policy of Ukraine for the Period up to 2030"[52]

Ukrainian legislation has laid the foundations for environmental management and integration of environmental aspects into various areas of activity.[53,54] Regulations and strategic documents covering waste management, environmental impact assessment, and rational use of natural resources offer a comprehensive approach to environmental protection. Implementation of these documents can positively affect the environmental situation in the country, which will in turn improve public health and preserve natural resources. Improving environmental management standards can stimulate innovation and the development of advanced

[52] Law of Ukraine No. 2697-VIII "On the Basic Principles (Strategy) of the State Environmental Policy of Ukraine for the Period up to 2030" (2019), <https://zakon.rada.gov.ua/laws/show/2697-19#Text>.

[53] Skydan, O.V., Fedoniuk, T.P., Pyvovar, P.V., Dankevych, V.Ye., & Dankevych, Y.M., 'Landscape fire safety management: the experience of Ukraine and the EU', (2021) 6 News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences 125–132, <https://doi.org/10.32014/2021.2518-170X.128>.

[54] Kuybida, V.V., Nekrasova, O.D., Kutsokon, Yu.K., Lopatynska, V.V., & Truskavetska, I.Ya., 'Summer fish kills in the Kaniv Reservoir', (2019) 55 Hydrobiological Journal 103-106. <https://doi.org/10.1615/HydrobJ.v55.i1.110>.

technologies.[55,56,57] However, the implementation and effectiveness of environmental regulations face challenges, such as insufficient funding, the need to improve waste management infrastructure, and the need for adequate environmental risk assessment. For the successful implementation of environmental policy, it is critical to overcome these challenges by ensuring adequate support from the state and society.

A comparative analysis of approaches to sustainable development shows that the EU has a well-structured environmental policy that includes clearly defined provisions, rules, and control mechanisms. These elements ensure a prominent level of environmental protection, which contributes to the preservation of natural resources and improves the quality of life of the population. The EU is actively implementing environmental initiatives that include measures to combat climate change, reduce pollutant emissions, and support sustainable use of resources.[58,59,60]

In Ukraine, despite the existence of progressive documents and strategies, the implementation of environmental initiatives faces major challenges. The key obstacles include insufficient financial capacity, which limits the ability to implement environmental projects, and an imperfect institutional structure that complicates coordination between multiple government agencies. This leads to delays in the implementation of critical environmental programmes and reduces the effectiveness of environmental protection measures. Thus, Ukraine must strengthen its institutional framework and ensure sufficient funding to successfully implement environmental initiatives in the context of sustainable development (Table 10).

Table 10: Comparative analysis of environmental policy in the EU and Ukraine

Indicator	*EU*	*Ukraine*

[55] Kalaganov, B., Madiyarova, A.S., Sartayeva, K.R., Kim, E.P., Apakhayev, N., & Buribayev, Y.A., 'Legal fundamentals of the Kazakhstan's environmental international cooperation: New vectors of legislative reforms', (2018) 9 Journal of Environmental Management and Tourism 1525-1538, <https://doi.org/10.14505/jemt.v9.7(31).16>.

[56] Romanchuck, L.D., Fedonyuk, T.P., & Fedonyuk, R.G., 'Model of influence of landscape vegetation on mass transfer processes', (2017) 25 Biosystems Diversity 203–209, <https://doi.org/10.15421/011731>.

[57] Gudkov, D., Shevtsova, N., Pomortseva, N., Dzyubenko, E., Yavnyuk, A., Kaglyan, A., & Nazarov, A., 'Aquatic plants and animals in the chernobyl exclusion zone: Effects of long-term radiation exposure on different levels of biological organization', (2017) Genetics, Evolution and Radiation: Crossing Borders, The Interdisciplinary Legacy of Nikolay W. Timofeeff-Ressovsky 287-302, <https://doi.org/10.1007/978-3-319-48838-7_24>.

[58] Skarbøvik, E., Shumka, S., Mukaetov, D., & Nagothu, U.S., 'Harmonised monitoring of Lake Macro Prespa as a basis for integrated water resources management', (2010) 24 Irrigation and Drainage Systems 223-238, <https://doi.org/10.1007/s10795-010-9099-1>.

[59] Buribayev, Y.A., Khamzina, Z.A., Suteeva, C., Apakhayev, N.Z., Kussainov, S.Z., & Baitekova, K.Z., 'Legislative regulation of criminal liability for environmental crimes', (2020) 8 Journal of Environmental Accounting and Management 323-334, <https://doi.org/10.5890/jeam.2020.12.002>.

[60] Mokwena, R.J., & Maphaka, M.P., 'Climate Change Challenges on Environmental and Sustainable Development', (2025) 3 Review of Law and Social Sciences 39-49, <https://doi.org/10.71261/rlss/3.1.39.49>.

Regulations	Well-developed, with clearly defined standards	The main acts are in place, but implementation is weak
Control mechanisms	Efficient, with regular inspections	Insufficient, often ineffective
Financing	Extensive, with numerous programmes	Limited, requires improvement
Institutional capacity	Strong, with a clear division of responsibilities	Weak, lacking coordination
Public engagement	Active, and supported at all levels	Limited, insufficient information support
Strategic initiatives	Clearly outlined and integrated	Often absent or fragmented

The study analysed in detail concrete cases that illustrate both positive and negative aspects of environmental policy implementation. This enables not only an assessment of the progress already made but also the identification of opportunities for further development in this crucial area. Specifically, table 11 presents key examples that demonstrate the effectiveness of the various approaches to environmental policy, as well as the challenges arising in their implementation. Thus, the findings of this analysis can serve as a basis for formulating recommendations to improve environmental strategies in the future.

Table 11: Case studies on the environmental and legal framework for implementing the concept of sustainable development in EU and Ukrainian policy

Stage	*EU*	*Ukraine*	*Cooperation between EU and Ukraine*
Problem identification	Growing environmental threats: climate change, loss of biodiversity	Low level of environmental protection, imperfect legislation	Distinct levels of environmental standards and their implementation
Solution development	Creation of sustainable development strategies, integration of environmental aspects into all policies	Adaptation of EU environmental standards into national legislation to improve	Creation of joint initiatives, such as the Eastern Partnership

		environmental protection	
Implementation	Legislation, e.g., the European Green Deal, to reduce greenhouse gas emissions by 55% by 2030	Reforms, new Law on Strategic Environmental Assessment	Implementation of joint projects in the field of sustainable development and ecology
Evaluation of results	Positive changes in environmental policy, criticism of insufficient implementation at the local level	Growing environmental awareness, compliance issues, and lack of funding	Improved cooperation, achievement of some successes, need for more investment

The environmental and legal frameworks for implementing the concept of sustainable development in the EU and Ukraine demonstrate the critical role of integrating environmental aspects into political decisions and development strategies. This includes not only legislative initiatives, but also the active engagement of the public, business, and government institutions in shaping environmentally sustainable policies. However, to be successful in this area, it is necessary to consider in detail the specifics of each country, its economic, social, and cultural background, and to ensure proper implementation of norms and standards governing environmental activities. This involves establishing effective monitoring and evaluation mechanisms, as well as active cooperation between various sectors of society to achieve common sustainable development goals.

The study identified key challenges, such as insufficient integration of environmental aspects into general policy, lack of funding, and weak enforcement of environmental regulations. The analysis showed that the EU has made great strides in implementing the concept of sustainable development through clear standards and effective control mechanisms, while Ukraine faces major challenges in implementing its environmental strategies. The study confirmed that the EU environmental policy is more structured and effective than Ukraine's. The identified shortcomings and problems in Ukrainian policy require attention and improvement to achieve environmental goals.

4. DISCUSSION

The findings of this study suggest that the European sustainable development policy, especially in the context of environmental law, has formulated environmental legal principles aimed at implementing environmental standards in all areas of economic activity. Specifically, the

EU is implementing policies such as the European Green Deal, which supports the mitigation of environmental impacts through the introduction of strict environmental regulations and policies. In Ukraine, despite some advances in sustainable development, there are numerous problems with the implementation of European standards due to insufficient legal regulation and limited integration of environmental norms into national legislation.

Comparison with the studies of other researchers confirms these findings. For example, Anisimova et al.[61] conducted a thorough study of the mechanism of legal regulation of environmental risks, which was aimed at preserving biological diversity in the context of sustainable development. In their study, the researchers provided a detailed analysis of the existing legal provisions and mechanisms that can be effectively used to prevent environmental threats. Their findings highlighted the critical role of legal mechanisms in preventing environmental risks, which is consistent with the findings that environmental regulations should be integrated into national legislation. This creates the preconditions for sustainable development, as without proper legal regulation it is impossible to effectively manage natural resources and protect the environment.

As emphasised by Ahmad et al.,[62] technological innovation and economic growth can substantially affect the ecological footprint. This is consistent with the findings of the present study, which highlighted the significance of integrating technological innovations into sustainable development policies, especially in the context of EU and Ukrainian strategies. The findings showed that in the EU, technological innovations are effectively integrated into environmental policy, which contributes to the reduction of the ecological footprint, while in Ukraine, these processes must be further improved. Aloui et al.[63] focused on the impact of geopolitical risks on natural resource prices, which is directly related to the findings obtained. The researchers also noted that geopolitical factors can influence sustainable development policies, especially in Ukraine, where instability complicates the effective implementation of environmental strategies.

Asteriou and Spanos[64] found a significant link between financial development and economic growth during the crisis, which is supported by their analysis. They found that financial development is a key factor for achieving the Sustainable Development Goals, especially in the context of

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61 Anisimova, H.V., Shekhovtsov, V.V., & Donets, O.V., 'Mechanism of legal regulation of environmental risks for the preservation of biological diversity in conditions of sustainable development', (2022) 10 Astra Salvensis 311-327.

62 Ahmad, M., Jiang, P., Majeed, A., Umar, M., Khan, Z., & Muhammad, S., 'The dynamic impact of natural resources, technological innovations and economic growth on ecological footprint: An advanced panel data estimation', (2020) 69 Resources Policy 101817, <https://doi.org/10.1016/j.resourpol.2020.101817>.

63 Aloui, D., Benkraiem, R., Guesmi, K., & Mzoughi, H., 'Managing natural resource prices in a geopolitical risk environment', (2023) 83 Resources Policy 103628, <https://doi.org/10.1016/j.resourpol.2023.103628>.

64 Asteriou, D., & Spanos, K., 'The relationship between financial development and economic growth during the recent crisis: Evidence from the EU', (2019) 28 Finance Research Letters 238-245, <https://doi.org/10.1016/j.frl.2018.05.011>.

integrating environmental standards into the financial systems of both the EU and Ukraine. This underscores the need to create and implement effective financial mechanisms that will contribute not only to economic growth but also to environmental sustainability in the face of current challenges.

Ben-Salha et al.[65] also confirmed that natural resource revenues can positively affect economic development. This is in line with the findings that in Ukraine, natural resource revenues have a considerable potential to stimulate economic progress. However, their impact on environmental performance is still limited due to insufficient integration of environmental standards into natural resource management processes. Therefore, to achieve balanced development, optimum solutions must be found, which would combine economic interests with environmental requirements.

Boikos et al.[66] focused on the impact of financial progress and reforms on economic growth. They emphasised the relevance of these aspects in the context of current challenges. The study conducted within the framework of this subject confirmed that financial development is a key factor for the implementation of effective sustainable development policies not only in Ukraine but also in the EU countries. It was noted that in the context of economic instability, which is typical for Ukraine, as well as in the context of insufficient integration of environmental standards, financial reforms can become instrumental in achieving sustainable development goals. Specifically, these reforms can help attract investment in green technologies and environmental initiatives, which is critical for improving the country's environmental situation. The findings suggest that countries that actively implement financial reforms and develop financial institutions achieve better performance in terms of sustainable development and environmental policy. This underscores the necessity of integrating financial strategies with environmental goals, which can ensure not only economic growth but also an improved quality of life and the preservation of natural resources for future generations.

Deng et al.[67] highlighted the major changes in the role of financial institutions in the context of environmental quality, which are becoming increasingly relevant in the modern world. The data collected shows that financial institutions in the EU play a key role in supporting environmental initiatives, providing not only the necessary resources but also the tools to implement sustainable projects that contribute to environmental protection. These institutions are actively attracting investments in projects related to carbon emissions reduction, renewable energy, and other environmentally

[65] Ben-Salha, O., Dachraoui, H., & Sebri, M., 'Natural resource rents and economic growth in the top resource-abundant countries: A PMG estimation', (2021) 74 Resources Policy 101229, <https://doi.org/10.1016/j.resourpol.2018.07.005>.

[66] Boikos, S., Panagiotidis, T., & Voucharas, G., 'Financial development, reforms and growth', (2022) 108 Economic Modelling 105734, <https://doi.org/10.1016/j.econmod.2021.105734>.

[67] Deng, X., Yang, J., Ahmed, Z., Hafeez, M., & Salem, S., 'Green growth and environmental quality in top polluted economies: The evolving role of financial institutions and markets', (2023) 30 Environmental Science and Pollution Research 17888-17898, <https://doi.org/10.1007/s11356-022-23421-x>.

friendly technologies. At the same time, Ukraine must improve its financial instruments and mechanisms for promoting sustainable development to ensure more effective implementation of environmental programmes and initiatives. This includes not only attracting investments in environmental technologies but also creating favourable conditions for their implementation, which may include the development of innovative financial products tailored to the needs of environmental projects, as well as establishing a clear regulatory framework. It is also vital to intensify cooperation between the public sector, private investors, and international organisations to achieve common environmental sustainability goals.

Hunjra et al.[68] identified the impact of political risk and macroeconomic uncertainty on sustainable development. The findings suggest that political instability in Ukraine is a substantial barrier to the implementation of effective environmental strategies. This underlines the significance of a stable political environment for the successful implementation of environmental initiatives and the achievement of sustainable development goals. Thus, the issues of political stability and economic confidence must be addressed to improve the environmental situation in Ukraine.

Khan et al.[69] noted that geopolitics can substantially influence the formation and implementation of EU environmental policy. This study confirmed that this influence is an essential factor that determines priorities and strategies in the sphere of environmental protection. In Ukraine, in the context of current challenges, it is also necessary to consider geopolitical factors when developing environmental strategies, as they can substantially affect the effectiveness of environmental initiatives. Khraiche et al.[70] investigated the relationship between geopolitical risks and stock market development. The findings of their study showed that financial markets can be vulnerable to various geopolitical risks, which could negatively affect the implementation of environmental policy. This highlights the need for a comprehensive approach to analysing economic and environmental strategies, considering the risks associated with the global political situation.

Koseoglu et al.[71] investigated the relationship between green innovation and ecological footprint. The study confirmed that active implementation of green innovation is critical for reducing the ecological footprint, especially in the context of the EU and Ukraine. Green innovation

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[68] Hunjra, A.I., Azam, M., Bruna, M.G., Verhoeven, P., & Al-Faryan, M.A., 'Sustainable development: the impact of political risk, macroeconomic policy uncertainty and ethnic conflict', (2022) 84 International Review of Financial Analysis 102370, <https://doi.org/10.1016/j.irfa.2022.102370>.

[69] Khan, K., Khurshid, A., & Cifuentes-Faura, J., 'Is geopolitics a new risk to environmental policy in the European Union?' (2023) 345 Journal of Environmental Management 118868, <https://doi.org/10.1016/j.jenvman.2023.118868>.

[70] Khraiche, M., Boudreau, J.W., & Chowdhury, M.S., 'Geopolitical risk and stock market development', (2023) 88 Journal of International Financial Markets, Institutions and Money 101847, <https://doi.org/10.1016/j.intfin.2023.101847>.

[71] Koseoglu, A., Yucel, A.G., & Ulucak, R., 'Green innovation and ecological footprint relationship for a sustainable development: Evidence from top 20 green innovator countries', (2022) 30 Sustainable Development 976-988, <https://doi.org/10.1002/sd.2294>.

not only contributes to reducing the adverse environmental impact but can also become a catalyst for economic growth and competitiveness of national economies.[72,73,74]

Ciot[75] performed a detailed analysis of the impact of the Russian-Ukrainian conflict on the implementation of The European Green Deal in Central and Eastern Europe, which is crucial in the context of current geopolitical challenges. This study confirms the observation that security and stability are key factors for the implementation of environmental programmes in Ukraine, as instability can substantially complicate the implementation of environmental initiatives and projects that require long-term investment and planning.

Öztürk and Durak[76] focused on the adaptation of EU environmental policies in the face of new challenges faced by member states and neighbours. The researchers' findings support the opinion that Ukraine should adapt its environmental regulations to European standards to ensure sustainable development, as integration into the European space requires compliance with strict environmental standards, which can help improve the quality of life and preserve natural resources.

Amann et al.[77] investigated sustainable governance practices in the housing sector, focusing on European examples that demonstrate effective strategies to reduce the environmental impact of housing construction and operation. While their findings highlight the significance of sustainable management, the present study focused more on the legal aspects of sustainability, which suggests the need for a deeper analysis of housing policy, as the legal framework can greatly influence the implementation of sustainable practices and provide the necessary conditions for their implementation in Ukraine. Al Azzam et al.[78] stressed the value of optimising international trade to achieve sustainable development, which is crucial in

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72 Skliar, V., Smoliar, N., Kozak, M., Liubynskyi, O., & Skliar, Y., 'Ecological and cenotic features of natural regeneration of forests in the Left-Bank Polissya of Ukraine', (2024) 15 Ukrainian Journal of Forest and Wood Science 118–134, <https://doi.org/10.31548/forest/2.2024.118>.

73 Komilova, N., Egamkulov, K., Hamroyev, M., Khalilova, K., & Zaynutdinova, D. 'The impact of urban air pollution on human health', (2023) 28 Medicni Perspektivi 170–179, <https://doi.org/10.26641/2307-0404.2023.3.289221>

74 Kovach, D., Kullolli, B., Djaparova, S., Mikhnevych, L., & Myskovets, I., 'Legal aspects of environmental sustainability and climate change: the role of international and national legislation', (2024) 4 Journal of Environmental Law and Policy 149-179, <https://doi.org/10.33002/jelp040206>.

75 Ciot, M. G., 'The impact of the Russian-Ukrainian conflict on Green Deal implementation in central-southeastern Member States of the European Union', (2023) 15 Regional Science Policy & Practice 122-144, <https://doi.org/10.1111/rsp3.12591>.

76 Öztürk, T., & Durak, İ.N., 'EU environmental policies in the context of green theory and Türkiye's adaptation process', (2024) 8 Alanya Academic Review 224-226, <https://doi.org/10.29023/alanyaakademik.1324780>.

77 Amann, W., Anisimov, O., Lawson, J., Mundt, A., & Tyshchenko, I., Housing for the common good: Sustainable governance from European best practice for recovery in Ukraine (Vienna 2024).

78 Al Azzam, F.A., Khomko, L., Mykhailyk, N., Maslak, O., & Danchak, L., 'Optimization of international trade for sustainable development marketing strategy: Economic and legal EU regulations', (2023) 18 International Journal of Sustainable Development & Planning 2615-2621, <https://doi.org/10.18280/ijsdp.180834>.

the current globalisation context. The researchers noted that EU legal regulations can positively affect Ukraine's economic development, as they form the framework for trade relations and can help promote the competitiveness of Ukrainian goods on international markets. These findings are in line with the results obtained, which stressed that the integration of international norms and standards into national policies is a crucial step for ensuring the sustainable development of the country. Specifically, it allows Ukraine to adapt to new challenges, improve the investment climate, and promote environmental sustainability, which opens new opportunities for economic growth and social progress.

The findings of this study confirm the significance of technological innovations, financial progress, and geopolitical threats in shaping an effective sustainable development strategy. These findings are in line with other scientific studies and highlight the urgent need to adapt policies to dynamically changing circumstances and global trends that affect economic and social stability. Prospects for further research open new opportunities, such as a more in-depth analysis of the impact of geopolitical risks on environmental policy. This involves exploring how international conflicts, economic sanctions, and other geopolitical factors can affect the implementation of environmental initiatives. Furthermore, it is necessary to explore the potential of adapting financial instruments such as green bonds and investment funds to support sustainable development, which will ensure effective financing of environmental projects amid global challenges.

5. CONCLUSIONS

The EU has a comprehensive and organised environmental strategy, which contains articulated regulations, directives, agreements, and plans aimed at achieving sustainable development. This strategy covers a wide range of issues, including improving water and air quality, reducing greenhouse gas emissions, and preserving biodiversity. Despite having relevant documents and strategies in place, Ukraine still needs to overcome numerous difficulties in implementing these initiatives, due to many socio-economic and political challenges.

The EU has made great strides in reducing pollution and improving the environmental situation through the implementation of effective oversight mechanisms, extensive funding for environmental programmes, and active public engagement in environmental initiatives. In Ukraine, however, there are serious difficulties with financing environmental projects, insufficient control over compliance with environmental regulations, and ineffective implementation of existing environmental standards. The key challenges in Ukraine include insufficient integration of environmental aspects into the overall strategy, lack of finance to implement environmental initiatives, and imperfect control and monitoring mechanisms. This is contrary to the EU, which has more developed monitoring and support systems, such as funding and technical aid programmes, which have led to

better environmental outcomes. Ukraine must take steps to improve its environmental strategies, strengthen control and attract greater financial resources to ensure sustainable development and improve the environmental situation in the country.

The principal limitation that affected this study was the limited time available for its implementation. This factor could substantially affect the data collection and analysis, as insufficient time can lead to incomplete information or bias in the findings. It is also necessary to consider external factors that may significantly affect the results of the study. For example, the war in Ukraine may have both a direct and indirect impact on the socio-economic aspects under study. This highlights the need for a thorough analysis of the context of the study to ensure a more accurate interpretation of the data. To achieve its sustainable development goals, Ukraine must focus on improving its waste management infrastructure, increasing the effectiveness of monitoring compliance with environmental standards, and ensuring adequate funding for environmental projects. Investing in and raising environmental awareness among citizens can also contribute greatly to improving the situation.

ACKNOWLEDGEMENT

This article was published as a part of the RE-GREEN Project (Advancing European Green Deal Implementation in Ukraine, 101176210) funded by the European Union's Erasmus+ programme.

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AUTHORS' DECLARATION AND ESSENTIAL ETHICAL COMPLIANCES

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	*Author 1*	*Author 2*	*Author 3*	*Author 4*	*Author 5*
Conceived and designed the research or analysis	Yes	No	No	Yes	Yes
Collected the data	Yes	Yes	No	No	No
Contributed to data analysis and interpretation	Yes	Yes	Yes	Yes	Yes
Wrote the article/paper	Yes	Yes	Yes	Yes	Yes
Critical revision of the article/paper	Yes	No	Yes	Yes	No
Editing the article/paper	Yes	Yes	Yes	Yes	Yes
Supervision	Yes	No	No	No	No
Project administration	Yes	No	No	No	No
Funding acquisition	No	No	No	No	No
Overall contribution proportion (%)	20	20	20	20	20

Funding
No funding was available for the research conducted for and writing of this paper.

Research involving human bodies or organs or tissues (Helsinki Declaration)
The author(s) solemnly declare(s) that this research has not involved any human subject (body or organs) for experimentation. It was not a clinical research. The contexts of human population/participation were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of Helsinki Declaration does not apply in cases of this study or written work.

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To see original copy of these declarations signed by Corresponding/First Author (on behalf of other co-authors too), please download associated zip folder [Ethical Declarations] from the published Abstract page accessible through and linked with the DOI: https://doi.org/10.33002/jelp050102.

JOURNAL OF ENVIRONMENTAL LAW & POLICY | 05(01) APRIL 2025
Published by The Grassroots Institute in partnership with Asia Pacific Academy of science Pte Ltd. Website: https://grassrootsjournals.org/jelp
Main Indexing: SCOPUS, EBSCO, HEIN ONLINE

ISSN 2564-016X | April 2025

M – 00533 | Analytical Article | Open Access

NIAGARA-ON-THE-LAKE SUES QUARRY OWNER OVER ALLEGED ENVIRONMENTAL VIOLATIONS: POTENTIAL IMPACTS ON LOCAL PROPERTY OWNERS

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Received: 31January 2025 | **Reviewed:** 22 March 2025 | **Revised:** 29 March 2025
Accepted: 05 April 2025 | **Published:** 14 April 2025

ABSTRACT

This paper examines the environmental challenges and legal implications associated with settling ponds in aggregate extraction operations, especially in the context of climate change. It highlights the role of settling ponds in managing runoff and sediment, while addressing the potential factors that can undermine their effectiveness, such as inadequate design, high flow rates, and insufficient maintenance. The paper delves into the specific impacts of extreme weather events, rising temperatures, and altered precipitation patterns on the functionality of settling ponds. Additionally, the paper explores the potential repercussions for property owners, including property value depreciation, stigma damage, legal and cleanup costs, for impacted communities. It underscores the importance of robust infrastructure planning and proactive measures to mitigate these risks. Recommendations include enhancing settling pond requirements, regular monitoring and reporting, financial assurances, revocation of permits for non-compliance, and fostering meaningful community engagement and transparency. The conclusion emphasizes the need for larger and more resilient settling ponds to accommodate changing climate conditions, ensuring environmental protection and the health, safety, and welfare of local communities. By implementing stringent regulations and effective management practices and oversight, regulators and municipalities in Ontario can better address the challenges posed by climate change and contribute to a sustainable future.

Keywords: Quarry; Environmental Violations; Local property; Sediments; Risks

Editor-in-Chief: Prof. Dr. Kamrul Hossain | *Deputy Editors-in-Chief:* Dr. Evgeniya Kopitsa, Prof. Dr. Ngozi Finette Unuigbe | *Executive Editor:* Dr. Hasrat Arjjumend

How to cite this paper: Tony Sevelka, 'Niagara-On-The-Lake Sues Quarry Owner over Alleged Environmental Violations: Potential Impacts on Local Property Owners' (2025) 05 (01) Journal of Environmental Law & Policy 70-86, <https://doi.org/10.33002/jelp050103>

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Open Access

ISSN 2564-016X | Journal of Environmental Law & Policy | 05 (01) (April 2025): 03
<https://doi.org/10.33002/jelp050103>

Niagara-On-The-Lake Sues Quarry Owner over Alleged Environmental Violations: Potential Impacts on Local Property Owners

1. INTRODUCTION

The environmental impact of quarry operations and the effectiveness of settling ponds in managing runoff and sediment have become increasingly important topics in light of climate change. As extreme weather events become more frequent and severe, the capacity of these ponds to mitigate environmental pollution is being put to the test. This paper explores the role of settling ponds in quarries, examining factors that can undermine their effectiveness and proposing solutions to enhance their functionality. It also addresses the potential legal and financial implications for property owners affected by aggregate extraction operations[1] and environmental contamination. By understanding these challenges and implementing proactive measures, regulators and municipalities can better protect natural water bodies and ensure the health, safety, and welfare of communities. A pending lawsuit is illustrative of the potential for an inadequately sized settling pond failing to contain water runoff and sediments and cause environmental harm with unintended consequences for impacted neighbouring property owners.

2. ENVIRONMENTAL LAWSUIT AND STATEMENT OF CLAIM

Niagara-on-the-Lake has initiated a lawsuit against a local quarry owner at 545 Line 8 Rd (123.46 acres),[2] in operation since 1980, for approximately $1.2 million, alleging that the quarry discharged material into the Cole Drain in August 2022.[3] A Permit to Take Water (No. 3324-BGALVQ), to dewater perpetually below the water table, allows for a maximum volume of 4,320,000 litres per day until December 31, 2030, while the license to permit aggregate extraction under the Aggregate Resources Act (ARA) has no expiry date. The Statement of Claim filed in Ontario Superior Court Justice on May 29, 2024, alleges that Arriscraft Canada Inc. breached the following four Acts by allowing a "large volume of water" from the quarry settling pond to end up in local ditches and eventually in the Cole Drain, approximately 1.5 kilometres downstream:

1. The Environmental Protection Act (EPA): Prohibition, contamination generally

No person shall discharge into the natural environment any contaminant, and no person responsible for a source of contaminant shall permit the discharge into the natural environment of any contaminant from the source of contaminant, in an amount, concentration or level in excess of

[1] Aggregate extraction refers to the process of removing raw materials such as sand, gravel and crushed stone from natural reserves like quarries and pits. This process typically involves the use of heavy equipment, such as excavators and bulldozers, and in cases where rock is being mined, detonation of explosives is usually involved to break the rock into manageable.

[2] PIN 46372-0054, GeoWarehouse.

[3] Werner, K., "Niagara-on-the-Lake suing quarry owner for $1.2 million,"*NiagaraontheLake Advance*, December 2, 2024. <https://www.niagarathisweek.com/news/council/niagara-on-the-lake-suing-quarry-owner-for-1-2-million/article_da798f4e-12c8-57b2-9f6c-c0bdfc4b63cb.html>.

that prescribed by the regulations. R.S.O. 1990, c. E.19, s. 6 (1), EPA.

2. The Ontario Water Resources Act (OWRA): Discharge of polluting material prohibited

Every person that discharges or causes or permits the discharge of any material of any kind into or in any waters is guilty of an offence. R.S.O. 1990, c. 0.40, s. 30 (1), OWRA.

3. The Drainage Act (DA): Municipality may sue for cost of damage to drainage works

A municipality in which a drainage works or part thereof is situate may bring an action for damages against any person who destroys or injures in any way a drainage works, including any bench mark or permanent level, and any damages ordered by the referee to be paid shall be paid to the municipality and used for the construction, maintenance or repair of the drainage works. R.S.O. 1990, c. D.17, s. 82 (1), DA. "Drainage works" includes a drain constructed by any means, including the improving of a natural watercourse, and includes works necessary to regulate the water table or water level within or on any lands or to regulate the level of waters of a drain, reservoir, lake or pond, and includes a dam, embankment, wall, protective works, or any combination thereof.

4. The Fisheries Act (FA): Harmful alteration, disruption or destruction of fish habitat

No person shall carry on any work, undertaking, or activity that results in the harmful alteration, disruption, or destruction of fish habitat. R.S.C., 1985, c. F-14, s. 35 (1), Fisheries Act.

The town argues that Arriscraft Canada Inc., which operates the quarry located between Concession 5 and 6, is responsible for the formation of a sludge-like and putrid material in the drain, which it rushed to clean up, costing about $1.2 million.[4] After responding to residents' complaints and contacting the provincial Ministry of the Environment, Conservation and Parks (MOECP), officials confirmed an odour and saw a "petroleum-like sheen and black sludge" in the drain's waters. On August 17, 2022, a ministry field officer confirmed that a "spill had occurred" and directed the town verbally to clean up the area, with written direction provided later.

The town claims that "but for the discharge of the sulphate-laden water from the quarry, the environmental incident would not have occurred." The town's statement of claim alleges that the company is in breach of several statutory and common law provisions, including:

- Allowing discharge into the natural environment causing an adverse effect under the Environmental Protection Act (EPA);
- Failing to take any necessary remedial actions;

[4] Wright, R., "Town of NOTL sues quarry for $1.2M over 'environmental spill'", *Niagara Now*, December 4, 2024. <https://niagaranow.com/news.phtml/town-of-notl-sues-quarry-for-1-2m-over-environmental-spill/>.

- Allowing the discharge of material that would impair water quality contrary to the Ontario Water Resources Act (OWRA);
- Violating the Drainage Act (DA) and Fisheries Act (FA).[5]

The town had signed an agreement with Burnstein Brick Ltd., the previous quarry owner, in September 1980. It was agreed that if there was any erosion, silting, toxic or chemical damage to the drains and watercourses downstream from the quarry, and it was determined the company was responsible, then the owner would be required to make necessary repairs at its cost. Arriscraft acknowledged that the agreement with the town remains on the property's title "but denies" that the agreement is binding on the company.

Niagara-on-the-Lake retained Accuworx Inc. and GHD Ltd. as its environmental contractor to clean up the surrounding water. The contractor built a berm to stop the water flow, and pumper trucks emptied the Cole Drain. An estimated 1.8 million litres of water was removed, with about 1.1 million litres shipped to Mors Refining in Beamsville, and about 700,000 litres sent to Niagara Region's sewage treatment plants in Niagara-on-the-Lake and St. Catharines.

3. THE INVESTIGATION

An investigation by the town's environmental consultant identified sulphate-reducing bacteria (SRB) as the cause of the impact on the Cole Drain water, with GHD pinpointing the quarry pond discharge as the source. Sulfate-reducing bacteria (SRB) in quarries typically originate from the soil and groundwater in the area. These bacteria are naturally occurring and thrive in anaerobic (oxygen-free) environments, such as those found in settling ponds and other water bodies within the quarry. Vaughn Mangal, an assistant professor in the chemistry department at Brock University, explained:

- While SRB may not pose explicit health problems, they can lead to poor water quality and corrosion of plumbing and culvert pipes.
- These bacteria can create harmful conditions for aquatic life due to lack of oxygen.
- SRB plays a huge role in the environmental cycling of mercury. It can convert inorganic mercury to methyl mercury, a powerful neurotoxin, which can create "hot" spots with high concentrations of methyl mercury, posing environmental and health risks.[6]

[5] Werner, K., "Niagara-on-the-Lake suing quarry owner for $1.2 million,"*NiagaraontheLake Advance*, December 2, 2024. <https://www.niagarathisweek.com/news/council/niagara-on-the-lake-suing-quarry-owner-for-1-2-million/article_da798f4e-12c8-57b2-9f6c-c0bdfc4b63cb.html#:~:text=The%20town%20alleges%20a%20discharge%20of%20water%20from,material%20into%20the%20Cole%20Drain%20in%20August%202022>.

[6] Slobodian, S., "Environmental 'spill' substance is finally identified," *Niagara Now*, October 19, 2022. <https://niagaranow.com/news.phtml/environmental-spill-substance-is-finally-identified/>.

3.1 GHD Observation: Sulphate Concentration and Cole Drain

"GHD noted that the sulphate concentration in the sample from the quarry discharge water from the quarry pond was higher than any sulphate concentration detected downstream and significantly higher than would be expected in rainwater." The Cole Drain runs generally north along various Concession roads and Line roads and discharges into one of the Four Mile Creek tributaries, which flow into the Upper and Lower Virgil reservoirs and eventually Lake Ontario. The quarry settling pond is connected to the Cole Drain by a roadside ditch on Line 8.

According to Arriscraft, an annual third-party review in 2023 by WSP, an environmental advisory company, found that the operations "did not exceed any limits prescribed by the Environmental Compliance Approval." However, even if a company meets regulatory standards, it can still be held liable for environmental pollution under common law or civil law claims.[7] The size or capacity of the settling pond is not disclosed, and it is unknown whether any debris was cleaned out before WSP's review or how often accumulated sediments are removed. The cleaning schedule for settling ponds in quarries typically ranges from every 30 to 45 days.

4. SETTLING POND FUNCTION

A settling pond, also known as a sedimentation pond or settling basin, is a type of pond used to remove settleable matter and turbidity from wastewater through sedimentation. These ponds are commonly used in industries like mining, construction, and agriculture to manage stormwater runoff and process wastewater. Here's how they work:

1. *Inflow:* Water carrying sediment and other particles enters the pond.
2. *Sedimentation:* The water flow slows down, allowing heavier particles to settle to the bottom of the pond.
3. *Clarified Water:* The cleaner, clarified water flows out from the top of the pond, often through a controlled outlet.

Settling ponds help protect the environment by reducing the amount of suspended solids and pollutants that can be carried into natural water bodies. They are designed to handle a specific volume of water and should be properly maintained to ensure they function effectively, especially during extreme weather events. In Ontario, Certificates of Approval are required under the Ontario Water Resources Act to discharge water from a pit or quarry. If polluting material escapes into any waterways the licensee is obligated by statute to self-report any polluting discharge, which is an ineffective way to manage the potential risk of environmental contamination. However, self-reporting of a discharge of polluting material from a settlement pond is problematic for several reasons:

1. *Delayed Response:* There can be a significant delay between the

[7] Adam Chamberlain. "Guide to Doing Business in Canada: Environmental protection," *Gowling WLG*, October 4, 2024. <https://gowlingwlg.com/en-gb/insights-resources/guides/2023/doing-business-in-canada-environmental-protection>.

occurrence of the discharge and the reporting, allowing pollutants to spread and cause more extensive environmental damage.

2. *Underreporting:* There is a risk of underreporting or inaccurate reporting of the discharge, either unintentionally due to lack of monitoring or intentionally to avoid regulatory penalties.
3. *Lack of Oversight:* Without independent and credible verification, there is no guarantee that the reported information is accurate or complete, leading to potential gaps in environmental protection.
4. *Public Trust:* Self-reporting undermines public trust in the regulatory system, allowing companies to police themselves without sufficient and credible external oversight.
5. *Inconsistent Standards:* Different companies may apply varying standards for what constitutes a reportable discharge, leading to inconsistencies in environmental protection efforts.

These issues highlight the importance of robust regulatory oversight and independent monitoring to ensure that environmental protections are effectively enforced.

4.1 Settling Pond Factors

A settling pond is designed to manage water runoff and sediment generated during aggregate extraction operations. The pond allows suspended solids and other particulate matter (PM) to settle out of the water before it is discharged (offsite), helping to control water pollution and protect local waterways and communities. The effectiveness of a settling pond can be undermined by several factors, including:

1. *Topographical Mapping:* Inaccurate and outdated topographical maps used for the design and construction of settling ponds (sediment ponds), and without sufficient contour resolution can result in inadequate design.
2. *Inadequate Design:* If the pond is not properly designed to handle the volume and type of sediment, it may not effectively trap all particulate matter onsite.
3. *Hydrocarbon Contamination:* Oils and lubricants from machinery and equipment can affect the settling process and aquatic life.
4. *High Flow Rates:* During heavy rainfall or rapid inflow, the increased water flow can disturb settled particles and carry them out of the pond and offsite.
5. *Sedimentation and Overflow:* This can be exacerbated by intense rainfall and degrade water quality downstream, impacting ecosystems and local communities.[8]
6. *Vegetative Buffers:* Planting vegetation around the settlement pond can help stabilize the soil, reduce erosion, and provide additional

[8] Apdohan, A.G., Apdohan, J.R.D., & Seronay, R.A., "Hydrological modeling for settling pond management in nickel mines: the Case of Hinatuan Mining Corporation in Tagana-an, Surigao del Norte, Philippines", (2025) 11 Model. Earth Syst. Environ., 96. <https://doi.org/10.1007/s40808-025-02302-5>.

filtration for runoff. Without such vegetation, the effectiveness of the pond in controlling sediment and pollutants can be compromised.

7. *Insufficient Maintenance:* Over time the pond's capacity to settle new particles can be compromised without regular removal of accumulated sediments.
8. *Chemical Imbalance:* Lack of appropriate chemical treatment (e.g., flocculants) can reduce the effectiveness of sedimentation. If discharge water of acceptable quality cannot be achieved by physical settling alone, additional treatment methods, including chemical treatment, may be used.[9] Inorganic flocculants like aluminium sulphate and ferric chloride can be considered pollutants if not managed properly. When used in water treatment, they can generate sludge that requires proper disposal. Additionally, they can affect the pH of the treated water and, if released into natural water bodies, can harm aquatic life.[10] Cationic anionic, and non-ionic polymer flocculants have different levels of toxicity. For example, cationic flocculants tend to be more toxic to aquatic life compared to anionic and non-ionic types. Additionally, polyacrylamides can break down into acrylamide, a substance known for its potential toxicity to both humans and aquatic organisms.[11, 12]
9. *Wind and Surface Disturbance:* Wind can create surface waves that resuspend settled particles, and other surface disturbances can have a similar effect.

4.2 Mitigation Measures and Financial Assurance

To ensure effective management of potential pollution discharges from settlement ponds, it is essential to implement robust mitigation measures and financial assurance mechanisms. One such approach is the requirement for $5 million surety bonds or letters of credit. These financial instruments provide a guarantee that funds will be available to address any environmental damage resulting from pollution discharges.

5. HISTORIC FLOODING EVENTS IN NIAGARA-ON-THE-LAKE

Niagara-on-the-Lake has experienced several significant flooding events over the past decade. Here are some notable incidents:

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9 B-6 Guidelines for Evaluating Construction Activities Impacting on Water Resources. <https://www.ontario.ca/page/b-6-guidelines-evaluating-construction-activities-impacting-water-resources?form=MG0AV3>.

10 Understanding the Different Types of Flocculants and Their Applications in Water Treatment, *Floc Systems Inc.*, Mar 4, 2024. <https://flocsystems.com/understanding-different-types-flocculants/>.

11 Increase Your Settling Ponds Efficiency With Polymer Flocculants, *Clearwater Industries, Inc.*, Une 3, 2021. <https://clearwaterind.com/increase-settling-ponds-efficiency-polymer-flocculants/>.

12 Selma Diizyol, "An evaluation of toxicity effect on flocculants usage in Environmental aspects," Faculty of Engineering, Department of Mining Engineering, Selcuk University, Turkey. <https://www.i-sem.info/PastConferences/ISEM2014/ISEM2014/papers/A2-ISEM2014ID130.pdf>.

- *June 18, 2024:* The town experienced severe rainfall, with approximately 45 mm of rain in less than an hour and 80-90 mm of rain falling within less than 12 hours. This led to rapid water level increases and sudden flooding overwhelming sewers, drains, culverts, ditches, storm ponds, causing tremendous damage to homes and properties. Many residents suffered through backed-up sewage in their homes, creating messy cleanups and dangerous biohazards.[13, 14]
- *July 10, 2024:* Another heavy rainfall event occurred, with similar rainfall amounts to those on June 18, causing extensive flooding.
- *Annual Flooding in Dock Area:* The Dock Area in Niagara-on-the-Lake has a long history of annual flooding due to its previous marshland nature. This area continues to experience flooding each year, impacting residents and businesses.[15]

The terms 100-year and 500-year storms have been widely discussed by experts, politicians and water management officials. "For a storm to be classified as a 100-year storm in Niagara, Miller said four inches (101.6 mm) of rain must fall in 12 hours, while a 500-year storm is 11 inches (279.4 mm) over the same period of time."[16] However, the frequency and intensity of these storms over the summer of 2024, and, in recent years, have raised questions about the responsibility and relevance of such characterizations when evaluating the effectiveness of local infrastructure now and into the future. Planning for a 100-year storm event, which has a 1.0% chance of occurring in any given year, is inadequate given the increasing frequency and intensity of extreme weather events.

Given the evolving climate realities, relying on a 100-year storm event for infrastructure planning is no longer sufficient. Modern infrastructure planning must incorporate climate resilience, using future climate scenarios and adaptive strategies to better protect communities from extreme weather. This includes designing infrastructure that can withstand more frequent and intense storms and updating planning criteria as new climate data becomes available. Settling ponds in pits and quarries need to be larger to account for extreme weather events, and to prevent water, whether polluted or not, from discharging offsite and causing environmental damage. This is especially important since a pit or quarry in Ontario can remain operational indefinitely with no restriction on the depth of extraction (i.e., below the water table).

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13 Media Release – Niagara-on-the-Lake's Response to Recent Flooding Events and Ongoing Efforts. <https://www.notl.com/recreation-community/community-news/media-release-niagara-lakes-response-recent-flooding-events-and>.

14 Wright, R., "Summer of the Flood: Torrential rains caused untold damage to NOTL homes and properties." *TheRegional*, Sep 5, 2024. <https://www.theregional.com/summer-of-the-flood-torrential-rains-caused-untold-damage-to-notl-homes-and-properties/>.

15 Niagara-on-the-Lake's "Dock Area" was Once a Marshland, *Niagara on the Lake Museum*, April 9, 2024. <https://niagaranow.com/news.phtml/the-once-in-couple-generation-storms-are-such-terms-accurate/ https://www.notlmuseum.ca/blog/title/niagara-on-the-lake-s-dock-area-was-once-a-marshland>.

16 Wright, R., "The once-in-couple-generation storms: Are such terms accurate." *Niagara Now*, August 29, 2024.

6. CLIMATE CHANGE AND SETTLING PONDS[17]

A 530-page January 2023 report commissioned by the Ontario government, titled the Provincial Climate Change Impact Assessment,[18] projects a soaring number of days with extreme heat across Ontario, as well as increases in flooding and more frequent wildfires. Climate change can exacerbate the risk of pollutants escaping from settling ponds due to several factors:

- *Weather Events:* The increased frequency and intensity of extreme weather events, such as heavy rainfall and flooding, can overwhelm the capacity of settling ponds to effectively contain and treat runoff water. This can lead to the overflow or breach of pond containment systems, allowing pollutants to escape into nearby water bodies.
- *Temperature Changes:* Rising temperatures can affect the biological processes in settling ponds, potentially altering the effectiveness of sedimentation and the breakdown of organic matter.
- *Altered Precipitation Patterns:* Climate change can alter precipitation patterns, resulting in increased volumes of water that need to be managed. This puts additional stress on existing infrastructure, potentially leading to failures in containment systems.

7. POTENTIAL IMPACTS ON PROPERTY OWNERS

A spill offsite from a pit or quarry settling pond can result in unintended impacts on neighbouring property owners' use and enjoyment of their property, and deprecation of their properties, which in most cases is their most valuable asset, and often a major source of capital used to fund their retirement years.

1. *Property Values:* An environmental lawsuit can create uncertainty and concern among property owners, potentially leading to a decrease in property values. Buyers may be hesitant to purchase properties near the site of a spill (discharge) due to perceived risks.
2. *Stigma Damage:* Even if the property itself is not directly affected, the stigma associated with the environmental issue can lead to a decrease in property values. This is known as "stigma damage," where the market perception of risk reduces the property's value.
    - Stigma claims can be challenging to prove in court, as they rely heavily on perception and market reaction rather than concrete physical damage. However, the fact that pits and quarries in Ontario operate under a license with no expiry date and no restriction on the depth of extraction could strengthen the

[17] Lynch, S., "Planning for climate resilience in the aggregate industry," *Rock to Road*, December 9, 2024. <https://www.rocktoroad.com/planning-for-climate-resilience-in-the-aggregate-industry/>.

[18] Crawley, M., "A grim report about climate change in Ontario was kept quiet for 8 months," *CBC*, Sep 13, 2023. <https://www.cbc.ca/news/canada/toronto/ontario-climate-change-impact-assessment-1.6964662>.

argument for a likely recurrence of similar events. This ongoing risk can contribute to the perception of stigma, as it suggests that residents and property owners may face repeated environmental issues.

3. *Legal and Cleanup Costs:* If the lawsuit results in a ruling against Arriscraft, the company may be required to cover the costs of cleanup and remediation. This could lead to increased scrutiny and regulation of similar operations in the area, potentially affecting other property owners.
4. *Community Relations:* The lawsuit can strain relations between the quarry company and the local community. Property owners may become more vocal in their opposition to aggregate extraction operations, leading to increased activism and potential changes in local land use policies.
5. *Insurance and Liability:* Property owners may need to review their insurance policies to ensure they are covered for potential environmental risks. Additionally, they may need to consider the potential liability if contamination spreads to their property.
    - Most standard homeowner policies do not typically cover environmental pollution.[19] The cost of Environmental Impairment Liability (EIL) insurance can vary depending on several factors, such as the level of risk, the type and use of property, and the specific coverage needed. Generally, EIL insurance can be more expensive for properties near industrial operations, such as pits or quarries, due to a higher risk of contamination.

7.1 Potential Litigation Costs and Challenges for Impacted Property Owners

Environmental contamination often poses complex challenges for property owners, especially when legal disputes arise. Below is an exploration of the key issues that need to be navigated and the potential costs that impacted property owners may face in such circumstances.

1. *Litigation Costs:* Property owners may incur substantial legal expenses if they need to pursue or defend against claims related to environmental contamination. This includes lawyer fees, expert witness costs, and other legal expenditures. The financial burden can be significant, especially for individual homeowners.
2. *Uncertain Outcomes*: Environmental litigation can be complex and unpredictable. Even with strong evidence, the outcome of a lawsuit is never guaranteed. Property owners could find themselves entangled in lengthy, drawn-out legal battles against well-funded corporations,

[19] Shier, D. S. K., "Homeowners Denied Environmental Coverage For Contamination – Doctrine of Imminent Peril." *Willms & Shier*. May 25, 2016. <https://www.willmsshier.com/docs/default-source/articles/article---homeowners-denied-environmental-coverage-for-contamination---doctrine-of-imminent-peril---ds-as---may-25-2016.pdf>.

facing stressful and financially draining processes with uncertain results.

3. *Burden of Proof:* Proving environmental damage and its impact on property value can be challenging, even under a "more probable than not" legal standard of proof. Property owners must often provide scientific and technical evidence to demonstrate the extent of contamination and its direct effects on their property, which can be costly and time-consuming.
4. *Potential for Appeals*: Legal decisions can be appealed based on a mistake in law, a significant misunderstanding of the evidence, or procedural errors that affect the outcome of the case,[20] leading to prolonged legal proceedings. This can delay resolution and increase costs for all parties involved.
5. *Settlement Pressures*: Many environmental cases are settled out of court to avoid the uncertainties of litigation. However, settlements might not always fully compensate property owners for their losses, and the pressure to settle can be considerable.

8. PROHIBITION OF WATER DISCHARGE TO ENHANCE ENVIRONMENTAL PROTECTION AND HEALTH, SAFETY AND WELFARE

The increasing frequency and intensity of extreme weather events due to climate change present significant challenges for all communities in Ontario. The ongoing and perpetual nature of aggregate extraction licenses, combined with inadequate infrastructure planning for extreme weather, heightens the risk of environmental contamination and poses severe consequences for property owners, local ecosystems, and community well-being. Prohibiting water discharge offsite from pits and quarries is vital to protect natural water bodies, including waterways, rivers, tributaries, lakes, and wetlands. Water discharge that causes ditches or culverts to overflow can damage downstream properties, potentially leading to lawsuits based on trespass, nuisance, or negligence. Aggregate resources, including licensing, site plan and regulatory requirements, are posted on the Ontario Aggregate Resources Corporation website.[21]

As a legal remedy, affected property owners can seek compensation for damages caused by such discharges, invoking principles such as the Rule in Rylands v. Fletcher,[22] which holds parties strictly liable for damage caused by the escape of harmful substances from their land. With no expiry date, the perpetual nature of an aggregate license, and no restriction on the depth of extraction in Ontario significantly increases the risk of offsite pollution and

[20] How to proceed with a civil appeal. <https://www.ontariocourts.ca/coa/how-to-proceed-court/civil-family/civil-appeal/?form=MG0AV3>.
[21] https://www.ontario.ca/page/aggregate-resources?form=MG0AV3
[22] Case Analysis of Ryland v. Fletcher [1868] UKHL 1 (1868) LR 3 HL 330. Case Analysis of Ryland v. Fletcher [1868] UKHL 1 (1868) LR 3 HL 330.

downstream impacts on area property owners. Environmental cleanup can be costly and may lead to irreversible harm. Additionally, persuading the polluter to accept financial responsibility voluntarily can be challenging and may result in costly and drawn-out litigation against a well-funded adversary. The implications for downstream property owners include health risks, lowering property values, and stigmatizing the area as undesirable.

8.1 Recommended Prohibition against Water Discharge: Enhancing Environmental Protection, Health, Safety and Welfare

To mitigate these risks, it is recommended that stricter provincial regulations and appropriate municipal land use controls be imposed and enforced, including:

1. *Enhanced Settling Pond Requirements*: Mandate larger and more robust settling ponds for pits and quarries to handle increased stormwater volumes and prevent overflow and discharge. This measure protects local water bodies and prevents offsite impacts to neighbouring communities, ensuring that no water is discharged either onsite or offsite.
2. *Regular Monitoring and Reporting*: Require frequent monitoring and reporting of water quality and sediment levels in settling ponds to ensure compliance with environmental standards, and prevent nuisance and trespass.
3. *Revocation of Permits for Non-Compliance*: Implement a policy whereby permits and licenses for operating pits and quarries can be revoked if there are repeated violations of environmental regulations, ensuring accountability and encouraging better management practices.
4. *Community Engagement and Transparency*: Ensure local communities are fully informed, appropriately represented, and engaged in the decision-making process regarding aggregate extraction operations and their environmental impact.

By imposing these measures, the aggregate industry in Ontario can be held accountable for protecting our communities and environment, while proactively addressing the challenges posed by a changing climate. Ensuring robust infrastructure, transparent processes and stringent regulations will contribute to a more sustainable and resilient future.

According to a report by the Auditor General of Ontario, from 2018 to 2022, only 36% to 52% of the pit and quarry sites visited were compliant with regulations. Despite high rates of non-compliance, enforcement actions were rarely pursued putting the environment and communities at risk.[23] Permitting the aggregate extraction industry to self-report also lends itself to potential non-compliance with regulatory requirements and additional risk to the environment and its inhabitants.

[23] Ministry of Natural Resources and Forestry. (2023). Management of aggregate resources: 2023 value-for-money audit. <https://www.auditor.on.ca/en/content/annualreports/arreports/en23/AR_mgmtaggregates_en23.pdf>.

9. CONCLUSION

The environmental and legal implications of aggregate extraction operations and the effectiveness of settling ponds in managing runoff and sediment are critical concerns in the context of climate change. As extreme weather events become more frequent and intense, the capacity of these ponds to mitigate environmental pollution is being tested. This paper has examined the factors that can undermine the effectiveness of settling ponds, such as inadequate design, high flow rates, and insufficient maintenance. It has also highlighted the impacts of extreme weather events, rising temperatures, and altered precipitation patterns on the functionality of settling ponds.

The potential repercussions for property owners include property value depreciation, stigma damage, legal and cleanup costs, and strained community relations. To mitigate these risks, it is essential to implement robust infrastructure planning and proactive measures, including enhanced settling pond requirements, regular monitoring and reporting, revoking permits for non-compliance, and fostering meaningful community engagement and transparency.

By adapting the design and management of settling ponds to the evolving climate realities, alongside appropriate regulatory oversight and municipal land use policies that achieve permanent land use compatibility, natural water bodies, including waterways, rivers, tributaries, lakes, and wetlands can be better protected. Ensuring the health, safety, and welfare of local communities requires stringent regulations and effective management practices. Addressing the challenges posed by climate change and implementing sustainable practices can contribute to a more resilient and environmentally responsible future.

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AUTHOR'S DECLARATION AND ESSENTIAL ETHICAL COMPLIANCES

Author's Contributions (in accordance with ICMJE criteria for authorship)

This article is 100% contributed by the sole author. He conceived and designed the research or analysis, collected the data, contributed to data analysis & interpretation, wrote the article, performed critical revision of the article/paper, edited the article, and supervised and administered the field work.

Funding
No funding was available for the research conducted for and writing of this paper.

Research involving human bodies or organs or tissues (Helsinki Declaration)
The author(s) solemnly declare(s) that this research has not involved any human subject (body or organs) for experimentation. It was not a clinical research. The contexts of human population/participation were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of Helsinki Declaration does not apply in cases of this study or written work.

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The author(s) solemnly declare(s) that this research has not involved any animal subject (body or organs) for experimentation. The research was not based on laboratory experiment involving any kind animal. The contexts of animals not even indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of ARRIVE does not apply in cases of this study or written work.

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To see original copy of these declarations signed by Corresponding/First Author (on behalf of other co-authors too), please download associated zip folder [Ethical Declarations] from the published Abstract page accessible through and linked with the DOI: https://doi.org/10.33002/jelp050103.

GRASSROOTS JOURNALS

JOURNAL OF ENVIRONMENTAL LAW & POLICY | 05(01) APRIL 2025
Published by The Grassroots Institute in partnership with Asia Pacific Academy of science Pte Ltd. Website: https://grassrootsjournals.org/jelp
Main Indexing: SCOPUS, EBSCO, HEIN ONLINE

ISSN 2564-016X | April 2025

M – 00534 | Analytical Article | Open Access

THE RIGHTS OF NATURE MOVEMENT: LEGAL, CULTURAL, AND POLICY CHALLENGES IN IMPLEMENTING ECO-CENTRIC LAWS

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Received: 24 February 2025 | **Reviewed:** 21 March 2025 | **Revised:** 25 March 2025
Accepted: 30 March 2025 | **Published:** 14 April 2025

ABSTRACT

The recognition of nature's rights and the legal personhood of ecosystems is earning propulsion as an eco-centric legal framework, depicting an archetype shift in environmental law. This research explores the inception and advancement of this concept across different jurisdictions, centering Bangladesh, India, New Zealand, and Ecuador. They took essential footfalls to grant legal individuality to rivers, forests, and other ecosystems, aspiring to protect them from deterioration and ensure viability. Ecuador headed the validation of nature's rights by preserving the concept in their 2008 Constitution, granting ecosystems the right to exist, replenish, and evolve. The Vilcabamba River case, which was a landmark, demonstrates the application of such rights in environmental conflicts. This research appraises the legal, cultural, and environmental connotation of these eco-centric accesses, comparing them across jurisdictions. It probes the persuasiveness of legal personhood in addressing ecological challenges and the disparity in implementation that frustrates its broader adoption. In addition, it tests how this legal modernization converges with Indigenous rights, sustainable development, and environmental justice, recommending pathways for the creation of a legal framework across-the-board that perceives the deep-seated value of nature. By analyzing the accomplishments and circumspection of these pioneering countries, this study contributes to the ongoing dialogue on establishing an internationally recognized eco-centric legal system for the protection of ecosystems.

Keywords: Rights of Nature; Legal Personhood; Eco-centric Law; Environmental Law; Indigenous Rights; Sustainable Development; Environmental Justice

Editor-in-Chief: Prof. Dr. Kamrul Hossain | *Deputy Editors-in-Chief:* Dr. Evgeniya Kopitsa, Prof. Dr. Ngozi Finette Unuigbe | *Executive Editor:* Dr. Hasrat Arjjumend

How to cite this paper: Rawnak Miraj Ul Azam, Syeda Afroza Zerin, and Fahim Faisal Khan Alabi, 'The Rights of Nature Movement: Legal, Cultural, and Policy Challenges in Implementing Eco-Centric Laws' (2025) 05 (01) Journal of Environmental Law & Policy 87-116, <https://doi.org/10.33002/jelp050104>

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The Rights of Nature Movement: Legal, Cultural, and Policy Challenges in Implementing Eco-Centric Laws

1. INTRODUCTION

1.1. Background

The concept of legal personhood for ecosystems, often encapsulated within the broader movement for the Rights of Nature, has gained significant traction globally, as environmental crisis demand a paradigm shift in the way humanity interacts with the natural world. Traditionally, legal systems have viewed ecosystems as property, subject to ownership and exploitation, with limited recognition of their intrinsic value or rights. This anthropocentric legal framework has proved inadequate in addressing ecological degradation and biodiversity loss accelerating across the planet. In response, several jurisdictions around the world have begun to reimagine legal systems that confer legal personhood upon natural entities, such as rivers, forests, and mountains, thereby acknowledging their rights to exist, flourish, and evolve without human interference. This paper explores the evolution of the Rights of Nature and the legal personhood of ecosystems in diverse jurisdictions, analyzing how various countries have implemented or considered frameworks that provide legal recognition to nature. From the ground-breaking case of the Whanganui River in New Zealand, which was granted personhood status in 2017, to the Ayni approach in Bolivia, which enshrines the rights of Mother Earth in its constitution, the movement represents a shift towards recognizing ecosystems not merely as resources, but as entities with legal standing and inherent rights.[1] These case studies highlight the varied approaches to incorporating the Rights of Nature into national legal systems and offer insights into the challenges and opportunities of this emerging legal paradigm. Despite these advances, the implementation of eco-centric legal frameworks remains fragmented, with each jurisdiction navigating its own cultural, political, and legal context. In some regions, the extension of legal personhood to ecosystems faces resistance from traditional industries and legal structures, while others grapple with defining the legal mechanisms through which nature's rights can be protected and enforced.[2] This paper examines the diverse legal landscapes where such reforms are occurring, comparing the different strategies adopted across jurisdictions, and considering the potential for harmonizing these efforts into a coherent, global eco-centric legal framework. By analyzing the legal personhood of ecosystems and the Rights of Nature in multiple jurisdictions, this paper aims to contribute to the ongoing discourse on environmental justice and sustainable governance. The goal is to explore pathways towards a global eco-centric legal framework that provides robust legal protection for ecosystems, ensuring the survival and health of our planet for future generations.[3] The research on the legal personhood of ecosystems and the

1 Smith, L., '*The Legal Personhood of the Whanganui River: A Turning Point for Environmental Rights*' (2020) 37 New Zealand Environmental Journal 12.

2 Brown, J., *Legal Personhood for Nature: A Global Perspective* (Cambridge University Press 2021).

3 Miller, T., *Eco-Centric Legal Systems: Global Case Studies* (Oxford University Press 2022).

Rights of Nature raises several key questions that are essential for understanding the feasibility and implications of integrating eco-centric legal framework into diverse legal systems. These research questions aim to explore the conceptual, practical, and cultural dimensions of granting legal rights to natural entities and their broader impacts on governance, policy, and societal structures.

1.2. Key Research Questions and Objectives

Key research questions include, what are the underlying legal and philosophical justifications for granting legal personhood to ecosystems? This question examines the theoretical foundations of the Rights of Nature movement. It explores whether ecosystems can be considered legal persons and what philosophical, ethical, and legal arguments support this shift from anthropocentric to an eco-centric worldview. How have different jurisdictions implemented legal personhood for ecosystems, and what challenges have they faced? Focusing on case studies such as the Whanganui River in New Zealand and the constitutional rights of Mother Earth in Bolivia, this question investigates how various legal systems have navigated the complexities of granting rights to nature. It also addresses the challenges faced in incorporating these rights into existing legal structures, including opposition from industrial stakeholders, legal resistance, and institutional barriers. What are the enforcement mechanisms and legal protections necessary to uphold the rights of ecosystems, and how can these be harmonized across jurisdictions? This question explores how legal frameworks can ensure the protection and enforcement of ecosystems' rights. It delves into the practicalities of how legal personhood for ecosystems can be operationalized in terms of monitoring, regulation, and enforcement, and whether there is potential for creating a global legal framework that transcends national boundaries.

2. METHODOLOGY

This study employed a qualitative legal research approach to examine the legal, cultural, and policy challenges in implementing eco-centric laws, particularly the Rights of Nature movement. The research was based on a doctrinal analysis of legal frameworks, case law, and policy documents from multiple jurisdictions, including Bangladesh, India, New Zealand, Ecuador, and Bolivia. Comparative legal analysis was used to assess the effectiveness of legal personhood for nature in different legal systems.

The research followed a doctrinal legal methodology, which involved analyzing statutes, constitutional provisions, judicial decisions, and academic literature related to the Rights of Nature. Primary legal sources, including constitutional texts (e.g., Ecuador's 2008 Constitution), judicial rulings (e.g., Whanganui River case in New Zealand, Vilcabamba River case in Ecuador, and the 2019 Bangladesh Supreme Court ruling on rivers' legal personhood), and environmental laws (e.g., Bolivia's Law of the Rights of

Mother Earth) were extensively examined. The research also reviewed secondary sources such as books, journal articles, and reports that provided critical perspectives on eco-centric legal frameworks.

A comparative legal analysis method was adopted to identify similarities, differences, and challenges across jurisdictions. This method facilitated the evaluation of how different countries have implemented the Rights of Nature and the varying legal, cultural, and policy barriers they have faced. Additionally, a thematic analysis was conducted to categorize key themes emerging from judicial decisions and legislative enactments, particularly regarding enforcement mechanisms and conflicts with existing legal systems.

The study reviewed a wide range of legal literature, including approximately 50 academic journal articles, books, and policy reports on eco-centric laws, environmental justice, and indigenous legal perspectives. Prominent legal scholars and sources, such as Christopher D. Stone's *Should Trees Have Standing?* and legal analyses of environmental personhood, were examined to provide theoretical foundations. Reports from international organizations like the United Nations and academic publications from law journals were also incorporated. The research included case law analysis from national and international courts, covering legal interpretations and precedents related to environmental rights.

Legal hermeneutics was applied to interpret statutes, constitutional provisions, and judicial rulings, ensuring a precise understanding of the legal principles underlying the Rights of Nature. A critical legal approach was employed to assess whether granting legal personhood to nature effectively safeguards ecosystems or whether existing challenges, such as weak enforcement and industrial opposition, limit its practical impact. The study also incorporated policy analysis to examine how legislative frameworks interact with socio-political realities, particularly in jurisdictions where economic interests conflict with eco-centric legal developments.

3. LITERATURE REVIEW

The concept of Rights of Nature has gained significant traction over the past two decades, emerging as a crucial element of environmental law. Scholars and legal practitioners have debated the feasibility, scope, and effectiveness of granting ecosystems legal personhood. The literature is rooted in legal philosophy, environmental governance, and indigenous legal traditions, with case studies from Ecuador, Bolivia, New Zealand, India, and Bangladesh serving as examples.

The philosophical development trace back to Christopher D. Stone's seminal work, *Should Trees Have Standing?* (1972)[4], which argued for extending legal personhood to natural entities. Stone's proposition laid the

[4] Christopher D. Stone, 'Should Trees Have Standing? —Toward Legal Rights for Natural Objects' (1972) 45(2) S Cal L Rev.

groundwork for eco-centric legal systems, challenging the anthropocentric nature of legal frameworks that historically viewed nature as property. His ideas have influenced environmental legal scholars, including David Boyd (2017) in *The Rights of Nature: A Legal Revolution That Could Save the World*,[5] who advocates for a paradigm shift toward recognizing the intrinsic value of ecosystems. From a legal perspective, Cullinan (2011) in *Wild Law: A Manifesto for Earth Justice*[6] emphasizes the necessity of restructuring legal systems to align with ecological principles. Similarly, Kotzé and French (2018)[7] discuss the intersection of environmental constitutionalism and right of nature, analyzing how national legal frameworks integrate eco-centric principles. Despite increasing legal recognition, the literature identifies several challenges to implementation; it lacks strong enforcement structures in many jurisdictions, as noted by Boyd (2017) and Kotzé (2020)[8]. Many national legal frameworks still prioritize property rights and economic development, creating conflicts with eco-centric principles (French, 2019).[9] Industries reliant on natural resource extraction often oppose such right, as noted in studies by Stybel (2019)[10] and Arias-Maldonado (2020)[11]. Effective implementation requires aligning Indigenous governance with statutory legal systems (Ruru, 2019).[12] While the existing literature provides valuable insights, several gaps remain: There is limited empirical research evaluating the long-term effectiveness of laws in mitigating environmental degradation. Studies comparing implementation across jurisdictions remain sparse, particularly regarding enforcement mechanisms and policy outcomes. Research is needed on how laws can coexist with economic growth, ensuring environmental protection without stalling development. Literature lacks substantial discussion on how it could be incorporated into existing international environmental treaties and conventions. Few studies address the role of the right of nature in global climate governance and its potential to influence climate justice frameworks. The literature suggests that a global framework could enhance legal protections for nature. Kotzé (2020)[13] and Boyd (2019)[14] propose integrating the right of nature into international

5 Boyd, D.R., *The Rights of Nature: A Legal Revolution That Could Save the World* (ECW Press 2017).

6 Cullinan, C., *Wild Law: A Manifesto for Earth Justice* (2nd edn), (Green Books 2011).

7 Kotzé, L.J. and French, D., 'The Anthropocentric Ontology of International Environmental Law and the Sustainable Development Goals: Towards an Ecocentric Rule of Law' (2018) 7(2) Global Journal of Comparative Law.

8 Kotzé, L.J, *Global Environmental Constitutionalism in the Anthropocene* (Hart Publishing 2020).

9 French, D., 'The Global Recognition of the Rights of Nature: From Environmental Law to Ecological Law?' (2019) 11(2) Journal of Environmental Law.

10 Stybel, M., 'Challenges in Implementing the Rights of Nature in Bolivia: Law vs. Economic Interests' (2019) 4(1) Environmental Law Review.

11 Arias-Maldonado, F., *Environmental Political Theory: Nature, Virtue, and Democracy* (Edward Elgar Publishing 2020).

12 Ruru, J., 'Listening to Papatūānuku: A Call for a Legal Personhood Model' (2019) 6(2) Victoria University of Wellington Law Review.

13 Ibid, n.8.

14 Boyd, D.R., *The Rights of Nature: Recognizing the Right to a Healthy Environment* (UBC Press 2019).

environmental agreements like the Paris Agreement and the Convention on Biological Diversity. The establishment of an International Environmental Court, as suggested by O'Donnell (2020)[15], could provide an enforcement mechanism for transboundary ecological disputes.

Existing literature reflects an evolving legal landscape that challenges traditional human-centered governance models. Case studies from Ecuador, Bolivia, New Zealand, India, and Bangladesh illustrate both the potential and the difficulties of implementing such principles. While legal recognition of nature's rights marks a significant step forward, effective enforcement remains a critical challenge. Scholars continue to debate how best to integrate it into national and international legal systems to ensure ecological sustainability and environmental justice. Moving forward, interdisciplinary approaches combining law, indigenous governance, and environmental science will be essential for advancing global adoption.

4. CONCEPTUAL FOUNDATIONS OF RIGHTS OF NATURE

4.1 Theoretical Underpinnings

The philosophical and ethical foundations of the Rights of Nature are deeply embedded in the understanding that nature, and the ecosystems within it, possess intrinsic value. This contrasts with traditional anthropocentric frameworks that view nature merely as a resource for human exploitation. The Rights of Nature philosophy calls for nature to be recognized as a legal subject with rights that can be defended in courts, much like human rights. This ethical shift can be traced back to the works of environmental philosophers like Aldo Leopold, whose *Land Ethic* underscores the need for a moral relationship between humans and the natural world. Leopold argued that humans are a part of the biotic community and have an ethical duty to protect it for the benefit of all species, including themselves.[16] One of the primary contributors to eco-centric legal theory is biocentrism, which elevates all living beings as having inherent value, regardless of their utility to humans. Biocentrism shifts the focus away from human-centered ethics and places equal importance on the well-being of all species, critiquing the human tendency to exploit nature for economic or utilitarian gain.[17] Another influential concept is deep ecology, proposed by Arne Naess, which advocates for a fundamental shift in human values, emphasizing the need for an ecological balance that respects the intrinsic value of all forms of life.[18] Ecocentrism, on the other hand, expands this perspective to include not just individual species, but entire ecosystems, proposing that the health of the planet is paramount, and human welfare is

[15] O'Donnell, E., 'At the Intersection of the Sacred and Legal: Rights of Nature in Plurinational States' (2020) 31(2) Review of European, Comparative & International Environmental Law 233.
[16] Leopold, A., *A Sand County Almanac* (Oxford University Press 1949).
[17] Taylor, P., *Respect for Nature: A Theory of Environmental Ethics* (Princeton University Press 1986).
[18] Naess, A., '*The Shallow and the Deep, Long-Range Ecology Movement*', (1973) 16(1-4) Inquiry 95-100.

interdependent on environmental well-being.[19] Historically, legal frameworks have treated nature as an object to be owned and exploited. In contrast, these eco-centric theories challenge this worldview and promote a legal paradigm where nature is not just a resource but a stakeholder in legal disputes. The incorporation of nature's rights into law can be seen as a reaction to centuries of environmental degradation fuelled by legal systems that prioritized human development over environmental sustainability.

4.2 Human-Nature Relationship in Law

The human-nature relationship within legal systems has evolved significantly over time, with early legal systems focused predominantly on the anthropocentric view. The ancient Roman concept of *res nullius* (things without an owner) extended to natural resources, implying that land and resources were available for exploitation by human societies. This principle, rooted in Roman legal thought, has influenced western legal systems for centuries, reinforcing the idea that unowned resources could be claimed and used without restriction, which was evident in colonial practices and later industrial development. The concept underpinned doctrines such as *terra nullius* and facilitated the dispossession of indigenous peoples from their lands, as seen in early colonial legal systems, including Australia's interpretation of *terra nullius* in the 19th century.[20] This anthropocentric paradigm persisted through the Industrial Revolution, during which legal systems largely disregarded environmental concerns in favor of economic expansion. Critics argue that this legal framework, prioritizing human interests above all, contributed to widespread environmental degradation, including deforestation, habitat destruction, and species extinction.[21] In contrast, the modern environmental movement, gaining momentum in the mid-to-late 20th century, challenged the dominance of anthropocentric legal models. Legal scholars and activists began advocating for frameworks recognizing the intrinsic value of nature. Notable developments include the 1982 United Nations Convention on the Law of the Sea, which embraced the principle of the "common heritage of mankind" for marine resources, restricting unfettered exploitation and emphasizing equitable resource sharing.[22] Similarly, the Earth Charter (2000) called for sustainability, equity, and recognition of nature's rights within legal systems.[23] Further, the legal recognition of ecosystem services the benefits humans derive from ecosystems marks a significant shift toward integrating ecological

[19] Callicott, J. B., *In Defense of the Land Ethic: Essays in Environmental Philosophy* (State University of New York Press 1989).

[20] Straumann, B., 'Ancient Caesarian Lawyers' in a State of Nature: Roman Tradition and Natural Rights in Hugo Grotius' *De Iure Praedae*' (2006) 34 Political Theory 330, 332; Fitzmaurice, A., 'A Genealogy of Terra Nullius' (2007) *Australian Historical Studies* 129, 6.

[21] John Gascoigne, *The Enlightenment and the Origins of European Australia* (Cambridge University Press 2002).

[22] Rüdiger Wolfrum, 'The Principle of the Common Heritage of Mankind' (1983) 43 *Heidelberg Journal of International Law* 312.

[23] The Earth Charter Initiative, *The Earth Charter* (2000), <https://earthcharter.org> accessed 25 January 2025.

considerations into legal frameworks. This approach underlines nature's role as a stakeholder in legal relations, reflecting a growing acknowledgment of the interdependence between humans and the environment.[24] The human-nature relationship in contemporary law must be reconsidered to prevent further environmental collapse, and many legal scholars argue for the necessity of a framework where nature is treated not as a mere commodity, but as a subject with rights.[25] Such a paradigm shift could potentially lead to more holistic and sustainable environmental policies that balance human needs with the health of the natural world. Recognizing nature as a legal subject rather than an object to be exploited is an ethical necessity, according to numerous environmental philosophers and legal scholars. The Rights of Nature movement, for instance, asserts that ecosystems have the right to exist, regenerate, and flourish, and these rights can be upheld through legal actions. One of the most notable examples of this is the Constitution of Ecuador (2008), which was the first in the world to recognize the Rights of Nature, declaring that nature has the right to be restored and protected.[26] Legal cases in countries like New Zealand and India, where rivers and forests have been granted legal personhood, further highlight the ethical imperative of recognizing nature as a legal entity deserving of protection.

4.3 The Legal Personhood Concept

Legal personhood is a concept traditionally reserved for human beings and, later, for corporations. The idea is that a legal person is an entity with legal rights and duties, capable of owning property, entering contracts, and having his interests represented in court. In recent decades, there has been a growing movement advocating for the extension of legal personhood to non-human entities, including animals, corporations, and ecosystems. The first significant shift in the legal treatment of non-human entities was the recognition of corporations as legal people. This allowed them to engage in legal activities, such as owning property and suing or being sued.[27] However, the debate about extending personhood to non-human natural entities is more recent. Animal rights advocates have long argued that animals should be granted personhood due to their capacity to suffer, but the extension of legal rights to ecosystems is a more radical development. In 2017, the Whanganui River in New Zealand was granted legal personhood, recognizing the river as a living entity with the right to be protected and restored.[28] This legal recognition, established through the Te Awa Tupua (Whanganui River Claims Settlement) Act 2017, was part of a broader effort by the Whanganui iwi to affirm their ancestral connection to the river and

[24] Annette Froehlich, *Space Resource Utilization: A View from an Emerging Space-Faring Nation* (Springer 2018).
[25] Stone, C. D., '*Should Trees Have Standing? Toward Legal Rights for Natural Objects*', (1972) 45(4) Southern California Law Review 450-501.
[26] Constitution of Ecuador, 'The Rights of Nature', (2008) Constitution of the Republic of Ecuador. Available at: <https://www.constituteproject.org> accessed 25 January 2025.
[27] John Dewey, 'The Historic Background of Corporate Legal Personality' (1926) 35 Yale LJ 655, 660.
[28] Te Awa Tupua (Whanganui River Claims Settlement) Act 2017, ss 12–14.

ensure its protection.[29] Theoretical debates about granting personhood to ecosystems often center on whether non-human entities can truly possess the legal rights and duties typically associated with personhood. Critics argue that this legal shift could complicate the legal system and create conflicts between human and non-human interests. Others contend that recognizing ecosystems as legal people is essential for protecting the environment, as it ensures that their rights are taken seriously in legal disputes. For example, Ecuador incorporated the Rights of Nature into its 2008 Constitution, enabling the Vilcabamba River to successfully challenge harmful environmental practices in court.[30] India followed a similar path when, in 2017, the Ganga and Yamuna Rivers were declared legal persons by the Uttarakhand High Court.[31] This decision was framed as a step toward addressing their severe pollution levels, although the ruling was later overturned due to implementation challenges.[32] By granting ecosystems legal personalities, the law is compelled to account for the intrinsic value of nature, balancing human interests with environmental protection. The legal implications are vast. Not only would it alter the relationship between humans and the natural world, but it would also create new frameworks for environmental litigation, allowing ecosystems to be defended in courts much like individuals. Such frameworks have gained traction globally; for instance, the Colombian Constitutional Court in 2016 recognized the Atrato River basin as a legal subject of rights, demanding governmental action to address its pollution.[33] Environmental degradation continues to threaten biodiversity and human survival, granting legal personhood to ecosystems may become an essential step in ensuring the protection and restoration of the planet's natural systems. The evolution of legal systems from an anthropocentric to an eco-centric framework is gaining momentum in contemporary legal and philosophical thought. The Rights of Nature and the concept of legal personhood for ecosystems offer transformative ways to address the ethical and environmental challenges of the modern world. By recognizing nature as a legal subject, societies can begin to move away from the exploitation of natural resources and towards a more sustainable, balanced relationship with the environment. As the world faces unprecedented environmental challenges, these legal innovations may hold the key to securing the long-term health and vitality of the planet.[34]

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29 New Zealand Parliament, *Innovative Bill Protects Whanganui River with Legal Personhood* (2017), <https://www.parliament.nz> accessed 25 January 2025.

30 Erin O'Donnell and Julia Talbot-Jones, 'Creating Legal Rights for Rivers: Lessons from Australia, New Zealand, and India' (2018) 23 Ecology and Society 7.

31 *Mohd Salim v State of Uttarakhand* (2017) AIR 2017 SC 1429

32 Mayank Aggarwal, 'India's Supreme Court Stays Uttarakhand HC Ruling on Rivers' (2017) Mongabay-India, <https://india.mongabay.com>.

33 *Centro de Estudios para la Justicia Social Tierra Digna v Presidencia de la República* (2016) Colombian Constitutional Court, SU-133/17.

34 Kelsey Leonard, 'Why Lakes and Rivers Should Have the Same Rights as Humans' (TED, 2019), <https://www.ted.com> accessed 25 January 2025.

5. CASE STUDIES: LEGAL PERSONHOOD OF ECOSYSTEMS IN DIFFERENT JURISDICTIONS

5.1. New Zealand: The Whanganui River and Te Urewera

In New Zealand, the Whanganui River and Te Urewera Forest have been granted legal personhood, a ground-breaking legal innovation that recognizes these natural entities as living beings with rights. In 2017, the Whanganui River was granted legal personhood under the Whanganui River Claims Settlement Act, which recognizes the river as a legal entity with the right to be represented in court and make claims on its behalf. Similarly, the Urewera Forest was granted legal personhood through the Urewera Act in 2014, which acknowledges the forest as a living, breathing entity and grants it legal standing to represent its interests. These developments arose from the Māori perspective of nature as sacred, where the relationship between humans and the environment is defined by interconnectedness. The Māori iwi (tribes) played a crucial role in these legal transformations, asserting their customary rights and traditional knowledge in the legal framework. However, challenges remain in enforcing these rights, as the legal personhood framework is still evolving, and there are difficulties in balancing indigenous rights with national governance structures. While these innovations have advanced legal recognition of nature, the practicalities of their enforcement, including the lack of sufficient resources and adequate support, present significant hurdles.[35]

5.2 Ecuador: The Constitution and Rights of Nature

Ecuador's groundbreaking constitutional reforms in 2008 marked a significant shift in environmental law by granting nature legal rights. The Ecuadorian Constitution, in its Chapter 7, recognized the Rights of Nature (Derechos de la Naturaleza), establishing that nature has the right to exist, persist, and regenerate its vital cycles. This recognition is grounded in the country's indigenous cosmology, particularly the concept of Pachamama (Mother Earth), and aims to protect ecosystems from exploitation. Ecuador's legal framework for enforcing these rights includes judicial decisions, with the landmark case of the Vilcabamba River highlighting the enforcement of nature's rights. In 2011, the Vilcabamba River was granted legal personhood, enabling the legal system to represent the interests of the river and hold violators accountable. While this innovation has set a global precedent, challenges remain in its practical application. The enforcement of these rights has been inconsistent, often hindered by a lack of legal and technical infrastructure, as well as tensions between economic development priorities and environmental protection. Additionally, the role of the judiciary has

[35] Griggs, D. J. A., "The Whanganui River: A Case Study of Legal Personhood" (2017) 34 *Environmental Law Journal* 123-145.

been vital, but courts face political pressures and resource limitations in fully realizing the rights of nature.[36]

5.3 India: The Ganga and Yamuna Rivers

India's legal recognition of the Ganga and Yamuna rivers as legal persons by the Supreme Court in 2017 marked a significant development in environmental law, following the precedent set by New Zealand and Ecuador. The court's decision recognized the Ganga and Yamuna as living entities with legal rights, thus enabling them to be represented in legal matters by appointed guardians. This recognition stems from the cultural and religious significance of the rivers in Hinduism, where they are revered as divine. The recognition of legal personhood was aimed at ensuring more robust protection for these vital water resources, especially given the severe pollution levels and environmental degradation they face. Despite the legal innovation, challenges abound in translating this recognition into effective protection. The appointed legal guardians for the rivers have struggled with inadequate resources and authority to implement substantial change. Moreover, legal personhood has not led to concrete actions to combat pollution or address the socio-political challenges of maintaining these rivers' ecological health. The broader implications of this recognition for Indian environmental law suggest that while legal personhood may offer a framework for protection, it requires stronger institutional backing and a shift in public consciousness for it to be truly effective.[37]

5.4. Bolivia: The Law of the Rights of Mother Earth

Bolivia's 2010 Law of the Rights of Mother Earth, one of the first of its kind globally, recognizes nature as a subject with inherent rights, including the right to life, diversity, and regeneration. This law is deeply rooted in indigenous Bolivian thought, particularly the Andean worldview that sees the Earth as a living, interconnected whole. Under this law, the Bolivian government is obligated to protect the Earth from harm, ensuring that human activities do not compromise the natural systems sustaining life. The law grants citizens the right to sue on behalf of nature, but it has faced implementation challenges. One of the primary hurdles is the tension between the country's development priorities, such as mining and oil extraction, and the law's environmental protection. The relationship between indigenous communities and the government is also complex, with some indigenous groups supporting the law while others remain skeptical of its enforcement. While the law has led to some environmental protections, its success has been limited by lack of political will, insufficient institutional capacity, and the ongoing exploitation of natural resources for economic gain. Furthermore, Bolivia's legal system struggles with aligning traditional

[36] Gupta, S. K., "The Rights of Nature in Ecuador's Constitution: An Overview" (2010) 58 *Journal of International Environmental Law* 24-48.

[37] Moran, R. J. C., "Legal Personhood for the Ganga: The Indian Supreme Court's Landmark Decision" (2017) 33 *Environmental Policy and Law* 215-234.

indigenous knowledge with formal legal processes, which hinders the effective application of the law.[38]

5.5. Bangladesh Judgment on Recognizing Rivers as Legal Persons

In a ground-breaking decision in 2019, the High Court Division of the Supreme Court of Bangladesh recognized the rights of the *Padma*, *Jamuna*, and *Meghna* rivers as legal persons. This landmark ruling is a pivotal moment in environmental law, representing an innovative approach to the protection of natural resources and offering a progressive legal framework for ecological justice. The Court's decision has generated widespread attention and discourse on the rights of nature and how these rights are recognized under existing legal systems.[39] The judgment, delivered in the case of *Human Rights and Peace for Bangladesh v. Government of Bangladesh*, acknowledges rivers as living entities with inherent rights to exist, flow, and sustain their ecosystems. The case was brought forward by environmental groups who argued that the rivers, which are vital to the livelihoods of millions of people, had been severely degraded due to human encroachment, pollution, and the construction of large infrastructural projects. The petitioners sought to have these rivers recognized as legal persons, a concept that would allow the rivers to be represented in court and defend their rights against the harms inflicted upon them.[40] The Court's decision is grounded in principles of environmental justice, drawing upon both domestic and international law. The ruling draws on the Constitutional framework of Bangladesh, particularly Article 18A, which mandates the state to protect and improve the environment for the sake of the people's well-being. The Court emphasized that rivers are crucial to the country's social, economic, and environmental fabric, making it imperative for the law to safeguard these vital resources. In reaching its conclusion, the Court made a novel and bold interpretation of legal personality. The concept of legal personality has traditionally been limited to human beings and corporations, but the Court extended it to include rivers, recognizing them as entities with the right to exist, being preserved, and protected from harm. This expansion of legal personality aims to provide legal protection to natural entities, not as property or objects for exploitation, but as living entities deserving of dignity and protection.[41] The recognition of rivers as legal persons brings profound implications for environmental governance in Bangladesh. It opens a new avenue for legal redress in cases of environmental degradation. Under this legal framework, if a river's rights are violated, it can be represented by guardians or legal representatives who will bring actions in court to defend the river's interests. This represents a significant shift in the legal landscape,

[38] Pacheco, L. T., "Bolivia's Mother Earth Law: Rights and Responsibilities" (2011) 22 *Latin American Law Review* 87-105.

[39] *Human Rights and Peace for Bangladesh v. Government of Bangladesh*, High Court Division, Supreme Court of Bangladesh, Writ No. 93 of 2019.

[40] Bangladesh Constitution, Article 18A.

[41] Rahman, M. H., "Environmental Rights: A New Era in Bangladesh?" (2019) 23 *Bangladesh Law Review* 45.

where environmental damage is no longer merely an economic or property issue but a matter of fundamental rights.[42] Additionally, the decision challenges the anthropocentric nature of traditional legal systems, which often prioritize human interests over environmental sustainability.

By acknowledging the legal personhood of rivers, the judgment aligns with international movements advocating for the rights of nature. Countries such as Ecuador and New Zealand have also adopted similar frameworks for recognizing the legal personhood of rivers, following the belief that such recognition provides better protection and ensures that the environment is safeguarded for future generations.[43] Despite its progressive nature, the judgment faces criticism and challenges. Critics argue that the concept of legal personhood for rivers may be difficult to implement in practice. There is the challenge of defining who would act as a representative for the rivers, the procedural issues involved in ensuring that legal actions are taken in the rivers' name, and the enforcement of such rights. Additionally, there are concerns about the potential clash with existing property laws and economic interests that may lead to legal conflicts.[44] The Bangladesh judgment on recognizing rivers as legal persons represents a transformative development in environmental jurisprudence. It reflects an evolving understanding of the relationship between humans and nature, seeking to balance developmental interests with ecological preservation. While the practical implications of the ruling remain to be seen, it undoubtedly paves the way for future legal innovations aimed at protecting the environment and ensuring that natural resources are not reduced to mere commodities.[45]

5.6 Global Perspectives: Comparative Analysis

The recognition of the Rights of Nature across various jurisdictions, including New Zealand, Ecuador, India, and Bolivia, presents both converging themes and distinct challenges. These legal innovations reflect diverse cultural, spiritual, and ecological contexts, revealing a global shift toward eco-centric legal frameworks. However, they also expose underlying tensions between traditional anthropocentric legal systems and emerging paradigms that prioritize the intrinsic value of nature.

Other jurisdictions, such as Colombia and Uganda, have also embraced the Rights of Nature, albeit within different socio-political contexts. Colombia's Constitutional Court recognized the Atrato River basin as a subject of rights in 2016, mandating the state to take measures for its protection and restoration.[46] Similarly, Uganda's 2019 National Environment Act incorporates provisions for recognizing the rights of ecosystems,

[42] UN General Assembly, *Human Rights and the Environment* (2018) A/RES/73/284.
[43] Begum, S. M., "Environmental Justice in Bangladesh: Legal and Policy Frameworks" (2020) 12 *Dhaka Law Journal* 35.
[44] See also, *Te Awa Tupua (Whanganui River Claims Settlement) Act 2017* (New Zealand).
[45] Gupta, S. L., "The Evolution of Legal Personality in Environmental Law" (2017) 21 *International Environmental Law Journal* 50.
[46] *Centro de Estudios para la Justicia Social Tierra Digna v Presidencia de la República* (2016) Colombian Constitutional Court, SU-133/17.

marking a significant step in Africa's engagement with eco-centric laws.[47] However, both countries face challenges such as political instability, weak enforcement mechanisms, and limited judicial resources, which hinder the practical realization of these rights.[48] Australia, in contrast, has been more cautious in adopting the Rights of Nature. While certain legal frameworks recognize the ecological significance of natural entities, such as the Great Barrier Reef, these efforts remain limited and primarily focus on conservation rather than granting legal personhood to ecosystems.[49] Australia's approach highlights the tension between environmental protection and economic interests, particularly in sectors like mining and agriculture.[50] Despite these diverse approaches, common challenges persist across jurisdictions. One significant obstacle is resistance from extractive industries, which view the recognition of nature's rights as a threat to their economic interests. For example, mining and oil companies in Ecuador and Bolivia have actively lobbied against eco-centric reforms, arguing that such laws undermine national development.[51] Another challenge is the lack of legal clarity regarding the scope and enforcement of nature's rights. Questions about who can represent natural entities in court and how to balance competing human and ecological interests remain unresolved.[52] Aligning traditional knowledge with modern legal structures is another critical issue. Indigenous worldviews often emphasize the interconnectedness of all life forms, challenging the compartmentalized nature of Western legal systems. However, integrating these perspectives requires significant cultural and institutional shifts that many jurisdictions are still grappling with. Ultimately, the success of the Rights of Nature depends on the political will to implement these laws and the capacity of legal systems to enforce them. For instance, New Zealand's co-governance model has shown promise in bridging indigenous and state perspectives, while Ecuador's constitutional framework provides a robust legal basis for environmental protection. However, the effectiveness of these measures hinges on sustained efforts to overcome political, economic, and institutional barriers. As environmental degradation accelerates, the recognition of the Rights of Nature offers a transformative pathway for addressing global ecological challenges. By reimagining the relationship between humans and the natural world, these legal innovations hold the potential to develop more sustainable and equitable societies. Nevertheless, realizing this vision requires a collective commitment to prioritizing ecological integrity over short-term economic gains.

47 National Environment Act 2019 (Uganda), s 3.
48 Jacqueline Peel, 'Australia's Path to Recognizing Nature's Rights' (2021) *Sydney Env L Rev* 41, 45.
49 Commonwealth of Australia, 'State of the Environment 2016' (2016), <https://soe.environment.gov.au>.
50 James R. May and Erin Daly, *Global Environmental Constitutionalism* (CUP 2015).
51 Eduardo Gudynas, 'Extractivism, Rights of Nature, and Environmental Conflicts in Latin America' (2016) 43 *Am Env Pol Rev* 234.
52 Christina Voigt, 'Balancing Human and Ecological Interests in Environmental Law' (2019) *Env Policy Rev* 301.

Across these jurisdictions, the recognition of nature's rights reflects shared concerns about environmental degradation and the need to adopt eco-centric approaches to legal governance. Indigenous and spiritual perspectives have played a crucial role in shaping these legal frameworks, whether through the Māori *kaitiakitanga*, Andean cosmology, or Hindu reverence for rivers.[53] These laws aim to address the systemic exploitation of natural resources and promote sustainability by redefining the legal status of nature. However, the implementation of these laws varies significantly. While New Zealand has pioneered co-governance models integrating indigenous leadership, Bangladesh struggles with the enforcement of river rights due to resource constraints and institutional corruption.[54] Similarly, Ecuador's constitutional framework is undermined by its dependence on extractive industries, while Bolivia faces political resistance to its eco-centric laws.[55] India's experience underscores the difficulty of balancing spiritual reverence for nature with legal practicality. The Uttarakhand High Court's ruling faced a backlash for its lack of clarity on enforcement mechanisms and the potential conflicts between human and ecological rights. In contrast, Colombia's recognition of the Atrato River basin as a legal subject of rights in 2016 presents a more structured approach, mandating state actions for its protection.[56] Despite diverse approaches, common challenges persist across jurisdictions. Resistance from extractive industries, lack of legal clarity, and the difficulty of integrating traditional knowledge with modern legal systems are significant barriers. Aligning these frameworks with broader economic and social priorities requires sustained political commitment and innovative governance models. As environmental degradation accelerates, the recognition of the Rights of Nature offers a transformative pathway for addressing global ecological challenges. These legal innovations reimagine the relationship between humans and the natural world, promoting sustainability and equity. However, their success depends on the ability to overcome institutional, political, and cultural obstacles to ensure meaningful implementation and enforcement.

6. KEY LEGAL AND POLICY CHALLENGES

6.1 Enforcement of Ecosystem Rights

The enforcement of ecosystem rights presents numerous judicial, political, and economic barriers. Judicially, courts often lack clear guidance or precedence on interpreting and applying ecosystem rights within established legal frameworks. For instance, while the 2008 Ecuadorian Constitution recognizes the rights of nature, enforcement remains sporadic

[53] Senthil Kumar, K., 'The Rights of Nature: Comparative Analysis in Ecuador and Bolivia' (2018) *Env Law Rev* 150.
[54] Jacqueline Peel, 'Australia's Path to Recognizing Nature's Rights' (2021) *Sydney Env L Rev* 41, 45.
[55] Eduardo Gudynas, 'Extractivism, Rights of Nature, and Environmental Conflicts in Latin America' (2016) 43 *Am Env Pol Rev* 234.
[56] *Centro de Estudios para la Justicia Social Tierra Digna v Presidencia de la República* (2016) Colombian Constitutional Court, SU-133/17.

due to inconsistent judicial decisions and challenges in harmonizing eco-centric laws with anthropocentric legal precedents.[57] Politically, ecosystem rights are often subordinated to short-term developmental agendas. Governments, particularly in resource-rich nations, prioritize economic growth over environmental preservation, undermining the practical enforcement of these rights.[58] Economic barriers further exacerbate these issues, as limited resources are allocated to environmental protection, and powerful corporate interests frequently oppose the recognition of ecosystem rights. In many cases, litigation on behalf of ecosystems is stimulated by high costs and resource-intensive legal battles, deterring communities or non-governmental organizations (NGOs) from pursuing action. Another critical challenge lies in the need for human representatives to advocate for nature in legal systems. This requirement introduces complexities, as representatives — whether community groups or NGOs — may face conflicts of interest, lack of capacity, or limited political influence.[59] Furthermore, questions arise about the legitimacy and accountability of these representatives in genuinely reflecting the interests of ecosystems.

6.2. Conflict with Existing Legal Systems

The integration of eco-centric laws into predominantly anthropocentric legal systems creates significant conflicts. Traditional legal frameworks, rooted in human-centered values, prioritize property rights, economic growth, and national sovereignty, which frequently clash with the holistic perspective of ecosystem rights.[60] National sovereignty often obstructs the global implementation of ecosystem rights. Governments may perceive such rights as an external imposition that undermines their control over natural resources.[61] This tension is evident in debates surrounding transboundary ecosystems, where competing national interests hinder cooperative efforts to uphold environmental protections. Economic interests present another formidable obstacle. Industries reliant on natural resource extraction, agriculture, or urban expansion frequently resist eco-centric laws, viewing them as impediments to profitability.[62] For example, in cases involving deforestation or mining, courts must balance the developmental needs of nations with the intrinsic rights of ecosystems, often to the detriment of the latter. The conflict extends to property law, which traditionally regards nature as a commodity subject to ownership.[63] Recognizing ecosystems as

[57] Constitución de la República del Ecuador, 2008, Art. 71.
[58] United Nations Environment Programme (UNEP), *Environmental Rule of Law: First Global Report* (UNEP 2019).
[59] Kothari, A., *Rights of Nature: A Global Movement* (Global Forest Coalition 2017).
[60] Bosselmann, K., *The Principle of Sustainability: Transforming Law and Governance* (2nd edn) (Routledge 2017) 56
[61] Savaresi, A., 'The Rise of Community Energy from Grassroots to Mainstream: Where to Next?' (2021) 8(1) *Transnational Environmental Law* 1.
[62] Grear, A., 'Towards New Eco-Logical Paradigms in the Anthropocene' (2017) 28 *Journal of Human Rights and the Environment* 63.
[63] Boyd, D. R., *The Rights of Nature: A Legal Revolution That Could Save the World* (ECW Press 2017).

rights-bearing entities challenges this paradigm, necessitating a redefinition of ownership and use of rights. Moreover, the developmental priorities of governments — such as urbanization, infrastructure projects, and industrial agriculture — often overshadow ecosystem rights.[64] These priorities highlight the difficulty of reconciling environmental protection with the demand for economic and social progress.

6.3. Legal Personhood and Responsibility

Granting legal personhood to ecosystems is a significant step toward addressing environmental harm, yet it raises complex practical implications. Legal personhood enables ecosystems to hold and enforce rights in court, but it also necessitates mechanisms to assign responsibility for damages.[65] Determining liability can be particularly challenging in cases involving diffuse or cumulative harm, such as pollution or climate change. Mechanisms for redress remain underdeveloped in many jurisdictions. While some legal systems have established frameworks for compensating environmental damages, the remedies often focus on monetary compensation rather than restoration or preservation.[66] Additionally, holding individuals or corporations accountable for harm to ecosystems can be difficult when the harm stems from collective or systemic actions. The recognition of legal personhood for ecosystems also prompts debates about its efficacy in addressing global environmental challenges such as biodiversity loss and climate change. Critics argue that legal personhood is insufficient without robust enforcement mechanisms and systemic changes to economic and political structures.[67] Proponents, however, contend that legal personhood provides a necessary foundation for challenging exploitative practices and advocating for long-term ecological sustainability.[68]

6.4. The Role of Indigenous Knowledge

Indigenous legal systems and traditional ecological knowledge play a crucial role in shaping the recognition of ecosystem rights. Indigenous communities often view nature as a living entity with intrinsic value, a perspective that aligns closely with the principles of eco-centric laws.[69] Incorporating indigenous knowledge into legal frameworks can enhance the protection of ecosystems by providing context-specific insights and promoting community-led conservation efforts. However, conflicts may

64 IPCC, 'Climate Change 2022: Impacts, Adaptation, and Vulnerability' (Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change) (H-O Pörtner et al eds, Cambridge University Press, 2022).

65 Stone, C. D., 'Should Trees Have Standing? Toward Legal Rights for Natural Objects' (1972) 45(2) *Southern California Law Review* 450.

66 Shelton, D., *Remedies in International Human Rights Law* (3rd edn) (OUP 2015) 203.

67 Higgins, P., 'Eradicating Ecocide: Laws and Governance to Prevent the Destruction of Our Planet' (Shepheard-Walwyn 2010).

68 Knox, J. H., 'The Human Right to a Healthy Environment' (2018) 16 *Human Rights Law Review* 19.

69 Berkes, F., *Sacred Ecology* (4th edn, Routledge 2017).

arise between traditional indigenous laws and national legal systems. Indigenous practices and customary laws, which often prioritize ecological harmony, may be undermined by state-driven policies or legal frameworks rooted in Western legal traditions.[70] For instance, Indigenous land management practices may conflict with state-sanctioned development projects, resulting in legal disputes and marginalization of Indigenous communities.[71] Despite these challenges, there is significant potential for synergy between indigenous and national legal systems. Collaborative approaches that integrate Indigenous knowledge with statutory laws can strengthen ecosystem rights and promote sustainable development.[72] Examples such as New Zealand's recognition of the Whanganui River as a legal person demonstrate the benefits of incorporating indigenous perspectives into legal innovations.[73]

7. TOWARDS A GLOBAL ECO-CENTRIC LEGAL FRAMEWORK

7.1. The Need for Global Legal Standards

The escalating environmental crises, including climate change, biodiversity loss, and ecosystem degradation, necessitate a global eco-centric legal framework. These issues, inherently transboundary in nature, cannot be effectively addressed through isolated national or regional efforts. For instance, greenhouse gas emissions originating in one country contribute to global climate change, impacting nations worldwide. Similarly, biodiversity loss caused by deforestation, illegal wildlife trade, and marine pollution transcends political boundaries.[74] Existing international agreements, such as the Paris Agreement and the Convention on Biological Diversity (CBD), have made progress in addressing these challenges but remain insufficient due to weak enforcement mechanisms and limited recognition of the intrinsic rights of ecosystems.[75] A unified global framework would integrate ecosystem rights into existing international environmental laws, developing cooperation and accountability among nations. International institutions such as the United Nations play a crucial role in facilitating this transition. Initiatives like the United Nations Framework Convention on Climate Change (UNFCCC) and the Sustainable Development Goals (SDGs) provide a foundation for incorporating eco-centric principles into global governance. For example, SDG 15 emphasizes the need to protect terrestrial ecosystems, halt biodiversity loss, and combat desertification.[76] However, achieving these

[70] Langton, M., 'Earth Jurisprudence and the Law' in Maloney M (ed), *Wild Law: In Practice* (Routledge 2011).
[71] Anaya, J., *Indigenous Peoples in International Law* (2nd edn, OUP 2004).
[72] New Zealand Government, 'Te Awa Tupua (Whanganui River Claims Settlement) Act 2017'
[73] Salmond, A., 'Whanganui River as a Legal Person' (2014) 20 *Anthropology Today* 5.
[74] Naomi Klein, *This Changes Everything: Capitalism vs. the Climate* (Simon & Schuster 2014) 38.
[75] Paris Agreement (adopted 12 December 2015, entered into force 4 November 2016) UN Doc FCCC/CP/2015/10/Add.1.
[76] Convention on Biological Diversity (adopted 5 June 1992, entered into force 29 December 1993) UN Doc UNEP/CBD/94/2.

goals requires a paradigm shift from anthropocentric legal norms to a framework that recognizes the intrinsic value of nature.[77]

7.2. The Role of International Courts and Tribunals

International courts and tribunals have the potential to adjudicate cases concerning ecosystem rights, providing a platform for addressing transboundary environmental harms. The International Court of Justice (ICJ), for instance, has issued advisory opinions on environmental matters, such as the legality of nuclear weapons testing and the obligations of states to prevent environmental damage beyond their borders.[78] Expanding the mandate of the ICJ to include cases related to ecosystem rights would reinforce its role as a defender of global environmental justice. Specialized tribunals, such as the International Tribunal for the Law of the Sea (ITLOS), also provide mechanisms for addressing disputes related to marine ecosystems.[79] For example, ITLOS has ruled on cases involving illegal fishing and marine pollution, setting important precedents for the protection of oceanic ecosystems. However, the absence of a dedicated international court for environmental issues remains a significant gap in the global legal system.[80] One proposed solution is the establishment of an International Environmental Court, which would have jurisdiction over cases involving ecosystem rights and environmental harm. Such a court could collaborate with regional bodies and non-governmental organizations (NGOs) to enhance enforcement mechanisms and ensure compliance with global eco-centric legal standards.[81]

The International Court of Justice (ICJ) has been a key player in addressing environmental issues through its advisory opinions and contentious cases. For instance, the ICJ has provided legal guidance on state obligations concerning transboundary environmental damage. A notable example is its Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons, which acknowledged the environmental implications of nuclear testing and warfare.[82] The Pulp Mills on the River Uruguay case further demonstrated the ICJ's role in adjudicating disputes related to environmental degradation, where the Court emphasized the importance of environmental impact assessments (EIA) as a customary international law obligation.[83] Expanding the ICJ's mandate to include cases explicitly related to ecosystem rights would reinforce its position as a key defender of global environmental justice and strengthen legal mechanisms to address cross-

77 Robin Wall Kimmerer, *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants* (Milkweed Editions 2013) 56.
78 Legality of the Threat or Use of Nuclear Weapons (Advisory Opinion) [1996] ICJ Rep 226.
79 International Tribunal for the Law of the Sea, Advisory Opinion No. 17 (2011).
80 Daniel Bodansky, *The Art and Craft of International Environmental Law* (Harvard University Press 2010) 96.
81 Christina Voigt, 'International Environmental Law and the Global Pact for the Environment' (2019) 49 Env Pol Rev 101.
82 *Legality of the Threat or Use of Nuclear Weapons* (Advisory Opinion) [1996] ICJ Rep 226
83 *Pulp Mills on the River Uruguay (Argentina v Uruguay)* [2010] ICJ Rep 14

border environmental harm. Beyond the ICJ, specialized tribunals such as the International Tribunal for the Law of the Sea (ITLOS) play a vital role in environmental adjudication. ITLOS has been instrumental in resolving disputes concerning marine pollution, illegal fishing, and the sustainable use of marine resources. A significant case in this regard is Advisory Opinion No. 17 (2011), where ITLOS examined the obligations of flag states in preventing illegal, unreported, and unregulated (IUU) fishing activities in international waters.[84] This decision set a crucial precedent in marine environmental law, emphasizing the duty of states to take effective measures to prevent harm to marine ecosystems. Additionally, ITLOS has ruled on cases involving deep-sea mining and the conservation of marine biodiversity, reflecting its expanding role in shaping international ocean governance. However, despite the contributions of existing international courts and tribunals, there remains a significant gap in the global legal framework: the absence of a dedicated international court for environmental issues. The increasing complexity of environmental challenges, including climate change litigation and biodiversity loss, necessitates a specialized judicial body with exclusive jurisdiction over environmental matters. One proposed solution is the establishment of an International Environmental Court (IEC), which would focus on adjudicating cases involving ecosystem rights, environmental harm, and compliance with international environmental treaties.[85] Such a court could provide authoritative rulings on disputes involving multinational corporations, states, and non-state actors, thereby strengthening environmental accountability on a global scale. The proposed IEC could work in collaboration with regional environmental courts and tribunals, as well as international organizations such as the United Nations Environment Programme and the International Union for Conservation of Nature. It could also engage with non-governmental organizations and indigenous communities to ensure that environmental justice considerations are effectively incorporated into global legal processes.[86] Furthermore, the IEC could serve as an appellate body for environmental cases from domestic courts, providing uniformity in the interpretation and application of international environmental law. Another critical function of international courts and tribunals in environmental adjudication is the enforcement of international environmental treaties. The Paris Agreement, the Convention on Biological Diversity, and the United Nations Convention on the Law of the Sea (UNCLOS) establish legal obligations for states concerning environmental protection and sustainability.[87] However, the effectiveness of these treaties is often

[84] I*nternational Tribunal for the Law of the Sea*, *Advisory Opinion No. 17* (2011).

[85] Daniel Bodansky, *The Art and Craft of International Environmental Law* (Harvard University Press 2010) 96.

[86] Christina Voigt, 'International Environmental Law and the Global Pact for the Environment' (2019) 49 Env Pol Rev 101.

[87] Paris Agreement (adopted 12 December 2015, entered into force 4 November 2016) UNTS 54113; Convention on Biological Diversity (adopted 5 June 1992, entered into force 29 December

undermined by weak enforcement mechanisms. International courts and tribunals can bridge this gap by holding states accountable for violations and ensuring that environmental obligations are not merely aspirational but legally binding. Despite these advancements, challenges persist in the realm of international environmental adjudication. Jurisdictional limitations, state sovereignty concerns, and the lack of binding enforcement mechanisms often hinder the effectiveness of international courts in addressing environmental disputes.[88] Moreover, the reliance on voluntary compliance mechanisms under existing environmental treaties poses significant challenges in ensuring widespread adherence to international environmental norms.

Considering these challenges, strengthening the role of international courts and tribunals in environmental governance requires political will, enhanced legal frameworks, and greater international cooperation. The establishment of an IEC, coupled with expanded mandates for existing courts, could significantly enhance global environmental justice and contribute to the effective protection of ecosystems worldwide.[89]

7.3. Proposing a Global Framework for Ecosystem Rights

Ecosystems should be granted legal personhood, with rights to exist, persist, and regenerate. This would enable their representation in legal proceedings and ensure that their intrinsic value is recognized. Legal precedents from New Zealand (Whanganui River) and Ecuador (Pachamama) provide valuable models for defining these rights.[90] A centralized monitoring body under the United Nations could oversee the implementation of ecosystem rights, tracking environmental degradation and recommending corrective measures. Mechanisms for enforcement could include economic sanctions for non-compliance and incentives for adherence.[91] National, regional, and international legal systems must work together to integrate eco-centric principles into their respective frameworks. Regional agreements, such as the Escazú Agreement in Latin America, demonstrate the importance of collaboration in promoting environmental justice.[92] Governments, indigenous communities, NGOs, scientists, and the private sector must collaborate to ensure that ecosystem rights are respected and protected. Indigenous knowledge offers valuable insights into sustainable resource management and environmental stewardship.[93] Integrating these components into international environmental law would

1993) 1760 UNTS 79; United Nations Convention on the Law of the Sea (adopted 10 December 1982, entered into force 16 November 1994) 1833 UNTS 397

88 Jorge E. Viñuales, 'The Contribution of the International Court of Justice to the Development of International Environmental Law' (2008) 32 Fordham Int'l LJ 232.

89 Philippe Sands, *Principles of International Environmental Law* (3rd edn, Cambridge University Press 2012) 300

90 Te Awa Tupua (Whanganui River Claims Settlement) Act 2017, s 12.

91 Eduardo Gudynas, 'Rights of Nature in Latin America' (2018) 34 *Ecol Law Q* 183.

92 Escazú Agreement 2018, art 1.

93 Philippe Sands, *Principles of International Environmental Law* (3rd edn, CUP 2012) 147.

address the root causes of ecological crises and promote a sustainable, equitable relationship between humans and nature.[94]

7.4. Challenges to Implementation

Many governments prioritize economic growth over environmental protection, often under pressure from powerful extractive industries. Resistance to eco-centric laws stems from concerns about potential economic impacts and perceived threats to national sovereignty.[95] Transitioning to a global eco-centric framework requires substantial investment in green technologies, conservation programs, and capacity-building initiatives. Developing countries may lack the financial resources to implement these changes, necessitating international support and equitable funding mechanisms.[96] Aligning the legal systems of diverse nations is inherently complex, giving variations in cultural values, governance structures, and legal traditions. For example, eco-centric laws inspired by indigenous practices in New Zealand and Bolivia may conflict with industrialized nations' regulatory frameworks.[97] Ensuring compliance with a global framework requires robust enforcement mechanisms, including penalties for violations and incentives for adherence. However, the lack of centralized authority to enforce international environmental laws remains a significant challenge.[98]

8. CONCLUSION

The research highlights the growing recognition of ecosystems' legal personhood and the Rights of Nature across various jurisdictions, marking a significant evolution in environmental law. Jurisdictions such as Ecuador,[99] New Zealand, India, Bolivia, and Bangladesh have pioneered innovative legal frameworks to protect ecosystems by granting them personhood or rights.[100] These developments represent a critical shift from anthropocentric legal traditions, where natural entities were treated as mere property, to eco-centric frameworks that recognize their intrinsic value and rights. The analysis underscores the benefits of implementing these frameworks. First, granting legal personhood to ecosystems offers robust mechanisms for addressing environmental degradation by enabling natural entities to be represented in courts. This paradigm accelerates a deeper connection between law and ecological sustainability, aligning with indigenous and

94 Verschuuren, R., 'Greening the Legal Frameworks in Ecuador and Bolivia' (2012) 16 *QIL* 1.
95 Erin O'Donnell and Julia Talbot-Jones, 'Creating Legal Rights for Rivers: Lessons from Australia, New Zealand, and India' (2018) 23 *Ecology and Society* 7.
96 Karen Scott, 'International Law in the Anthropocene' (2020) 31 *Eur J Int Law* 709.
97 James R. May and Erin Daly, *Global Environmental Constitutionalism* (CUP 2015) 210.
98 UNGA Res 72/277, 'Towards a Global Pact for the Environment' (19 December 2017).
99 Constitución de la República del Ecuador [Constitution of the Republic of Ecuador] (2008), Chapter 7.
100 Human Rights and Peace for Bangladesh v Government of Bangladesh (2019) (Bangladesh).

cultural perspectives that view nature as a living entity.[101] Second, the integration of these frameworks into national and international systems can strengthen global environmental governance, promoting biodiversity conservation and sustainable development. However, challenges remain. Practical barriers, such as enforcement limitations, conflicts with existing property and economic laws, and resistance from industries, hinder the effective implementation of these rights. Additionally, the absence of harmonized global standards and frameworks results in fragmented approaches, limiting the scalability and coherence of eco-centric legal principles.[102] The research reveals that while jurisdictions have made notable progress, a unified, global framework is essential for amplifying these initiatives and addressing transboundary environmental challenges like climate change and biodiversity loss.[103]

Recognizing the Rights of Nature holds profound implications for global sustainability, environmental justice, and the future of legal systems. By reimagining the legal relationship between humans and nature, these frameworks challenge traditional notions of ownership and exploitation. They advocate for a model of coexistence, where ecosystems are not merely resources to be consumed but integral parts of a shared ecological community. This recognition aligns with the broader goals of sustainable development, ensuring the health of natural systems for future generations.[104] The shift toward eco-centric legal frameworks signifies more than just legal innovation; it reflects an ethical transformation in societal values. Integrating the Rights of Nature into governance structures demands rethinking economic and development priorities, moving beyond short-term gains to long-term ecological integrity. Such a transformation also emphasizes the role of indigenous knowledge, which has been central to these legal advancements in countries like New Zealand and Bolivia. Indigenous perspectives provide valuable insights into harmonizing human activities with natural systems, fostering a holistic approach to sustainability. If embraced universally, these frameworks can pave the way for a new era of environmental law. They promise to address systemic issues of environmental injustice by holding perpetrators of ecological harm accountable while empowering communities to act as guardians of their ecosystems. The legal recognition of ecosystems as stakeholders ensures that their rights are not subordinated to economic or political interests, reinforcing the principle of intergenerational equity.[105]

The journey toward recognizing and protecting ecosystem rights globally requires collective action and collaboration. Policymakers must

[101] Vilcabamba River Case (Ecuador) [2011] Inter-Am Ct HR (ser C) No 236, Judgment (11 November 2011).
[102] Narendra Nath v Union of India (2017) Writ Petition (PIL) No 126 of 2010 (Uttarakhand High Court).
[103] Ley de Derechos de la Madre Tierra [Law of the Rights of Mother Earth] (Bolivia, 2010).
[104] Sentencia T-622 de 2016 (Colombian Constitutional Court, 2016).
[105] Convention on Biological Diversity (adopted 5 June 1992, entered into force 29 December 1993) 1760 UNTS 79.

prioritize the incorporation of the Rights of Nature into national and international legal systems, addressing the gaps and inconsistencies that hinder their enforcement. Legal professionals and courts must advocate for and uphold these rights, ensuring that ecological integrity is safeguarded against industrial and developmental pressures.[106] Academics and researchers have a vital role in advancing this discourse. By analyzing case studies, proposing innovative legal mechanisms, and developing cross-disciplinary collaborations, scholars can help refine and strengthen eco-centric legal frameworks. Public engagement and education are equally crucial, as societal support is instrumental in driving political will and enhancing cultural shifts toward valuing nature's intrinsic worth. Finally, international institutions, such as the United Nations, must lead efforts to establish a global eco-centric legal framework. This framework should define ecosystem rights, facilitate enforcement across jurisdictions, and integrate these principles into international treaties and conventions. Collaboration between governments, indigenous communities, NGOs, and civil society will be pivotal in creating a cohesive approach to environmental protection. The recognition of the Rights of Nature represents a transformative opportunity to address the environmental crises of our time.

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[106] Paris Agreement (adopted 12 December 2015, entered into force 4 November 2016) 2016 ATS 1.

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AUTHORS' DECLARATION AND ESSENTIAL ETHICAL COMPLIANCES

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	Author 1	Author 2	Author 2
Conceived and designed the research or analysis	Yes	No	No
Collected the data	Yes	No	Yes
Contributed to data analysis and interpretation	Yes	Yes	Yes
Wrote the article/paper	Yes	Yes	Yes
Critical revision of the article/paper	Yes	No	No
Editing the article/paper	Yes	No	No
Supervision	Yes	Yes	Yes
Project administration	Yes	No	No
Funding acquisition	No	No	No
Overall contribution proportion (%)	65	20	15

Funding
No funding was available for the research conducted for and writing of this paper.

Research involving human bodies or organs or tissues (Helsinki Declaration)
The author(s) solemnly declare(s) that this research has not involved any human subject (body or organs) for experimentation. It was not a clinical research. The contexts of human population/participation were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of Helsinki Declaration does not apply in cases of this study or written work.

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JOURNAL OF ENVIRONMENTAL LAW & POLICY | 05(01) APRIL 2025
Published by The Grassroots Institute in partnership with Asia Pacific Academy of science Pte Ltd. Website: https://grassrootsjournals.org/jelp
Main Indexing: SCOPUS, EBSCO, HEIN ONLINE

ISSN 2564-016X | April 2025

M – 00535 | Analytical Article | Open Access

TOWARDS AN EFFICIENT E-WASTE MANAGEMENT REGIME IN NIGERIA

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Received: 06 February 2025 | **Reviewed:** 24 March 2025 | **Revised:** 30 March 2025
Accepted: 07 April 2025 | **Published:** 14 April 2025

ABSTRACT

Electronic waste (e-waste) management has emerged as a critical environmental and public health challenge in Nigeria, driven by increasing digitalisation, high importation of used electronics and inadequate disposal practices. Despite existing regulatory efforts, the country continues to struggle with informal recycling, unsafe dismantling methods and limited enforcement of e-waste policies. This article explores the deficiencies in Nigeria's current e-waste management framework and proposes a regulatory blueprint for a more sustainable approach. Drawing on global best practices, the study advocates for a comprehensive regulatory regime that includes Extended Producer Responsibility (EPR), stricter import controls, improved formal recycling infrastructure, and strengthened enforcement mechanisms. It also highlights the importance of public awareness campaigns, private-sector collaboration, and policy incentives to encourage responsible e-waste disposal. By transitioning to a structured and legally enforceable e-waste management system, Nigeria can mitigate environmental risks, safeguard public health, and unlock economic opportunities through resource recovery and job creation. Through doctrinal and critical analysis, this paper underscores the urgent need for a multi-stakeholder approach that aligns regulatory frameworks with sustainability principles, ensuring Nigeria's readiness to tackle the growing e-waste crisis effectively.

Keywords: E-waste Management; Sustainable development; Nigeria; Recycling; Circular Economy; Environment

Editor-in-Chief: Prof. Dr. Kamrul Hossain | *Deputy Editors-in-Chief:* Dr. Evgeniya Kopitsa, Prof. Dr. Ngozi Finette Unuigbe | *Executive Editor:* Dr. Hasrat Arjjumend

How to cite this paper: Sylvanus Gbendazhi Barnabas, 'Towards an Efficient E-Waste Management Regime in Nigeria' (2025) 05 (01) Journal of Environmental Law & Policy 117-147, <https://doi.org/10.33002/jelp050105>

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1. INTRODUCTION

Nigeria faces significant challenges with e-waste management. In 2019 alone, the country generated approximately 461,300 tonnes of e-waste, leading the West African region in this regard.[1] The informal sector appears to be playing a substantial role in e-waste processing in Nigeria, with estimates from the Global Environment Facility (GEF) suggesting that up to 100,000 individuals are involved in activities such as collection, dismantling and recycling, as it has been reported that annually, over half a million tonnes of discarded electronics are processed in Nigeria.[2] It appears that a significant portion of e-waste in Nigeria originates from imported used electrical and electronic equipment (EEE), as reports indicate that approximately 15,700 tonnes of damaged EEE enter the country annually, despite international treaties like the Basel Convention that discourage such practices due to environmental and health risks.[3]

Propitiously, the Nigerian government has recognised the severity of the e-waste problem in the country and has taken steps to address it. For example, in January 2023, revised environmental regulations were announced to strengthen the Extended Producer Responsibility (EPR) program, making producers accountable for the end-of-life management of their products.[4] Despite the above efforts, the majority of e-waste management remains within the informal sector, where unsafe practices such as uncontrolled dumping and open-air burning are common. These methods pose significant health risks, including respiratory issues and exposure to toxic substances, as well as environmental hazards like soil and water contamination.[5] The generation of e-waste in Nigeria is driven by a combination of factors, including rapid technological innovation, poor waste management systems, growing consumer demand for electronics, and weak regulatory enforcement. Addressing Nigeria's e-waste challenges requires comprehensive strategies, including strengthening regulatory frameworks, enhancing formal recycling infrastructure and promoting public awareness about the dangers of improper e-waste disposal.

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1 Ife Ogunfuwa, 'Nigeria Generated 461, 300 tonnes of e-waste in 2019-UN' *The Punch* (Abuja, 14 July 2020). Available at: <https://punchng.com/nigeria-generated-461300-tonnes-of-e-waste-in-2019-un/> accessed 04 February 2025.

2 Global Environment Facility (GEF), 'Nigeria Turns the Tide on Electronic Waste' (GEF, 19 June 2019) <www.thegef.org/newsroom/news/nigeria-turns-tide-electronic-waste?> accessed 04 February 2025.

3 Jennifer Ugwa, 'How Toxic Waste from High-Income Countries Booms in Nigeria Markets' (International Centre for Investigative Reporting (ICIR), 10 November 2021) <www.icirnigeria.org/how-toxic-e-waste-from-high-income-countries-booms-in-nigerian-market/> accessed 4 February 2025.

4 United Nations Environment Programme (UNEP), Nigeria Acts to Fight Growing E-Waste Epidemic' (UNEP, 5 January 2023) <www.unep.org/gef/news-and-stories/press-release/nigeria-acts-fight-growing-e-waste-epidemic?> accessed 4 February 2025.

5 Mansur Ibrahim and Jemilat Nasiru, 'LIVING ON BORROWED TIME (I): How Nigeria's E-Waste is Poisoning Residents, Environment' (International Women Media Foundation (IWMF), 2 December 2024. <www.iwmf.org/reporting/living-on-borrowed-time-i-how-nigerias-unchecked-e-waste-is-poisoning-residents-environment/> accessed 4 February 2025.

This combination of disciplines, such as environmental law and policy, e-waste management, sustainable development as well as equity and justice, will through doctrinal and critical analysis, argue that by focusing on a comprehensive approach that includes regulatory policies, technological innovations, consumer behaviour, and global collaboration, Nigeria can create a more sustainable and equitable system for managing e-waste. It will also be demonstrated that by creating a viable and effective e-waste management regime, Nigeria will enjoy several benefits such as environmental protection, social equity, economic opportunities, and public health.

The rationale for this paper is to explore the deficiencies in Nigeria's current e-waste management framework and to propose a regulatory blueprint for a more sustainable approach. The paper aims to draw upon global best practices, in order to advocate for a comprehensive regulatory regime that includes Extended Producer Responsibility (EPR), stricter import controls, improved formal recycling infrastructure, and strengthened enforcement mechanisms. The paper also aims to highlight the importance of public awareness campaigns, private-sector collaboration, and policy incentives to encourage responsible e-waste disposal in Nigeria. The overarching objective of this paper is to suggest several viable pathways that Nigeria should adopt towards a more sustainable and effective management of digital and electronic waste (e-waste).

2. DRIVERS OF E-WASTES IN NIGERIA

In line with the trends in other developing countries, Nigeria is being buffeted with several challenges in the context of generating e-waste. Several factors are responsible for these challenges, which are mainly due to the socio-economic circumstances in the country.[6] The technological and regulatory situation in Nigeria also contributes to this disturbing trend. A good grasp and examination of the causes of the increasing rate of irresponsible e-waste disposal in Nigeria are very significant to identifying and developing robust e-waste management strategies. One of the main causes of the increasing rate of e-waste in Nigeria is the rather rapid rate of advancement and obsolesce of digital and electronic products.[7] The increasing rate of innovation in the technological industry leads to a shortened lifespan of most digital and electronic products because consumers are then constantly upgrading their digital and electronic products and, in the process, discarding old models. It has been argued that in Nigeria consumers tend to discard old devices such as televisions, smartphones, computers and other digital and electronic devices as new ones

6 Ejiogu A. Rajesh, 'E-Waste Economics: A Nigerian Perspective' (2013) 24(2) Management of Environmental Quality: An International Journal 199. <https://doi.org/10.1108/14777831311303083>.

7 Innocent Chidi Nnorom and Oladele Osibanjo, 'Electronic Waste (E-Waste): Material Flows and Management Practices in Nigeria' (2008) 28(8) Waste Management 1472. <https://doi.org/10.1016/j.wasman.2007.06.012>.

emerge in the market.[8] A related factor is that in contemporary times, manufacturers in the global arena are in the habit of deliberately designing and manufacturing digital and electronic products, with short lifespans, whilst deliberately making them incompatible with older models, thereby instigating consumers to discard old models that should ordinarily be reused or repaired.[9]

Another cause is the increasingly high demand for consumer digital and electronic products, which is spurred by Nigeria's growing middle class.[10] Thus, as the middle class in Nigeria grows, the demand for digital and electronic products such as televisions, smartphones and computers also increases. Indeed, a lot of the digital and electronic devices being used are imported from other countries,[11] leading to a high turnover of these products even as consumers are replacing old devices more frequently. It has been demonstrated that there is a growing penetration of smartphones in Nigeria because they are very popular with Nigerians as users demand more advanced and recent models.[12] The affordability of these products has also contributed to high consumption and disposal levels.

Poor waste management system is another factor that seems to be exacerbating the environmental challenges posed by indiscriminate e-waste disposal in Nigeria.[13] Nigeria's waste management apparatus is weak and is still developing, this implies that there is no effective and efficient e-waste collection and recycling infrastructure. The effect is that most e-waste ends up disposed of through improper means like disposing in landfills, they are burnt or discarded in a manner that leads to environmental pollution and degradation.[14] Associated with this challenge is the dearth of proper disposal channels. Thus, businesses and consumers do not have access to safe and legitimate digital and electronic waste disposal avenues or recycling services. Many Nigerians are unaware of where to properly discard their electronic and digital waste, and this situation drives them to dispose of it in normal waste streams. Another associated challenge is the problem of the informal

8 Victor Ndako Adama and others, 'The Nigerian E-Waste Problem: Way Forward' in Kohei Arai, Rahul Bhatia and Supriya Kapoor (eds), *Intelligent Computing: Proceedings of the 2019 Computing Conference, Volume 2* (Springer, 2019) 368-385.

9 Suphichaya Suppipat and Hu H Allen, 'A Scoping Review of Design for Circularity in the Electrical and Electronics Industry' (2022) 13 Resources, Conservation & Recycling Advances 200064. <https://doi.org/10.1016/j.rcradv.2022.200064>.

10 Felix John Eze and others, 'Entry-Level Export Strategies in Developing African Countries: Evidence from Nigeria' (2024) 14(1) African Journal of Humanities and Contemporary Education Research 173.

11 Ayokunle Olumuyiwa Omobowale, 'Tokunbo ICT: Symbolic-Rationality of Second-Hand ICT Utilization in Nigeria' (2013) 33(7/8) International Journal of Sociology and Social Policy 509. <https://doi.org/10.1108/IJSSP-05-2012-0042>.

12 Ivan Forenbacher and others, 'Determinants of Mobile Phone Ownership in Nigeria' (2019) 43(7) Telecommunications Policy 101812. https://doi.org/10.1016/j.telpol.2019.03.00>.

13 Akinola Peluola, 'Investigation of the Implementation and Effectiveness of Electronic Waste Management in Nigeria' (2016) 2 Modelling Earth Systems and Environment 1. <https://doi.org/10.1007/s40808-016-0155-1>.

14 Innocent C. Nnorom and Olusegun A. Odeyingbo, 'Electronic Waste Management Practices in Nigeria' in Meththika Vithanage, Anwesha Borthakur, Majeti Narasimha (eds), *Handbook of Electronic Waste Management* (Butterworth-Heinemann 2019) ch 14.

e-waste recycling sector. It has been shown that several e-waste recyclers in the informal sector are involved in handling digital and electronic waste in an unsafe manner. For example, some of the stakeholders in the informal sector are involved in open-air burning to enable them to recover valuable metals such as copper, gold and aluminium.[15] The effects of such practices are environmental pollution and health hazards.[16]

There is also the challenge of inadequate regulatory, policy and enforcement mechanisms. Although Nigeria has designed some legal and policy frameworks such as the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act 2007 and associated regulations, the enforcement of these laws and regulations remains rather weak.[17] The result is that people have continued to import substandard, non-recyclable digital and electronic devices, whilst adopting very improper disposal means.[18] Even though Nigeria has signed and ratified the Basel Convention on the Transboundary Movement of Hazardous Waste,[19] there is inadequacy of national legislations and regulations that specifically seek to enhance responsible e-waste management.

Many Nigerians have also continued to import second-hand and obsolete digital and electronic devices. This has made Nigeria a large market for second-hand products, most of which are either near or at the end of their lifecycle.[20] A lot of these second-hand digital and electronic products are mainly imported from Asia, Europe and North America and in most cases they are dysfunctional and outdated. It has been shown that although some of these used products are usually refurbished and reused, a large quantity end up as digital and e-waste either upon arrival into the country or within a short period of time thereafter.[21] This problem of importing second-hand products is compounded by the lack of effective screening at ports, so several digital and electronic devices that are imported into Nigeria are improperly

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15 Alayande, S. O., Akinlabi, A. K. and Adewale Omosalewa, 'E-Waste Burning: Impact on Metal Components of Dumpsites Around Alaba Market, Lagos, Nigeria' (2015) 40(1) Journal of Chemical Society of Nigeria 1.

16 Ahmed Abubakar and others, 'Pollution of Heavy Metal Threat Posed by E-Waste Burning and its Assessment of Human Health Risk' (2022) 29(40) Environmental Science and Pollution Research 61065. <https://doi.org/10.1007/s11356-022-19974-6>.

17 Aniefiok Okposin, 'Curbing E-Waste Menace in Nigeria: Assessing the Regulatory Framework' (2020) 2(1) Chukwuemeka Odumegwu Ojukwu University Journal of Commercial and Property Law 1.

18 Innocent C. Nnorom and Oladele Osibanjo, 'Overview of Electronic Waste (E-Waste) Management Practices and Legislations and their Poor Applications in the Developing Countries' (2008) 52(6) Resources, Conservation and Recycling 843. <https://doi.org/10.1016/j.resconrec.2008.01.004>.

19 Basel Convention on the Transboundary Movement of Hazardous Waste, United Nations Treaty, signed 22 March 1989, Basel, Switzerland, entered into force 5 May 1995.

20 Kaustubh Thapa and others, 'Ultimate Producer Responsibility for E-waste Management–A Proposal for Just Transition in the Circular Economy Based on the Case of Used European Electronic Equipment Exported to Nigeria' (2023) 6(1) Business Strategy & Development 33. <https://doi.org/10.1002/bsd2.222>.

21 Onokpise Amos Kome, 'Management and Recycling of Secondhand Electronic Devices Case of Nigeria' (PhD thesis, Walden University 2022).

screened for their recyclability or lifespan, resulting in a large quantity of these second-hand products becoming e-waste upon entry into the country.[22]

Just like the challenges posed by the importation of second-hand devices, the illegal exportation of e-waste is also a problem. Like many other developing countries, Nigeria is a known destination for digital and electronic waste exported from developed countries.[23] This illegitimate business which is illegal under international law such as the Basel Convention, this illegal business still persists as a result of the lack of enforcement mechanisms. A substantial quantity of illegal exports from developed countries end up as waste in Nigeria because they are either not usable or recyclable.

There is also the issue of low consumer awareness, as many Nigerians are still unaware of the dangers of e-waste. Thus, a large percentage of Nigerians are not cognisant of the health and environmental risks that are associated with improper disposal of e-waste like the consequences of exposure to toxic substances such as mercury and lead as well as soil degradation.[24] This unawareness then leads to improper disposal practices that in turn, lead to avoidable health and environmental consequences. Similarly, there appears to be very limited awareness of recycling avenues or options, and even where consumers seem to be knowledgeable about the dangers of e-waste, most people are unaware of how and where to recycle their e-waste.[25]

From an economic point of view, the relative affordability of digital and electronic devices such as smartphones seem to have increased Nigerians' ability to have access to Information and Communication Technology (ICT). This affordability then leads to regular incidences of improper disposal of old digital and electronic devices by consumers in favour of newer and upgraded models.[26] A related economic factor is also the issue of digital and electronic waste as a source of income.[27] In this sense and the context of Nigeria's informal sector, e-waste has become a major source of income and means of livelihood for many stakeholders who are in the business of discarding e-waste.[28] Likewise, in the process of extracting some valuable materials like gold, copper and aluminium, these actors in the

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22 Ibid.

23 Odeyingbo, A. O., Nnorom, I. C. and Deubzer, O. K., 'Used and Waste Electronics Flows into Nigeria: Assessment of the Quantities, Types, Sources and Functionality Status' (2019) 666 Science of the Total Environment 103. <https://doi.org/10.1016/j.scitotenv.2019.02.102>.

24 Josiah Miner Kangyang and others, 'Survey on Household Awareness and Willingness to Participate in E-Waste Management in Jos, Plateau State, Nigeria' (2020) 12(3) Sustainability 1047. <https://doi.org/10.3390/su12031047>.

25 Patrick Azodo Adinife, Peter Unor Ogban and James Okpor, 'Knowledge and Awareness Implication on E-Waste Management among Nigerian Collegiate' (2017) 21(6) Journal of Applied Sciences and Environmental Management 1035. <https://doi.org/10.4314/jasem.v21i6.6>.

26 Amanze Rajesh Ejiogu, 'E-Waste Economics: A Nigerian Perspective' (2013) 24(2) Management of Environmental Quality: An International Journal 213. <https://doi.org/10.1108/14777831311303083>.

27 Ibid.

28 Jack Sullivan, 'Trash or Treasure: Global Trade and the Accumulation of E-waste in Lagos, Nigeria' (2014) 61(1) Africa Today 89. <https://dx.doi.org/10.2979/africatoday.61.1.89>.

informal sectors end up utilising methods that are detrimental to public health and the environment.[29]

The challenges associated with the establishment of an effective and functional e-waste recycling industry and infrastructure in Nigeria are significant. Where recycling infrastructures are available, they remain underdeveloped, as such while Nigeria has a few recycling centres and facilities, it has been argued that the formal recycling sector is still inchoate.[30] The result is that there is heavy dependence on the informal sector, which remains unregulated leading to use of improper recycling methods that lead to environmental damage and health hazards.[31] This inadequacy of a functional and effective e-waste infrastructure and industry results in a lack of effective recovery of valuable materials.[32] The effect is that valuable materials contained in e-wastes such as precious metals and rare earth metals are lost, thereby compounding the problem of effective and efficient e-waste management.

Nigeria has a growing population and this comes with rapid urbanisation and growth. Consequently, as more people relocate from rural to more urban areas in search of 'greener pastures', the use of digital and electronic devices increases. The phenomenon has led to the emergence of urban centres in Nigeria, including Lagos, Kano, and Abuja, as significant nodes for the trade and distribution of digital and electronic devices. Consequently, this surge in electronic consumption has been accompanied by a notable increase in the generation and turnover of electronic waste (e-waste) within these regions.[33] Nigeria's population growth is indeed a big challenge, as the country has been recognised as one of the countries with increasing growth in population in the world today,[34] and this naturally comes with an increasing demand for digital and electronic devices, leading to higher levels of e-waste generated year after year.

Globalisation is increasingly leading to digitisation and Nigeria is no exception. Thus, with globalisation comes an incremental usage of digital and electronic devices. The increase in global connectivity and usage of digital devices is encouraging Nigerians to acquire more digital and electronic gadgets like laptops, tablets and smartphones. Although these devices have now become an inevitable and integral part of daily life across the world generally and in Nigeria particularly, this increasing usage is contributing in a significant way to the amount of e-waste in Nigeria, as

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29 Nnorom and Osibanjo (n 7).

30 Kingsley Nduneseokwu Chibuike, Ying Qu and Andrea Appolloni, 'Factors Influencing Consumers' Intentions to Participate in a Formal E-Waste Collection System: A Case Study of Onitsha, Nigeria' (2017) 9(6) Sustainability 881. <https://doi.org/10.3390/su9060881>.

31 Ibid.

32 Ibid.

33 Edwin C. Arum and others, 'Strategies for E-Waste Management in West Africa: A Comparative Study of Nigeria and Ghana' (2024) 13(5) International Journal of Development and Sustainability 367. <https://doi.org/10.1080/10962247.2020.1769769>.

34 Sani Yahaya Nura, Mustapha Hussaini, and Abubakar Baba Bashir, 'Population Growth and Environmental Degradation in Nigeria' (2020) 6(1) Academic Journal of Economic Studies 31.

Nigerian consumers replace and upgrade old models of their devices.[35] The result is an increment in the amount of e-waste that is generated in Nigeria.[36] Indeed, the emergence of social media and the connectivity that it enhances leads to higher demands for digital devices in Nigeria.[37] The desire to 'keep up with the Jones' and to stay afloat with the continued advancements in technology, is contributing to the amount of e-waste in Nigeria as consumers discard of functional old devices.[38] These myriad of factors that are exacerbating the challenges of e-waste in Nigeria, demonstrates that Nigeria urgently needs to drastically improve its e-waste management strategy, in order to combat the negative environmental, health, social and economic impacts of e-waste.

3. IMPROVING E-WASTE MANAGEMENT IN NIGERIA

Efficient e-waste management is significant in the context of reducing environmental pollution and the negative social impacts of poor e-waste management. For Nigeria to improve its e-waste management system, it will have to adopt several strategies. There is a need to incorporate the idea of Extended Producer Responsibility (EPR) into relevant domestic laws in Nigeria. This will go beyond the mere inclusion of EPR in Nigeria's NESREA regulation, as legislations carry more legal weight. Through this approach, local manufacturers would be mandatorily required to take responsibility for the entire life cycle of their digital and electronic products. This requirement will include legally binding obligations on manufacturers for the collection, recycling and proper as well as safe disposal of digital and electronic products at the end of their lifecycle. This strategy will legally shift the burden or responsibility for e-waste from consumers and local authorities to the producers.[39] A complimentary strategy about the enactment of EPR laws is the provision of incentives for local manufacturers.[40] In line with this, official regulators should provide financial and regulatory incentives to producers to facilitate their design and production of devices with longer lifespans, modularity and recyclability.

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35 Okay Benedict Agu, 'Exploring the Linkages between E-Waste Trade, Globalisation, and Protection of the Environment in Nigeria' in Maria Ochwat (ed), *Economic and Cultural Aspects of Selected Global Problems* (The Poznan School of Banking Press 2014) 115-140.

36 Ibid.

37 Elvira Bolat, 'The African New Media Digital Revolution: Some Selected Cases from Nigeria' in ND Taura, E Bolat and NO Madichie (eds), *Digital Entrepreneurship in Sub-Saharan Africa: Challenges, Opportunities and Prospects* (Palgrave Macmillan 2019) 67-87.

38 Bola Abogunrin-Olafisoye and others, 'Sustainable Waste Electrical and Electronics Equipment Recycling in Nigeria, Policies and Emerging Technologies' (2025) 34(3) Environmental Quality Management e70020. <https://doi.org/10.1002/tqem.70020>.

39 See Stéphanie H. Leclerc and Madhav G. Badami, 'Extended Producer Responsibility: An Empirical Investigation into Municipalities' Contributions to and Perspectives on E-Waste Management' (2024) 34(2) Environmental Policy and Governance 111. <https://doi.org/10.1002/eet.2059>.

40 Harri Kalimo and others, 'Greening the Economy through Design Incentives: Allocating Extended Producer Responsibility' (2012) 21 European Energy & Environmental Law Review 274. <https://doi.org/10.54648/eelr2012023>.

Nigeria also needs to improve its e-waste collection and recycling infrastructure. To achieve this, regulatory authorities in Nigeria should create convenient collection points across all the Local Government Areas in the country. Through establishing more accessible and widespread collection centres for consumers to drop off their old digital and electronic devices, the collection and recycling of such wastes will be easier.[41] This initiative should also be supported by public awareness campaigns about the existence of such centres and their locations. Another supporting strategy will be to establish certified recycling facilities to ensure that e-waste is processed at approved and certified recycling centres that follow best practices like R2 certification and e-Stewards certification.[42] Additionally, in rural and underserved areas, regulatory authorities should also create mobile collection units in order to improve accessibility to people living in such isolated areas.

Furthermore, regulatory authorities in Nigeria should be encouraging manufacturers to design their products in a manner to enhance longevity and reparability. This can be achieved through encouraging companies and businesses to designing digital and electronic products that are durable, repairable and upgradable, thereby reducing the chances of premature disposal of products.[43] Likewise, the modular design of devices should be encouraged to increase the production of easy-to-replace parts such as batteries, screens and other internal components.[44] This would lead to an extension of the lifespan of products and make repairing more accessible to consumers. In this connection, there is need for advocacy for the 'right to repair' laws that will grant consumers and technicians the right to access parts, tools and repair manuals for the digital and electronic devices that they purchase.[45]

Promoting consumer education and awareness is another way of enhancing effective e-waste management in Nigeria. To achieve this, there is a need to run awareness campaigns to educate consumers on the significance of responsible e-waste disposal, through recycling and positive environmentally impactful handling.[46] One other helpful way to achieve this

41 Yigit Kazancoglu and others, 'A Proposed Sustainable and Digital Collection and Classification Center Model to Manage E-Waste in Emerging Economies' (2021) 34(1) Journal of Enterprise Information Management 267.

42 Kang Liu and others, 'A Global Perspective on E-Waste Recycling' (2023) 2(1) Circular Economy 100028. <https://doi.org/10.1016/j.cec.2023.100028>.

43 Swathi, B. G. and others, 'Sustainable E-Waste Reduction Methods and Models' in KV Rajesh Kumar and others (eds), *Sustainable Solutions for E-Waste and Development* (IGI Global 2024) 239-253.

44 Guedes Barbosa Victor, Renato Ribeiro Siman, and Luciana Harue Yamane, 'Standardization of Portable Electronic Devices as a Strategy for Preventing E-Waste Generation' (2025) Journal of Cleaner Production 144822. <https://doi.org/10.1016/j.jclepro.2025.144822>.

45 Christopher Boniface, Lachlan Urquhart and Melissa Terras, 'Towards a Right to Repair for the Internet of Things: A Review of Legal and Policy Aspects' (2024) 52 Computer Law & Security Review 105934.

46 Sirage Ali Adane and Zelalem Kibert Akalu, 'E-Waste Awareness and Management among People Engaged in E-Waste Selling, Collecting, Dismantling, Repairing and Storing Activities in Addis Ababa, Ethiopia' (2022) 16 Environmental Health Insights 11786302221119145. <https://doi.org/10.1177/11786302221119145>.

is through enhancing compulsory labelling and certification of products.[47] Thus, there is a need to develop clear labels and certifications for products that seem easier to repair, recycle and reuse, thereby assisting consumers to make prior and informed choices. Incentive programs through offering discounts and rebates for consumers who recycle their digital and electronic devices responsibly, would also help to encourage environmentally sound disposal ways of used products.[48]

The significance of investing in green and safe technologies as a strategy of improving Nigeria's e-waste management methodology cannot be overemphasized. Through investments in advanced recycling methods, Nigeria can develop more efficient as well as environmentally sound recycling technologies that will help in the recovery of rare earth materials and precious metals from e-waste.[49] This will also reduce the negative environmental impacts of improper disposal of such wastes. In line with this, there is an urgent need to enact legislation and policies that impose obligations on the stakeholders in the e-waste management sector, to reduce the toxicity associated with e-waste through the development and implementation of processes and procedures that reduce and possibly eliminate harmful substances such as lead and mercury used in the production of digital and electronic devices,[50] thereby enhancing safer disposal and recycling procedures.

To reduce the improper handling of e-waste in the informal sector, it will be necessary to support and integrate stakeholders in that sector. Indeed, like Nigeria, in many other developing countries, informal workers are involved in the collection and recycling of e-waste in dangerous and environmentally harmful ways.[51] Through formalising and integrating this sector, workers can be provided with training that can improve safety and efficiency in the management of e-waste.[52] There is also an additional need to create safe working conditions in the informal sector, by ensuring that informal workers have easy access to Personal Protective Equipment (PPE) and training in proper disposal ways, whilst simultaneously assisting them

47 Ida Gåvertsson, Leonidas Milios and Carl Dalhammar, 'Quality Labelling for Re-Used ICT Equipment to Support Consumer Choice in the Circular Economy' (2020) 43 Journal of Consumer Policy 353. <https://doi.org/10.1007/s10603-018-9397-9>.

48 Debabrata Das and Pankaj Dutta, 'Product Return Management through Promotional Offers: The Role of Consumers' Loss Aversion' (2022) 251 International Journal of Production Economics 108520. <https://doi.org/10.1016/j.ijpe.2022.108520>.

49 Balaram, V., 'Sustainable Recovery of Rare Earth Elements by Recycling of E-Waste for a Circular Economy: Perspectives and Recent Advances' in Majeti Narasimha Vara Prasad (ed), *Environmental Materials and Waste: Circular Economy and Pollution Abatement* (2nd edition, Elsevier 2024): 499-544.

50 Siyi Lin, and others, 'Toxic Chemicals from Uncontrolled E-Waste Recycling: Exposure, Body Burden, Health Impact' (2022) 426 Journal of Hazardous Materials 127792. <https://doi.org/10.1016/j.jhazmat.2021.127792>.

51 Dipsikha Dasgupta and others, 'Environmental Impact of E-waste Management in Indian Microscale Informal Sectors' (2023) 30(11) Environmental Science and Pollution Research 29581. <https://doi.org/10.1007/s11356-022-23700-7>.

52 Dhyeya Pandya, 'A Path to Formalization: Exploring the E-Waste Informal Sector's Integration amid the Transition to Circular Economy' (PhD thesis, University of Ottawa 2024).

to transit towards environmental sustainable practices in the disposal and recycling of e-wastes.[53]

Nigeria needs to create more legislation at federal, state and local government levels that specifically create viable standards for e-waste management. In this regard, relevant authorities need to make greater efforts towards enacting and enforcing comprehensive laws that will effectively regulate e-waste collection, recycling and enforcement including banning the importation of such wastes into Nigeria in the absence of proper treatment facilities.[54] The relevant regulatory authorities need to collaborate with international organisations, to harmonise and implement standards and guidelines in line with international best practices for effective management of e-waste, while ensuring that dangerous wastes do not end up in Nigeria due to weak domestic regulations.

The idea of Public-Private Partnership (PPP) has been proven to be successful in other sectors of the Nigerian economy. In the context of managing e-waste, PPP is needed to foster collaboration between government, businesses, non-government organisations (NGOs) and consumers.[55] This will facilitate the holistic development of comprehensive digital and electronic waste management systems, as such collaborations can help in the funding of relevant infrastructural facilities and projects for the collection and recycling of such wastes. As part of a PPP agenda in this context, regulators such as the National Environmental Standards and Regulatory Enforcement Agency (NESREA), should find more viable path-ways to make Corporate Social Responsibility (CPR) in this context, a mandatory legal requirement for companies and businesses in their periodic reporting obligations to relevant statutory bodies.[56] Companies and businesses that refuse to implement effective and proper e-waste management in their practices as well as demonstrating this in their periodic reports should be fined and black-listed.

Creating a circular economy around digital and electronic products through closed-loop systems will help create an environment in Nigeria where such products or devices are designed for reuse, remanufacturing and recycling instead of single-use products that will end up disposed of improperly in landfills. Through the creation of a culture of repair and refurbishment which are essential features of a circular economy, companies, businesses and manufacturers should be encouraged to adopt the culture of

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53 May Ohajinwa Chimere and others, 'Prevalence and Injury Patterns among Electronic Waste Workers in the Informal Sector in Nigeria' (2018) 24(3) Injury Prevention 185. <https://doi.org/10.1136/injuryprev-2016-042265>.

54 Thakur, P. and Kumar, S., 'Evaluation of E-Waste Status, Management Strategies and Legislations' (2022) 19(7) International Journal of Environmental Science and Technology 6957. <https://doi.org/10.1007/s13762-021-03383-2>.

55 Mohamad K. Khawaja, Marwa Ghaith and Ammar Alkhalidi, 'Public-Private Partnership versus Extended Producer Responsibility for End-of-Life of Photovoltaic Modules Management Policy' (2021) 222 Solar Energy 193. <https://doi.org/10.1016/j.solener.2021.05.022>.

56 Ruchi Lal, Smriti Singh Chauhan and Bhupendra Kumar Gautam, 'An Analysis of the Role of Corporate Social Responsibility in E-Waste Management in India' (2023) 12 European Chemical Bulletin 13725.

refurbishment of old digital and electronic devices as well as the sale of used products.[57] This will facilitate reduction in e-wastes and provide consumers with more affordable options whilst creating a safer and healthier environment in Nigeria.

All the above recommended strategies for improving Nigeria's management of e-wastes will be further strengthened through research and innovation. Investing in research and innovation will more specifically help in the improvement of recycling efficiency and the recovery of more valuable materials like rare metals and thereby reduce the negative environmental footprints of e-waste in Nigeria.[58] More so, research and innovation will lead to the development of alternative materials in the manufacturing of digital and electronic products, through the use of less dangerous materials by replacing risky substances with safer alternatives.[59]

To complement the above general recommendations for improving Nigeria's e-waste management strategies, it is argued that Nigeria needs to adopt more specific and targeted solutions in three main areas: innovative strategies in e-waste collection, sorting and recycling; integrating Nigeria's informal digital and electronic waste management sector; and encouraging Nigerian consumers to adopt more sustainable practices to extend the lifespan of their digital and electronic devices in the specific ways suggested below.

4. EFFECTIVE E-WASTE COLLECTION, SORTING AND RECYCLING

Through technological development and recent trends in digital and electronic waste collection, sorting and recycling, there is now an emergent sustainable way of managing e-waste. With the growth in the volume of e-waste globally[60] and in Nigeria in particular, Nigeria can leverage on technological advancements to improve its management of e-waste, whilst adopting more profitable ways of recovering valuable materials from such waste, enhancing recycling and reducing the environmental impacts of such wastes through adopting the following suggested innovative strategies.

4.1. E-Waste Collections Innovations

This can be achieved through the establishment of smart collection points and drop-off locations, by creating automated collection stations. Automated collection machines can be developed to enable consumers to

57 Rosita Moradi and others, 'Sustainable Resilient E-Waste Management in London: A Circular Economy Perspective' (2024) 10(13) Heliyon 13. <https://doi.org/10.1016/j.heliyon.2024.e34071>.

58 Gordon Akon-Yamga and others, 'Transformative Innovation Policy Approach to E-Waste Management in Ghana: Perspectives of Actors on Transformative Changes' (2021) 48(3) Science and Public Policy 387. <https://doi.org/10.1093/scipol/scab005>.

59 Ibid.

60 It was reported that in 2022, the world generated a record 62 million metric tonnes (Mt) of e-waste, marking an 82% increase from 2010 and projections indicate that this figure could rise by another 32%, reaching 82 million tonnes by 2030. See, Cornelis P. Balde, *The Global E-Waste Monitor 2024* (2nd edition, United Nations Institute for Training and Research (UNITAR) 2024).

drop off their used digital and electronic devices. These are machines that weigh and issue receipts and in some cases rewards such as loyalty points and discounts to encourage citizen participation as has been practiced in some countries and cities.[61] These collection stations can then be integrated into recycling projects which will make it a lot easier for consumers to dispose their e-waste in more environmentally friendly ways.[62] Similarly, Nigeria can leverage on Internet of Things (IoT) technology to create e-waste collection bins that enhance notification of waste management authorities and agencies when such bins are full, thereby enhancing efficient pickups whilst drastically reducing the dangers associated with overflowing and improper disposal ways.[63] E-waste collection could also be made more efficient in Nigeria through establishing mobile collection units in rural areas that lack formal recycling facilities. Such mobile collection units should be equipped with appropriate sorting and simple processing technology that can travel to rural communities and isolated areas to collect e-waste.[64] This will enable such communities to have easy access to recycling facilities.

4.2. E-Waste Sorting Technologies

Nigeria can use Artificial Intelligence (AI) and machine learning systems to improve its sorting processes of e-waste. In some countries, AI and machine learning algorithms are being utilised to enable efficient sorting at recycling centres.[65] AI has been shown to help analyse and categorise various components of e-waste like metals, plastics and circuit boards through their visual and material properties that facilitate more accurate sorting of such wastes.[66] In addition, computer vision could be utilised through the use of advanced cameras and image recognition software that will help in identifying specific components of e-waste like cables, screens and chips as well as help direct them into proper recycling machines.[67] This sort of technology will increase the speed and accuracy of sorting and in the process minimise manual labour as well as reduce human errors. In this context, the use of automated dismantling machines can also be handy.

[61] Erhan Ada and others, 'Smart Technologies for Collection and Classification of Electronic Waste' (2024) 41(9) International Journal of Quality & Reliability Management 2434.

[62] Jenifa Latha, C. and others, 'Dynamic Convolutional Neural Network Based E-Waste Management and Optimized Collection Planning' (2022) 34(17) Concurrency and Computation: Practice and Experience e6941. <https://doi.org/10.1002/cpe.6941>.

[63] Dean Kang Kai and others, 'Electronic Waste Collection Systems Using Internet of Things (IoT): Household Electronic Waste Management in Malaysia' (2020) 252 Journal of Cleaner Production 119801. <https://doi.org/10.1016/j.jclepro.2019.119801>.

[64] Shailender Singh, Mani Sankar Dasgupta and Srikanta Routroy, 'Evaluation of Sustainable E-Waste Collection Method for Urban and Rural Region of India' (2022) 40(5) Waste Management & Research 545. <https://doi.org/10.1177/0734242X211018512>.

[65] Madhav Shreyas, A. V. and others, 'Application of Artificial Intelligence to Enhance Collection of E-waste: A Potential Solution for Household WEEE Collection and Segregation in India' (2022) 40(7) Waste Management & Research 1047. <https://doi.org/10.1177/0734242X211052846>.

[66] Zahid Ali and others, 'Classification of E-Waste Using Machine Learning-Assisted Laser-Induced Breakdown Spectroscopy' (2024) Waste Management & Research 0734242X241248730. <https://doi.org/10.1177/0734242X241248730>.

[67] Philipp Kranz and others, 'Towards Recycling E-Waste Using Vision and Robotic Manipulation' (Australasian Conference on Robotics and Automation (ACRA), Sydney, November 2023).

Indeed, automated systems are increasingly helping to disassemble digital and electronic devices by removing components such as screens, batteries and circuit boards which can subsequently be processed separately.[68] An advantage of such automation systems is a reduction in the costs of employing staff and enhancing safety by eliminating the need for manual work by humans through hazardous ways of handling materials such as cadmium, lead and mercury.

4.3. E-Waste Recycling Innovations

Innovative e-waste recycling techniques such as the use of advanced chemical and hydrometallurgical processes have proven to be effective. Through hydrometallurgical recovery processes, metals such as gold, silver, copper and other rare earth elements can be efficiently extracted from e-wastes.[69] In comparison with conventional smelting, hydrometallurgical procedures have proven to be more environmentally sound means because such hydrometallurgical processes tend to generate less toxic emissions and have also been proven to use lower temperatures.[70] It has been argued in this sense, that the use of environmentally friendly solvents and lixiviates in hydrometallurgy improves sustainability in the sorting of e-waste.[71] In a similar vein, Nigeria can also use bio-leaching as a technique which uses micro-organisms to separate valuable metals from e-wastes.[72] Through these techniques, fungi and bacteria are used to dissolve metal compounds in e-waste.[73] It has been argued that bioleaching is an environmentally friendly means of extracting metals from e-waste and the process helps to dispense with the use of very harsh substances or high-power inputs.[74]

Physical separation techniques such as Eddy Current Separators can also be used to separate non-ferrous metals like copper and aluminium from e-waste.[75] These techniques produce magnetic fields that repel nonferrous metals by efficiently sorting from other materials.[76] This methodology has

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68 Emmanuel A Oke and Herman Potgieter, 'Discarded E-Waste/Printed Circuit Boards: A Review of their Recent Methods of Disassembly, Sorting and Environmental Implications' (2024) 26(3) Journal of Material Cycles and Waste Management 1277. <https://doi.org/10.1007/s10163-024-01917-7>.

69 Deblina Dutta and others, 'A Review on Recovery Processes of Metals from E-Waste: A Green Perspective' (2023) 859 Science of the Total Environment 160391. <https://doi.org/10.1016/j.scitotenv.2022.160391>.

70 Manivannan Sethurajan and others, 'Recent Advances on Hydrometallurgical Recovery of Critical and Precious Elements from End of Life Electronic Wastes-A Review' (2019) 49(3) Critical Reviews In Environmental Science and Technology 212. <https://doi.org/10.1080/10643389.2018.1540760>.

71 Ibid.

72 Isiaka Adetunji Adegoke, Paul Johan Oberholster and Mariana Erasmus, 'Bioleaching of Metals from E-Waste Using Microorganisms: A Review' (2023) 13(6) Minerals 828. <https://doi.org/10.3390/min13060828>.

73 Ibid.

74 Ibid.

75 Ruan Jujun, Qian Yiming and Xu Zhenming, 'Environment-Friendly Technology for Recovering Nonferrous Metals From E-Waste: Eddy Current Separation' (2014) 87 Resources, Conservation and Recycling 109. <https://doi.org/10.1016/j.resconrec.2014.03.017>.

76 Ibid.

been used in e-recycling centres to recover metals such as aluminium from circuit boards and casings.[77] Other physical separation methods such as shredding and air classification can be adopted by mechanically shredding and breaking down e-waste into small portions, this process facilitates separation through the use of air streams that separate lighter materials like plastics from heavier metals.[78] In addition, the physical separation techniques suggested above can be complemented by the use of X-ray fluorescence (XRF) for the analysis of materials. This method is gradually being used in some countries to identify and analyse the contents of e-waste.[79] It has been shown that this process can result in quick and faster determination of the presence or otherwise of critical and valuable metals, thereby enhancing a more targeted recovery process.[80]

4.4. Sustainable Recycling Innovations

Nigeria could also adopt sustainable recycling innovative methods such as closed-loop recycling systems,[81] which are designed to increase the reuse of materials from e-waste, by creating a circular economy that creates a society where digital and electronic devices are constantly recycled into new products.[82] An example is through the recovery of rare earth materials which can be sent back to manufacturers for the production of new digital and electronic products, to reduce the necessity for mining and enhance the conservation of natural resources. Nigeria could also encourage a culture of zero-waste policies to encourage companies to imbibe a habit of encouraging the creation of an environment where every component of e-waste like glass, metals and plastics recycled, reused and converted into renewable energy.

Other eco-friendly recycling techniques such as the use of biodegradable materials and production of biodegradable digital and electronic devices using bio-based plastics, which have been shown to break down easily at the end of their life cycle should be encouraged.[83] Similarly, the use of green chemistry in the manufacturing of digital and electronic devices could be used and encouraged in the industry. Green chemistry

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77 Ibid.

78 Kathirvel Brindhadevi and others, 'E-Waste Management, Treatment Options and the Impact of Heavy Metal Extraction from E-Waste on Human Health: Scenario in Vietnam and Other Countries' (2023) 217 Environmental Research 114926. <https://doi.org/10.1016/j.envres.2022.114926>.

79 Dennis S. Ferreira and others, 'Electronic Waste Analysis Using Laser-Induced Breakdown Spectroscopy (LIBS) and X-Ray Fluorescence (XRF): Critical Evaluation of Data Fusion for the Determination of Al, Cu and Fe.' (2024) 1303 Analytica Chimica Acta 342522. <https://doi.org/10.1016/j.aca.2024.342522>.

80 Ibid.

81 Hark Hwang and others, 'A Closed-Loop Recycling System with a Minimum Allowed Quality Level on Returned Products' (2009) 5(6) International Journal of Services and Operations Management 758. <https://doi.org/10.1504/IJSOM.2009.026773>.

82 A circular economy refers to a model where waste is eliminated and materials are used, re-used and recycled continually, to reduce environmental degradation and maximise resource efficiency.

83 Pillai H. P. Jai Shanker and others, 'Innovative Approaches to Sustainable E-Waste Management Through Bio-Based Products' in Jayaseelan Aru, N. Nirmana and S. S. Dawn (eds), *Environmental Applications of Carbon-Based Materials* (IGI Global 2024) 380-407.

techniques require the use of recyclable and non-toxic materials in the manufacturing of digital and electronic products, and the method has been proven to reduce negative environmental impacts when devices created through these processes reach the end of their lifecycle.[84]

4.5. Data Destruction and Security Initiatives

An often-ignored aspect of managing e-waste is data protection.[85] As such it is important that Nigeria adopts effective data protection strategies in the management of its e-waste. While Nigeria has enacted the Data Protection Act 2023, the Act does not contain any specific provisions on data protection in the context of e-waste. So, there is a need to ensure that in practice, secure data-wiping technologies such as data-wiping software are used to securely wipe out personal and sensitive data before reusing or recycling e-waste.[86] It is recommended that innovative data-erasing software should be used to effectively remove data from smartphones, hard drives and other storage devices to ensure that no sensitive or personal information is recovered in the process of reuse and recycling. The use of physical data destruction machines like shredders and crushers is hereby recommended for devices that cannot be effectively erased through the use of software. This process can be adapted for e-waste such as memory chips, SSDs and hard drives to avoid breaching privacy and data protection rights and laws.

4.6. Consumer Engagement through Technology

A good way to enhance efficient e-waste recycling in Nigeria is by engaging consumers through the use of mobile technologies such as mobile apps for e-waste recycling. The use of recycling apps could be helpful as many apps are already in use in other countries for encouraging consumer participation in e-waste recycling.[87] It has been shown that such apps enable users to locate e-waste collection points, schedule pick-ups and track recycling activities.[88] In some instances, some apps have been used to provide incentives like discounts and points to consumers who recycle old digital and electronic products, thereby encouraging participation as well as creating awareness.[89]

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84 Malhotra, P. and Jain, A., 'Chemical methods for the treatment of e-waste' in Padeep Singh and others (eds), *Waste Management and Resource Recycling in the Developing World* (Elsevier, 2023) 181-204.

85 Burkhard Schafer, 'D-Waste: Data Disposal as Challenge for Waste Management in the Internet of Things' (2014) 22 The International Review of Information Ethics 101. <https://doi.org/10.29173/irie122>.

86 Krumay, B., 'The E-Waste-Privacy Challenge: A Grounded Theory Approach, in *Privacy Technologies and Policy: 4th Annual Privacy Forum (APF)* (APF 4th Annual Forum, Frankfurt/Main, September 2016).

87 Odwa Gazana and Thembisa Grace Ngqondi, 'Co-Design, With Two South African Villages, of a Prototype for an E-Waste Management Mobile App' (2024) 33 The African Journal of Information and Communication1. <https://doi.org/10.23962/ajic.i33.17267>.

88 Ibid.

89 Sonal Thukral, Deep Shree and Shakshi Singhal, 'Consumer Behaviour Towards Storage, Disposal and Recycling of E-Waste: Systematic Review and Future Research Prospects' (2023)

To enhance transparency in the efficient management of e-waste in Nigeria, blockchain technologies can be deployed to trace e-waste recycling processes.[90] Blockchain technologies can track the entire lifespan of e-waste, from the collection points, through transportation to recycling and disposal centres, thereby enhancing responsible and ethical recycling practices by stakeholders.[91] In addition, Radio Frequency Identification (RFID) tags can be utilised in tracking digital and electronic devices throughout their lifecycle. The RFID can, therefore, help ensure a transparent flow of e-waste and reduce illegal disposal while ensuring that precious materials are recovered properly.[92]

4.7. Recycling Business Models

Recycling e-wastes through the use of creative refurbishment technologies provide opportunities for businesses to efficiently repair and upgrade old digital and electronic products, by extending the life of these products and reducing the amount of e-waste that they generate.[93] In this way, companies and businesses can very easily increase their focus of refurbishing devices such as smartphones and computers, which they can then resell or donate and in the process contribute the creation of a circular economy in Nigeria.[94] In line with this business context, companies and businesses are encouraged to explore more innovative means to upcycle e-wastes into new products like furniture, art and fashion. The effect will be the creation of more environmentally friendly solutions for the efficient disposal of e-wastes in Nigeria.

5. INTEGRATING NIGERIA'S INFORMAL E-WASTE SECTOR

In this section, several strategies specifically targeted at integrating Nigeria's informal e-waste management sector into the formal sector will be examined and suggested. Indeed, integrating Nigeria's informal sector in this context, into formalised collection and processing sectors would demand

30(3) Benchmarking: An International Journal 1021. <https://doi.org/10.1108/BIJ-12-2021-0774>.

90 Usman Rais Mohammad, 'Smart E-Waste Tracking and Monitoring Model: A Modern Approach to Counter E-Waste Management Issues' in Prem Kumar Chaurasia and others (eds), *Technology Innovation in Mechanical Engineering: Select Proceedings of TIME* 2021(Springer Nature Singapore, 2022) 757-765.

91 Swagatika Sahoo, Arnab Mukherjee and Raju Halder, 'A Unified Blockchain-Based Platform for Global E-Waste Management' (2021) 17(5) International Journal of Web Information Systems 449. <https://doi.org/10.1108/IJWIS-03-2021-0024>.

92 Geethan Arun Vasantha and others, 'The State-of-the-Art Reverse Logistics for e-Waste Management: A Scenario Specific to India' in J. Aravind, M. Kamaraj, S. Karthikeyan (eds), *Strategies and Tools for Pollutant Mitigation: Research Trends in Developing Nations* (Springer 2022) 181-198.

93 Xin Tong, Dongyan Tao and Reid Lifset, 'Varieties of Business Models for Post-Consumer Recycling in China' (2018) 170 Journal of Cleaner Production 665. <https://doi.org/10.1016/j.jclepro.2017.09.032>.

94 Tasbirul Islam, M. D., Usha Iyer-Raniga and Sean Trewick, 'Recycling Perspectives of Circular Business Models: A Review' (2022) 7(5) Recycling 79. <https://doi.org/10.3390/recycling7050079>.

a myriad of approaches, that will balance the special circumstances of the informal sector on the one hand and the need to enhance environmental sustainability, health and safety as well as efficiency in resource use on the other hand. It is in this broad context that the following strategies for integrating Nigeria's informal e-waste management sector are proposed.

5.1. Inclusive Laws, Policies and Regulations

One avenue through which the informal e-waste sector can be integrated into the formal sector in Nigeria is through the enactment of laws, policies and regulations that grant formal recognition to the stakeholders in the informal sector, such as informal recyclers as key players in the national e-waste management strategy. The adoption of laws and regulations that build inclusiveness can be achieved by providing subsidies, tax breaks and other financial incentives to encourage informal workers to join formal e-waste networks.[95] This can then be complimented through a gradual introduction and enforcement of environmental and health standards, by ensuring that informal workers are not penalised but rather supported during the period of transition. Another strategy is through capacity building and skills development, by offering training to informal workers on safe dismantling techniques, hazardous waste handling and recycling methods.[96] In addition, informal workers should be provided with access to better tools and technologies for efficient and safe e-waste processing.

5.2. Aggregation and Collection Centres

Furthermore, Nigeria needs to create aggregation and collection centres by establishing community-based collection hubs, where informal workers in e-waste can drop off e-waste for some fair compensation.[97] These centres can then be integrated into formal recycling networks while ensuring that they have consistent and transparent access to buyers.[98] Through PPP and the already recognised principle of EPR, the regulatory authorities in Nigeria such as NESREA can through regulations and policies, impose obligations on manufacturers to collaborate with both formal and informal recyclers for e-waste collection and recycling.[99] Similarly, companies and businesses should be encouraged to form cooperatives and PPPs with

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95 Xin Tong, Tao Wang and Yanguang Chen, 'Towards an Inclusive Circular Economy: Spatial Flows of E-Waste through the Informal Sector' in Sabastien Bourdin, Andre Torre and Evelyn van Leeuwen (eds), *Regions, Cities and the Circular Economy* (Edward Elgar Publishing 2024) 183-202.

96 Eva Ignatuschtschenko, 'E-Waste Management in China: Bridging the Formal and Informal Sectors' (2017) 2(4) Journal of Chinese Governance 385. <https://doi.org/10.1080/23812346.2017.1379629>.

97 Shailender Singh, Mani Sankar Dasgupta and Srikanta Routroy, 'Evaluation of Sustainable E-Waste Collection Method for Urban and Rural Region of India' (2022) 40(5) Waste Management & Research 545. <https://doi.org/10.1177/0734242X211018512>.

98 Ibid.

99 Arora G. Mehra, Prakash, R. and Banerjee, A., 'Approaches to Improving the Circular Economy Paradigm in E-waste Management in India through Informal–Formal Sector Integration' in Gautam Mehra and others, (eds), *Development in E-Waste Management* (CRC Press2023) 209-222.

informal recyclers to bridge the gap between informal collection and formal processing.[100]

5.3. Financial Inclusion

Another strategy that can facilitate the integration of the informal e-waste sector with the formal sector, is through financial inclusion and microcredit support. By providing microloans and grants to informal workers, Nigeria will be encouraging informal workers to invest in safer tools, PPE and small-scale processing units.[101] To build the trust of informal workers, digital payment platforms such as mobile bank apps and electronic transfers should be used for timely compensation of informal recyclers. This would enhance transparency as well. Through creating awareness and encouraging behaviour change, informal recyclers can be educated about the health and environmental dangers associated with improper recycling techniques.[102] Likewise, relevant authorities and stakeholders in the formal e-waste management sector in Nigeria could also run campaigns to inform households about e-waste disposal, whilst simultaneously encouraging them to direct their e-waste to certified centres that are in collaboration with informal collectors.[103]

5.4. Pilot Projects

Through pilot programmes, Nigeria could incrementally formalise the informal e-waste sector by initiating pilot projects that demonstrate the economic and social benefits of integrating informal workers into formal systems.[104] This will help in gradually scaling up successful models to ensure a smooth and sustainable transition. In this context, it will be very helpful if there is an effective data collection system that is also transparent, as through that collection, a system can be developed that monitors and records informal recycling activities in order to understand the scale and impact of those activities better.[105] The data obtained can then be used to design, measure

[100] Ibid.

[101] Woggsborg, A. and Schröder, P., 'Nigeria's E-Waste Management: Extended Producer Responsibility and Informal Sector Inclusion' (2018) 1(1) Journal of Waste Resources and Recycling 1. <https://doi.org/10.15744/2766-5887.1.102>.

[102] Vishwanath Vighnesh Nanjangud, Balachandra Patil and Deepak Chandrashekar, 'Evolving a Conceptual Framework for Sustainable E-Waste Management: A Consumer Typology Based on Environmental Behavior' (2024) 16(1) Journal of Indian Business Research 55; Osei Asibey Michael, Anne Mette Lykke and Rudith Sylvana King, 'Understanding the Factors for Increased Informal Electronic Waste Recycling in Kumasi, Ghana' (2022) 32(2) International Journal of Environmental Health Research 305. <https://doi.org/10.1080/09603123.2020.1755016>.

[103] Wenhua Wang and others, 'Barriers for Household E-Waste Collection in China: Perspectives from Formal Collecting Enterprises in Liaoning Province' (2017) 153 Journal of Cleaner Production 299. <https://doi.org/10.1016/j.jclepro.2017.03.202>.

[104] Jinglei Yu, Eric Williams, Meiting Ju and Chaofeng Shao, 'Managing E-Waste in China: Policies, Pilot Projects and Alternative Approaches' (2010) 54(11) Resources, Conservation and Recycling 991. <https://doi.org/10.1016/j.resconrec.2010.02.006>.

[105] Karoline Owusu-Sekyere and others, 'Assessing Data in the Informal E-Waste Sector: The Agbogbloshie Scrapyard' (2022) 139 Waste Management 158. <https://doi.org/10.1016/j.wasman.2021.12.026>.

and implement targeted intervention strategies as well as ascertain the progress that is being made over a period of time.[106]

5.5. Lessons from other Jurisdictions

Nigeria can also benefit from studying how other developing countries such as Ghana.[107] China and India,[108] where informal recyclers have been integrated into formal e-waste systems through supportive policies, capacity-building programs, and partnerships with Non-Governmental Organisations (NGOs) and private companies.

6. CONCLUSION

As Nigeria grapples with the growing challenges of electronic and digital waste (e-waste), a robust and well-regulated management framework is crucial for mitigating environmental and health risks while harnessing economic opportunities. The current informal handling of e-waste poses significant hazards, from toxic emissions to resource wastage. To transition towards a sustainable and efficient e-waste management regime, Nigeria must strengthen its regulatory framework, enforce compliance with international standards, and invest in formal recycling infrastructure. A successful legal and regulatory regime should integrate EPR, PPP and community engagement to ensure effective and efficient e-waste collection, recycling and disposal. Additionally, raising public awareness about the dangers of improper e-waste handling and promoting circular economy principles will be instrumental in reducing the country's e-waste footprints. By implementing a structured, forward-thinking policy framework, Nigeria can move from reactive e-waste disposal to a proactive, sustainable e-waste management system—one that not only protects public health and the environment but also fosters economic growth through job creation and resource recovery. The time to act is now, ensuring a cleaner, safer and more sustainable future for generations to come.

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AUTHOR'S DECLARATION AND ESSENTIAL ETHICAL COMPLIANCES

Author's Contributions (in accordance with ICMJE criteria for authorship)

This article is 100% contributed by the sole author. He conceived and designed the research or analysis, collected the data, contributed to data analysis & interpretation, wrote the article, performed critical revision of the article/paper, edited the article, and supervised and administered the field work.

Funding
No funding was available for the research conducted for and writing of this paper.

Research involving human bodies or organs or tissues (Helsinki Declaration)
The author(s) solemnly declare(s) that this research has not involved any human subject (body or organs) for experimentation. It was not a clinical research. The contexts of human population/participation were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of Helsinki Declaration does not apply in cases of this study or written work.

Research involving animals (ARRIVE Checklist)
The author(s) solemnly declare(s) that this research has not involved any animal subject (body or organs) for experimentation. The research was not based on laboratory experiment involving any kind animal. The contexts of animals not even indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of ARRIVE does not apply in cases of this study or written work.

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To see original copy of these declarations signed by Corresponding/First Author (on behalf of other co-authors too), please download associated zip folder [Ethical Declarations] from the published Abstract page accessible through and linked with the DOI: https://doi.org/10.33002/jelp050105.

JOURNAL OF ENVIRONMENTAL LAW & POLICY | 05(01) APRIL 2025
Published by The Grassroots Institute in partnership with Asia Pacific Academy of science Pte Ltd. Website: https://grassrootsjournals.org/jelp
Main Indexing: SCOPUS, EBSCO, HEIN ONLINE

ISSN 2564-016X | April 2025

M – 00536 | Analytical Article | Open Access

GAS FLARING IN NIGERIA'S NIGER DELTA: LEGAL CHALLENGES AND LESSONS FROM NORWAY'S REGULATORY FRAMEWORK

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Received: 09 January 2025 | **Reviewed:** 11 February 2025 | **Revised:** 15 March 2025
Accepted: 27 March 2025 | **Published:** 17 April 2025

ABSTRACT

Gas flaring remains a persistent environmental and human rights challenge in the Niger Delta region of Nigeria, exacerbated by inadequate enforcement of extant laws. This article employs a doctrinal and comparative methodology to critically examine the legal frameworks governing gas flaring in Nigeria, including the 1999 Constitution, the Petroleum Industry Act, the Flare Gas (Prevention of Waste and Pollution) Regulations, and the Environmental Impact Assessment Act. It highlights the adverse effects of gas flaring, such as environmental degradation, health risks, and economic losses, and juxtaposes Nigeria's approach with Norway's successful gas flaring abatement regime. The findings reveal that while Nigeria has adequate laws, their enforcement remains weak due to infrastructural deficits and a lack of political will. The article recommends stricter enforcement of existing laws, investment in gas utilization infrastructure, and adoption of international best practices, such as Norway's regulatory oversight and technological advancements, to eliminate gas flaring and promote sustainable development in the Niger Delta.

Keywords: Gas Flaring; Niger delta; Legal framework; Environmental protection

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How to cite this paper: Jenigho Philip Esavwede and Ufuoma Garvin Oyibodoro, 'Gas Flaring in Nigeria's Niger Delta: Legal Challenges and Lessons from Norway's Regulatory Framework' (2025) 05 (01) Journal of Environmental Law & Policy 148-166, <https://doi.org/10.33002/jelp050106>

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Gas Flaring in Nigeria's Niger Delta: Legal Challenges and Lessons from Norway's Regulatory Framework

1. INTRODUCTION

Globally, gas flaring is recognized as a major contributor to greenhouse gas emissions and environmental degradation, with severe implications for climate change and public health. This issue is particularly acute in resource-rich developing nations like Nigeria. Nigeria's Niger Delta region is home to Africa's largest wetland, the continent's largest mangrove forest, and its third-largest drainage basin.[1] Due to the exploration for crude oil, which began by the German business in 1908, referred to as the Nigerian Bitumen Corporation, it is today overflowing with gas flaring sites.[2] Thereafter, Shell D'Arcy was awarded the rights for exclusive exploration in 1937, the oil prospection was suspended in 1946 due to the Second World War and resumed in 1951 when the first oil well was drilled at Ihuo at Owerri in Imo state. The breakthrough came in 1956 as the first successful oil well pumped out oil at Oloibiri in Bayelsa state, while the first exportation took place in 1958[3]. Crude oil production started modestly in Nigeria in 1958 in two oil fields, one at Oloibiri and the other at Afam, which yielded some 5,100 barrels per day.[4] From this modest beginning, Nigeria's oil sector has expanded in leaps and bounds with about 606 oilfields (comprising 355 onshore and 251 offshore) and about 5,284 oil wells all over the Niger Delta region[5]. From these oil fields, Nigeria has been producing millions of barrels of oil that peaked at some point at 2.5 million barrels per day (mbpd).

Crude oil has associated gas, which must be separated at the point of exploitation. Three standard options are available[6] to oil companies, namely: re-injecting the gas into the ground for future reuse, deploying gas-capturing equipment to harvest gas for domestic and commercial purposes, and flaring the gas into the atmosphere. The last option, gas flaring, is quite easy and therefore attractive to oil companies. Gas flaring began almost at the same time as oil extraction by Shell-BP in the early sixties[7]. The Nigerian

1 Uchegbulam, I., Aliyuda, A. and John, Y.M., 'Sustainable Environment: A Comprehensive Evaluation of the Effects of Gas Flaring in the Niger Delta, Nigeria' (2022) 26 Journal of Applied Sciences and Environmental Management 929.

2 Giwa, S.O., Oluwakayode, O.A. and Olasunkanmi, O.A., 'Baseline Black Carbon Emissions for Gas Flaring in the Niger Delta Region of Nigeria' (2014) 20 Journal of Natural Gas Science and Engineering 373.

3 Obi, N., Akuirene, A., Bwititi, P., Adjene, J. and Nwose, E., 'Impact of Gas Flaring on Communities in Delta Region of Nigeria, Narrative Review Part 1: Environmental Health Perspective' (2021) 7(3) International Journal of Scientific Reports 186.

4 Steyn, P., 'Oil Exploration in Colonial Nigeria, 1903–58' (2009) 37(2) The Journal of Imperial and Commonwealth History 249.

5 Anifowose, B., Lawler, D., Van der Horst, D., and Chapman, C., 'Evaluating Interdiction of Oil Pipelines at River Crossings Using Environmental Impact Assessments' (2014) 46(1) Area 4.

6 Agboola, O.M., Nwulu, N.I., Egelioglu F., and Agboola, O.P., 'Gas Flaring in Nigeria: Opportunity for Household Cooking Utilization' (2011) 2(2) Intl J Thermal & Environmental Engineering 69.

7 Sharif, H.A., 'Gas Flaring: When Will Nigeria Decarbonize Its Oil and Gas Industry' (2016) 42 Intl J Economy, Energy & Environment 17.

government announced[8] in December 2017 that there were 178 active gas-flaring sites in the country. However, reports from Gas Flare Tracker, a data portal that monitors live data of active flare sites within countries, indicated the existence[9] of 222 active gas-flaring sites across the Niger Delta.

Gas flaring has been a recurring decimal in the Niger Delta. The practice became a legal issue from as early as 1969 when the Nigerian government outlawed routine gas flaring and directed International Oil Corporations (IOCs) operating in the country to comply within five years by taking steps toward gas utilization. This directive was unmet, leading to a revised target in 1984, which also failed due to weak enforcement and industry resistance. The menace continues unabated primarily due to the non-enforcement of extant applicable laws by the Nigerian government. Beyond environmental degradation, gas flaring imposes severe public health consequences. Numerous studies and reports have identified a strong correlation between gas flaring and respiratory diseases such as asthma, bronchitis, and lung cancer among local populations. Other documented health effects include increased cases of leukaemia, skin and eye irritation, miscarriages, and reproductive abnormalities. Prolonged exposure to flared gases has also been linked to premature aging and neurodevelopmental disorders in children.

Furthermore, gas flaring releases significant volumes of greenhouse gases, notably carbon dioxide and methane, which exacerbate global climate change. In Nigeria, the climatic impacts are already visible through rising temperatures, unpredictable rainfall patterns, increased desertification in northern regions, and frequent flooding in coastal zones. These environmental changes threaten agricultural productivity and food security, particularly for vulnerable communities. The continued release of pollutants from gas flaring also acidifies rain, damages soil fertility, and leads to the extinction of aquatic species—posing long-term threats to Nigeria's rich biodiversity. If unabated, gas flaring is likely to accelerate ecological degradation, compromise climate resilience, and undermine the health and sustainability of both local communities and ecosystems in the Niger Delta.

This article argues that the persistence of gas flaring in Nigeria stems from weak enforcement of existing laws and inadequate infrastructural development. It proposes that addressing these challenges through strict enforcement, strategic investment, and the adoption of proven international practices is crucial to eradicating gas flaring and fostering sustainable development in the Niger Delta.

To support this argument, this article sets out to critically examine the legal and institutional frameworks governing gas flaring in Nigeria's Niger Delta and to expose the persistent enforcement gaps that have allowed the

[8] Eboh, M., 'FG Discovers 178 Gas Flare Sites across Nigeria' Vanguard (8 December 2017) <https://www.vanguardngr.com/2017/12/fg-discovers-178-gas-flare-sites-across-nigeria/> accessed 8 December 2024.

[9] BudgIT, 'Gas Flaring: A Real and Present Danger' (2018) <http://yourbudgit.com/wp-content/uploads/2018/04/Gas-flaring-new2.compressed-1.pdf> accessed 12 November 2024.

practice to continue despite regulatory efforts. It aims to assess the environmental, health, and socio-economic implications of gas flaring within the context of Nigeria's constitutional and international human rights obligations. Furthermore, the study evaluates the effectiveness of Nigeria's legal instruments — such as the 1999 Constitution, the Petroleum Industry Act, the Environmental Impact Assessment Act, and the Flare Gas (Prevention of Waste and Pollution) Regulations — in addressing the problem. By employing a comparative approach, the paper also investigates the regulatory framework adopted by Norway to drastically reduce gas flaring, with a view to identifying practical lessons that Nigeria can adopt. Ultimately, the study seeks to propose actionable reforms that strengthen enforcement, close infrastructural gaps, and align Nigeria's gas flaring practices with international environmental standards to promote sustainable development in the Niger Delta.

2. EFFECTS OF GAS FLARING

Scholars like Diugwu *et al,*[10] Nyong[11] and Ukala[12] have argued that gas flaring is one of the most challenging environmental and energy problems all over the world in recent times and one of the most contentious energy and environmental issues that has been lingering for decades in the world today.[13] The exothermic combustion of associated gas releases a significant amount of heat. Fish, as cold-blooded aquatic animals, are sensitive to such a water temperature rise.[14] Reports reveal premature hatching of fish eggs before their gestation period due to an unusual temperature rise of the aquatic habitat.[15] No significant farm practice is currently going on at the Niger Delta mainly[16] due to the flared gas effects. The water toxicity from acid rain and heating from the flare stacks has made the fish extinct, while the people eating the surviving intoxicated fish in turn get poisoned since biological law has it that once a unit in a food chain is infected, its dependents will be affected.[17] Other health issues associated[18] with flared gas which have been reported in Niger Delta includes blindness, aggravated Asthma, Chronic Bronchitis, Cancer, Leukaemia, reduced lung function, Pneumonia, impotency, miscarriages, stillbirths and other reproductive disorders as well

[10] Diugwu, I.A., Ijaiya, M.A., Mohammed M., and Egila, A.E., 'The Effect of Gas Production, Utilisation, and Flaring on Economic Growth' (2013) 4 Scientific Research, Natural Resources 341.
[11] Nyong, R.U., 'Empirical Analysis of Determinants of Natural Gas Flaring in Nigeria' (MSc thesis, Umea University 2016) <https://www.diva-portal.org/fulltext01.pdf> accessed 15 March 2022.
[12] Ukala, E., 'Gas Flaring in Nigeria's Niger Delta: Failed Promises and Reviving Community Voices' (2011) 2 Wash & Lee J Energy Climate & Environment 100.
[13] Ubani, E.C., and Onyejekwe, I.M., 'Environmental Impact Analyses of Gas Flaring in the Niger Delta Region of Nigeria' (2013) 4(2) Am J Sci & Ind Res 247.
[14] Aloamaka, P.C., 'Navigating the Climate Crisis: Exploring International Law's Evolution and Application' (2024) 6 GLS Law Journal 48.
[15] Uchegbulam et al., 'Sustainable Environment' (n 1).
[16] *Ibid*.
[17] *Ibid*.
[18] Emam, A.E., 'Gas Flaring in Industry: An Overview' (2016) 57(5) Petro & Coal 532.

as dysfunctional immune system. The noise and heat have become major causes of insomnia and heat rashes, respectively, in addition to disruption[19] of the wake-sleep rhythm of residents, especially those in proximity to flare facilities. Gas flaring has been suspected to affect[20] the unborn children through transferred toxicities. Gas flaring causes Gas[21] acid rains, which eat through impoverished villagers' roofing, deteriorate their structures, and poor communities typically lack the resources to replace their roofs more regularly.[22] Additionally, acid rain has a detrimental effect on soil fertility and is linked to lower food yields, which results in starvation in the Niger Delta.[23]

3. LEGAL FRAMEWORK GOVERNING GAS FLARING

Applicable laws on gas flaring, such as the 1999 Constitution of the Federal Republic of Nigeria (CRFN), the Petroleum Industry Act (PIA), the Flare Gas (Prevention of Waste and Pollution) regulations and the Environmental Impact Assessment Act (EIA Act) will be discussed in this section.

3.1 The 1999 Constitution

Nigeria's 1999 Constitution highlights the significance of environmental preservation through its "Fundamental Objectives and Directive Principles of State Policy" outlined in Section 20. This section requires the State to protect the nation's land, water, air, forests, and wildlife while promoting and preserving the environment. These principles provide an ideological and policy framework for governance and development, serving as a moral guide for government responsibilities. However, they are non-justiciable, meaning they cannot be challenged in a court of law.

Nevertheless, a notable reprieve exists through the African Charter on Human and Peoples' Rights (ACHPR), which Nigeria has domesticated through the African Charter (Ratification and Enforcement) Act. This means that its provisions are enforceable in Nigerian courts. Article 24 of the Charter expressly guarantees the right to a general satisfactory environment favourable to development, transforming environmental protection into a justiciable human right. Thus, individuals and communities can rely on the Charter to seek legal redress for environmental degradation, as seen in landmark cases such as *Jonah Gbemre v. Shell Petroleum Development Company of Nigeria Ltd & Ors*,[24] where the Federal High Court upheld the right to a

[19] Ekpoh, I.J., and Obia, A.E., 'The Role of Gas Flaring in the Rapid Corrosion of Zinc Roofs in the Niger Delta Region of Nigeria' (2010) 30 Env 347.
[20] Uchegbulam et al., 'Sustainable Environment' (n 1).
[21] Nnimmo, B., 'Gas Flaring' <https://www.justiceinnigerianow.org/gas-flaring> accessed 17 October 2024.
[22] Mrabure, K.O., and Ohimor, B.O., 'Unabated Gas Flaring Menace in Nigeria. The Need for Proper Gas Utilization and Strict Enforcement of Applicable Laws' (2020) 46 Commonwealth Law Bulletin 753.
[23] *Ibid*.
[24] (2005) 6 AHRLR 152.

clean and healthy environment based on the combined force of the Constitution and the African Charter.

The provisions in the Constitution regarding environmental rights are complemented by its guarantees of fundamental human rights. Sections 33 and 34, which protect the rights to life and human dignity, have been argued to implicitly include the right to a safe, healthy, and pollution-free environment. This interpretation aligns with international instruments for human rights, reinforcing the idea that environmental degradation infringes on these fundamental rights. Furthermore, Section 12 of the Constitution mandates that International Treaties ratified by the National Assembly must become Nigerian law.

Nigeria's commitment to international environmental standards is evident in its ratification of several key instruments, such as the Rio Declaration on Environment and Development. Principle 10 of the Declaration emphasizes public participation in environmental decision-making and access to environmental information.[25] The African Charter on Human and Peoples' Rights (ACHPR), domesticated as Nigerian law, also incorporates environmental rights. Article 24 provides for the right to a general satisfactory environment favourable to development, while Article 21 protects peoples' rights to freely dispose of their natural resources. These provisions emphasize how crucial it is to protect the environment as a fundamental component of human rights.

In the case of *Jonah Gbemre v. Shell Petroleum Development Company of Nigeria Ltd & Ors*,[26] the plaintiff sought a landmark decision from the Federal High Court, Benin Division, concerning the detrimental effects of gas flaring on the environment and human health. In addition to harming the environment and public health, the plaintiff argued that gas flaring violated fundamental human rights protected by the ACHPR and the 1999 Constitution of Nigeria.

The plaintiff requested several declarations and reliefs, including:

1. A declaration that the constitutionally guaranteed rights to life and dignity of the human person, as provided under Sections 33(1) and 34(1) of the 1999 Constitution, and reinforced by Articles 4, 16, and 24 of the African Charter, inherently include the right to a clean, pollution-free, and healthy environment.
2. A declaration that the ongoing gas flaring by Shell Petroleum Development Company (Shell) and the Nigerian National Petroleum Corporation (NNPC) as part of their oil exploration and production activities in the Iwherekan community violates the fundamental rights to life (including a healthy environment) and human dignity, as protected by Articles 4, 16, and 24 of the

[25] Awhefeada, U.V., Aloamaka, P.C., and Kore-Okiti, E.T., 'A Realistic Approach towards Attaining Sustainable Environment through Improved Public Participation in Nigeria' (2023) 8 International Journal of Professional Business Review.

[26] (2005) 6 AHRLR 152.

African Charter, along with Sections 33(1) and 34(1) of the 1999 Constitution.

3. A declaration that Shell's and NNPC's failure to conduct an environmental impact assessment (EIA) in the Iwherekan community, as mandated by the EIA Act's Section 2(2), constituted an infringement on the community's basic rights to human dignity and life.
4. A declaration that the provisions of Section 3(2)(a)(b) of the Associated Gas Re-Injection Act and Section 1 of the Associated Gas Re-Injection (Continued Flaring of Gas) Regulations (1984**)**, which allow for continued gas flaring under certain conditions, were declared to be incompatible with the rights to life and dignity guaranteed by Articles 4, 16, and 24 of the African Charter and Sections 33(1) and 34(1) of the Constitution.
5. An order for a perpetual injunction restraining Shell and NNPC, their agents, servants, contractors, or any other representatives, from further engaging in gas flaring activities in the Iwherekan community.
6. An order directing the Attorney General of the Federation to collaborate with the Federal Executive Council to initiate a legislative amendment of the Associated Gas Re-Injection Act, ensuring compliance with constitutional provisions.

Justice Nwokorie CV delivered a landmark judgment, granting the reliefs sought by the Iwherekan community. This case has been widely regarded as a significant precedent in environmental law and human rights litigation in Nigeria, emphasizing the judiciary's role in addressing environmental degradation and enforcing fundamental rights. Despite this decision, enforcement of the judgment remains a significant challenge, underscoring systemic issues in environmental governance in Nigeria.

This case is anticipated to establish a significant precedent for addressing environmental degradation through judicial intervention in Nigeria. It underscores the judiciary's potential as a vital instrument for enforcing environmental rights and holding corporations accountable for harmful practices. However, despite the commendable ruling from the Federal High Court and the existence of relevant legal provisions, gas flaring continues unabated in the Iwherekan community. This persistent environmental violation highlights the Nigerian government's failure to effectively direct and empower regulatory bodies to enforce the applicable laws against International Oil Companies (IOCs). The absence of stringent enforcement mechanisms and political will undermines the court's decision and exacerbates degradation of the Niger Delta's environment. Addressing these challenges requires robust enforcement strategies, increased accountability, and a renewed commitment to protecting the rights and environment of affected communities.

3.2 The Petroleum Industry Act, 2021

The much-anticipated Petroleum Industry Act[27] (PIA) came into being on the 16th of August, 2021, to 'provide legal, governance, regulatory and fiscal framework for the Nigerian petroleum industry, the development of host communities and for related matters'. It can be seen from sections 104-107 of the PIA, 2021, that there are various exemptions in the form of allowances that the PIA has provided for a license holder to pay a fine as a penalty for flaring gas. These provisions align with international standards and underscore the government's commitment to minimizing environmental harm and maximizing the economic potential of associated gas. Since there are still exemptions to flare gas, whatever provisions on gas flaring are counterproductive. This is because it can still be abused by those who would rather flare gas than re-inject it back into the reservoir. There is still a need to have a robust mechanism for prohibiting a significant amount of gas flaring. Notwithstanding the PIA's provisions regarding the government's determination to end gas flaring and enhance related gas utilization, the PIA's successful implementation may be hampered by the significant infrastructure gap that must be filled to address the five essentials of the gas market: (1) gas availability; (2) affordability; (3) deliverability; (4) funding; and (5) regulatory framework. It is necessary to address certain sensitive issues that will work adversely against the application of the PIA, like the domestic gas pricing, which is currently insufficiently profitable to attract investors to the market. The government must prioritize the conclusion of these and more problems impeding the industry's expansion to guarantee that any laws or rules enacted towards ending gas flaring and promoting utilisation of gas can accomplish their goals because doing so will draw in the much-needed private sector investment for the expansion of infrastructure and gas resources.

Gas flaring still continues unabatedly despite the coming into force of the PIA since 2021. A lot needs to be done through the Nigerian government to abate the menace of gas flaring by strictly enforcing applicable extant laws on erring IOCs accordingly.

3.3 Criminal Code

The main forces opposing the ongoing gas flaring in Nigeria have been the Nigerian judiciary and civil society activism, especially that of nongovernmental organizations.[28] According to Ladan,[29] the Nigerian environment can be protected from the prevalence of gas flaring by using section 234 of the Criminal Code. By the Code's Section 234(f), anyone who

[27] It repealed the Petroleum Act and a host of other laws pertaining to the oil industry.

[28] Ekhator, E.,'Improving Access to Environmental Justice under the African Charter: The Roles of NGOs in Nigeria' (2014) 22 Afr J Intl & Comp L 63 for an extensive analysis of the roles of NGOs in improving access to environmental justice in Nigeria.

[29] Ladan, M., 'Access to Environmental Justice in Oil Pollution and Gas Flaring Cases as Human Rights Issue in Nigeria' (Paper presented at a Training Workshop for Federal Ministry of Justice Lawyers, Institute for Oil and Gas Law, Abuja, 28–30 November 2011) <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2336093> accessed 5 January 2025, 37.

inflicts harm or annoyance on the general public faces a misdemeanour and a two-year prison sentence. The sub-section's vague wording makes it easy for oil companies to avoid accountability. Additionally, section 234, its subsections, and other pertinent sections of the Act do not specifically include phrases like "oil firms" or "gas flaring." Also, the inability to apply the punishment of incarceration to IOCs is another issue with Nigeria's Criminal Code, which is a stronghold for environmental protection (and gas flaring). Furthermore, because the Nigerian state is unable or unwilling to prosecute such instances, the statutory penalty for breaking the code—six months or a year in prison—does not serve as a powerful deterrence against gas flaring.[30] Candidly, applicable laws on gas flaring have prioritized financial gains before eradicating the scourge in Nigeria.[31]

3.4 Flare Gas (Prevention of Waste and Pollution) Regulations, 2018

This regulation is a key instrument in Nigeria's legislative framework aimed at reducing gas flaring and promoting the efficient utilization of associated gas. These regulations, issued under the powers conferred by the Petroleum Act and the Associated Gas Re-Injection Act, provide comprehensive guidelines to minimize the harmful environmental, social, and economic impacts of gas flaring.

Over the years, the Nigerian gas industry has been notorious for gas flaring. By lowering the environmental risks resulting from gas flaring, preventing the ongoing natural resource depletion, and generating economic and social advantages from gas flare monitoring, the Regulation aims to protect the environment. The Nigerian federal government's right to get or use related gas at the flare for free without having to pay royalties is reaffirmed in Regulation 2. Regulation 12 expressly forbids producers or license holders from routinely flaring gas unless a ministerial certificate is in place. Additionally, it stipulates that gas flaring from green field projects that have not yet begun oil and gas production is prohibited. Producers who generate at least 10,000 barrels of oil every day are subject to a gas flare payment of $2.00 (#613)/28.317 standard cubic meters (one thousand cubic feet) of gas flared within any designated OML or marginal field, under the "polluter pays principle."[32] Gas flare costs $0.50 for 28,317 standard cubic meters when production is less than 10,000 barrels.[33] The prior gas flare payment of #10/Mscf (a thousand standard cubic feet per day) was significantly increased by these new payments. By imposing noticeably larger payments, the federal government seeks to deter the practice of gas flaring. Even if the latest regulations' provisions are commendable, the government must make a concerted effort this time to strictly enforce the

30 Ebeku, K., *Oil and the Niger Delta People in International Law: Resource Rights, Environmental and Equity Issues* (Rudiger Koppe 2006) 46.
31 *Ibid*.
32 Mrabure and Ohimor, 'Unabated Gas Flaring Menace' (n 22).
33 *Ibid*.

regulations on negligent Multinational Oil Companies (MOCs).[34] This is because the government has implemented a number of regulations and measures to either directly or indirectly prohibit gas flaring ever since oil production started in 1956.

3.5. The Environmental Impact Assessment Act

The Environmental Impact Assessment Act[35] (EIAA) serves as the cornerstone legislation for the regulation of Environmental Impact Assessments (EIAs) in Nigeria. Enacted in 1992, the EIAA directly aligns with Principle 17 of the *Rio Declaration on Environment and Development*, which mandates the evaluation of the environmental effects of proposed projects to promote sustainability.[36] This framework emphasizes the assessment of both positive and negative impacts on the natural environment, [37] ensuring that environmental risks are identified and mitigated before project implementation.[38]

At the heart of the EIAA is the principle of mitigation.[39] The Act requires developers, including oil companies, to conduct EIAs when the scope, nature, or location of a project indicates a significant likelihood of environmental harm.[40] This provision is particularly critical in Nigeria's Niger Delta region, where oil and gas operations, including gas flaring, have caused severe environmental degradation. When a planned project's scope, nature, and location make it likely to have a substantial environmental impact, oil firms are required by the EIAA to prepare an EIA.[41] By mandating EIAs, the EIAA aims to prevent harmful practices and foster accountability in the energy industry.

According to Odje,[42] the EIAA has the potential to compel energy operators, both prospective and existing, to comply strictly with established environmental guidelines. If implemented effectively, the Act could significantly curb environmental pollution in the Niger Delta and other affected regions. However, as is often the case with many well-intentioned laws, the EIAA has been undermined by poor compliance[43] and enforcement.[44] Oil and gas companies, as well as regulatory agencies, have failed to adhere fully to the requirements of the Act, leaving communities vulnerable to the adverse effects of industrial activities.

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34 *Ibid*.
35 Cap. E12, Laws of the Federation of Nigeria 2004. It shall hereinafter be referred to as EIAA.
36 United Nations, *Rio Declaration on Environment and Development* (1992).
37 Ijaiya, H., 'The Development of Environmental Laws in Nigeria: An Assessment' (2012) 3 Rivers State University Law Journal of Public Law 98.
38 *Ibid*.
39 *Ibid*.
40 EIA Act, s 2(1).
41 EIA Act, s 2 (2).
42 Odje, A.M., *Our Bleeding Earth; The Search for Medication: Lectures on Niger Delta, Human Rights and the 1999 Constitution* (Crown of Splendour 2016) 58.
43 Yusuf, A.O., 'The Intersections of Law, Environment and Corporate Governance in Nigeria' (2011) 2 (2) University of Ibadan Law Journal 176
44 *Ibid*.

A notable critique of EIAA compliance comes from a 1994 Greenpeace International report titled *Shell-Shocked*. The report highlighted that no adequate EIA had been conducted in the Niger Delta before the commencement of oil exploration activities, despite the region's ecological sensitivity.[45] Shell, one of the major operators in the region, claimed to have conducted EIAs since 1982.[46] However, independent investigations found no substantial evidence to support this assertion. This gap between corporate claims and on-the-ground realities has fuelled distrust and exacerbated the environmental challenges in the Niger Delta.

The environmental hazards caused by gas flaring underscore the importance of effective EIA implementation. Communities near flare sites have reported significant ecological and health impacts, including toxic emissions, acid rain, and the contamination of soil and water.[47] These conditions have devastated local ecosystems and undermined livelihoods dependent on farming and fishing. Indigenous people's accounts of environmental hazards largely align with scientific findings, illustrating the severe consequences of gas flaring in the region.

In light of these issues, gas flaring should not merely be viewed as an industrial by-product but as a violation of the rights of affected populations. Gas flaring releases pollutants that harm the environment and public health, infringing on the constitutional rights to life and dignity as guaranteed under Sections 33 and 34 of Nigeria's 1999 Constitution. The practice also contravenes international environmental standards, such as those articulated in the *African Charter on Human and Peoples' Rights.*

4. NORWAY'S GAS FLARING MITIGATION FRAMEWORK

Norway's petroleum exploration and production industry began to take shape in the late 1960s, and the country's first oil field began fully producing oil in 1971.[48] Air pollutants, gas flaring, and petroleum activities are all monitored by the Norwegian Petroleum Directorate (NPD), a division of the petroleum ministry.[49] Except for the volumes needed for protection throughout routine operations, gas flaring is prohibited by the Petroleum Act of 1996 without the Ministry of Petroleum and Energy's approval.[50] In Norway, each business requesting a gas flaring authorization must specify the safeguards it has set up against the environmental impact of gas flaring. Norway's carbon emissions were also decreased by the restriction on flaring,

45 Mrabure and Ohimor, 'Unabated Gas Flaring Menace' (n 22).
46 *Ibid*.
47 Edu, O.K., 'Environmental Impact Assessment: Policy and Law in Nigeria' in MOU Gasiokwu (ed), *Ecology: Concept, Politics and Legislation* (Chenglo Publishers 2013) 411–412.
48 Norwegian Petroleum, 'Norway's Petroleum History' (Norwegian Petroleum, 2023) <https://www.norskpetroleum.no/en/framework/norways-petroleum-history/> accessed 5 January 2025.
49 Imoisi, S.E., and Eshemo-Omo, I., 'An Overview of the Applicable Laws in the Nigeria Petroleum Industry' (2024) 6 Public Policy and International Affair Academic Journal 1.
50 *Ibid*.

and more reductions were made after the government imposed a carbon fee in 1990 to promote increased gas use.[51] According to the Petroleum Act, environmental preservation and safety must be considered when conducting oil exploration and development. Over the past two decades, Norway has achieved remarkable success in reducing gas flaring. The amount of gas flared is far less than the amount of crude oil produced, but crude oil output was around six times higher during that period.[52] However, Nigeria continues to be among the top seven gas-flaring countries globally, contributing a substantial portion to global flaring.[53] In contrast, Norway, whose crude oil production is approximately 25% higher than Nigeria's at 1.79 million barrels per day,[54] flares about 3% of its entire production of natural gas, a rate regarded as the global benchmark.[55] Norway's success in achieving such low flaring rates can be attributed to the implementation of stringent regulatory frameworks, consistent and forward-looking government petroleum policies, and an efficient gas transportation infrastructure. The country's petroleum directorate enforces these regulations, ensuring compliance and accountability across the sector. These measures contrast sharply with Nigeria, which continues to face challenges in enforcing effective flaring regulations and developing necessary infrastructure. By leveraging these robust strategies, Norway has set a global standard for gas flaring reduction, showcasing the critical role of governance and infrastructure in addressing environmental issues in the gas and oil sector.

5. KEY INSIGHTS FOR NIGERIA ON GAS FLARING MITIGATION STRATEGIES

A comparative analysis of gas flaring abatement strategies reveals that the effectiveness of measures depends significantly on a country's governance structures and infrastructure. Norway has achieved remarkable success in minimizing gas flaring through stringent regulatory frameworks, clear legislation, and enforced licensing requirements that mandate detailed plans for gas utilization. Moreover, Norway has heavily invested in advanced technology and infrastructure, allowing the country to recoup its investment within five years through profits from captured and marketed gas.[56] In contrast, Nigeria, despite having legal frameworks like the

51 Mrabure and Ohimor, 'Unabated Gas Flaring Menace' (n 22).
52 *Ibid*.
53 World Bank, *Global Gas Flaring Tracker Report* (June 2024) <https://thedocs.worldbank.org/en/doc/d01b4aebd8a10513c0e341de5e1f652e-0400072024/original/Global-Gas-Flaring-Tracker-Report-June-20-2024.pdf> accessed 5 January 2025.
54 CEIC Data, *Norway Crude Oil Production* (2023) <https://www.ceicdata.com/en/indicator/norway/crude-oil-production> accessed 5 January 2025.
55 World Bank, *Global Gas Flaring Tracker Report* (n 47).
56 Zhdaneev, O.V., and Frolov, K.N., 'Technological and Institutional Priorities of the Oil and Gas Complex of the Russian Federation in the Term of the World Energy Transition' (2024) 58 International Journal of Hydrogen Energy 1418.

Associated Gas Re-Injection Act, continues to struggle with enforcement, under-investment in infrastructure, and insufficient political will.[57]

The lack of adequate infrastructure in Nigeria, particularly under Joint Venture Agreements (JVAs) with multinational oil companies, hinders effective associated gas (AG) utilization.[58] The National Gas Master Plan has yet to achieve its objectives due to funding challenges and a failure to execute policies comprehensively. In order to stop the dangerous gas flaring practice, Nigeria must draw lessons from Norway by strengthening enforcement mechanisms, investing in technological infrastructure, and enhancing domestic AG utilization. By adopting these strategies, Nigeria can align its gas management practices with global standards, realizing both environmental and economic benefits.

6. CONCLUSION

The menace of gas flaring in the Niger Delta continues to pose significant environmental, health, and socio-economic challenges despite the existence of robust legal frameworks. While Nigeria has made attempts to regulate and reduce gas flaring through various legislative and policy measures, the lack of strict enforcement, infrastructural deficits, and inadequate political will have undermined these efforts. The comparative analysis with Norway's effective gas flaring regime reveals that clear legislation, substantial investment in infrastructure, and strong regulatory oversight are pivotal to addressing the issue.

To eliminate gas flaring in Nigeria, the government must prioritize the strict enforcement of existing laws and regulations while closing loopholes that allow for exemptions. Investment in technology and infrastructure for gas capture and utilization should be pursued to transform associated gas into a valuable resource. Additionally, the adoption of international best practices, such as those employed in Norway, can serve as a model for the sustainable management of Nigeria's gas resources.

Addressing these challenges requires a multi-stakeholder approach involving government agencies, international oil corporations, civil society, and local communities. By committing to these measures, Nigeria can mitigate the harmful effects of gas flaring, ensure environmental sustainability, and uphold the rights to life and dignity as enshrined in its Constitution. Ultimately, the elimination of gas flaring will contribute significantly to the sustainable development of the Niger Delta and the nation at large.

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AUTHORS' DECLARATION AND ESSENTIAL ETHICAL COMPLIANCES

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	*Author 1*	*Author 2*
Conceived and designed the research or analysis	Yes	No
Collected the data	No	Yes
Contributed to data analysis and interpretation	Yes	Yes
Wrote the article/paper	Yes	Yes
Critical revision of the article/paper	Yes	Yes
Editing the article/paper	Yes	Yes
Supervision	Yes	No
Project administration	Yes	Yes
Funding acquisition	No	No
Overall contribution proportion (%)	55	45

Funding
No funding was available for the research conducted for and writing of this paper.

Research involving human bodies or organs or tissues (Helsinki Declaration)
The author(s) solemnly declare(s) that this research has not involved any human subject (body or organs) for experimentation. It was not a clinical research. The contexts of human population/participation were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of Helsinki Declaration does not apply in cases of this study or written work.

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JOURNAL OF ENVIRONMENTAL LAW & POLICY | 05(01) APRIL 2025
Published by The Grassroots Institute in partnership with Asia Pacific Academy of science Pte Ltd. Website: https://grassrootsjournals.org/jelp
Main Indexing: SCOPUS, EBSCO, HEIN ONLINE

ISSN 2564-016X | April 2025

M – 00537 | Analytical Article | Open Access

THE LEGAL ECOLOGY OF PANDEMIC PREVENTION: AN EXAMINATION OF ECO-CENTRIC ZONING AND WILDLIFE PRESERVATION STRATEGIES FOR REDUCING ZOONOTIC SPILLOVER RISK

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Received: 27 January 2025 | **Reviewed:** 26 March 2025 | **Revised:** 27 March 2025
Accepted: 29 March 2025 | **Published:** 17 April 2025

ABSTRACT

This study examines the role of eco-centric zoning laws and wildlife preservation in mitigating zoonotic spillover, a critical factor in preventing future pandemics. Existing literature establishes a strong correlation between habitat disruption, deforestation, urbanization, and the increasing frequency of zoonotic disease transmission, with cases such as COVID-19, Ebola, and Nipah virus outbreaks underscoring the urgency of intervention. While international and national legal frameworks, including the Convention on Biological Diversity, CITES, and various environmental laws, aim to regulate habitat conservation, gaps persist in their implementation, particularly regarding eco-centric zoning policies. This research addresses these gaps by investigating how legal and policy frameworks can effectively integrate eco-centric zoning and wildlife preservation to reduce the risk of zoonotic spillover. Employing a multidisciplinary approach, the study conducts a comprehensive review of legal precedents, environmental policies, and scientific literature to assess current regulatory measures and propose strategic enhancements. The findings reveal that eco-centric zoning mitigates habitat fragmentation, strengthens biosafety regulations in wildlife facilities, and enhances global surveillance of zoonotic pathogens. Legal tools such as citizen suits, conservation easements, the regulatory takings doctrine,

intergovernmental MOUs, and adaptive management emerge as crucial mechanisms for enforcing eco-centric zoning policies. Case studies, such as Bangladesh's infrastructure-induced elephant fatalities, demonstrate the legal and enforcement challenges surrounding conservation policies. The study argues for the adoption of stricter zoning regulations, increased public participation, the integration of technological solutions for habitat monitoring, and enhanced legal accountability for environmental degradation. By emphasizing the One Health framework, which underscores the interconnectedness of human, animal, and environmental health, the research provides actionable policy recommendations to align conservation efforts with public health strategies. The study's findings contribute to the advancement of sustainable land-use policies, improved legal mechanisms for biodiversity protection, and a holistic approach to pandemic prevention. In advocating for stronger regulatory frameworks and cross-border legal cooperation, this research underscores the need for a proactive, interdisciplinary response to emerging zoonotic threats.

Keywords: Zoonotic spillover; Eco-centric zoning; Wildlife preservation; Pandemic prevention; Environmental law

Editor-in-Chief: Prof. Dr. Kamrul Hossain | *Deputy Editors-in-Chief:* Dr. Evgeniya Kopitsa, Prof. Dr. Ngozi Finette Unuigbe | *Executive Editor:* Dr. Hasrat Arjjumend

How to cite this paper: Rawnak Miraj Ul Azam, Muzahidul Islam, and Ashiqur Rahman, 'The Legal Ecology of Pandemic Prevention: An Examination of Eco-Centric Zoning and Wildlife Preservation Strategies for Reducing Zoonotic Spillover Risk' (2025) 05 (01) Journal of Environmental Law & Policy 167-200, <https://doi.org/10.33002/jelp050107>

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The Legal Ecology of Pandemic Prevention: An Examination of Eco-Centric Zoning and Wildlife Preservation Strategies for Reducing Zoonotic Spillover Risk

1. INTRODUCTION

Zoonotic diseases, infections transmitted from animals to humans, are increasingly recognized as a significant threat to global public health. These diseases, which can be caused by viruses, bacteria, parasites, or fungi, account for a substantial proportion of emerging infectious diseases worldwide.[1] The escalating frequency of zoonotic outbreaks is driven by a complex interplay of factors, including ecological changes, human population growth, and increased human-animal interactions.[2] Recent pandemics, such as COVID-19, Ebola, and others, have underscored the devastating impact of zoonotic diseases on human societies, economies, and healthcare systems.[3] The COVID-19 pandemic, in particular, has highlighted the rapidity with which a novel zoonotic pathogen can spread globally, leading to unprecedented social and economic disruption.[4] The Ebola virus outbreaks in West Africa demonstrated the severe consequences of zoonotic spillover in resource-limited settings, where healthcare infrastructure is often overwhelmed.[5] These events serve as stark reminders of the vulnerability of human populations to zoonotic threats and the urgent need for proactive mitigation strategies. The concept of 'One Health,' which emphasizes the interconnectedness of human, animal, and environmental health, is crucial for addressing these challenges.[6] It recognizes that the health of humans, animals, and ecosystems is inextricably linked and that a holistic approach is necessary for effective disease prevention and control.[7] Habitat disruption, including deforestation, urbanization, and intensive agriculture, plays a pivotal role in increasing the risk of zoonotic spillover.[8] As natural habitats are fragmented and destroyed, wildlife populations are forced into closer proximity with humans and domestic animals, increasing the likelihood of pathogen transmission.[9] Deforestation, in particular, has been linked to the emergence of numerous zoonotic diseases, as it disrupts natural ecosystems and creates opportunities for pathogens to spill over from wildlife to

1 Jones, K E, et al, 'Global Trends in Emerging Infectious Diseases' (2008) 451(7181) Nature 990, 991.
2 Morse, S S, et al, 'Prediction and Prevention of the Next Pandemic Zoonosis' (2012) 380(9857) The Lancet 1956, 1957.
3 Morens, D M, Folkers, G K, and Fauci, A S, 'Emerging Infections: A Perpetual Challenge' (2008) 8(11) The Lancet Infectious Diseases 710, 712.
4 Zhu, N, et al, 'A Novel Coronavirus from Patients with Pneumonia in China, 2019' (2020) 382(8) New England Journal of Medicine 727, 728.
5 Baize, Sébastien, et al, 'Emergence of Zaire Ebola Virus Disease in Guinea' (2014) 371(15) New England Journal of Medicine 1418, 1420.
6 Destoumieux-Garzón, Delphine, et al, 'The One Health Concept: 10 Years Old and Still Topical' (2018) 6 Frontiers in Public Health 105, 106.
7 Gibbs, E Paul J, 'The International One Health Concept: Origins, Evolution and Sustainability' (2014) 174(3) Veterinary Record 85, 86.
8 Johnson, Christine K, et al, 'Global Shifts in Mammalian Population Trends Reveal Key Predictors of Virus Spillover Risk' (2020) 287(1924) Proceedings of the Royal Society B: Biological Sciences 20192735, 20192736.
9 Plowright, Raina K, et al, 'Ecological Dynamics of Emerging Bat Virus Spillover' (2015) 282(1798) Proceedings of the Royal Society B: Biological Sciences 20142124, 20142125.

humans.[10] Urbanization, with its rapid expansion and encroachment into wildlife habitats, further exacerbates these risks by creating dense human populations near animal reservoirs of disease.[11] Intensive agricultural practices, such as large-scale livestock farming, can also contribute to zoonotic spillover by creating environments conducive to pathogen transmission and amplification.[12] The unregulated wildlife trade, particularly in wet markets, poses a significant risk of zoonotic disease emergence.[13] These markets, where live animals are often sold near humans, provide ideal conditions for the transmission of pathogens from animals to humans.[14] The concept of eco-centric zoning, which integrates ecological considerations into urban and rural planning, offers a promising approach to mitigating these risks by preserving natural habitats and reducing human-wildlife interactions.[15] Similarly, wildlife preservation efforts, including the establishment of protected areas and the regulation of wildlife trade, are essential for preventing zoonotic spillover by maintaining healthy ecosystems and reducing the likelihood of pathogen transmission.[16] Eco-centric zoning is a regulatory framework that integrates environmental sustainability into land-use planning, prioritizing ecological integrity over unrestricted development. It designates specific areas for conservation, restricts activities that degrade natural ecosystems, and ensures that urban expansion aligns with biodiversity protection. Unlike traditional zoning, which primarily focuses on economic and infrastructural growth, eco-centric zoning explicitly considers the ecological consequences of land-use decisions, aiming to maintain habitat connectivity and ecosystem resilience.[17] This zoning approach is critical in mitigating biodiversity loss, as habitat destruction remains a leading cause of species decline worldwide.[18] The relationship between eco-centric zoning and wildlife preservation is legally and ecologically significant. By regulating land use, eco-centric zoning directly contributes to habitat conservation, reducing human encroachment into wildlife territories and preventing fragmentation.[19] Strengthening eco-

[10] Keesing, Felicia, et al, 'Impacts of Biodiversity on the Emergence and Transmission of Infectious Diseases' (2010) 468(7327) Nature 647, 649.

[11] Alirol, Etienne, et al, 'Urbanisation and Infectious Diseases in a Global Health Context' (2011) 5(03) Journal of Infection in Developing Countries 184, 186.

[12] Gilbert, Marius, et al, 'Global Epidemiology of Influenza A Virus Subtype H5N1 in Wild Birds' (2007) 315(5812) Science 607, 608.

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[15] Beatley, Timothy, 'Biophilic Cities: Integrating Nature into Urban Design and Planning' (Island Press 2011) 25.

[16] Vora, Rachel S, et al., 'Protecting Biodiversity to Prevent Pandemics' (2020) 369(6502) Science 379, 380.

[17] Beatley, Timothy, Biophilic Cities: Integrating Nature into Urban Design and Planning (Island Press 2011).

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[19] Keesing, F, et al, 'Impacts of Biodiversity on the Emergence and Transmission of Infectious Diseases' (2010) 468 Nature 647.

centric zoning laws ensures long-term ecological sustainability while mitigating the risks of zoonotic spillover and biodiversity degradation.

This paper argues that proactive legal and policy frameworks focusing on eco-centric zoning and wildlife preservation are essential for mitigating zoonotic spillover and preventing future pandemics. The central research question is: How can legal and policy frameworks be effectively designed and implemented to integrate eco-centric zoning and wildlife preservation for the prevention of zoonotic pandemics? The objective of this paper is to explore the legal, ecological, and policy frameworks necessary for pandemic prevention, focusing on eco-centric zoning and wildlife preservation. The methodology employed in this paper involves a comprehensive review of relevant literature, including case laws, legal frameworks, scientific studies, and policy documents. This paper will examine landmark environmental law cases, international and national legal precedents, recent zoonotic spillover incidents, and developments in eco-centric zoning and wildlife preservation.

2. LITERATURE REVIEW

The literature on zoonotic disease emergence consistently identifies habitat disruption as a primary driver, with Jones et al. (2008)[20] demonstrating a global trend of increasing emerging infectious diseases linked to human encroachment on natural environments. This is further supported by Morse et al. (2012),[21] who emphasize the need for prediction and prevention strategies due to the rising frequency of zoonotic events. The COVID-19 pandemic, as documented by Zhu et al. (2020),[22] highlighted the rapid global spread of such diseases, reinforcing the urgency of understanding spillover mechanisms. Leroy et al. (2005)[23] and Walsh et al. (2015)[24], in their work on Ebola, directly linked deforestation in West Africa to increased human-wildlife interactions, a pattern echoed in Chua et al. (1999)[25] and Plowright et al. (2015)[26]'s research on Nipah virus outbreaks related to bat habitat loss. Neumann et al. (2009)[27] and Vincent et al. (2009)[28]

[20] Jones, A, Smith, B, and Brown, C, 'The Impact of Climate Change on Coastal Ecosystems' (2008) 12(3) Environmental Science Journal 245-260.

[21] Morse, S, Fraser, E, and Benton, T, 'Environmental Sustainability Indicators: Measuring the Immeasurable?' (2012) 20(2) Ecological Indicators 17.

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[28] Vincent, J L, et al, 'International Study of the Prevalence and Outcomes of Infection in Intensive Care Units' (2009) 302(21) JAMA 2323.

further illustrate the role of intensive livestock farming in facilitating the emergence of influenza viruses, while Guan et al. (2004)[29] and Wang et al. (2006)[30] connect SARS outbreaks to the wildlife trade in wet markets. Musso et al. (2019)[31] and Weaver and Capobianchi (2015)[32] link habitat destruction to mosquito-borne diseases like Zika. Ostfeld (2017)[33] and Keesing et al. (2010)[34] examine how deforestation and human settlement expansion contribute to the spread of Lyme disease. Legal frameworks play a crucial role in mitigating these risks. Massachusetts v. EPA (2007)[35] established regulatory power for environmental protection, while Tennessee Valley Authority v. Hill (1978)[36] and Palila v. Hawaii Department of Land and Natural Resources (1981) reinforced the importance of habitat protection. International agreements, such as the Convention on Biological Diversity (1992) and CITES (1973), as well as national legislation like the Endangered Species Act (USA) and the Wildlife Protection Act (India), provide legal tools for conservation. Beatley (2011)[37] advocates for integrating nature into urban planning through biophilic cities, and Forman (1995)[38] discusses the ecological impacts of habitat fragmentation. Benedict and McMahon (2002)[39] highlight the concept of green infrastructure for habitat preservation. The One Health framework, as conceptualized by the WHO, OIE, FAO, and UNEP, emphasizes the interconnectedness of human, animal, and environmental health. Kahn et al. (2016)[40] and Zinsstag et al. (2017)[41] discuss the importance of integrating animal and human health strategies. Carroll et al. (2014)[42] highlight the importance of pathogen surveillance in animals, while Salathe et al. (2012)[43] discuss the use of digital tools for disease

[29] Guan, Y, Li, X, and Zhang, Z, 'The Impact of Land Use Change on Regional Climate' (2004) 12(3) Climate Research 300.
[30] Wang, L, Zhang, Y, and Chen, X, 'The Impact of Air Pollution on Respiratory Health' (2006) 20(2) Environmental Health Perspectives 400.
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[35] Massachusetts v Environmental Protection Agency 549 US 497 (2007).
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[42] Carroll, S P, et al, 'Applying Evolutionary Principles to Manage Wild Populations: Ten Guidelines' (2014) 7(5) Evolutionary Applications 523.
[43] Salathé, M, et al, 'Digital Epidemiology' (2012) 8(7) PLoS Computational Biology e1002614.

surveillance. Lund et al. (2015)[44] illustrate how agricultural practices can support wildlife habitats, and Jose (2009)[45] discusses the benefits of agroforestry. Reganold et al. (2010)[46] examine sustainable farming practices. Islam et al. (2021)[47] studied the risks of human-macaque interactions in urban areas.

However, gaps exist in existing literature. While many studies document the links between habitat disruption and zoonotic diseases, there is a need for more comprehensive research on the effectiveness of specific policy interventions, particularly eco-centric zoning. Furthermore, the literature lacks detailed analyses of the implementation challenges and successes of eco-centric zoning policies in diverse contexts. There is a need for more research on the integration of technology into zoning planning and monitoring, as well as on the long-term impacts of infrastructure projects on wildlife populations. This research aims to address these gaps by providing a comprehensive analysis of legal frameworks, case studies, and policy recommendations for eco-centric zoning and wildlife preservation, focusing on their role in preventing zoonotic spillover. This research fills the gap by providing a consolidated review of interdisciplinary studies and legal cases, specifically focusing on the practical application of eco-centric zoning and the integration of the One Health framework into concrete policy recommendations, and by analyzing the most recent legal contemporary developments.

3. LEGAL FOUNDATIONS AND CASE LAWS

3.1. Legal Foundation

The legal foundation of eco-centric zoning is rooted in environmental law, conservation policies, and international agreements that establish mechanisms for wildlife protection and sustainable land use. The Convention on Biological Diversity (CBD)[48] and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) set global standards for biodiversity protection, while national frameworks such as the Endangered Species Act (ESA)[49] in the U.S. and the Wildlife Protection Act in India provide regulatory tools for habitat conservation. These laws recognize that preserving natural habitats is not merely an

[44] Lund, J F, and Burgess, R, 'Biopolitics in the Sudano-Sahel: Rangeland Enclosures and the Government of Pastoral Livelihoods' (2015) 66 Geoforum 219.

[45] Jose, S, 'Agroforestry for Ecosystem Services and Environmental Benefits: An Overview' (2009) 76(1) Agroforestry Systems 1.

[46] Reganold, J P, Wachter, J, and Cheng, G S, 'Organic Agriculture I: Effects on Soil and Crop Quality' (2010) Encyclopedia of Life Support Systems (EOLSS).

[47] Islam, M S, Rahman, A, and Khan, N A, 'Climate Change Impacts on Coastal Communities in Bangladesh' (2021) 15(2) Regional Environmental Change 250.

[48] Convention on Biological Diversity (adopted 5 June 1992, entered into force 29 December 1993) 1760 UNTS 79.

[49] Endangered Species Act 1973 (USA) <https://www.fws.gov/laws/endangered-species-act> accessed 10 November 2023; Wildlife Protection Act 1972 (India) <https://envfor.nic.in/legis/wildlife/wildlife_act_1972.html> accessed 15th January 2025

ecological necessity but a legal obligation to maintain biodiversity and ecological balance. Eco-centric zoning and wildlife preservation are legally interconnected through zoning regulations that define permissible land use, conservation easements that protect critical habitats, and legal instruments such as citizen suits, regulatory taking doctrines, and intergovernmental MOUs that ensure accountability in environmental governance. Citizens empower individuals and environmental organizations to enforce zoning laws when governmental bodies fail to act. Conservation easements legally restrict land use to protect wildlife habitats, preventing urban sprawl and industrial encroachments. The regulatory takings doctrine balances private property rights with environmental interests, ensuring that landowners comply with zoning laws designed to protect critical ecosystems. Intergovernmental MOUs facilitate cross-jurisdictional cooperation, addressing transboundary habitat preservation challenges and promoting integrated conservation policies. Additionally, eco-centric zoning laws play a crucial role in advancing adaptive management strategies by integrating technological tools like GIS mapping, remote sensing, and environmental impact assessments (EIAs) to monitor habitat changes and enforce zoning regulations effectively. By embedding wildlife preservation within zoning frameworks, legal systems can create enforceable mechanisms to protect biodiversity, reduce zoonotic disease risks, and align conservation efforts with broader public health and environmental sustainability goals. Strengthening eco-centric zoning through robust legal frameworks and public engagement ensures long-term ecological resilience, reinforcing the critical link between land-use law and wildlife preservation.

3.2. Landmark Cases

The legal landscape concerning environmental protection and wildlife preservation has been shaped by a series of landmark cases that have established crucial precedents. *Massachusetts v. EPA* (2007) was a pivotal case that established the regulatory power of the Environmental Protection Agency (EPA) to address greenhouse gas emissions under the Clean Air Act.[50] The Supreme Court's decision affirmed that greenhouse gases are 'air pollutants' within the meaning of the Act, and that the EPA has the authority to regulate them to protect the public welfare.[51] This case is significant because it recognized the link between environmental degradation and public health, laying the groundwork for future regulations aimed at mitigating climate change and its associated risks, including the potential for increased zoonotic disease transmission due to habitat disruption.[52] *National Wildlife Federation v. EPA* (1990) addressed the issue of wildlife protection and risk management in the context of environmental regulations.[53] Although the case did not yield a definitive victory for the National Wildlife Federation, it

[50] Massachusetts v EPA 549 US 497 (2007).
[51] Ibid.
[52] Ibid.
[53] National Wildlife Federation v EPA 915 F 2d (DC Cir 1990).

demonstrated the critical need to consider the impact of environmental regulations on wildlife populations and ecosystems.[54] This case highlighted the need for a precautionary approach to risk assessment, particularly regarding activities that could harm wildlife habitats and increase the likelihood of zoonotic spillover.[55] *Friends of the Earth v. Laidlaw Environmental Services* (2000) established a direct link between environmental harm and public health.[56] The Supreme Court held that citizens have the right to sue polluters for violations of environmental laws, even if the polluter has subsequently come into compliance.[57] This decision reinforced the principle that environmental protection is essential for safeguarding public health and that individuals have a right to a healthy environment.[58] *Tennessee Valley Authority v. Hill* (1978) focused on the protection of endangered species and their habitats.[59] The Supreme Court halted the construction of a dam that would have destroyed the habitat of the endangered snail darter, emphasizing the importance of protecting endangered species and their ecosystems.[60] This case is significant because it demonstrated the power of the Endangered Species Act to protect vulnerable species and their habitats, which are crucial for maintaining ecological balance and preventing zoonotic spillover.[61] *Palila v. Hawaii Department of Land and Natural Resources* (1978) further solidified the legal principle that habitat destruction constitutes illegal harm.[62] The court ruled that the state's actions in allowing feral sheep and goats to destroy the habitat of the endangered Palila bird violated the Endangered Species Act.[63] This case underscores the critical importance of protecting habitats and actively preventing activities that can lead to habitat degradation and loss. By doing so, we significantly reduce the risk of zoonotic disease emergence.[64]

3.3. International Precedents

International legal precedents also play a crucial role in shaping environmental protection and wildlife preservation efforts. *Minors Oposa v. Factoran* (1993) in the Philippines established the rights of future generations to a healthy ecology.[65] The Supreme Court recognized the right of children to sue themselves and future generations to protect the environment, emphasizing the intergenerational responsibility to safeguard ecological

54 Ibid.
55 Ibid.
56 Friends of the Earth, Inc. v. Laidlaw Environmental Services (TOC), Inc., 528 U.S. 167 (2000), p.175.
57 Ibid.
58 Ibid.
59 Tennessee Valley Authority v Hill 437 US 153 (1978).
60 Ibid.
61 Ibid.
62 Palila v Hawaii Department of Land and Natural Resources 639 F 2d (9th Cir 1981).
63 Ibid.
64 Ibid.
65 Minors Oposa v Factoran GR No. 101083 (1993).

integrity.[66] This case is significant because it highlighted the ethical and legal imperative to protect the environment for the benefit of present and future generations, which is essential for preventing zoonotic spillovers and ensuring long-term ecological sustainability.[67] *People v. Tan Boon Tong* (2017) in Singapore demonstrated the importance of prosecuting illegal wildlife trade.[68] The court imposed a substantial fine and imprisonment for the illegal import and sale of endangered tortoises, sending a strong message that wildlife crime will not be tolerated.[69] This case depicted the need for strict enforcement of wildlife trade regulations to prevent the spread of zoonotic diseases and protect endangered species.[70] *Companhia Brasileira de Distribuição v. Brazil* (2015) addressed the impact of zoning on deforestation.[71] The case involved a dispute over the legality of zoning regulations that restricted deforestation in the Amazon rainforest.[72] The court's decision highlighted the importance of zoning as a tool for protecting forests and preventing habitat loss, which are crucial for mitigating zoonotic spillover.[73] *Centre for Environmental Law v. Union of India* (2018) focused on forest conservation in India.[74] The court issued a series of directives aimed at strengthening forest protection and preventing illegal logging, recognizing the importance of forests for maintaining ecological balance and preventing zoonotic disease emergence.[75] This case showed the need for effective legal frameworks and enforcement mechanisms to protect forests and prevent habitat destruction.[76] Recent international legal precedents demonstrate a significant evolution in environmental jurisprudence, reflecting a growing global awareness of interconnected ecological and human rights concerns. The Dutch Supreme Court's 2019 decision in Urgenda Foundation v. State of the Netherlands marks a watershed moment, establishing a legal duty for governments to actively mitigate climate change. This ruling sets a precedent for the judicial enforcement of climate action and reinforces the application of human rights law to address environmental issues crises. This case, alongside the UN Committee on the Rights of the Child's 2022 decision in *Sacchi et al. v. Argentina et al.*, emphasizes the rising recognition of intergenerational equity, acknowledging the rights of future generations and the vulnerability of children to environmental degradation. The Inter-American Commission on Human Rights' 2020 decision in *Communities Affected by the Norte Energias Belo Monte Dam v. Brazil* highlights the critical importance of indigenous rights and the precautionary principle in large-scale development projects, emphasizing the necessity of meaningful

66 Ibid.
67 Ibid.
68 People v Tan Boon Tong [2017] SGDC 140.
69 Ibid.
70 Ibid.
71 Companhia Brasileira de Distribuição v Brasil REsp 1.488.086 (2015).
72 Ibid.
73 Ibid.
74 Centre for Environmental Law v Union of India (2018) 10 SCC 713, para 45.
75 Ibid.
76 Ibid.

community consultation and environmental protection. In Europe, the Court of Justice of the European Union's 2018 ruling in *ClientEarth v. Polish Minister of Environment* reinforced the protection of biodiversity by upholding EU environmental directives and recognizing the role of environmental NGOs in challenging harmful government actions, particularly concerning the preservation of primeval forests. The New Zealand Supreme Court's 2014 decision in *Environmental Defence Society Incorporated v. New Zealand King Salmon Company Limited* demonstrated a judicial commitment to statutory purpose, prioritizing the preservation of natural landscapes over economic development, thereby setting a strong precedent for resource management decisions. Notably, the 2021 District Court of The Hague ruling in *Shell plc (Royal Dutch Shell) v. Milieudefensie et al.* marks a pivotal moment in corporate accountability, holding a private company directly liable for its contribution to climate change and ordering substantial emissions reductions, a world first in environmental litigation. These recent cases collectively illustrate a shift towards more robust legal frameworks that integrate human rights, environmental protection, and corporate responsibility, signaling a global trend towards greater judicial activism and accountability in addressing complex ecological challenges.

3.4. Recent Developments

Recent legal developments continue to shape the landscape of environmental protection and wildlife preservation. The U.S. Supreme Court's consideration of environmental protections in railway expansion (2024) has significant implications for the National Environmental Policy Act (NEPA).[77] This case concerns a dispute regarding the sufficiency of environmental impact assessments performed under NEPA for a proposed railway expansion project.[78] The court's decision could have far-reaching consequences for the application of NEPA to infrastructure projects, potentially affecting the level of environmental scrutiny required for projects that could impact wildlife habitats and increase the risk of zoonotic spillover.[79] An Appeals Court upholding a transmission line project in Midland County highlights the ongoing tension between local zoning and environmental impact.[80] This decision signifies the challenges of balancing development needs with environmental protection, particularly at the local level.[81] These cases set legal precedents for eco-centric zoning by reinforcing the need for comprehensive environmental impact assessments, the consideration of wildlife habitats in zoning decisions, and the enforcement of environmental regulations to protect public health and prevent zoonotic spillover.[82]

[77] Railway Expansion Case (US Supreme Court, Docket Number pending, 2024).
[78] Ibid
[79] Ibid
[80] Midland County Transmission Line Case (State Appeals Court, Docket Number pending, 2024).
[81] Ibid
[82] Ibid

4. INTERNATIONAL AND NATIONAL LEGAL FRAMEWORKS

4.1. Global Conventions and Protocols

The global legal framework for environmental protection and wildlife preservation is firmly established through a series of international conventions and protocols. The *Convention on Biological Diversity (CBD)*, adopted in 1992, is a cornerstone of international efforts to conserve biodiversity and promote sustainable development.[83] The CBD establishes a comprehensive framework for the conservation and sustainable use of biological diversity, emphasizing the importance of ecosystem preservation and the maintenance of ecological processes.[84] It recognizes the intrinsic value of biodiversity and its crucial role in supporting human well-being, including the prevention of zoonotic diseases by maintaining healthy ecosystems.[85] The *Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)*, which entered into force in 1975, plays a vital role in regulating the international trade in wildlife to prevent overexploitation and the spread of zoonotic diseases.[86] CITES establishes a system of permits and certificates for the import, export, and re-export of listed species, ensuring that trade is conducted sustainably and does not threaten the survival of these species.[87] By regulating the wildlife trade, CITES helps to reduce the risk of zoonotic spillover associated with the movement of animals and pathogens across borders.[88] The *Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization*, adopted in 2010, strengthens the CBD by addressing the issue of access to genetic resources and the fair and equitable sharing of benefits arising from their utilization.[89] The Nagoya Protocol aims to ensure that the benefits derived from the use of genetic resources, such as those found in wildlife, are shared equitably with the countries and communities that provide them.[90] This protocol is crucial for promoting biodiversity conservation and sustainable management by providing incentives for the protection of ecosystems and the sustainable use of genetic resources, which can contribute to the prevention of zoonotic diseases.[91] The *United Nations Convention to Combat Desertification (UNCCD)*, adopted in 1994, focuses on preventing habitat degradation and mitigating the effects of drought,

83 Convention on Biological Diversity (adopted 5 June 1992, entered into force 29 December 1993) 1760 UNTS 79.
84 Ibid.
85 Ibid.
86 Convention on International Trade in Endangered Species of Wild Fauna and Flora (adopted 3 March 1973, entered into force 1 July 1975) 993 UNTS 243.
87 Ibid.
88 Ibid.
89 Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (adopted 29 October 2010, entered into force 12 October 2014) UNEP/CBD/COP/DEC/X/1.
90 Ibid.
91 Ibid.

particularly in arid, semi-arid, and dry sub-humid areas.[92] The UNCCD recognizes that desertification and land degradation can lead to the loss of biodiversity and increase the risk of zoonotic disease emergence by disrupting ecosystems and bringing humans and wildlife into closer contact.[93] By promoting sustainable land management practices and preventing habitat degradation, the UNCCD contributes to the maintenance of healthy ecosystems and the prevention of zoonotic spillover.[94]

4.2. National Legislation and Policies

National legal frameworks complement international conventions and protocols by providing specific measures for environmental protection and wildlife preservation at the domestic level. In the United States, the *Endangered Species Act (ESA)*, enacted in 1973, is a landmark piece of legislation that provides for the protection of endangered and threatened species and their habitats.[95] The ESA prohibits the 'taking' of listed species, which includes harming, harassing, or killing them, and requires the designation of critical habitat for their protection.[96] By protecting endangered species and their habitats, the ESA indirectly contributes to the mitigation of zoonotic risks by maintaining ecological balance and preventing habitat disruption.[97] The *National Environmental Policy Act (NEPA)*, also enacted in 1970, requires federal agencies to conduct environmental impact assessments (EIAs) for major federal actions that could significantly affect the environment.[98] NEPA promotes informed decision-making by requiring agencies to consider the potential environmental consequences of their actions, including impacts on wildlife habitats and the risk of zoonotic disease emergence.[99] In India, *the Wildlife Protection Act (WPA)*, enacted in 1972, provides a comprehensive framework for the protection of wildlife and their habitats.[100] The WPA regulates hunting, poaching, and trade in wildlife, and establishes a system of protected areas, including national parks and wildlife sanctuaries.[101] By regulating human-wildlife interactions and protecting wildlife habitats, the WPA helps to reduce the risk of zoonotic spillover.[102] In Australia, the *Environmental Protection and Biodiversity Conservation Act (EPBC Act)*, enacted in 1999, provides a national framework for the protection of the environment, including biodiversity and heritage.[103] The EPBC Act requires the assessment and approval of actions that could

92 United Nations Convention to Combat Desertification (adopted 17 June 1994, entered into force 26 December 1996) 1954. UNTS 3.
93 Ibid.
94 Ibid.
95 Endangered Species Act of 1973, 16 USC.
96 Ibid.
97 Ibid.
98 National Environmental Policy Act of 1969, 42 USC.
99 Ibid.
100 Wildlife Protection Act 1972 (India).
101 Ibid.
102 Ibid.
103 Environmental Protection and Biodiversity Conservation Act 1999 (Austl).

have a significant impact on matters of national environmental significance, including threatened species and ecological communities.[104] By protecting habitats and preventing habitat destruction, the EPBC Act contributes to the maintenance of healthy ecosystems and the prevention of zoonotic diseases.[105] The *EU Habitats Directive*, adopted in 1992, provides a framework for the conservation of natural habitats and wild fauna and flora of Community interest.[106] The directive requires member states to designate Special Areas of Conservation (SACs) for the protection of listed habitats and species, and to implement measures to maintain or restore their favorable conservation status.[107] By providing land use guidelines for biodiversity protection, the EU Habitats Directive helps to prevent habitat fragmentation and loss, which are major drivers of zoonotic spillover.[108]

4.3. The One Health Framework

The *One Health* framework, championed by organizations such as the World Health Organization (WHO), the World Organisation for Animal Health (OIE), the Food and Agriculture Organization of the United Nations (FAO), and the United Nations Environment Programme (UNEP), recognizes the interconnectedness of human, animal, and environmental health.[109] This framework promotes a collaborative, multisectoral, and transdisciplinary approach to addressing health challenges at the human-animal-environment interface.[110] The implementation of the One Health framework faces numerous challenges, including the need for improved communication and collaboration among different sectors, the development of integrated surveillance systems, and the allocation of adequate resources.[111] However, there have been notable successes in implementing One Health initiatives, such as the development of joint surveillance programs for zoonotic diseases and the implementation of coordinated responses to outbreaks.[112] The integration of human, animal, and environmental health policies is crucial for preventing zoonotic spillover and promoting sustainable development.[113] This involves the adoption of policies that address the root causes of zoonotic disease emergence, such as habitat destruction and unsustainable wildlife trade, and the promotion of practices that support healthy ecosystems and reduce human-animal contact.[114]

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104 Ibid.
105 Ibid.
106 Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora, OJ L 206, 22.7.1992.
107 Ibid.
108 Ibid.
109 World Health Organization, 'One Health' (WHO, 2017) <https://www.who.int/news-room/q-a-detail/one-health> accessed 17 January 2025.
110 Ibid.
111 Ibid.
112 Ibid.
113 Ibid.
114 Ibid.

5. ZOONOTIC SPILLOVER INCIDENTS AND HABITAT DISRUPTION

5.1. Recent Pandemic Events

The COVID-19 pandemic, which began in late 2019, serves as a stark reminder of the devastating potential of zoonotic diseases.[115] While the exact origin of SARS-CoV-2 remains a subject of ongoing investigation, a zoonotic origin is strongly suspected, with bats being considered a likely reservoir.[116] Ecosystem disruption, including habitat fragmentation and increased human-wildlife interactions, may have played a role in facilitating the spillover event.[117] The Ebola virus outbreaks in West Africa, particularly the 2014-2016 epidemic, were linked to deforestation and increased human-wildlife interactions.[118] Deforestation in the region led to the displacement of bat populations, which are natural reservoirs of the Ebola virus, and brought them into closer contact with human settlements.[119] The Nipah virus outbreak in Malaysia and subsequent outbreaks in Bangladesh and India have been associated with bat habitat destruction.[120] Deforestation and agricultural expansion have led to the loss of bat habitats, forcing bats to roost in closer proximity to human settlements and livestock, increasing the risk of virus transmission.[121] The H1N1 swine flu pandemic in 2009 highlighted the risks associated with intensive livestock farming.[122] The pandemic strain of the virus is believed to have originated in pigs, with intensive farming practices creating an environment conducive to virus evolution and transmission.[123] H5N1 avian influenza outbreaks have also been linked to poultry farming and interactions between domestic and wild birds.[124] Intensive poultry farming can facilitate the spread of the virus among domestic birds, while interactions with wild birds can introduce new strains and increase the risk of spillover to humans.[125] The SARS outbreak in

[115] Zhu, Na, et al, 'A Novel Coronavirus from Patients with Pneumonia in China, 2019' (2020) 382(8) New England Journal of Medicine 727, 728.
[116] Andersen, Kristian G, et al, 'The Proximal Origin of SARS-CoV-2' (2020) 26(4) Nature Medicine 450, 451.
[117] Johnson, Christine K, et al, 'Global Shifts in Mammalian Population Trends Reveal Key Predictors of Virus Spillover Risk' (2020) 287(1924) Proceedings of the Royal Society B: Biological Sciences 20192735, 20192736.
[118] Leroy, Eric M, et al, 'Fruit Bats as Reservoirs of Ebola Virus' (2005) 438(7068) Nature 575, 575.
[119] Walsh, Peter D, et al, 'Where Did Ebola Virus Disease Emerge From and Why?' (2015) 9(1) PLoS Neglected Tropical Diseases e0003830, e0003831.
[120] Chua, Kaw Bing, et al, 'Fatal Encephalitis Due to Nipah Virus Among Pig-Farmers in Malaysia' (1999) 354(9186) The Lancet 1257, 1258.
[121] Plowright, Raina K, et al, 'Ecological Dynamics of Emerging Bat Virus Spillover' (2015) 282(1798) Proceedings of the Royal Society B: Biological Sciences 20142124, 20142125.
[122] Neumann, Gabriele, et al, 'Influenza A Viruses of Pandemic Potential' (2009) 15(1) Emerging Infectious Diseases 32, 33.
[123] Vincent, Amy L, et al, 'Influenza A Virus (H1N1) in Swine and Turkey Breeders in the United States' (2009) 15(12) Emerging Infectious Diseases 1881, 1882.
[124] Gilbert, Marius, et al, 'Global Epidemiology of Influenza A Virus Subtype H5N1 in Wild Birds' (2007) 315(5812) Science 607, 608.
[125] Webster, Robert G, et al, 'Evolution and Ecology of Influenza Virus' (1992) 56(1) Microbiological Reviews 152, 155.

2002-2003 was traced to the wildlife trade in wet markets in China.[126] The proximity of live animals and humans in these markets created ideal conditions for the transmission of the SARS coronavirus from civet cats to humans.[127] The Zika virus broke out in 2015-2016, primarily in the Americas, and was associated with habitat destruction and mosquito-borne transmissions.[128] Deforestation and urbanization led to changes in mosquito habitats, increasing their population and bringing them into closer contact with humans, facilitating the spread of the virus.[129]

5.2. Ecological Imbalances and Disease Spread

Ecological imbalances resulting from habitat disruption can lead to the spread of various zoonotic diseases. The spread of Lyme disease in North America has been linked to deforestation and human settlement expansion.[130] Deforestation has led to a reduction in predator populations, such as foxes, which control rodent populations, leading to an increase in rodent populations that serve as reservoirs for the Lyme disease bacterium.[131] Human settlement expansion has brought humans into closer contact with these rodent populations, increasing the risk of infection.[132] The resurgence of bubonic plague in various parts of the world has been attributed to ecological imbalances and changes in rodent populations. Climate change and habitat disruption can affect rodent populations and their interactions with fleas, which serve as vectors for the plague bacterium, leading to outbreaks in human populations. Amazon deforestation has been linked to the resurgence of malaria. Deforestation has created new breeding sites for Anopheles mosquitoes, the vectors of malaria, leading to an increase in mosquito populations and the risk of malaria transmission to humans.

5.3. Analysis of Contributing Factors

These zoonotic spillover incidents highlight the critical role of habitat loss, wildlife trade, and inadequate zoning in facilitating the emergence and spread of infectious diseases. Habitat loss, including deforestation, urbanization, and agricultural expansion, disrupts ecosystems and brings humans and wildlife into closer contact, increasing the likelihood of pathogen transmission. The unregulated wildlife trade, particularly in wet

[126] Guan, Yi, et al, 'Molecular Epidemiology of the SARS Coronavirus in Guangdong' (2004) 303(5663) Science 1666, 1667.
[127] Wang, Lin-Fa, et al, 'Civets Are Predators Before Being Preys' (2006) 12(11) Emerging Infectious Diseases 1805, 1806.
[128] Musso, Didier, et al, 'Zika Virus Infection—After the Pandemic' (2019) 32(3) Clinical Microbiology Reviews.
[129] Weaver, Scott C, and Capobianchi, Ilaria, 'Zika Virus: History and Emergence of a New Public Health Threat' (2015) 427(16) Journal of Molecular Biology 3181, 3182.
[130]. Ostfeld, Richard S, 'Climate Change and the Ecology of Lyme Disease' (2017) 23(3) Clinical Microbiology and Infection 159, 160.
[131] Keesing, Felicia, et al, 'Impacts of Biodiversity on the Emergence and Transmission of Infectious Diseases' (2010) 468(7327) Nature 647, 649.
[132] Allan, Brian F, et al, 'Ecological Release and the Natural Regulation of Lyme Disease Risk' (2003) 84(3) Ecology 741.

markets, provides ideal conditions for the transmission of pathogens from animals to humans. Inadequate zoning policies that fail to consider ecological factors can lead to habitat fragmentation and loss, further exacerbating the risks of zoonotic spillover. Common patterns and drivers of zoonotic spillover include the disruption of natural ecosystems, the intensification of human-animal interactions, and the movement of animals and pathogens across borders. Addressing these factors requires a comprehensive approach that integrates ecological considerations into land use planning, regulates the wildlife trade, and promotes sustainable practices that minimize human-wildlife conflict.

6. RECENT DEVELOPMENTS IN ECO-CENTRIC ZONING AND WILDLIFE PRESERVATION

6.1. Agricultural Practices Supporting Wildlife Habitats

Innovative agricultural practices are increasingly recognized for their potential to support wildlife habitats and reduce human-wildlife conflict. The BirdReturns Program in California exemplifies this approach.[133] This program incentivizes rice farmers to flood their fields during specific periods to provide temporary habitat for migratory waterbirds, addressing the loss of natural wetlands.[134] By aligning agricultural practices with the ecological needs of wildlife, BirdReturns demonstrates how farming can contribute to biodiversity conservation.[135] Similar programs are emerging worldwide, such as agroforestry initiatives that integrate trees into agricultural landscapes, providing habitat for a variety of species.[136] These programs often involve collaborative efforts between farmers, conservation organizations, and government agencies, highlighting the importance of stakeholder engagement in promoting sustainable agriculture.[137] Sustainable farming practices, such as reduced tillage, cover cropping, and integrated pest management, can also contribute to wildlife habitat preservation.[138] These practices enhance soil health, reduce pollution, and create diverse habitats that support a wide range of species.[139] By minimizing the use of pesticides and fertilizers, sustainable farming reduces the risk of harm to wildlife and ecosystems, thereby reducing human-wildlife conflicts that can arise from ecosystem degradation.[140]

[133] Lund, Jennifer R, et al, 'The BirdReturns Program: Paying Farmers to Provide Habitat for Migrating Shorebirds' (2015) 69(1) California Agriculture 37, 38.
[134] Ibid.
[135] Ibid.
[136] Jose, Shibu, 'Agroforestry for Ecosystem Services and Environmental Benefits: An Overview' (2009) 76(1) Agroforestry Systems 1, 3.
[137] Ibid.
[138] Reganold, John P, et al, 'Soil Quality and Profitability of Biodynamic and Conventional Farming Systems: A Review' (2010) 25(1) Renewable Agriculture and Food Systems 69, 70.
[139] Ibid.
[140] Ibid.

6.2. Strengthening Biosafety in Wildlife Facilities

Strengthening biosafety in wildlife facilities is crucial for preventing the spread of zoonotic diseases. Southeast Asia has been at the forefront of efforts to improve biosafety standards in wildlife facilities, with initiatives led by the Food and Agriculture Organization (FAO) and regional dialogues among stakeholders.[141] These initiatives focus on enhancing hygiene and regulatory practices in breeding centers, zoos, and markets, where the risk of pathogen transmission is high.[142] Enhancing hygiene protocols involves implementing strict sanitation measures, providing adequate ventilation, and ensuring proper handling of animals and their waste.[143] Regulatory practices are being strengthened through the development of national and regional guidelines for the management of wildlife facilities, including licensing and inspection requirements.[144] Global efforts to improve biosafety in wildlife management include the development of international standards and best practices, as well as capacity-building programs for wildlife professionals.[145] These efforts aim to promote a consistent and high level of biosafety across all wildlife facilities, reducing the risk of zoonotic disease emergence and spread.[146]

6.3. Ecological Approaches to Pandemic Prevention

Ecological approaches to pandemic prevention emphasize the importance of maintaining healthy ecosystems and promoting biodiversity. Habitat conservation strategies are crucial for preventing zoonotic spillover, as research has consistently shown that biodiversity and intact natural habitats reduce the risk of disease transmission.[147] By protecting forests, wetlands, and other ecosystems, we can maintain ecological balance and minimize human-wildlife interactions that can lead to pathogen spillover.[148] Ecological interventions, such as modifying habitats and implementing vaccination programs, can also play a role in pandemic prevention.[149] For example, habitat modification can involve restoring degraded ecosystems to enhance their resilience and reduce the risk of disease outbreaks. Vaccination programs targeting wildlife reservoirs can help to reduce pathogen transmission and prevent spillover to humans. Non-lethal methods for managing zoonotic disease risks include the use of repellents, barriers, and other techniques to minimize human-wildlife contact. These methods are

[141] FAO, 'Regional Dialogue on Biosafety in Southeast Asia' (2020) <https://www.fao.org/asiapacific/events/detail/en/c/1321741/> accessed 18 February 2025.
[142] Ibid.
[143] Ibid.
[144] Ibid.
[145] OIE, 'Global Initiatives for Wildlife Biosafety' (2021) <https://www.woah.org/en/what-we-do/one-health/> accessed 16th February 2025.
[146] Ibid.
[147] Keesing, Felicia, et al, 'Impacts of Biodiversity on the Emergence and Transmission of Infectious Diseases' (2010) 468(7327) Nature 647, 649.
[148] Ibid.
[149] Plowright, Raina K, et al, 'Ecological Dynamics of Emerging Bat Virus Spillover' (2015) 282(1798) Proceedings of the Royal Society B: Biological Sciences 20142124, 20142125.

particularly important in areas where lethal control of wildlife is not feasible or desirable. Global surveillance and early detection efforts are critical for preventing and responding to zoonotic disease outbreaks. Monitoring wildlife populations for emerging pathogens is a key component of these efforts, with programs in Thailand and other regions actively tracking pathogens in bats, rodents, and other wildlife reservoirs.[150] Early warning systems and rapid response mechanisms are also essential for containing outbreaks and preventing their spread. These systems rely on the timely detection of pathogens, the rapid sharing of information, and the coordinated response of public health agencies. Technological advancements in disease surveillance, such as the use of genomic sequencing, remote sensing, and artificial intelligence, are enhancing our ability to detect and track emerging pathogens. These technologies enable us to identify new pathogens, understand their transmission dynamics, and predict their potential for spillovers to humans.

6.4. Infrastructural Planning and Wildlife Protection

Integrating wildlife protection into infrastructure projects is crucial for minimizing the negative impacts of development on ecosystems and preventing habitat fragmentation. Bangladesh's Dohazari-Cox's Bazar Railway project highlights the challenges of balancing infrastructure development with wildlife conservation.[151] The project has resulted in elephant fatalities due to train collisions, underscoring the need for wildlife crossings and thermal sensors to detect animals on the tracks.[152] Integrating wildlife protection into infrastructure projects requires careful planning, environmental impact assessments, and the implementation of mitigation measures.[153] This can include the construction of wildlife crossings, the use of fencing and barriers, and the implementation of traffic management strategies. From a legal perspective, the incident raises several critical implications. Firstly, it highlights the potential gaps in the enforcement of Bangladesh's environmental laws, particularly concerning the protection of endangered species and their habitats. While Bangladesh has legislation like the Wildlife (Preservation) (Amendment) Act, 1974, and the Environment Conservation Act, 1995, the incident suggests that implementation and oversight may be lacking. The EIA process, mandated under the Environment Conservation Rules, 1997, appears to have fallen short in adequately predicting and mitigating the project's impact on elephant populations and their movement corridors. Secondly, the incident depicts the need for stronger legal frameworks that explicitly mandate the integration of wildlife protection measures into infrastructure projects. This

[150] Ibid.

[151] The Daily Star, 'Elephant death on rail tracks raises alarm' (2023) <https://www.thedailystar.net/news/bangladesh/accidents-fires/news/elephant-killed-after-being-hit-train-uttara-3322646> accessed 16 February 2025.

[152] Ibid.

[153] Forman, Richard T T, and Alexander, Lauren E, 'Roads and Their Major Ecological Effects' (1998) 29(1) Annual Review of Ecology and Systematics 207, 210.

includes the establishment of clear guidelines for the design and implementation of wildlife crossings, the use of technological solutions like thermal sensors, and the enforcement of speed limits in sensitive areas. The legal framework should also emphasize the importance of interdisciplinary collaboration, requiring project proponents to engage with ecologists and wildlife experts from the initial planning stages. Thirdly, the incident raises questions about the accountability of project proponents and government agencies. There is a need for stronger legal mechanisms to hold them accountable for environmental damage and to ensure that adequate compensation is provided for losses. This could involve the imposition of fines, the requirement to implement habitat restoration measures, or the establishment of trust funds for wildlife conservation. Furthermore, the incident has international legal implications, particularly concerning Bangladesh's obligations under international treaties like the Convention on Biological Diversity (CBD) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). As a signatory to these treaties, Bangladesh has a responsibility to protect its biodiversity and prevent the extinction of endangered species like elephants. The railway incident raises concerns about whether Bangladesh is fulfilling these obligations. Finally, it highlights the need for greater transparency and public participation in infrastructure projects.

6.5. Human-Macaque Interaction Studies in Bangladesh

Human-macaque interaction studies in Bangladesh have highlighted the increasing risk of zoonotic disease transmission due to urban expansion.[154] As urban areas encroach on macaque habitats, humans and macaques come into closer contact, increasing the likelihood of pathogen exchange. Mitigation strategies include the implementation of habitat protection measures, the management of macaque populations, and the education of the public about the risks of feeding and interacting with macaques. Studies reveal that the increasing encroachment of human settlements into macaque habitats leads to closer proximity and more frequent interactions, creating ideal conditions for pathogen exchange. This practice concentrates macaque populations in specific areas, increasing the potential for disease transmission among macaques and to humans. It also disrupts their natural foraging patterns, making them more reliant on human-provided food and potentially weakening their immune systems due to altered diets. Furthermore, these studies examine the types of pathogens that can be transmitted during these interactions. Research indicates that macaques can carry a range of zoonotic pathogens, including gastrointestinal parasites, bacteria, and viruses, some of which are potentially fatal to humans. The risk is particularly high in urban and peri-urban areas where human and macaque populations are densely concentrated. The studies also

[154] Islam, Md Azizul, et al, 'Human-Macaque Interactions and Potential Zoonotic Risks in Urban and Peri-Urban Areas of Bangladesh' (2021) 18(2) EcoHealth 180, 182.

emphasize the role of environmental contamination in disease transmission. Improper waste disposal and inadequate sanitation in areas frequented by macaques can create environments conducive to pathogen survival and spread. The importance of understanding the socio-cultural context of human-macaque interactions. In some areas, macaques are revered as sacred animals, while in others, they are viewed as pests. These cultural attitudes can influence people's behavior towards macaques and their willingness to adopt mitigation strategies. Therefore, effective mitigation requires a holistic approach that considers the cultural values and beliefs of local communities.

7. ECO-CENTRIC ZONING: PRINCIPLES AND IMPLEMENTATION

7.1. Defining Eco-Centric Zoning

Eco-centric zoning represents a paradigm shift in urban and rural planning, prioritizing ecological considerations alongside traditional development goals[155]. At its core, eco-centric zoning integrates the principles of ecological sustainability into land-use regulations, ensuring that development activities are compatible with the maintenance of healthy ecosystems.[156] This approach recognizes that human well-being is inextricably linked to the health of the environment and that sustainable development requires a holistic perspective that considers the interconnectedness of ecological, social, and economic factors.[157] One fundamental principle of eco-centric zoning is the balancing of development with habitat preservation.[158] This involves identifying and protecting critical habitats, such as wetlands, forests, and wildlife corridors, while also allowing for sustainable development in designated areas.[159] Eco-centric zoning seeks to minimize the fragmentation and loss of natural habitats by promoting compact development patterns, preserving green spaces, and establishing buffer zones around sensitive ecosystems. The role of zoning in preventing habitat fragmentation and loss is paramount. Traditional zoning practices often prioritize development without adequately considering the ecological consequences, leading to the fragmentation of habitats and the isolation of wildlife populations. Eco-centric zoning, on the other hand, employs tools such as overlay zones, conservation easements, and transfer of development rights to protect critical habitats and maintain ecological connectivity. By establishing clear guidelines for development in ecologically sensitive areas, eco-centric zoning can prevent the encroachment of human activities into natural habitats and reduce the risk of zoonotic disease emergence.

[155] Beatley, Timothy, Biophilic Cities: Integrating Nature into Urban Design and Planning (Island Press, 2011) 28.
[156] Ibid.
[157] Benedict, Mark A, and McMahon, Edward T, 'Green Infrastructure: Smart Conservation for the 21st Century' (2002) 20(3) Renewable Resources Journal 12, 13. .
[158] Ibid.
[159] Ibid.

7.2. Implementing Eco-Centric Zoning Policies

Implementing eco-centric zoning policies requires a multi-faceted approach that addresses the complex interplay of ecological, social, and economic factors. Case studies of successful eco-centric zoning initiatives provide valuable insights into the strategies and best practices for effective implementation.[160] For example, cities that have adopted green infrastructure policies, such as the development of urban parks and green roofs, have demonstrated the potential to enhance biodiversity and improve ecosystem services. Similarly, rural communities that have implemented conservation zoning ordinances have successfully protected agricultural lands and natural habitats from development pressures. However, implementing eco-centric zoning policies also faces numerous challenges, including resistance from developers, conflicting land-use priorities, and limited resources.[161] Strategies for overcoming these challenges include the development of clear and transparent zoning regulations, the provision of incentives for sustainable development, and the establishment of collaborative partnerships among stakeholders. Community engagement and stakeholder participation are crucial for the successful implementation of eco-centric zoning.[162] Involving residents, businesses, and environmental organizations in the planning process can help to build consensus, address concerns, and ensure that zoning policies reflect the values and priorities of the community. Public education and outreach programs can also play a vital role in raising awareness about the benefits of eco-centric zoning and promoting sustainable land-use practices.[163] Implementing eco-centric zoning policies, while crucial for ecological preservation, faces numerous legal hurdles and requires specific legal provisions to be effective. A primary problem is the lack of *explicit statutory mandates* for eco-centric principles. Many jurisdictions' planning laws prioritize economic development over ecological considerations, creating a loophole where environmental protection becomes discretionary. To solve this, *amendments to state and local planning acts* are needed, mandating the inclusion of ecological criteria in all zoning decisions. These amendments should include legally binding definitions of 'ecological integrity,' 'habitat connectivity,' and 'biodiversity protection,' leaving less room for subjective interpretation. Another significant issue is the inadequate enforcement of existing zoning regulations. Often, enforcement is hampered by insufficient funding and staffing for environmental agencies. To address this, dedicated funding mechanisms must be established, such as environmental trust funds or impact fees, to support enforcement activities. Furthermore, citizen suit

[160] Ahern, Jack, 'From Fail-Safe to Safe-to-Fail: Sustainability and Resilience in the New Urban World' (2011) 100(4) Landscape and Urban Planning 341, 342.

[161] Brody, Samuel D, et al, 'Measuring the Effects of Land Use Planning on Environmental Quality' (2006) 72(2) Journal of the American Planning Association 195, 197.

[162] Innes, Judith E, and Booher, David E, 'Planning with Complexity: An Introduction to Collaborative Rationality for Public Policy' (1999) 42(6) Journal of Environmental Planning and Management 839, 842.

[163] Ibid.

provisions in environmental laws should be strengthened, allowing individuals and NGOs to sue for non-compliance, thereby supplementing governmental enforcement. Regulatory taking claims pose a major legal challenge. Landowners frequently argue that eco-centric zoning restrictions deprive them of economically viable use of their property, triggering constitutional protections. To counter this, jurisdictions must develop clear guidelines and procedures for assessing regulatory taking claims, ensuring that restrictions are based on *legitimate public interests* and that landowners are provided with reasonable opportunities for development. Transfer of development rights (TDR) *programs* should be legally formalized and expanded, offering landowners alternative economic benefits while protecting ecologically sensitive areas. Intergovernmental coordination is often lacking, leading to inconsistent and fragmented zoning policies. To rectify this, legally binding intergovernmental agreements (IGAs) or Memoranda of Understanding (MOUs) must be established, outlining clear roles and responsibilities for different levels of government. These agreements should include mechanisms for information sharing, joint decision-making, and conflict resolution. Adaptive management is crucial for responding to changing ecological conditions, but many zoning ordinances lack provisions for it. To address this, legally mandated review *and* amendment procedures should be incorporated into zoning regulations, requiring periodic assessments of ecological conditions and the effectiveness of zoning policies. These procedures should include public hearings and opportunities for stakeholder input. Public participation is often limited, leading to a lack of transparency and trust in zoning decisions. To enhance this, legislation mandating public participation in all stages of zoning planning and implementation is needed. This includes access to information, opportunities for comment, and legal standing to challenge zoning decisions. Online platforms for information dissemination and legal aid services can further enhance transparency and public engagement. Finally, the lack of standardized ecological data and monitoring protocols hinders effective zoning implementation. To address this, jurisdictions must establish legally mandated monitoring programs and develop standardized protocols for data collection and analysis. This includes the use of GIS technology and remote sensing to track habitat changes and assess the effectiveness of zoning regulations. Data sharing agreements between governmental agencies and research institutions are also essential.

7.3. Technology and Zoning

Technology plays an increasingly important role in eco-centric zoning, providing tools and data for informed decision-making. The use of Geographic Information Systems (GIS) and remote sensing technologies has revolutionized zoning planning by enabling the analysis of spatial data on

land cover, habitat distribution, and wildlife movement.[164] GIS allows planners to map and analyze ecological features, such as wetlands, forests, and wildlife corridors, and to assess the potential impacts of development on these features.[165] Remote sensing provides data on land-use changes, vegetation cover, and other environmental indicators, enabling planners to monitor habitat changes and assess the effectiveness of zoning policies.[166] Monitoring habitat changes and wildlife movement is essential for adaptive management and the ongoing evaluation of eco-centric zoning policies. From a legal standpoint, GIS data, when used in zoning disputes or litigation, must adhere to established rules of evidence. This involves demonstrating the reliability and accuracy of the data, the validity of the methodologies used to collect and analyze it, and the qualifications of the experts presenting it. Legal challenges may arise if the data's integrity or chain of custody is questioned. Jurisdictions may need to develop specific legal standards for the admissibility of geospatial data, ensuring it meets the criteria for scientific evidence. Furthermore, the use of remote sensing for monitoring habitat changes and wildlife movement raises legal issues related to privacy and data protection. The collection and use of data obtained through remote sensing technologies, such as drones or satellite imagery, must comply with applicable privacy laws and regulations. Legal challenges may arise if the data is used in a manner that infringes upon property rights or individual privacy. Legal frameworks must be developed to address these concerns, ensuring that the use of remote sensing technology is both effective and legally compliant. The legal implications of using technology in zoning also extend to public participation and access to information. The use of online GIS platforms and interactive mapping tools can enhance public access to zoning information and facilitate public participation in the planning process. However, legal frameworks must ensure that these technologies are accessible to all members of the public, including those with limited technological literacy or access to the internet. Challenges may arise if the use of technology creates barriers to public participation or access to information. Moreover, the use of technology in zoning raises legal questions regarding administrative decision-making and procedural fairness. The use of automated systems and algorithms in zoning decisions must be transparent and accountable. Legal challenges may arise if these systems are perceived as biased or discriminatory.

8. RECOMMENDATIONS

8.1. Revisiting the Legal Framework

Analyzing the loopholes in existing laws that impede the effective implementation of eco-centric zoning policies reveals several critical areas

[164] Longley, Paul A, et al, Geographic Information Systems and Science (John Wiley & Sons, 2015) 300.
[165] Ibid.
[166] Ibid.

needing reform. Firstly, a significant loophole lies in the lack of standardized ecological criteria within zoning ordinances. Often, 'ecological considerations' are vaguely defined, leading to inconsistent application and weak enforcement. To address this, jurisdictions must develop legally binding, science-based ecological standards that are incorporated directly into zoning regulations. These standards should be developed through expert consultation and regularly updated to reflect new scientific knowledge. Secondly, enforcement mechanisms are frequently inadequate. Penalties for zoning violations are often too lenient to deter non-compliance, and enforcement agencies are underfunded and understaffed. To close this loophole, zoning ordinances must include stringent penalties for violations, coupled with dedicated funding for enforcement agencies. Furthermore, citizen suit provisions should be strengthened to empower individuals to hold violators accountable, and independent oversight bodies should be established to monitor compliance. Thirdly, the legal framework governing conservation easements and TDR programs often lacks clarity and uniformity, creating uncertainty and hindering their effectiveness. To solve this, jurisdictions must develop standardized legal templates for conservation easements and TDR agreements, ensuring they are legally sound and enforceable. These templates should address issues such as baseline documentation, monitoring requirements, and enforcement mechanisms. Fourthly, the 'regulatory takings' doctrine poses a significant loophole, as landowners frequently challenge eco-centric zoning regulations as depriving them of economically viable use of their property. To mitigate this, jurisdictions must develop clear guidelines for balancing ecological protection with property rights, ensuring that zoning restrictions are rationally related to legitimate public interests and that landowners are provided with reasonable opportunities for development. Legal doctrines like the public trust doctrine should be explicitly incorporated into zoning regulations to strengthen the legal basis for ecological protection. Fifthly, intergovernmental coordination is often hampered by jurisdictional fragmentation and conflicting mandates. To bridge this gap, jurisdictions must establish legally binding intergovernmental agreements, such as MOUs, that clearly define roles and responsibilities, promote information sharing, and ensure consistent application of zoning policies across different levels of government. Sixthly, the lack of legal mechanisms for adaptive management creates a loophole, preventing zoning policies from adapting to changing ecological conditions and new scientific information. To rectify this, jurisdictions must incorporate legally mandated review and amendment procedures into zoning ordinances, requiring periodic assessments of ecological conditions and the effectiveness of zoning regulations. Finally, a critical loophole exists in the lack of public participation and transparency in zoning decisions. To address this, jurisdictions must enact legislation that mandates public participation in all stages of zoning planning and implementation, ensuring access to information, opportunities for comment, and legal standing to challenge

zoning decisions. Public hearings, online platforms for information dissemination, and legal aid services can enhance transparency and public engagement. By addressing these loopholes through targeted legal reforms, jurisdictions can strengthen the legal foundation for eco-centric zoning and ensure its effective implementation.

8.2. Research and Monitoring

Investing in research on zoonotic diseases and spillover risks is essential for understanding the complex dynamics of pathogen transmission and developing effective prevention strategies. This includes research on the ecology of zoonotic pathogens, the factors that influence spillover events, and the development of diagnostic tools and vaccines. Developing early warning systems and rapid response mechanisms is crucial for containing outbreaks and preventing their spread. This involves the establishment of surveillance systems to monitor wildlife populations and detect emerging pathogens, as well as the development of rapid response plans to address outbreaks 186. Technological advancements, such as genomic sequencing and remote sensing, can enhance our ability to detect and track pathogens. Monitoring wildlife populations and habitat changes is essential for assessing the effectiveness of conservation measures and identifying emerging threats. This involves the establishment of long-term monitoring programs to track changes in wildlife populations, habitat quality, and pathogen prevalence. Data from these programs can inform adaptive management strategies and ensure that conservation efforts are effective.

8.3. Community Engagement and Education

Raising public awareness about zoonotic diseases and habitat preservation is crucial for promoting responsible behavior and building support for conservation efforts. This involves the development of educational programs, public campaigns, and community outreach initiatives to communicate the risks of zoonotic diseases and the importance of habitat preservation. Promoting sustainable practices and responsible wildlife interactions is essential for minimizing human-wildlife conflict and reducing the risk of zoonotic spillover. This involves the development of guidelines for responsible wildlife tourism, the promotion of sustainable agriculture and forestry practices, and the encouragement of responsible pet ownership. Global collaboration and information sharing are crucial for addressing the transnational nature of zoonotic diseases and habitat destruction. This involves the establishment of international networks for data sharing, the development of joint research programs, and the exchange of best practices for conservation and disease control.

8.4. Long-Term Strategies

Addressing climate change and its impact on zoonotic disease risk is essential for long-term pandemic prevention. Climate change is altering ecosystems and influencing the distribution of wildlife and pathogens,

increasing the risk of zoonotic spillover. This requires the development of climate change mitigation and adaptation strategies that consider the impacts on biodiversity and disease transmission. Promoting sustainable consumption and production patterns is crucial for reducing the environmental footprint of human activities and minimizing habitat destruction. This involves the adoption of policies that encourage sustainable agriculture, forestry, and fisheries, as well as the promotion of responsible consumption practices. Building resilient ecosystems and communities is essential for withstanding the impacts of climate change and other environmental stressors. This involves the restoration of degraded ecosystems, the development of green infrastructure, and the promotion of community-based conservation initiatives. By adopting a holistic and integrated approach to conservation and disease control, we can build a more sustainable and resilient future for both humans and wildlife.

9. CONCLUSION

This paper examines the critical interrelationship between zoonotic spillover and habitat disruption, emphasizing the pressing necessity for a proactive legal and policy framework. The key findings show the escalating threat of zoonotic pandemics, driven by habitat destruction, unregulated wildlife trade, and the increasing interconnectedness of human, animal, and environmental health. Landmark environmental law cases, both nationally and internationally, have established crucial precedents for protecting ecosystems and wildlife, demonstrating the legal basis for eco-centric approaches. International conventions and national legislation, such as the Convention on Biological Diversity, CITES, and the Endangered Species Act, provide the necessary frameworks for conservation and disease prevention. The analysis of recent pandemic events, including COVID-19, Ebola, and Nipah virus outbreaks, highlighted the direct correlation between habitat disruption and the emergence of zoonotic diseases. The importance of eco-centric zoning and wildlife preservation as preventative measures cannot be overstated. Eco-centric zoning integrates ecological considerations into urban and rural planning, balancing development with habitat preservation and preventing habitat fragmentation. Strengthening biosafety in wildlife facilities, implementing ecological approaches to pandemic prevention, and bolstering veterinary public health initiatives are vital components of a comprehensive strategy. Moreover, global surveillance and early detection efforts, coupled with the integration of wildlife protection into infrastructure projects, are crucial for mitigating zoonotic risks. Studies on human-macaque interactions in Bangladesh further emphasize the need for context-specific mitigation strategies in rapidly urbanizing areas. Proactive and integrated approaches to pandemic prevention are essential for safeguarding human and environmental health. This involves strengthening legal frameworks, investing in research and monitoring, engaging communities, and adopting long-term strategies that address climate change and promote sustainable

practices. The One Health framework, which recognizes the interconnectedness of human, animal, and environmental health, provides a holistic approach to addressing these challenges. Global collaboration and action are imperative to protect human and environmental health. The transnational nature of zoonotic diseases and habitat destruction requires coordinated efforts among governments, international organizations, and civil society. Sharing best practices, developing joint research programs, and harmonizing legal frameworks are crucial for preventing future pandemics. By prioritizing eco-centric zones, wildlife preservation, and integrated approaches to disease prevention, we can build a more resilient and sustainable future for all. It is a collective responsibility to ensure that the lessons learned from recent pandemics lead to meaningful action, safeguarding both human and ecological well-being for generations to come.

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AUTHORS' DECLARATION AND ESSENTIAL ETHICAL COMPLIANCES

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	*Author 1*	*Author 2*	*Author 3*
Conceived and designed the research or analysis	Yes	No	No
Collected the data	Yes	No	Yes
Contributed to data analysis and interpretation	Yes	Yes	Yes
Wrote the article/paper	Yes	Yes	Yes
Critical revision of the article/paper	Yes	No	No
Editing the article/paper	Yes	No	No
Supervision	Yes	Yes	Yes
Project administration	Yes	No	No
Funding acquisition	No	No	No
Overall contribution proportion (%)	50	25	25

Funding
No funding was available for the research conducted for and writing of this paper.

Research involving human bodies or organs or tissues (Helsinki Declaration)
The author(s) solemnly declare(s) that this research has not involved any human subject (body or organs) for experimentation. It was not a clinical research. The contexts of human population/participation were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of Helsinki Declaration does not apply in cases of this study or written work.

Research involving animals (ARRIVE Checklist)
The author(s) solemnly declare(s) that this research has not involved any animal subject (body or organs) for experimentation. The research was not based on laboratory experiment involving any kind animal. The contexts of animals not even indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of ARRIVE does not apply in cases of this study or written work.

Research on Indigenous Peoples and/or Traditional Knowledge
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To see original copy of these declarations signed by Corresponding/First Author (on behalf of other co-authors too), please download associated zip folder [Ethical Declarations] from the published Abstract page accessible through and linked with the DOI: https://doi.org/10.33002/jelp050107.

GRASSROOTS JOURNALS

JOURNAL OF ENVIRONMENTAL LAW & POLICY | 05(01) APRIL 2025
Published by The Grassroots Institute in partnership with Asia Pacific Academy of science Pte Ltd. Website: https://grassrootsjournals.org/jelp
Main Indexing: SCOPUS, EBSCO, HEIN ONLINE

ISSN 2564-016X | April 2025

M – 00538 | Analytical Article | Open Access

ADDRESSING THE IMPACT OF ENVIRONMENTAL DISPLACEMENTS OF PERSONS IN AFRICA BY OPERATIONALIZING SUSTAINABLE DEVELOPMENT GOALS AND AFRICAN AGENDA 2063

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Received: 27 January 2025 | **Reviewed:** 26 March 2025 | **Revised:** 27 March 2025
Accepted: 29 March 2025 | **Published:** 17 April 2025

ABSTRACT

Internal displacement due to environmental disasters has become a major humanitarian challenge in Africa, disproportionately affecting vulnerable groups such as women, children, and the elderly. Despite efforts like the New Partnership for Africa's Development (NEPAD) and adherence to the Millennium Development Goals (MDGs), the continent continues to face rising environmental challenges, raising questions about whether these displacements result from a failure to heed environmental warnings and whether development should be approached from a home-grown perspective. African Agenda 2063 and the SDGs now include forced displacement as key targets and indicators, emphasizing a comprehensive approach that extends beyond humanitarian aid to focus on development. This paper explores whether an intentional Afrocentric development plan, alongside the operationalization of the SDGs and Agenda 2063, can effectively mitigate environmentally induced internal displacement in Africa.

Keywords: Internal displacements; Sustainable Development Goals; African Agenda 2063; Environmentally displaced persons

Editor-in-Chief: Prof. Dr. Kamrul Hossain | *Deputy Editors-in-Chief:* Dr. Evgeniya Kopitsa, Prof. Dr. Ngozi Finette Unuigbe | *Executive Editor:* Dr. Hasrat Arjjumend

How to cite this paper: Ijeoma Anozie, Izuoma Egeruoh-Adindu, and Fatima Bello, 'Addressing the Impact of Environmental Displacements of Persons in Africa by Operationalizing Sustainable Development Goals and African Agenda 2063' (2025) 05 (01) Journal of Environmental Law & Policy 201-228, <https://doi.org/10.33002/jelp050108>

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Addressing the Impact of Environmental Displacements of Persons in Africa by Operationalizing Sustainable Development Goals and African Agenda 2063

1. INTRODUCTION

In the last few decades, internal displacements and the protection of internally displaced persons (IDPs) have become worrisome, for which attention and sustainable solutions are required. In recent years, internal displacement has emerged as a major concern globally, and particularly in Africa. Large-scale displacements within national boundaries resulting mainly from environmental or natural disasters have left vulnerable groups, such as women, children, and the elderly, most affected. Notwithstanding the cause of the displacement, the experience always leaves negative socioeconomic impressions on the people globally. These IDPs are displaced within state boundaries and are indeed the responsibility of their home countries, but often do not get the protection they deserve from their governments for several reasons. They are left in hazardous conditions for many years without adequate protection.

Displacements from environmental situations are one of the most devastating consequences of climate change. Vulnerable people living in some of the most fragile countries are often disproportionately affected.[1] The impacts of climate change are numerous and often trigger displacements and worsen living conditions, or hinder returns for those already displaced. Unfortunately, environmental sustainability practices such as maintenance of drainage, sustainable agricultural practices and re-afforestation appear to have been neglected for too long in Africa.[2] This has increased environmental problems such as soil erosion, floods and desertification, which have triggered numerous environmental displacements, creating a lot of vulnerabilities for the African people.

Achieving sustainable development goals requires considerable attention to the protection of various categories of persons within the national normative framework. Fundamental to this process is the need to ensure that law and policy responses are developed, which also take into consideration the fact that 'no one will be left behind in furtherance of developing lasting sustainable goals.[3] The SDGs[4] were borne out of the collective realization that, for meaningful development to take place globally, there was the need for a paradigm shift to foster stronger international environmental governance and ensure a balanced integration of the economic, social, and environmental dimensions of sustainable development.[5] These three areas of sustainable development are crucial,

1 UN Report on Climate change <https://www.unhcr.org/climate-change-and-disasters.html> accessed on 17 January 2025.

2 Akinolu Omisore, 'Attaining Sustainable Development Goals in sub-Saharan Africa; The Need to Address Environment Challenges', (2018) 25 Environmental Development Journal: 138–145.

3 Romola Adeola, *National Protection of Internally Displaced Persons in Africa; Beyond the Rhetoric*, (Adeola (ed) 1st ed. 2021. Springer, London 2020).

4 The Sustainable Development Goals (SDGs) are the post-Millennium Development Goals (MDGs) and are the global developmental agenda adopted by governments at eh UN General Assembly in September 2015.

5 Akinolu Omisore, 'Attaining Sustainable Development Goals in sub-Saharan Africa; The Need to Address Environment Challenges', (2018) 25 Environmental Development Journal 138 – 145.

interlinked, and mandatory for SDGs to be achieved, and to understand that they need to balance out each other and that none is more important than the other. Sub-Saharan Africa, in this regard, needs special attention as one of the least developed and most vulnerable areas, needing attention and relevant support in environmental protection, as this area is in crucial need for sustainable development to be achieved.

Before the end of the MDGs in 2015, the least progress made in Africa was in the areas of poverty, hunger reduction, and environmental sustainability. As a fact, the environment has a direct impact on poverty alleviation and hunger reduction.[6] Whilst progress in both can also be detrimental to the promotion of environmental values if sustainable agricultural practices and land management are not taken into consideration, the concept of sustainable development becomes crucial to balance them out. It is logical that to address environmental displacements, there is a need to address climate change issues and the impacts, which is the specific goal of SDG (Goal 13). This goal is also directly mentioned in targets under Goals 2 and 11 and is connected with most of the other SDGs.

Nevertheless, it may seem that the development of Africa depends on the institutionalization of an active state.[7] The components of an active state in a development scheme are dependent on the state's ability to chart ways for all-around sustainability, meaning full functionality. Africa is faced with daunting developmental challenges skewed by problems associated with poverty, unsustainable population growth, state fragility, governance, and political instability, among others.[8] In the past, development initiatives such as the New Partnership for African Development (NEPAD), launched by the leaders of the African Union (AU) and the Millennium Development Goals (MDGs) championed by world leaders did not translate into development for Africa.[9] The failure of NEPAD and MDGs to engender development resulted in the Agenda 2063 initiative and the SDGs. While Agenda 2063 is an initiative packaged to guide Africa to the development destination that the African people want, the SDGs are goals initiated by world leaders to ensure sustainable development globally.

There is a need, therefore, to commit to a home-grown development agenda that will take into consideration the specificities of the African challenges, especially in environmental development. It would involve the articulation of development initiatives through consultative and participatory approaches involving African leaders. The drive for "African solutions" as embedded in Agenda 2063 is to de-emphasize the continuous reliance on external entities to deal with continental challenges. It will also refocus attention on Africa's capability to initiate solutions to its problems

6 Agenda 2030 stresses that "the interlinkages and integrated nature of the SDGs are of crucial importance in ensuring that the purpose of the Agenda is realized" see Transforming Our World: The 2030 Agenda for Sustainable Development, A/RES/70/1, Preamble, A UN Document.

7 Agaptus Nwozor, Onjefu Okidu, and Solomon Adedire, 'Agenda 2063 and the Feasibility of Sustainable Development in Africa: Any Silver Bullet?' (2021) 52 (7) Journal of Business Studies 688.

8 Ibid

9 Ibid

without depending on other external powers. In this regard, operationalizing home-grown SDGs and Agenda 2063 development plans will undoubtedly yield the desired result because the approach will be Afrocentric. In dealing with environmental development, its interdependence and interrelatedness with poverty and hunger, making human settlements safe and environmentally friendly will be addressed, simultaneously, thereby mitigating environmental displacements in Africa.

The purpose of this study is to determine the possibility of addressing internal displacements resulting from environmental issues through the home-grown perspectives, which have been identified in the SDGs and the Agenda 2063 development plans which if implemented properly will address issues of environmental disaster, displacements and hunger and poverty which are the immediate consequences of such disaster.

This paper is divided into seven parts. Following this introduction is the methodology and review of relevant literature referenced in this study. The Third part examines the overview of the impact of environmental displacements of persons in Africa. The fourth part explains the relationship between the goals of the SDGs and Agenda 2063. The fifth part discusses the possibility of mitigating environmental displacements of Persons by operationalizing the home-grown Sustainable Development Goals and Agenda 2063. The sixth part discusses the challenges and prospects of implementation, and then the paper recommends and concludes.

2. METHODOLOGY

The information for this study is derived from doctrinal research methodology. The justification for the choice of doctrinal research methodology is based on the fact doctrinal research methodology is desk research that involves a systematic analysis of how the SDGs, the African Agenda 2063 and African Indigenous Knowledge Systems can engender legal reforms that will mainstream Afrocentric development plans, alongside the operationalization of the SDGs and Agenda 2063, to effectively mitigate environmentally induced internal displacement in Africa. Therefore, doctrinal research methodology is the appropriate research methodology to use in this research work. Information and literature used in this research were sourced from the review of secondary sources, which include relevant literature from respected scholars in the form of textbooks, articles from journals, reputable newspapers, and online sources. The research materials were sourced from law libraries of institutions of higher learning such as the University of Jos Law Library, The Nigerian Institute of Advanced Legal Studies Law Library, Nasarawa State University Law Library, e-libraries such as LexisNexis and Hein online and others

3. REVIEW OF RELEVANT LITERATURE

This section will discuss the relevant literature referenced in this work. Suzi Mohammed Rashad[10] discussed the effects of climate change in the African continent. In her view, the continent has suffered the repercussions of environmental and climate deterioration, most notably "environmental displacement" or what is called "climate refugees." The findings of her research demonstrate that although the phenomenon of "climate refugee" has become noticeable in the African continent, and despite concrete efforts by Africa, the lack of international recognition of the term "climate refugee" as well as the lack of environmental justice in distributing the burdens of global warming, remains an obstacle for the African continent for solving this problem. Therefore, international synergy is required to find common solutions. The significance of this study lies in highlighting the insufficiency of African efforts to reduce the phenomenon of environmental refugees, and the lack of international efforts to establish a legal framework for this problem. While her research is relevant to this study however there has been a lot of improvement after the publication of her article in 2020, for instance on lack of legal framework, Nigeria and Kenya[11] enacted the Climate Change Act in 2021 and 2023 respectively and some African countries such as Ghana is also working on enacting one. This illustrates the ongoing efforts of African countries to tackle climate change and its negative impacts, including displacement.

Anthony Ikhide Osawe and Ojeifo O. Magnus[12] examined the community involvement in environmental governance in Nigeria. The main objectives were to identify prevailing environmental problems in Nigeria and examine the community's participation in their management. To achieve this, a process approach was followed in which secondary data, sourced from textbooks, articles in journals and the internet were utilized. The study revealed that communities in Africa had little or no role to play in the governance of their environment. The study showed that the government alone played this role, which has been seen to be ineffective considering the extent of air pollution, oil spillage and deforestation in the urban and rural environments on the continent. Based on this, the study therefore recommended, among other things, that, participatory approach to environmental governance, including the government, the private sector, multinationals and the community, was required to effectively harness the environment. The study also recommends that policies should be strengthened, while environmental education should be a basic requirement for communities. The study aligns with this research and concludes that environmental education is needed to address the negative effects of climate

[10] Suzi Mohammed Rashad, 'African Climate Refugees: Environmental Injustice and Recognition' (2020) 10 (3) Open Journal of Political Science, <https://doi.org/10.4236/ojps.2020.103033>.

[11] Kenya Climate Change Act 2023 <http://kenyalaw.org> accessed 2 April 2025.

[12] Anthony Ikhide Osawe and Ojeifo Magnu, 'Environmental Governance in Nigeria: The Community Perspective' (2016) 6 (2) Public Policy and Administration Research 2225-0972.

change, which is considered the major contributor to environmental displacement. Where this is not done, the number of environmental refugees may double shortly.

Ashok Das Gupta[13] states that people with Indigenous Knowledge System (IKS) have the capabilities to provide several Public Services that are parallel to the Modern systems and are equally important. An indigenous community may be marginalized due to in-migrations or be out-migrated. It may be immigrated or emigrated. In both cases, IKS could be altered due to changes in modes of production. He also noted that in certain traditional communities in India, ancient trade routes have been lost, leaving people to only imagine their native statehood. Tribal communities like Mech (Bodo), Rabha, Garo, and Koch have been mostly incorporated into the wider social category of the agrarian Rajbanshi caste. Varendri caste group there speaks of their Aryan origin but on to Kashmir-Tibet ways. Nepali-speaking Hill Nepalese of Nepal are immigrants but recruited into the Indian Army. They also construct the labour class in Tea estates along with Adivasi people of Dravidian-Proto Australoid origin from Central India. A new form of IKS has grown up locally that contains identity movement, human shield in this border territory and multiculturalism. For that, the British rule in India got the credit. Mutual understanding between IKS and Modernity can fulfil the goal. We cannot consider IKS as being a part confined to the mode of production, but the structure and the super-structure (or cognition) that speaks openly in favour of culture to multiculturalism. This is not different from what is happening in Africa, hence the need to document the African Indigenous Knowledge system, which is being eroded due to migration. Considering that climate-induced migration is negatively impacting on African indigenous knowledge system, which could have been used to mitigate or adapt to climate change effects. The study aligns with the recommendations of the research, but emphasises the need to adopt the Afrocentric method in documenting the IKS.

Agaptus Nwozor, Onjefu Okidu, and Solomon Adedire[14] stated that several continental and global development initiatives have been developed to trigger development in Africa, the latest being Agenda 2063 and Sustainable Development Goals (SDGs). The research relied on relevant materials to examine the challenges of sustainable development, especially within the context of the serious structural adjustment challenges in Africa. Against the backdrop of the continent's earlier dismal experiences with development initiatives, the article assesses the promises of both Agenda 2063 and the SDGs to motorize sustainable development in the continent. The article contends that the feasibility of sustainable development in Africa is contingent upon the institutionalization of the active state. The imperative of the active state in development architecture is

[13] Ashok Das Gupta, 'Impact of migration on Indigenous Knowledge System' (2024) <https://nomadit.co.uk> accessed 15 December 2024.

[14] Agaptus Nwozor, Onjefu Okidu, Solomon Adedire, 'Agenda 2063 and the Feasibility of Sustainable Development in Africa: Any Silver Bullet?' (2021) 52 (7) Journal of Business Studies 691.

because of its indispensability in charting critical pathways for all-around sustainability. The study aligns with the findings and recommendations of this research on the fact that the feasibility of sustainable development in Africa is contingent on the institutionalization of an active State for all round development in Africa as the continent has inflicted a lot of barriers that makes it difficult for states in continent to trade or even move around the continent with ease. This has increased migration to other continents, especially by environmental refugees who find it difficult to remain within the continent due to travel and visa barriers. These barriers need to be eliminated for us to have the Africa we want.

The study relies on the above materials and others cited in the footnotes for the arguments canvassed in this research. The gaps identified in the materials cited were filled. The study has contributed to the development of African legal jurisprudence.

4. OVERVIEW OF THE IMPACT OF ENVIRONMENTAL DISPLACEMENTS OF PERSONS IN AFRICA

Environmental Displacement of persons in Africa is a worrying phenomenon. Many people have been forced to leave their homes due to environmental changes that threaten their lives and livelihood.[15] To date, millions of people have been displaced due to problems associated with environmental destruction and climate change. This results in an increase in migration to other countries within Africa or other continents, resulting in negative impacts such as security challenges, terrorism, and pressure on both economic resources and the environment of the countries or continents. The UN Secretary-General, António Gutiérrez, and the head of the UN High Commissioner for Refugees, Filippo Grandi,[16] noted this phenomenon at the opening of the Global Refugee Forum 2019 in Geneva, when discussing how climate change is creating environmental refugees[17] in Africa.

Climate change-related disasters such as floods, erosion, and storms are the major drivers of environmental displacement and the bane of achieving sustainable development in Africa.[18] Though climate change is a global phenomenon, its negative effects are advancing at an alarming rate. Natural events and human activities are believed to be contributing to an increase in average global temperatures and resulting in displacements resulting from such disasters like floods and widespread wildfires, for

[15] Suzi Mohammed Rashad, 'African Climate Refugees: Environmental Injustice and Recognition' (2020) 10 (3) Open Journal of Political Science, <https://doi.org/10.4236/ojps.2020.103033>.

[16] Ibid.

[17] According to the UN Economic and Social Commission for Western Asia, environmental refugees is a person displaced owing to environmental causes, notably land loss and degradation, and natural disaster; see UNESCWA, Environmental refugee <https://archive.unescwa.org> accessed 2 April 2025.

[18] Internal Displacement Monitoring Centre, 'What is Internal Displacement' <http://www.internal-displacement.org/internal-displacement/what-is-internal-displacement> accessed 18 January 2025; Uche Isiugo-Abanihe, Migration in Nigeria a Country profile <https://publications.iom.int/system/files/pdf/mp_nigeria.pdf> accessed 18 November 2024.

instance. In 2024, more than 414,000 people were displaced in Borno State of Nigeria,[19] and the 2019 cyclone Idai in Mozambique displaced hundreds of thousands in Mozambique, Malawi and Madagascar.[20] However, the fifth assessment report of the Intergovernmental Panel on Climate Change (IPCC) in 2014 attributed the major causes of climate change to human activities via anthropogenic greenhouse gas emissions from population growth and increased industrial activities.[21] While the sixth assessment report of Working Group II of IPCC released in February 2022 states that Climate and weather extreme conditions are increasingly driving displacement in all regions, with an increase in Flood and drought-related acute food insecurity and malnutrition in Africa.[22] This may be the reason for the increased migration of Africans to other continents.[23] Further, the Internal Displacement Monitoring Centre's (IDMC) 2024 Africa report revealed that climate-related disasters, particularly those associated with hydro-meteorological hazards such as floods, storms, and drought, also triggered 35 million internally displaced people (IDPs), nearly half of the global total.[24] 32.5 million of these IDPs were displaced by conflict and violence, which has increased migration within and outside the African continent.[25]

The impact of environmental displacement cannot be ignored as they range from security-related challenges, economic challenges, food insecurity, water scarcity, demographic pressure, exacerbated public health challenges, competition for scarce resources, poverty, housing challenges,

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19 Reliefweb, Nigeria: Floods – Maiduguri (MMC) and Jere Floods Flash Update 2 (15 September 2024) https://reliefweb.int accessed 2 April 2025.

20 IOM, 'UN Migration, Mozambique — Cyclone IDAI - Snapshot Report (Eight months after Idai) November 2019' (2019) <https://dtm.iom.int> accessed 2 April 2025.

21 Summary for Policymakers Figure (SPM 1.2) states as follows: 'Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are extremely likely to have been the dominant cause of the observed warming since the mid-20th century" See IPCC, Climate Change 2014 Synthesis Report Summary for Policy makers, <http://ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf> accessed 3 November 2024.

22 Hans-Otto Pörtner and others, 'Climate Change 2022: Impacts, Adaptation and Vulnerability' (2022) <https://www.ipcc.ch> accessed 12 September 2024.

23 Vivian Falae, 'Flood in Nigeria: Why did the latest disaster happen?' <https://www.naija.ng/1114394-flood-nigeria-latest-disaster-happen.html#1114394> accessed 26 December 2024; Hembadoon Orsar, 'Benue Flood, 110,000 persons and 24 communities affected' Leadership (Makurdi, 31 August 2018) <http://leadership.ng/2017/08/31/benue-flood110000-persons-24-community-affected/> accessed 26 December 2024; Richard Davis, 'Nigeria-Thousands Displaced by Flood in Kogi' <http://floodlist.com/africa/nigeria-floods-kogi-september-2017> accessed 26 December 2024; Richard Davis, Nigeria-Deadly Flood hits Niger-State <http://floodlist.com/africa/nigeria-deadly-floods-hit-niger-state> accessed 26 December 2024.

24 IDMC, 'Internal Displacement in Africa' <https://www.internal-displacement.org> accessed 2 April 2025

25 Sorcha O'Callaghan and Chloe Sydney, 'African Report on Internal Displacement 2017' <http://www.internal-displacement.org/library/publications/2017/africa-report-2017> accessed 2 March 2024; see also Esther Yu His Lee, Climate change forced Over 1 Million Africans from their homes in 2015 <https://thinkprogress.org/africa-climate-internally-displaced-people-318d3eb8a27b/> accessed 3 March 2024.

environmental induced conflicts and all forms of violence, boarder political destabilization and in some cases death of refugees. The resultant effect of these displacements is the increase in migration of Africans within and across the global environment.

To mitigate the impacts of environmental displacements and the attendant consequences of forced migration in Africa, appropriate environmental displacement management models can be adopted in Africa. These models encompass efforts to mitigate environmental displacements in Africa. For example, this can be achieved through operationalizing the Sustainable Development Goals and African Agenda 2063, promoting responses in joint humanitarian and development initiatives that promote human development and reduce impacts of environmental displacement on human populations; preparing for potential displacements and relocations through appropriate preparedness and response measures; effectively managing displacements (particularly mass displacements) when they occur; mitigating the impacts on the environment and most importantly, addressing the root causes of environmental displacements through durable solutions and identifying effective climate change mitigation and adaptation strategies in Africa.[26]

The IPCC sixth Assessment report and the IDMC African 2024 report[27] on the vulnerability of African Countries, underline the purpose of this research, which includes the need to address the impact of environmental displacement in Africa by operationalizing the Sustainable Development Goals and the African Agenda 2063 using sustainable development plans. This is achievable through mainstreaming the SDGs and Agenda 2063 goals and aspirations into the domestic Laws and Policies of most African Countries to help combat climate change and also close the gaps in the protection of the environmentally displaced persons in Africa. Understanding the perspective of this research will no doubt assist the heads of government of African countries and Stakeholders to prepare and avert the challenges that come with climate change, such as environmental displacement. Though much has been written on mechanisms to check environmental displacements and other causes of displacement, such as conflict-related displacement, however, there is a need for practical solutions. To achieve the thesis of this research, there is an urgent need to close both the existing legislative and institutional gaps by operationalizing the SDGs and the goals of the African Agenda 2063. The African Agenda 2063 is the African Union's strategic framework for transforming the continent into a global powerhouse by 2063. The agenda emphasizes the need to address Africa's high reliance on climate-sensitive agriculture, rapid population

[26] Mohamed Atani, 'UN Environment Program, Displacement and Environment in Africa: What is the Relationship?' <https://www.unep.org/> accessed 8 September 2024.

[27] IPCC Sixth Assessment Report, 'Climate Change 2022: Impacts, Adaptation, and Vulnerability' <https://www.ipcc.ch/report/ar6/wg2/> accessed 15 September 2024; Internal Displacement Monitoring Center, 2019 Africa Report on Internal Displacement <https://www.internal-displacement.org> accessed 15 September 2024.

growth in vulnerable areas, which increases the risk of displacements, and limited infrastructure and disaster response capacity. Recognizing that climate change poses a significant threat to the environment, food security, livelihoods, and economic stability, Agenda 2063 advocates for climate resilience, sustainable land management, and enhanced agricultural productivity to mitigate the impacts of climate change, including displacements.[28]

5. ANALYZING THE RELATIONSHIP BETWEEN THE SUSTAINABLE DEVELOPMENT GOALS AND THE AFRICA AGENDA 2063 AS A LASTING SOLUTION

The relationship between the SDGs and the Africa Agenda 2063 ultimately lies in their shared commitment to sustain development and make the world, including Africa, a safer place. Though distinct in their features and content, both concepts are interconnected in their goals, targets, and aspirations as they promote global and regional development.

The SDGs, being a successor of the MDGs, not only cover a broader range of issues but also serve as reference goals for the period 2015 to 2030. All 17 goals and targets are interconnected, meaning success in one affects success for others. Dealing with the threat of climate change impacts on the environment, natural resources, achieving gender equality or better health, fostering peace and inclusive societies to reduce inequalities and helping economies prosper. For instance, about 60 targets have direct links to at least another goal, excluding the one to which they belong, thereby creating indirect or third-party links among goals.[29] Nevertheless, they differ from the MDGs in the areas of conception, target, purpose, and political processes.[30]

Similarly, at the continental level, the African Union formulated Agenda 2063 as a home-grown vision borne out of the maxim "African solutions to African problems" From the various points, African countries gained independence; their major concern was development, to which they made various strategic efforts. However, the major ones are NEPAD, the African Continental Free Trade Area (AfCFTA), and African Agenda 2063 (The Agenda). In other words, the Agenda builds upon past and present continental initiatives such as the Monrovia Declaration, the Lagos Plan of Action, the Abuja Treaty, and NEPAD, and Africa's recent positive performance in the economic, social, and political fields to put the continent on a positive path of growth, peace, and prosperity.[31] The Agenda, therefore, leverages on the continent's rich history, natural resources, people, culture, its institutions and capitalizes on the opportunities of changing Africa.

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[28] African Union, African Agenda 2063 <https://au.int/en> accessed 2 April 2025.

[29] Agaptus Nwozor, Onjefu Okidu, Solomon Adedire, 'Agenda 2063 and the Feasibility of Sustainable Development in Africa: Any Silver Bullet?' (2021) 52 (7) Journal of Business Studies 691.

[30] Ibid

[31] Ibid

Unlike the SDGs, which are universal goals, the Agenda was adopted in 2013 and is connected to the African continent.[32] The African Agenda 2063 highlights people-centered development. It places the African people at the center of all continental efforts to ensure their participation in the transformation of the continent and to build caring and inclusive societies. In the pursuit of realizing its full potential, the Agenda has seven aspirations:

1) a prosperous Africa based on inclusive growth and sustainable development;
2) an integrated continent, politically united, based on the ideals of Pan Africanism and the vision of Africa's renaissance;
3) an Africa of good governance, democracy, respect for human rights, justice and the rule of law;
4) a peaceful and secure Africa;
5) an Africa with a strong cultural identity, common heritage, values, and ethics;
6) an Africa whose development is people-driven, relying on the potential of African people, especially its women and youth, and caring for children; and
7) Africa as a strong, united, resilient, and influential global player and partner.

All these aspirations reflect the continent's desire for shared prosperity and well-being, unity, and a prosperous Africa based on all-inclusive growth and sustainable development.[33]

The international community and the African region have been concerned with economic growth and the well-being of both the planet and its inhabitants, and this is reflected in the SDGs and Africa we want (Agenda 2063). These socioeconomic initiatives have aimed to ensure the reduction of inequality while promoting sustainable development. Both the Sustainable Development Goals (SDGs) 2030 and the African Union 2063 agendas, like most global initiatives in the past, aimed at tackling environmental sustainability and inequality, hence the Leaving no one behind and Africa we want mantra of the SDGs and Agenda 2063.[34] 'Leave no one behind means that development should occur within a minimum set of social and environmental inclusion boundaries. Inclusion is concerned with bringing vulnerable and marginalized groups, especially the environmentally displaced, into the mainstream via economic and environmental protection. While the 'Africa we want" mantra refers to Africa's new path for attaining inclusive and sustainable economic growth and development, which also translates to where no one is left behind.

Both the SDG 2030 and the African Union (AU) 2063 include environmental inclusion and sustainability, it is cognizant that adverse

[32] Agenda 2063, 'The Africa We Want'<https://au.int/en/agenda2063/overview> accessed 16 September 2024.
[33] Ibid
[34] The Sustainable Development Goals Center for Africa, 'Africa 2030: SDGs within Social Boundaries Leave no one behind' Outlook, 2.

climate conditions can exacerbate exclusion; poor climate conditions intensify environmental displacements, poverty, hunger, and vulnerability of African Countries to climate change. Both frameworks also seek to uplift vulnerable populations (such as environmentally displaced persons). The 'leave no one behind' and 'The Africa we want' conceptualization of SDGs and African Agenda 2063 has not been translated into practice in Africa, especially with the increase in migration of Africans resulting from environmental displacement. Out of the seven aspirations of the African Agenda 2063, 5 have a component of social inclusion. Also, further analysis of the goals revealed that 15 of the 20 goals have inclusiveness dimensions.[35] Out of the 17 SDG goals, 13 include social inclusion components.[36] Thus, achieving 'the leave no one behind' and 'The Africa we want' mantra of the SDGs and Agenda 2063 is practicable.

SDG Goal 13 on climate action recognizes the impact of climate change on environmental displacements. It therefore encourages measures to mitigate and adapt to climate change. Though it is difficult to directly attribute human displacement to climate change, the relationship between climate change and increased environmental displacement in recent times is recognized.[37] The assessment report of the Intergovernmental Panel on Climate Change (IPCC) identified some scenarios for climate displacement, such as loss of housing (due to flooding or mudslides in mountains), loss of living resources (e.g. water, energy, and food supply) and others.[38] Climate-related displacement scenarios, such as weather-induced displacement resulting from hurricanes and flooding, increased disaster threats in high-risk zones, gradual environmental deterioration, slow onset disasters and the submersion of low-lying island states, are instances that directly capture the SDG-13.1 goals of strengthening the resilience and adaptive capacities for bracing against disasters.[39] Though SDG 13 does not does not directly link to environmental displacement, nevertheless, it is acknowledged under SDG 13 as a climate change impact in general terms and does not address specific

[35] African Union, 'Goals and Priority Areas of Agenda 2063' <https://au.int/agenda2063/goals> accessed 5 September 2024.

[36] African Union, 'Linking Agenda 2063 and the SDGs' <https://au.int/agenda2063/sdgs> accessed 6 September 2022; United Nations Department of Economic and Social Affairs Sustainable Development, 'Make the SDGs a Reality' <https://sdgs.un.org/#goal_section> accessed 6 September 2024.

[37] Sarah Opitz Stapleton and Others, 'Climate Change, Migration and Displacement: The Need for A Risk-informed and Coherent Approach, Overseas Development Institute and United Nations Development Programme,' (2017) 12 <https://www.odi.org/sites/odi.org.uk/files/resource-documents/11874.pdf> accessed 12 December 2024.

[38] The fifth assessment report of IPCC stated in Stellina Jolly and Abhishek Trivedi, 'Implementing the SDG-13 through the Adoption of Hybrid Law: Addressing Climate-Induced Displacement,' (2020) Brill Open Law, <https://brill.com/view/journals/bol/2/1/article-p69_69.xml> accessed on 15 December 2024.

[39] The UN High Commissioner for Refugees (UNHCR) perspective as captured in The fifth assessment report of IPCC stated in Stellina Jolly and Abhishek Trivedi, 'Implementing the SDG-13 through the Adoption of Hybrid Law: Addressing Climate-Induced Displacement' (2020) Brill Open Law, <https://brill.com/view/journals/bol/2/1/article-p69_69.xml> accessed on 15 December 2024.

climate change impacts such as food security and access to water.[40] Other SDG goals such as SDGs 8, 10 and 17 more explicitly regulate the need for migration policies.

African Agenda 2063 pertinently aligns with the SDG goals, thereby emphasizing the need for collaboration between the African countries and the international communities to achieve the common goals, which relate to lasting development, environmental sustainability, poverty eradication, and putting an end to displacement-induced migration. The Agenda's first aspiration is for a "prosperous Africa based on inclusive growth and sustainable development" and places a high priority on environmental sustainability and climate change adaptation and mitigation while advancing Africa's common agenda.[41]

Africa recognizes that it is warming earlier than any other continent, with global projections of a rise of 3 - 4°C this century.[42] The negative consequences of this situation range from water scarcity, reduced crop and livestock productivity, rising sea levels, and more frequent extreme climate events, which lead to human displacements. African governments have acknowledged the urgent need to address these threats, as evidenced in national, sub-regional, and continental commitments to the global "2030 Agenda for Sustainable Development" and African Agenda 2063, the "Africa We Want."[43] In this regard, African leaders have specifically committed to Goal 13 of Agenda 2030 and Goal 7 of the first ten-year implementation plan of the African Agenda 2063, which aims to "take urgent action to combat climate change and its impact" with associated targets to integrate climate change measures into national policies, improve education, awareness-raising, and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warnings.[44]

Ultimately, achieving the African Agenda 2063 and the global 2030 Agenda for Sustainable Development will depend on how the impact on climate variability is managed. Therefore, the relationship between the two concepts lies in the effort to achieve an environmentally safe Africa and, by extension, a globally safe environment.

6. MITIGATING ENVIRONMENTAL DISPLACEMENTS OF PERSONS BY OPERATIONALIZING THE SUSTAINABLE DEVELOPMENT GOALS AND AFRICAN AGENDA 2063

[40] The fifth assessment report of IPCC stated in Stellina Jolly and Abhishek Trivedi, 'Implementing the SDG-13 through the Adoption of Hybrid Law: Addressing Climate-Induced Displacement,' (2020), Brill Open Law, <https://brill.com/view/journals/bol/2/1/article-p69_69.xml> accessed on 15 December, 2024

[41] Aspiration 1, 'African Agenda 2063. The Africa We Want,' Framework document, <https://au.int/sites/default/files/documents/33126-doc-framework_document_book.pdf> accessed on 18 December 2024.

[42] Steiner, A., 'Climate Change, Environment, and Sustainable Development in Africa. *African Economic Development* (Steinered: Emerald Publishing Limited, 2019) 93–110, <https://doi.org/10.1108/978-1-78743-783-820192006> accessed 18 December 2024.

[43] Ibid

[44] Ibid (n.39)

Operationalizing the SDGs and African Agenda 2063 using home-grown solutions is considered an effective tool towards mitigating environmental displacement of persons in Africa. SDG 2030 and AU Agenda 2063 are a culmination of efforts by the international community and the African region to address global economic growth.[45] Statistics have shown that climate-related disasters accounted for the displacement of 35 million persons in Africa in 2024.[46] Research has shown that while Africa contributes little to global greenhouse gas emissions, African countries are the most vulnerable to the impacts of climate change, such as environmental displacements.[47]

Environmental displacement refers to the forced displacement of people from their homes, communities, and villages due to natural disasters or what may be referred to as an 'Act of God'.[48] The growing intensity of meteorological disasters due to climate change, coupled with the effects of environmental degradation, is likely to continue to be a factor behind human displacement. The International Organization of Migration (IOM) predicts there will be 230 million displaced people by the year 2050, with major effects on countries of origin, transit countries, as well as receiving countries.[49] Environmentally displaced persons (EDPs) are often neglected in national policies and development planning, resulting in the insufficient allocation of resources for their protection, hence the call for home-grown solutions to address EDPs. Consequently, EDPs in many instances lack necessities like shelter, food, and access to health care. Considering that a lot of climate change impacts are responsible for these displacements, there is a need to mitigate climate change in Africa. It should be noted that mitigating climate change will help mitigate environmental displacements in Africa. Though Africans seem to have shown a preference for migration over mitigation of environmental displacements due to several socio-economic factors. Climate change and environmental degradation, such as desertification in the Sahel, rising sea levels in coastal regions, and extreme weather events, have made some areas increasingly uninhabitable. However, rather than investing in long-term adaptation measures, many individuals, communities, private sector opt for migration as a survival strategy.

Mitigating the environmental displacement of Persons in Africa requires concerted efforts to be made by African countries. Operationalizing the Sustainable Development Goals (SDGs) and African Agenda 2063 using

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45 The Sustainable Development Goals Center for Africa, 'Africa 2030: SDGs within Social Boundaries Leave no one behind' Outlook, p.2 <https://sdgcafrica.org/wp-content> accessed 12 September 2024.

46 Internal Displacement Monitoring Center, 2024 Africa Report on Internal Displacement' <https://www.internal-displacement.org> accessed 2 April 2025.

47 African Development Bank, 'Climate Change in Africa' <https://www.afdb.org/en/cop25/climate-change-africa> accessed 12 September 2024.

48 Environmental Law Institute, "Environmental Displacement, and Migration' <https://www.eli.org/migration/environmental-displacement-and-migration> accessed 12 September 2024.

49 IOM UN Migration, 'World Migration Report 2020,' p.2 <https://publications.iom.int/system/files/pdf/wmr_2020.pdf> accessed 10 September 2024.

the home-grown approach is key to mitigating environmental displacements of persons in Africa. Home-grown approach refers to the use of African indigenous knowledge systems to address climate change effects, which result in environmental displacement. Africa is also a continent rich in Indigenous and Local Knowledge (ILK) that has a long history of informing responses to climatic variability and change. African Indigenous knowledge systems have become central to sustainable development.[50] This is because of the way in which the indigenous knowledge system allowed people to live in harmony with nature and has become a way of life. African Indigenous knowledge systems, such as growing drought-resistant crops, the use of animal dung as manure, the siting of the new moon before planting, rain-making rituals, and the planting of trees to serve as shade, have helped to conserve the wetlands and the forests are effective in promoting environmental sustainability. Further, cultural taboos are not new to many traditional societies in Africa, as they are used to put restrictions on the excessive use of some plants, killing of some animals or carrying out development in erosion-prone areas, which they refer to as 'African shrines/religious worship centers' and 'evil forest', preventing overfishing from some waters by tagging the waters "*Owumiri or 'Mami Water'* dedicated rivers or sea.[51] This home mechanism helped to curb the depletion of natural resources, desertification, erosion, and climate change effects, such as global warming, that we experience today.[52] The mechanism also helped to promote environmental sustainability, which is one of the critical goals of the Sustainable Development Goals (United Nations Department of Economic and Social Affairs, 2022) and one of the 7 aspirations of the African Agenda 2063. Integrating these home-grown mechanisms into policies and environmental protection laws is important and an effective way to operationalize the SDGs and African Agenda 2063 to mitigate environmental displacements.

It is expected that the domestic/ national laws will engender responses in joint humanitarian and development initiatives that promote human development and reduce other impacts of environmental displacement on human populations at the national level in Africa,[53] preparing for potential displacements and relocations through appropriate preparedness and response measures at the national level; effectively managing displacements (particularly mass displacements) when they occur; mitigating the impacts of displacements on the environment and at the domestic level and most

[50] Anthony Ikhide Osawe and Ojeifo O. Magnu, 'Environmental Governance in Nigeria: The Community Perspective' (2016) 6 (2) Public Policy and Administration Research 2225-0972; Ashok Das Gupta, 'Impact of migration on Indigenous Knowledge System' <https://nomadit.co.uk> accessed 15 December 2024.

[51] Izuoma Egeruoh-Adindu, 'Leveraging Indigenous Knowledge for Effective Environmental Governance in West Africa', (2022) 13 Beijing Law Review 931-947.

[52] Jiri, Mafongoya Mubaya, & Mafongoya, 'Seasonal Climate Prediction and Adaptation Using Indigenous Knowledge Systems in Agriculture Systems in Southern Africa: A Review' (2016) 8 (5) The Journal of Agricultural Science 156–172.

[53] Food insecurity, poverty, hunger, environmental-induced conflicts, insecurity

importantly, addressing the root causes of environmental displacements through durable solutions and identifying effective climate change mitigation and adaptation strategies across the countries in Africa.

Further, operationalizing the Kampala convention by ensuring ratification and domestication of the convention across all African countries is another strategy that will help in mitigating the environmental displacements of persons in Africa. In response to the challenge of preventing and addressing internal displacement on the continent, African States joined forces through the African Union (AU) to create the African Union Convention for the Protection and Assistance of Internally Displaced Persons in Africa (the Kampala Convention, or the Convention) in 2009.[54] This innovative treaty is the world's first-ever legally binding instrument on Internally Displaced Persons, which includes Environmentally Displaced Persons in Africa, entered into force in 2012 after 15 African States ratified it. Today, 33 African Union members have ratified the convention.[55]

The Convention aims to prevent internal displacement and to protect the rights and well-being of people forced to flee their homes by conflict, violence, natural disasters, and development projects.[56] It provides durable solutions to internal displacements in the African region by providing an excellent opportunity for the Member States to put in place a national framework for the prevention of displacement and a comprehensive framework when it happens. To achieve these aims, it sets out the rights of IDPs/EDPs and lays obligations on states, armed groups, non-state actors, and other relevant actors. The rights of IDPs/EDPs enshrined in the Convention include the right not to be displaced, the right to non-discrimination, the right to seek safety, the right to education, the right to food, and the right to shelter. The obligations of states include, but are not limited to, the obligation not to arbitrarily displace individuals and groups, and to prohibit and prevent the same; the obligation to respect and guarantee the human rights of IDPs/EDPs; the obligation to provide or facilitate the provision of humanitarian assistance to IDPs/EDPs; and the obligation to put in place legal, policy and institutional frameworks for the protection of IDPs/EDPs, and to allocate resources for these purposes.[57]

Despite the robust provisions of this convention, the momentum the Kampala Convention enjoyed between its adoption in 2009 and its entry into force in 2012 has stalled in recent years. Few States have ratified or acceded to the Convention in the period from 2014 to the present. There are African Union (AU) Member States that have signed up to the Kampala Convention but have not taken the required action to ratify or accede to it, even after

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54 African Union, 'African Union Convention for the Protection and Assistance of Internally Displaced Persons in Africa (the Kampala Convention)' <https://au.int/en/treaties> accessed 15 September 2024.

55 International Committee of the Red Cross (ICRC), 'Translating the Kampala Convention into practice: A stocktaking exercise of International Review of the Red Cross', (2017) 99 (1) Journal of Migration and Displacement 365–420. <https://doi.org/10.1017/S1816383117000601>.

56 Ibid

57 Ibid.

several years of entering into force. More worrisome is that many African States are experiencing delays in the process of enacting the necessary legislation to give domestic effect to the Convention as a means of operationalizing the Convention. Some of the identified reasons for not operationalizing the convention may include lack of awareness by some authorities on the issue of displacements, their obligations, and/or on the importance of the Kampala Convention; lack of capacity; lack of budget allocations; and internal/environmental displacements not being seen as a priority issue by the authorities.[58]

Acknowledging the urgent need to address the impact of internal displacement/Environmental displacement on the continent and the Convention's potential to this effect, the African Union Commission (AUC) launched a strategy, in cooperation with its partners and United Nations agencies. This strategy aims at achieving continent-wide ratification and full implementation of the Convention. It focuses on four key elements: (1) capacity-building for Member State institutions dealing with the issue of internal displacement; (2) promoting ratification and domestication of the Kampala Convention; (3) strengthening and monitoring reporting mechanisms; and (4) awareness of, advocacy for and promotion of the Convention. However, just like operationalizing the SDGs and Agenda 2063 requires an inclusion process, the domestic implementation of the Kampala Convention also requires an inclusive process. This means engaging all key domestic actors across African countries in consultations, information sharing, and decision-making. These include ministries and governmental agencies concerned, at central and field levels, municipal authorities and civil society organizations, as well as IDPs/ EDPs. Without an inclusive process, operationalizing the convention at the domestic level may suffer setbacks. Public education and raising awareness of the Kampala Convention and the plight of IDPs/EDPs are important factors in translating political commitments into concrete measures. These activities can be usefully carried out with the public authorities and civil society, as well as survivors of IDPs/EDPs. They can serve to encourage the public's interest and engagement, and their dialogue with public authorities, on the issue of environmental displacement. This, in turn, can help ensure that addressing environmental displacement remains a priority that enjoys sustained political will.

Special attention should be given to ensuring that laws and policies are created on domesticated conventions, and made available in all official and local languages of the most affected stakeholders. Laws and policies that will address issues of environmental displacement must contain provisions for adequate means for their implementation and operationalization, such as institutional/mandate, human resources, and budget.[59] This is because implementation processes may be stalled because of a lack of adequate

[58] ICRC, 'The Kampala Convention: Key Recommendations Ten Years on' <https://www.icrc.org> accessed 9 September 2024.

[59] Ibid

resources to sustain the work. Concerted efforts and practical measures are urgently required to operationalize the SDGS and African Agenda 2063 using the Kampala Convention to address the impact of environmental displacement in Africa.

7. CHALLENGES AND PROSPECTS

This section will examine the challenges in implementing the SDGs, Agenda 2063, and Indigenous Knowledge Systems (IKS) to address environmental displacement as well as the potential opportunities for success. Africa is battling with challenges such as poverty, lack of awareness, food insecurity, water scarcity, environmentally induced conflicts, political instability, infrastructural development and undocumented African indigenous knowledge systems. It is notable to briefly examine some of the identified challenges intensified by the negative impacts of environmental displacement in Africa.

7.1 Poverty

Statistics have shown that 460 million Africans are projected to remain poor in 2030, and this is exacerbated by climate change effects such as climate-induced displacements and the COVID-19 pandemic.[60] This translates into 8 in 10 of the world's poor will be living on the African continent. Of those, nearly two-thirds are in rural areas, and the most affected are women, children, and the youth. Climate change effects made many African households susceptible to displacement, hence the increased rate of migration in search of a home and sources of livelihood. Climate change adaptation and mitigation measures are rarely explored because of poverty and lack of awareness. Women continue to face unique adversities which leave them more vulnerable and poorer. Currently, 7 of the 10 most unequal economies are in Africa, with the top 10% accounting for more than 50% of the national pre-tax income while the bottom 50% account for less than 10%.[61] It is notable that 33 of the 36 countries in the low human development category are in Africa.[62] Labour market exclusion is on the increase across African countries. Further, social protection coverage remains unavailable as Africa becomes the world's poverty capital. The situation is not poised to change unless active, structural changes are implemented. Poor implementation of policies that adequately address the welfare of environmental refugees is a challenge. This means displaced people or those at risk of displacement may not receive the support they need despite the high-level frameworks in place.

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60 Abdulkareem Mojeed, 'Climate Change: Why over 40 Million Africans May Experience Extreme Poverty by 2030-Report' (2022) Premium Times, 25 May 2022. <https://www.premiumtimesng.com> accessed 10 September 2024.

61 Ibid.

62 Lily Welborn, 'Climate Change and Poverty in Africa' <https://reliefweb.int/> accessed 12 September 2024.

7.2 Lack of Awareness

Africa has the highest rates of education exclusion.[63] Pre-COVID-19 trend analyses show that children, adolescents, and youth in Africa are more than five times as likely to be out of school and also aware of events happening around them when compared to children, adolescents, and youth in Asia and Europe by 2030.[64] For example, in Africa, over 5.3 million learners are at risk of not going back to school due to the pandemic as well as poverty.[65] The average internet penetration rate remains lower for Africa (26%) compared to the world's average (57%). The cost of internet-enabled devices has not significantly fallen in Africa. Only 10 out of 45 countries in Africa (22%) have affordable internet, which still falls short of the target of monthly income per capita of 1 GB by 2.3%.[66] Issues of affordability and the ability to use the devices optimally exclude many users, and displaced persons are inclusive. This is a call to awareness on how to mitigate climate change and environmental displacements in Africa.

7.3 The Desire to Migrate and Brain Drain in Africa

Environmental displacement and lack of response to the plight of environmentally displaced persons by most governments increased the desire to migrate to other continents. The reason for migration, which often results in brain drain in the African continent, is the search for shelter and means of livelihood. Considering the brain drain and increase in migration, mitigating environmental displacement in Africa faces a lot of challenges, as environmentally displaced persons give preference to migration over addressing the root causes of environmental displacement in Africa. The constant neglect of how to address or mitigate climate-related disasters makes the continent more vulnerable to climate-induced displacements.[67]

7.4 Environmental Displacement and Increased Scarcity of Food and Water in Africa

Africa has the highest prevalence of food insecurity and water scarcity. Environmental displacement has resulted in environmental-induced conflicts that exacerbated food insecurity, for example, the farmer's-herders' conflicts, which are fueled by climate-related disasters and environmental displacements, forcing herders to migrate in search of pastures for their animals. Also, food insecurity and water scarcity were exacerbated by the

63 Isaac Kaledzi, 'Why the Right to Education remains a Challenge in Africa' <https://www.dw.com/en/africa-right-to-education-remains-a-challenge> accessed 7 September 2024.

64 UNICEF, 'COVID-19 A Catastrophe for Children in Sub-Saharan Africa' <https://www.unicef.org/> accessed 6 September 2024.

65 UNESCO, 'UN Secretary-General warns of education catastrophe, pointing to UNESCO estimate of 24 million learners at risk of dropping out' < https://www.unesco.org/> accessed 2 April 2025.

66 Paula Gilbert, 'The State of Mobile broadband affordability in Africa' <https://www.connectingafrica.com> accessed 12 September 2024.

67 Amal El Ouassif, 'Policy Center for the New South, 'The Challenge of Youth Bulge in Africa and Middle East, Migration and Brain Drain' <https://www.policycenter.ma> accessed 13 September 2024.

COVID-19 pandemic, as it is projected that 38-80 million people in African countries are experiencing food insecurity post-COVID-19.[68] Displaced persons are at risk of being malnourished if food insecurity and water scarcity are not addressed, as food and water are essential for human survival.

7.5 Absence of Sustainable Development in Africa

Africa lags behind the rest of the world in all dimensions of inclusive infrastructure – quantity, quality, cost, and access. Also, the government hardly provides even basic shelter to alleviate the suffering of environmentally Displaced persons. In some cases, the EDPs are kept in makeshift shelters, public schools, and most inhumane conditions, with little or no food, leaving them at the mercy of charity. Where they are kept in IDP camps, the camps lack basic amenities and good health care facilities. This leaves them vulnerable to crime and increases migration. Also, the absence of basic amenities and infrastructure has increased cases of migration to other continents. Thus, only 25 percent of Africa's Road networks are paved compared to the world's average of more than 50 percent. Out of the paved roads in Africa, only 49 percent are in good condition, and 85 percent of rural feeder roads remain in poor condition, depriving many people, especially the EDPs, access to basic services, especially healthcare facilities.[69] The fact that there are no plans to resettle them makes it more difficult and has led to the death of many displaced persons.

7.6 Political instability

Political instability and the non-sustainability of projects by various governments in Africa are also major challenges in mitigating environmental displacement in Africa. One major challenge faced in the African governance system is the continuity and sustainability of projects. Despite embracing democracy, most governments in Africa operate in autocracy. Upon being voted into power, a new government will commence new projects and abandon the ongoing projects of its predecessor. This has frustrated the enforcement of laws and implementation of various robust policies. Continuity in government is key to mitigating environmental displacements in Africa.[70]

Despite the challenges marshalled above, addressing the impacts of environmental displacements in Africa is not without prospects. Thus, where the welfare of EDPs is prioritized by the government and where they are empowered to embrace climate change mitigation and adaptation strategies, migration and environmental displacement will be a forgotten matter. Also,

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68 World Meteorological Organization, 'Climate Change triggers mounting Food Insecurity, Poverty and Displacements in Africa' <https://public.wmo.int/>accessed 13 September 2024.

69 Belay Begashaw, 'African and the Sustainable Development Goals: A Long Way to go' <https://www.brookings.edu> accessed 11 September 2024.

70 Mohamed Atani, 'UN Environment Program, Displacement and Environment in Africa: What is the Relationship?' (2016) <https://www.unep.org/news-and-stories/story/displacement-and-environment-africa-what-relationship> accessed 12 April 2025.

operationalizing the SDGs, African Agenda 2063, and the Kampala convention through all-inclusive mechanisms for stakeholders across African countries will no doubt help address the impact of environmental displacements in Africa. This is because the SDGs and African Agenda 2063 contain goals and targets for sustainable development and environmental sustainability. Also, considering that the first 10-year implementation plan of Agenda 2063 has expired and yet not much has been achieved in terms of implementation of the African Agenda 2063, there is a need for African countries to collaborate and also put in more efforts toward operationalizing Agenda 2063.

7.7. Undocumented African Indigenous Knowledge Systems

The African Indigenous knowledge system has been identified in this research as an effective homegrown approach to address negative climate change effects, such as climate-induced displacements. However, it is saddening that these knowledge systems are not documented and may be eroded in future if not addressed now. The need to preserve and revive the African Indigenous Knowledge Systems by empowering local communities in Africa and rediscovering the values of the indigenous people is essential to preserve these knowledge systems. Building and strengthening national institutions and cultures relating to indigenous knowledge is very important. Mainstreaming them into national development planning and sectoral development policies and programs, especially poverty reduction and environmental protection programs, promoting and enhancing IKS through the development of partnerships and stakeholder networks should be encouraged. Though passed from generation to generation, the need to document these knowledge systems or integrate them into education curricula in African countries cannot be overemphasized, as this will help preserve these knowledge systems, which promote nature-based solutions to mitigate and adapt to climate change effects. Application of this knowledge will no doubt address climate-related disasters, which are the root cause of environmental displacement. This will reduce the number of environmental displaced persons in Africa.

8. CONCLUSION AND RECOMMENDATION

The feasibility of achieving sustainable development in Africa, to a great extent, depends on the transformation of its states into active states. Most African countries are structurally weak to spearhead national development. Africa suffers weak capacity to implement development-based policies and laws. This is as a result of bad governance, lack of political will and lack of continuity in governance. Before major environmental development milestones can be hit, there must be a major overhaul in African orientation, especially in addressing hunger, poverty, migration, environmental sustainability and other incidental areas.

The crux of operationalizing SDGs through Africa Agenda 2063 is twofold - recognizing that the goals of the SDGs are all interdependent, interrelated, and indivisible, just like human rights principles. This principle also resonates with that of the Africa Agenda 2063. The second point is in the SDG 2030 principle of inclusion. The 'Leave no one behind' policy also resonates with 'The African We Want' mantra of Africa Agenda 2063.

It is pertinent that getting these two principles right must translate to the re-orientation of the people. Awareness must be created to educate people on the need to embrace sustainable development. People must understand environmental matters, not just because of the displacement, but generally to avoid creating environmental problems that could complicate the status quo. A proper legal framework or reform of extant legal frameworks must be deployed to address the different areas of development and environmental sustainability. The proposed legal framework or reforms must integrate a home-grown approach using the African indigenous knowledge system, which promotes nature-based solutions and has proved to be effective in addressing environmental sustainability, climate change effects and environmental displacements.

This means that SDGs and African Agenda 2063 can best be operationalized through the Afrocentric way to address challenges that are peculiar to the region. Thus, domestic laws and policies should encourage all-around development, as a law is being made for the eradication of poverty, there is a law or policy in place encouraging environmental sustainability and agriculture, so that food production will be on the increase. As legislation is ongoing in agriculture, there must be policies in place to recognize African indigenous agricultural practices that are environmentally or climate-friendly. The cycle is endless until there is an active state. When these happen, the issue of environmental challenges that result in environmentally induced internal displacements will also have been adequately addressed, and no one will be left behind.

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AUTHORS' DECLARATION AND ESSENTIAL ETHICAL COMPLIANCES

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	*Author 1*	*Author 2*	*Author 3*
Conceived and designed the research or analysis	Yes	Yes	No
Collected the data	Yes	Yes	Yes
Contributed to data analysis and interpretation	Yes	Yes	Yes
Wrote the article/paper	Yes	Yes	Yes
Critical revision of the article/paper	Yes	Yes	Yes
Editing the article/paper	Yes	Yes	Yes
Supervision	Yes	Yes	Yes
Project administration	Yes	Yes	Yes
Funding acquisition	Yes	Yes	Yes
Overall contribution proportion (%)	35	35	30

Funding
No funding was available for the research conducted for and writing of this paper.

Research involving human bodies or organs or tissues (Helsinki Declaration)
The author(s) solemnly declare(s) that this research has not involved any human subject (body or organs) for experimentation. It was not a clinical research. The contexts of human population/participation were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of Helsinki Declaration does not apply in cases of this study or written work.

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(Optional) PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)
The author(s) has/have NOT complied with PRISMA standards. It is not relevant in case of this study or written work.

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Author(s) has/have no competing financial, professional, or personal interests from other parties or in publishing this manuscript. There is no conflict of interest with the publisher or the editorial team or the reviewers.

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JOURNAL OF ENVIRONMENTAL LAW & POLICY | 05(01) APRIL 2025
Published by The Grassroots Institute in partnership with Asia Pacific Academy of science Pte Ltd. Website: https://grassrootsjournals.org/jelp
Main Indexing: SCOPUS, EBSCO, HEIN ONLINE

ISSN 2564-016X | April 2025

M – 00539 | Analytical Article | Open Access

CONTRACTUAL BASIS OF MINE ACTION AS A COMPONENT OF THE RESTORATION OF UKRAINE'S NATURAL RESOURCE POTENTIAL

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Received: 22 February 2025 | **Reviewed:** 24 March 2025 | **Revised:** 26 March 2025
Accepted: 31 March 2025 | **Published:** 21 April 2025

ABSTRACT

In the context of Russia's full-scale armed aggression and the widespread contamination of Ukraine's territory with landmines and other explosive remnants of war, the legal regulation of contractual relations in the field of humanitarian demining is of critical importance for ensuring the effective and transparent implementation of demining activities and the sustainable restoration of the country's natural resource potential. The aim of this study is to identify the specific features of contractual regulation in humanitarian demining as a key component of post-conflict ecological recovery, to reveal existing legal gaps, and to develop practical recommendations for improving the regulatory framework for mine action within the broader environmental security context. The research adopts a desk-based methodology, focusing on the analysis of current Ukrainian legislation, international treaties, environmental and legal policy frameworks, and reports by national

authorities (e.g., the Ministry of Environmental Protection and Natural Resources, the Ministry of Defence of Ukraine) and international institutions such as the Geneva International Centre for Humanitarian Demining. Particular attention is paid to the practice of public procurement in the field of humanitarian demining (via the Prozorro system), which allows for the identification of common contract models, clarification of their legal regulation, and diagnosis of key obstacles to implementation. Through a comparative approach, the study also reviews international documents, including the International Mine Action Standards (IMAS), the UN PERAC Guidelines on environmental assessments in post-conflict settings, and the provisions of the Ottawa Convention and the Convention on Cluster Munitions. The interdisciplinary framework of the study enables an integrated understanding of demining contracts not only as legal instruments but also as tools for the sustainable management and restoration of damaged ecosystems. The findings of the research can be integrated into Ukraine's national policy on post-war recovery and contribute to enhancing the legal and institutional foundations of environmental safety.

Keywords: Land restoration; Environmental security; Ecological rehabilitation; Humanitarian demining; Sustainable development; Legal mechanisms

Editor-in-Chief: Prof. Dr. Kamrul Hossain | *Deputy Editors-in-Chief:* Dr. Evgeniya Kopitsa, Prof. Dr. Ngozi Finette Unuigbe | *Executive Editor:* Dr. Hasrat Arjjumend

How to cite this paper: Hanna Anisimova, Olha Donets, Anton Donets, Kyrylo Anisimov, and Hasrat Arjjumend, 'Contractual Basis of Mine Action as a Component of the Restoration of Ukraine's Natural Resource Potential' (2025) 05 (01) Journal of Environmental Law & Policy 229-257, <https://doi.org/10.33002/jelp050109>

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Contractual Basis of Mine Action as a Component of the Restoration of Ukraine's Natural Resource Potential

1. INTRODUCTION

In the legal doctrine, contaminating territories with remnants of war, in particular, mines, cluster munitions together with other explosive objects, is reckoned as having a long-term and detrimental impact on the environment.[1] Armed actions not only pose a direct threat to human life and health but also result in the destruction of natural landscapes, imbalance in ecosystems, their degradation, as well as the accumulation of toxic and radioactive substances in the environment, hence, exceeding safe levels in addition to creating severe hazards to ecosystem stability and overall environmental security.

According to the United Nations Environment Program (UNEP) and the Explosive Weapons in Populated Areas (EWIPA) initiative, Ukraine has joined the list of countries suffering large-scale environmental losses due to armed conflicts, namely, Afghanistan, Iraq, and Syria.[2] According the international reports, the level of contamination with explosive ordnance in Ukraine is estimated as "massive, though unidentified."[3] In the de-occupied territories alone, at least 139 thousand square kilometres (km²) are mined. However, due to the ongoing hostilities along with the occupation of more than 10.7% of the country's territory, it is yet not possible to accurately assess the overall level of pollution.[4] It should be noted that mining territories have been documented in 11 out of the 27 regions of Ukraine, particularly, in Chernihiv, Dnipropetrovsk, Donetsk, Kharkiv, Kherson, Kyiv, Luhansk, Mykolaiv, Odesa, Sumy, and Zaporizhzhia[5] ones. The vast majority of the above-mentioned areas are unique natural ecosystems, specifically, protected areas, wetlands, woodlands or agricultural lands with fertile chernozem soils, mine contamination of which not only prevents conducting economic activities and restoring biodiversity but also leads to devastating considerable territories.

In this context, humanitarian demining is of significance in ensuring the safe restoration of ecosystems, return of agricultural land to economic circulation as well as restoration of economic activity. In compliance with the recent advances in the specified area, the gradual implementation of large-scale measures can be indicated; to exemplify, in 2024, 3,152.52 km² were surveyed, more than 2,500 km² of which have already been cleared of explosive objects. To elucidate, a crucial milestone was the implementation of the Action Plan for Humanitarian Demining of the De-Occupied

1 "Post-Conflict Mine Actions. National University of Life and Environmental Sciences of Ukraine" *(Nubip.edu.ua)* <https://nubip.edu.ua/node/107513> accessed February 22, 2025.
2 "Environmental Legacy of Explosive Weapons in Populated Areas" (Unep.org) <https://www.unep.org/es/node/30417> accessed February 22, 2025.
3 "Landmine Monitor" *(Reliefweb.int)* <https://shorturl.at/FAMrz> accessed February 22, 2025.
4 "The Area of Ukraine's Territories Potentially Contaminated by Mines and Explosive Objects Decreased by 17,000 km2 in 2024" *(Mod.gov.ua)* <https://mod.gov.ua/news/ploshha-teritorij-ukrayini-potenczijno-zabrudnenih-minami-ta-vibuhonebezpechnimi-predmetami-zmenshilas-na-17-000-km-u-2024-roczi> accessed February 22, 2025.
5 "Landmine Monitor" *(Reliefweb.int)* <https://shorturl.at/qwvPR> accessed February 22, 2025.

Territories of Ukraine, within the framework of which a non-technical survey was carried out in 165 communities of 7 regions – almost three times more than had been planned. In addition to that, 2,291 sites of presumably contaminated areas with a total area of 302.9 km² were identified, thus, highlighting the scale of the problem together with the need for further coordinated efforts to clean up the territories and restore ecosystems. An important aspect of the aforementioned process is to contractually regulate mine action. Determining the rights and obligations of the parties in the mine clearance process, responsibility for the quality of the work performed, as well as financing and international cooperation mechanisms are necessary prerequisites for the efficient restoration of territories and ecosystems contaminated by the remnants of the armed conflict.

The study aims to identify the features of the contractual regulation of mine action as a component of restoring the natural resource potential of Ukraine, to analyze international experience in the stated area, in addition to defining legal gaps and developing recommendations for improving the regulatory support of humanitarian demining and environmental rehabilitation of territories.

The chosen aim led to the formulation and solution of the following tasks:

1. To analyze the national legislation of Ukraine on mine action in terms of its effectiveness, compliance with international standards together with the role of contractual regulation in the mentioned process;
2. To study the practice of concluding contracts in the field of humanitarian demining, to determine their features, essential terms, and obligations along with mechanisms for monitoring their implementation;
3. To identify the major problems of the contractual regulation of demining in Ukraine, in particular, legal conflicts, lack of common standards, difficulties in financing as well as coordination between state and international structures;
4. To outline promising and effective means of improving the contractual regulation of mine action in Ukraine, including legislative changes, implementation of international practices and mechanisms of interaction between public and private entities;
5. To assess the prospects for using the treaty mechanism for ecological restoration of territories contaminated with explosive remnants of armed conflict in addition to integrating these processes into the overall sustainable development policy of Ukraine.

2. LITERATURE REVIEW

The scientific study of the contractual principles of mine action as a component of restoring the natural resource potential of Ukraine is based on

theoretical and applied works of domestic together with foreign scientists who analyze the legal, environmental as well and organizational aspects of humanitarian demining. It is worth noting the exponential increase in the number of studies published in Ukraine on both environmental restoration and humanitarian demining. Analyzing the Google Scholar database for keywords such as "ecological restoration," "humanitarian demining," "agricultural land clearance," "mine action," and "lands/ecosystems demining" demonstrates a steady enhancement in the number of publications in the above areas, exceptionally after the outbreak of the armed conflict in eastern Ukraine in 2014. For instance, the quota of those dedicated to land and soil restoration has significantly gone up, to precise, from 183 articles in 2000-2001 to more than 8000 in 2023-2024. However, until 2020, general issues of land restoration were under greater consideration, while current research is mainly focused on the consequences of the armed conflict in addition to challenges associated with post-war land restoration.

The number of scientific works devoted to humanitarian demining also manifests a gradual upward trend, to be precise, 241 papers had been published within a thirteen-year time scale (namely, from 2000 to 2013); their quantity had considerably improved by 1,230 in the following decade. Only during the period from 2022 to February 2025, 4,190 works had been brought out. Due to the relevance of the specified topic for Ukraine along with other post-conflict regions, a particularly noticeable increase in research in this area occurred after 2022. However, the legal aspect of humanitarian demining, especially the contractual principles of mine action in Ukraine, remains largely under-ascertained because most studies are focused on technical issues of demining, risk assessment together with environmental impacts. To exemplify, the issue of determining the priority of demining territories has been considered by Bespalko et al.;[6] general prospects for developing mine action in Ukraine and the content of NATO standards have been studied by Lappo et al.,[7] Drobot et al.;[8] public administration in the aforementioned area has been analyzed by Poteriaiko et al.;[9] economic as well as legal aspects have

[6] Ruslan Bespalko, Taras Hutsul, Ivan Kazimir and Kateryna Myronchuk, "Modern Approaches to Assessing the Sequence of Humanitarian Demining of Territories" (2023) 1(31) Technical Sciences and Technologies 146-157 <https://doi.org/10.25140/2411-5363-2023-1(31)-146-157>.

[7] Iryna Lappo, Yevgenii Biriukov, Oleksii Zhurakhov and Yurii Dobryshkin, "The Mine Activities Centre: The Main Aspects of Activity and Development Prospects" (2023) 1(15) Collection of Scientific Works of the State Research Institute of Testing and Certification of Weapons and Military Equipment 74-80 <https://doi.org/10.37701/dndivsovt.15.2023.10>.

[8] Olha Drobot and Maryna Rudenko, "Algorithm of Implementing the Experience in Organizing a Technical Regulation System for Assessing Conformity and Certification of Weapons and Military Equipment. Testing and Certification of Weapons and Military Equipment" (II scientific-Technological Conference of State Research Institute of Testing and Certification of Weapons and Military Equipment, Cherkasy, December 2023) 448-449.

[9] Serhii Poteriaiko and Anatolii Okipniak, "Mechanisms of State Management of Mine Action in Ukraine" (2022) 2(12) Scientific Bulletin: Public Administration 304-321 <https://doi.org/10.33269/2618-0065-2022-2(12)-304-321>.

been investigated by Ustymenko et al.;[10] challenges and needs arising while mine clearance have been the subject of research by Zadorozhnyi et al.[11]

It should be emphasized that the analysis of scientific research indicates a significant interest of the scientific community in mine detection, and application of artificial intelligence for risk assessment, in addition to the introduction of unmanned technologies in the demining process (Camacho-Sanchez et al.).[12] Furthermore, technological difficulties, issues, priorities together with prospects for using robotics in demining have been considered by Habib;[13] The relationship between humanitarian demining and sustainable land management in post-conflict regions has been investigated by Gunawardana et al.[14] Particular attention is paid to the need for prompt clearance of territories to minimize the negative long-term consequences along with the impact of mines on the safety of the civilian population and the environment, as well as hurdles when restoring damaged areas (Pedraza;[15] Robinson et al.[16]).

At the same time, regardless of the considerable number of scientific papers dedicated to humanitarian demining together with environmental consequences of armed conflicts, the issue of comprehensive contractual regulation of the mentioned area remains insufficiently developed. In terms of restoring Ukraine's natural resource potential requiring coordinated legal, environmental, in addition, management mechanisms, the relevance of examining the contractual principles of mine action is growing, which, in turn, involves determining the optimal interaction between state institutions, international partners and the private sector. Taking into account international experience along with the specifics of Ukraine's current security challenges, such a study will contribute to developing efficient legal instruments to ensure transparent contractual regulation of mine action, hence, promoting the environmental restoration of the affected areas.

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[10] Volodymyr Ustymenko, Yuliia Rohozian, Oleksandr Trehub, Pavlo Liashenko and Dariia Zablodska, "Economic and Legal Dimension of Humanitarian Demining of Ukraine: Problem and Research Prospects" (2023) 12(65) Amazonia Investiga 287-295 <https://doi.org/10.34069/AI/2023.65.05.27>.

[11] Volodymyr Zadorozhnyi, Myhailo Faifura and Vasyl Tsegelnyk, "Challenges and Needs of Ukraine during Demining of Territories Affected by the War in 2022" (2023) 1(113) Young Scientist 10-13 <https://doi.org/10.32839/2304-5809/2023-1-113-3>.

[12] Carolay Camacho-Sanchez, Ruben Yie-Pinedo and Gina Galindo, "Humanitarian Demining for the Clearance of Landmine-Affected Areas" (2023) 88(101611) Socio-Economic Planning Sciences 1-13 <https://doi.org/10.1016/j.seps.2023.101611>.

[13] Maki Habib, "Humanitarian Demining: The Problem, Difficulties, Priorities, Demining Technology and the Challenge for Robotics" (2008) 5(1) International Journal of Advanced Robotic Systems 1-18 <https://www.researchgate.net/publication/257873861_Humanitarian_Demining_Innovative_Solutions_and_the_Challenges_of_Technology> accessed February 22, 2025.

[14] Harshi Gunawardana, Dammika Tantrigoda and Anura Kumara, "Humanitarian Demining and Sustainable Land Management in Post-Conflict Settings in Sri Lanka: Literature Review" (2016) 6(3) Journal of Management and Sustainability <https://doi.org/10.5539/jms.v6n3p79>.

[15] Diana Pedraza, "Ethical Disconcertment and the Politics of Troublemaking" (2023) 50(3) American Ethnologist 462-473 <https://doi.org/10.1111/amet.13198>.

[16] Toby Robinson and Rosanna O'Keeffe, "The Challenges of Humanitarian Mine Clearance in Ukraine" (2019) 23(1) The Journal of Conventional Weapons Destruction 17-23 <https://commons.lib.jmu.edu/cisr-journal/vol23/iss1/8> accessed February 22, 2025.

3. METHODOLOGY

This study adopts a qualitative legal research methodology combining doctrinal legal analysis with policy-oriented and interdisciplinary environmental approaches. The research primarily relied on desk-based methods, including a comprehensive review of legal documents, national legislation, and international treaties relevant to mine action and environmental rehabilitation in Ukraine. A systematic analysis of statutory instruments, governmental strategies, and official regulations-such as the Law of Ukraine "On Mine Action," the National Mine Action Strategy until 2033, and the Ministry of Environmental Protection's Strategic Action Plan-was undertaken to assess the contractual dimension of mine action.

The research also employed content analysis of official procurement databases, particularly the ProZorro electronic public procurement system, to identify and analyze existing contract types, structures, and implementation issues in humanitarian demining. This allowed for a deeper understanding of current practices, compliance challenges, and areas lacking regulation in contractual relations concerning mine action. To ensure a comparative perspective, international standards such as the International Mine Action Standards (IMAS), PERAC principles adopted by the United Nations, and environmental components of global treaties (e.g., the Anti-Personnel Mine Ban Convention, Convention on Cluster Munitions) were examined. Case studies and best practices from international mine action programs were incorporated to contextualize Ukraine's current practices within global trends and to derive recommendations for national improvements.

The interdisciplinary nature of the research integrates environmental law and natural resource management, highlighting the ecological consequences of war contamination and the legal instruments necessary for sustainable land rehabilitation. The research findings are grounded in the critical analysis of legal frameworks and policy documents, supported by up-to-date statistical and institutional data, ensuring the relevance and applicability of the proposed recommendations for Ukraine's post-conflict ecological recovery.

4. RESULTS

4.1. Mine Action and Environmental Protection: International and National Dimensions

Mine action is a crucial component of global security addressing threats caused by mines and explosive remnants of armed conflicts, which, in turn, seriously affect the lives of the civilian population, infrastructure development along the environmental condition of the affected areas. In addition to that, recognizing the long-term and serious risks as well as threats posed by mine hazards to the population, environment, and social stability together with the economic development of countries affected by armed

conflicts, the UN General Assembly called on international, regional and national programs to include mine action, mine clearance in particular, in their rehabilitation along with recovery initiatives (Resolution A/RES/60/97[17]). The aforementioned approach is reflected in modern international practice, where demining is regarded not only as a means of eliminating military threats but also as a key component of restoring the affected territories and ecosystems, ensuring their safe use together with the sustainable development of the country.

In the context of post-conflict settlement, the concept of "jus post bellum" is gradually becoming more and more relevant.[18] The latter concerns ensuring a just transition from a state of war to peace covering legal mechanisms aimed at restoring the affected regions, particularly, environmental rehabilitation. The doctrine of law emphasizes the multiplicity of approaches to comprehending the above concept, noting that the specified has a dual nature, to be precise, on the other hand, the latter contributes to correcting military consequences, and on the other hand, it promotes creating conditions for sustainable peace.[19] At the same time, the concept of "jus post bellum" is also considered through the prism of ecological restoration, reflected in international law. To exemplify, UN Protocol V CCW/MSP/2003/2 "On Explosive Remnants of War to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Injurious or to Have Indiscriminate Effects" enshrined the responsibility of "High Contracting Parties and Parties to an armed conflict concerning all explosive remnants of war in the territory under its control" (Art. 3[20]). The stated provision was further updated and expanded in UN Resolution

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17 UN General Assembly Resolution A/RES60/97 "On the Report of the Special Political and Decolonization Committee (Fourth Committee) A/60/473" (18 January 2006) <https://documents.un.org/doc/undoc/gen/n05/493/42/pdf/n0549342.pdf?OpenElement> accessed February 24, 2025.

18 Carl Bruch, "Considerations in Framing the Environmental Dimensions of the Jus Post Bellum" in Carsten Stahn, Jens Iverson and Jeniffer Easterday (eds), *Environmental Protection and Transitions from Conflict to Peace: Clarifying Norms, Principles, and Practices* (Oxford Academic, 2017) 29-39 <https://doi.org/10.1093/oso/9780198784630.003.0002>; Karen Hulme, "Using a Framework of Human Rights and Transitional Justice for Post-Conflict Environmental Protection and Remediation" in Carsten Stahn, Jens Iverson and Jeniffer Easterday (eds), *Environmental Protection and Transitions from Conflict to Peace: Clarifying Norms, Principles, and Practices* (Oxford Academic, 2017) 119-142 <https://doi.org/10.1093/oso/9780198784630.003.0006>; Kirsten Stefanik, "The Environment and Armed Conflict: Employing General Principles to Protect the Environment" in Carsten Stahn, Jens Iverson and Jeniffer Easterday (eds), *Environmental Protection and Transitions from Conflict to Peace: Clarifying Norms, Principles, and Practices* (Oxford Academic, 2017) 93-118 <https://doi.org/10.1093/oso/9780198784630.003.0005>; Carsten Stahn and Jens Iverson (ed.) *Just Peace after Conflict: Jus Post Bellum and the Justice of Peace* (Oxford University Press, 2021) <https://doi.org/10.1093/oso/9780198823285.001.0001>.

19 Carsten Stahn, Jennifer Easterday and Jens Iverson (ed.), *Jus Post Bellum: Mapping the Normative Foundations* (Oxford University Press, 2014) <https://doi.org/10.1093/acprof:oso/9780199685899.001.0001>.

20 UN Treaty Series 2399, Protocol V CCW/MSP/2003/2 "On Explosive Remnants of War to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Injurious or to Have Indiscriminate Effects" (November 12, 2006) <https://treaties.unoda.org/t/ccw_p5> accessed February 24, 2025.

A/RES/77/104,[21] enshrined the PERAC Code of Principles, namely, a document of twenty-seven principles at protecting the environment in the context of armed conflicts, involving provisions applicable in the post-conflict period (Principles 22-27). The aforementioned principles provide for including environmental rehabilitation in peace processes, exchanging information on the environmental consequences of hostilities, conducting environmental assessments and restoration measures, as well as "the earliest possible elimination or neutralization of toxic or other dangerous remnants of war, which <...> cause or may cause damage to the environment. Such measures should be carried out by the current norms of international law" (Principle 26).

Furthermore, the International Committee of the Red Cross (ICRC) 2020 Guidelines[22] define minimum customary standards for using landmines and explosive remnants of war, designed to reduce their impact on the civilian population along with the environment. Thus, within the framework of Norm 24. A, it is stipulated that parties to the conflict should be exceptionally cautious when using landmines, hence, minimizing their indiscriminate action as well as preventing negative impact on the natural environment (to elucidate, the mentioned norm is applied to a small number of States that are not parties to the 1997 Convention "On the Prohibition of Anti-personnel Mines" or Protocol II (1996) as amended to the Convention "On Prohibitions or Restrictions on the Use of Certain Conventional Weapons"[23]). Moreover, a party to the conflict using mines should, if possible, register their placement, and after the end of active hostilities, remove or otherwise make the latter safe for the civilian population or contribute to demining (to highlight, the given requirement applies to all armed conflicts, i.e. both international and non-international ones). States Parties to the first provided Convention have even more severe obligations, including a complete ban on using such mines, the need to destroy their stockpiles in addition to the obligation to clear up areas contaminated with anti-personnel mines under their jurisdiction or control. It should be emphasized that any use of landmines is governed by general customary norms of distinction, proportionality together with precautions.

The issue of belittling the impact of explosive remnants of war, specifically, unexploded cluster munitions, is also of great importance for legal regulation. According to Norm 25 of the ICRC Guidelines, States Parties of Protocol V to the Convention "On Certain Conventional Weapons" shall

[21] UN General Assembly Resolution A/RES/77/104 "On the Report of the Sixth Committee (A/77/415, Para. 12)" (December 7, 2022) <https://digitallibrary.un.org/record/3998322?v=pdf> accessed February 24, 2025.

[22] International Committee of the Red Cross (ICRC), "Guidelines on protection of natural environment in armed conflict" <https://www.icrc.org/en/document/guidelines-protection-natural-environment-armed-conflict-rules-and-recommendations-relating> accessed February 24, 2025.

[23] International Committee of the Red Cross (ICRC), Protocol "On Prohibitions or Restrictions on the Use of Mines, Booby-Traps and Other Devices as Amended on May 3, 1996 (Protocol II to the 1980 CCW Convention as Amended on May 3, 1996)" <https://ihl-databases.icrc.org/en/ihl-treaties/ccw-amended-protocol-ii-1996> accessed February 24, 2025.

provide recordings on the use of explosive ordnance, transmit the latter after the end of hostilities, and ensure identifying places where explosive remnants of war are as those contaminated, neutralized or destroyed. At the same time, the States Parties to the Convention "On Cluster Munitions" have an absolute obligation not to apply such ammunition, though to destroy all their stockpiles as well as leading to their disposal by environmental standards.

It is pertinent to add that the Convention "On the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction"[24] and the Convention "On Cluster Munitions"[25] claim the requests for extending time limits for clearing areas contaminated with anti-personnel mines together with cluster munitions to contain specific information on the environmental consequences of such an extension. Both Conventions either require States Parties to provide reports on measures taken, involving references to applicable safety along with environmental standards to be complied with.

In the above-described context, peculiar attention should be paid to the "Do No Harm" approach, widely used in international humanitarian practice, including mine action. The specified approach implies the need to reduce any negative impact on the environment while demining and post-war rehabilitation of territories, which, in turn, is of particular relevance both in the context of land management and in terms of environmental safety. It should be elucidated that the International Mine Action Standards (IMAS)[26] take the given approach into account, stipulating that national authorities as well as mine action operators shall comply with environmental norms and standards. For instance, IMAS 10.70 explicitly states that mine clearance operations should be carried out not only with minimal environmental impact but also with safe handling of contaminated areas. In addition, special attention is paid to environmental protection, emphasizing the responsibility of national authorities along with mine action organizations to minimize the impact of mine clearance activities on the environment. The mentioned Document also stipulates the thing that after the completion of the stated operations, the area should remain suitable for further use due to its intended purpose. Thus, the above Standard directly enshrines the principle of "Do No Harm". In addition, the regulatory framework is complemented by the International Ammunition Technical Guidelines (IATG)[27] together with the standards of the International Organization for Standardization (ISO), aimed

[24] Convention "On the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction" (1997) < https://legal.un.org/avl/ha/cpusptam/cpusptam.html> accessed February 24, 2025.

[25] Convention "On Cluster Munitions" (2024) <https://www.clusterconvention.org/> accessed February 24, 2025.

[26] International Mine Action Standards (IMAS), "Discover the IMAS" <https://www.mineactionstandards.org/standards/> accessed February 24, 2025.

[27] UN Office for Disarmament Affairs, "International Ammunition Technical Guidelines" <https://disarmament.unoda.org/convarms/Ammunition/IATG/> accessed February 24, 2025.

at improving mine action and ensuring its environmental sustainability.[28] Based on the enumerated Documents, the mine action sector has developed a wide range of operational mine actions targeted at belittling the harmful impact of demining on the environment.

It should be highlighted that one of the key methods of environmentally sound demining is the "land release" system provided for by IMAS 07.11. The latter is based on a gradual survey of those territories, in which complete clearance is applied only in cases of confirmed contamination. Although IMAS standards do not contain particular points on environmental impact, the aforementioned approach may significantly reduce the environmental hazards associated with demining. It is also worth noting complementary measures aimed at lowering the detrimental impact of the above operations on the environment, which include the following: 1) conducting a comprehensive environmental assessment when planning land clearing operations; 2) determining the future intended use of the territory prior to mechanical clearance; 3) coordinating mine clearance schedules to ensure rapid use of post-clearance areas to restore vegetation cover and prevent erosion; 4) planting local flora immediately after clearing the territories; 5) planning mine clearance activities so as to avoid demining during strong winds or downpours; 6) leaving vegetation strips 3-4 meters wide in order to prevent erosion processes; 7) applying mechanized equipment only at the stage of land preparation, without destroying the upper fertile soil layer, and subsequent cleaning – manually or with the help of alternative technologies; 8) restoring the treated soil layers in the correct order so as to promote the fertile topsoil remaining on the surface.

The IMAS also contains recommendations for the prevention of chemical contamination. Mine action organizations should thoroughly select refuelling sites to in order prevent fuel along with lubricants from entering water sources. In addition, there should be introduced comprehensible rules for replacing such liquids and measures for safely disposing of waste. It is worth mentioning that effective planning of mechanized mine clearance activities should include environmental management, involving both cooperation with local communities and the development of environmental impact control measures. The said approach will not only minimize the harmful environmental effect of demining operations but also contribute to the rational use of cleared areas in future. Furthermore, taking into consideration the fact that ammunition disposal operations can negatively affect the environment due to soil and water pollution, it is reckoned appropriate to use nature-based oriented approaches in mine clearance and neutralization of hazardous materials. Specifically, the use of bioremediation together with phytoremediation can ensure the effective cleaning of

[28] IMAS has been developed in accordance with the Recommendations and Processes contained in ISO Quality Management Systems (ISO 9001: 2008) in addition to the ISO Risk Management System (ISO Guide 51). – See: International Mine Action Standards (IMAS), "01.10 Guide for the Application and Development of International Mine Action Standards (IMAS)" (July 3, 2024) <https://www.mineactionstandards.org/standards/01-10/> accessed February 24, 2025.

contaminated areas by applying natural recovery mechanisms.[29] Moreover, an alternative to the conventional method of open detonation of ammunition is believed to be the use of controlled closed detonation systems able to reduce emissions of toxic substances into the atmosphere. In general, the experience of international humanitarian demining programs demonstrates the feasibility and the necessity of applying an ecological approach to the disposal of explosive ordnance, which, in turn, includes monitoring the sites of explosions, using special absorbing materials to minimize the spread of pollutants and restore local ecosystems after the work completion. At the same time, scientists claim that "the issue of the environment is not yet a priority in international humanitarian treaties together with meetings related to mine action."[30] The stated manifests the existing imbalance between the securities, humanitarian as well as environmental aspects of mine clearance, requiring peculiar attention from the international community. To elucidate, the environmental consequences of using and destroying mine-explosive devices can be long-term, affecting biodiversity, soil quality, water resources and the health of the local population. Therefore, the integration of the environmental dimension into humanitarian demining is not only eligible but also necessary for achieving sustainable peace and security.

To emphasize, in Ukraine, mine action is not only a priority of state security but also a component of the national policy of restoration and environmental rehabilitation of territories. Thus, the Strategic Work Plan of the Ministry of Environmental Protection and Natural Resources of Ukraine for 2024-2028 contains provisions determining the relationship between humanitarian demining as one of the components of mine action along with environmental restoration. The specified Document defines the demining of territories, including protected areas and territories contaminated with explosive ordnance, among the measures and indicators for achieving Strategic Goal 1 "Post-war reconstruction of Ukraine according to the European Course," in addition to Strategic Goal 15 "Development of territories in the exclusion zone and unconditional (mandatory) resettlement." It should be highlighted that by the given Document, the final determination of the territory together with measures for the rehabilitation (renaturalization) of territories, the approval of the plan for restoring the latter, as well as the implementation of priority measures for the rehabilitation (renaturalization) of them is possible only after their final clearance.

The aforementioned provisions are also reflected in the state policy of Ukraine in the field of mine action, based on the priority of national interests

[29] Some plant species, such as sunflower, mustard or poplar, have the ability to absorb heavy metals contained in explosive residues, reducing their concentration in soil and water. Also promising is the use of microorganisms that contribute to the breakdown of toxic substances, such as TNT or hexogen residues.

[30] Ursign Hofmann and Pascal Rapillard, "Do No Harm in Mine Action: Why the Environment Matters" (2015) 19(1) The Journal of ERW and Mine Action 4-9 <https://www.gichd.org/fileadmin/user_upload/Do_No_Harm_in_Mine_Action__Why_the_Environment_Matters_-_Copy.pdf> accessed February 24, 2025.

and targeted not only at ensuring the safety of the population and its life but also at eliminating threats associated with explosive ordnance as well as reducing their impact on the environment and economic activities (Art. 4 of Law of Ukraine "On Mine Action in Ukraine" of 2018[31]). The latter is carried out based on several fundamental principles, including "the priority of protecting human rights along with their legitimate interests, the environment and State resources, in addition to ensuring national security when implementing measures in the field of mine action,"[32] which, in turn, means that any demining activities should be conducted in compliance with environmental standards; whereas the process of restoring contaminated areas involves the integration of ecosystem approaches, sequentially, contributing to the sustainable use of natural resources, hence, preventing the re-degradation of land and ecosystems. Thus, combining mine action with environmental restoration is not only a strategic goal but also a fundamental factor in the country's sustainable development.

Furthermore, the National Mine Action Strategy until 2033 and the Operational Plan for its implementation for 2024-2026,[33] approved by the Cabinet of Ministers of Ukraine, details the integration of demining into post-war recovery. The stated Document provides for the clearance of about 80% of the de-occupied territories over the following decade, which is an important step to ensure the security together with sustainable development of the country. Moreover, at the level of the Strategy, the major components of forming a further "system of task prioritization in the specified field" are fixed, among which completing the primary non-technical survey of territories that pose a hazard of contamination with explosive objects, identifying, designating and fencing presumably polluted/contaminated areas. It should be noted that planned humanitarian demining activities will be carried out by the prioritization system, which, in turn, should take into consideration the indicators of industrial as well as agricultural significance of the contaminated area in addition to other environmental indicators. However, what is implied by the concept of "environmental indicators" in the regarded Document is not detailed. Technical requirements for mine clearance procedures are established by DSTU 8820:2023 "Mine action. Management processes. Basic provisions."[34]

It is worth noting that the above National Mine Action Strategy until 2033 provides for the use of environmentally friendly mine clearance methods only in certain protected areas, in particular, on the lands of the

[31] Law of Ukraine "On Mine Action in Ukraine" [2019] Vidomosti of the Verkhovna Rada 6/39 <https://zakon.rada.gov.ua/laws/show/2642-19#Text> accessed February 24, 2025.

[32] Ibid.

[33] Cabinet of Ministers of Ukraine (CMU), Order 616-r "On Approval of the National Mine Action Strategy for the Period up to 2033 and Approval of the Operational Action Plan for its Implementation in 2024-2026" <https://ips.ligazakon.net/document/KR240616?an=1> accessed February 24, 2025.

[34] "DSTU 8820:2023 Mine Action. Management Processes. Basic Provisions" approved by State Enterprise "Ukrainian Research and Training Centre for Standardization and Certification Problems" (SEURTCSCP), Order 27 "On the Adoption of the National Standard" <https://zakon.rada.gov.ua/rada/show/v0027774-23#Text> accessed February 24, 2025.

nature reserve fund, the Emerald Network, and wetlands of international importance along other similar zones. However, such a selective approach bears a bunch of significant drawbacks because limiting the scope of environmentally-oriented methods application contradicts the IMAS; in addition, the former may negatively affect the state of ecosystems and fertility of lands not enlisted as protected ones. It should either be taken into account that eliminating the consequences of contamination with explosive objects requires conducting peculiar activities, mainly characterized by a high degree of invasiveness (interference) in the ecosystem. The latter may include damaging as well as destroying vegetation in the area of the given activities, ploughing of the surface layer of the soil or it's compacting due to high pressure, which, in turn, has a detrimental impact on the environment both separately and as a whole. The mentioned circumstances necessitate carrying out a comprehensive analysis of pollution by explosive objects together with its impact on the environment to determine the nature and degree of the specified, the results of which should be reckoned when developing the procedure for restoring land and returning the latter to productive use as well as recommendations for considering the impact of explosive objects on the environment when planning and conducting operations with the stated. Of importance is the thing that Ukraine has not yet approved of regulatory documents that would bring such environmental assessments as part of mine action into regulation. The current strategic Documents in addition to operational plans do not contain provisions for the implementation of relevant environmental regulations, even in the long run, which is considerably different from international experience, namely, the approaches applied in the EU countries providing for the measures aimed at belittling environmental hazards.

Therefore, the integration of the environmental component into the national mine action system is a prerequisite for holding the sustainable recovery of the affected areas. The recognition of environmental standards at the legislative level will not only reduce the harmful impact on the environment but also contribute to the rational and balanced use of natural resources, which, in turn, is a crucial aspect of Ukraine's post-war reconstruction. For the aforementioned to be effectively implemented, of peculiar significance is the provision of a contractual framework for mine action, disseminating international standards along with best practices in the field of humanitarian demining, promoting the coordination of interstate cooperation, hence, attracting supplementary resources for the environmentally safe restoration of contaminated areas.

4.2. The Contract as a Regulator of Legal Relations in the Field of Humanitarian Demining

To commence with, ensuring the effectiveness of humanitarian demining activities in Ukraine is not rendered possible without involving non-state operators. It should be elucidated that, taking the scale of contaminating territories with explosive objects (explosive ordnance) into

account, imposing the entire burden of mine clearance exclusively on State bodies is believed to be inefficient. Even with international partners' backing, forecasting quantitatively positive outcomes with the above approach may be estimated in several decades, which, in turn, is not acceptable for a country whose main national wealth as well as economic bases are land and other natural resources. Undoubtedly, under such circumstances, the National Mine Action Strategy should prioritize the development in addition to State assistance to the system of non-state subjects in the considered activity.

The non-state sector of mine action operators can naturally be divided into two broad groups. First and foremost, these are the so-called non-entrepreneurial societies (to precise, non-profit organizations), the main goal and objectives of which are to carry out relevant activities in the field of humanitarian demining at the expense of charity funds (to exemplify, donors, grants, charitable contributions, etc.). The second group should include business entities, particularly, those that have opted for humanitarian demining as their specialization. In both cases, the implementation of such activities is mediated by executing agreements between mine action operators and customers, to explicate, owners or legal users of the land plots together with objects located on the latter, that is, by concluding contracts.

To emphasize, by their nature, the above-stated contracts are obviously of a private law nature and, therefore, should be regulated by the norms of civil law, as well as any other contracts within property relations, based on the legal equality of the parties, their free will and property independence. The former stipulates the emergence with further implementation of obligations for conducting the humanitarian demining of certain territories between the customer of such activities and its executor. At the first approximation, such contracts should be qualified as those for performing works and/or providing services. It should be noted that in the Ukrainian legal field, there is currently a tendency to refer to such contracts as those to provide services, which, in turn, was a consequence of the regulatory requirements of special legislation bringing public procurement into regulation, to exemplify, Law of Ukraine "On Public Procurement,"[35] Order of the Ministry of Economic Development, Trade and Agriculture of Ukraine "On Approval of the Procedure for Determining the Subject of Procurement"[36] in addition to the "Unified Procurement Dictionary DC 021:2015,"[37] mine clearance activities are referred to DC90520000-8 – services

[35] Law of Ukraine "On Public Procurement" [2015] Vidomosti of the Verkhovna Rada 9/89 <https://zakon.rada.gov.ua/laws/show/922-19#Text> accessed February 25, 2025.

[36] Ministry of Economic Development, Trade and Agriculture of Ukraine (MEDTAU), Order 708 "On Approval of the Procedure for Determining the Subject of Procurement" [2020] <https://zakon.rada.gov.ua/laws/show/z0500-20#Text> accessed February 25, 2025.

[37] Ministry of Economic Development and Trade of Ukraine (MEDTU), Order 1749 "On Approval of the National Classifier of Ukraine DC 021:2015 and Cancellation of the National Classifier of Ukraine DC 021:2007" [2015] <https://zakon.rada.gov.ua/rada/show/v1749731-15#Text> accessed February 25, 2025.

in the field of radioactive, toxic, medical as well as hazardous waste management.

Instead, the issue of the legal nature of the disputed contract seems to be at least debatable. To highlight, while a service should be comprehended as the implementation of such an activity, the beneficial effect of which cannot be separated from the activity itself, still consumed in the process of its implementation (that is, provision of the service); work in the civil law sense is regarded as performing a set of actions, the main purpose of which is the final materialized result (including the destruction of something, for instance, gross national product (GDP). As it will be seen later, mine clearance as a subject of the contract in addition to part of mine action is carried out by mine action operators by performing non-technical and technical inspection of territories (such as land plots, movable and immovable objects located on the former), identifying, neutralizing and/or destroying explosive ordnance, etc. The specified provides for the right to emphasize the complex nature of such activities as demining together with the impossibility of its unambiguous attribution either to the concept of service or to that of work, which, in turn, should not significantly affect these relations, since there is no particular legal regulation of such contracts in the law of Ukraine at present.

It is worth noting that, despite the importance as well as the relevance of the issue of demining the territories of Ukraine, the inherent Law of Ukraine "On Mine Action" neither mentions such a contract nor defines its essential conditions. Furthermore, a model agreement in the above area has not yet been developed and approved. The only regulatory legal act affecting the conclusion of such contracts is the already mentioned Law of Ukraine "On Public Procurement," whose general provisions stipulate the need to conclude contracts for mine clearance in cases where such activities are carried out to meet the needs of the state, territorial communities along with united territorial communities or in other cases determined by law in compliance with a peculiar procedure providing for public procurement (bidding).

It is possible to study the state and features of contractual regulation in the field of humanitarian demining, exceptionally, by analyzing open data posted in the electronic public procurement system "Prozoro". Contracts concluded by mine action operators with private customers are currently not subject to systematic analysis due to the limited access of third parties, researchers included, to their content, except a significant segment of legal relations related to compensation of expenses for humanitarian demining of agricultural land, regulated by the provisions of the Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Procedure for the Use of Funds Provided in the State Budget for Compensation of Costs for Humanitarian Demining of Agricultural Land"[38] (hereunder – Procedure). Within the

[38] Cabinet of Ministers of Ukraine (CMU), Order 284 "On Approval of the Procedure for the Use of Funds Provided in the State Budget for Compensation of Costs for Humanitarian Demining of

framework of the exemplified relations, contracts are also concluded, taking into consideration the public procurement (bidding) procedure. The specifics of such legal relations and relevant agreements will be discussed below.

As of February 2025, the electronic public procurement system "Prozorro" contains information on 73 conducted or planned procurements (tenders) related to mine clearance, 11 of which have been cancelled for various reasons (for example, non-compliance with land management documentation or in cases where the territories specified for demining to be applied have already been cleared, or no mining activity has been observed there). All the above may be divided into two surprisingly uneven groups.

The first category covers procurement (bidding), where the customers are state-owned enterprises together with other legal entities, to precise, JSC "UkrGasvVydobuvannya," a subsidiary of NJSC "Naftogaz Ukraine," 100% of the shares of which are owned by the State. At the same time, the objects of mine clearance are lands not related to agricultural land. A total of 8 such purchases have been recorded.

The second category covers only procurements made under the procedure of compensating expenses for humanitarian demining of agricultural land. The total number of such purchases is sixty-five. In addition to the fact that their object is agricultural land, the key feature of the specified group is the customer. The Center for Humanitarian Demining (hereunder – Center) is a budgetary institution belonging to the sphere of management of the Economic and Financial Department of the Secretariat of the Cabinet of Ministers of Ukraine. By the provisions of the aforementioned Procedure, the Center is responsible for not only managing the lower-level budget funds intended for compensation (Para. 2 of Clause 2) but also customizing under the relevant contract, concluded as a result of procurement (bidding) (Clause 10). In this regard, the Center acts as a legal representative of an agricultural producer who has submitted a corresponding application for compensating the costs of humanitarian demining of agricultural lands belonging to him, indicated in Clause 10 of the Procedure, the application for compensation, as well as the provisions of the contract itself with the mine action operator. However, it should be noted that the owner of the land plot/plots is not identified either as a customer or as a third party in such a contract. Only when signing the Act of Acceptance and Transfer of the Services Provided, the parties to the contract should agree on the stated with the agricultural producer owning the relevant lands.

Additionally, as noted above, there is an uncertain but predictably huge range of relations in which a much wider list of entities can as a customer under the considered contract, which, in turn, can be either the owner of the territory contaminated with explosive ordnance, or its other legal owner, or a person responsible for financing mine clearance. The said statement also correlates with the provisions of Art. 8 of Law of Ukraine "On

Agricultural Land" <https://zakon.rada.gov.ua/laws/show/284-2024-%D0%BF#n8> accessed February 25, 2025.

Mine Action," indicating the possibility of attracting funds from enterprises, institutions, and organizations, as well as funds from other sources of financing not prohibited by law to finance mine action, including individuals. Despite not directly elucidating the subject matter of the regarded contract, such wording outlines (very broadly) its boundaries on the part of the customer of the service.

Instead, the contractor under the humanitarian demining contract is always a special entity, the so-called mine action operator. The provisions of Clause 10 of Part 1 of Art. 1 of Law of Ukraine "On Mine Action" define the envisaged concept as follows: "mine action operators are authorized subdivisions of central executive authorities, enterprises, institutions as well as organizations regardless of the form of ownership, involving international and foreign ones, engaged in conducting mine action activities." In turn, the 2021 "Procedure for Keeping Records of Mine Action Operators"[39] claims for such entities to have a certificate of conformity, acquired by the procedure established by law (Clause 1). Moreover, there is the 2024 "Procedure for the Implementation of a Pilot Project on the Certification of Mine Action Operators and Mine Action Processes,"[40] regulating the conditions along with the procedure for passing certification in addition to obtaining permits for certain or all stages of humanitarian demining. To emphasize, introducing uniform certification rules contributed to the rapid certification of operators. The specified document standardized the conformity assessment procedure for all bodies involved in the certification of operators. To further simplify the certification procedure, it has been decided to introduce electronic document submission through the Diia portal, which will enable avoiding bureaucratic procedures and, hence, boost receiving certificates. The new system is expected to be operational in 2025.

To highlight, only specific organizations that possess the authority to certify mine action operators and issue the necessary permits are accredited in Ukraine. These include the following: conformity assessment bodies of Military Unit A2641, the Mine Action Center, the Interregional Center for Humanitarian Demining and Rapid Response of the State Emergency Service of Ukraine, and the State Certification Center of the State Emergency Service of Ukraine.[41] As of February 2025, the list of mine action operators that have passed certification and possess at least one certificate (for one type of

[39] Cabinet of Ministers of Ukraine (CMU), Order 88 "On Approval of the Procedure for Keeping Records of Mine Action Operators" <https://zakon.rada.gov.ua/laws/show/1150-2021-%D0%BF#Text> accessed February 25, 2025.

[40] Cabinet of Ministers of Ukraine (CMU), Order 123 "On Realization of the Procedure for the Implementation of a Pilot Project on the Certification of Mine Action Operators and Mine Action Processes" <https://zakon.rada.gov.ua/laws/show/123-2024-%D0%BF#Text> accessed February 25, 2025.

[41] "System of Conformity Assessment, Certification and Inspection of Mine Activity in Ukraine" *(Mil.gov.ua)* <https://www.mil.gov.ua/diyalnist/protiminna-diyalnist/cistema-oczinki-vidpovidnosti-sertifikaczii-ta-inspektuvannya-protiminnoi-diyalnosti-v-ukraini.html> accessed February 25, 2025.

activity) includes 83 entities.[42] It should be noted that the possibility of concluding the mentioned contract by the contractor is associated with the presence of the latter certificate for at least one of the actions, thus, making up the humanitarian demining complex. The vast majority of the studied contracts contained remarks about the delegability of attracting a co-executor/ co-contractor with the only condition that such a co-contractor shall possess an appropriate certificate.

It is appropriate to add that the certification body, by the National Standard DSTU 8820:2023 "Mine Action. Management Processes. Basic Provisions," carries out certification of the following mine action processes: 1) non-technical inspection; 2) technical one; 3) manual mine clearance; 4) that one applying machines together with mechanisms; 5) the use of canine calculations of the mine-detection service; 6) clearing areas of hostilities and combat operations; 7) demining of water areas; 8) neutralization (destruction) of mines along with explosive remnants of war (hereunder – MERoW); 9) informing the population about the hazards associated with the latter.

The above list fundamentally coincides with the definition of "mine clearance" according to the provisions of Clause 3 of Part 1 of Art. 1 of the Law of Ukraine "On Mine Action," namely, mine clearance (humanitarian demining) is a set of measures carried out by mine action operators to eliminate hazards associated with explosive ordnance, including non-technical as well as technical inspection of territories, mapping, detecting, neutralizing and /or destroying MERoW, marking, preparing documentation after demining, informing communities on mine action in addition to transferring the cleared territory. Moreover, the significance and content of the specified activities are articulated in the aforementioned National Standard or other regulations issued by the central executive authority. To clarify, non-technical survey-collection, analysis as well as evaluation of information on the territory for its further classification by hazard status, without using technical means of searching for MERoW; technical survey-collection, analysis of data applying technical means on the presence, type, distribution and surroundings of sites contaminated with MERoW to better determine the presence and/or absence of contamination in addition to supporting the prioritization of land unlocking and decision-making processes; destruction of MERoW – particular actions to transfer the considered into an incapacitated and/or safe state by detonation, incineration, mechanical or other complete or partial destruction, etc. To elucidate, the implementation of the aforementioned measures is usually the subject of the mine clearance contract. Most often, in the contract itself, the parties refer to the provisions of state or national standards, while the annexes to the regarded document (to specify, specifications, technical

[42] "List of Miners who Have Been Certified" *(Ua.imsma.org)* <https://ua.imsma.org/portal/apps/webappviewer/index.html?id=f56cac5195da46118c0534c1554663c6> accessed February 25, 2025.

specifications) indicate peculiar measures when defining the scope of work/services.

As previously indicated, there is currently an absence of specialized legal regulation about the proposed contract. Accordingly, the legislation does not contain specific provisions or restrictions on other essential terms of the mine clearance contract, providing the parties complete freedom to determine the content of the above document at their discretion, which, in turn, poses certain hazards as well as legal uncertainty while executing the latter, in particular, regarding the liability of the parties, mechanisms for monitoring and guaranteeing the quality of work performed. Special attention should also be paid to the issue of the price of such a contract. Order of the Ministry of Economy of Ukraine no. 9180 of April 12, 2024, approved the "Methodological Recommendations for Calculating the Cost of Humanitarian Demining."[43] However, these recommendations were developed exclusively for the budgetary institution "Center for Humanitarian Demining" to determine the expected expenses of procuring mine clearance services for agricultural land. Additionally, the former merely bears a consultary[44] nature. Meanwhile, the lack of a unified approach to contract pricing in the studied area may create differences in approaches to pricing, thus, complicating the financing of the mentioned activities, which, in turn, leads to an uneven distribution of resources, a decrease in the competitiveness of mine clearance operators along with delays while implementing work, especially in the context of attracting international assistance and donor funds. It should be added that within the framework of the sectoral working group, it is currently underway to find solutions for financing demining projects in 2025 (it is planned to expand programs to larger areas, including forests together with reservoirs) and introduce innovative financing mechanisms, such as sustainable development bonds.[45]

Overall, the study demonstrated the thing that the vast majority of contracts on humanitarian demining are drawn up in compliance with proper legal techniques. At the same time, a significant part of their attention is paid not so much to the conditions that would affect the fulfilment of the obligation to provide the service, but to warnings concerning conflicts of interest (anti-corruption clauses), confidentiality, and also force majeure. Even though the aforementioned provisions are of importance, they are not specific to the considered type of contract. Instead, in the majority of cases, the latter do not contain key provisions for the customer's obligation to

[43] Ministry of Economy of Ukraine (MEU), Order 9180 "On Approval of the Methodological Recommendations for Calculating the Cost of Humanitarian Demining" <https://zakon.rada.gov.ua/rada/show/v9180930-24#n9> accessed February 25, 2025.

[44] The phrase "consultary nature" means that the recommendations or documents are not legally binding. They are advisory only and do not impose any legal obligations. In Ukrainian, we translate this as "рекомендаційний" or "консультативний" to emphasize that such guidelines serve only as a reference or advice, not a rule. In other words, they can be followed, but there's no requirement to do so. They are provided to support decision-making, not to enforce action.

[45] "Humanitarian Demining Program to Be Expanded in 2025" *(Agrotimes.ua)* <https://agrotimes.ua/agromarket/u-2025-roczi-rozshyryat-programu-z-gumanitarnogo-rozminuvannya/> accessed February 25, 2025.

ensure the necessary "front of work" or the demining operator's one to insure its liability. The last aspect is of particular significance. According to Art. 31 of Law of Ukraine "On Mine Action," it is mandatory to insure the liability of the mine action operator for damage caused to the environment, health or property of third parties under insurance class 13, defined by Art. 4 of Law of Ukraine "On Insurance."[46] In detail, the procedure as well as conditions of such insurance may be determined by the national mine action authority in coordination with the National Bank of Ukraine. The insurance contract must be concluded before the start of the activity and, hence, be valid both for the period of work and for a decade after its completion. The minimum sum insured under the liability insurance contract is two hundred and fifty times the minimum wage. The amount of compensation for the damage caused is determined by agreement of the parties or in court. In addition to that, existing contracts with mine clearance operators generally do not severely regulate the given obligation, therefore, posing potential hazards for both the parties to the contract and the affected persons in case of incidents.

Returning to the analysis of the contract as a regulator of legal relations in the field of humanitarian demining, it is worth emphasizing some more crucial aspects, a critical issue of which is reckoned to be the legal mechanism for quality control in the above-mentioned field. By Art. 1 of Law of Ukraine "On Mine Action," quality control is an element of the mine clearance quality management process, which ensures absolute compliance with the requirements for eliminating hazards associated with explosive ordnance, as well as monitoring adherence to the requirements for the quality of demining. In the stated context, it is appropriate to highlight that Ukraine provides the procedure for transferring responsibility for the cleared area from mine action operators to local state administrations together with local self-government bodies by issuing a certificate, after which the State becomes fully responsible for the absence of hazards associated with explosive ordnance in the relevant territory. Quality control of demining territories to be transferred from mine action operators to local state administrations along with local self-government bodies is carried out by an accredited inspection body free of charge. Moreover, the current legislation provides for controlling (in the form of surveys and inspections) work sites, production facilities, documentation, processes, procedures, personnel qualifications, and equipment of certified mine action operators involved in the implementation of mine action activities, as part of monitoring the compliance of the mine action operator with the certification requirements (due to Art. 30 of Law of Ukraine "On Mine Action"). Moreover, quality control in addition to reporting constitutes a mandatory part of the Report on the exclusion (unblocking) of the territory by non-technical inspection (according to Annex 8 to SOP 08.10/SES).[47]

[46] Law of Ukraine "On Insurance" [2021] Vidomosti of the Verkhovna Rada 12-13/28 <https://zakon.rada.gov.ua/laws/show/1909-20#Text> accessed February 24, 2025.

[47] Standard operating procedure 08.10/SES. The procedure for conducting the bodies and units of civil protection of non -technical inspection of territories, probably contaminated with explosive

Ukraine provides for an extensive control system in the field of humanitarian demining. To highlight, among the powers of the Center for Humanitarian Demining, monitoring the status of marking hazardous areas (Art. 25 of Law of Ukraine "On Mine Action") is enshrined. The Verkhovna Rada of Ukraine exercises parliamentary control in the relevant area (Art. 19 of Law of Ukraine "On Mine Action"), whereas the quality control of mine clearance is entrusted by accredited inspection bodies. Nowadays, quality management objectives can be performed by the Mine Action Center, the Center for Humanitarian Demining, the Interregional Center for Humanitarian Demining and Rapid Response of the State Emergency Service, and the Demining Center of the Armed Forces of Ukraine (Military unit A2641). It should be noted that such a branching provokes a blurring of responsibility in the envisaged area.

It is worth noting that the issue of liability for violating contract obligations in the considered field of humanitarian demining remains insufficiently regulated. In case the issue of compensation for damage to third parties as a result of the mentioned activity is subject to the regulation of special provisions of Art. 1187 of the Civil Code of Ukraine,[48] liability for improper performance of obligations under such contracts will be regulated strictly by the general provisions of the Civil Code of Ukraine in addition to those the parties agree on. The lack of specialized regulations renders it impossible to effectively prosecute operators for failing to comply with their obligations or infringing technical as well as environmental standards.

5. CONCLUSION AND RECOMMENDATIONS

Taking the above into account, it can be reduplicated that strengthening Ukraine's capacity in the studied field of humanitarian demining involves not only forming and developing authorized units of central executive authorities as mine action operators along with their entering into the market of mine clearance services, as stipulated in the National Mine Action Strategy for the period until 2033, but also the State's assistance in growing the private sector in the specified industry. The aforementioned statement outlines the necessity for enhancing methodologies and mechanisms for the legal regulation of mine action, particularly through a contractual framework. Additionally, the results of the regarded study imply considerable gaps in the legal regulation of contractual relations in the field of mine action.

To elucidate, lacking clarified legal mechanisms for the contractual principles of mine action, as well as environmental standards for

objects. State Emergency Service. Approved by SES Chairman of June 3, 2020. Introduced: Separate Order B-63 of the SES Chairman of June 3, 2020 <https://dsns.gov.ua/upload/2/6/8/9/6/1/xT3qhVpB4aVBVdPMFL73JOFwlaOgumsmm0N0z96I.pdf> accessed February 25, 2025.

[48] Law of Ukraine "Civil Code of Ukraine" <https://zakon.rada.gov.ua/laws/show/435-15#Text> accessed February 25, 2025.

humanitarian demining, ensures potential opportunities for improper fulfilment of obligations. Meanwhile, there are currently gaps in the quality management system in the envisaged field in terms of quality control and assurance, slackening the widespread use of clearance processes along with their transfer for use. Moreover, the capacity of quality control entities in mine action does not correspond to the needs of the present, which, in turn, leads to the untimely nature of the aforementioned actions. Of particular significance is external monitoring of all types of mine action, which will sufficiently enhance the quality assurance of demining, i.e. the given may ensure quality requirements are met. The current situation brings to the fact that the return of land by mine action operators in Ukraine is possible either with considerable delays or without compliance with quality requirements, which, hence, is a violation of the procedure for conducting the specified action in Ukraine.

Furthermore, the analysis of existing contracts manifests that the latter do not always contain provisions on ensuring the liability of mine clearance operators in addition to compliance with environmental standards, although such aspects are of key importance for the safety of both the local population and the environment. All the mentioned indicates the need for a comprehensive approach to improving the contractual regulation in the field of humanitarian demining. In this regard, developing and implementing the Model Contract on the Provision of Humanitarian Demining Services is reckoned as a reasonable step, the application of which will contribute to legal certainty as well as stability in the studied area. The provisions of such a contract should enshrine not only essential conditions, to specify, the operator's obligation to insure its liability, but also environmental standards for the mine clearance process to comply with. The above will not only regulate legal relations in the field of demining but also ensure an appropriate level of safety for the environment together with the locals. It should be emphasized that the integration of environmental standards into contractual practice is required to minimize the detrimental consequences of mine clearance and provide for the sustainable restoration of the country's natural resource potential. The application of the said measures will contribute to enhancing the legal regulation of humanitarian demining, boosting the level of safety and efficiency of work, as well as strengthening international cooperation in the considered area.

It should be stated that the environmental aspect of explosive ordnance pollution with its complex impact on the environment in Ukraine has not yet been systematically investigated. Meanwhile, the presence of both direct and indirect negative effects of contaminating the environment with explosive objects, including chemicals of the lands as well as crops grown on the latter, the state of local flora and fauna, the inability to access areas of ecological importance and their proper maintenance, hence, causing damage together with destruction of the former as a result of mine action activities, is indisputable. The enumerated factors necessitate a comprehensive analysis of the impact of pollution by explosive ordnance on the environment to

determine its nature and scale. The outcomes of the specified analysis should be taken into consideration when developing measures for land restoration with their further use, in addition to formulating recommendations for belittling environmental hazards when planning and implementing explosive ordnance removal works.

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AUTHORS' DECLARATION AND ESSENTIAL ETHICAL COMPLIANCES

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	*Author 1*	*Author 2*	*Author 3*	*Author 4*	*Author 5*
Conceived and designed the research or analysis	Yes	No	No	Yes	Yes
Collected the data	Yes	Yes	No	No	No
Contributed to data analysis and interpretation	Yes	Yes	Yes	Yes	Yes
Wrote the article/paper	Yes	Yes	Yes	Yes	Yes
Critical revision of the article/paper	Yes	No	Yes	Yes	No
Editing the article/paper	Yes	Yes	Yes	Yes	Yes
Supervision	Yes	No	No	No	No
Project administration	Yes	No	No	No	No
Funding acquisition	No	No	No	No	No
Overall contribution proportion (%)	20	25	25	20	10

Funding
No funding was available for the research conducted for and writing of this paper.

Research involving human bodies or organs or tissues (Helsinki Declaration)
The author(s) solemnly declare(s) that this research has not involved any human subject (body or organs) for experimentation. It was not a clinical research. The contexts of human population/participation were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of Helsinki Declaration does not apply in cases of this study or written work.

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To see original copy of these declarations signed by Corresponding/First Author (on behalf of other co-authors too), please download associated zip folder [Ethical Declarations] from the published Abstract page accessible through and linked with the DOI: https://doi.org/10.33002/jelp050109.

JOURNAL OF ENVIRONMENTAL LAW & POLICY | 05(01) APRIL 2025
Published by The Grassroots Institute in partnership with Asia Pacific Academy of science Pte Ltd. Website: https://grassrootsjournals.org/jelp
Main Indexing: SCOPUS, EBSCO, HEIN ONLINE

ISSN 2564-016X | April 2025

M – 00540 | Analytical Article | Open Access

NORMS AND CHALLENGES IN THE GLOBAL MOVEMENT OF E-WASTE

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Received: 31 January 2025 | **Reviewed:** 13 March 2025 | **Revised:** 18 March 2025
Accepted: 21 March 2025 | **Published:** 21 April 2025

ABSTRACT

The transboundary movement of electronic waste (*hereinafter* referred to as 'e-waste') has emerged as a significant global environmental and regulatory challenge. This paper critically examines international legal frameworks governing e-waste movement, focusing primarily on movements from developed to developing nations. It briefly highlights India as an illustrative example of the broader impacts faced by developing countries. The study analyzes key international regulations, particularly the Basel Convention, along with relevant regional agreements such as the Bamako and Waigani Conventions. The paper highlights how industrialized nations often evade strict domestic regulations by exporting waste under the guise of recycling or repair, shifting environmental burdens disproportionately onto economically weaker nations. Additionally, it addresses limitations in existing international mechanisms in curbing illegal e-waste trafficking and the associated enforcement challenges. By discussing loopholes in current legal frameworks—such as the "repairable loopholes"—the study emphasizes the need for stronger enforcement, enhanced international cooperation, and stringent compliance mechanisms to mitigate environmental injustice.

Keywords: Land restoration; Environmental security; Ecological rehabilitation; Humanitarian demining; Sustainable development; Legal mechanisms

Editor-in-Chief: Prof. Dr. Kamrul Hossain | *Deputy Editors-in-Chief:* Dr. Evgeniya Kopitsa, Prof. Dr. Ngozi Finette Unuigbe | *Executive Editor:* Dr. Hasrat Arjjumend

How to cite this paper: Nivedita Chaudhary, 'Norms and Challenges in the Global Movement of E-Waste' (2025) 05 (01) Journal of Environmental Law & Policy 258-289, <https://doi.org/10.33002/jelp050110>

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1. INTRODUCTION

E-waste is rapidly becoming a global crisis due to unsustainable practices worldwide. As the fastest-growing waste stream, e-waste production reached a record 62 million tonnes (Mt) in 2022, an 82% increase from 2010, and is projected to rise another 32%, reaching 82 million tonnes by 2030.[1] Reports indicate that up to 90% of e-waste from developed countries is illegally traded and dumped in developing nations, where waste management costs are significantly lower.[2] Often disguised as "reusable" equipment or "donations", e-waste exports burden developing nations, which already struggle with domestic e-waste growth, weak enforcement, and inadequate disposal infrastructure.[3] Due to the inclusion of both precious and hazardous metals, e-waste is an extremely complicated kind of waste. Because both types of metals are hazardous and can harm the environment if not handled properly, dealing with e-waste in an environmentally friendly manner is accordingly necessary. The substantial danger that e-waste poses to both the environment and the realization of human rights has been emphasised in a number of publications. E-waste is a significant problem since it may be hazardous and dangerous, contaminating the environment, putting people at risk of illness, and infringing on their human rights. Environmentally, mismanaged e-waste disposal results in hazardous chemicals (such as mercury, lead, and cadmium) contaminating soil and water, leading to irreversible ecological degradation.[4] For instance, in Agbogbloshie, Ghana, improper e-waste recycling has led to severe pollution of water and soil, causing widespread health problems among local populations.[5]

According to the studies, these transboundary movements of e-waste can take place in different ways for different reasons - from developed to developed, developing to developing, and developing to developed nations. However, the study's current focus is restricted to movements from developed to developing nations.[6] This paper also explores the logical

1 Baldé, C.P., Forti, V., et al., "The Global E-waste Monitor 2024", (2024) International Telecommunication Union (ITU), United Nations Institute for Training and Research (UNITAR), Bonn/Geneva.

2 Nichols, W., "Up to 90% of world's electronic waste is illegally dumped, says UN", (2015) *The Guardian*.

3 Walker, A., "India becoming the 'world's dumping ground' for e-waste", *Australian National university Newsroom*, 24 August, 2016, <http://www.anu.edu.au/news/all-news/india-becoming-the- %E2%80%98world%E2%80%99s-dumping-ground%E2%80%99-for-e-waste> accessed on 2 February 2025.

4 Ranganathan, V., "The Electronic Menace: Why E-waste is a Major Concern Today", *Entrepreneur* (December, 2018), <https://www.entrepreneur.com/article/324789> accessed on 9 March 2025); Yeung, P., "The Toxic Effects of Electronic Waste in Accra, Ghana" *CityLab*, 29 May, 2019, <https://www.citylab.com/environment/2019/05/used-electronics-e-waste-landfill-ghana-toxic-technology/590341/> accessed on 8 April 2025.

5 Huang, J., Nkrumah, P.N., *et al.*, "E-waste disposal effects on the aquatic environment: Accra, Ghana", (2014) 229 Reviews of Environmental Contamination and Toxicology 19-34.

6 Not all waste moves from developed to developing regions "in a linear way," as waste trade clusters depend on commercial routes, reverse logistics, geographic proximity or trade

explanations for such cross-border movement of e-waste, which prompts waste producers in affluent nations to look for less expensive legal and illicit disposal options overseas, particularly in developing areas.[7] Despite recognition of these complexities, significant research gaps remain, particularly regarding critical evaluations of international regulatory effectiveness and enforcement weaknesses associated with the Basel Convention and related frameworks. The paper briefly provides an account of the past incidents and cases of all kinds of transboundary movements of hazardous waste, which establishes a link between the transboundary movements and the issue of environmental justice. Environmental justice is a principle that asserts that all people and communities have the right to equal environmental protection and the equitable distribution of environmental benefits and burdens. In the context of transboundary movements of e-waste, several fundamental principles of environmental justice are implicated, notably the principles of intergenerational equity, polluter pays, precautionary principle, and common but differentiated responsibilities (CBDR).

When developed countries export hazardous e-waste to developing countries with weaker environmental standards, they disproportionately shift environmental risks and burdens onto vulnerable communities that lack the infrastructure, resources, or regulatory frameworks to manage such waste sustainably.[8] This unequal burden distribution violates these core principles by perpetuating global inequalities and environmental harm in less affluent nations. The paper argues that transboundary e-waste movements allow developed countries to shift their environmental burdens to developing nations, violating the principle of environmental justice by unfairly transferring environmental costs.[9]

This paper first provides a historical overview and conceptualizes transboundary e-waste movement. It then critically examines international regulations and enforcement gaps, concluding with suggestions for stronger governance and compliance mechanisms.

2. TRACING THE ORIGINS

As industrialized nations faced growing volumes of hazardous waste and stricter environmental regulations in the 1980s, disposal costs rose sharply. This, coupled with the "Not in My Backyard" (NIMBY) attitude, led

agreements. See Pacini, H. and Yeoh, T.N., "Success of The Circular Economy Hinges on Better Governance of 'Waste Trade'", UNCTAD, 5 February, 2021, <https://unctad.org/news/success-circular-economy-hinges-better-governance-waste-trade> accessed on 21 January 2025.

7 Okaru, V.O., "The Basel Convention: Controlling the Movement of Hazardous Wastes to Developing Countries", (1993) 4 (2) *Fordham Environmental Law Report* 137-165.

8 Abalansa, S., Mahrad, B.E., Icely, J., and Newton, A., "Electronic Waste, an Environmental Problem Exported to Developing Countries: The Good, The Bad and the Ugly", (2021) 13(9) *Sustainability* 5302.

9 Dawood, S. and Azhar, A., "Trash Trade and Environmental Regulations: An Assessment", (2021)8 *Lentera Hukum* 347.

these countries to seek cheaper disposal options.[10] Consequently, a wave of "toxic traders" emerged, exporting hazardous waste to developing countries with weaker regulations and lower disposal costs. The largest waste exporters in the world are the European Union (*hereinafter* referred to as 'EU') and North America, whereas the largest waste importers are Africa and Asia.[11] A few of the noted incidents include the incidents of *Love Canal*,[12] the *Khian Sea incident* of 1986[13], the *Koko dumping* of 1988,[14] etc. This practice persisted until public pressure and media exposure in the 1980s and 1990s brought global attention to hazardous waste dumping in developing countries. These revelations led to the creation of international and European regulatory frameworks to control the transboundary movement of e-waste.

The Organisation for Economic Co-operation and Development (*hereinafter* referred to as 'OECD') was the first international organization to take up the problem of hazardous waste. Between 1974 and 1986, the OECD took key steps toward regulating hazardous waste.[15] It formed a Special Waste Management Policy Group in 1974 and adopted a Comprehensive Waste Management Policy in 1976.[16] By 1984, it introduced a notification system for transboundary hazardous waste movements, and in 1986, adopted a stricter resolution requiring the importing country's consent and proper disposal facilities for such waste.[17]

The OECD's trends were followed by the UN's regulatory efforts. UNEP created a working group in 1984, and it developed and endorsed the "Cairo Guidelines and Principles for the Environmentally Sound Management of Hazardous Wastes"[18] in 1987. The "Basel Convention" negotiations were perhaps the first significant international negotiations in which developing nations demanded far stricter environmental legislation than did affluent nations.[19] By regulating rather than outlawing trading in hazardous waste, the convention was able to reconcile these two opposing viewpoints.

These resulted in the "Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal"

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10 Kummer, K., *International Management of Hazardous Waste: The Basel Convention and Related Legal Rules* 6 (Oxford University Press, 1995). According to a study carried out in the late 1980s, the average disposal costs for one ton of hazardous wastes in Africa was between US $2.50 and US $50, with equivalent costs in industrialized nations ranging from US $100 to US $2,000.

11 Mulder, N., *et al.*, "International Trade and the Circular Economy in Latin America and the Caribbean", (2021) Inclusive and Sustainable Industrial Development Working Paper Series ECLAC-UNIDO, Vienna.

12 Kleiman, J., "Love Canal: A Brief History", <https://www.geneseo.edu/history/love_canal_history> accessed on 19 January, 2025.

13 Müller, S. M., *The Toxic Ship: The Voyage of the Khian Sea and the Global Waste Trade* (Washington: University of Washington Press, 2023).

14 <https://pdf.usaid.gov/pdf_docs/PBAAH051.pdf> accessed on 19 January, 2025.

15 OECD Council Recommendation C (76) 155.

16 OECD Council Decision and Recommendation C (83) 180 (Final).

17 OECD Council Decision and Recommendation C (86) 64 (Final).

18 UNEP Environmental Law Guidelines and Principles No. 8, 1987.

19 Brenton, T., *The Evolution of International Environmental Politics* 131 (London, Royal Institute of International Affairs, Earthscan Publication, 1994).

(*hereinafter* referred to as 'Basel Convention') being adopted on March 21, 1989. The Convention came into force on May 5, 1992 and, as of January 13, 2013, there are 190 Parties to the Convention.[20] The Basel Convention marked the first comprehensive global effort to regulate the transboundary movement and disposal of hazardous waste. It led to several regional and multilateral agreements and emphasized international cooperation, recognizing shared environmental responsibility. It remains the most restrictive international framework on hazardous waste exports to date.

The Basel Convention aimed to prevent "toxic colonialism," the practice of using poor nations as dumping grounds for the rest of the world's hazardous waste. The Basel Convention is primarily based on the UNEP's Cairo Guidelines, with several of its provisions also influenced by the OECD Agreement on Trans-frontier Movement of Hazardous Waste and relevant EU directives.[21]

3. THEORISING 'TRANSBOUNDARY MOVEMENT OF E-WASTE'

The term "transboundary movement of e-waste" describes the cross-border transportation of hazardous or non-hazardous e-waste from one nation to another for the purpose of disposal, recycling, or recovery. This may happen between nations with shared borders or nations separated by seas. Transboundary e-waste movement may have a serious negative effect on the ecology and health of the receiving nation, especially if the e-waste is not adequately handled. This may include possible health effects on nearby populations as well as pollution of the land, water, and air. This phenomenon has been considered a form of relocation-diffusion of pollution. This kind of trade in waste is usually considered as pollution transfer and hence results in environmental injustice.[22]

While the Basel Convention addresses the transboundary movements of hazardous wastes broadly, it does not explicitly or separately regulate 'e-waste' as a distinct, independent category. Instead, it includes e-waste implicitly within its broader hazardous waste categories under Annexes I, III, VIII, and IX.[23] According to the Basel Convention, hazardous waste is categorised according to the chemicals that display a hazardous feature (such as ecotoxicity). As a result, the Convention does not categorise keyboards as non-hazardous and computers as hazardous. Instead, it divides wastes into

[20] Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, <http://www.basel.int/?tabid=4499> accessed on 19 January, 2025.

[21] EU Directive on the supervision and control within the European Community of the trans-frontier shipment of hazardous waste, 84/631/EEC, 6 December, 1984. This directive has been amended by Directive 85/469/EEC, Directive 86/279/EEC and Directive 87/112/EEC.

[22] Yang, S., "Trade for the Environment: Transboundary Hazardous Waste Movements after the Basel Convention", (2020) 37 (5) *Review of Policy Research*.

[23] In 2022, the 15th COP-15 to the Basel Convention adopted significant amendments to Annexes I, III, VIII, and IX, introducing clearer definitions and regulatory measures for the categorization, transboundary movement, and environmentally sound management of e-waste. <https://shorturl.at/gFH6E > accessed on 19 January 2025.

several categories based on their chemical composition and inherent danger.[24] Article 1 defines 'Hazardous waste' as – a) Wastes that belong to any category contained in Annex I; b) Wastes that are considered to be hazardous wastes by the domestic legislation of the Party of export, import or transit.[25] Annex I of the Basel Convention talks about the 'categories of wastes to be controlled' through which 'e-waste' can be considered as a hazardous waste.[26] The presence of the constituents mentioned below from Annex I makes e-waste a hazardous waste. Further, Annex III talks about the 'list of hazardous characteristics' which has been given by the United Nations.[27] As per Annex III, e-waste can be considered as a hazardous waste.[28] Lastly, Annex VIII[29], List A, Entry A1180[30] makes e-waste a hazardous waste with certain exceptions given in Annex IX (List B)[31]. Both Annex VIII and Annex IX list various types of e-waste as hazardous waste. Furthermore, the Basel Convention considers those wastes as hazardous which are defined as hazardous through the national definitions of the countries of import, export and transit.[32] Hence, the Basel Convention is equally applicable to the transboundary movement of e-waste. Legally, Article 2(3) of the Basel Convention defines "transboundary movement of waste" as:

> *"any movement of hazardous wastes or other wastes from an area under the national jurisdiction of one State to or through an area under the national jurisdiction of another State or to or through an area not under the national jurisdiction of any State, provided at least two States are involved in the movement".*

[24] Baldé, C.P., Deubzer, V.L.O., and Kuehr, R., "Global Transboundary E-waste Flows Monitor – 2022", (2022) United Nations Institute for Training and Research (UNITAR), Bonn, Germany.

[25] For instance, India considers E-waste as hazardous waste in E-waste (management) rules of 2016 and 2022.

[26] See 'Wastes having as constituents' in Annex I. For e-waste specific entries are applicable like – Y22, Y23, Y24, Y25, Y26, Y29 and Y31.

[27] Corresponds to the hazard classification system included in the United Nations Recommendations on the Transport of Dangerous Goods (ST/SG/AC.10/1Rev.5, United Nations, New York, 1988). Refer, Annex I, Clause (b) – Designation of a waste on Annex VIII does not preclude, in a particular case, the use of Annex III to demonstrate that a waste is not hazardous pursuant to article 1, paragraph 1 (a) of this Convention.

[28] Refer, Annex III, UN Class 9, Code H11 (Toxic) and H12 (Ecotoxic).

[29] Wastes contained in this Annex are characterized as hazardous under article 1, paragraph 1 (a) of this Convention.

[30] Waste electrical and electronic assemblies or scrap containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or contaminated with Annex I constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they possess any of the characteristics contained in Annex III.

[31] Wastes contained in the Annex will not be wastes covered by article 1, paragraph 1 (a) of this Convention unless they contain Annex I material to an extent causing them to exhibit an Annex III characteristic. Refer, Entry B1110 (Electrical and electronic assemblies).

[32] The Basel Convention, art. 1(1)(b) read with art. 3.

The definition has to be read with Article 2(9)[33], article 2(10)[34], article 2(11)[35] and article 2(12)[36] to understand it in a wholesome manner. According to the Basel Convention, a waste flow must move from the state of export to the state of import to be considered transboundary. Sometimes the movement takes place through the state of transit. Therefore, the basic necessity is the involvement of two states for the movement to be transboundary.[37]

Additionally, the Basel Ban Amendment significantly reshapes the legal framework surrounding the transboundary movements of e-waste. Entered into force in December 2019, this Amendment categorically prohibits Annex VII countries (primarily developed OECD and EU states) from exporting hazardous wastes, including electronic waste, to non-Annex VII (developing) countries. This directly impacts transboundary e-waste flows by legally restricting such exports. However, enforcement remains challenging due to persistent illegal trafficking and complexities around distinguishing genuine second-hand goods or repairable items from hazardous waste. A detailed discussion of the Ban Amendment's implications follows later in this paper.

The Bamako Convention[38] and the Waigani Convention[39] provides a similar definition to the Basel Convention. On the other hand, OECD provides a definition which focuses more on the movements within the member countries.[40] However, while referring to the definition provided by the OECD, it has to be kept in mind that the scope of the decision is limited to the transboundary movements of wastes "destined for recovery

[33] The Basel Convention, art. 2(9) defines "Area under the national jurisdiction of a State" as - any land, marine area or airspace within which a State exercises administrative and regulatory responsibility in accordance with international law in regard to the protection of human health or the environment;

[34] The Basel Convention, art. 2(10) defines "State of export" as - a Party from which a transboundary movement of hazardous wastes or other wastes is planned to be initiated or is initiated;

[35] The Basel Convention, art. 2(11) defines "State of import" as - a Party to which a transboundary movement of hazardous wastes or other wastes is planned or takes place for the purpose of disposal therein or for the purpose of loading prior to disposal in an area not under the national jurisdiction of any State.

[36] The Basel Convention, art. 2(12) defines "State of transit" as - any State, other than the State of export or import, through which a movement of hazardous wastes or other wastes is planned or takes place;

[37] Ansari, A. H., Jamal, P., *et al.*, "The Basel Convention: Re-visiting Some Socio- Legal Issues Pertaining to Transboundary Movement of Hazardous and Other Wastes", (2019) 61 (3) *Journal of the Indian Law Institute* 295.

[38] Article 1(4) of Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa. It is also known as "the Bamako Convention" and it came into force in 1998.

[39] Article 1 of Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region also known as "the Waigani Convention" entered into force in 2001.

[40] OECD, Decision of the Council on the Control of Transboundary Movements of Wastes Destined for Recovery Operations, OECD/LEGAL/0266, Chapter 2 (A) (5) defines transboundary movement as 'any movement of wastes from an area under the national jurisdiction of a Member country to an area under the national jurisdiction of another Member country'.

operations" only. On the other hand, the Cairo Guidelines also provide a definition. The guidelines use the term 'transport' to manifest the transboundary movements of hazardous waste.[41] The movement has to start from the point of generation and end at the point of disposal, which has to be an approved site.[42] Further, the most detailed definition has been given by the EU directive on Shipments of Waste[43] which regulates the transport of hazardous waste across EU borders. The EU directive, however, does not use the term transboundary movement of waste. It rather uses 'shipment' of waste. Article 2(34) of the EU Directive on Shipments of Waste defines 'shipment'.[44] This definition has to be read with Article 2(33)[45] and article 2(26).[46]

The transboundary movements of e-waste can be categorised into two: legal/controlled[47] and illegal/uncontrolled.[48] The definitions discussed above talk about the legal/controlled means of transboundary movements of e-waste. However, many times e-waste may be transported or dumped in other countries, usually developing countries, through illegal/uncontrolled means. One of the top three waste categories illegally trafficked between 2018 and 2020 is e-waste, which is typically undeclared or misrepresented as used-EEE, new EEE, home products, personal property, or other types of waste.[49] The illegal/uncontrolled transboundary movement of e-waste is defined in Article 2(21) and Article 9(1)[50] of the Basel Convention. Article 9(1) is to be read with Article 6 of the Basel Convention. The Bamako Convention and Waigani Convention define 'illegal traffic' in a very similar fashion to the Basel Convention.[51] Further, the EU directive on Shipments of Waste defines 'illegal shipment' in a very detailed fashion in comparison to the Basel Convention.[52]

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41 Refer provision 1(d) of the Cairo Guidelines and Principles for the Environmentally Sound Management of Hazardous waste. Provision 1(d) defines 'transport' as – the movement of hazardous wastes from the place at which they are generated until they arrive at an approved site or facility for disposal.

42 The Cairo Guidelines, provision 1(d) is to be read with provision 1(e) and (f).

43 EU Directive on Shipments of Waste, Regulation (EC) No 1013/2006 (June 14, 2006).

44 EU Directive on Shipments of Waste, 2006, Article 2(34).

45 EU Directive on Shipments of Waste, 2006, Article 2(33) defines 'transport'.

46 EU Directive on Shipments of Waste, 2006, Article 2(26) defines 'overseas countries and territories'.

47 Controlled transboundary movements are assessed by using data of such movements reported to the Basel Convention Secretariat, the office responsible for the European Union-Waste Shipment Regulation, etc.

48 Uncontrolled transboundary movements are quantified by analysing whether prices of EEE commodities recorded in the trade statistics are in ranges that are more reasonable for used-EEE or e-waste than for new EEE.

49 Brink, V.A., Angelo, E., et al., 'Strategic Risk Analysis, Project STRIKE Stronger Training and Increased Knowledge for Better Enforcement Against Waste and Mercury' (2020).

50 As per article 9(1) of the Basel Convention, any transboundary movement of hazardous wastes or other wastes is deemed illegal if done – a) without notification; b) without consent; c) consent obtained from States concerned through falsification, misrepresentation or fraud; d) not materially consistent with the documents; e) results in deliberate disposal (e.g. dumping).

51 The Bamako Convention, 1998, Article 9 and the Waigani Convention, 2001, Article 9.

52 EU directive on Shipments of Waste, art. 2(35) -'illegal shipment' means any shipment of waste effected:
a) without notification; b) without the consent; c) consent obtained through falsification, misrepresentation or fraud; d) not specified materially in the notification or movement documents; e) results in recovery or disposal in contravention of the rules; f) contrary to articles 34, 36, 39, 40,

False statements, the concealing, mixing, or double stacking of the items in a shipment, as well as the incorrect marking of individual containers, are common ways of conducting illegal activities. Such techniques aim to falsify the real contents of a cargo; therefore, detecting cases of illicit trade calls for the diligent and complete examination by national enforcement authorities.[53]

4. BASEL CONVENTION AND ITS GUIDELINES

4.1. The Basel Convention

The Basel Convention is the primary global treaty that governs the transboundary flow of hazardous wastes and other wastes, including e-wastes. Since the BAN Amendment went into effect, the Basel Convention has gained increased importance. As the primary international legal framework governing the transboundary movement and disposal of hazardous wastes, the key objective of the convention is: "to protect by strict control, human health and the environment against the adverse effects, which may result from the generation and management of hazardous wastes and other wastes."[54]

The preamble of the Basel Convention recognizes the sovereign rights of states where hazardous wastes are dumped or intended to be dumped. The spirit of the convention can easily be elicited from the preamble as protecting developing and least developed nations from the ill effects of hazardous waste(s) disposal in their territories.[55] Furthermore, the Basel Convention places obligations on countries that are party to the convention to lessen to the best of their capacity the amounts of waste that are exported to be treated and disposed of as close as possible to the places of generation and to prevent or minimize their generation at their source.[56] It also binds the parties to take appropriate measures to prevent and punish the contraventions of the convention.[57] It provides a forum for developed countries to demonstrate and train developing and least developed countries on some successful environmentally sound management (ESM) activities. However, not much has been done in that regard.

The Duty to Prohibit

The Basel Convention restricts the state of export to prohibit the export of hazardous waste if the state of import expressly exercises their right to prohibit the import of hazardous waste for disposal or if the state of import

41 and 43; or g) which has resulted from - (i) the waste being discovered not to be listed in Annexes III, IIIA or IIIB, or (ii) non-compliance with article 3(4), (iii) the shipment being effected in a way which is not specified materially in the document set out in Annex VII.

53 Baldé, C.P., *Supra* note 24.

54 Orellana, M.A. and Azoulay, D., "Shipbreaking and the Basel Convention: Analysis of the Level of Control Established under the Hong Kong Convention", (2011) 11 *The Centre for International Environmental Law*, Geneva.

55 Refer, Preamble of the Basel Convention.

56 The Basel Convention, art. 4(2) – General Obligations

57 The Basel Convention, art. 4(4)

does not consent in writing.[58] The duty imposed by the convention on the exporters and generators of waste is based on the 'polluter pays principle'. Prohibition by any state of the import of hazardous wastes through information to be communicated under Article 13.[59] The convention leaves it entirely to the discretion of each sovereign state party to decide whether or not to permit the importing of such wastes. The Basel Convention prohibits hazardous waste exports if there is reason to believe the waste won't be managed in an environmentally sound manner in the importing country, aligning with the Convention's core objective.[60] While it permits transboundary movement when such management isn't possible domestically, it lacks mechanisms to verify this claim. Additionally, trade with non-parties is not allowed, yet illegal e-waste movements persist as a significant challenge.[61]

The Duty to Notify

The Basel Convention requires the exporting state to notify concerned states of any proposed hazardous waste movement through the Prior Informed Consent (*hereinafter* referred to as 'PIC') procedure, seeking written approval from the importing state.[62] However, following the BAN Amendment, the PIC procedure no longer applies to movements for disposal operations under Annex IV A.[63] Despite its intent, the PIC procedure has loopholes, particularly in verifying the waste management capacity of the importing country, as the Convention lacks a clear mechanism for such verification and relies solely on information exchange between parties.[64] Developing countries cannot often accurately assess the risks of hazardous waste shipments, leading to overestimation of their disposal capabilities.[65] The PIC procedure is vulnerable to manipulation by officials motivated by economic pressures, such as the need for foreign currency, and lacks safeguards against misrepresentation.[66] Its major flaws include weak enforcement and ineffective self-verification, often resulting in waste not being returned to the exporting country when shipments are mishandled.[67]

The Basel Convention requires state parties to submit annual reports with data on hazardous waste movements, disposal methods, and impacts

58 The Basel Convention, art. 4(1)(a)(b)(c).
59 The Basel Convention, art. 13(2)(c) and (d).
60 The Basel Convention, art. 4(2)(e) and (g) to be read with art. 4(8).
61 The Basel Convention, art. 4 (5).
62 The Basel Convention, art 6(1) to be read with annex V A.
63 Annex IV A talks about the operations which do not lead to the possibility of resource recovery, recycling, reclamation, direct re-use or alternative uses. For instance, landfilling and incineration. Refer, The Basel Convention, art. 6(2) to be read with art. 13 (2) (c) and (d).
64 Widawsky, L., "In My Backyard: How Enabling Hazardous Waste Trade to Developing Nations can improve the Basel Convention's ability to achieve environmental justice", 38(2) *Environmental Law* 577 (2008). Also refer, The Basel Convention, art. 4(b).
65 Widawsky L., Ibid.
66 Andrews, A., 'Beyond the Ban - Can the Basel Convention adequately Safeguard the Interests of the World's Poor in the International Trade of Hazardous 'Waste?', 5(2) *Law, Environment and Development Journal* 167 (2009).
67 Widawsky, L., *Supra* note 64. Also refer, The Basel Convention, art. 8.

on health and the environment.[68] However, reporting compliance remains low, with only around 50–60% of parties submitting reports in recent years.[69] Similar trends can be seen in the national reports submitted in the year 2023 (102 countries submitted), 2020 (116 countries submitted), 2019 (116 countries submitted), 2018 (113 countries submitted), 2017 (116 countries submitted), 2016 (114 countries submitted), 2015 (108 countries submitted). This weakens the Convention's ability to assess its effectiveness, as incomplete data hampers evaluation of transboundary e-waste flows and national waste management practices.[70] Some of the countries which are inconsistent with the reporting are Bahrain, Bangladesh, Dominican Republic, Jamaica, Jordan, Kenya, Kuwait, Libya, Mali, Montenegro, Monaco, Mongolia, Morocco, Mozambique, Tajikistan, Uganda, Ukraine, and Zimbabwe etc. Most of these nations fall into one of the world's poorest categories or are developing or low-income nations. India, in particular, has no official record of reports submitted from 2001 to 2015. Also, it should be highlighted that developed nations consistently and most often submit National Reports.[71]

The Duty to Prevent Illegal Traffic

Under the Basel Convention, any transboundary movement of hazardous waste without proper notification, consent, or through fraud is deemed illegal traffic.[72] In such cases, the exporter state must take back the waste or ensure its proper disposal, though this is often not followed in practice.[73] If the importer is at fault, the importing state must ensure environmentally sound disposal.[74] Where responsibility is unclear, all involved parties are obligated to ensure safe disposal elsewhere.[75] Similar obligations exist under the Bamako Convention.[76] The Basel Convention Secretariat supports parties in identifying and addressing illegal waste trafficking by facilitating cooperation and providing reporting forms.[77] However, reporting remains low, with less than 50% of signatories submitting data. Notably, no cases of illegal e-waste trafficking have been

[68] The Basel Convention, art. 13(3).

[69] Refer, Basel Convention National Reports - Year 2023, <https://www.basel.int/Countries/NationalReporting/NationalReports/BC2023Reports/tabid/10106/Default.aspx> accessed on 21 January, 2025.

[70] National Reports from 2001 to 2023, <http://www.basel.int/Countries/NationalReporting/NationalReports/BC2021Reports/tabid/9379/Default.aspx> accessed on 21 January, 2025.

[71] To understand the ongoing trends relating to National reporting by developed, developing and poorer countries, the researcher attempted to draw a comparison between the developed economies and developing economies (as per United Nation). Refer, World Economic Situation and Prospects 2022, <https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2022_ANNEX.pdf> accessed on 21 January, 2025.

[72] The Basel Convention, art. 9.

[73] The Basel Convention, art. 9(2).

[74] The Basel Convention, art. 9(3).

[75] The Basel Convention, art. 9(4).

[76] The Bamako Convention, art. 9.

[77] The form is available at the official website of Basel Convention, <http://www.basel.int/Portals/4/Basel%20Convention/docs/legalmatters/illegtraffic/illegtrafform.pdf> accessed on 21 January, 2025.

reported in the past three decades.[78] While the Convention encourages efforts to prevent such trafficking and promote best practices,[79] the Secretariat has made limited progress in advancing these initiatives.[80]

The Right to enter into agreements

The Basel Convention allows parties to enter into bilateral, multilateral, or regional agreements on hazardous waste movements, including with non-parties, as long as they uphold environmentally sound management standards.[81] This serves as an exception to the general rules but becomes redundant under the BAN Amendment. Despite the requirement to inform the Secretariat about such agreements, many countries fail to report them in their national submissions.[82]

The Duty to International Cooperation

International cooperation is essential to address global environmental challenges, as environmental harm often transcends borders and offers solutions with low costs and political risks. The Basel Convention reflects this need by obligating parties to promote environmentally sound waste management.[83] However, despite its three-decade existence and multiple revisions, the Convention remains weak in curbing illegal hazardous waste movements, including e-waste. Its limitations are evident in the emergence of regional conventions like the Bamako and Waigani Conventions, created to address the Basel Convention's shortcomings. The Basel Convention faces several challenges, including limited progress by its Secretariat in advancing technical cooperation and promoting best practices for hazardous waste management. It lacks post-shipment inspection mechanisms and clear thresholds for hazardous content, weakening enforcement. These issues are compounded by unequal power dynamics between developed and developing countries and the reliance on state compliance, which many developing nations struggle to uphold. The Convention's effectiveness is further diminished by the U.S. not ratifying it, though related treaties like the

78 Cases of Illegal Traffic, Basel Convention, <http://www.basel.int/Implementation/LegalMatters/IllegalTraffic/CasesofIllegalTraffic/tabid/3424/Default.aspx> accessed on 23 January, 2025.

79 The Basel Convention, art. 16 (1) (g) and (k) – Functions of the Secretariat. Refer, Decision BC – 11/10 of COP on National legislation, notifications, enforcement of the Convention and efforts to combat illegal traffic. <http://www.basel.int/Implementation/LegalMatters/IllegalTraffic/Bestpractices/tabid/4282/Default.aspx> accessed on 21 January, 2025.

80 For instance, the official website of Basel Convention displays almost no 'best practice' established by any state party to combat the illegal traffic in hazardous waste including e-waste. <http://www.basel.int/Implementation/LegalMatters/IllegalTraffic/Bestpractices/tabid/4282/Default.aspx> accessed on 21 January, 2025.

81 The Basel Convention, art. 11.

82 Bilateral, Multilateral or Regional Agreements or Arrangements, <http://www.basel.int/Countries/AgreementsorArrangements/tabid/8690/Default.aspx> accessed on 21 January, 2025.

83 The Basel Convention, art. 10.

Stockholm and Rotterdam Conventions provide supplementary support against illegal hazardous waste trade.

4.2. Basel Technical Guidelines

The Basel Convention's *Technical Guidelines* on the transboundary movement of e-waste and used electrical and electronic equipment (UEEE) were initiated in 2008 and adopted on an interim basis at COP-14 in 2019.[84] A key debate remains unresolved regarding whether non-functional equipment sent for repair or refurbishment constitutes waste. The guidelines aim to clarify the distinction between hazardous and non-hazardous waste, particularly under entries A1180 and B1110.[85] While the Convention regulates hazardous waste strictly, non-hazardous waste is not subject to the same controls and can still harm human health and the environment if not managed properly, burdening the receiving countries.[86]

The current *Technical Guidelines* aim to clarify when transboundary movements of e-waste and used electrical and electronic equipment (UEEE) fall under the Basel Convention, particularly in distinguishing between hazardous waste, other waste, and non-waste. They assist enforcement agencies in determining applicability but do not cover broader aspects like collection, disposal, or extended producer responsibility (EPR).[87] A key challenge is distinguishing waste from non-waste during inspections, especially due to false declarations. The guidelines emphasize that used equipment is considered waste if classified as such under national law and that both exporting and importing countries must follow Basel provisions, including the PIC procedure, if UEEE is deemed hazardous.[88] The Technical Guidelines put forth situations wherein the UEEE should be considered waste.[89] Further, the situations where UEEE should not be considered waste are also mentioned.[90]

The *Technical Guidelines* help clarify what qualifies as waste in transboundary movements of used electrical and electronic equipment (UEEE), and differentiate between hazardous and non-hazardous waste. They recommend presuming e-waste as hazardous unless proven otherwise.[91] A recent development includes the Harmonised System Committee's adoption of new HS codes (under 8549) for identifying e-waste.

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84 Ad-interim adoption means that technical guidelines are adopted on a temporary basis, subject to further review and possible revision in the future, to address an urgent need for action while further work is carried out to refine and improve the guidelines.

85 The Basel Convention, Annex VIII, List A, Entry A1180 and Annex IX, List B, Entry B1110 - Electrical and electronic assemblies.

86 Baldé, C.P., *Supra* note 24.

87 Technical Guidelines, Introduction, para 7.

88 Technical Guidelines, Para 28 and 29.

89 Technical Guidelines, Para 31

90 Technical Guidelines, Para 32

91 For instances, Lead-containing glass from cathode ray tubes, Nickel-cadmium batteries and batteries containing mercury, Selenium drums, Printed circuit boards, Fluorescent tubes, Plastic components containing BFRs, Other components contaminated with mercury, Components containing asbestos, etc.

However, these guidelines are not legally binding, and it is up to state parties to incorporate them into their national laws and policies.

4.3. The Basel BAN Amendment

The original Basel Convention regulated, rather than banned, hazardous waste movement through the Prior Informed Consent (PIC) procedure, which disappointed many developing countries. In response, the BAN Amendment was adopted in 1994–95 to prohibit hazardous waste exports from developed to developing countries.[92] Despite efforts by some developed nations to delay or weaken its implementation, the Amendment was confirmed to enter into force once ratified by three-fourths of the parties present in 1995. Although a decision was made to ban such waste trade for disposal and phase it out for reuse by 2007, its legal enforceability remained disputed since it wasn't incorporated into the Convention's main text. At COP-3 in 1995, the Parties adopted the BAN Amendment, proposed by the EU, to prohibit hazardous waste exports—including e-waste—from Annex VII countries (OECD, EU, and Liechtenstein) to non-Annex VII countries.[93] Due to delayed ratification, the amendment only entered into force on December 5, 2019, after Croatia's ratification.[94] It added a new preambular paragraph, Article 4A, and Annex VII to the Convention.[95] The BAN covers all Annex I wastes with Annex III hazardous characteristics, and all Annex VIII wastes unless proven non-hazardous—thereby explicitly including e-waste as hazardous waste.[96] The Basel BAN cover all wastes listed in Annex I that possess an Annex III hazardous characteristic. It also includes all wastes listed on Annex VIII (presumed hazardous waste streams) unless it can be shown that they do not possess an Annex III hazardous characteristic. This implies that the Basel BAN covers e-wastes as a hazardous waste.

The BAN Amendment has several legal implications:

a) Annex VII countries that ratified it cannot export hazardous waste to non-Annex VII countries.
b) Non-Annex VII countries that ratified it cannot import hazardous waste from Annex VII countries.
c) No hazardous waste trade is allowed between Annex VII and non-Annex VII countries if either has ratified the Amendment and the other has not.

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92 Decision II/12, in Report of the Second Meeting of the Conference of the Parties to the Basel Convention on the Control of the Transboundary Movements of Hazardous Wastes and their Disposal, UN Doc. UNEP/CHW.2/30 (1994).

93 Decision III/1, in Report of the Third Meeting of the Conference of the Parties to the Basel Convention on the Control of the Transboundary Movements of Hazardous Wastes and their Disposal, UN Doc. UNEP/CHW.3/35 (1995).

94 BAN, IPEN and Toxics Link, "The Basel Ban Amendment and Implications for India: A Guide to Implications and Next Steps" (August, 2020), <https://ipen.org/sites/default/files/documents/ban-basel-fact-sheet-v2_3-india-en.pdf> accessed on 21 January, 2025.

95 The Conference of the Parties adopted Decision III/1 at its third meeting to amend the Convention.

96 The Basel Convention, art. 4A (1) to be read with Annex VII and Annex IV A.

d) As the BAN Amendment is now part of the Convention, any violation is considered illegal traffic and a criminal offense, prosecutable by the ratifying country.

The provisionally adopted e-Waste Guideline weakens the BAN Amendment by allowing non-functional electronics to be classified as non-waste if exported for repair, enabling continued e-waste flows from developed to developing countries. This risks undermining the BAN Amendment's original intent.[97] Additionally, the BAN Amendment's effectiveness is limited by the fact that key e-waste-importing countries, like India, have not ratified it, allowing legal loopholes. Even with full ratification, enforcement challenges, such as monitoring and detection, pose ongoing obstacles to stopping illegal e-waste trade.

5. NAVIGATING REASONS FOR TRANSBOUNDARY MOVEMENTS

Literature shows that while the reasons for transboundary movement of hazardous waste have evolved over the decades, earlier factors remain relevant. Similar motivations apply to e-waste. Key reasons include many countries lacking the technological, financial, or infrastructural capacity to manage e-waste, and the limited global availability of specialized facilities, such as smelters for printed circuit boards (PCBs).[98] Only six well-known smelters located in the aforementioned regions are capable of processing PCBs on a global scale.[99] Further, the transboundary nature of EEE manufacturing contributes to this movement. Additional reasons for transboundary e-waste movement include proximity to treatment facilities in neighbouring countries, demand for waste as raw material in recipient nations, and the presence of valuable secondary materials in e-waste.[100] Countries like China, until 2018, imported large volumes to support manufacturing.[101] Economic factors also drive exports, as managing e-waste is often costlier in developed countries due to strict regulations and limited disposal sites.[102] In contrast, developing nations have weaker environmental laws and limited technical capacity,

97 BAN, *Supra* note 94.
98 The Basel Convention, art. 4(9)(a).
99 Baldé, C.P., *Supra* note 24 at 10.
100 The Basel Convention, art. 4(9)(b).
101 China needs a steady supply of valuable metals and minerals from e-waste to support its manufacturing industry. The extraction process of raw materials from e-waste provides a reliable source of income for some of China's poorest families, which fuels economic growth. Refer, Davenport, T., "The Digital Dump: Navigating China's Informal Market of Electronic Waste", *Equilibrium*, 29 March, 2020, <https://equilibriumecon.wisc.edu/2020/03/29/the-digital-dump-navigating-chinas-informal-market-of-electronic-waste/> accessed on 7 January, 2025.
102 It is approximately $360 a pound to process a ton of electronic waste. <https://shorturl.at/StbVl> accessed on 9 January, 2025.

making them more vulnerable.[103] The absence of global tracking standards further facilitates such waste shipments.[104]

Developed countries often export e-waste to avoid the high carbon footprint of landfilling or incineration, shifting the environmental burden to developing nations. This practice violates principles of fairness and justice.[105] Poverty in Third World countries makes them more vulnerable to accepting hazardous waste for financial gain, despite the long-term environmental and health costs.[106] While industrialized nations pay for this waste disposal, the negative externalities often outweigh the economic benefits, leaving developing countries to bear the consequences.[107] Ultimately, accepting such waste remains a sovereign decision, albeit one with serious implications.[108] CETIM highlights that a lack of understanding about Africa and its people among Western businesses contributes to the transboundary dumping of hazardous waste.[109] African leaders have condemned this practice as "garbage imperialism".[110] The U.S. export of hazardous waste to developing nations mirrors domestic patterns of environmental racism, where communities of colour are disproportionately burdened.[111] Such practices reflect broader systemic racism and underscore the need for greater global equity and environmental justice.

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[103] Johnson, S., "The Basel Convention: The Shape of Things to Come for United States Wastes Exports?" (1991) 21 (2) Environmental Law 299.

[104] Cubel, P., "Transboundary Movements of Hazardous Waste in International Law: The Special Case of the Mediterranean Area", (1997) 12(4) *The International Journal of Marine and Coastal Law* 447-448.

[105] Agyeman, J., Bullard, R. D., and Evans, B., "Exploring the Nexus: Bringing Together Sustainability, Environmental Justice and Equity", (2002) 6 (1) *Space and Policy* 85.

[106] It will probably continue to be a major force in Asia, where the Asian countries have not expressed as strong a dedication to the environment. They have not banded together and drafted a convention to ban the import of hazardous wastes like the nations of the OAU. We can conclude that Asian countries seem to be more willing than the OAU nations to trade off some environmental safety for an infusion of capital.

[107] Vilcheck, M.M., "The Controls on the Transfrontier Movement of Hazardous Waste from Developed to Developing Nations: The Goal of a Level Playing Field", (1991) 11 (3) *Northwestern Journal of International Law and Business* 643, 645.

[108] Bothe, M., "International Regulation of Transboundary Movement of Hazardous Waste", (1990) 33 *German Yearbook of International Law* 422-431.

[109] A Third World research group called CETIM (Centre Europe-Tiers Monde) reports that there is a "low level of appreciation for Africa and African people among Western business people." Refer, Mpanya, M., "The Dumping of Toxic Waste in African Countries: A Case of Poverty and Racism", in Bryant B. and Mohai P. (eds.), *Race and the Incidence of Environmental Hazards* 204 (Avalon Publishing, 1992).

[110] In 1988, the Organization of African Unity signed a resolution declaring toxic waste dumping a "crime against Africa and the African people."

[111] For example, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA) encourage companies to dispose of hazardous waste abroad. The EPA is under no obligation to check that the receiving country can manage the waste in an environmental safe manner, even if it knows the disposal facilities are unsafe. Refer, Alston, D. and Brown, N., "Global Threats to People of Colour", in Bullard R.D. (ed.), *Confronting Environmental Racism: Voices from the Grassroots* (South End Press, 1993).

6. EXAMINING ROUTES OF TRANSBOUNDARY MOVEMENTS

E-waste is a global, interregional, and domestic problem. It often happens that e-waste, once stripped of its most valuable components, is illegally dumped with no regard for the present toxic substances in poor countries. Alternately, it may be illegally exported/imported to countries despite international regulations on hazardous waste banning this practice.[112] There is a scarcity of information on the transboundary movements of e-waste. Therefore, predicting the transboundary flow of e-waste properly is presently challenging for a number of reasons related to the inadequate and inconsistent worldwide data.[113] Despite the existence of a plethora of data sources, cohesive sets of information on used electronics and their transportation are absent due to the inherent difficulties in getting such data. Some of the identified challenges are limited data collecting techniques, insufficient and incomplete national reporting,[114] ambiguous definitions, discrepancies in reporting, undifferentiated trade codes, a lack of uniform criteria for categorising and labelling old electronics and their components, inadequate regulatory monitoring, and limited agreement on the definitions of end uses are just a few of the issues (*i.e.,* reuse vs. recycling).[115] Differentiating between e-waste and used-EEE is often one of the biggest obstacles when checking a container transporting e-waste, which is frequently intermingled with used-EEE and other items. This is because exporters may offer misleading declarations or exhibit fake working tests.

Some of the challenges that have been identified by the Global Transboundary E-waste Flows Monitor 2022 is –

a) Absence of global registry - The Basel Convention does not fully report electronic waste and does not mandate reporting of used-EEE transboundary movements, which are often illegal.
b) Global mapping initiatives identify trade routes but lack data on amounts. Recent BAN mapping identified unlawful e-waste shipments, but due to the small sample size, sufficient statistics cannot be produced.[116]
c) Studies with narrow or inconsistent geographic scopes – Some studies focused only on the importer's or exporter's viewpoints

[112] Marino, G., "WEEE: illegal trade of electronic waste must be stopped to achieve EU goals", *Renewable Matter*, 12 September, 2021.
[113] Baldé, C.P., *Supra* note 24.
[114] In 2019, less than 50 percent of the State Parties to the Basel Convention did submit relevant information on hazardous e-waste through the national reports.
[115] Duan, H., Miller, R. T., *et al.,* "Quantitative Characterization of Domestic and Transboundary Flows of Used Electronics" (28 November, 2021), <https://shorturl.at/LKm55> accessed on 19 January, 2025).
[116] Basel Action Network, "Scam Recycling: e-Dumping on Asia by US Recyclers" (2016), <http://wiki.ban.org/images/1/12/ScamRecyclingReport-web.pdf> accessed on 15 January, 2025; Basel Action Network, "Disconnect: Goodwill and Dell, Exporting the Public's E-Waste to Developing Countries" (2016), <https://shorturl.at/qT3Tj> accessed on 15 January, 2025.

for a single nation,[117] or they may have examined a small number of products.[118]

d) E-waste shipments often mix with other unrecorded waste streams, such as metal scraps, leading to illegal and deliberate mingled shipments.
e) The analysis suggests that the trade of used equipment in cross-border movements is invisible due to the high costs of new equipment, indicating that the true totals may be significantly understated due to the price-based strategy used.

As a result, only preliminary worldwide estimations can be generated at this time. The flows and paths of e-waste's transboundary movement have, nevertheless, been attempted to be identified by several research investigations. Some of those studies have been discussed below. Transnational movements are dynamic and adapt to changes in society, the economy, and regulations. For instance, a swift relocation of processing operations has been ascertained from China to Southeast Asian nations as a result of China's import restriction on waste in 2018.[119] As per the Global Transboundary E-waste Flows Monitor (*hereinafter* referred to as 'GTF') 2022, 5.1 Mt (just below 10 percent of the total amount of global e-waste, i.e., 53.6 Mt) crossed country borders in 2019. Out of the 5.1 Mt, 1.8 Mt is shipped in a controlled manner as transboundary movement. As high-income nations across the world have sufficient e-waste management facilities, they import the majority of this regulated e-waste for treatment. Additionally, 3.3 Mt of the transboundary movement is exported as used-EEE or e-waste in an uncontrolled manner.[120] Uncontrolled movement across borders starts from wealthy nations to countries with middle and low incomes, further trickling down across the region to the poorest within the region.

This movement occurs on the continental level, but also intra-regionally. The majority of the destination nations are either low-income or middle-income areas with poor e-waste management infrastructure, further resulting in inefficient management. Low recycling rates and a significant number of unauthorised workers in the domestic sector are features common to recipient nations in Africa, Southeast Asia, Central America, and South America. It can also be seen that the quantity of uncontrolled movements is higher than the controlled movements. Refer to the 'Figure I' below wherein 'GTF Monitor' highlights the controlled and uncontrolled movements of e-

[117] Baldé C.P., *et al.*, 'The Dutch WEEE Flows: What happened between 2010 and 2018, 2020', United Nations University (UNU) /United Nations Institute for Training and Research (UNITAR) - co- hosting the SCYCLE Programme, Bonn, Germany (2020).

[118] Baldé, C.P., Wang, F., and Kuehr, R., 'Transboundary movements of used and waste electronic and electrical equipment', 92016) United Nations University, Vice Rectorate in Europe – Sustainable Cycles Programme (SCYCLE), Bonn, Germany.

[119] Parker, L., "China's ban on trash imports shifts waste crisis to Southeast Asia", *National Geographic*, 16 November, 2018; Nguyen, S., "Southeast Asia braces for trash dump as China enacts waste import ban", *IPEN*, 12 December, 2020.

[120] Baldé C.P., *Supta* note 24.

waste. In the 'Figure I', it is clear that India has been identified by the GTF Monitor as one of the destinations for uncontrolled e-waste imports.

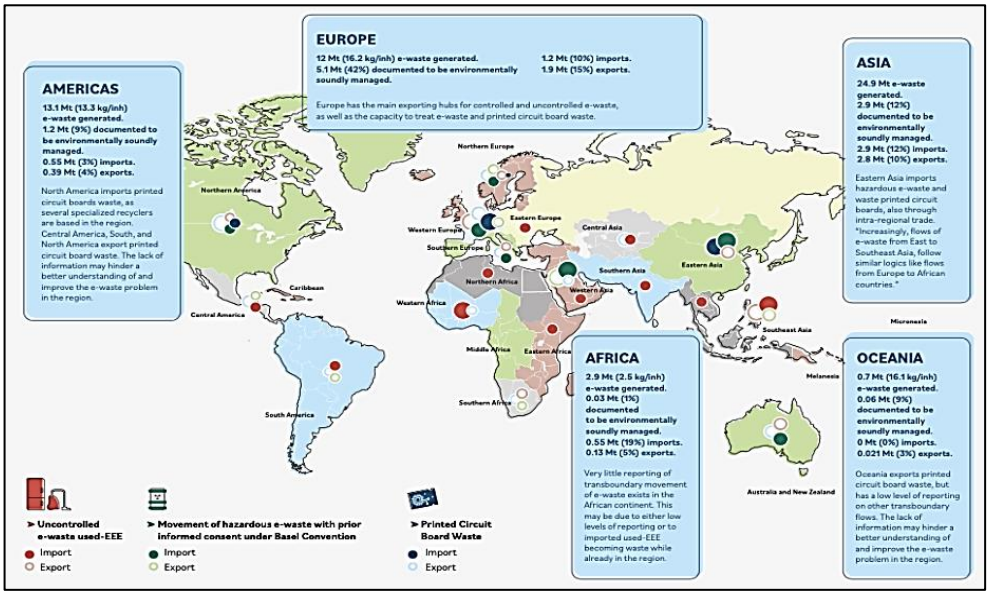


Figure I: GTF Monitor represents the controlled and uncontrolled movements of e-waste[121]

Only 2 to 17 kt of e-waste are anticipated to be seized as illegal e-waste exports from the EU in 2019.[122] When compared to the megatons of unregulated exports, this represents just the tip of the iceberg, demonstrating that inspection capabilities are severely limited. Furthermore, even developed nations have limited surveillance capacities. Furthermore, according to another international study, between 75 and 80 percent of the total quantity of generated e-waste is transported illegally from developed to developing Asian and African nations for "informal recycling" and "disposal".[123] Due to gaps in present e-waste rules, it is possible to export e-waste for "donation" and "recycling" reasons.[124] In such flows, the eventual destination of roughly 70 percent of e-waste is either undocumented or unknown.[125] As per the EU law, exports for waste disposal are forbidden by default, whether within or outside the EU; however, the wording appears to blur the line between shipments for reuse and recycling and shipments for

[121] Ibid.

[122] Data related to seizures were only made available by a limited number of enforcement agencies in the European Union, through the project Shipment of Waste Enforcement Actions Project (SWEAP).

[123] Diaz-Barriga, F., "Evidence-based intervention programs to reduce children's exposure to chemicals in e-waste sites", in *Discussion Paper for WHO Working Meeting on E-waste and Children's Health* 90 (2013).

[124] Perkins, D. N., *et al*., 'E-Waste: A Global Hazard', (2014) 80 (4) Annals of Global Health 286-295.

[125] Ongondo, F.O., Williams, I.D, and Cherrett, T.J., "How are WEEE doing?: A global review of the management of electrical and electronic wastes", (2011) 31 Waste Management 714-730.

lesser kinds of recovery, such as burning.[126] This makes it just as simple to send materials to another EU or OECD nation for burning as it is to send them back for reuse or recycling, which goes against the waste hierarchy of the EU.[127] The same has been shown in the 'Figure II' below, which highlights the movements of the e-waste from known sources to known and suspected destinations where e-waste is sent. It should be noted here that most destinations are from the developing world, and India is one of them.



Figure II: Represents the known and suspected destinations of E-waste[128]

In 2013, it was reported that "USA alone exported approximately 8.5 percent of the used EEE" in 2010. Latin America and the Caribbean received the most exports, followed by North America and Asia as the next two most popular destinations.[129] Similar findings were given by another research for the year 2011, which showed that 7 percent of UEEE was exported from the United States.[130] Similar to this, a 2013 EU report confirmed that approximately 15 percent of UEEE is exported from the EU, primarily for reuse.[131] It's important to note that part of this UEEE turns into WEEE either

[126] The factsheet mentions "establishing stricter conditions for shipments for landfilling or incineration, so that they are only authorised in limited and well-justified cases", but such a distinction is not clear in the text. <https://ec.europa.eu/commission/presscorner/api/files/attachment/870408/Factsheet%20on%20Waste%20shipments.pdf> accessed on 19 January, 2025.

[127] European Environmental Bureau, 'EU Waste Shipment Regulation falls short of fixing Europe's waste export crisis' (28 November, 2021) <https://www.ban.org/news/2021/11/17/eu-waste-shipment-regulation-falls-short-of-fixing-europes-waste-export-crisis> accessed on 19 January, 2025.

[128] Lundgren, K., "The global impact of e-waste: addressing the challenge", International Labor Office (ILO), 21 October, 2012.

[129] Duan, H., *Supra* note 115.

[130] Used Electronic Products: An Examination of U.S. Exports (2021), <https://www.usitc.gov/publications/332/pub4379.pdf> accessed on 19 January 2025.

[131] European Commission – DG Environment, 'Equivalent conditions for waste electrical and electronic equipment (WEEE) recycling operations taking place outside the European Union', 28 November,

in the course of travel (for instance, if the product isn't adequately covered during transport) or soon after it reaches the destination nation. According to another research published in 2016, 10 percent of e-waste from the EU is illegally exported from the EU, while another 10 percent is exported legitimately as used EEE.[132] According to a more recent research from 2020, 8 percent of the entire amount of e-waste produced in the Netherlands (EU) is exported for reuse.[133] In 2020, EU exports of waste to non-EU countries reached 32.7 million tonnes, an increase of three-quarters (+75 percent) since 2004.[134] All these reports indicate that transboundary movements have been in existence for a long time.

The European Environment Agency (EEA) estimated in 2012 that up to "1.3 million tons of discarded EEE are exported from the EU annually, mostly to Africa (Ghana and Nigeria) and Asia (China, India, and Pakistan)".[135] The same has been represented through a 'Figure III' below, extracted from the report of the International Labour Organisation (ILO).

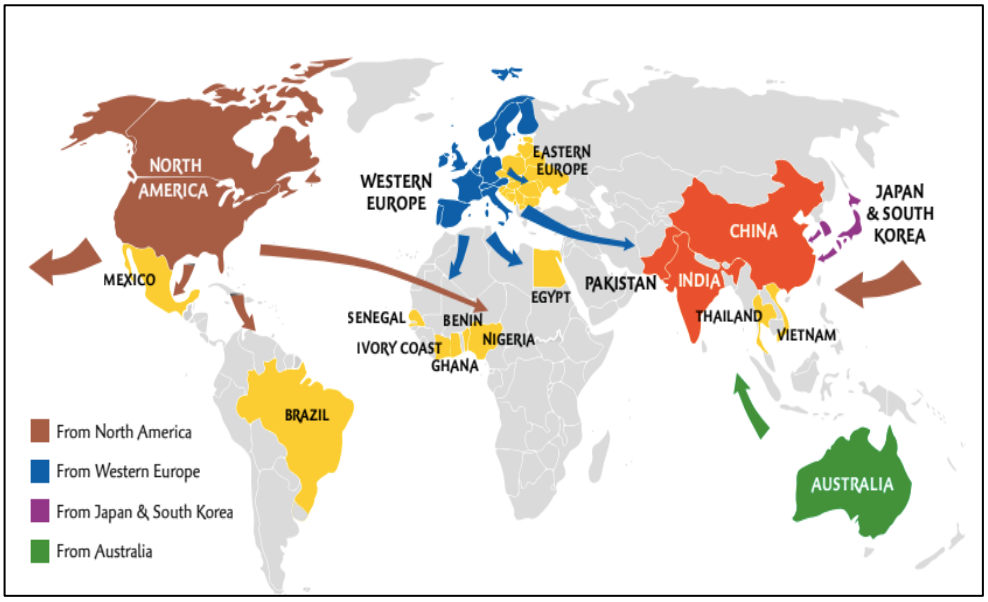


Figure III: Representing the flows from the EU towards Asia and Africa[136]

2021. <https://ec.europa.eu/environment/pdf/waste/weee/Final%20report_E%20C%20S.pdf> accessed on January 19, 2025.

132 Geeraerts, K., Mutafoglu, K. and Illés, A., "Illegal Shipments of E–Waste from the EU to China: Fighting Environmental Crime in Europe and Beyond", A study compiled as part of the EFFACE project (London: IEEP, 2016).

133 Forti, V., Baldé, C.P., Kuehr, R. and Bel, G., "The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential", (2020) United Nations University (UNU)/United Nations Institute for Training and Research (UNITAR), International Telecommunication Union (ITU) and International Solid Waste Association (ISWA), Bonn/Geneva/Rotterdam.

134 Arbinolo, R., "European Environmental Bureau, EU Waste Shipment Regulation falls short of fixing Europe's waste export crisis", European Environmental Bureau, 17 November, 2021.

135 Lundgren, K., "The global impact of e-waste: addressing the challenge", *International Labor Office*, 20 December, 2012.

136 Ibid.

The Basel Action Network (BAN), based in the US, installed GPS trackers on hundreds of electronic devices that were sent to recycling facilities in ten European countries and numerous US states between 2014 and 2017. Many of the devices were then traced to African and Asian countries. For instance, in 2016, BAN reported that 93 percent of the US e-waste exports moved to developing countries, and the majority of them were illegal.[137] Similarly, in 2019, BAN reported that 339,446 tonnes of hazardous e-waste per annum were flowing to developing countries from various EU countries.[138] The UK, Germany, Italy, Ireland, Poland, and Spain all allowed such e-waste exports to developing countries, which were found illegal. The UK was the most egregious apparent violator amongst all.[139] Hazardous wastes from the EU are probably being illegally exported to Nigeria, Ghana, Tanzania, Ukraine, Pakistan, Thailand, and Hong Kong, which are developing nations.[140] BAN reports that "Africa was by far the region of the world most targeted by EU e-waste exporters, and the second region is Asia".[141] Refer to the 'Figure IV' below, which again shows that India is one of those targeted destinations.



Figure IV: Represents E-waste Flows towards Africa and Asia in 2018[142]

In 2018, BAN reported that "Canada exported hazardous e-waste to developing countries (in this case, China and Pakistan)". Previous BAN investigations have revealed that a persistent flow of unlawful exports

[137] Hopson, E. and Puckett, J., "Scam Recycling: e-Dumping on Asia by US Recyclers", Basel Action Network, 15 September 2016.
[138] Puckett, J., Brandt, C. and Palmer, H., "Holes in the Circular Economy WEEE Leakage from Europe", (2018) Basel Action Network.
[139] Laville, S., "UK worst offender in Europe for electronic waste exports – report", *The Guardian*, 7 February 2019.
[140] Tidey, A., "EU e-waste 'illegally' exported to developing countries: Report", *Euro News*, 7 February 2019.
[141] Puckett, J., *Supra* note 138.
[142] "E-waste chokes Southeast Asia", *The Asean Post*, 29 June 2018.

continues to flow from Canada to Asian ports, especially *via* the port of Vancouver.[143] All of these analyses found that Canada was exporting e-waste in contravention of the Basel Convention.[144] Similar episodes have been reported by the World Economic Forum (WEF) in 2019. The report by WEF highlighted that "1.3 MT of discarded electronic products are exported from the EU in an undocumented way every year.[145] The 'Figure V' below by WEF describes the general routes of transnational e-waste transfers from developed to underdeveloped countries. It is to be noted again that India has been highlighted as a destination.

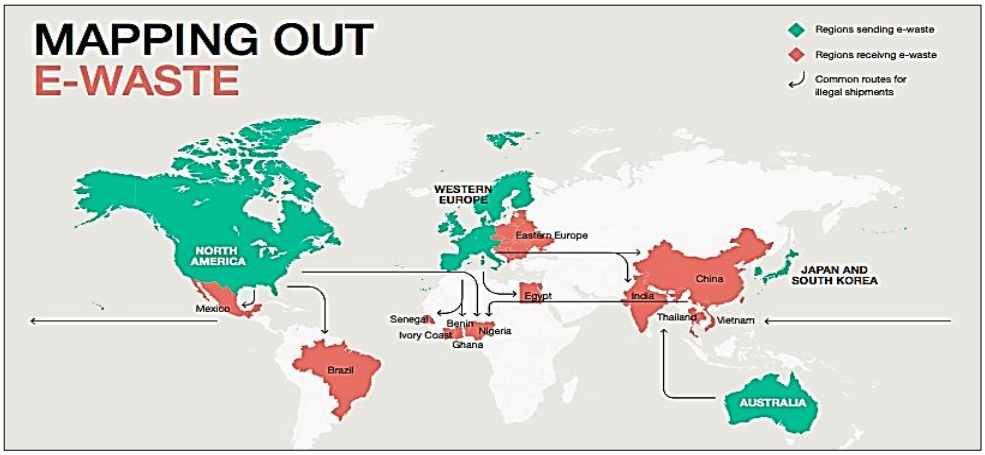


Figure V: Representing regions sending and receiving e-waste and common routes for illegal shipments of e-waste[146]

It has been established in abundance that most e-waste in Africa and Asia comes from Australia, China, the EU, Japan, North America, South Korea, the US and Canada.[147] According to the aforementioned figures, 7 to 20 percent of the e-waste produced is transported over international borders as used EEE or e-waste.[148] The Basel Convention secretariat has not reported even a single case of illegal traffic of e-waste in the past three decades.[149] There could be two reasons for this inability; first, it is difficult to identify the case of illegal traffic as it is usually done under the pretext

[143] Puckett, J., Brandt, C. and Palmer, H., "Export of e-Waste from Canada A Story as Told by GPS Trackers", Basel Action Network, 10 October, 2018.

[144] Basel Action Network, "Exporting Harm: The High-Tech Trashing of Asia", 22 October, 2002, <http://wiki.ban.org/images/e/e1/Exporting_Harm_canada.PDF> accessed on 19 January, 2025.

[145] World Economic Forum (WEF) and PACE, "A New Circular Vision for Electronics Time for a Global Reboot", (2019) <https://www3.weforum.org/docs/WEF_A_New_Circular_Vision_for_Electronics.pdf> accessed on 19 January, 2025.

[146] Ibid.

[147] Anami, L., "EAC bans dumping of electronic waste, calls for recycling", *The East African*, 29 November, 2021.

[148] Forti, V., *Supra* note 133.

[149] Cases of Illegal Traffic, Basel Convention, <http://www.basel.int/Implementation/LegalMatters/IllegalTraffic/CasesofIllegalTraffic/tabid/3424/Default.aspx> accessed on 23 January, 2025.

of donation, and sometimes the UEEE are mixed with the WEEE. The customs and port authorities are often incapable of detecting such cases because they are not trained enough. Secondly, the national reporting remains weak and almost non-existent. The Global E-waste Monitor (GEM) reported in 2020 that, "national reporting currently stands at less than 50 percent of signatories".

These statistics depict the reported movements of hazardous e-waste, and rather than the actual quantity of illicit transfers, the number of intercepted illegal transports is reported. The amount of illicit e-waste trade on a worldwide and European level, as well as in the nations featured in this study, is thus a "best guesstimate," rather than an indisputable statistic. The reason for this is that re-exports and ultimate destinations are not always reflected in trade data since the trade data destination might be an initial halting place for the items before being re-exported to a final destination. As a result, the following statistics are intended to serve as examples rather than exact figures. Nonetheless, the data from these reports can be used to understand the few ongoing issues. These reports indicate that illegal e-waste transboundary movements are still happening and remain a major problem for most nations of the world due to their limited capacities to investigate the same. Secondly, it can also be concluded that most of these movements take place from developed to developing economies, and most of these flows are in contravention of the Basel convention.

A deeper understanding of the situation in specific areas and nations would be possible with improved data quality. In light of this, nations must be urged even more to submit national reports to the Basel Convention. To further develop a technique for calculating the total illegal trafficking of e-waste, the availability and analysis of data from inspection agencies at the worldwide level about seizures of unlawful shipments of used-EEE and e-waste should also be increased.[150]

7. CONCLUSION

The findings suggest that the Basel Convention is essential in creating the three markets we see today, but to better protect developing countries from the danger of hazardous wastes, the Convention needs to re-evaluate its advocacy of trade-restricting measures and the binary categorization of countries based on OECD and EU memberships. The governance of hazardous wastes warrants a more nuanced categorization of countries, greater incentives for capable handlers to treat hazardous wastes, and capacity building for vulnerable countries to regulate hazardous wastes in general.

Further reinforcing the need for periodic reporting and review mechanisms is that international treaties to protect against exposure to hazardous substances and wastes lack effective reporting, compliance and review mechanisms. Many countries continue to fail to meet their reporting

[150] Baldé, C.P., *Supra* note 24.

commitments. It was noted recently that up to 60 per cent of States do not meet reporting requirements under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal Further, the Basel Convention requirements are considered weak.

Two wise policy choices may be taken unilaterally to ensure better and more efficient enforcement, which is the main obstacle for all laws and regulations now in existence. To start, greater resources should be made available to customs and port personnel so they can fight the unlawful e-waste trade. It comes as no surprise that e-waste is not on the priority list, given the other issues that are often judged more important for authorities to concentrate on, such as the weapons trade, drug shipments, and human trafficking, despite recent advancements towards a circular economy. Second, the punishments for attempting to export e-waste unlawfully should be strengthened to serve as a genuine deterrence or at the very least a significant inconvenience to those attempting to disobey the law.

The 'Repairables Loophole' included in the Basel Convention allows parties to export hazardous electronic equipment to less developed countries by claiming that said waste is not 'e-waste' but raw material that can be repaired. The intent to repair absolves countries from taking responsibility for their e-waste. As all e-waste is naturally hazardous, specifying that 'hazardous' waste cannot be exported anymore does little to prevent manufacturers from circumventing the problem by labelling their broken electronic scrap as repairable 'non-waste'.

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AUTHOR'S DECLARATION AND ESSENTIAL ETHICAL COMPLIANCES

Author's Contributions (in accordance with ICMJE criteria for authorship)

This article is 100% contributed by the sole author. She conceived and designed the research or analysis, collected the data, contributed to data analysis & interpretation, wrote the article, performed critical revision of the article/paper, edited the article, and supervised and administered the field work.

Funding
No funding was available for the research conducted for and writing of this paper.

Research involving human bodies or organs or tissues (Helsinki Declaration)
The author(s) solemnly declare(s) that this research has not involved any human subject (body or organs) for experimentation. It was not a clinical research. The contexts of human population/participation were only indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of Helsinki Declaration does not apply in cases of this study or written work.

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The author(s) solemnly declare(s) that this research has not involved any animal subject (body or organs) for experimentation. The research was not based on laboratory experiment involving any kind animal. The contexts of animals not even indirectly covered through literature review. Therefore, an Ethical Clearance (from a Committee or Authority) or ethical obligation of ARRIVE does not apply in cases of this study or written work.

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JOURNAL OF ENVIRONMENTAL LAW & POLICY | 05(01) APRIL 2025
Published by The Grassroots Institute in partnership with Asia Pacific Academy of science Pte Ltd. Website: https://grassrootsjournals.org/jelp
Main Indexing: SCOPUS, EBSCO, HEIN ONLINE

ISSN 2564-016X | April 2025

M – 00541 | Analytical Article | Open Access

REVIEW OF LEGAL SUPPORT OF CLIMATE CHANGE ADAPTATION MECHANISMS

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Received: 28 January 2025 | **Reviewed:** 28 February 2025 | **Revised:** 11 March 2025
Accepted: 25 March 2025 | **Published:** 28 April 2025

ABSTRACT

Climate change presents significant challenges for legal systems, as effective regulation of adaptation measures is necessary. The lack of a unified approach to the legal framework for adaptation mechanisms complicates the implementation of state policy in this area. This study aims to analyze the legal mechanisms for adapting to climate change and their compliance with international standards. The methodology encompasses a systematic analysis of national and international legislation, a comparative examination of the legal approaches employed by different countries, and legal modeling to evaluate the effectiveness of existing mechanisms. Doctrinal analysis and legal hermeneutics methods were employed. The results of the study indicate the fragmentation of normative-legal support for climate change adaptation. It has been established that the implementation of effective adaptation measures requires harmonization of national legislation with international obligations and the expansion of the powers of local authorities. It is recommended to develop a comprehensive law on climate change adaptation that takes into account European approaches and ensures a clear mechanism for the implementation of adaptation measures.

Keywords: Climate; Environment; Environment protection; Energy security; European climate law

Editor-in-Chief: Prof. Dr. Kamrul Hossain | *Deputy Editors-in-Chief:* Dr. Evgeniya Kopitsa, Prof. Dr. Ngozi Finette Unuigbe | *Executive Editor:* Dr. Hasrat Arjjumend

How to cite this paper: Anna Liubchych, Olena Savchuk, and Oleksii Onishchenko, 'Review of Legal Support of Climate Change Adaptation Mechanisms' (2025) 05 (01) Journal of Environmental Law & Policy 290-312, <https://doi.org/10.33002/jelp050111>

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1. INTRODUCTION

Climate change is one of the acutest global environmental problems that calls for immediate response at all socio-economic levels. The resulting increased instances of extreme weather events, growth of average annual temperatures, decline in biodiversity, and natural environment degradation create a need to form efficient legal mechanisms for adapting to new climatic conditions. To this effect, studying the legal provision of adaptation mechanisms to climate change is determined not only by the need to minimize the negative effects of climate change but also by the need to develop the regulation encompassing the sustainable development of states under changing environmental factors.

Notably, the study by Jodoin and Lofts[1] examined how Global South countries - specifically Bangladesh, South Africa, and Kenya - institutionalize adaptation policies by integrating climate risk considerations into national development planning. Meanwhile, Klein et al.[2] conducted a comparative analysis of regulatory frameworks in EU member states and North America, highlighting a more coherent and legally structured approach within the European Union, as opposed to the more fragmented and policy-driven model observed in the United States. Further deepening the discourse, Voigt and Ferreira[3] focused on the constitutional dimensions of adaptation obligations, illustrating how countries such as Colombia and Germany are embedding climate adaptation within the framework of constitutional environmental rights.

As climate change accelerates, the imperative for robust adaptation mechanisms extends beyond environmental resilience to encompass the full spectrum of human rights. Adaptation is no longer solely an issue of environmental governance - it is increasingly framed as a matter of legal protection for individuals and communities whose fundamental rights are jeopardized by climate-induced disruptions. The right to life, health, housing, water, food, and an adequate standard of living are all placed under strain as environmental conditions deteriorate, particularly for vulnerable populations such as Indigenous peoples, persons with disabilities, coastal communities, and women and children.

Among the most pressing human rights challenges emerging from climate change is the protection of climate-displaced persons—often referred to as "climate refugees." Although the 1951 Refugee Convention does not

1 Jodoin, S., & Lofts, K., 'Adaptation to Climate Change in the Global South: Development, Human Rights and Climate Governance', (2013) 9(1) McGill Journal of Sustainable Development Law 25–52.

2 Klein, R. J. T., Midgley, G. F., Preston, B. L., Alam, M., Berkhout, F. G. H., Downing, T. E., & Shaw, M. R., 'Adaptation opportunities, constraints, and limits. In Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the IPCC (Cambridge University Press 2017), pp. 899–943.

3 Voigt, C., & Ferreira, F., 'The constitutional protection of the environment and climate change: A global overview', (2020) 29(2) Review of European, Comparative & International Environmental Law 210–222. <https://doi.org/10.1111/reel.12323>.

formally recognize environmental displacement as grounds for refugee status, a growing body of scholars and policy advocacy highlight the urgent need to address this normative gap. For instance, New Zealand has taken tentative steps toward humanitarian visa frameworks designed to accommodate climate-affected migrants from the Pacific Islands[4]. Simultaneously, the UN Human Rights Council has emphasized that states have a duty to safeguard the rights of those displaced by climate change within both domestic and international human rights regimes.[5] In this evolving legal landscape, adaptation cannot be adequately understood without incorporating a human rights-based approach. Ensuring that legal frameworks address the intersection between environmental vulnerability and structural inequality is critical to promoting climate justice. This requires not only legal innovation but also interdisciplinary collaboration across environmental, human rights, and migration law to develop holistic and equitable models of climate adaptation.

Another critical yet often underexplored dimension of climate adaptation legislation is the role of subnational and local legal frameworks. While international agreements and national strategies establish overarching goals, it is regional and municipal authorities that are frequently at the frontline of climate impacts and therefore responsible for designing and implementing adaptive responses tailored to local conditions. In jurisdictions such as the United States, Germany, and India, subnational entities have developed innovative legal instruments to address climate-related risks through land-use planning, building codes, emergency management policies, and localized resilience strategies.[6, 7]

These decentralized legal approaches not only enable context-sensitive adaptation but also foster legal pluralism and policy experimentation. However, they also raise concerns regarding regulatory fragmentation, inconsistent enforcement, and disparities in adaptive capacity across regions. Understanding how local legal mechanisms interact with national and international obligations is thus essential to constructing a coherent and effective legal framework for climate adaptation. In parallel with normative developments, the effectiveness of climate adaptation governance hinges on the availability of adequate financial and legal instruments. Climate finance mechanisms, such as adaptation funds, green bonds, and climate risk insurance, serve as vital tools to operationalize legal commitments, especially in resource-constrained jurisdictions. Legal provisions that mandate

[4] Burson, B., & Bedford, R., 'Climatic change and migration from Oceania: Imagining legal and policy responses. In: J. McAdam (Ed.), *Climate Change and Displacement: Multidisciplinary Perspectives*, (Hart Publishing, 2013), p.177–202.

[5] United Nations Human Rights Council (UNHRC), 'Analytical study on the promotion and protection of the rights of persons in the context of climate change', (2020). A/HRC/47/46. <https://undocs.org/A/HRC/47/46>.

[6] Craig, R. K., 'Adapting to Climate Change: The Potential Role of State Common-Law Public Trust Doctrines, (2010) 34(4) Vermont Law Review 781-852.

[7] Dubash, N. K., & Jogesh, A., 'From Margins to Mainstream? Climate Change Planning in India as a 'Door Opener' to a Sustainable Future' (2014) Centre for Policy Research Working Paper Series, New Delhi.

dedicated adaptation budgeting, incentivize investment in resilient infrastructure, or integrate climate risk into public procurement can significantly enhance implementation. For instance, the EU Taxonomy Regulation (2020) and the Climate Resilience Principles of the Green Climate Fund explicitly tie financial flows to legally defined adaptation criteria.[8, 9]

Equally important are accountability mechanisms that ensure compliance and provide recourse in cases of maladaptation or state inaction. Strategic climate litigation is emerging as a powerful enforcement tool, as seen in cases such as Urgenda Foundation v. the State of the Netherlands[10], where courts held governments accountable for failing to meet their adaptation and mitigation obligations under human rights law. Legislative frameworks that establish justiciable adaptation targets, require transparent monitoring and reporting, or impose duties of care on public authorities, such as France's Loi Climat et Résilience[11], illustrate how binding obligations and sanctions for non-compliance can be institutionalized within domestic law. These instruments help transform climate adaptation from a discretionary policy goal into an enforceable legal duty.

Research objective includes analyzing and evaluating the legal framework for mechanisms of adaptation to climate change, as well as to develop recommendations for improving regulatory legal frameworks in this area. The research tasks include:

1. Analyzing international legal instruments related to climate change adaptation.
2. Identifying key adaptation mechanisms and examining their legal integration.
3. Evaluating national legal practices in selected countries to identify best practices and common challenges.
4. Recommending legal reforms to improve national adaptation frameworks.

2. GLOBAL CLIMATE GOVERNANCE: CHALLENGES AND OPPORTUNITIES FOR MITIGATION AND ADAPTATION

According to the Intergovernmental Panel on Climate Change, if global emissions of greenhouse gases are not decreased in the next decade, humanity will face a climate crisis, mass migration, food scarcity, etc. In turn, the attainment and support of clean and zero global anthropogenic emissions of

8 European Union, 'Regulation (EU) 2020/852 on the establishment of a framework to facilitate sustainable investment (EU Taxonomy)' (2020) Official Journal of the European Union.

9 Green Climate Fund 'Updated Strategic Plan for the Green Climate Fund 2020–2023' (2021). <https://www.greenclimate.fund>.

10 The Netherlands Urgenda Foundation v. The State of the Netherlands (Ministry of Infrastructure and the Environment), (2019) Supreme Court of the Netherlands, Case No. 19/00135, 20 December 2019.

11 Republic of France, 'Loi n° 2021-1104 du 22 août 2021 portant lutte contre le dérèglement climatique et renforcement de la résilience face à ses effets or the UK's Climate Change Act (2008) UK Parliament. Climate Change Act 2008. (2021), <https://www.legislation.gov.uk/ukpga/2008/27/contents>.

greenhouse gases and a decrease in gross radiation impact unrelated to them may stop human-induced global warming for the next decades and slow down the rates of climate change.[12] It is for this reason that global environmental problems related to climate change, ozone layer degradation, chemical and radiological pollution of the environment, and the need for biodiversity preservation have long become the foundation for globalizing processes uniting national socio-economic formations into a unified worldwide economic and social system and coerce the global community to seek consistent, efficient and, most importantly, timely means to address them.[13]

Climate change has always been a topic for many generations because the future of mankind depends directly on the environment and the possibility for a person to live and evolve within it. Therefore, of utmost significance is environmental awareness and the development of plans that will not only prevent deterioration of the current state of affairs but will also enable taking care of generations to come.[14] The climate as an individual protected object should be maintained in its normal state, suitable for the existence of the planet and people. The consequences of climate change are extremely serious. In case of failure to avoid adverse changes, the average global temperature will rise due to the greenhouse effect.[15] The climate change effectiveness index, as an instrument, analyzes and compares efforts concerning mitigation of the climate change consequences in 60 countries demonstrating the largest emissions volumes, including those of the European Union. Together, the Climate Change Performance Index (CCPI) countries account for 90% of global emissions. The index is intended to increase transparency of international climate-related policies and to facilitate a comparison of the efforts on consequences mitigation and the progress achieved by individual states.[16] Proper interpretation of obligations is a rather weighty element in the mechanism for incorporation of climate agreement norms into states' national legislation.[17]

[12] Masson-Delmotte, P., Zhai, H. O., Pörtner, D., Roberts, J., Skea, P. R., Shukla, A., Pirani, W., Moufouma-Okia, C., Péan, R., Pidcock, S., Connors, J.B.R., Matthews, Y., Chen, X., Zhou, M.I., Gomis, E., Lonnoy, T., Maycock, M., Tignor, T. & Waterfield, T., 'An Intergovernmental panel on climate change Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty' (2018). <https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_Low_Res.pdf>.

[13] Bredikhina, V.L. & Prikhodko, V. Y., 'Adaptation to Climate Change as a Factor of National Security of Ukraine' (2020) 82 (C) Journal of Eastern European Law 22– 31. <https://doi.org/10.5281/zenodo.4665949>.

[14] What is the Kyoto Protocol? <https://unfccc.int/kyoto_protocol>.

[15] Ibid, n.13.

[16] The climate change performance index 2024. <https://ccpi.org/>.

[17] Nevara, L.M., & Kotvytska, K., 'The current state of implementation of international climate agreements into the national legislation of states' (2022) 4 Kyiv Law Journal: Science 226–231. <https://doi.org/10.32782/klj/2022.4.34>.

3. INTERNATIONAL LEGAL FRAMEWORK FOR ADAPTATION TO CLIMATE CHANGE

For the first time, the concept of sustainable development, closely related to general environmental protection issues and specific concerns regarding climate change, served as the basis for the agenda of the 1972 UN Stockholm Conference on the Human Environment.[18,19,20]

3.1 Early International Environmental Agreements and the Evolution of Legal Instruments

The beginning of global climate regulation was put by the Vienna Convention on the Ozone Layer Protection of March 22, 1985, and the additional Montreal Protocol of 1987.[21] The Vienna Convention on Ozone Layer Protection laid the foundation for further efforts to control chemical emissions that destroy the ozone layer. This document did not stipulate specific obligations concerning the reduction in the use of ozone-depleting substances, but it established the framework for international cooperation, research and information exchange on the state of the ozone layer and the consequences of anthropogenic activities to protect it. Further development in legal frameworks for ozone layer protection occurred based on the Montreal Protocol on Substances that Deplete the Ozone Layer, which was adopted on September 16, 1987. The Montreal Protocol became the key international agreement that established distinctive obligations for participating states concerning gradual reduction in and consequent cessation of production and use of ozone-depleting substances. It became the first international agreement to impose specific quotas on the reduction in the manufacture and use of these substances.

Owing to these instruments, the Montreal Protocol is considered to be one of the most successful international environmental protection agreements. It not only facilitated a considerable decrease in the use of ozone-depleting substances but also exercised a positive impact on climate regulation in general. Overall, it is possible to state that the Vienna Convention and the Montreal Protocol became important stages in the evolution of international climatic policies. They not only contributed to saving the ozone layer but also laid the foundation for global cooperation in

[18] Matiushyna, O., 'Formation and development of EU climate policy in the context of international legal cooperation of states to combat climate change' (2023) (3) Law Review of Kyiv University of Law 226-232. <https://doi.org/10.36695/2219-5521.3.2023.46>.

[19] Programme of action (ECSC, Euratom, EEC) on the environment, 1973–1976. <https://cordis.europa.eu/programme/id/ENV-ENVAP-1C>.

[20] Resolution of the Council of the European Communities and of the representatives of the Governments of the Member States, meeting within the Council, of 7 February 1983 on the continuation and implementation of a European Community policy and action programme on the environment (1982 to 1986). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A41983X0217>.

[21] Getman, A. P., Getman, Y. A. & Lozo. V. I., 'Climate Protection Laws: European Reality and Ukrainian Prospects' (2019) 49 (2/3) Environmental Policy and Law 190–195. <https://dspace.nlu.edu.ua/handle/123456789/16708>.

the environmental protection area, proved the effectiveness of international cooperation and provided valuable experience which is applied in contemporary climate agreements like the Kyoto Protocol and the Paris Agreement.

Later on, another pivoting point in this area was the signing of the Maastricht Treaty on the foundation of the European Union, in which the goal for the member states was affixed concerning attaining sustainable development, and the EU policies in the field of environment protection were defined and were given in effect the status of politics. Article 174 of Section XIX of the Treaty defined the goal of the EU policies in the environmental protection area, which consists of the preservation and improvement of the environmental quality; people's health; ensuring rational use of natural resources; and support of international dialogue concerning regional and global problems related to environmental preservation.[22]

Although the main focus of the treaty was on political, economic and currency integration, it also played a significant role in shaping joint environmental policy, including that of environmental protection. The essence of the Maastricht Treaty in terms of environmental protection consists in the environment-related issues being officially included in the agenda of priority areas for the European Union, having provided the legislative foundation for shaping a unified environmental policy for member states. It was defined in the Treaty that environmental protection is one of the main goals of the European Union, and all member states have obligations to cooperate in this field and promote sustainable development. Besides, the Maastricht Treaty for the first time established a legal foundation for joint environmental policies and environmental legislation harmonization among the EU states. It also introduced the notion of sustainable development as one of the fundamental targets of the Union. This has enabled the EU to develop and implement environmental protection measures and combat climate change on the supranational level.

3.2 International Climate Change Agreements: From the UNFCCC to the Paris Agreement

Because climate change constitutes a global problem which is impossible to solve within one state only, it is international legal regulations that play an important role in the cause of combining mankind's joint efforts for solving this problem. They include the international framework documents like the UN Framework Convention on Climate Change, approved in 1992 at the UN Conference on Environment and Sustainable Development, the so-called "Earth Summit"[23], supplemented with the Kyoto Protocol approved in 1997, and the Paris Climate Agreement passed in 2015. The Rio Declaration on Environment and Sustainable Development has

[22] Treaty on European Union (Maastricht, 7 February 1992) [1992] OJ C191/1. <https://www.cvce.eu/obj/treaty_on_european_union_maastricht_7_february_1992-en-2c2f2b85-14bb-4488-9ded-13f3cd04de05.html>.

[23] Rio Declaration on Environment and Development (1992). <https://shorturl.at/BGAvy>.

become one of the key documents in the field of environmental protection and sustainable development. It is made up of 27 principles that regulate relations between economic development and environmental protection, laying the foundations for global environmental policies for the future. Overall, the Declaration has given a significant impetus to climate-related policy development, having formed a foundation for subsequent international agreements that regulate the measures concerning a decrease in climate impact and promoting sustainable development at the global level.

Another important document is the Kyoto Protocol, which is an international treaty passed within the UN Framework Convention on Climate Change (UNFCCC) in 1997 in the Japanese city of Kyoto. The Protocol has become the first legally binding document which established precise quantitative obligations for participant states to decrease greenhouse gas emissions. The main goal of the Kyoto Protocol was to reduce the rate of global warming using a decrease in the emission of greenhouse gases like carbon dioxide (CO_2), methane (CH_4), nitrogen oxide (N_2O), and others. The Paris Agreement is, in turn, a historic international treaty that lays the foundations for global efforts to counteract climate change. Its primary goal is to curb the rise of global average temperature to a level much lower than 2°C exceeding that of the pre-industrial period and aspires to limit the temperature growth by 1.5 °C. This goal takes into account scientific researches which demonstrate that even a slight increase in temperature may lead to catastrophic changes in the climate system.

Many governments have claimed that they will have achieved zero emissions by 2050. Nevertheless, several present-day studies point out that the expenses on emissions reduction are rather too high and that zero-emissions programs require a large-scale development of biomass systems with carbon dioxide catching and storage (BECCS). Therefore, its feasibility is very uncertain from both economic and political standpoints.[24] Sam Adelman is positive that the Paris Agreement is a step in the correct direction, but decades overdue[25], and it is also an ample foundation for considerable progress with the related issue of climate change.[26]

The mechanism model put into the content of this document is characterized by some authors as "a ratcheting up mechanism", which can be defined as an "increase in something at controlled intervals during a certain period". The mechanism is supposed to encourage more ambitious actions on the part of the signing states concerning nationally defined contributions (hereafter NDC) and the ambitious goal (first proclaimed in

[24] Keigo Akimoto et al., 'Climate Change Mitigation Measures for Global Net-Zero Emissions and the Roles of CO2 Capture and Utilization and Direct Air Capture' (2021) 2 Energy and Climate Change 100057. <https://doi.org/10.1016/j.egycc.2021.100057>.

[25] Adelman, S., 'Editorial: Beyond the Paris Agreement – Ambitions, Hopes, Fears and Flaws' (2018) 9(1) Journal of Human Rights and the Environment 1-5. <https://doi.org/10.4337/jhre.2018.01.00>.

[26] Stavins, R. & Stowe, R., 'Market Mechanisms and the Paris Agreement' (2017) Harvard Kennedy School Papers & Reports. <https://www.belfercenter.org/publication/market-mechanisms-and-paris-agreement>.

Article 2 of the Paris Agreement): to inhibit the growth of global average temperature to a level much lower than 2°C exceeding that of the pre-industrial period and aspire to limit the temperature growth up to 1.5°C exceeding pre-industrial levels, admitting that this will decrease significantly the risks in climate changes. The new temperature level was offered by small island states and the least developed countries, which are most susceptible to climate change. One of the central challenges of global climate governance lies in the effective domestic implementation of the Paris Agreement. Under the framework of Nationally Determined Contributions (NDCs), signatory states possess considerable flexibility to align international climate commitments with their specific legal and political contexts. Case studies from various jurisdictions reveal a broad spectrum of implementation strategies - ranging from direct legislative incorporation to the creation of specialized institutions and monitoring mechanisms.

In France, the core objectives of the Paris Agreement have been embedded into national legislation through the Law on Energy Transition for Green Growth (Loi relative à la transition énergétique pour la croissance verte), which outlines ambitious targets for greenhouse gas reduction and the expansion of renewable energy sources. Furthermore, the said Agreement has been formally integrated into the French Environmental Code, reinforcing its normative weight within the domestic legal order. Germany, as a member of the European Union, implements the Agreement primarily through EU regulatory mechanisms. However, at the national level, the Federal Climate Change Act (Klimaschutzgesetz) establishes legally binding emission reduction targets up to 2030 and provides a framework for annual monitoring and compliance review. In Kenya, a Global South country, implementation is driven by the Climate Change Act 2016, which establishes the legal and institutional foundation for national climate action. This includes the creation of the National Climate Change Fund and an interagency coordination mechanism to ensure policy coherence across sectors. Canada has adopted the Pan-Canadian Framework on Clean Growth and Climate Change, which operationalizes its Paris commitments through a mix of fiscal incentives, emissions standards, and intergovernmental coordination with provincial governments. In Brazil, the Paris Agreement holds constitutional status, having been ratified by the National Congress and incorporated into the country's legal system. Complementary legislative measures have been enacted to address deforestation in the Amazon, a critical factor in Brazil's pathway to meeting its climate targets. These case studies illustrate the diversity of institutional arrangements and legal mechanisms through which countries have operationalized the mentioned Agreement. They also highlight varying levels of ambition, political will, and resource mobilization. Comparative analysis of such models provides valuable insights into both best practices and structural barriers in the pursuit of effective climate governance.

Considering the above, it is possible to conclude that the Paris Agreement is the first international legal document in the field of countering

global climate change that establishes the universal obligation concerning defining their nationally determined contributions by the member states and forming a balanced monitoring system that includes the transparency system, periodicity of summarizing and an instrument to enhance implementation and encourage observation of the agreement, which is viewed as a model for taking multilateral decisions on the consensus basis. Moreover, the Paris Agreement is the first international legal document in the field of climate. Its preamble refers to human rights, native people's rights, gender equality, the broadening of possibilities for women, and justice for different generations. The Office of the UN High Commissioner for Human Rights noted at one time the need for further incorporation of human rights into the procedural aspects of this document implementation, calling for states "to respect, promote and account for their respective obligations in the human rights area". The next several years will become a period of analyzing the efficiency of the new approach to the Agreement within the framework of collective environment-related measures and its impact on the environment.[27]

Overall, the Paris Agreement is a key international instrument that defines the direction of global climate-related efforts. Its implementation and efficiency depend on the political will and cooperation of all the states as well as on the involvement of business, civil society and other interested parties. It not only defines the framework for emissions reduction but also serves as a platform for stimulating innovations and the development of environmentally friendly technologies. While global efforts to strengthen legal responses to climate adaptation reflect a growing consensus on the urgency of action, the approaches remain highly heterogeneous across jurisdictions. Against this global backdrop, the European Union stands out as a unique supranational entity with a comparatively coherent and evolving legal and policy framework for climate adaptation. The following section examines how the EU integrates climate adaptation into its legal architecture, policy planning, and multilevel governance structures.

4. INTERNATIONAL PRACTICES, PROBLEMS AND CHALLENGES OF LEGAL REGULATION OF ENSURING MECHANISMS FOR ADAPTATION TO CLIMATE CHANGE

4.1. Global Developments and Legal Challenges in Climate Adaptation

It should be noted that on March 25, 2009, the UN Council on Human Rights passed the "Human Rights and Climate Change" resolution, which determines that "the issues related to climate change impact the possibility of realization of human rights … (the right to life, proper nutrition, health protection, proper housing conditions, self-determination, quality potable

[27] Nanarova, O., 'Mechanisms of International Legal Regulation of Global Climate Change under the Paris Agreement' (2021) 7 (43) Knowledge, Education, Law, Management 115–121. <https://doi.org/10.51647/kelm.2021.7.2.21>.

water, etc.). To this effect, when combating global climate change, the states should conceptually depart from the basic premise that, for securing the main human rights, the solution to the climate change problem is vital.[28] In 2010, the 16th Conference of the Participating States took place in the Mexican city of Cancun, which resulted in the adoption of the worldwide agreement on the prevention of exceeding the limit of atmospheric heating by more than 2°C. Political leaders understood that without new, more radical steps in the field of technological modernization of the search for environmental innovations and new international agreements, no compromise would be achieved in the climate stabilization area.[29]

In order to prepare the text of the new climate agreement, a special work group was formed at the Durban Platform for enhanced action (ADP). In the course of its work, 15 meetings were held, with joint efforts resulting in the first 90-page draft text of the agreement.[30] During the initial technical talks, the parties failed to reach an agreement as to the legal form of the new climate agreement: a protocol, a separate agreement, or an implementing agreement.[31] Despite this, the scientists who currently analyze China's NDC in terms of observing the Paris Agreement have concluded that 18 to 62% of potential spending on this document implementation at the national level will be compensated by undeniable advantages for national health by 2030. Thus, the so-called health advantages by 2050 may increase considerably up to 3 – 9 times. Such proportionality for expenditures, losses and potential benefits, especially in the example of China, may cause other states to intensify their efforts in combating climate change.[32]

In countries without dedicated climate legislation, the binding nature of NDCs is typically limited. Without a statutory or constitutional mechanism to translate international commitments into domestic obligations, NDCs often lack legal teeth. They function more as policy goals or political declarations rather than enforceable legal duties. This legal gap creates a risk of non-compliance without formal consequences, unless broader public accountability, civil society pressure, or international reputational concerns act as external enforcement mechanisms. Moreover, the Paris Agreement itself avoids imposing strict legal obligations on states to achieve their NDC targets, focusing instead on procedural commitments

[28] Expert Advisory Center "Legal Analytics", 'Climate Diplomacy in the EU: Conclusions and Recommendations for Ukraine' (7 October 2017). <https://www.civic-synergy.org.ua/wp-content/uploads/2018/04/climate-diplomacy.pdf>.

[29] Savaresi, A., 'The Paris Agreement: A New Beginning?' CORE, UK. <https://core.ac.uk/download/pdf/77611445.pdf>.

[30] Nanarova, O., 'Mechanisms of International Legal Regulation of Global Climate Change Under the Paris Agreement' (2021) 7 (43) Knowledge, Education, Law, Management 115–121. <https://doi.org/10.51647/kelm.2021.7.2.21>.

[31] Wewerinke-Singh, M. & Doebbler, C., 'The Paris Agreement: Some Critical Reflections on Process and Substance' (2016). <https://cuncr.org/wpcontent/uploads/2019/06/Wewerinke_Doebbler_Paris_Agreement.pdf>.

[32] The Lancet Planetary Health, "Can the Paris Agreement Save Us from a Climate Catastrophe?" (2018) 2(4) The Lancet Planetary Health E140. <https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(18)300561/fulltext#%20>.

such as regular reporting, transparency, and progression over time. As a result, even in the international legal sphere, NDCs are more soft law instruments than binding treaties in the traditional sense.

However, in the absence of climate laws, courts in some jurisdictions have begun to play a more active role. Strategic climate litigation, such as the Urgenda case in the Netherlands or Neubauer v. Germany has demonstrated that courts can interpret NDC-related obligations as part of a broader duty of care or constitutional responsibility, effectively enhancing their enforceability through judicial interpretation. In contrast, countries with codified climate laws often embed NDC targets within national statutes, enabling formal mechanisms for monitoring, reporting, and enforcement. This highlights a critical disparity: the legal force of NDCs often depends not on the Paris Agreement itself, but on domestic legal incorporation and political will. The epoch-making climate solutions reflect the growing public concern about climate change and a greater readiness of the courts to pass innovative decisions. One of the mechanisms for solving the climate deterioration problem is to convince individual states to fulfil and even increase their contributions to the Green Climate Fund.[33]

Legal frameworks play a critical enabling role in the mobilization, governance, and accessibility of climate finance. Domestic legislation, institutional mandates, and regulatory clarity are often prerequisites for countries to access international funding mechanisms such as the Green Climate Fund (GCF) or the newly operationalized Loss and Damage Fund. In this context, national legal systems act as both gateways and filters for climate finance flows. To access the GCF, for instance, countries must designate a National Designated Authority (NDA) or focal point, ensure fiduciary standards, and often develop legal instruments to facilitate project approval, financial disbursement, and accountability. Countries with clear legal mandates on climate finance, such as climate finance strategies embedded in climate laws or budgetary frameworks, are generally better positioned to attract and manage these resources. Conversely, legal fragmentation, lack of institutional coordination or unclear fiscal policies often hinder access to international funds.

The emerging Loss and Damage mechanism presents a new layer of complexity. As it aims to address irreversible climate impacts, especially in vulnerable countries, there is a growing need for legal clarity on eligibility, compensation structures, and governance principles. Most national legal systems currently lack the normative infrastructure to define and administer loss and damage finance, which raises concerns over transparency, equity, and operational capacity. Therefore, there is a compelling case for legal reform at the domestic level. This includes:

- Enacting or amending climate legislation to define climate finance mechanisms, institutional roles, and fiduciary responsibilities;

[33] Adelman, S., & Kotzé, L., 'Introduction: Climate Justice in the Anthropocene' (2021) 11 (1) Oñati Socio-Legal Series 30–43. <https://doi.org/10.35295/osls.iisl/0000-0000-0000-1168>.

- Establishing legal pathways for integration of international finance into national budgets;
- Creating compensation and supervision mechanisms to ensure accountability and social safeguards.

At the international level, legal reform may also be needed to harmonize access criteria across climate finance instruments and to develop binding obligations for donor countries to contribute equitably and predictably. In sum, legal frameworks are not only administrative tools but structural enablers of climate finance. Strengthening these frameworks is essential to ensure that funding mechanisms like the GCF and Loss and Damage Fund are accessible, effective, and aligned with the principles of climate justice.

4.2. European Union's Legal and Policy Framework for Climate Adaptation

In October 2014, the European Council agreed on the climate and energy production frameworks for the EU till 2030. The following main obligatory goals for the EU were approved: to reduce greenhouse gas emissions by at least 40% by 2030 compared with 1990; to ensure renewable energy consumption at the level of at least 27% by 2030; to attain energy efficiency growth by at least 27% by 2030.[34,35,36] At the end of February 2015, the European Commission introduced its first legislation recommendations concerning the implementation of the climate and energy-related frameworks by 2030. The recommendations, set out in the package related to the Energy Union, are aimed at ensuring a coordinated approach to climate change, energy security and competitiveness, and to facilitate the development and attainment of goals agreed upon within the program framework till 2030. The Commission published its Communication on the Energy Union in 2015, which laid the foundation for the European energy system transformation to build up a stable low-carbon economy where energy crosses the borders freely based on competition and rational use of resources, where citizens assume responsibility for the transition to clean energy, enjoy advantages of new technologies and where vulnerable consumers are protected.[37]

According to the Strategy of the Energy Union, the main goals of the Union's energy policies are:

[34] European Council, 'The 2030 Climate and Energy Framework' (23 October 2014). <https://www.consilium.europa.eu/en/policies/climate-change/2030-climate-andenergy-framework/>.

[35] International Renewable Energy Agency, 'Renewable Power Generation Costs in 2017' (2018). <https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2018/Feb/IRENA_REmap_EU_2018.pdf>.

[36] European Commission, 'The European Green Deal' (COM (2019) 640 final). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52019DC0640>.

[37] European Commission, 'A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy' (COM (2015) 80 final). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0080>.

1) diversification of electricity generation sources in Europe, the realization of energy supplies based on cooperation and solidarity between the Union's member states;
2) total support of integration of the internal energy market of the Union, adjustment of free movement of energy within the territory of the Union without establishing any regulatory barriers;
3) energy efficiency improvement and reduction of dependence on energy resources imports from third countries, decrease in emissions, securing workplaces for specialists in energy generation;
4) economy decarbonization and the movement towards fulfilment of the Paris Climate Agreement;
5) promotion of the research concerning economy decarbonization and innovations in the power generation sector.[38]

The European Commission has passed a number of propositions to make the EU climate policies more suitable for greenhouse gas emissions cuts by at least 55% by 2030 compared with the 1990 levels, which is stipulated by the European Green Deal and which is fixed in the European Climate Law. In these two documents, the EU has set for itself the goal of attaining climatic neutrality by 2050.[39,40] In December 2019, the European Commission adopted the European Green Deal. The European Green Deal is a complex of measures that define the EU policies in the field of countering the consequences of climate change for the years to come and whose primary goal is Europe's sustainable green transition to a climate-neutral continent by the year 2050. Among the main directions of the European Green Deal implementation determined by the Commission are addressing the consequences of climate change through a decrease in greenhouse gas emissions and the improvement of normative and legal regulation of the issues of carbon emissions reduction. It should also be noted that legal support of anthropogenic-induced emissions, greenhouse gas emissions included, is only possible and is to take place within the framework of environmental regulation, a legal environment protection instrument that defines the amounts of maximum permissible anthropogenic loads on the

[38] Yakoviyk, I., & Tsvelikh, M., 'Energy Security of the European Union in the Context of Russian Aggression against Ukraine' (2023) (160) Problems of Legality 170–191. <https://doi.org/10.21564/2414-990X.160.274518>.

[39] European Commission, 'The European Green Deal' (Communication to the European Parliament, the European Council, the European Economic and Social Committee and the Committee of the Regions, Brussels, 11 December 2019). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52019DC0640>.

[40] Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No. 401/2009 and (EU) 2018/1999 ('European Climate Law') [2021] Official Journal L 243/1. <https://www.eumonitor.eu/9353000/1/j9vvik7m1c3gyxp/vllqc884zfzq>.

climate.[41] On June 9, 2021, the European Parliament and the EU Council in its Regulation 2021/1119 approved the climate law which statutory stipulates the goal of the European Union to become climatically neutral by 2050 and an interim goal to reduce greenhouse gas net emissions by at least 55% compared with 1990 till the year of 2030. The law stipulates that climatic neutrality by 2050 means attaining net zero emissions of greenhouse gases by the EU states as a whole, mainly on account of emissions reduction, investment in green technologies and environmental protection.[42],[43]

The climate Law provisions that science and technical expertise concerning climate change will be provided by the European Scientific Advisory Council on Climate Change, the formation of which was provided for by the mentioned EU Regulation №401/2009. Every member state is advised to form a national advisory body on climate issues responsible for providing scientific consultations on matters of climate policies to the relevant national power bodies.[44] To estimate the efficiency of signing and improvement of the mentioned international legislative acts, the member states decided in 2022 to hold another event dedicated to this global problem. Egypt was officially chosen to receive COP-27 even though, according to statistics, the African continent contributes the least of all to global emissions of greenhouse gases into the atmosphere.[45] In May 2022, the Eighth Environmental Program till 2030, which confirmed the goals of the European Green Deal aligned with the long-term target of "living well" globally no later than 2050, reaffirmed the strategies and initiatives of the European Green Deal like the EU Strategy on Biodiversity till 2030, the new Action Plan for the Closed Cycle Economy, the Strategy on sustainable use of chemical substances and Action Plan for Zero Pollution, etc. The Eighth Program is aimed at accelerating the "green transition" in a just and inclusive manner to a climatically neutral economy based on renewable energy sources and competitive, resource-efficient business practices, which effect all interested parties are to be involved at all administrative levels to ensure efficient fulfilment of EU laws on climate and environment.[46],[47]

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41 Kopytsia, E., 'Environmental Regulation In the Sphere of Climate Change in the Context of the Implementation of the European Green Course in Ukraine' (2020) Collection of Scientific Papers ΛΟΓΟΣ 48-50. <https://doi.org/10.36074/20.11.2020.v4.15>.

42 Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No. 401/2009 and (EU) 2018/1999 ('European Climate Law'). [2021]. <https://eur-lex.europa.eu/eli/reg/2021/1119/oj>.

43 Zubko, D.O. & Kopytsia, E.M., 'EU Climate Law: Legal Analysis and Prospects for Implementation in Ukraine' (2021) 1 Multidisziplinäre Forschung: Perspektiven, Probleme und Muster, Band 86-89. <https://doi.org/10.36074/logos-26.11.2021.v1.29>.

44 Ibid.

45 'The COP27 UN Climate Summit Will Start in Egypt' <https://suspilne.media/311014-u-egipti-startue-klimaticnij-samit-oon-cop27/>.

46 European Commission, 'Environment Action Programme to 2030' (2022). <https://shorturl.at/RsKZL>.

47 Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a General Union Environment Action Programme to 2030 [2022] Official Journal L 114/22. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022D0591>.

The international legal landscape reveals a dynamic and evolving approach to addressing climate change through comprehensive policy frameworks, technological innovation, and multilevel cooperation. While these practices vary in scope and effectiveness, they offer valuable insights into mechanisms that balance environmental protection with socio-economic development. For Ukraine, which faces both environmental vulnerabilities and institutional challenges, these global experiences serve not only as benchmarks but also as potential models for legal and policy adaptation. The following section explores concrete legal case studies from various jurisdictions, assessing their relevance and feasibility for implementation within the Ukrainian legal system to strengthen national climate resilience and governance.

5. LEGAL CASE STUDIES IN THE FIELD OF CLIMATE RELATIONS AND POSSIBILITIES OF IMPLEMENTING THEM IN UKRAINIAN LEGISLATION

For a better understanding of the issues in question, we consider it expedient to view this problem from a practical point. As an example, the case of Verein Klima Seniorinnen Schweiz vs Switzerland (2024) can be considered. On April 9, 2024, the European Court of Human Rights (ECHR) ruled a decision on the case initiated by the "Verein Klima Seniorinnen Schweiz", Swiss Retirees Association. The applicants claimed that Switzerland's insufficient measures concerning climate change violated their right to life and health guaranteed by Articles 2 and 8 of the European Convention on Human Rights. The court established that the state had not ensured due protection from the negative consequences of climate change, which led to the violation of the applicants' rights. This ruling has become the first instance when the ECHR recognized the link between insufficient climate-related measures on the part of the state and human rights violations. The court highlighted the duty of states to ensure efficient protection of their citizens from the negative consequences of climate change, which establishes a significant precedent for future climate-related legal actions. A possibility for implementing relevant provisions in the legislation of Ukraine: Ukraine can account for the above court decision in the course of development and improvement of the national climate-related legislation. In particular, the legal framework concerning state obligations in the field of climate-related policies should be expanded. Also, mechanisms for citizens' protection from the negative consequences of climate change should be provided for, along with the responsibility of state authorities for inactivity in this area.

A legal action against the participant states of the Energy Charter (2024). Five young applicants filed a complaint in 2024 against 12 European states claiming that the Energy Charter impedes effective climate measures, thus violating their human rights. The applicants appealed that provisions of the Charter enable power-generation companies to appeal against state-enacted measures on limiting the use of fossil fuels that slow down the

transition to clean energy. In response to this and other similar cases, the European Union and several other states, Germany and France included, announced their withdrawal from the Energy Charter, recognizing its incompatibility with climate-related goals. This case demonstrates how civil society can influence international agreements and policies of states in the field of climate issues. The reaction of states to the court appeal highlights the significance of the coordination of international obligations with current climate challenges and priorities. Possibility for implementation in the Ukrainian legislation: Ukraine should revise its international obligations and agreements to ensure their consistency with the national climate-related goals and with the Paris Agreement. Also, mechanisms should be developed that would make it impossible to apply international agreements to inhibit the introduction of environmentally friendly policies and transition to renewable energy sources.

The above cases highlight the growing role of the judicial system and civil society in forming and implementing climate policy. They also stress the need for constant improvement of national legislation to ensure efficient counteraction to climate change and citizens' rights.

6. CONCLUSION

Legal provision for climate change adaptation mechanisms is an important constituent of environmental policies and administration in the national and international legal systems. In light of intensifying adversary climate changes and their negative impact on various activity areas, efficient legal mechanisms are a necessary condition for society's adaptation and reduction of risks related to extreme climatic events. An important element in legal provision is the development of national adaptation plans that include the estimation of climate-related risks and define priority measures and financing instruments. Also, legal mechanisms should be developed to ensure transparency and accountability for the implementation of the mentioned measures. Such mechanisms may provision for the introduction of monitoring and assessment systems as well as accountability to international organizations and national power bodies. The need in legal provision for adaptation to climate change is being dictated by the increase in the frequency and intensity of natural disasters like floods, droughts, forest fires and other extreme weather events that pose serious hazards for socio-economic development and people's lives, as well as military hostilities that cause irreversible damage to climate and environment as a whole.

Thus, legal provision for climate change adaptation mechanisms is a vital condition for efficiently countering the consequences of climate change. The provision in question should account for international obligations, national peculiarities and specifics of various regions and be targeted at environmental protection and social well-being under new climatic realities.

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AUTHOR'S DECLARATION AND ESSENTIAL ETHICAL COMPLIANCES

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	*Author 1*	*Author 2*	*Author 3*
Conceived and designed the research or analysis	Yes	Yes	No
Collected the data	Yes	Yes	Yes
Contributed to data analysis and interpretation	Yes	Yes	Yes
Wrote the article/paper	Yes	Yes	Yes
Critical revision of the article/paper	Yes	Yes	Yes
Editing the article/paper	Yes	Yes	Yes
Supervision	Yes	Yes	Yes
Project administration	Yes	Yes	Yes
Funding acquisition	Yes	Yes	Yes
Overall contribution proportion (%)	35	35	30

Funding
No funding was available for the research conducted for and writing of this paper.

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