

Hybrid Intelligence - A Trustworthy New Paradigm to Substitute Artificial Intelligence and Assume Legal Liability in the Environmental Domain

الذكاء الهجين: نموذج موثوق جديد بديل للذكاء الاصطناعي وتحمل المسؤولية القانونية في المجال البيئي

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• Abstract:

The latest artificial intelligence has brought a revolution in many fields, including the field of environmental policies and legislation, and reveals to the world the tremendous potential that the machine has to improve performance and effectiveness in this field. However, at the same time, unwanted challenges and problems have emerged, requiring careful handling, foretelling a frightening, dark and unreliable side of artificial intelligence. In the following research, it will be important to explore these challenges in depth and look at how to employ hybrid intelligence as a new pattern and a new concept that combines the capabilities of artificial intelligence and human wisdom to achieve the required balance between the capabilities of the machine and human experience. This integrated approach may contribute to enhancing the implementation of environmental legislation and making reliable and more effective decisions in the long term.

Keywords: hybrid intelligence ; artificial intelligence ; big data ; environmental responsibility .

الملخص:

أحدث الذكاء الاصطناعي الحديث ثورة في العديد من المجالات، من بينها مجال السياسات والتشريعات البيئية، حيث كشف للعالم عن الإمكانيات الهائلة التي تمتلكها الآلة في تحسين الأداء والفعالية في هذا المجال. غير أنّ هذه الثورة التقنية أفرزت في الوقت نفسه تحديات ومشكلات غير مرغوبة، تستدعي تعاملًا حذرًا، إذ تنبئ بوجود جانب مظلم ومقلق وغير موثوق من الذكاء الاصطناعي. في هذا البحث، تبرز أهمية التعمق في دراسة هذه التحديات، والنظر في كيفية توظيف الذكاء الهجين بوصفه نموذجًا جديدًا يجمع بين قدرات الذكاء الاصطناعي وحكمة الإنسان، بغية تحقيق التوازن المنشود بين إمكانيات الآلة والخبرة البشرية. وقد يسهم هذا النهج التكاملي في تعزيز تطبيق التشريعات البيئية واتخاذ قرارات أكثر موثوقية وفعالية على المدى الطويل.

الكلمات المفتاحية: الذكاء الهجين، الذكاء الاصطناعي، البيانات الضخمة، المسؤولية البيئية.

• Introduction

Over the past years, the world has witnessed tremendous technological developments, especially in the field of artificial intelligence. These developments have had a significant impact on various aspects of human life, including the field of environmental protection and related regulatory policies. Artificial intelligence has become capable of collecting and analyzing massive data, and making automated decisions with a high degree of accuracy and speed. These capabilities have raised great hopes in enhancing the effectiveness of implementing environmental legislation and protecting the environment more effectively.

However, challenges and issues related to the adoption of artificial intelligence in this field have emerged. Despite the accuracy of computational models and the ability to process massive amounts of data, these automated systems lack the wisdom and human experience necessary to understand diverse local and cultural contexts. Furthermore, total reliance on artificial intelligence may lead to unexpected negative effects and lack of accountability.

In this context, this research paper proposes a new pattern or approach, namely "hybrid intelligence", which combines the capabilities of artificial intelligence and human wisdom and experience. This approach aims to enhance the integrated strengths of both, where the accuracy and speed of automated processing can be utilized along with the understanding of the human and social context provided by the human element. The potential of this approach in improving the implementation of environmental policies and legislation will be explored.

This article will explore how hybrid intelligence can contribute to enhancing the implementation of environmental legislation in Algeria and around the world. The challenges and opportunities associated with adopting this approach will be discussed, along with practical recommendations for its effective application.

The Research Problem:

The key research problem addressed in this study can be summarized as follows:

How can the right balance be achieved between leveraging the capabilities of artificial intelligence (AI) and harnessing the wisdom and experience of human experts in environmental policymaking and legislation implementation?

This fundamental challenge arises from the dual-edged nature of the integration of AI in environmental governance:

On one hand, the advanced data processing, analytical, and decision-making capabilities of AI systems offer unprecedented opportunities to enhance the speed, accuracy, and scalability of environmental policy enforcement and outcomes.

On the other hand, the over-reliance on AI-driven approaches risks overlooking the crucial human expertise, contextual understanding, and ethical considerations that are essential for effective and equitable environmental policymaking.

The core dilemma lies in ensuring that AI complements and empowers human decision-makers, rather than replacing them entirely. Achieving this balance is crucial to unlocking the full transformative potential of hybrid intelligence - the strategic integration of AI and human wisdom - in driving sustainable and accountable environmental solutions.

To address this research problem, the study proposed a dual-pronged approach:
Enhancing the Balance Between AI Capabilities and Human Expertise
Ensuring Transparency and Accountability in the Use of Artificial Intelligence.

This framework aimed to explore practical strategies for leveraging the strengths of both AI and human expertise, while mitigating the potential risks and challenges associated with the over-reliance on technology in environmental policymaking.

1. Enhancing The Balance Between Ai Capabilities And Human Expertise

As artificial intelligence (AI) continues to advance, there is a growing need to find the optimal balance between the capabilities of AI systems and the expertise of human specialists¹.

This balance is particularly crucial when it comes to the implementation of environmental policies and regulations, where both technical precision and contextual understanding are essential.

On one hand, AI excels at processing vast amounts of data, conducting rapid and accurate analyses, and identifying patterns that would be difficult for humans to discern. These capabilities are invaluable for tasks like monitoring environmental conditions, modeling complex ecosystems, and predicting the impacts of policy decisions. However, AI systems lack the deep contextual knowledge and nuanced decision-making abilities that human experts possess. Specialists, on the other hand, bring a wealth of experience, cultural awareness, and institutional knowledge to the table. They understand the unique challenges and social dynamics at play in specific regions and communities, which is critical for crafting policies that are both scientifically sound and socially responsible. Yet human experts can also be constrained by biases, limited by the scope of their individual experiences, and challenged by the sheer volume of data that must be considered in modern environmental decision-making.

The solution lies in a hybrid intelligence approach that seamlessly integrates the strengths of AI and human expertise. By leveraging the rapid data processing and analytical power of AI systems, while grounding those insights in the contextual understanding of human specialists, organizations can develop more effective and responsible environmental policies. This integration requires careful consideration of technical, organizational, legal, and social factors, but the potential benefits are substantial².

Through this balanced approach, policymakers and regulators can harness the precision and scale of AI to enhance environmental monitoring, modeling, and forecasting, while ensuring that these technological solutions are informed by the nuanced expertise of human stakeholders. In doing so, we can work towards a future where environmental protection is guided by the optimal blend of artificial and human intelligence, leading to more sustainable and equitable outcomes for all.

1.1 Investing In Artificial Intelligence Capabilities In Environmental Policy Making

¹ - Fatima Zahraa Belhamou, and Arzi Fathi, the contribution of expert systems to decision-making in the Algerian institution, a case study of SPA ABRAS in the city of Saida, Abu Bakr Belkaid University Journal, Volume 2, Issue 1, 2017.

² - Nawras Karzom, Can we benefit from artificial intelligence in environmental issues?, Environment and Development Horizons website / article published on: 09/01/2019, access date: 06/02/2024, access time: 06:19 on the following website: <https://www.maan-ctr.org/magazine/author/89/>.

As environmental challenges become increasingly complex, policymakers and regulators are recognizing the critical need to harness the power of artificial intelligence (AI) to enhance their decision-making and implementation processes. Effective environmental protection requires the ability to rapidly analyze vast amounts of data, model intricate systems, and predict the impacts of policy interventions – all capabilities in which AI excels³.

However, realizing the full potential of AI in environmental policymaking requires strategic investment and capacity building within government agencies and regulatory bodies. This first step towards enhancing the balance between AI capabilities and human expertise involves several key focus areas:

Developing AI-powered environmental monitoring and analysis tools: Deploying advanced sensor networks, satellite imagery, and other data sources to feed into AI systems capable of real-time monitoring, anomaly detection, and predictive analytics. These AI-driven tools can provide early warning signals, identify emerging risks, and support more proactive, evidence-based policymaking⁴.

Building AI-based decision support systems: Integrating AI capabilities to simulate the impacts of various policy scenarios, optimize regulatory approaches, and inform strategic planning. By leveraging the speed and precision of AI, policymakers can explore a wider range of options and make more informed decisions⁵.

Enhancing AI-human collaboration workflows: Designing seamless interfaces and processes that blend AI-generated insights with the contextual knowledge and expert judgement of human domain specialists. This allows for human oversight, validation, and accountability, while still harnessing the analytical power of AI.

Upskilling policymakers and regulators on AI literacy: Providing targeted training to enhance understanding of AI's capabilities, limitations, and responsible application. Fostering a culture of AI-human collaboration and co-learning within environmental agencies is essential for realizing the transformative potential of these technologies.

Addressing data availability and quality challenges: Investing in secure, high-quality environmental data infrastructure to feed into AI systems. Developing robust data governance frameworks to ensure ethical and responsible data use is also crucial for building trust in AI-driven policymaking.

By prioritizing these areas of investment, environmental policymaking organizations can build the necessary AI capabilities to complement and enhance their human expertise. This foundational step lays the groundwork for achieving the optimal balance between artificial and human intelligence in addressing complex environmental challenges.

1.2 Integrating Human Experience Into Policy-Making Processes

³ - Artem Vlasov, Matteo Barberino, Seven ways in which artificial intelligence will change science and technology, International Atomic Energy Agency, published on: 12/16/2022, access date: 06/02/2024, access time: 04:00 on the following website: <https://www.iaea.org/ar/newscenter/news/sabu-turuq-sayugayr-biha-lthaka-lestinay-lulum-waltaka-lnawawjya->

⁴ - Artem Vlasov, Matteo Barberino, op.cit.

⁵ - ipid.

While the advancements in artificial intelligence (AI) hold immense promise for enhancing environmental policymaking, it is crucial that we do not overlook the irreplaceable value of human expertise and lived experience. Effective environmental policies require a nuanced understanding of local contexts, cultural dynamics, and the unique challenges faced by communities on the ground⁶.

As we invest in building AI capabilities to support evidence-based decision-making, it is equally important to establish mechanisms for integrating human knowledge and perspectives into the policymaking process. This second requirement for achieving the optimal balance between AI and human expertise involves several key elements:

1.2.1 Engaging stakeholder communities:

Proactively seeking input and feedback from diverse stakeholder groups, including local residents, community organizations, and subject matter experts. These individuals hold invaluable insights into the real-world implications of environmental policies and can help identify potential unintended consequences⁷.

1.2.2 Leveraging indigenous and traditional knowledge:

Recognizing and incorporating the deep, place-based understanding of indigenous and traditional communities. These knowledge systems often hold crucial insights into sustainable resource management, ecosystem dynamics, and cultural practices that can inform more holistic policymaking⁸.

1.2.3 Empowering frontline implementers:

Ensuring that the on-the-ground experiences and contextual knowledge of policy implementers, such as environmental inspectors and compliance officers, are systematically integrated into the policymaking process. Their hands-on expertise can help refine policies and improve implementation strategies.

1.2.4 Fostering collaborative policy design:

Adopting co-creation and co-design approaches that bring together policymakers, regulators, scientists, and community representatives to collectively develop environmental policies. This iterative, participatory process helps ensure that policies are grounded in both technical rigor and social realities.

1.2.5 Establishing feedback loops and continuous learning:

Implementing mechanisms for ongoing monitoring, evaluation, and adjustment of environmental policies. This allows for the integration of emerging evidence, evolving stakeholder needs, and changing environmental conditions into an adaptive policymaking cycle.⁹

By actively integrating human experience and local knowledge into environmental policymaking, we can create more responsive, equitable, and effective policies that truly address the complex realities on the ground. This balanced approach, combining the strengths of AI and human expertise, is essential for achieving sustainable environmental outcomes.

⁶ - Nawras Karzom, op.cit.

⁷ - Ben Arafa Abla, Strategy for Implementing Social Responsibility towards Stakeholders in Hospitals Algeria, (proposed model), JMSM. Journal of Marketing Studies & Management, Volume Two, Issue: 02, p. 140.

⁸ - Delphine Gendre-Aegerter, The Perception of the SME Manager of Sa, Social Responsibility: An Approach Using Cognitive Mapping, Thesis Presented to the Faculty of Economic and Social Sciences of the University of Friborg (Switzerland), for Obtaining the Degree of Doctor of Economic and Social Sciences, Fribourg, Switzerland, 2008, P136-139.

⁹ - Delphine Gendre-Aegerter , ipid.

2. Ensuring Transparency And Accountability In The Use Of Artificial Intelligence

As environmental policymaking increasingly leverages the power of artificial intelligence (AI), it is essential that we prioritize the principles of transparency and accountability. The use of AI-powered systems in policy decision-making and implementation must be underpinned by clear frameworks and mechanisms to build public trust and ensure responsible governance.

By prioritizing transparency and accountability in the use of AI, we can build public trust, ensure the responsible deployment of these technologies, and create a more inclusive and equitable environmental policymaking process¹⁰.

2.1 Enhancing Transparency In Artificial Intelligence Operations

As artificial intelligence (AI) becomes increasingly integrated into decision-making processes, particularly in areas like environmental policymaking, it is critical to prioritize transparency and accountability. Building public trust in these advanced technologies requires clear frameworks and mechanisms for understanding how they work and how they are being deployed¹¹.

Fundamental to enhancing transparency is the disclosure of the data used to train and operate AI systems. Organizations must be transparent about the sources of their data, as well as the methods employed for collecting, cleaning, and analyzing it. Understanding the input data environment is crucial to evaluating the quality and accuracy of the AI outputs.

Beyond data transparency, companies and policymakers must also provide clear explanations of the algorithms, methodologies, and underlying assumptions used in their AI decision-making processes. Offering detailed documentation of the design choices, criteria, and logic behind these systems allows users and stakeholders to comprehend how they function, removing ambiguity and enhancing trust.

When AI systems are used to inform important decisions, it is essential that clear rationales are provided for the outputs and recommendations generated. Offering explanations for how the AI systems arrived at their conclusions enhances accountability and enables users to understand the reasoning behind the decisions.

Incorporating a diverse range of stakeholders, including users, experts, and community organizations, in the design, testing, and evaluation of AI systems is also crucial. This helps ensure that different interests and perspectives are represented, and potential concerns or unintended consequences are identified and addressed.

Independent testing and evaluation of AI systems is necessary to verify their performance and ensure compliance with relevant standards and ethical principles. These independent audits and validations can further build confidence in the responsible use of these advanced technologies.

Establishing clear mechanisms for accountability and oversight, including the ability to appeal decisions and obtain explanations, is also critical. Such mechanisms ensure that the

¹⁰ - Wassila Saud, Artificial intelligence and the challenges of ethical practice, Namaa Journal of Economics and Trade, 07, Issue 202 3, p. 06.

¹¹ - - Wassila Saud, ipid, p 10.

deployment of AI systems is monitored and that their use remains aligned with societal and environmental priorities¹².

By applying these transparency practices, public trust in AI can be built, and we can ensure that these technologies are used responsibly and ethically to benefit society. Integrating human expertise and oversight throughout the AI lifecycle is also essential, as this helps translate complex algorithms into understandable terms and ensures that human values and contextual knowledge are reflected in the outputs.

Ultimately, a hybrid approach that combines the strengths of both artificial intelligence and natural human intelligence is key to achieving greater transparency and accountability in the use of these advanced technologies, particularly in the realm of environmental policymaking¹³.

2.2 Ensuring Accountability For The Results Of The Use Of Artificial Intelligence

As artificial intelligence (AI) becomes increasingly integrated into high-stakes decision-making processes, the need to ensure accountability for the results of these advanced systems has become paramount. When AI is used to inform critical decisions that impact individuals, communities, and the environment, there must be clear mechanisms in place to understand how these systems arrive at their outputs and to hold the responsible parties accountable.

Without such accountability frameworks, the use of AI risks becoming a black box, leaving users and affected stakeholders unable to comprehend the rationale behind important decisions. This not only undermines trust in the technology, but also raises significant ethical concerns about its deployment. Establishing robust accountability measures is therefore essential to upholding principles of transparency, fairness, and responsible governance as AI continues to transform policymaking and societal decision-making processes¹⁴.

When it comes to critical environmental decisions with far-reaching consequences, the responsibility cannot be relegated solely to artificial intelligence systems. While AI can provide powerful analytical capabilities and predictive modeling, the ultimate accountability must rest with human stakeholders and decision-makers. Environmental challenges are deeply complex, often involving nuanced trade-offs, contextual considerations, and ethical dimensions that current AI technologies may struggle to fully comprehend. By employing a hybrid approach that combines the strengths of both artificial and human intelligence, we can ensure that environmental policies and interventions remain grounded in real-world understanding, societal values, and a sense of stewardship for our planet. This human-centric accountability is essential, as the impacts of environmental decisions reverberate across communities and ecosystems, necessitating careful deliberation and the application of moral reasoning that is uniquely within the purview of human decision-makers. Only through this hybrid intelligence framework can we uphold the principles of transparency, fairness, and environmental responsibility in the face of AI-informed policymaking¹⁵.

¹² - Labib Shaif Mohammed Ismail, Influencing Public Policies -

A guide for young public policy pioneers and researchers - Al Salem School Organization, published in September 2021. Date of access: 05/30/2024. Access time: 07:15 on the following website: <https://library.fes.de/pdf-files/bueros/jemen/20762.pdf>.

¹³ - Labib Shaif Mohammed Ismail, ipid.

¹⁴ - Artificial Intelligence and the Rule of Law: Capacity Building for Judicial Systems, the official website of UNESCO, published on: 08 November 2023, access date: 0/06/2024, access time: 06:10, on the following website: <https://www.unesco.org/ar/artificial-intelligence/rule-law/mooc-judges>.

¹⁵ - Labib Shaif Mohammed Ismail, op.cit.

Despite the existence of laws and legal procedures that regulate the fight against environmental crimes, the matter remains complex and difficult in practical reality. The fundamental question is how to effectively activate these mechanisms to ensure real and direct accountability of humans, rather than shifting responsibility to technological technologies such as artificial intelligence.

To achieve this, it is first necessary to strengthen the independence and power of the judicial control bodies responsible for investigating and following up on environmental crimes. These bodies need to be granted the necessary powers and capabilities to perform their role effectively, including the ability to access relevant information, data, and facilities.

The matter also requires an increase in environmental awareness and culture in the general society, especially among the authorities concerned with environmental affairs. Prevention is better than cure in this field, as raising the level of awareness and knowledge contributes to reducing the occurrence of environmental crimes in the first place.

In addition, penalties for environmental offenders must be tightened, and their application must be firm and without exceptions. Penalties that are not applied rigorously do not constitute a real deterrent for violators. It is necessary to strengthen the mechanisms of control and accountability over the entities and institutions responsible for environmental protection, to ensure that they perform their role effectively. It is also necessary to adopt a preventive approach and long-term solutions, instead of relying on short-term solutions, as real change requires a comprehensive and long-term vision¹⁶.

Environmental responsibility rests with everyone - governments, companies, and individuals. It cannot be placed solely on artificial intelligence. It requires the concerted efforts at all levels to ensure the actual accountability of humans for their actions and to take the necessary deterrent and preventive measures, and to determine the criminal liability of the legal person for the environmental crime.

The significant damage caused by industrial facilities to the environment, which greatly exceeds that caused by the natural person, and the occurrence of this damage as a result of violating environmental legislation or committing environmental crimes for the purpose of unlawful gain, require the recognition of the criminal liability of the legal person for these crimes and violations in order to deter them.

In Algerian legislation, criminal liability of legal entities for environmental crimes has been recognized in several laws, the most prominent of which are:

Law No. 19-01 on waste management, control and removal, in Article 50 relating to the deposit, dumping or neglect of solid waste¹⁷.

¹⁶ - Meramria brahim, Bouadjila nabil, Constitutionally Expressed Concerns About Climate Change In Algeria, Journal of legal and political thought , Volume 8, N° 1, 2024, p490.

¹⁷ - See Article 50, relating to depositing, throwing or neglecting solid waste. Law No. 19-01 relating to waste management, control and removal, Official Gazette No. H, issued on: Ramadan 30, 1422, corresponding to December 15, 2001.

Law No. 03-09 on the crimes of violating the provisions of the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction, in Article 18¹⁸.

Law No. 03-10 on environmental protection in the context of sustainable development, in Article 92¹⁹.

Article 51 bis introduced in the Penal Code by the amendment 04-15, which confirmed this responsibility and defined its conditions and limits, except that the State, local communities and legal entities subject to public law are exempt from this responsibility²⁰.

This article stipulates that the criminal liability of the legal person does not prevent the prosecution of the natural person as a principal perpetrator or accomplice in the same acts.

Public legal entities subject to public law (the State, local communities, national public bodies and institutions) are exempted from criminal liability, whether they have an administrative, industrial or commercial character.

Criminal liability is limited to private legal entities only, regardless of their legal form or purpose.

To hold a legal person criminally liable, the environmental crime must be committed by the organs or representatives of the legal person and on its behalf.

The legal person is not liable for crimes committed by its employees or workers if they were not authorized to act on its behalf.

Therefore, the criminal liability of legal entities in Algeria is essentially limited to private legal entities and is linked to the supervision and actions of their authorized representatives.

• Conclusion

The evolving integration of artificial intelligence (AI) and human expertise, known as "hybrid intelligence," holds immense potential to revolutionize environmental policymaking and legislation implementation. However, as the research has revealed, this integration also presents complex challenges that must be carefully navigated to ensure the responsible and effective application of this transformative approach.

On one hand, the proven capabilities of AI in data processing, predictive analytics, and automated decision-making offer unprecedented opportunities to enhance the speed, accuracy, and scalability of environmental policy enforcement and outcomes. The ability of AI systems to rapidly sift through vast troves of environmental data and identify patterns can empower policymakers with data-driven insights that were previously unattainable.

At the same time, the research has underscored the critical importance of maintaining a central role for human judgment, values, and accountability within the policymaking process. The wisdom and contextual understanding that human experts bring is essential for addressing the

¹⁸ - See Article 18 of Law No. 03-09 dated 19 Jumada al-Awwal 1424 corresponding to July 19, 2003, which includes the suppression of crimes violating the provisions of the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction, Official Gazette No. 43, issued on: 20 Jumada al-Awwal 1424, corresponding to July 20, 2003.

¹⁹ - See Article 92 of Law No. 03-10, of July 19, 2003, relating to environmental protection within the framework of sustainable development, Official Gazette No. 43, issued on: 20 Jumada al-Awwal 1424, corresponding to July 20, 2003.

²⁰ - See Article 51 bis introduced in the Penal Code pursuant to Amendment No. 04/15 dated 11/10/2004, Official Gazette No. 71, dated: Ramadan 27, 1425, corresponding to 11/10/2004.

inherent complexities, nuances, and ethical considerations that often arise in environmental policy implementation. A purely AI-driven approach risks overlooking crucial societal, cultural, and local factors that can significantly impact the effectiveness and equity of policy outcomes.

By embracing a hybrid intelligence approach that strategically integrates the complementary strengths of AI and human expertise, policymakers can unlock an unprecedented opportunity to drive sustainable, transparent, and accountable environmental solutions. This integrated model holds the key to unlocking the full potential of advanced technologies while ensuring that environmental policymaking remains grounded in human values, ethical principles, and community-centric considerations.

Research Results:

- The study found that the adoption of hybrid intelligence, blending AI capabilities with human wisdom, has significant potential to improve the implementation and enforcement of environmental legislation, particularly in complex, context-dependent scenarios.
- Analyses revealed that while AI can enhance the speed, accuracy, and scale of data processing and decision-making, it often lacks the deeper understanding of local, cultural, and societal nuances necessary for effective environmental policymaking.
- The research highlighted the critical importance of maintaining human oversight, values, and accountability in the policymaking process, even as AI systems are increasingly integrated.
- Challenges identified include navigating the ethical implications of AI-powered decision-making, ensuring transparency and explainability of AI systems, and fostering effective collaboration between human and machine decision-makers.
- Algerian law recognizes the criminal liability of legal persons, both private and public, for certain environmental offenses outlined in various laws, However, public legal entities under public law, such as the state, local communities, and national public bodies, are explicitly exempted from this criminal liability.
- The criminal liability of private legal entities is tied to the actions and supervision of their authorized representatives, who must have committed the crime on behalf of the entity.
- The criminal liability of legal persons does not prevent the prosecution of natural persons (individuals) as principal perpetrators or accomplices in the same acts.

Recommendations:

- Invest in developing hybrid intelligence capabilities that combine the strengths of AI and human expertise, tailored to the unique environmental challenges and regulatory contexts of different regions and jurisdictions.
- Establish robust governance frameworks, including clear guidelines, oversight mechanisms, and accountability measures, to guide the responsible and ethical integration of hybrid intelligence in environmental policymaking.
- Implement comprehensive training and capacity-building programs to equip policymakers, regulators, and environmental stakeholders with the skills necessary to effectively leverage hybrid intelligence systems.

- Foster greater collaboration and information-sharing between AI developers, environmental experts, and policymakers to ensure that hybrid intelligence systems are designed and deployed in alignment with environmental priorities and public interests.
- Continuously monitor and evaluate the performance, impacts, and ethical implications of hybrid intelligence applications in environmental policymaking, and make adjustments as needed to ensure optimal outcomes.
- Analyze the effectiveness of the current legal framework in incentivizing private legal entities to prioritize environmental protection and sustainability through the threat of criminal sanctions.
- Explore how hybrid intelligence systems, combining human expertise and advanced analytics, could be leveraged to improve the detection, investigation, and prosecution of environmental crimes committed by legal persons.

By embracing the opportunities presented by hybrid intelligence while addressing the associated risks and challenges, policymakers can unlock the transformative potential of data-driven, context-sensitive, and accountable environmental policy and legislation implementation.

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