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Integrating sustainable coastal tourism and aquaculture principles into higher education curricula: a comprehensive literature review

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Abstract: Education can play a key role in achieving Goal 14 of the Sustainable Development Goals (SDGs) by raising awareness of the importance of sustainable aquaculture and coastal tourism practices. Despite the global recognition of the importance of the SDGs and their significance in promoting the sustainable development of oceans, seas, and marine resources as well as the role of education in achieving these goals, only a few studies have focused on aquaculture and coastal tourism in higher education. The aim of this paper is to provide a comprehensive literature review that examines the current status of education in higher education institutions (HEIs) with regard to aquaculture and coastal tourism. Through an analysis of papers published between 2000 and 2023, this study offers a starting point for more discussion and also offers a conceptual framework, thus providing a basis for further research on the integration of sustainable coastal tourism and aquaculture principles into higher education curricula. Opportunities, implications and future research directions to enhance the role of HEIs in fostering a more sustainable coastal tourism and aquaculture sector are also discussed.

Keywords: higher education; coastal tourism; aquaculture; Sustainable Development Goals; SDGs; oceans; higher education institutions; HEIs.

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1 Introduction

In September 2015, the United Nations Member States adopted the Sustainable Development Goals (SDGs), also known as the Global Goals, to encourage efforts in building a better world for people and our planet by 2030. These 17 interlinked global goals were designed to promote sustainability by 2030 and to address the challenges of climate change, poverty, improvement of education, health, and economic growth (United Nations, 2015a).

Among other goals, they introduced Goal 14, with the view to preserving our oceans. In particular, Goal 14 focuses on the conservation and sustainable use of oceans, seas, and marine resources for sustainable development. Its objective is to safeguard marine ecosystems, reduce pollution, preserve marine biodiversity, and promote sustainable practices in coastal and marine environments (United Nations, 2015b). Oceans are extremely important to the health and the well-being of Earth for several reasons; they help regulate our planet's climate, they are home to many different plants and animals, which provide us with food, they support a range of industries, such as the tourism industry, they provide opportunities for recreation as well as a unique environment for scientific research (Kumar and Devi, 2023). During the recent Ocean 2023 Conference organised in Panama, it was emphasised that to defend the ocean's health, we must establish areas for preserving and researching its diverse life forms, such as sustainable fishing practices that will ensure the conservation of the resource and will generate wealth, job creation and a reliable food supply.

In order to address complex sustainability challenges and to participate in environmental activities, it is also important to educate individuals by equipping them with the knowledge, skills, and attitudes needed (Dewi and Parikesit, 2023). This is why Goal 4 of the SDGs, focuses on ensuring inclusive and quality education for all (United Nations, 2015a). Education is essential for sustainable development, and it is mostly the higher education institutions (HEIs) that play a critical dual role in promoting it; they create knowledge and transfer it to society and also, they prepare students for their future role in society (Stough et al., 2018).

Despite the global recognition of the importance of the SDGs and the role of education in achieving them, only a few studies on tourism highlighted coastal tourism

courses in higher education. Also, no previous research has explored the integration of sustainable coastal tourism and aquaculture principles into higher education curricula. Aquaculture, an approximate aquatic equivalent to agriculture and an important part of coastal tourism, is a sustainable option for consumers and the result of the search for sustainable alternative food sources (Perles-Ribes et al., 2022). Coastal tourism and aquaculture are linked as strategies for economic diversification in coastal fishing communities playing pivotal roles in supporting the economies of coastal areas, sharing common challenges, and involving local stakeholders in their development and sustainability (Jodice et al., 2015). Aquaculture tourism is special interest tourism that refers to commercial operations, such as aquaculture farms, primarily involved in non-tourist activities but enhancing their value by offering tourism experiences linked to their core operations (Mohammadi et al., 2022).

Therefore, in this current effort, our aim is to bring clarity to the subject of sustainable aquaculture and coastal tourism in higher education by examining the contributions made by the literature.

To achieve this, we will focus on the following research questions:

- What is the current status of sustainable coastal tourism and aquaculture education in HEIs?
- How can HEIs effectively integrate curriculum content for coastal tourism and aquaculture to promote sustainability?
- What are the opportunities and challenges in integrating coastal tourism and aquaculture principles into HEI curricula?

The main contributions of this paper are:

- 1 To our knowledge, this is the first comprehensive review conducted in the field of sustainable coastal tourism and aquaculture in higher education.
- 2 This study provides an overview of the evolution of sustainable coastal tourism and aquaculture education in the literature from 2000 until 2023.
- 3 A comparative review of the existing frameworks and methodologies for sustainable coastal tourism and aquaculture education is provided.
- 4 The future research perspectives for sustainable coastal tourism and aquaculture in higher education are identified and described.
- 5 This article serves as reference material for professionals, researchers, and academics working with sustainable coastal tourism and aquaculture education.
- 6 The domain of the review is wide enough to be attractive to those working in the tourism, hospitality and environmental sectors, or with education in sustainability issues, such as those who are interested in the role of education in promoting sustainable development.

This article is structured as follows. Section 1 introduces the methodology used to conduct the various stages of the review. Section 2 presents the evolution of the aquaculture and coastal tourism in sustainable coastal development and HEIs in the literature. The next section provides an overview of the existing characteristics of selected studies in the literature on the subject. Then, the findings are summarised and

existing methodologies, frameworks and concepts are elaborated. The final section reveals the conclusions and future work suggestions.

2 Literature review methodology

In this study, a literature review approach was used as defined by Tranfield et al. (2003) in order to ensure a well-structured analysis of the available literature. This methodology encompasses three phases as also depicted in Figure 1.

- **Phase 1: Planning the review**

As a first step, the review for the integration of sustainable coastal tourism and aquaculture principles into HEIs curricula was planned. The guidelines proposed by Tranfield et al. (2003) were followed, so an active involvement of experts in tourist and environmental issues along with the partnership with practitioners who are actively working in the field of coastal tourism were included in order to gather diverse insights to plan the review.

- **Phase 2: Executing the review**

Then, the review was conducted through the identification, selection, study, extraction and synthesis of relevant literature related to sustainable coastal tourism and aquaculture education and HEIs. The research questions were clearly defined, the studies were evaluated for their relevance to the research questions and information was extracted, organised and synthesised.

- **Phase 3: Summarising**

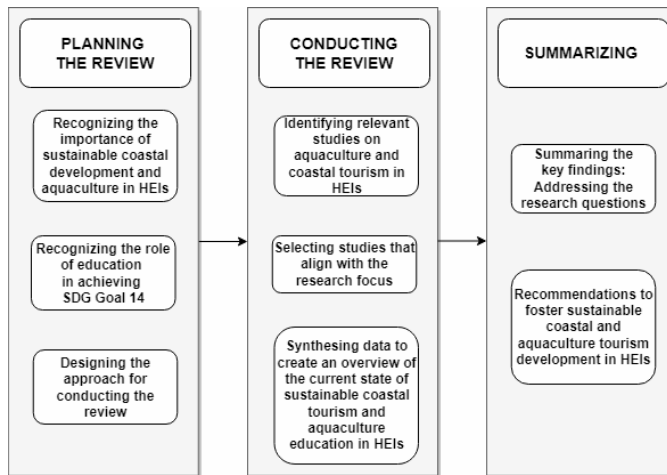
Finally, the findings were summarised and implications and recommendations for sustainable coastal development were provided. Valuable insights into the current status of sustainable coastal tourism and aquaculture education in HEIs were gained through our review of the literature and the development of a conceptual framework that helps to understand the challenges and opportunities faced by HEIs.

In the 1st stage and based on the importance of the SDGs and the role of education in achieving them, the need of this study is driven by the aim to explore the current status and the gaps in the existing literature in HEIs curricula towards the integration of sustainable coastal tourism and aquaculture principles into them. The review is initially based on literature recorded in academic databases, including Emerald, Science Direct, Taylor & Francis, and Google Scholar. A general analysis of the filtered documents was then conducted to obtain the evolution of the incorporation of sustainable coastal tourism and aquaculture principles within HEIs in the existing literature.

The analysis on the 2nd stage was based on the key words (coastal tourism education), (sustainable coastal tourism higher education), (aquaculture tourism education) to obtain a first list of works combining these terms in the title, abstract or keywords. The research included papers between 2000 and 2023 because it is a relatively recent period and we wanted to include the current state of research on the subject. Besides, it is a field that has gained attention in the recent years due to its potential on sustainability.

The literature review was guided by the questions outlined in Table 1. The results were then filtered by subject area and keywords.

Figure 1 Methodology of the literature review



Source: Tranfield et al. (2003) and authors' modification

Table 1 Questions used to guide the literature review

Topic	Question
Current status	What is the current status of sustainable coastal tourism and aquaculture education in HEIs?
Integration of curriculum content	How can HEIs effectively integrate curriculum content for coastal tourism and aquaculture to promote sustainability?
Opportunities and challenges	What are the opportunities and challenges in integrating coastal tourism and aquaculture principles into higher education curricula?

Finally, a general analysis of the gaps, trends, future directions and challenges was performed in 3rd stage, based on findings from the previous stages to provide perspectives on the existing state of the topic discussed.

2.1 Literature review on the evolution of aquaculture and coastal tourism in sustainable coastal development and HEIs

2.1.1 Aquaculture and tourism: towards sustainable coastal development

Aquaculture, also called fish or shellfish farming, can be considered as the aquatic complement to traditional agriculture; it is the cultivation of fish and other aquatic species in freshwater and marine environments (Kim et al., 2017; Wingenbach et al., 1999). Fish and its products have become the most extensively traded food globally, while aquaculture is recently experiencing a rapid growth as the fastest-growing food production system (Hasimuna et al., 2023; Ragasa et al., 2022). There are various forms of aquaculture which play an essential role in the advancement of the agricultural and farming sector; for example, they contribute to poverty reduction, mitigation of

production risks, food security improvement, and sustainable farming practices promotion by providing nutritious food, generating revenue and employment, and enhancing farm sustainability (Hasimuna et al., 2023).

Responsible and sustainable aquaculture requires a paradigm shift towards holistic approaches, involving the participation of stakeholders from fishers and local communities, integrating aquaculture with agriculture and silviculture, and promoting self-regulation through codes of conduct and best management practices (Primavera, 2006). Both aquaculture and coastal tourism can benefit from sustainable practices, improved management, and cooperation among stakeholders (Primavera, 2006). Stephanou (1999) highlighted the need for an integrated approach to coastal zone management, demonstrating the enduring significance of collaboration between the government and the private sector in order to achieve sustainable development of both tourism and aquaculture. More recent studies agree, such as Shen et al. (2021), who found that close collaboration among the aquaculture industry, the educational and research institutions and the government is needed for advancing technologies in fish reproduction and innovative aquaculture systems. In addition to collaboration, open educational resources (OERs) in higher education courses can also play a role in sustainable coastal development; OERs have the potential to increase teaching efficiency, improve teaching quality, and reduce economic and geographic barriers to education in the aquaculture and fisheries sector (Pounds and Bostock, 2019).

Aquaculture is becoming important to coastal destinations because it can help to ensure a steady supply of local seafood and as such, to differentiate coastal destinations from other tourist destinations (Kim et al., 2017). Aquafarms often hold a cognitive and gastronomic appeal for tourists; thus, a harmonious balance should be established between them (Melikh et al., 2019). Tourism can be a way to educate the public about the benefits of aquaculture; therefore, further exploration of the relationship between aquaculture and tourism is needed (Kim et al., 2017). However, the socio-economic connections between aquaculture and tourism have received limited attention so far and the concept of aquaculture tourism is a value-added activity that is only recently gaining attention (Mohammadi et al., 2022). Aquaculture tourism mutually benefits both aquaculture enterprises and the tourism sector (Mohammadi et al., 2022). To promote education about the benefits of aquaculture, it would be valuable to examine the potential of value-added tourism experiences in coastal communities before investing further in tourism-focused initiatives related to aquaculture (Kim et al., 2017). Incorporating effective aquaculture education into community-level initiatives, including tourism experiences could serve as a means for sustainable aquaculture growth (Jodice et al., 2015).

2.1.2 Coastal tourism: education and sustainability

Coastal tourism encompasses a wide range of tourism and leisure activities in the coastal zone and offshore coastal waters, including the establishment of tourism facilities, supporting infrastructure as well as various recreational experiences such as boating, ecotourism, cruises, swimming, fishing, snorkelling, and diving (Hall, 2001). In this paper, the term ‘coastal tourism’ will be utilised to encompass various aspects explored in the literature, both in the coastal zone and offshore coastal waters, including underwater, marine, aquatic, and other related terms within the coastal environment.

As noted by Ducrotoy et al. (2000), tourism education plays a crucial role in coastal management by providing several benefits. For example, it cultivates a new generation of professionals who are knowledgeable in addressing coastal issues and raises environmental awareness among the general public. The ultimate goal is to foster a generation of passionate instructors who will advocate for coastal concerns. To achieve this, Ducrotoy et al. (2000) suggest that HEIs integrate curricula focused on coastal culture, emphasising sustainable coastal development.

According to Renfors et al. (2021) in their country report on skills development in coastal and maritime tourism in Finland, during the process of creating immersive and engaging tourism experiences that focus on coastal and maritime environment, understanding the unique characteristics and resources of coastal and maritime surroundings is essential, along with integrating sustainability in product development.

Coastal tourism education plays a vital role in the sustainable development of coastal areas and the utilisation of marine resources, contributing to economic growth and regional spread; an exemplary initiative can be observed in the Integrated Islamic Elementary School Mahabbatul Haq in Batam City (Nisa and Utanto, 2022), where the integration of coastal local content into the curriculum serves to educate students about marine conservation and the preservation of coastal communities' wisdom. Through diverse learning programs encompassing waste recycling, marine resource utilisation, and immersive nature trips to mangrove forests and beaches, students in Batam City gain hands-on experiences and valuable knowledge about the coastal environment, preparing them to become responsible stewards of coastal tourism in the future.

The study of Schaffer and Tham (2019) acknowledges the benefits of aligning tourism experiences with scientific research and conservation goals as a coherent approach to engaging tourists in research activities in the context of marine tourism. Marine tourism is a subset of coastal tourism, encompassed within the broader concept of coastal tourism (Hall, 2001).

Wilks (2022) commentary on coastal and marine tourism education opportunities provides evidence that education can help to promote sustainable coastal tourism and highlights that governments and industry groups are recognising the significance of education within the industry. Adopting responsible management practices is crucial for sustainable coastal tourism, as it not only protects the environment but also ensures the long-term viability of coastal destinations by preserving their unique natural attraction (Aziz and Niazi, 2023; Baitalik and Bhattacharjee, 2023). Thus, it is important to incorporate education for tourists in order to address irresponsible actions and foster awareness to protect coastal environment (Aziz and Niazi, 2023).

Based on the studies mentioned in this section and the previous one, it becomes evident that education can play a vital role in sustainable coastal tourism. HEIs can play a key role in this by integrating curricula focused on coastal culture and sustainable coastal development. Aquaculture can also be a part of sustainable coastal tourism, as it can provide food security and economic benefits for coastal communities. The next paragraph discusses the role of HEIs in sustainable coastal tourism in more detail.

2.1.3 The role of HEIs for sustainable coastal tourism

The travel and tourism industry is one of the largest sectors and its adverse effects and negative impacts have led to the widespread adoption of sustainable tourism to mitigate these effects and promote responsible tourism development (Zolfani et al., 2015).

According to the Tourism4SDGs (n.d.) website, tourism has the potential to contribute, directly or indirectly to all of the 17 SDG goals and can play a significant role in delivering sustainable solutions for people and the planet, for prosperity and peace.

There is a growing recognition of the role of education in supporting sustainability efforts. For example, education plays a critical role in sustaining and developing industries, including tourism, by fostering growth and providing a skilled labour supply, while quality education enhances a country's competitiveness (Lewis-Cameron et al., 2020). The rising importance of sustainability in the hospitality and tourism industry emphasises the need to educate university students on strategies to optimise the industry's benefits while minimising negative impacts (Boley, 2011). Education for sustainability goes beyond teaching about sustainability and focuses on transformative learning, intrinsic values, capacity building, engaging multiple stakeholders, adopting a whole system approach, and following core sustainability principles (Moscardo and Murphy, 2015). Despite the close connection between tourism and sustainability, current approaches to tourism education do not align well with these principles of education for sustainability; so, there is a need to bridge this gap and incorporate these principles into tourism education for a more sustainable tourism industry (Moscardo and Murphy, 2015).

Educational institutions have the opportunity to instil values that equip students in tourism to navigate future uncertainties and lead societal and industry shifts responsibly (Lewis-Cameron et al., 2020). HEIs play a key role in promoting sustainable development principles, preparing students for their societal roles, and integrating sustainability into curricula, particularly in business schools (Stough et al., 2018). For example, Hawkins (2013) emphasises the role of HEIs in transferring knowledge into practice within the context of the tourism industry and the need for ongoing partnerships between HEIs and the tourism sector at all levels to ensure the practical use of knowledge in the industry. Sustainable tourism education combines awareness-building and quality education to equip students with critical thinking skills for addressing societal challenges and fostering sustainable practices in the tourism sector (Mínguez et al., 2021). Studies in tourism education have demonstrated that the integration of sustainability programs across the curriculum, rather than as isolated courses, can effectively shape students' attitudes towards sustainability (Mínguez et al., 2021; Slocum et al., 2019).

Boley (2011) proposes that incorporating sustainability throughout the entire hospitality and tourism curriculum, rather than confining it to a specific course or specialised major, is the most effective approach to educate students on sustainability, while still recognising the importance of specialised classes. Sustainable tourism education involves not only the acquisition of theoretical knowledge but also a transformative shift in mindset and active engagement, with educators serving as role models for sustainability, inspiring and motivating students towards more sustainable tourism futures (Lund-Durlacher, 2015).

For coastal tourism specifically, education and awareness-raising play a crucial role in the context of coastal tourism and the oceans as they have a significant impact on addressing factors of pollutions in the oceans (Kumar and Devi, 2023). Coastal and marine resources, including coral reefs, face increasing threats from climate change, detrimental fishing practices, coastal development, and pollution, prompting the need to examine the involvement of tourism and tourists in raising awareness and assuming responsibility for global environmental issues (Jamal and Smith, 2017). Incorporating sustainable practices in coastal tourism, the destination's natural and cultural assets are preserved and its long-term success is ensured (Goffi et al., 2019). Coastal management

necessitates the acquisition of suitable skills, placing higher education under the responsibility of fostering motivated graduates with scientific expertise, necessitating collaboration with employers and the development of dynamic curricula to meet evolving industry demands (Ducrotoy et al., 2000).

Based on a study from Yusuf et al. (2018), which explores the development of an undergraduate academic tourism curriculum in universities in Indonesia (a coastal country with significant tourism potential), a comprehensive tourism education should incorporate both practical and theoretical aspects to equip graduates with the knowledge and skills necessary for successful careers in tourism planning, management, and decision-making processes. Also, the review by Smith Johnson (2020) highlights the importance of incorporating a global maritime curriculum, including hospitality and tourism, into HEIs, to align with emerging market needs driven by the technologies of Industry 4.0. Besides, it is important to internationalise the curriculum in tourism education due to the highly international nature of the tourism industry because of the need for internationally competent personnel to meet the demands of a multicultural and global society (Renfors, 2018b).

The close relationship between sustainable tourism and the global SDGs highlights the responsibility of HEIs to actively contribute to the long-term achievement of these goals, emphasising the importance of integration and promoting global awareness and transformation (Slocum et al., 2019). Nevertheless, HEIs seem to fail in their efforts to educate individuals as critical thinkers as well as to understand tourism as an influential force in promoting sustainability (Mínguez et al., 2021). As regards coastal tourism within European HEIs, the inadequacy of skill development has led to low education standards in this sector, thus a more comprehensive educational approach is necessary (Wilks, 2022). Wilks (2022) notes that the majority of HEIs lack specialised curricula or courses tailored for coastal tourism.

The studies discussed in this paragraph provide evidence that HEIs have a role to play in educating students about the importance of sustainability in aquaculture and coastal tourism, and in developing the skills and knowledge that will be needed to manage these industries in a sustainable way.

2.2 Selected studies on coastal tourism and aquaculture in sustainable coastal development and HEIs

Limited research specifically addressing coastal and aquaculture tourism higher education was found in the existing literature; in particular, only 20 papers were included from which the 16 papers were published after 2015. Due to the scarcity of studies focused solely on HEIs in this field, a few studies related to coastal tourism were also included to provide a comprehensive perspective. This also indicates the growing interest of this research area in recent years and suggests that the exploration of integration coastal tourism and aquaculture principles in HEIs is a relatively recent development in the literature. Table 2 summarises the main characteristics of the selected studies.

Table 2 Main characteristics of the selected studies

<i>First author</i>	<i>Year</i>	<i>Country</i>	<i>Study design</i>	<i>Level of education</i>	<i>Key findings</i>
Duerotoy, J.P.	2000	England	Qualitative approach	Higher education	<ul style="list-style-type: none"> • Successful coastal management requires appropriate competencies. • Collaboration between academia, industry, and policy-makers is crucial. • NGOs have an important role in sharing scientific knowledge and applying it to coastal management practices.
Lück	2003	New Zealand	Questionnaires and open-ended data collection	N/S	<ul style="list-style-type: none"> • Tourists on coastal mammal tours have a strong desire for structured interpretation programs and more information about the coastal environment.
Lewis, A.	2005	Caribbean	Qualitative (semi-structured in-depth interviews)	N/S	<ul style="list-style-type: none"> • Effective interpretation and education are crucial components of these tours, addressing tourists' expectations and contributing to their satisfaction while also raising awareness about environmental issues. • It is essential to involve stakeholders in the decision-making process for curriculum development, in order for tourism education to contribute to the sustainable development of the tourism industry in small island states (SIS).
Azevedo-Santos, V.M. (2015)	2015	Brazil	Short essay	All levels	<ul style="list-style-type: none"> • Educational opportunities and well-informed society members can lead to more rational and balanced decisions. • The study proposes educational practices tailored to aquaculture, fishkeeping, and sport fishing.
Lewis-Cameron, A. (2015)	2015	Caribbean	Conceptual analysis	Higher education	<ul style="list-style-type: none"> • Tourism higher education plays a critical role in preparing graduates to shape an improved Caribbean tourism society and conducting research. • Tourism is more than an economic solution for the islands but can also have a significant social impact by addressing important issues in the region. Thus, tourism higher education plays a vital role in promoting a transformative approach that goes beyond viewing tourism as a mere industry to be controlled and managed.
Gough, A.	2017	N/S	Viewpoint	School	<ul style="list-style-type: none"> • Coastal education is an important part of environmental education, which is essential to achieve sustainability. • Coastal education struggles to find a place in the school curriculum in most places. • Coastal scientists need to be promote the importance of coastal education in school.

Table 2 Main characteristics of the selected studies (continued)

<i>First author</i>	<i>Year</i>	<i>Country</i>	<i>Study design</i>	<i>Level of education</i>	<i>Key findings</i>
Jamal, T.	2017	Australia	Exploratory case study	N/S (a sample of visitors)	<ul style="list-style-type: none"> • Visitors to the Great Barrier Reef (GBR) are generally well-educated, aware of climate change impacts on the reef and have a strong desire to learn more about the environmental, social, and cultural heritage of the GBR. • Visitors believe that pedagogic experiences can enhance their enjoyment and learning of the reef's ecological wonders and recognise the shared responsibility of various stakeholders in addressing environmental threats to the GBR. • There is a need for a stronger pedagogic role to be adopted by tourism experience providers and site managers to facilitate climate change literacy and responsible enjoyment and learning.
Agustin, H. et al.	2018	Indonesia	Exploratory case study	Tourism vocational high school	<ul style="list-style-type: none"> • Absence of specific content on coral reefs conservation in the tourism vocational high school curriculum in Pangandaran, Indonesia. • Incorporating coral reef conservation materials into the educational curriculum is essential to enhance students' knowledge and awareness of coastal conservation. • The absence of coral reef conservation materials in tourism vocational high schools poses a threat to the sustainable development of tourism in the region.
Permana, M.P.	2018	Association of Southeast Asian Nations	Literature review	Vocational education	<ul style="list-style-type: none"> • The concept of vocational education based on marinepreneurism provides opportunities for coastal community empowerment and the sustainable development of coastal potential in ASEAN. • Marinepreneur-based vocational education follows a sequential process that includes identifying and analysing natural resources potential, defining work competencies, designing and implementing training processes, developing the curriculum, and conducting skills competency tests.
Renfors, S.M.	2018a	Finland	Qualitative (semi-structured interviews)	Higher education	<ul style="list-style-type: none"> • It is important to develop the curriculum content of coastal tourism in HEIs to support sustainable growth and competitiveness. • The study emphasises the need for a themed curriculum to meet the evolving needs of stakeholders and provide graduates with sector-specific skills and knowledge.
Renfors, S.M.	2018b	Central Baltic Area	Literature review, case study	Higher tourism education	<ul style="list-style-type: none"> • It highlights the benefits of collaboration among universities, including broadened expertise and industry-oriented education.

Table 2 Main characteristics of the selected studies (continued)

<i>First author</i>	<i>Year</i>	<i>Country</i>	<i>Study design</i>	<i>Level of education</i>	<i>Key findings</i>
Renfors, S.M.	2018b	Central Baltic Area	Literature review, case study	Higher tourism education	<ul style="list-style-type: none"> • It emphasises the importance of aligning curriculum with industry needs and the role of higher education in internationalising educational activities. • It recommends that HEIs consider industry needs, stakeholder opinions, and the purpose of internationalising the curriculum when planning educational activities.
Yusuf, M.	2018	Indonesia	Analysis of policy documents and stakeholder perspectives	Higher education	<ul style="list-style-type: none"> • Through the analysis of the development of the undergraduate academic tourism curriculum in Indonesian universities, it was found that stakeholders, including the government, non-governmental tourism associations, tourism academics, and trade associations, contribute to curriculum development. • Specific teaching and assessment methods that are more applicable to the industry were identified. • Coastal tourism curricula should be comprehensive and industry-focused.
Jonas, L.C.	2019	South Africa	Mixed methods approach with a multiphase design	Higher education	<ul style="list-style-type: none"> • There is a lack of emphasis on coastal tourism curricula in university programs.
Schaffer, V.	2019	N/S	Systematic review	N/S	<ul style="list-style-type: none"> • Engaging tourists as citizen scientists in coastal tourism has great potential for advancing research and conservation efforts. • The importance of training, engagement, and reliable data collection by tourist scientists is emphasised. • Factors like participant diversity, project design, and collaboration with tourism operators are key to the success of citizen science initiatives in the tourism industry.
Lewis-Cameron, A.	2020	Caribbean	Cross-sectional research design	Higher education	<ul style="list-style-type: none"> • Tourism education is moving away from just teaching job skills and is now focusing more on how millennials can contribute to building their nations and communities. • Students in tourism education want to learn through practical experiences and activities, going beyond traditional classrooms to gain hands-on knowledge and skills. • It is important to focus on experiential tourism education and developing practical skills through real-life experiences in order to engage and transform millennials in the curriculum.

Table 2 Main characteristics of the selected studies (continued)

<i>First author</i>	<i>Year</i>	<i>Country</i>	<i>Study design</i>	<i>Level of education</i>	<i>Key findings</i>
Smith Johnson, E.M.	2020	Jamaica	Literature review and analysis	Higher education	<ul style="list-style-type: none"> • It highlights the importance of restructuring coastal education and training curricula to align with the changing market requirements driven by the Fourth Industrial Revolution. • The emergence of technologies and innovations, such as autonomous shipping and cyber-physical systems, necessitates a shift in instructional approaches and curriculum planning in coastal education and training curricula.
Renfors, S.M.	2021	Finland, Estonia, Latvia, the Netherlands, Ireland	A mixed-methods approach, combining desk research with data collection through expert interviews and focus group discussions	Higher education	<ul style="list-style-type: none"> • Sustainability and responsibility are crucial in coastal tourism development in Finland. • Understanding the unique characteristics of coastal and maritime surroundings, including natural and cultural heritage, is essential for designing memorable experiences. • Stakeholder cooperation and coordination, including public-private partnerships, play a vital role in managing coastal tourism destinations effectively. • Safety, legislation, and Integrated Coastal Zone Management are important considerations for ensuring the well-being of tourists and sustainable coastal development.
Li, L.	2022	South Asia	Policy-based analysis of ocean and marine economy and tourism in South Asia through ARDL regression analysis	N/S	<ul style="list-style-type: none"> • The study emphasises the significance of understanding how coastal tourism promotes financial development in a sustainable economy. • The research highlights the importance of studying the relationship between the ocean economy, coastal tourism, and economic growth.
Nisa, A.	2022	Indonesia	Descriptive qualitative research with a case study design	Middle education	<ul style="list-style-type: none"> • Lack of implementation of coastal-focused curriculum content due to internal factors such as the absence of necessary documents and reliance on syllabus guidance. • Environmental and cultural aspects influence the application of coastal-focused curriculum content to support the preservation of coastal community wisdom. • Coastal-focused curriculum is designed to promote ecological behaviour and maintain the coastal environment's beauty and resources.
Dewi, R.	2023	Indonesia	Qualitative method with GAP analysis and GIS analysis	High school	<ul style="list-style-type: none"> • Curriculum design can be divided into two approaches: one that adds material according to the landscape and contextual conditions, and another that introduces new material. • The goal is to design and develop the curriculum according to the landscape and contextual conditions of the coastal area for creating a sustainable environment.

2.3 *Addressing the research questions*

After reviewing the literature about sustainable coastal tourism and aquaculture education in HEIs, the following trends, gaps, future research opportunities and existing challenges have been identified, addressing the research questions as follows:

- Current status of sustainable coastal tourism and aquaculture education in HEIs

While there is a growing interest in sustainable coastal tourism and aquaculture education in HEIs, it seems that there is a lack of emphasis on these topics in university programs, as also highlighted by the recent commentary of Wilks (2022). Specifically, an extensive search on Google for ‘university programs in coastal tourism’ validated this observation, uncovering just one complete program that seemed to encompass a comprehensive range of these topics (Wilks, 2022). Also, this lack of emphasis on aquaculture within HEIs could be attributed to several factors, including limited awareness and integration of aquaculture-related content into existing curricula (Azevedo-Santos et al., 2015). Tourism higher education plays a critical role in shaping an improved tourism society, addressing important issues, and promoting a transformative approach. Coastal education is an important part of environmental education, but it faces challenges in finding a place in curricula. Successful coastal management requires appropriate competencies, collaboration between academia, industry, and policymakers, and the involvement of NGOs. Thus, there is a need for a more comprehensive and industry-focused curriculum that includes both theoretical and practical aspects.

- Integration of curriculum content for coastal tourism and aquaculture

It is suggested that curriculum content align with industry needs and emphasise sustainable growth, competitiveness, and internationalisation.

Other research also underscores the necessity to align education-training programs with the specific needs of this sector. For example, a study in the coastal region Antalya, in Turkey, emphasises the necessity for practical training and urges HEIs to ensure adequate resources for both physical infrastructure and equipment, with a dual focus on government allocation and industry collaboration (Yilmaz, 2021). HEIs should work with industry stakeholders to identify the skills and knowledge that are needed in the workforce. Involving stakeholders, including also the government, non-governmental tourism associations, tourism academics, and trade associations, in curriculum development is essential for tourism education to contribute to sustainable development. Besides, themed curriculum and collaboration with industry stakeholders are crucial for providing sector-specific skills and knowledge.

HEIs should also incorporate sustainability principles into the curriculum, such as by teaching students about the importance of reducing their environmental impact. Incorporating specific content on coastal conservation, including coral reef conservation, is necessary to enhance students’ knowledge and awareness. Moreover, vocational education based on marinepreneurism empowers coastal communities and supports sustainable maritime development (according to Permana et al., 2018, marinepreneurism involves the provision of human resources or workers who have the competence and motivation to manage island and coastal resources in a

sustainable way). Thus, curriculum content should promote ecological behaviour and maintain the coastal environment's beauty and resources. Restructuring coastal education and training curricula is essential to meet changing market requirements driven by technological advancements. This is why HEIs curriculum design should be tailored to the specific landscape and contextual conditions of the region.

- Opportunities and challenges in integrating coastal tourism and aquaculture principles into HEI curricula

Opportunities that emerge from the key findings include the growing interest in these topics among students and educators, the availability of resources, the possibility of collaboration with industry partners, and the use of technology. Specifically, there is a growing interest in coastal tourism and aquaculture topics among students and educators in HEIs with an emphasis on environmental considerations. Successful coastal management requires appropriate competencies, collaboration between academia, industry, and policy-makers. There are a number of resources available to help HEIs develop curriculum content on these topics. Collaboration with industry partners, coastal management organisations and tourism associations can provide valuable insights into the practical aspects of these sectors and facilitate the alignment of curricula with the tourism industry needs. Also, technological advancements can complement traditional teaching methods to enhance education in coastal tourism and aquaculture.

Some of the challenges that HEIs may face include the lack of awareness of sustainability principles among stakeholders, the high cost of developing and delivering sustainable tourism and aquaculture programs and lack of access to practical experience. COVID-19 brought attention to the coastal tourism sector vulnerability and highlighted the need for a more sustainable tourism sector where educational institutions have a key role to play in this, by embedding the principles of sustainability into their curricula (Wilks, 2022). Based on these findings, it is recommended that HEIs with a strong focus on sustainable tourism prioritise the integration of sustainable coastal tourism and aquaculture principles into their curricula.

3 Overview: key findings, implications, and recommendations for sustainable coastal tourism and aquaculture education in HEIs

Table 3 is a matrix summarising the key findings, implications, and recommendations for sustainable coastal tourism and aquaculture education in HEIs. It can serve as a practical tool to aid in decision-making and curriculum planning, guiding efforts to align higher education with the industry's needs and the challenges of sustainability in coastal regions.

In Figure 2, the findings of the comprehensive literature review are conceptualised in order to provide a clear and organised representation. Figure 2 illustrates the interconnectedness of the concepts and the recommendations related to coastal tourism and aquaculture in higher education, emphasising the growing interest of the importance of sustainable coastal tourism and aquaculture education and the importance of involving stakeholders for developing effective curricula. Specifically, the increasing demand for sustainable practices in these sectors has led to a growing interest of the need for

integrating specialised coastal educational programs, including the engagement and collaboration of various stakeholders in order to gain insights into the evolving challenges of coastal tourism and aquaculture. To meet the industry needs, HEIS must align their curriculum content accordingly, including the integration of sustainability principles to raise environmental awareness in order to increase the skills and competencies of their graduates in these competitive fields and also help them gain a deeper understanding of environmental issues. This process necessitates collaboration with the industry to provide practical training so as to allow students apply theoretical knowledge in real-world coastal challenges.

Table 3 Summary of key findings, implications, and recommendation

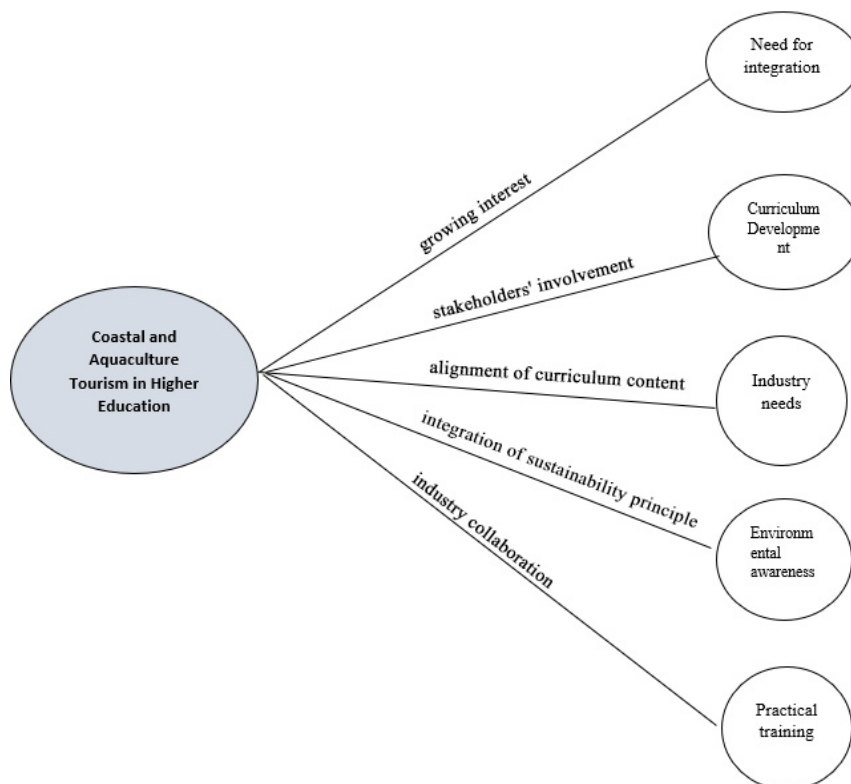
<i>Key findings</i>	<i>Implications</i>	<i>Recommendations</i>
Growing interest in sustainable coastal tourism and aquaculture education in HEIs.	Need for HEIs to prioritise these topics in their curricula.	Develop specialised courses in sustainable coastal tourism and aquaculture.
Lack of emphasis on these topics in university programs	Incorporate sustainability principles into HEIs curricula with a strong focus on sustainability.	Foster partnerships with industry stakeholders for practical insights.
Tourism higher education plays a critical role in shaping improved tourism society, shifting towards cultivating millennials.	Importance of involving stakeholders in curriculum development.	Establish partnerships with government, NGOs, and industry.
Coastal education faces challenges in finding a place in curricula.	Need to prioritise coastal education in environmental curricula.	Promote coastal education and develop specialised courses or modules dedicated to it.
Successful coastal management requires collaboration between academia, industry, and policymakers.	Importance of stakeholder cooperation for effective coastal management.	Encourage public-private partnerships for coastal management.
Need for a comprehensive and industry-focused curriculum that includes theoretical and practical aspects.	HEIs should align curricula with industry needs and advancements.	Foster collaboration with industry partners to continuously update and adapt the curriculum.
Involvement of stakeholders is essential for tourism education to contribute to sustainable development.	Engage government, tourism associations, and academia in curriculum development.	Ensure curriculum relevance to local and global contexts
Stakeholder cooperation is critical in coastal surroundings	Develop models for effective stakeholder cooperation.	Facilitate public-private collaborations in coastal areas
Safety, legislation, and Integrated Coastal Zone Management are important considerations	Ensure awareness of safety and relevant legislation among stakeholders	Promote Integrated Coastal Zone Management education

3.1 Geographical and methodological scope of the literature review

As regards the geographical scope, the literature review revealed that the integration of sustainable coastal tourism and aquaculture principles into HEIs curricula is a global issue and a topic that is gaining attention, albeit in a limited number of countries, like New Zealand, the Caribbean, Indonesia, Finland, South Africa, and South Asia.

The methodologies used in the reviewed papers varied; some studies used qualitative methods, such as interviews from experts, while others applied quantitative ones, such as survey data gathered from tourists. This suggests that there is a variety of methods that can be used to gain insights in this topic.

Figure 2 Conceptual framework of sustainable coastal tourism and aquaculture education in HEIs (see online version for colours)



3.2 Gaps and future directions

Gaps in the field and opportunities for further research were identified and are described as following:

- there is a lack of emphasis on coastal and aquaculture tourism curricula in university programs

- there is a lack of research on the effectiveness of different approaches to integrating these principles into HEI curricula
- there is a lack of resources for HEIs to develop curriculum content on these topics
- there is insufficient integration of coastal education in school curricula and an absence of specific content on coastal conservation in tourism vocational high school curricula
- there is very limited research on the integration of aquaculture tourism education into higher education curricula
- there is a lack of practical experiences and experiential learning opportunities for students
- the need for collaborative approaches and stakeholder engagement in curriculum development is highlighted

There is a need to address the above points and include sustainable coastal tourism and aquaculture principles into HEI curricula. Therefore, future research should strive to address these gaps by conducting more research on the effectiveness of different approaches to integrating sustainable coastal tourism and aquaculture principles into HEI curricula, developing resources to help HEIs develop curriculum content on these topics and encouraging HEIs to place more emphasis on coastal tourism curricula. More research is needed to identify the most effective approaches to integrating coastal tourism and aquaculture principles into HEI curricula, like the development of online courses and modules and the creation of partnerships between HEIs and industry stakeholders. It is vital to take these principles into account when developing new tourism and aquaculture programs and policy to achieve sustainability.

4 Implications and limitations

This study provides a valuable contribution to the field of sustainable coastal tourism and aquaculture education by identifying the key challenges and opportunities in this area and by developing a conceptual framework that can be used to guide the development of effective higher educational coastal programs. The framework highlights the interconnectedness of the key concepts in this area and these findings can inform the development of high-quality educational programs that can contribute to the long-term sustainability of coastal regions and marine resources.

Although this study helps fill a gap in existing knowledge in the literature, limitations still remain. Firstly, the scope of the review was limited to articles published between 2000 and 2023, which may have excluded relevant studies published before 2000. Additionally, the review primarily focused on articles published in English-speaking books and journals, potentially limiting the inclusion of valuable literature published in other languages. Despite these limitations, the research on sustainable coastal tourism and aquaculture higher education is a growing field, and there is a lot of potential for this research to make a positive impact on the future of these industries.

5 Conclusions

The findings of this literature review indicate a growing interest in the topics studied among students and educators, emphasising the significance of integrating sustainable coastal tourism and aquaculture principles into HEI curricula.

The current status reveals a need for greater emphasis on these topics in university programs. Tourism higher education plays a critical role in shaping an improved tourism society by cultivating a new generation of professionals who can actively contribute to building their communities, by addressing important regional issues and by promoting a transformative approach beyond viewing tourism solely as an industry to be managed. However, coastal education faces challenges in finding its place in curricula, warranting collaborative efforts between academia, industry, and policymakers to facilitate successful coastal management. To effectively integrate coastal and aquaculture education into HEIs curricula, involvement of stakeholders such as government bodies, non-governmental tourism associations, and trade associations is essential.

Based on the key findings, HEIs which place a strong emphasis on sustainability issues in the tourism sector are advised to give priority to incorporating principles of sustainable coastal tourism and aquaculture into their educational programs. This can be achieved through fostering partnerships with industry stakeholders, engaging students in practical experiences, and promoting environmental awareness and sustainability at all levels of education.

In conclusion, HEIs can play a significant role in achieving SDG 14 and contribute to a more sustainable future for coastal regions and marine resources, by promoting responsible aquaculture practices. The number of articles in this area is likely to continue to grow. This review serves as an important avenue for further research to advance sustainable coastal development. Future research should focus on extending this investigation to include other destination markets in order to obtain a more complete picture of the global implementation and impact of sustainable coastal tourism and aquaculture education in HEIs as well as expanding the investigation to quantitative methodologies. Also, the application of quantitative methodologies, such as surveys or data analytics, would provide a holistic perspective of the interrelationships of the conceptual framework presented in this study.

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