Revista ARACÊ
ISSN: 2358-2472

DECARBONIZATION OF TOURIST DESTINATIONS: A CONCEPTUAL VISION IN THE LIGHT OF SCIENCE

https://doi.org/10.56238/arev7n2-251

Submitted on: 01/21/2025 **Publication date:** 02/21/2025

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ABSTRACT

Tourism is a sector that grows continuously and lives a paradox: it depends on the climate for its survival, but it is also responsible for a significant portion of greenhouse gas emissions. Using a systematic review with basic research, exploratory objective, qualitative approach and bibliographic and documentary procedure, this research aimed to reflexively analyze the concept of decarbonization from the geographical, sociocultural, engineering and management perspectives of tourist destinations. The results demonstrate that decarbonization is understood as a multifaceted process that involves changes in the transport sector, modernization of industry and green development; it is a component of social justice and behavior change; It is an effort of technological innovation, focused on the transition to renewable energies and essential for the sustainability of tourist destinations, requiring new management models, strategies to reduce greenhouse gas emissions and maintain economic benefits. It is concluded that the understanding of the concept of decarbonization from the perspective of other disciplines provides the opportunity to develop new strategic alternatives for an assertive and efficient climate journey. That the concept promotes with more security the perspective of achieving the goals defined in the Paris Agreement and SDGs 12 and 13 proposed by the United Nations.

Keywords: Tourism. Decarbonisation. Interdisciplinarity.

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INTRODUCTION

Global warming presents challenges for governments and societies around the planet. The concentration of major greenhouse gases such as carbon dioxide (CO2), methane gas (CH4) and nitrous oxide (N2O) reached record levels in 2022, for which figures are available today (WMO, 2023).

At the current time, the global average near-surface temperature in 2023 (until October) was about 1.40 ± 0.12 °C above the 1850–1900 average (IPCC, 2024; IPCC, 2023; WMO, 2023). At this threshold, the perspectives for monitoring the warming of the earth, the methodologies for assessing and inventorying the emission of greenhouse gases and, above all, the common but differentiated responsibility of developed countries in relation to other countries, are crucial issues for global society to establish strategies and actions to mitigate and adapt to this global emergency. especially those related to decarbonization processes.

All corners of the planet, without distinction and classification, suffer from the destructive effects of climate change, putting in check the seasonal cycles of fauna and flora and the resilience of natural and human ecosystems. In view of this, societies and governments demand the need to promote viable responses from an economic and technical point of view, which can stabilize again, at acceptable levels, the reduction of the worsening of global warming.

According to the United Nations (UN, 2024), WMO studies point to an 80% probability that the planet's average global temperature will exceed 1.5°C, temporarily at pre-industrial levels (1850-1900), at least in one of the next five years. According to the studies, these temporary violations, however, do not call into question the Paris Agreement, which stipulated the goal of limiting the increase in global temperature to below 2°C.

Current indicators indicate that several sectors of the economy have already been suffering from the effects of climate change, especially as a result of the burning of fossil fuels such as coal, oil and gas, used in the modern industrial and logistics production system. These systems trigger widespread and adverse impacts, as well as loss and damage to nature and people. Of particular note are the drop in agricultural production, the melting of the polar ice caps, the rise in sea levels, coral bleaching, the increase in the incidence of extreme natural events such as prolonged droughts, floods, windstorms, fires and periods of reduced winter, which are repeated, putting at risk natural and human

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ecosystems across the planet, on the one hand, and on the other hand, the costs associated with mitigation and adaptation skyrocket (IPCC, 2023).

One of these sectors is tourism. Its system operates on all continents, at all scales of its production chain, with markedly different businesses, administrative structures and at levels that vary from place to place and segment to segment. From aviation to means of accommodation. From the exchange to the installed tourist itineraries. The sector also contributes to global warming and faces challenges not only to inventory its emissions, but, above all, to quantify and develop accepted methodologies that can propose mitigation and adaptation actions to reduce vulnerabilities (WTO, 2023a; WTO, 2023b; UNCTAD, 2023; GÖSSLING BULLETS MAYER SUN 2023 GÖSSLING, SCOTT, 2018; SCOTT, HALL, STEFAN, 2012; SCOTT AND BECKEN, 2010).

In this context, the processes of decarbonization of tourist destinations emerge as one of the main global agendas as a response to the global crisis. It becomes a collective effort to reduce greenhouse gas emissions that put life on earth and tourism systems in question. In fact, they provide opportunities for proactive action capable of improving production processes, reducing the risks associated with the modern system of production and enjoyment of free time, through tourism activity.

It is a process that absorbs circular alternatives instead of linear ones. The pattern suggests that conversion is gradually becoming a priority in governments and sectors. Rodriguez, Florido, and Jacó (2020) state that circular economies become alternatives to solve environmental problems, and surplus resources and transformed into waste should be understood as a new production resource, a system characterized by extraction, production, consumption, collection, and recycling, an approach that goes from cradle to cradle. It implies the adoption of sustainable, low-carbon practices and public policies that promote the reduction of pollutants and carbon balance.

Given this, and in the face of dependence on fossil fuels, cultural resistance to change, economic limitations, and technical and methodological difficulties, understanding how the concept of decarbonization is currently treated in the light of the sciences can contribute to an inter- and multidisciplinary approach in the quest to make tourist destinations greener and more resilient.

In these terms, the objective of this article is to reflexively analyze the concept of decarbonization from the geographical, sociocultural, engineering and management perspective of tourist destinations. To achieve this objective, a qualitative approach was

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adopted, with a descriptive and exploratory objective, through a bibliographic and documentary survey, through the use of a systematic review, research resulting from the postdoctoral internship, which sought to deepen the knowledge of the concept of decarbonization.

DECARBONIZATION: THE CONCEPTUAL VISION AND THEORETICAL-PRACTICAL ARGUMENTS OF THE SCIENCES

The view of the sciences on an object of analysis, or in other words of a problem situation, allows the process of maturation of the concepts and practices involved on this given issue to receive multidisciplinary contributions. This results in the broadening of the understanding of the researched theme, making it possible to capture, understand, interpret, assimilate and develop actions that promote the well-being of society in that specific field under analysis.

Bispo (2023) highlights that understanding how these contributions occur and are built allows for new advances in the scientific, practical, and methodological fields. The author states that in the scientific sphere, this expansion provides the opportunity for the development of new theories, revising, expanding or refuting existing theories. In the methodological aspect, it stimulates the expansion of new techniques and methods that help researchers find clear and consistent ways to conduct their research. And with regard to the practical aspect, it offers the improvement of techniques to solve real problems in the concrete world. That is, the researcher argues that understanding the contributions of the sciences is essential to promote significant advances, emphasizing, however, the importance of understanding how these contributions occur, resulting in theoretical development and technological innovation, the result of the dynamic interaction between theory, method, practice and analysis.

In this vein, the present discussion is based on the assumption that decarbonization is the process of reducing the amount of polluting gases emitted into the atmosphere on a daily basis. And, therefore, it is understood that it is a preventive measure. For the legislator, according to Law 12.608 of 2012, prevention is the set of actions and investments, including territorial planning, aimed at reducing the vulnerability of ecosystems and populations, aiming to avoid disasters and minimize their intensity, identifying, mapping and monitoring these risks. For these reasons, Ginzburg et al. (2022) stated that preventive adaptation measures are essential for the sustainable development

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of the economy, with consequent improvement in the quality of life of people and ecosystems.

In this context, the different perceptions of the concept of decarbonization are pointed out below, in addition to the bias of the search for the transition from a linear economy to a circular economy (GUSMEROTTI, ET AL, 2023). Ultimately, as a process that essentially seeks to contribute to the reduction of global warming to less than 2°C, as established by the Paris Agreement.

Gössling et al (2024) state that there is a consensus that the global tourism system needs to undergo an urgent decarbonization process to reach net zero. To achieve this goal with a goal set by 2030, the authors say, it is necessary that fundamental changes in the world tourism system occur. And this involves an overhaul of transport systems and ultimately a change that will lead to a new global geography of tourism.

In view of these facts, from the perspective of geography, Jackson (2023), when dealing with the topic in the context of the transport sector, argues that decarbonization involves a multifaceted understanding involving the various modes and that electric vehicles are a way to make the sector greener. From a political point of view, ecological modernization demonstrates that the decarbonization process is directly linked to the process of modernization of industry itself, and therefore, to a greater degree, in the attempt to turbocharge the economic system. In other words, that the free trade system can be greened through technological solutions resulting from the neoliberalization of the global economy, and from it, from the construction of an environmental policy. Therefore, it makes it clear that the decarbonization of the economy is a matter of modernizing industrial capacity.

The author brings this discussion to light, considering that studies indicate that the ecological sphere has started to overcome the ideas that all countries need to achieve a developed industrial capacity. And this gave rise to the German green movement and the Dutch movement of men and friendly companies, in the 70s and 80s. That is, ecological modernization inaugurates an era that suggests a process of change from an economy based on goods to an economy based on services.

Eadson and Veelen (2023), however, state that economies incorporate and change over time, which can reinforce existing industrial trajectories or evolve into something different. This results in the search for new paths, and decarbonization goes through these broad and urgent industrial changes, involved in the emerging development of green paths.

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And they argue that this transition of new paths is concerned with ensuring that decarbonization does not entrench new forms or even more inequalities, but on the contrary, in an optimistic way, seeks to address these inequalities. The authors argue that regional economic changes occur through the development of trajectories in order to offer solutions on how places and regions can develop new economic alternatives. And they warn that this can generate new forms of inequalities.

However, they emphasize that the search for new paths for green economic restructuring produces new geographies with a view to regional development. For these reasons, decarbonization becomes a lever for economic restructuring that gives rise to a growing branch of development of green paths and regional development in green industries. These processes of change seek to contribute to human and ecological well-being.

For Ballo, Freitas, Meister, and Axhausem (2023), the previous ideas make it clear that the decarbonization process is not just a matter of a technological nature. They understand that to combat global warming, it is not enough just to develop mitigation actions in the territory. But above all, they say, there is an inevitable need to build a framework of major changes in the behavior of the supply of goods and services, but also of demand, everywhere. They also assert that market actors need to make choices in sustainable ways, seeking ways to face the climate crisis. For the researchers, the delineation of new geographies of accessibility is a complex measure and that the production of space still requires a definition of social relations and not of its physical characteristics.

In these terms, decarbonization is a complex, multifaceted and indispensable process for the future of the planet. For these reasons, from a sociocultural perspective, Kaandorp, Pessoa, Pesch, Giesen and Abraão (2024) argue that energy justice is shaped by community initiatives on a human scale, reducing the use of fossil fuels and greenhouse gas emissions.

For Wilby, et al (2023), decarbonization first involves the alternative of avoiding carbon-intensive activities and reducing them. Then replace high-carbon activities with low-carbon and finally manage sinks to sequester emissions, with the consequent compensation resulting from these impacts. The studies applied by the authors in the context of mega sporting events and that stimulate sports tourism, consider the concept of decarbonization to be an evolutionary process. They say that these mega-events,

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compared to other activities such as transport, energy and manufacturing, also contribute to emissions. They state that for a set of mitigation actions to occur, it is essential that society gathers around the theme of behavior change.

Behavior change is also advocated by Constantino et al (2023) when they state that there is an urgent need for production and consumption patterns to be reviewed in order to deal with climate change. They point out that decarbonization is a component of norm-shifting and that individual actions and political support are important social processes, although political priorities and *lobbying* have slowed these efforts.

Decarbonization, therefore, requires the convergence of community behaviors and actions. In light of the engineering perspective, it seeks new technological standards and hybrid structures that can promote sustainability and green practices. In view of this, in parallel from the engineering perspective, decarbonization is an innovation, technological and integrated effort. Sun, Li, Dong Wan, and Feng (2023) reveal in their studies that the search for decarbonization is a prerequisite for new operational mechanisms for popularizing and implementing green practices. And they reinforce that the effort to promote sustainable development and achieve decarbonization goals requires the renewal of urban spaces, stressing, however, that there are still gaps both in the context of innovation and in its practical application.

The authors point to the existence of rigorous methods to establish an effective analytical system to understand the driving factors behind green practices. They use the multicriteria group decision-making approach, rooted in the theory of fuzzy mathematics. They point out that the pursuit of sustainability is a complex and systematic endeavor and that the use of hybrid frameworks provides a robust means to assess the factors that influence green practices.

However, they point out that social participation and the market environment emerge as more critical factors that influence more sustainable practices. Involvement in the planning, decision-making, and implementation phases are considered assets that ensure the integration of the parties' interests. With regard to the economic and market aspects, it involves a set of economic considerations that will enhance the social aspects and that together will exert a direct influence on the popularization and implementation of green practices. From a political point of view, the authors conclude that stakeholders should participate in the implementation of green building practices. And even that the general need is for society to cultivate a favorable market environment through a set of rules and

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policies for the government to stimulate the advancement of technology and assimilation of green design principles.

Alabugin, Osintsev, Aliukov and Alme (2023) corroborate this position when they state that progress in the decarbonization of countries and municipalities occurs through the need for structural changes that can promote interaction and cooperation between governments and scientific institutions. The authors state that without an efficient monitoring system it is impossible to guarantee the transition. Therefore, it is necessary to expand the space for decarbonization control.

However, Almeida, Aguilera, Blechinger, Berendes, Caamaño, and Alcalde (2020), state that tourism, population growth, the exploitation of local resources, and the high consumption of imported fossil fuels have put sustainable development in check. And they come to this conclusion from their research carried out in the Galapagos Islands. The authors highlight that the decarbonization process involves the need and guarantee of offering affordable, reliable, sustainable, and modern energy.

For this, they say, a transition process to renewable energies is important. Even more so in the context of islands, which, considering their territorial size and their remoteness from the mainland, require high fuel imports, since most islands around the planet have non-interconnected energy systems based on diesel power plants. In this way, they believe that the decarbonization process deals with the migration from the use of fossil fuels to renewable energies. And they argue that for this to occur, it is necessary to promote an adequate, innovative and reliable political environment; adoption of an energy identity; adhesion and willingness of multiple actors to move away from polluting energy generation systems and adequate methods of energy consumption.

But they also highlight the need to develop an energy culture that involves the participation, at all levels and of all actors, public and private, that promotes a specific, holistic and sustainable energy plan, through measures and analysis of local needs.

Considering that tourist destinations need to propose mitigation and adaptation actions and one of the alternatives is through processes of decarbonization of their activities, from the perspective of management, it implies rethinking the development strategies of these destinations. In this scenario , Glössling and Higham (2021) emphasize that tourism systems will have to be decarbonized in the next 30 years together with other sectors. This requires governments in the short and medium term to identify ways to obtain available efficiencies to immediately reduce carbon emissions. They declare that new

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models of destination management are needed to advance a paradigm that reduces the carbon footprint.

The authors understand that decarbonization involves the need to find new tourism models that can reduce emissions and at the same time maintain income and benefits in terms of employment. It requires rethinking the development strategies of destinations and the introduction of new managerial approaches to achieve decarbonization. It also needs to critically assess the resilience of the destination in other areas such as transportation, competitive accommodation systems and pandemic risks. They argue that it is necessary to create a high-value, low-carbon and economically resilient destination model. That is, decarbonization is fundamental. But it cannot jeopardize the promotion of employment and income, reducing the risks of mitigation.

The low-carbon destination model is hampered by platform economies and low-cost travel. In addition, the performance of tourism is invariably measured in terms of growth, boasting the capacity for progress through these indicators, disregarding, as a rule, the social and ecological costs of destinations.

They believe that for a decarbonization scenario, more attention is needed to social well-being, eliminating specific forms of tourism with high GHG emission potential. Regardless of the promises of future technical and scientific solutions.

However, Guix, Babakhani, and Sun (2023), proclaim that reducing the carbon footprint requires leadership from all stakeholders and that at the local level, tourism management organizations, must seek coherent strategies to pursue decarbonization.

When discussing the results of their research, the authors state that decarbonization is an issue that is related to the strategic planning of destinations, monitoring and evaluation, involving issues related to just transition and systemic change. Essentially, they point out that the climate issue involving the tourism sector implies the control of tourism growth, since with its acceleration, it is unlikely that tourist destinations will be able to reduce emissions to reach a net zero by the year 2050.

In this wake, tourist destinations have before them a challenge to inventory their emissions and reduce their vulnerabilities and environmental externalities. It is necessary to define what to measure and an accessible methodology that can define and project the responsibilities and a minimum set of actions that can actually remove tourism from the paradox that is installed, since at the same time it presents a significant portion for the global warming of the planet, and at the same time it depends on the climate for its

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survival, since as a result of a global competitive model of destinations, greenhouse gas emissions are increasingly increasing.

METHODOLOGY

The theoretical study addresses the issue of decarbonization in tourist destinations. The research was initiated through a systematic review with the following search descriptors: (*decarbonization OR low carbon) AND tourism AND (history OR sociology OR anthropology OR management OR mathematics OR engineering OR "environmental sciences")*.

The database chosen for the bibliographic survey was the *Web of Science*, a multidisciplinary database that indexes only the most cited journals in their respective areas. To advance the theme and the understanding of the concept of decarbonization, basic research was applied, since it seeks to generate knowledge, with an exploratory objective, in view of the need to gather more information on the main theme of the research, through a bibliographic and documentary procedure and a qualitative approach.

Based on the results of the research, the visions were organized into four major perspectives: geographical, sociocultural, engineering and management of tourist destinations. The filters used were year of publication, the period chosen covered the years 2024 to 2009, and the most cited works in each searched term were selected for analysis.

ANALYSIS AND DISCUSSION OF THE RESULTS

The discussion on the concept of decarbonization is essential for the development of sustainable public policies and support for a just transition to the use of renewable energies. They help and minimize the growing concern about the emission of greenhouse gases into the atmosphere.

The decarbonization process is understood as a mitigating measure that provides the opportunity to reduce the associated costs for the development of adaptation strategies, especially with regard to the development of infrastructures and support for the most vulnerable. These guidelines are fundamental for the design of actions in the present with a view to neutralizing a dark future.

The study provided the opportunity to establish a cut of the multifaceted understanding of the concept of decarbonization in the light of geography, sociocultural aspects, engineering and management of tourist destinations. This intersection of the

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concept in these areas of knowledge allowed us to understand the complexity of the tool for achieving environmental goals, for example, established in the Paris Agreement.

The understanding of the concept from the point of view of the disciplines investigated, made it possible to establish a correlation matrix between the concept, the disciplines, the theoretical convergences and divergences identified from the point of view of the authors researched and the consequent perception of the theme. Chart 1 shows the link between the integrated and multidisciplinary composition of the concept of decarbonization proposed in the matrix, as well as the theoretical contributions that the disciplines present in the context of the climate emergency, in the tourism system.

Table 1: Correlation matrix of the concept of decarbonization

Prospect	Convergence	Divergence	Decarbonisation
Geography	Gössling et al (2024), Jackson (2023), Eadson and Veelen (2023), and Ballo et al (2023) emphasize the need for decarbonization in the global tourism system. They agree that green modernisation and the transition to a green economy are crucial.	Jackson (2023) focuses on the modernization of industrial capacity as a path to decarbonization, while Eadson and Veelen (2023) highlight the importance of industrial trajectories that avoid new inequalities.	Decarbonization is seen as a multifaceted process that involves changes in the transport sector, modernization of industry, and development of new green economic pathways, at different scales.
Cultural	Kaandorp et al (2024) and Wilby et al (2023) agree that energy justice and behavior change are essential for decarbonization. Constantino et al (2023) emphasize the need to review production and consumption patterns.	Wilby et al (2023) focus on the reduction and replacement of carbon-intensive activities, while Constantino et al (2023) highlight the urgency of action in the face of *political lobbies* and priorities.	Decarbonization is seen as a component of social justice and behavior change, requiring community participation and a review of consumption patterns.
Engineering	Sun et al (2023) and Alabugin et al (2023) agree that technological innovation and cooperation between governments and institutions are essential for decarbonization. Almeida et al (2020) reinforce the need for renewable energy, especially in island contexts.	Sun et al (2023) emphasize the importance of multicriteria analysis and fuzzy mathematical theory, while Almeida et al (2020) highlight the need for an energetic identity and multi-stakeholder participation.	Decarbonization is seen as a technological innovation effort, with a focus on the transition to renewable energy and collaboration between various stakeholders.

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Destination Management	Glössling and Higham (2021) and Guix et al (2023) argue for the need for new management models that promote decarbonization and maintain economic benefits.	Glössling and Higham (2021) focus on creating low-carbon destination models, while Guix et al (2023) emphasize leadership and developing coherent strategies at the local level.	Decarbonization is seen as essential for the sustainability of tourist destinations, requiring new management models and strategies to reduce emissions and maintain economic benefits.

Source: prepared by the authors based on the systematic base review, 2024.

From the correlation matrix presented with Chart 1, it is inferred that the concept of decarbonization has a strong interdisciplinarity, which corroborates the perspective of Bispo (2023), allowing the enrichment of the conceptual, methodological and practical integration of the decarbonization theme, for technical-scientific advancement and for the strategic development of municipal plans to mitigate climate change.

By comprehensively bringing together the concept of decarbonization, the perspective for the development of a model that allows inventorying and measuring greenhouse gas emissions resulting from tourism activity becomes more feasible. And it is considered in this wake that the responsibility of the tourist system in controlling these emissions begins with the arrival of the tourist at the destination. It is believed that it is at this point that tourist destination organizations should start a process of inventorying emissions.

The ecological modernization and green transition advocated by Gössling et al (2024), Jackson (2023), Eadson and Veelen (2023) and Ballo et al (2023), can be initially achieved by the transition from a linear tourism economy to a circular tourism economy. This perspective is consolidated as the growing interest in circular practices becomes at the same time a challenge for tourist destinations, more than all, a strong opportunity for the development of strategies for the creation and establishment of green, smart, cognitive, sustainable and resilient tourist destinations. It is a challenge due to the need to establish mechanisms to control and monitor the results of the cyclical approach, also called cradle to cradle. It becomes an opportunity, as it provides the creation of more sustainable and cleaner business models. But also in stimulating a less aggressive production logic, through the recreation of value in the useful life of production inputs, for example, among other factors.

The dialogue based on the concept of decarbonization also allows us to demonstrate the impacts that the tool triggers in the context of cities, but above all the benefits on ecosystems and populations. Guix et al (2023), by emphasizing that the

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tourism sector strives to align strategies for climate action, demonstrates that the current carbon footprint is unacceptable and, therefore, stimulates the development of new leadership and governance practices. This imposition in the achievement of ambitious goals will allow progress in the review of public policies, marketing strategies, and the creation of more effective approaches that maintain the perspective of generating employment and income, as advocated by Glössling and Higham (2021). But above all, it allows you to identify and understand the factors that increase or decrease greenhouse gas emissions in the tourism system.

What is striking, however, is that in all the perspectives evaluated, the concept of decarbonization emphasizes the need for an energy transition. The reduction in dependence on fossil fuels is clear and seals those who meetings, seminars, lectures and agreements organized all over the planet, tirelessly discuss at the present time. Thus, by affirming the need for new strategies for the climate journey, Guix et al (2023), Gusmerotti, et al (2023) and Gössling et al (2024), for example, assume the perspective that the current model generates, on the one hand, opulence and waste, and on the other hand, enables the interruption in the supply of services triggered by the gradual, Aggressive and systematic extreme weather events that directly affect the tourism production chain.

In view of this, from the correlation matrix presented, a general consensus is observed on the need for behavioral changes in the production and consumption system. The sociocultural perspective aligned by Kaandorp et al (2024), Wilby et al (2023) and Constantino et al (2023), warrant this statement. The bias of community participation and energy justice occurs from the broad awareness in the application of sustainable practices, as Sun et al (2023) suggests, from an engineering perspective.

In the same vein, the issue of intervention scales is also highlighted. While the perspective of geography discusses networks, which are determined by the connection between municipalities, and are related to economic flows, traffic of people, with important and complex urban services, as well as transport systems, with their strategic measures for the fluidity of traffic of vehicles, people, cargo and information, stimulating integration with the use and occupation of land, intelligent and active mobility; From a sociocultural perspective, it focuses on community actions and behavioral changes.

In this community panorama, the emphasis is on the control and direct involvement of the community in the management and decision-making development of the climate journey. This practice allows for the inclusion and democratization of solutions to

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community problems. It becomes the epicenter for the empowerment and engagement of all without leaving anyone behind, stimulating in fact the shared understanding of the serious crisis that humanity and the tourism sector are experiencing with global warming, and the real importance for the transition in the use of renewable energies combined with a behavior that anticipates the various possibilities of worsening the planetary crisis.

FINAL CONSIDERATIONS

The worsening of the planetary crisis caused by global warming increases expectations and the certainty that the tourism sector and destination management agencies must strive to set goals to reduce greenhouse gas emissions. The planet's global average temperature and the likelihood of temporarily exceeding 1.5°C to pre-industrial levels at least once in the next five years underscores the need for immediate mitigation and adaptation actions.

In this context, decarbonization emerges as a strategy applicable to the environmental agendas of governments and societies, but also as an option for sustainability and resilience of tourist destinations. As an alternative, it proves to be a lever and at the same time a cause for a process of transition from a linear economy to a circular economy, with low-carbon practices.

The inter and multidisciplinary analysis of the concept of decarbonization, from the geographical, sociocultural, engineering and management perspectives, allowed the understanding of this mitigation action. Understanding its genesis from the interrelationships established with the correlation matrix makes it possible to design actions to reduce greenhouse gas emissions in a more solid, broad, and integrated way, which confirms the statements of Bispo (2023).

They positively corroborate to make tourist destinations greener and more resilient, initially based on a complete review of public policies, marketing strategies and, above all, the implementation of greener mechanisms in the production processes of the tourism chain. It is important to highlight the need to identify the processes that cause emissions, their inventory, and to establish a baseline with specific, measurable, realistic, and time-bound emission reduction targets with a view to net zero.

This transition to a large extent, understood by the group of authors who covered this study, such as Gössling et al (2024) and Jackson (2023), is repeated, offers

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mechanisms for the creation of green and resilient tourist destinations, enhancing ecosystem services.

In these terms, the present work highlighted the importance of the concept of decarbonization in the tourism system from the four aligned perspectives. This integration revealed the complexity and interdisciplinarity of the concept, highlighting the vision that the disciplines establish, which allows the design of new strategic alternatives for an assertive and efficient climate journey. It promotes more safely the prospect of achieving the goals defined in the Paris Agreement and sustainable development goals 12, making cities and urban settlements inclusive, safe and resilient, and goal 13, taking urgent action to combat global warming.

Specifically, it promotes goal 12.b with the probability of developing tools to monitor the impacts of tourism development, while generating employment and income, which reinforces the thinking of Glössling and Higham (2021) and also of Guix et al (2023) while also promoting the ideas of Wilby et al (2023) and Constantino et al (2023).

It is noteworthy that the results of this search are limited to the scope searched in the database chosen for this purpose. In these terms, it is emphasized that the perspective for future works provides the opportunity to continue the search for the interdisciplinarity of the central term by other disciplines, expanding the scope of interdisciplinarity, as well as the survey of practices and means to new procedural technologies of decarbonization.

For these reasons, it is understood that decarbonization, in addition to presenting itself as a preventive, mitigating measure, much less expensive than inaction on adaptation, also reveals, in the light of the research carried out for this article, a complex and multifaceted process, which requires a systemic, inclusive and participatory approach. And that through different perspectives promotes the fundamental elements for tourism to remain alive and sustainable, since if a city is good to live in, it will be even better to visit.

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