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REVIEW

Revitalising the Earth: Cross-International Solution Communication for Promoting Healthy Environmental Development

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ABSTRACT

With rising international environmental issues, there is a need to ensure effective communication of solutions across international boundaries to enhance sustainable development and environment sustainability. International solution communication entails the process of transmitting and localizing environmental innovations, technologies and policy-based or social, among nations and regions. This article discusses the actors, channels, and strategies that are significant to the transfer of environmental solutions with regard to identifying the obstacles that inhibit their universal adoption, and also the ethical concerns that would require consideration. Although there are viable solutions, the successful execution of these solutions is usually hampered by issues of governance mismatch, capacity gaps, political resistance, and cultural differences in different settings. This review offers an understanding of how trust, evidence-based communication, and local adaptation can improve solution transfer by the analysis of the mechanisms of delivering solutions and adopting them. Ethical issues, including data equity and environmental justice, are also addressed, and inclusive and open communication is essential. The article suggests an integrative model that connects the context, the mechanism of communication, and the outcome to provide a holistic model of maximizing cross-national solution communication. This framework will promote a situation in which environmental solutions result in measurable and sustainable enhancement of environmental health in the world by promoting collaboration and resolving barriers to communication.

Keywords: Cross-International Communication; Environmental Solutions; Solution Transfer; Policy Diffusion; Environmental Justice

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1. Introduction

The well-being of planet Earth and its inhabitants is interconnected[1]. Over the last decades, the unprecedented rate of climate change, pollution, biodiversity loss, and other environmental crises, increasingly transboundary in nature, has been observed. These phenomena represent global environmental issues that are intrinsically linked and therefore require universal solutions extending beyond local or national frameworks[2]. In light of their urgency, there is a necessity for both innovative solutions and effective mechanisms for the international dissemination and implementation of such solutions. In this context, cross-national communication of solutions, namely, the exchange and commercialization of environmental strategies, policies, and technologies among countries, plays a critical role in achieving sustainable and equitable environmental development.

Environmental issues such as climate change, air and water pollution and biodiversity loss are not subject to geopolitical boundaries[3]. For example, the emissions of a single country can make the air or water of an adjacent country unsatisfactory or influence its climate. These global environmental problems, therefore, require solutions that take into consideration the local contexts but also how the same can be translated and conveyed to other cultural, political and economic environments he effectiveness of such solutions is determined not only by their scientific and technical appropriateness, but also by the extent of their cross-national communication. This communication entails the actors, networks, and channels that have the capacity to overcome the policy, language, governance systems, and cultural values differences[4].

Communication of environmental solutions is a crucial aspect in deciding whether the solutions can be adopted, scaled and sustained across international borders[5]. This process that involves a broad range of stakeholders, ranging from governments and international organizations, to non-governmental organizations (NGOs), businesses, and civil society. Yet, even when viable technological or policy interventions exist, communication barriers often hinder their large-scale implementation. Among the barriers are misalignment of priorities, distrust amongst the involved parties, political and economic limitations, cultural misunderstandings, as well as unequal distribution of resources and knowledge. Specifically, communication channels may not consider the variations in terms of different governance systems, local concerns, and technology preparedness, which may block the transfer of solutions in one area to the other[6].

It is not just a question of knowledge across the borders, however, it is communication of knowledge translated and making it respond to the needs, values, and possibilities of specific countries and societies[7]. It involves selling such solutions in a way that is likely to attract different audiences, building trust among the interested parties, and rendering such solutions practical and sustainable within the local contexts. Additionally, it is the struggle against barriers to access to digital technologies, unequal access to the technologies, and the political economy of environmental regulation, which may cause miscommunication or the impossibility of accepting potential solutions[8].

The paper aims to explore the fact that the concept of International solution communication is important in the development of a healthy environment. What we mean is that, through effective environmental communication of solutions, the process of dissemination of effective environmental strategies to other countries can be accelerated, thus giving more resilient and equitable outcomes[9]. In carrying this out, the article will provide a comprehensive analysis of the mechanisms, actors, and strategies that can or cannot contribute to the transfer of environmental solutions across countries. It will also examine the ethical challenges and hurdles that are brought about during the process, particularly in issues of equity, justice, and access to resources. Finally, the paper will recommend an integrative model of apprehending and determining the arenas where communication would be effective in achieving a healthier environmental and developmental score.

The necessity of a solid, integrative structure of communication of the solutions across international borders has never been more acute. As the world environmental context grows increasingly complex, the mobility of knowledge, massified solutions, and constructive action between national boundaries becomes the most important[10]. We, in this respect, seek to offer a broad description of the available literature and practice regarding cross-national communication concerning environmental health, to what mechanisms success and failure are predetermined, and what the pitfalls are that should be avoided. This article can attempt to add to the current debate on the best ways to harmonize international

efforts that can enhance healthy environmental development and a more sustainable future for all by synthesizing the most current research and providing actionable ideas to policymakers, communicators, and practitioners.

Considering this exploration, we seek the answers to important questions that inform the intersection of communication, policy, and environmental outcomes [2]. What better way to communicate more effectively the complex environmental solutions required for sustainable development? What are the most effective actors, channels, and strategies of framing to break through cross-border adoption barriers to solutions? And, most importantly, what is the way to quantify the effects of communication strategies regarding to the real change in environmental and human health?

In the end, it should strive to develop a global dialogue on ways to overcome communication barriers and develop more inclusive, efficient, and effective channels of sharing solutions that can be used to make the planet healthier.

2. Methodology

2.1. Review Design

The method employed in this article is an integrative review, which is a synthesis of the literature in cross-cultural communication of solutions in the situation of environmental development. The integrative review methodology enables different study designs and methods to be included and incorporates the theoretical, empirical and practical knowledge of various fields. This methodology is especially suitable in tackling an interdisciplinary challenge such as the sharing of environmental solutions across borders, where the study cuts across disciplines of environmental science, policy transfer, communication studies, and international relations [11,12]. The literature is informed by the broad objective, which is to comprehend the mechanisms of communication's effect on transfer, scaling, and efficacy of environmental solutions on a global level. Combining numerous different points of view, the article will explore what difficulties and opportunities there are to enhancing the cross-border communication of solutions.

2.2. Search Strategy

The process of the relevant literature search took place in the range of the largest academic databases, such as Web of Science, Scopus, PubMed, and databases related to communication, such as Communication, Mass Media Complete and SSRN. The databases were selected due to their extensive coverage of interdisciplinary research, especially in the areas of environmental science, communication, and policy. The keywords were chosen in order to express the entire scope of the topic, which included words about environmental issues, solution communication, knowledge transfer, policy diffusion, and international cooperation. Such keywords as environmental solutions, cross-national communication, solution diffusion, policy transfer, knowledge translation, and global environmental governance were selected and used in different combinations to guarantee a thorough search [13,14].

The search was reduced to English-language literature, although the non-English-language literature was included when published in journals of high academic relevance or provided critical information concerning the regions that have scanty English-language publications. The fact that these works are included contributes to the assurance of a global view of the problem, as the fact that lots of environmental solutions and the way of their communication are considered regionally and locally, which cannot be fully represented in the English-language literature. Moreover, the literature review was limited to publications of the past two decades, ensuring the analysis of the latest developments in the field of solution communication and the evolution of environmental governance and digital media.

2.3. Inclusion and Exclusion Criteria

The inclusion criteria were meant to target those studies that would have a direct impact on perceiving international communication in terms of environmental solutions. This comprised both empirical research, theoretical articles, and case studies which investigated the processes of communication and the spread of environmental solutions across nations, regions, or cultural backgrounds. The studies were included in case they particularly considered communication strategies, networks, or actors that were to be involved in exchanging and transferring environmental solutions, whether they involved technological innovations, policy frameworks, or social practices.

The exclusion criteria were narrowed down to those that were not related to the international or cross-national aspects of environmental communication. In illustration, re-

search studies that showed only single-country settings where communication of transnational solutions was not taken into account were excluded. Also, the research that did not emphasize in its study solution adoption and scaling, but focused more on the use of risk communication or climate change communication, was excluded. It was further omitted that purely descriptive literature or those with no clear analytical structure were not included in the review because this would not give the depth required for the aims of this article.

2.4. Screening and Quality Appraisal

After the preliminary search, identification of the studies was done in a systematic fashion to ascertain that they fulfilled the inclusion criteria. To determine the relevance of the articles to the research questions, the titles and abstracts of all articles were first reviewed. The studies, which seemed to be relevant regarding these preliminary criteria, were put through a full-text inspection. At this stage, the inclusion criteria were the conformity of every article to the aims of the review, containing the study of communication mechanisms, actors, and the results of the international spread of environmental solutions.

The quality of the chosen research works was evaluated on the basis of the known criteria. The methodological rigor of the empirical studies was evaluated based on the clarity of the research design, sample size (where appropriate), method of data collection, and techniques of data analysis. The conceptual papers were rated in terms of theoretical consistency and topicality to the main themes of the review. The quality of every study was also viewed in the aspect of its transparency, such as the clarity with which the research reported its findings, limitations, and implications. Secondary quality check was carried out on a small number of studies in a bid to maintain uniformity in the evaluation process by the independent reviewers.

2.5. Data Extraction and Coding

The process of data extraction was carried out in a systematic manner because all the pertinent data were obtained and grouped according to the research questions of the current article. The most important data derived from both studies were the geographic reach of the study, the categories of environmental solutions addressed, the actors and ways of communication to be identified, the framing approaches used, and the outcomes which had to be attached to the solution diffusion and adoption. Specifically, the literature review was narrowed down to the extent to which communication can help reduce the impediments to the exchange of environmental solutions, including lack of trust, political opposition, and cultural variations[15,16].

A coding system was created to aid in creating the literature. This system contained the codes of various actors (e.g., governments, international organizations, NGOs), communication mechanisms (e.g., media, digital platforms, diplomatic channels), and communication strategies (e.g., framing, evidence standards, co-production). The course of the coding process also incorporated classifying the results that were discussed in the studies, which were from awareness and policy uptake to quantifiable benefits on the environment and health. This coding system was meant to systematize the literature in such a manner that patterns, common topics, and research gaps were identified.

2.6. Synthesis Approach

The literature review synthesis followed the oriented toward determining the major themes and patterns appearing due to the data extraction. The question, "What works, who, under what circumstances, and why," was answered through a realist framework applied in the context of international solution communication. This method can be used to identify not only mechanisms and agents of the solution transfer but also the situational factors that can affect the success or failure of such solutions in various countries and regions. The synthesis aimed at making an association between the communication strategies used and the results obtained to offer a more detailed insight into the role of communication in the adoption, scaling, and sustainability of cross-border environmental solutions.

Besides thematic synthesis, the review employed the comparative approach, comparing case studies and examples across regions and types of solutions in order to find patterns of how the optimization of communication strategies in different situations can be achieved. Other successful solutions to global environmental management that emerged out of this comparative analysis included the best practices in the field of cross-national solution communication and the obstacles that must be overcome in order to achieve a more effective

global environmental governance.

3. Conceptual and Theoretical Foundations

3.1. Clarifying Constructs

The main concepts involved in this review are that there are a number of core concepts that should be defined accurately to make the discussion clear. It is mainly concerned with international solution communication that is brought by processes and mechanisms that are involved in transferring and communicating environmental solutions (whether technological, policy-driven, or social innovations) across countries and regions. Such solutions can be renewable energy technologies, policies of the circular economy, or nature-based ecosystem restoration solutions. In this situation, communication is not just a mere distribution of information, but the adjustment and contextualization of knowledge in such a way that it can be comprehended, adopted, and acted upon in other cultural, political, and social situations [17].

The notion of healthy environmental development is one of the principles used in this review. It is the meeting point of environmental health and human health, where not only ecological sustainability is considered but also the enhancement of the general population's health and economic and social stability [18]. The need for environmentally healthy development is based on the systems thinking approach, which acknowledges the interdependence of environmental, social, and economic systems, in which the well-being of the planet has a direct impact on the well-being of the people who live on it [19].

border adoption of environmental innovations or interventions. Diffusion describes the process of the dissemination of innovations, and solution transfer is concerned with issues and processes of applying the innovations to new contexts and incorporating them [20]. This adjustment should be done with keen attention to the contexts in the area, the governmental systems, the ability to manage resources, and cultural values.

3.2. Core Theoretical Lenses

A number of theoretical approaches are used to explain international solution communication. The theories can be applied to conceptualize how communication can be used to adopt, scale, and succeed in the realization of environmental solutions. The synthesis of the literature reviewed in this article is based on the following major theoretical lenses:

3.2.1. Diffusion of Innovations

One of the most commonly applied theories that can be used to explain the spread of ideas, practices, or technologies within societies is the theory of diffusion of innovations, which was formulated by Everett Rogers [21]. This theory underlines that not all people adopt innovations in the same way; early, majority, and laggard adopters have different positions in the diffusion process. Diffusion theory can be used in the context of environmental solutions and clarifies the process by which green technologies or sustainable policies spread to various countries and regions [20]. Nevertheless, it also points to the difficulties of making sure that innovations are implemented in a manner that is culturally and contextually correct, and that is the key to their success in different contexts.

3.2.2. Policy Transfer and Lesson-Drawing

Policy transfer theory analyzes the process of policy, practice, and solution adaptation and adoption from one context to another [22]. This method is critical to the dynamics of cross-national communication in environmental governance, whereby nations seek models of effective solutions from each other. Lesson-drawing is an important idea in the policy transfer theory, which is defined as the process through which a policymaker could use the experiences of others to guide their own decisions. Lesson-drawing, in the case of environmental development, may reflect the modification of one country's climate change mitigation strategies or the waste management system to that of the other. Nevertheless, the theory also highlights the challenges at hand since political, social, and economic disparities can hamper the easy exchange of policies.

3.2.3. Knowledge Co-Production and Social Learning

The process is known as knowledge co-production, where various stakeholders, including scientists, governments, communities, and businesses, come together to generate and share knowledge [23]. This notion is especially significant in communicating environmental solutions, given the fact that most of the environmental issues demand the

involvement of various actors with multiple views and knowledge. Knowledge co-produced is prone to acceptance and implementation due to the fact that the knowledge in co-production is shared in ownership and considered legitimate by all concerned parties. In a related context, social learning can be described as a process through which individuals and communities learn from each other through common experiences and interactions [24]. With respect to the cross-national solution communication, social learning highlights the significance of participatory solution design and implementation, in which knowledge exchange is done not only between countries but also between communities and across sectors.

3.2.4. Network Governance and Epistemic Communities

Network governance is defined as a decentralized type of decision-making when different actors, in most cases, representing different areas, engage in the processes of governance without centralized decisions [25]. The networked type of collaboration is even becoming a feature of environmental governance, where solutions are jointly formed and shared across global networks of cities, research institutes, non-governmental organizations, and companies. Such networks are useful to help share the knowledge and solutions, but are also sensitive to coordinating and building trust among various actors. These networks are important in epistemic communities of experts that have a common understanding and knowledge base. They tend to be central contributors to the communication of cross-border solutions, offering technical expertise and legitimacy of environmental solutions that are being transferred intercountry.

3.2.5. Framing and Narrative Persuasion

The theory of communication known as framing explains that the manner in which an issue is framed may have a great impact on the knowledge and acceptance of the issue by the people. When it comes to environmental solutions, framing is especially relevant since it can be used to derive the perception of the solutions to the various stakeholders [26]. As an example, presenting a solution as economic co-benefits (e.g., job creation or energy security) might be more attractive to policymakers than presenting it as an environmental intervention. The narrative persuasion theory goes further to elaborate on this by discussing the use of stories and narratives to persuade attitudes and actions. Narratives are also effective in international solution communication, where complex issues are more familiarized and sentiments of the future are shared.

3.3. Analytical Levels

The review presupposes the analytical framework of the various levels where communication occurs and how this affects the transfer of solutions. There are these levels, and they are micro, meso, and macro levels, which are important in the understanding of the different factors that make or break cross-national solution communication.

3.3.1. Micro Level: Individual and Community

At the micro level, it is also interested in the behavior, perception of individual persons and how the local communities relate to environmental solutions. It is a point-to-point communication where the information is directly broadcast to individuals or groups either through campaigns, community forums, or digital channels. Some of the factors that influence the effectiveness of this communication include the credibility of the messenger, the closeness of the message to the local problems, and the perceived potential of the implementation of the solution [27].

3.3.2. Meso Level: Organizations and Networks

At the meso level, the most significant ones in the inter-boundary transfer of solutions are networks, organizations, and intermediaries. The level deals with the connection between NGOs, international organizations, governments, and the private sector, and these can be mediators, which can help to translate and adjust solutions to different situations. This type of communication is concerned with negotiating, coordinating, and addressing complexities of cross-national policy, technology, and resource sharing [15].

3.3.3. Macro Level: National and Global Policy Systems

And lastly, on the macro level, communication functions under the larger structures of the national policy and international governance structures. In this tier, there are the functions of international organizations such as the United Nations, international treaties, and climate accords that set the standards and regulations of cooperation in the environ-

mental sphere[28]. This level of communication is devoted to the framing of the environmental solutions in the bigger context of international relations, policy agenda, and global commitments.

3.4. Working Model

This review works on a working model that charts the correlation between the context, communication processes, actors, and outcomes. This model assumes that the success of the communication of solutions across international boundaries depends on several factors: the context in which the communication is conducted (political, cultural, economic), the mechanisms of communication which are used (channels, framing, evidence), the participants in the communication (international organizations, governments, NGOs, experts), and the outcomes of communication (adoption, scaling, sustainability). The model acts as a guiding line towards the understanding of how environmental solutions communication can be streamlined to ensure the development of a healthy environment in the world. The success of solution communication across borders, as shown in **Figure 1**, depends on several factors such as the local context, parties involved, communication mechanisms used, and the results obtained[29].

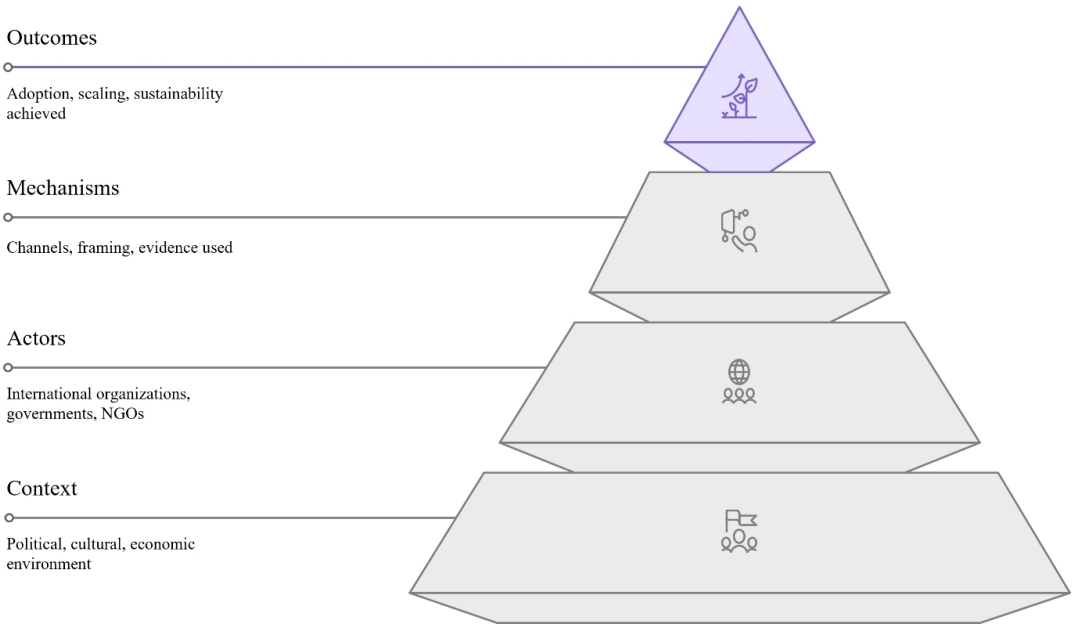

Figure 1. Conceptual model of international solution communication.

4. Evidence Synthesis: Pathways and Mechanisms of International Solution Communication

4.1. Actors and Roles

Communicating environmental solutions on an international level entails a complex network of actors that collaborate in different and complementary aspects in ensuring that innovations are transferred and adopted[29]. The actors can be broadly classified into the groups of governmental, non-governmental, intergovernmental, academic, and the groups of the private sector and local communities. All these groups play a role in various areas of the communication of solutions, such as the formulation of policies, knowledge sharing and capacity building, and the creation of collaborative networks.

The national agencies, ministries, and regulatory bodies of the government are commonly in charge of formulating, adapting, and executing the policies concerning the environment. These actors are capable of shaping the international movement of solutions by use of bilateral agreements, technical assistance programs, or by joining multilateral environmental programs like the United Nations Framework Convention on Climate Change (UNFCCC). The international organizations, including the World Bank, United Nations Environment Program (UNEP), and the World Health Organization (WHO), have a critical role in facilitating cross-border communication, standardization, and funding and expertise

of environmental initiatives [30,31].

Other major players include the non-governmental organizations and civil societies, which have the role of being the intermediaries between local people and international organizations. Local populations usually trust these actors, and they can make solutions be adopted by framing them in a culturally relevant manner, promoting policy change, and involving the local voices in decision-making. NGOs can, in most cases, fill the science-practice gap and communicate complex scientific information in forms that can be easily understood by policymakers and the general population [32].

With the help of studies, the creation of evidence, and involvement in global knowledge networks, academic institutions and researchers also play a role in the communication of solutions. They play a significant role in ensuring that environmental solutions are evidence-based and that solutions are also robust, and that can be transferred in various contexts by giving them a scientific basis. Research organizations also act as venues of communication and interaction where new solutions can be tried, developed, and distributed to the rest of the world [33].

The role of the private sector in the communication of solutions to environmental problems is getting more and more significant, especially with the creation of technologies and their distribution [34]. The companies that operate in the renewable energy field, the waste management field, and the sustainable agriculture sector, like the one mentioned, not only innovate but also have major roles in scaling solutions and disseminating them to other markets. They usually engage in it with the provision of technical expertise, investment capital, and access to international contacts.

Last but not least are local communities, which should be at the center of cross-national solution communication as recipients and solution generators [16]. Their involvement makes solutions culturally relevant, appropriate, and fair. Communities can be used as experimental environments for new solutions, which can also be valuable, as they can help to develop their application in a wider context.

4.2. Channels and Infrastructures

Communication of solutions across international boundaries relies on the mediums of sharing and transfer of knowledge [35]. These platforms are diverse, including the traditional diplomatic and intergovernmental forms of communication and the contemporary digital platforms, which enable the world to share knowledge. A communication channel is very important in identifying how far the solution will reach, whether it will be accessible, and whether it will be effective.

The bilateral negotiations, international treaties, and multilateral environmental agreements are still essential in the communication of high-level policies using diplomatic means [36]. These institutional mechanisms can be the most useful in establishing international environmental standards, providing technical cooperation, and raising financing for large-scale projects. The major ones are the Paris Agreement on climate change, in which nations undertake certain actions depending on negotiated solutions, and the Convention on Biological Diversity, which encourages the transfer of knowledge and practices between nations.

Another crucial platform of communication of the solution is through international conferences, summits, and working groups [37]. The events include professionals, policymakers, and practitioners worldwide to exchange experiences and ideas and develop their solutions. The Conference of the Parties (COP) meetings, as part of UNFCCC, and the annual meetings of the World Economic Forum, should be mentioned as outstanding examples. The cross-pollination of ideas and solutions is a possibility in those meetings, and new alliances, agreements, and action plans are often created.

The past years have brought new communication tools in the form of digital platforms and open-science portals [38]. Forums and webinars, as well as collaborative platforms, enable the actors of various countries and industries to communicate in real-time, exchange research findings, and work out solutions collectively. Another important role is the social media and digital networks that create awareness and attract support from the population for environmental efforts. Nevertheless, as the digital channels have increased the reach of the solution communication, they also introduce challenges, like the dissemination of misinformation and the digital divide, which may obstruct equal participation.

In addition, local networks of knowledge sharing, e.g., peer-to-peer sharing, sharing of solutions between cities, and regional environmental forums, have been shown to be very effective in solution transfer [39]. As shown in **Figure 2**, various channels of communication are of paramount importance

in the process of transferring solutions across countries and have their strong and weak points. Such networks build trust-based ties between the members, as well as support the communication of the best practices, creative ideas, and lessons learned. The smaller and more local channels of communication might also play a crucial role in the case of dealing with region-specific environmental challenges, as they may be more contextualized and tailored to specific areas. Different communication channels, which span the spectrum of diplomatic negotiations down to peer-to-peer networks, have different roles to play in transferring solutions across borders, as illustrated in **Table 1**.

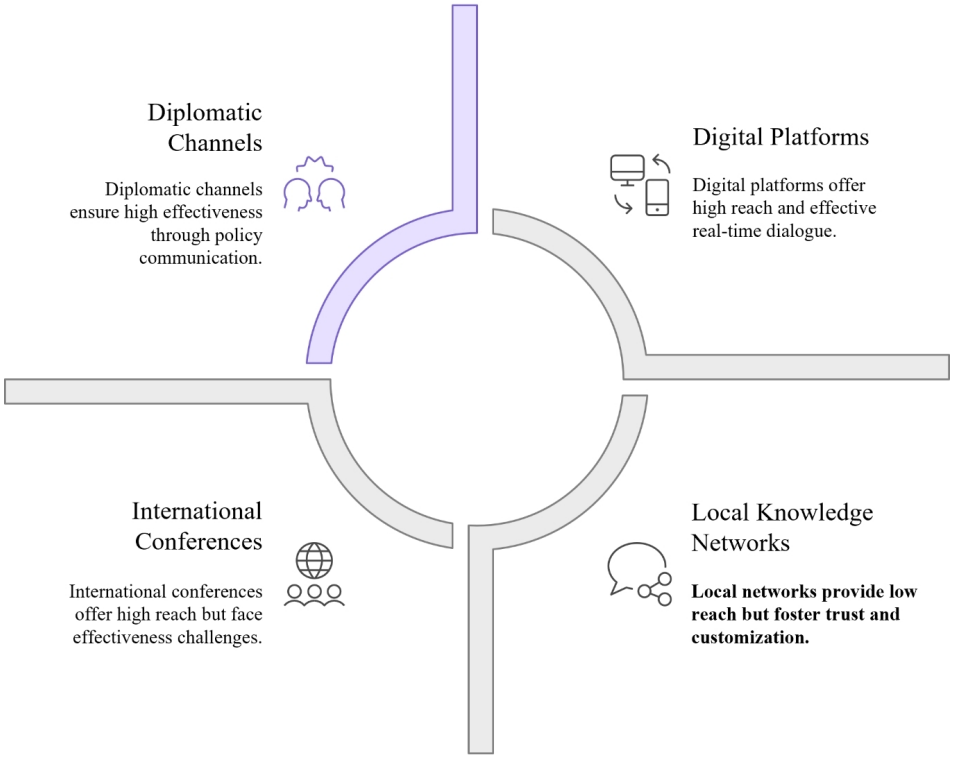

Figure 2. Communication channels for cross-national solution transfer.

Table 1. Communication channels for solution diffusion.

Channel Type	Description	Strengths	Limitations
Diplomatic Channels	Formal international agreements and treaties.	High-level policy influence, international legitimacy.	Slow process, potential for political resistance.
International Conferences	Forums like COP meetings or United Nations (UN) summits where solutions are shared.	Global participation, diverse stakeholder input.	Limited long-term impact, often short-term focus.
Digital Platforms	Online portals, webinars, and social media used for knowledge exchange.	Fast, wide reach, interactive.	Risk of misinformation, digital divide.
Peer-to-Peer Networks	City-to-city learning, regional forums, and informal exchanges.	Context-specific, builds trust, grassroots focus.	Limited scalability, can be resource-intensive.

4.3. Communication Strategies that Support Uptake

The approaches that are used to deliver the message are critical in determining the success of the international solution communication. Such strategies should be effective not only in sharing the knowledge but also in addressing the obstacles that hinder the transfer of the solutions across borders, including the cultural differences, the political opposition, and the financial limitations. Framing is one of the most important communication strategies. The manner in which a solution is framed may have a major impact on its adoption

and application. As an illustration, the promotion of a policy intervention as an economic opportunity (e.g., creation of jobs due to the use of green technology) could have more appeal to a policy maker in a developing world, whereas the promotion of the environmental co-benefits (e.g., better air quality and climate resilience) could be more attractive to a policy maker in the developed world where other needs are taken into consideration. Further specifying framing solutions in the framework of social justice and equity, including emphasizing the benefits of the marginalized groups or the global poor, may create a more widespread support for their implementation [40].

Another strategy that is necessary is the use of evidence-based communication [41]. It is important to ensure that evidence on the effectiveness of a solution is presented in a clear, transparent, and accessible manner in order to convince those in power, as well as citizens, that it is worth taking the solution. Such evidence may have a wide range of forms, such as scientific studies, case studies, impact assessments, or success stories, which have been used in other regions or countries. Specifically, the solutions with robust data on environmental, economic, and social effects have more chances to become popular on the international level.

Another strategy that can assure the success of cross-national communication is local adaptation [42]. Although global solutions can work in some situations, they need adjustments to suit the political, cultural, and economic situation of other nations. Communication strategies should accordingly consider these differences, and hence solutions should not be merely technically viable but also culturally popular and politically correct. This can include the localization of the communication, the use of local actors, and making the solution address the needs of the target population.

Effective communication has trust-building as its basic component. The ethos of the messenger can be an international organization, a country government, or a local NGO, and the way a solution is perceived can depend significantly on it. In most instances, the gap between global solutions and local adoption may be bridged by the intervention of trusted intermediaries, e.g., local leaders or other reputable community-based organizations [43]. This trust should be built and supported by transparency, accountability, and continuous engagement.

4.4. Diffusion Dynamics

The cross-border environment is not easily spurred into the spread of environmental solutions. It is influenced by a combination of factors such as the nature of the solution, the receiving nation, and the forces of world politics and economy [31]. The literature has shown that there are several diffusion pathways, and some of them are demonstration projects, peer-to-peer networks, and harmonization efforts within regions.

Demonstration projects can be considered as the first entry point of cross-national solution transfer [44]. Such projects are normally demonstrations of how a given solution will work in a given situation, which gives a proof of concept that can be applied elsewhere. Effective demonstration projects can also serve as a strong example that other nations can emulate. As an illustration, an effective project on urban sustainability in a particular city can act as a template for other cities struggling with the same environmental issues. Another significant diffusion mechanism is peer-to-peer networks, which could be formed using cooperation with city-to-city or intergovernmental systems. These networks bring about the sharing of knowledge and expertise between countries and cities with similar knowledge of environmental challenges. They offer learning and adaptation of the solutions to local contexts.

Introduction of regional harmonization, which involves nations in a particular geographical region taligning their policies and practices, also contributes to solution diffusion [45]. The conducive environment of transferring and scaling solutions across the neighboring countries is supported by the regional agreements and structures, including the climate and energy policies of the European Union. These efforts lower the burden of transfers of solutions in terms of standardization of regulations, consistency of implementation, and create cooperation in actions among nations.

Communication in each of these instances is of central interest in providing the environment where effective diffusion is achieved [46]. Through knowledge sharing, offering the flexibility of solutions, and establishing trust-based relationships, effective communication will help environmental solutions to rise above the hurdles to adoption and scale. Environmental solutions are spread by multiple channels, as illustrated in **Figure 3**. Demonstration projects, peer-to-peer networks, and regional harmonization efforts are some of

the channels that are all involved in scaling up the effective solutions.

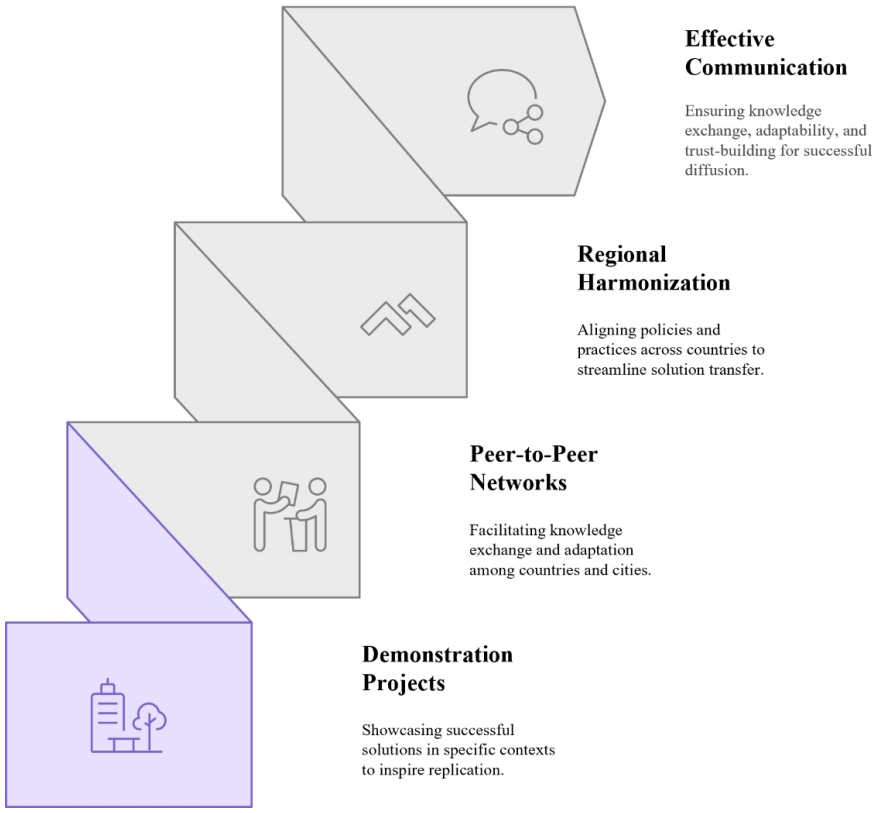

Figure 3. Pathways of solution diffusion.

5. Barriers, Ethics, Measurement, and an Integrative Framework

5.1. Why Solution Transfer Fails

In most cases, even though there are viable environmental solutions available, most of them do not transfer well across borders. Knowledge of the obstacles to the transfer of solutions would be needed to enhance the strategy and use of international communication to make global solutions applicable domestically. The barriers are complex, including institutional and structural issues coupled with communication and cultural barriers. Governance mismatch is one of the greatest obstacles in solution transfer[47]. Countries have diverse political regimes, rules and regulations, and institutional capacity. These variations in other situations might hamper the coordination of policies and structures required to engage environmental solutions. As an example, a policy model that has been successful in a highly developed country with solid government systems may not be effective in a developing country with weaker institutions and other socio-political priorities, but the solution can still be applicable with appropriate changes. Equally, there may be varying degrees of environmental protection generated by a legal framework; some countries may have strict regulations that favor a particular solution, whereas others may not have the required laws or implementation of the law enforcement structures to facilitate their application.

Another major impediment to solution transfer is the capacity gaps. In some cases, especially in developing countries, they might not have the technical skills, funds, and systems that are required to effectively implement these solutions. Although solutions may be theoretically possible, it may not be practically possible to implement them in the target country. It may involve a shortage of skilled workforce, lack of financial resources to support big projects or access to technologies and resources. Furthermore, the accelerated speed of environmental solution development is usually far ahead of the capabilities of many nations to follow, creating even more gaps in the ability to implement[48,49].

The political resistance is also very high. The implementation of some environmental solutions may conflict with the national interests, including economic development concerns, political ideologies, or even the self-interest of the industries that cause the environmental degradation. In most instances, they might not be willing to embrace policies that are said to curtail economic growth or interfere with the prevailing power systems. Political will is also a key element in the transfer of solutions, and a mismatch between local political interests and global environmental ambitions may act as a barricade to the implementation of solutions, especially when solutions necessitate significant changes in policy or behavior[50].

Cultural and social resistance is another barrier. What is effective in one culture or society may not necessarily be embraced in another. The variations in values, priorities, and social norms can have a major impact on the reception of environmental solutions[51]. In the case of community-based conservation methods in one country, which are effective, they might not be equally effective in another country when the local communities do not view environmental protection as a collective effort or the social institution appropriate to achieve the conservation methods. The cultural nuances require well-developed communication plans that will reflect these aspects and position solutions in a manner that aligns with local values, and make sure that solutions are tailored to a particular cultural setting.

Lastly, the lack of alignment of incentives among different actors in the transfer process may also hamper the adoption of solutions. To illustrate, when international organizations are oriented towards funding some solutions, as per the global objectives, whilst the local governments may have different priorities, then a lack of incentives may frustrate the efficient transfer of solutions. This mismatch may result in the wrong application of solutions or partial adoption. In summary, as shown in **Table 2**, the obstacles to communication of international solutions comprise governance differences, capacity differences, political opposition, and cultural differences, all of which should be resolved to transfer solutions[29].

Table 2. Barriers to cross-international solution communication.

Barrier Type	Description
Governance Mismatch	Differences in political systems, legal frameworks, and institutional capacities.
Capacity Gaps	Lack of technical expertise, infrastructure, and financial resources in target regions.
Political Resistance	Conflicting national interests, economic priorities, and political ideologies.
Cultural Resistance	Variations in local values, social norms, and acceptance of external solutions.
Misaligned Incentives	Conflicting priorities between global organizations and local stakeholders.

5.2. Ethical and Justice Dimensions

Ethical considerations of international solution communication are a critical aspect of ensuring that the solutions are effective as well as equitable[16]. An environmental solution can, in most cases, have extensive impacts that extend even to the people who rely on the environment as a source of livelihood. In this regard, environmental justice issues must be taken into account during inter-border communication of solutions. One of the most basic ethical issues is the representation and power in solution communication. The solutions devised by some countries or organizations presented as universal, but they are usually based on the values, priorities, and needs of the solution makers and might not be commensurate with the recipient nations. The result of this dynamic may include the enforcement of solutions that are ill-adapted to local contexts and may increase inequalities or neglect the needs of sidelined communities. Also, the local voices, especially of the indigenous communities and vulnerable groups, can be underrepresented in the communication of the global solutions, which results in the absence of inclusiveness and equity in decision-making.

There is also the risk of extractives in the international solution transfer. Extractive practices would be practiced when solutions are applied in a manner that favors external actors like multinational corporations or rich nations, but are not able to consider the interests of the local people or the environment where the solutions are being implemented. As an illustration, natural resource exploitation can be used as a solution, e.g., large-scale hydropower or biofuels plantations, which are harmful to local populations and destroy biodiversity in general, but only become useful to foreign forces. This problem shows the necessity to make sure that the solutions are co-developed with the local communities, and the gains

of the implementation should be distributed fairly [52,53].

Also, the issue of free, prior, and informed consent (FPIC) emerges especially when environmental solutions are applied to areas inhabited by indigenous people [54]. FPIC guarantees the rights of these communities to consent or not to give consent to projects that impact their land, resources, or cultural heritage. The rights should be honored and protected by means of effective communication, where the indigenous communities should not be excluded from the decision-making process and compelled to accept the solutions that might not suit their cultural values or land-use practices. Another ethical issue that is of paramount importance in the prerogative of cross-international communication is data justice. Data gathering and application in environmental monitoring and solution execution should not be in forms that invade the privacy and ownership of knowledge of the local communities [55]. In other instances, the technology involved in monitoring the environment might record information that can be utilized to conduct surveillance, and this brings up issues of the ethics involved in such activities. Moreover, an imbalance in accessing the data and digital divide may increase the existing inequities, whereby certain communities may be excluded from decision-making because they do not have access to information or even communication technologies. **Table 3** reveals that ethical issues, including representation, extractives, free, prior, and informed consent and data justice need to be given careful consideration in cross-border communication of environmental solutions.

Table 3. Ethical considerations in solution communication.

Ethical Concern	Description	Potential Strategies
Representation and Power	Solutions may reflect the values of the donor country, potentially marginalizing local needs.	Ensure inclusivity, involve local communities in decision-making.
Extractivism	Environmental solutions that disproportionately benefit external actors while harming local communities.	Prioritize local benefits, conduct environmental and social impact assessments.
Free, Prior, and Informed Consent	Indigenous communities may be excluded from decisions about solutions affecting their lands.	Respect FPIC principles, ensure genuine local engagement.
Data Justice	Issues around data ownership, privacy, and inequality in data access.	Develop equitable data-sharing practices and ensure community consent.

5.3. Measuring Impact

In order to determine the success of international solution communication, it is important to identify clear performance metrics . The impact measurement includes the proximal and the distal outcomes, which refer to the effects of communication in terms of awareness, trust, and engagement, and the environmental and health benefits, respectively [56].

On the proximal level, the significant indicators are changes in knowledge, attitudes, and behavior. These metrics are used to determine how well communication activities have been effective in educating the target groups about the advantages of a solution and how far they have gone in persuading policymakers, businesses, and communities to act. Signs of trust and legitimacy also matter, as more solutions will be implemented in case the actors are trusted by the local actors. Intermediate outcomes are concerned with the implementation and proliferation of solutions. The main signs in this area are policy shifts, the introduction of new laws, how many communities or organizations have embraced a solution, and the magnitude of financial resources channeled towards scaling. As an example, the broad usage of renewable energy technologies in numerous countries may be regarded as a transitional result of the effective communication and transfer of the solutions [57,58].

The final or the most distal results of solution communication are the environmental and health benefits. Such results could be a decrease in greenhouse gas emissions, better air and water quality, biodiversity growth, or a decrease in the occurrence of climate-related health conditions. These outcomes are more difficult to quantify, but are necessary in deciding whether transfer of solutions has led to significant environmental and health payoffs. To evaluate these results, it is very important to establish the monitoring, reporting, and verification (MRV) systems, which will result in consistent and accurate data in various contexts [59].

5.4. Proposed Integrative Framework

This article helps to formulate an integrative approach that would bring together the interdependent nature of con-

text, communication processes, actors engaged, and the desired outcomes when addressing the complications surrounding the communication of solutions across international borders. The proposed framework is intended to assist practitioners and researchers in comprehending the complexity of solution communication and its applicability as a solution promotion technique in regard to developing the environment in a sustainable manner. These dimensions focus on coherence in order to explain the functioning of communication practices in various contexts of governance and socio-environment.

The suggested framework involves a list of interrelated dimensions that, altogether, influence solution communication within the borders of countries [60]. The contextual processes, including local governance systems, political economy, existing social norms, and environmental features, are some of the factors that determine the reception and decoding of communication. The set of actors, such as governments, international organizations, non-governmental organizations, researchers, entities of the private sector, as well as local communities, has different roles and capabilities to communicate. The focus is shifted towards the content and framing of messages to maintain relevance and resonance within the particular local context, as well as the choice of the proper communication channels, which cut across digital platforms and face-to-face interaction. Trust-building, capacity development, and co-production of knowledge are mechanisms that are deemed important enablers of constructive communication, and they dictate the nature of information sharing, negotiation, and internalization in various contexts.

These dimensions, when integrated, can provide a wholesome approach to the optimization of communication of the solutions to cross-national applications. According to **Table 4**, the integrative framework of solution communication features context, actors, communication mechanisms, and outcomes as its dimensions, which provides a comprehensive way of understanding solution diffusion [61]. The framework identifies channels by which communication activities may promote adoption, promote scaling, and create quantifiable environmental and health-related payoffs. Coherence between contextual circumstances, participant interaction, message planning, and communication systems reveals how solution communications can help to achieve physical and equitable environmental changes in various global contexts. **Figure 4** shows the integrative framework, which is a combination of context, actors, communication mechanisms, and outcomes of cross-national solution communication to be effective.

Table 4. Integrative framework for international solution communication.

Dimension	Description	Elements to Consider
Context	Local environmental, political, and economic conditions influencing communication.	Governance systems, socio-political priorities, local capacity.
Actors	Key stakeholders involved in solution communication and transfer.	Governments, NGOs, international organizations, businesses, communities.
Message	The content and framing of the environmental solution.	Scientific evidence, co-benefits, equity framing, local relevance.
Medium	The channels and platforms used to communicate the solution.	Digital platforms, conferences, diplomatic channels, peer networks.
Mechanisms	Strategies to build trust, capacity, and adaptation.	Co-production of knowledge, participatory processes, feedback loops.
Outcomes	The impact of solution transfer on local and global environmental and health outcomes.	Adoption rates, environmental improvements, health benefits, equity.

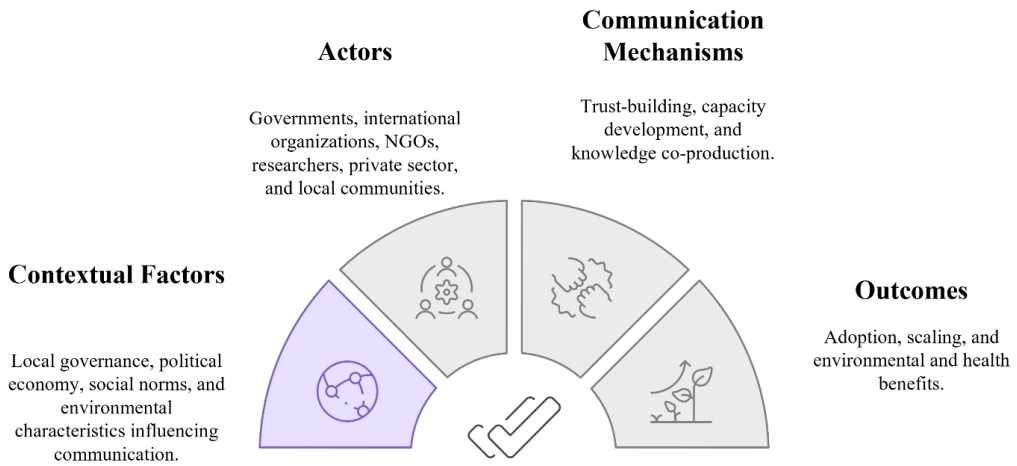

Figure 4. Integrative framework for solution communication.

6. Conclusion

The current environmental issues we experience in the world today, such as climate change, loss of biodiversity, water shortage, and air pollution, are interrelated and not limited to national borders. To solve these challenges, innovative solutions are needed, but also the mechanisms to establish the effectiveness of transferring these solutions across countries and regions. The mechanism through which environmental solutions are communicated across countries, international solution communication, is one of the central mechanisms that define the success of global environmental governance efforts. The review has revealed that, as much as there is an increasing awareness of the role of communication in solution diffusion, there are a number of challenges that still persist and pose a challenge to the successful transfer and scale of environmental solutions. Examples of such challenges that make the international exchange of solutions difficult include governance mismatches, capacity gaps, political resistance, cultural differences, and misaligned incentives, just to name a few. To overcome such barriers, one should not just use technical knowledge but have a profound knowledge of the socio-political, economic, and cultural contexts in which such solutions need to be conveyed.

Some of the key lessons that the review has taught have been that the sharing of information is not the only aspect of communication of solutions across international boundaries. It involves an adequately framed solution, intervention through the appropriate channels, and intervention of the trusted actors who have the capacity to negotiate the dynamics of international relations and the local circumstances. The role of the intermediaries can barely be overestimated, whether it is the international organizations, local NGOs, or leaders of the community. These actors will help in bridging the gap between the local and global in such a way that the solutions may be adaptable and acceptable to different audiences.

Ethics are also of central concern in cross-cultural communication. Imposed solutions that are not considerate of the local needs, values, and priorities may worsen inequalities and cause failure. Consequently, the communication tactics should focus on empathy, openness, and fairness, which should ensure that every stakeholder, in particular marginalized populations, is part of the decision-making process. Honoring the rights of the local communities, especially the indigenous people, and providing free, prior, and informed consent is a requisite to the creation of trust and legitimacy of the solutions being advocated. Moreover, it is necessary to gauge the effect of the communication activities to know how effective the solution transfer is. Although short-term increases in knowledge, attitudes, and behaviors are desired, it would be important to have long-term objectives of gaining measurable environmental and health gains. The introduction of effective monitoring, reporting, and verification strategies will be vital to trace the results of the solution communication and ensure that these solutions will lead to some concrete, sustainable advantages for people and the planet.

Based on these findings, this paper has presented a resolution communication framework for the solution communication of international solutions. This model is concerned with issues of context, actors, messaging, channels, mechanisms, and outcomes in influencing the effectiveness of solution diffusion. It is not only a theoretical approach but also a practical guide to practitioners and policymakers who are attempting to provide a healthy environment at the global level. The international solution communication will even be more substantial in the future, since the environmental threat will become even more pressing and complex. To ensure that the transfer of environmental solutions and scaling is cost-effective, the need to continue developing communication plans, building stronger networks of cooperation, and even investing in the capacity of actors and institutions at the local, national, and international levels will need to be addressed. Whether the future development is sustainable depends not only on the solutions that we work out but on how we will communicate, how we will adapt and implement ideas in an inclusive, equitable, and effective cross-border way.

Conclusively, the renewal of the earth by cross-international solution communication is not merely knowledge or technology transfer but the creation of a global movement towards sustainable, inclusive, and healthy development of the environment. Via dialogue, trust, and collaboration across cultural and national borders, we can ensure that the solutions that we will come up with today will translate to the creation of a healthier and stronger world tomorrow.

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References

[1] Dietz, T., Rosa, E.A., York, R., 2009. Environmentally efficient well-being: Rethinking sustainability as the relationship between human well-being and environmental impacts. Human Ecology Review. 16, 114–123.

[2] Brown, D.A., 1996. Thinking Globally and Acting Locally: The Emergence of Global Environmental Problems and the Critical Need to Develop Sustainable Development Programs at State and Local Levels in the United States. Dickinson Journal of Environmental Law & Policy. 5(2), 175–214.

[3] Rakonczai, J., 2018. Global and Geopolitical Environmental Challenges. Corvinus University of Budapest: Budapest, Hungary.

[4] Canare, F.D., 2024. Strategic communication practices in the institutionalization of environmental sustainability policies in higher education institutions. Chemical Engineering Transactions. 113, 217–222.

[5] Holzinger, K., Knill, C., Sommerer, T., 2008. Environmental policy convergence: The impact of international harmonization, transnational communication, and regulatory competition. International Organization. 62(4), 553–587.

[6] Ancillotti, E., Bruno, R., Conti, M., 2013. The role of communication systems in smart grids: Architectures, technical solutions and research challenges. Computer Communications. 36(17–18), 1665–1697.

[7] Desai, A., 2024. Cross-Cultural Communication and Global Environmental Cooperation: Challenges and Strategies. Journal of Jurivox. 1(2), 10–16.

[8] Khan, A., Wu, X., 2022. Digital economy and environmental sustainability: Do information communication and technology (ICT) and economic complexity matter? International Journal of Environmental Research and Public Health. 19(19), 12301.

[9] Olorunsogo, T.O., Ogugua, J.A., Muonde, M., et al., 2024. Environmental factors in public health: A review of global challenges and solutions. World Journal of Advanced Research and Reviews. 21(1), 1453–1466.

[10] Hulme, M., 2010. Problems with making and governing global kinds of knowledge. Global Environmental Change. 20(4), 558–564.

[11] Perz, S.G., Brilhante, S., Brown, I.F., et al., 2010. Crossing boundaries for environmental science and management: Combining interdisciplinary, interorganizational and international collaboration. Environmental Conservation. 37(4), 419–431.

[12] Snyder, H., 2019. Literature review as a research methodology: An overview and guidelines. Journal of Business Research. 104, 333–339.

[13] Plamondon, K.M., Pemberton, J., 2019. Blending integrated knowledge translation with global health governance: An approach for advancing action on a wicked problem. Health Research Policy and Systems. 17(1), 24.

[14] Busch, P.-O., Jörgens, H., 2013. The international sources of policy convergence: Explaining the spread of environmental policy innovations. In: Knill, C. (Ed.). Cross-National Policy Convergence. Routledge: London, UK. pp. 97–121.

[15] Halvorsen, K.E., Schelly, C., Handler, R.M., et al. (Eds.), 2019. A Research Agenda for Environmental Management. Edward Elgar Publishing: Cheltenham, UK.

[16] Kark, S., Tulloch, A., Gordon, A., et al., 2015. Cross-boundary collaboration: Key to the conservation puzzle. Current Opinion in Environmental Sustainability. 12, 12–24.

[17] Holliday, A., 2020. Culture, communication, context, and power. In: Jackson, J. (Ed.). The Routledge Handbook of Language and Intercultural Communication. Routledge: London, UK. pp. 39–54.
[18] Rogers, D.S., Duraiappah, A.K., Antons, D.C., et al., 2012. A vision for human well-being: Transition to social sustainability. Current Opinion in Environmental Sustainability. 4(1), 61–73.
[19] Summers, J., Smith, L.M., Case, J.L., et al., 2012. A review of the elements of human well-being with an emphasis on the contribution of ecosystem services. Ambio. 41(4), 327–340.
[20] Karakaya, E., Hidalgo, A., Nuur, C., 2014. Diffusion of eco-innovations: A review. Renewable and Sustainable Energy Reviews. 33, 392–399.
[21] Rogers, E.M., 1987. The diffusion of innovations perspective. In: Weinstein, N.D. (Ed.). Taking Care: Understanding and Encouraging Self-Protective Behavior. Cambridge University Press: Cambridge, UK. pp. 79–94.
[22] Niles, M.T., Lubell, M., 2012. Integrative frontiers in environmental policy theory and research. Policy Studies Journal. 40(s1), 41–64.
[23] Djenontin, I.N.S., Meadow, A.M., 2018. The art of coproduction of knowledge in environmental sciences and management: Lessons from international practice. Environmental Management. 61(6), 885–903.
[24] Berkes, F., 2009. Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. Journal of Environmental Management. 90(5), 1692–1702.
[25] Kapucu, N., Hu, Q., 2020. Network Governance: Concepts, Theories, and Applications. Routledge: New York, NY, USA.
[26] Osaka, S., Bellamy, R., Castree, N., 2021. Framing "nature-based" solutions to climate change. Wiley Interdisciplinary Reviews: Climate Change. 12(5), e729.
[27] Moser, S.C., 2010. Communicating climate change: History, challenges, process and future directions. Wiley Interdisciplinary Reviews: Climate Change. 1(1), 31–53.
[28] Newell, P., Pattberg, P., Schroeder, H., 2012. Multiactor governance and the environment. Annual Review of Environment and Resources. 37(1), 365–387.
[29] Bodin, Ö., 2017. Collaborative environmental governance: Achieving collective action in social-ecological systems. Science. 357(6352), eaan1114.
[30] Elnaiem, A., Mohamed-Ahmed, O., Zumla, A., et al., 2023. Global and regional governance of One Health and implications for global health security. The Lancet. 401(10377), 688–704.
[31] Brunet-Jailly, E., 2022. Cross-border cooperation: A global overview. Alternatives. 47(1), 3–17.
[32] Bitoun, R.E., Trégarot, E., Devillers, R., 2022. Bridging theory and practice in ecosystem services mapping: A systematic review. Environment Systems and Decisions. 42(1), 103–116.
[33] Ramirez-Andreotta, M.D., Brusseau, M.L., Artiola, J.F., et al., 2014. Environmental research translation: Enhancing interactions with communities at contaminated sites. Science of the Total Environment. 497, 651–664.
[34] Rashed, A.H., Shah, A., 2021. The role of private sector in the implementation of sustainable development goals. Environment, Development and Sustainability. 23(3), 2931–2948.
[35] Fazey, I., Evely, A.C., Reed, M.S., et al., 2013. Knowledge exchange: A review and research agenda for environmental management. Environmental Conservation. 40(1), 19–36.
[36] Falkner, R., 2016. The Paris Agreement and the new logic of international climate politics. International Affairs. 92(5), 1107–1125.
[37] Kuntsman, A., Rattle, I., 2019. Towards a paradigmatic shift in sustainability studies: A systematic review of peer reviewed literature and future agenda setting to consider environmental (Un)sustainability of digital communication. Environmental Communication. 13(5), 567–581.
[38] Berlato, M., Binni, L., Durmus, D., et al., 2025. Digital platforms for the built environment: A systematic review across sectors and scales. Buildings. 15(14), 2432.
[39] Hayes, B., Kamrowska-Zaluska, D., Petrovski, A., et al., 2021. State of the art in open platforms for collaborative Urban Design and sharing of resources in districts and cities. Sustainability. 13(9), 4875.
[40] Asad, M.M., Memon, A., Almusharraf, N.M., 2025. Climate change adoption programs to promote equity and social justice among youth: Insights from the global perspective. Equality, Diversity and Inclusion: An International Journal. 1–17. DOI: https://doi.org/10.1108/EDI-05-2025-0340
[41] Likens, G.E., 2010. The role of science in decision making: Does evidence-based science drive environmental policy? Frontiers in Ecology and the Environment. 8(6), e1–e9.
[42] Salmela, M.J., 2014. Rethinking local adaptation: mind the environment! Forest Ecology and Management. 312, 271–281.
[43] Dodman, D., Mitlin, D., 2013. Challenges for community-based adaptation: Discovering the potential for transformation. Journal of International Development. 25(5), 640–659.
[44] Popp, D., 2011. International technology transfer, climate change, and the clean development mechanism. Review of Environmental Economics and Policy. 5(1), 131–152.
[45] Awewomom, J., Dzeble, F., Takyi, Y.D., et al., 2024. Addressing global environmental pollution using environmental control techniques: A focus on environmen-

tal policy and preventive environmental management. Discover Environment. 2(1), 8.

[46] Green, L.W., Ottoson, J.M., García, C., et al., 2009. Diffusion theory and knowledge dissemination, utilization, and integration in public health. Annual Review of Public Health. 30(1), 151–174.

[47] Ingold, K., Driessen, P.P.J., Runhaar, H., et al., 2019. On the necessity of connectivity: Linking key characteristics of environmental problems with governance modes. Journal of Environmental Planning and Management. 62(11), 1821–1844.

[48] Perkins, R., 2003. Environmental leapfrogging in developing countries: A critical assessment and reconstruction. Natural Resources Forum. 27(3), 177–188.

[49] McMichael, A.J., 2000. The urban environment and health in a world of increasing globalization: Issues for developing countries. Bulletin of the World Health Organization. 78, 1117–1126.

[50] Meckling, J., Karplus, V.J., 2023. Political strategies for climate and environmental solutions. Nature Sustainability. 6(7), 742–751.

[51] Ives, C.D., Kendal, D., 2014. The role of social values in the management of ecological systems. Journal of Environmental Management. 144, 67–72.

[52] Liu, H.-Y., Jay, M., Chen, X., 2021. The role of nature-based solutions for improving environmental quality, health and well-being. Sustainability. 13(19), 10950.

[53] Islam, M.N., Vodden, K., 2025. How Does Community Renewable Energy (CRE) Help to Avoid Dispossession through Nature-based Solutions: A Systematic Review of Energy Justice in CRE Projects. In: Leal Filho, W., Nagy, G.J., Ayal, D. (Eds.). Handbook of Nature-Based Solutions to Mitigation and Adaptation to Climate Change. Springer: Cham, Switzerland. pp. 2483–2505.

[54] Sarmiento Barletti, J.P., Prouchet, L., Larson, A.M., 2023. Rights-based approaches and Indigenous peoples and local communities: Findings from a literature review. CABI Reviews. DOI: https://doi.org/10.1079/cabireviews.2023.0028

[55] Brammer, J.R., Brunet, N.D., Burton, A.C., et al., 2016. The role of digital data entry in participatory environmental monitoring. Conservation Biology. 30(6), 1277–1287.

[56] Briggs, D.J., 2008. A framework for integrated environmental health impact assessment of systemic risks. Environmental Health. 7(1), 61.

[57] Nkaizirwa, J.P., Nsanganwimana, F., Aurah, C.M., 2021. Reexamining the Measurement of Pro-Environmental Attitudes and Behaviors to Promote Sustainable Development: A Systematic Review. Eurasia Journal of Mathematics, Science and Technology Education. 17(9), em2001.

[58] Baum, C.M., Gross, C., 2017. Sustainability policy as if people mattered: Developing a framework for environmentally significant behavioral change. Journal of Bioeconomics. 19(1), 53–95.

[59] Bellassen, V., Stephan, N., Afriat, M., et al., 2015. Monitoring, reporting and verifying emissions in the climate economy. Nature Climate Change. 5(10), 956.

[60] Tapio, P., Willamo, R., 2008. Developing interdisciplinary environmental frameworks. AMBIO: A Journal of the Human Environment. 37(2), 125–133.

[61] Bibri, S.E., Alexandre, A., Sharifi, A., et al., 2023. Environmentally sustainable smart cities and their converging AI, IoT, and big data technologies and solutions: An integrated approach to an extensive literature review. Energy Informatics. 6(1), 9.