

Contributions of Artificial Intelligence to Achieve Gender Equality in the Decision-Making Processes in Energy Projects

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ABSTRACT

The aim of the research is to identify the contributions of artificial intelligence to achieving gender equality conditions in the decision-making processes of indigenous groups and communities in energy projects. Although local laws and international commitments protect the right to free, prior, and informed consent, experiences in Latin America indicate that women may encounter obstacles to representation in local communities, lack sufficient information, or have their needs, concerns, and desires overlooked regarding the impact of planned activities within their territories. Through the historic and analytical methods, this research will explore the vulnerability of indigenous women, as well as the rules and landmark cases that have interpreted the scope of the free, prior, and informed consent, which is important for the development of energy infrastructure. In this regard, further strategies should be implemented to effectively communicate with indigenous people. It is deemed that the appropriate use of artificial intelligence could be an important tool to explain clearly the risks and benefits of the energy projects and allow women to participate to offer some suggestions for improvements according to their own needs and aspirations, as well as to identify paths to achieve energy justice. The theoretical approach of this research will lead to further developments of artificial intelligence to assist women involved in the energy decision-making processes and explore further horizons for gender equality. In addition, it is important to consider that the uses of artificial intelligence should be aimed at helping vulnerable people. In this regard, the paths and challenges of artificial intelligence as a tool to contribute to the protection of human rights should be explored.

Keywords: Gender equality; free, prior and informed consent; energy justice; vulnerability; Artificial Intelligence.

INTRODUCTION

The development of energy infrastructure requires consideration of technical, financial, environmental, and social issues. Among the social issues, it is required to protect the right to a free, prior, and informed consultation for Indigenous people. This right is rooted in international human rights instruments and national laws that encourage the adoption of progressive measures to protect indigenous people against arbitrary measures of the State or abuses from civil society.

One of the areas in which the right of free, prior, and informed consent has been a major issue relates to energy infrastructure projects, as alleged by international organizations and civil society. Moreover, several cases have been brought before the national and regional courts, such as the Inter-American Court of Human Rights, that acknowledge the necessity of implementing procedures, authorities, and a proper methodology to fulfill that right so that indigenous people could be aware of the scope of the projects.

Indigenous women are more likely to deal with more problems, as even their communities do not give them enough consideration to understand their needs, nor a voice to participate in the political, economic, social, and cultural life of their groups.

As for energy infrastructure projects concerns, the public, private, and social sectors are required to reinforce the participation of indigenous women in the decision-making processes. In addition to fulfilling the right of free, prior, and informed consent for women, it is essential to determine the direction that energy justice must take to ensure accessible and affordable energy while promoting intergenerational equity.

Artificial intelligence could be one tool to approach indigenous women, as it may deliver accessible information about the project and even understand their health, educational, food, housing, and environmental inquiries, which may be helpful to design public policies and strategies for them.

The main objective of this research is to explore the contributions of artificial intelligence to grant Indigenous women the right of free, prior, and informed consent in energy projects and understand their needs to achieve energy justice and the full protection of their human rights.

The research question is the following: Does artificial intelligence contribute to guaranteeing the free, prior, and informed consent and active participation for Indigenous women in the decision-making processes in energy projects?

The working hypothesis is that artificial intelligence may offer an important tool to make clear and accessible information that may be useful for indigenous women to understand the scope of the energy project, express their gender concerns, and participate actively in the decision-making processes. The ethical and due application of artificial intelligence may shorten the language and the barriers that women face when dealing with the public, private, and their communities.

This research will consider a theoretical approach from the Critical Legal Feminist Theory for identifying the vulnerability of women and the problem of their silence within the legal sphere. In addition, it will enunciate the protection of women, indigenous groups, and the interpretation of the right of free, prior, and informed consent in international instruments, as well as some cases of the Inter-American Court of Human Rights.

This paper invites the development of artificial intelligence to assist women in the energy decisionmaking processes and explore the horizons of energy justice from the perspective of indigenous women. This task can be one of the starting points in identifying the possible contributions of artificial intelligence to explore additional strategies to protect human rights.

METHODOLOGY

Historical method

The historical method aims to consider the subordination of women as sustained by the Critical Legal Feminist Theory, as well as the vulnerability of indigenous women. The reference allows us to identify the need to include women in the dialogues in areas such as energy infrastructure, in which several violations of the rights of women have been recorded. In addition, the situation of indigenous women in Latin America will be explored in order to briefly identify the marginalization and misunderstandings that they have faced through history and the need to find approaching techniques and methods of dialogue, among which artificial intelligence could be a useful tool.

The first point of the analytical method that will be explored is a brief review of the Critical Legal Feminist Theory of Catherine MacKinnon, Andrea Dworkin, Annette Lyth, and Robin West, which highlights the problems of the subordination, domination, and lack of consideration of women within the legal sphere (Robles & Tovar, 2016). The aforementioned authors stress the difficulties that women have faced throughout history regarding their misrepresentation in the political, legal, social, economic, and cultural decision-making processes.

MacKinnon (1989: 434-435) urges us to acknowledge the way in which the social power of men over women goes beyond the family and society to inscribe itself into the law, as it reproduces gender inequality. With a feminist method, it is possible to explore the reality of women from inside and seek a change of their conditions. Moreover, it is important to claim a concrete reality of women, the power that men have over women, as well as the recognition of the dehumanization of women (MacKinnon, 1998).

For Dworkin (1973; 1975) women find a common systematic disregard for their intelligence, creativity, and strength, and there is a training for women to be considered as victims—subordinate, submissive, passive, and objects with no right to the slightest individual identity. For that reason, women must confront concrete oppressions to be part of the economic process, erase discriminatory laws, and control their lives and bodies.

The historical perspective shows the problems that women face, such as rape and abuses in armed conflicts (Lyth, 2001) and the exclusion of women from the political discourse and the protection of their rights (Dworkin, 1979; Gouges, 2009; Wollstonecraft, 2018), as well as vulnerability, subordination, submission, silence, and mistreatment.

The historical approach leads to fostering the conditions to achieve gender equality, which means that everyone, regardless of gender, has the same rights, obligations, and opportunities within all areas of life, such as distribution of power and influence, economy, education, work, health, and the cessation of violence (Holgerson & Wahl, 2003). For MacKinnon (2021), equality requires addressing the real social inequality. In this regard, it is important to consider that besides the protection of the rights of women in Law as a whole, it is required to identify those situations that keep women under domination and subordination.

The lines mentioned above illustrate how women may face subordination, exclusion, misunderstandings, oppression, and even undue protection of the law. The problems addressed since the 1970s should also be considered in the 21st century. Even though there have been improvements in the consideration of women, there are still issues where women have to be considered in the decision-making processes.

The situation of indigenous women in the History of Latin America is one of the facets that humanity should not ignore, due to the constant subjugation, violence, and silence to which they have been subject for centuries. In this regard, an approach to the situation of indigenous women in Latin America could be one example that requires consideration in order to identify strategies to include their perspective in the decision-making processes with the appropriate tools of approach.

The difficulties that indigenous women face in the legal, political, social, cultural, and economic spheres in Latin America can be traced to the pre-Hispanic era. Despite the several political, cultural, and social groups, it can be traced that women were coupled to the land and are responsible for the provision of food, the cultivation of plants, and the maintenance of the environment (Hall, 2011). However, the roles were different depending on the political group. For instance, Aztec women were to be dependent on men, with their sphere of development limited to home and childbearing (domestic world), in contrast with men, who participated in politics, the military, and trade (public world). Unlike the mentioned group, the Mayans gave women the same importance as men in the formation of lineages, and they occupied important political positions as female governors (Bárceñas Díaz, 2015).

The history of indigenous women remained relatively silent until the second half of the twentieth century, due to the need to protect women's rights against the increasing deforestation, marginalization, all types of violence, and privation of lands. Perini (2023) and the Inter-American Commission of Human

Rights (2017) have warned about how Indigenous women face limited access to health and education services, high rates of illiteracy, low participation in the political process, social marginalization, and a worrying escalation of violence against environmental and human rights defenders.

Gender violence, murders and repression of women can also be seen in the extractive industry and even in energy transition projects, such as bioenergetics (Valladares de la Cruz, 2020). The Business & Human Rights Resource Centre (2021) explored that the renewable energy development replicated the social and environmental violence of the oil industry, in which 61% of all allegations of abuses (mainly indigenous, territorial, marginalization of women, healthy environment, and free, prior, and informed consent rights) recorded globally were in Latin America. The referred situation may be relevant to identify that even areas of the economy that are considered to be desirable or harmless for the environment, such as the ones related to renewable energy, may impose a risk to the social sector, in which women could be more vulnerable.

Nevertheless, in the past decades indigenous people have been politically active to supporting and contributing to family and community well-being (Kellogg, 2005). Moreover, the Inter-American Commission of Human Rights (2017) highlighted that indigenous women have played a crucial role in the history of the struggle for their rights as women, guarantors of their culture, and protectors of their families and communities.

Therefore, indigenous women should not only be seen as victims but also as active participants in protecting their rights. For that matter, some strategies and tools for incorporating women in the decisionmaking processes

should be explored, considering the vulnerability that they face, as well as the subordination and oppression faced through history.

Analytical method

The analytical method is relevant in exploring the international protection of indigenous women, as well as the Inter-American Human Rights cases that have dealt with conflicts on free, prior, and informed consent and its scope in conflicts related to energy projects.

In general terms, it should be said that the national law and international instruments have made great strides in recognizing the rights of indigenous groups. Still, more needs to be done to ensure that indigenous rights become a reality and not just an ideal (Ruge, 2009).

In the international sphere, the protection of women's human rights is established in the Universal Declaration of Human Rights, the International Covenant on Civil and Political Rights, and the International Covenant on Economic, Social, and Cultural Rights. The protection of indigenous women is reinforced with the Declaration of the Rights of Indigenous Peoples of the United Nations (2007) that recognizes rights such as self-determination, life, physical and mental integrity, liberty, and security of indigenous individuals; the right of free, prior, and informed consent; and the special needs of indigenous elders, women, youth, children, and persons with disabilities. States shall take measures, in conjunction with indigenous peoples, to ensure that indigenous women and children enjoy the full protection and guarantees against all forms of violence and discrimination.

In addition, the Indigenous and Tribal Peoples Convention No. 169 of the International Labour Organization (1989) contemplates that indigenous and tribal peoples shall enjoy the full measure of human rights and fundamental freedoms without hindrance or discrimination (article 3); the adoption of special measures for safeguarding the persons, institutions, property, labor, cultures, and environment of the peoples concerned (article 4); and the right of consultation in good faith and in a form appropriate to the circumstances (articles 6 and 7).

Latin America is one of the regions with a higher indigenous population. There are 42 million indigenous people, among whom 43 percent are afflicted by poverty, and even 24 percent live in extreme poverty (World Bank, 2024). The poverty situation reinforces the need for protection of rights to fully guarantee the well-being of people, as several violations of human rights may be occurring in the region.

A written statement to the 21st session of the United Nations Human Rights Council (2012) illustrates that among the violations of the rights of indigenous people are those related to the fact that consultation usually takes place after decisions have been made, the hostile environment in which the consultations occur, and the lack of a robust legal framework with effective accountability mechanisms. The addressed problem shows that it is not enough to recognize the rights of people in local law or international instruments. Indeed, further actions need to be taken to protect this group of people; that requires, as a starting point, an ongoing dialogue between the public, private, and social sectors to identify their needs and set the actions to protect the rights of people according to their needs.

Certainly, in the Americas countries such as Argentina, Bolivia, Colombia, Mexico, Nicaragua, Paraguay, Peru, and Venezuela have recognized in their local law the protection of indigenous people, which has been reinforced by the rulings of local courts. Moreover, the Inter-American System of Human Rights protects life, integrity, dignity, health and participation in the previous consultation of indigenous women in articles 1, 2, 4, 5, 7, 9, 13, 17, 24 of the American Declaration of the Rights and Duties of Man; 1, 2, 3, 4, 5, 7, 13, 24 and 26 of the American Convention on Human Rights; 1, 2 and 6 the Inter-American Convention to Prevent and Punish Torture; 1, 2, 3, 10, 11, 12, 14, 17 and 19 of the Additional Protocol to the American Convention on Human Rights in the area of Economic, Social and Cultural Rights; 1, 2, 3, 4, 5, 6, 7, 8 and 9 the Inter-American Convention on the Prevention, Punishment and Eradication of Violence against Women; 1, 2, 3, 4, 8, 9 and 10 of the Inter-American Convention on Forced Disappearance of Persons; 1, 2, 3, 4 and 5 of the Inter-American Convention on the Elimination of All Forms of Discrimination against Persons with Disabilities; 1, 2, 3, 4, 5, 7, 12, 13, 14, 16, 17, 18, 19, 23, 29 and 30 of the American Declaration on the Rights of Indigenous People and the Declaration of Principles on Freedom of Expression.

Despite the protection in law and international agreements, there have been several violations of the rights of indigenous people, as can be seen in cases of the Inter-American Court of Human Rights, such as *Comunidad Indígena Yakye Axa vs. Paraguay* (2005), *Comunidad Garífuna Punta Piedra vs. Honduras* (2015), *Comunidad Garífuna Triunfo de la Cruz vs. Honduras* (2015), *Pueblos Kaliña y Lokoño vs. Surinam* (2015), *Comunidades Indígenas Miembros de la Asociación Lhaka Honhat (Nuestra Tierra) vs. Argentina* (2020), and *Comunidad Indígena Maya Q'Eqchi' Agua Caliente vs. Guatemala* (2023). In those cases, the Court interpreted that the right of free, prior, and informed consent is based on the relationship between indigenous communities and their territory, collective property, and cultural identity. Therefore, the State must guarantee: 1) Consultation must be conducted prior, in good faith, with the aim of reaching an adequate, accessible and informed agreement; 2) An approach to a pluralistic, multicultural, and democratic society to consider the values, customs, and forms of organization of indigenous people; 3) The creation of sustained, effective, and reliable channels of dialogue with representative institutions of indigenous and tribal peoples in consultation and participation procedures; 4) The organization of the governmental apparatus and structure of its rules and institutions, including control tasks and deploy protection of indigenous rights; 5) Administrative and legislative measures to protect the right of consultation; 6) Environmental and social impact evaluation.

Related with the oil industry cases such *Kichwa Indigenous People vs. Ecuador* (2012), and *Pueblo Indígena U'wa y sus miembros vs. Colombia* (2024) fostered that: 1) the State should adopt a methodology to grant the right of prior, informed and free consent, transparency and legitimacy to conduct the consultations; 2) Consultation must be perceived as an essential tool for promoting meaningful and effective social dialogue, mutual understanding, and legal certainty; 3) The transparency principle refers that public must be provided with the maximum amount of information, which must be complete, understandable, provided in accessible language, up-to-date, and provided in a manner that is effective for the different sectors of the population in order to understand the large-scale projects that affect their territories or natural resources.

The referred approach is of special relevance as new energy infrastructure projects are needed to satisfy the industrial, commercial, and common needs of developing countries (ExxonMobil, 2025). The lessons from the mentioned cases brought to the Inter-American Court may be relevant to prevent the violation of the rights of indigenous people and implement actions within the government and enterprises to protect the prior, free, and informed consent, life, dignity, health, environment, and property rights.

Special attention should be given to gender equality so that women can be considered in the decisionmaking processes at all levels. Their participation requires considerations on the vulnerability, language, traditions, clear methodology for consultations, and transparent information, as well as sustained, effective, and reliable channels of dialogue. Along with the political, anthropological, sociological, and cultural knowledge, innovative techniques and technology should be implemented to guarantee an appropriate dialogue with indigenous women.

Additionally, administrative and legislative measures must be adopted to promote the legitimate participation of women, as it can be inferred from the rulings of the Inter-American Court of Human Rights. Those mechanisms guarantee the legitimacy of the consultations, as well as promote meaningful and effective social dialogue.

The dialogue with indigenous women is relevant to achieving energy justice, which, according to Heffron (2021), is about the application of human rights across the energy life cycle, which deals with the just distribution of benefits and duties, the respect of legal process, the recognition of rights of different groups, the consideration that the energy activities and global business supply chains affect the whole world, the rectification of any injustice caused by the energy sector, and the enforcement of particular laws.

In this scheme, artificial intelligence may be relevant to approaching indigenous women in their own language and trying to explain graphically the scope of the projects, as well as to helping to identify ways to protect their rights.

The need to protect the free, prior, and informed consent of indigenous women and foster their participation in the decision-making processes points out the need to identify tools to give clear, complete, and understandable information about the energy projects that are planned to be constructed.

In this regard, artificial intelligence ought to be considered as a scientific and technological tool to offer the necessary information of the energy projects. Artificial intelligence represents the ability of machines to carry

out certain reasoning, which includes translation, simulation and additive manufacturing, virtual reality, and augmented reality (Vergara Villegas et al., 2021).

This tool may offer graphic, clear, new, and accessible information, as well as an immersive experience of the project for the whole community, the risks, and its impact on the environment. In addition, artificial intelligence may offer a communication alternative for women to express their suggestions and concerns about social and environmental issues amid the energy project. Hearing from indigenous women may give an interesting insight into how they are treated within their communities, the risks that they avert from the project, and even how effective measures can be adopted by the public, private, and social sectors to protect their lives.

The use of artificial intelligence should also consider the ethical dimension of the development and implementation of new innovations as a prerequisite for ensuring the credibility of its uses. Hauer (2022) addresses the ethical components of artificial intelligence: (1) it should respect fundamental rights, applicable regulations, and the guiding principles and values, ensuring the “ethical purpose” of AI, and (2) it should be technically robust and reliable, as AI technologies can cause unintended harm or damage.

This development requires the collaboration of investors, technicians, and researchers to design the information strategies that will be shown to the indigenous groups and design an acceptable methodology to conduct the dialogue with the public, private, and social sectors.

RESULTS

Suggestion of implementation of artificial intelligence to include women in the energy decisionmaking processes

Artificial intelligence can be considered as an auxiliary tool to fulfill the right of free, prior, and informed consent in energy projects, as well as a means to guarantee the participation of indigenous women in the decision-making processes. Specifically, it may help indigenous women to understand the scope of the project and the risks, raise some of the concerns about their situation, and even offer some proposals to protect their rights.

Regarding the free, prior and informed consent, artificial intelligence may be useful to offer solutions to explain the project in a dynamic way and in an understandable language for indigenous women. In this regard, natural language processing, as well as simulation tools that could be examples of implementation of artificial intelligence aimed at protecting the free, prior and informed consent right, as it will be briefly explained in the following paragraphs.

The use of the NLP could be auxiliary to creating a sustained, effective, and reliable channel of dialogue with representative institutions of indigenous and tribal peoples in consultation and participation procedures, transparency principles, as well as providing clear and understandable information for indigenous groups in the decision-making processes, which, according to the Inter-American Court of Human Rights, are aspects that should be taken into account to grant the right of prior, informed, and free consent, as indicated in the previous section. The implementation of the artificial intelligence tools should also be considered in the guidelines and methodology that the state and even the private sector use to give certainty, respect, and clarity in the uses of the technology.

Despite the benefits of NLP, there are still challenges ahead, such as ambiguity in language, context, and pragmatics; cultural and linguistic diversity; and scalability of models, which somehow have been addressed by experts by the proposal of solutions, such as transfer models, transfer learning and pre-trained models, data augmentation and synthetic data, and multilingual models (Rongali, 2025). These issues may be even more worrisome considering the cultural and linguistic diversity of indigenous groups, which requires further collaboration between the experts of artificial intelligence, sociologists, anthropologists, historians, and other social scientists to develop acceptable programming that may help to build dialogue channels in the decision-making processes in energy projects.

In addition, the developing of energy projects requires the understanding of technical issues in areas such as engineering, chemistry, technology, sustainability, and architecture, among other fields that may be inaccessible for non-technicians. As for the indigenous groups' concerns, the requirement of transparency and clear

information to grant the free, prior, and informed consent right will require the implementation of further strategies to make accessible the scope of the energy project.

Artificial intelligence may offer auxiliary tools through virtual, augmented, or simulation tools to offer graphic, direct, and accessible information about the scope of the project. For the purposes of this paper, some lines about simulation tools will be referred to in order to identify the possible uses in the consultation processes of energy projects.

Artificial intelligence combined with augmented reality creates live connections of virtual content to real environments by overlaying virtual information onto the physical world to enrich the understanding of the space that surrounds people and provide deeper interactions in areas such as business, education, or healthcare (Parvatha, 2024).

The interaction between virtual content and real environments may be useful to explain the scope of the energy project in a graphical way so that indigenous people may identify the risks and pose questions on the development of the project. For gender equality, this tool is relevant for women to identify which areas may pose a risk in terms of their family duties, energy needs, well-being, or environment protection, and what are the improvements that they consider in the development of the project. The vision of indigenous women is relevant, as they are the ones that may resent more directly the impact of the energy project due to their role in the family and communities. Therefore, the interaction with the scope of the project could be useful to have another perspective of the benefits, risks, and suggestions that could enrich the opinion of the male leaders of the indigenous communities.

The optimal use of artificial intelligence requires dealing with the biases that may underlie the programming so that this programming could be inclusive enough to consider the cultural diversity of the society. Therefore, the programming needs to consider the insights of anthropologists, linguists, sociologists, lawyers, social scientists, and even some members of the indigenous groups to broaden the scope of the language, ideas, and vision of the uses of artificial intelligence.

Ethics is also an issue that should be considered in the use of artificial intelligence with indigenous people. In this regard, the artificial intelligence should be an instrument to facilitate communication between indigenous people, especially women, and the public and private sectors. The aim is to contribute to protecting the right of free, prior, and informed consent, in which transparency, as well as proper and clear information, should be given to the members of indigenous groups, according to the rulings of the Inter-American Court of Human Rights.

The path of the uses of artificial intelligence for the public, private, and social sectors to include women in the decision-making processes in energy projects.

As for the public sector concerns, artificial intelligence should be clearly referred to as part of the methodology of free, prior, and informed consultation, as well as administrative and legal measures. This consideration may be challenging since the legal framework of artificial intelligence is under development. Nevertheless, it is needed to identify the uses of artificial intelligence in approaching indigenous groups, as well as to train public servants in its use.

The private sector should also consider, among their due diligence processes, a reference to artificial intelligence with guiding questions, topics, and the implementation of tools of artificial intelligence. In general terms, the due diligence refers to a process, or a set of processes that must be implemented to identify, prevent, mitigate and account for how they address the actual and potential negative impacts on human rights in which they may be involved (UNO, 2011).

The following chart may give some hints on the proposal of topics to consider the participation of indigenous women in energy projects:

Table 1. Chart of proposal of topics to consider the participation of indigenous women in energy projects

Topic	Guiding questions	Artificial Intelligence Tools
Indigenous people	1. Are indigenous people being considered in the energy project?	

	<p>2. What are the characteristics of the indigenous group?</p> <p>3. What are their representative mechanisms and authorities?</p> <p>4. Do women take part in the representative mechanisms and authorities?</p>	AI-driven language models, natural language processing (NLP), translation tools.
Energy project	1. Are indigenous people being considered in the energy project?	Translation AI Tools
	<p>2. Is the energy project duly explained?</p> <p>3. Is the energy project presented in an accessible language?</p>	Simulation tools Virtual and Augmented reality
Gender perspective	<p>1. Is the information considering the needs of women?</p> <p>2. Are women being considered in the decision-making processes?</p> <p>3. Are women duly represented in the dialogue and the decision-making processes?</p> <p>4. Are all perspectives being considered in the decisionmaking processes?</p> <p>5. Are the needs of women being considered?</p> <p>6. How will women be considered to give a follow-up?</p>	Translation AI Tools Simulation tools Virtual and Augmented reality
Asistance for women	<p>1. Are there any mechanisms and procedures aimed at helping women to exercise their civil, political, economic, social and cultural rights?</p> <p>2. Has there been identified discrimination or violence against women either by the government, the indigenous groups or the private sector?</p> <p>3. How can the needs of women be considered by the public, private, and social sectors involved in the energy project?</p> <p>4. What are the energy needs of women, and how can the project help them?</p> <p>5. How can AI help women to explore the proposed solutions offered by the public, private, and social sectors?</p>	Translation AI Tools Simulation tools Virtual and Augmented reality

Source: Own elaboration

Additionally, the social sector ought to evaluate the ethical perspective and the cosmovision of indigenous groups in designing the applications of artificial intelligence.

Important to bear in mind is that the implementation of AI does not guarantee an acceptance of the project, since indigenous people may have other political and economic objectives, as Uwa vs. Colombia (2024) illustrates.

However, it is important to use the development of scientific and technological tools, such as artificial intelligence, in order to help guarantee the protection of the rights of indigenous people and seek economic development.

Moreover, it should serve as a tool to avoid future damages and incorporate the situation of vulnerable people, such as women, in the development of energy infrastructure projects. In this regard, energy projects should not only be limited to reaching an economical goal but also be a means to achieve social goals for consumers and vulnerable women.

Throughout artificial intelligence, the public, private, and social sectors could create conditions for progressive measures that consider the promotion of the right of women to have their human rights respected and protected and modify social and cultural patterns of conduct, including the development of formal and informal educational programs to counteract prejudices, customs, and all other practices that harm women. In doing so, states shall adopt, in conjunction with indigenous peoples, the necessary measures to prevent and eradicate all forms of violence and discrimination.

DISCUSSION

The results demonstrate that artificial intelligence may be useful to grant the protection of the free, prior, and informed consent in energy projects, aiming at the inclusion of indigenous women in the decision-making processes.

The proposed use of artificial intelligence tools to promote gender equality in the energy sector opens avenues for further exploration of how such technologies may contribute to the protection of human rights.

Legal theory has played a central role in the development of human rights throughout the twentieth and twenty-first centuries, emphasizing the importance of protecting civil, political, economic, social, and cultural rights at both national and international levels, along with the corresponding responsibilities of individuals, corporations, states, and international organizations (Grimm, 2017; Ferrajoli, 2007). However, it remains necessary to critically assess whether artificial intelligence presents more advantages or disadvantages for the protection of human rights, as well as to identify the challenges it poses.

Concerns such as unequal access to artificial intelligence, unethical uses, and the programming biases of artificial intelligence (Varsha, 2023) are the subject of contemporary debates. Those topics should also be considered to examine whether and how artificial intelligence can effectively support the protection of human rights. This question calls for continued interdisciplinary and transdisciplinary research worldwide—particularly in developing countries—to identify the measures that public, private, and civil society actors should adopt to improve the living conditions of people.

The use of artificial intelligence should also be supported by an adequate legal framework, public policies, and the proper methodology that ensures its proper use in the energy field and the protection of human rights, with special consideration to vulnerable people, such as indigenous women, whose voices need to be considered in the decision-making processes.

CONCLUSION

Artificial intelligence plays a significant role in advancing gender equality by enhancing our understanding of the needs and concerns of indigenous women. It provides tools for ensuring free, prior, and informed consent and communication strategies to present solutions aimed at safeguarding their rights amid the development of an energy project.

Certainly, the translation tools, simulations, and virtual and augmented reality could be helpful for indigenous people to explore the scope of the project, participate in the decision-making processes, offer some proposals, and even explain their concerns regarding the protection of human rights. This will fulfill the requirements that local laws, international instruments, and the decisions of the Inter-American Court of Human Rights have identified regarding the free, prior, and informed concern in projects, such as the ones related to the energy sector. Moreover, the due application of artificial intelligence could be of special relevance to including women in the

participation, discussion, and suggestions of the decision-making process. Despite that some indigenous groups do not fully include women in their political institutions, the public, private, and social sectors ought to approach indigenous women to explore their points of view, their vulnerability, and even find strategies for the full protection of their rights.

Achieving gender equality in energy projects requires the collaboration of the public, private, and social sectors for incorporating artificial intelligence in the methodology, protocols, and mechanisms of the consent; the consideration of indigenous women as a vulnerable group, in the discussion and negotiation stages to fully protect their rights.

The use of artificial intelligence in decision-making processes for energy projects may help prevent social issues and develop additional strategies that leverage science and technology to safeguard human rights.

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