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The Future of Island City Development from the Perspective of Geographical Science

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ABSTRACT: Island cities are an important part of modern urban structure, playing an important role in the economic development of coastal countries. In recent years, with population growth and the need for socio-economic development, island urban development has been given top priority to create a suitable living and working environment for residents. At the same time, it protects the marine environment and ensures national security and defense. Besides the benefits that island urban development brings, there are negative impacts on island resources and the environment due to massive urban development. In particular, in a context where the world increasingly faces challenges of climate change, environmental pollution, and economic competition, sustainable island urban development is urgent. From a comprehensive perspective of geographical science based on synthesizing research documents on island urban areas, this article clarifies the future trend of island urban development, which requires attention to the unique characteristics of islands, if you want to develop sustainable island urban areas in the future, you need to follow the philosophy "Relying on Nature - Suitable for land - Harmony of people".

KEYWORDS: island city, urbanization, sea and island

1. INTRODUCTION

Urbanization has been an important trend in the world for many centuries and there are differences between developed and developing countries. Urbanization not only takes place in continental areas but also occurs rapidly and strongly in sea and island areas. That has led to the strong development of island cities; This is also an inevitable and objective trend in the process of modern social development of coastal countries in the world. Through the horizontal-vertical connection`` across the ocean, the cultural centers of the ancient Empire and the financial centers of the modern world existed and were distributed in the sea-island area. Russia's "sea doctrine", the US and Japan's "maritime strategy" or China's "one belt - one road" strategy have proven the great role and position of island cities in terms of multi-functionality and prominence in the country's marine economic development orientation.

The rapid change of the economy, and the strong development of the migration process in recent years, combined with the abundance of marine resources and favorable living conditions on the islands have led to the increase of the urbanization process on islands - the basis for the formation of island city, especially for small coastal islands. Island cities are one of three types of coastal cities including coastal cities, island cities, and ocean-based cities, which are often organized into chains of urban areas and occupy corresponding space segments, including coastal space, island/archipelago space, and marine space. Many large and populous cities in the world are developed based on islands such as New York (USA) or Lagos (Sub-Sahara Africa). The capitals of many European countries are formed on small islands such as Amsterdam, Copenhagen, London, Paris, and Stockholm. The question arises here: why are small island cities more likely to lead to the formation of large cities? That has attracted the attention of many scientists, especially geographical scientists, looking for answers to the above problem. Patricia Adrienne Tutt (2014), and Maciej Motak (2016) pointed out that the brand of small island urban areas (brand of landscape architecture, indigenous culture, environmental conditions, infrastructure, and safety) is the driving force for the development of large island cities. UNFPA (2014) points out the current trend of island urban development in particular in two directions: width and depth. Width-oriented development can be seen as geographical expansion, which also means administrative expansion. Depth-oriented development can be roughly understood as the development of urban quality, that is the upgrading of the social infrastructure of the city. Adam Grydehøj (2015) with his research has initially explained that the reason lies in the spatial characteristics and location of the island with the urban geography that creates territorial benefits, national defense benefits, and other economic and transportation benefits. However, the above argument only stops at explaining why small island settlements are more susceptible to dense urbanization than mainland areas.

In addition, the current strong development of island cities has caused negative impacts on the environment and marine resources such as problems with water, organisms, waste, and island culture… Therefore, the future island city development needs to be analyzed from a multi-dimensional perspective of geographical science to see the challenges that large cities as well as small and medium-sized cities are currently facing now. The analysis goes beyond needs and capabilities.

2. DATA AND RESEARCH METHODS

To carry out this research, we used methods of synthesizing and analyzing documents including the following documents:

Step 1: Collect documents from books and newspapers specializing in island city research.

Step 2: Synthesize and evaluate documents on the island city to select key and reliable documents.

Step 3: Analyze documents to present main points and important conclusions about island city development from the perspective of geographical science.

3. RESULTS AND DISCUSSION

3.1 The uniqueness of the island creates the difference between island cities and mainland cities

Island city is a concept that is becoming increasingly important in the context of current urban development. The construction and management of urban areas on islands require something special and different from urban areas on the mainland. The above issue has motivated geographical scientists to learn about the special nature of urbanization on islands and the differences between island cities and mainland cities. Research results have shown 06 different aspects between island cities and mainland cities related to the uniqueness of islands: (1) Isolation and diversity of geographical conditions; (2) Limitation on land area; (3) The need for fresh water and wastewater management is more severe than on land; (4) There is a rich and unique ecosystem, so urbanization needs to go hand in hand with biodiversity protection; (5) Sensitive to climate change and natural disasters; (6) Closely depends on national and international policies on sea and islands; (7) Depends on maritime traffic and multi-sectoral economy (especially tourism). These characteristics of the island greatly affect the orientation of island city development in general and sustainable island city development in particular.

First, the island is a remote, isolated area, strongly influenced by the sea.

The island's isolation is clearly shown from a geographical and historical perspective. Isolation not only creates a unique and distinct nuance in the culture and ecology of the island community (Evans, 1977) but also greatly affects the process of construction and development of the island city (a lot of resources are needed to build infrastructure and technical materials on the island). The island's isolation is strongly influenced by sea conditions such as wind, ocean currents, climate, and migration routes of marine species, which has created a diversity of geographical conditions of each island and the sensitivity to changes in social and environmental policies and institutions (Mulyila E, 2012). The island's isolation is limited only when globalization processes take place on the island to create opportunities for connection.

Second, islands are limited in land area.

Although they only account for about 2% of the world's land area and are continuously formed and shaped by geological, geomorphological, and biological factors, islands are connected to the mainland and other islands in different ways (Royle, 2001). This makes the island's urban development process more complicated because of its pressures.

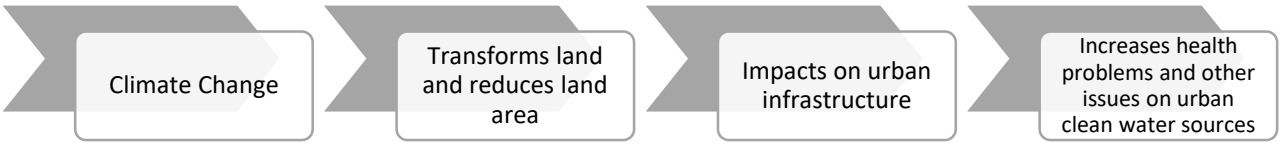
Third, there is a great need for fresh water and domestic wastewater management.

Island nations and small islands make up a quarter of the continent's area, but fresh water is a big problem for islands and archipelagos on Earth. Climate change, saltwater intrusion, and rising sea levels make this problem worse, continuing to threaten limited water supplies on small islands (Welsh K, 2022). Previously, many islands used drilled wells and built water pipes from other areas, but these water sources were both high-cost and unsustainable. Important sources of fresh water supply today are rainwater, and desalinated seawater at a considerable cost. Urbanization on the islands will increase pressure on freshwater supplies. Sustainable urbanization requires measures to address these issues, such as: Developing water management plans to tackle emergencies, as well as investing in sustainable solutions such as rainwater conservation and enhancement of green areas; Promoting regional and international cooperation programs to share experiences and effective solutions in managing freshwater resources on islands.

In addition, urban areas on the island also face the issue of effective wastewater treatment to protect the surrounding seawater environment. Urban development and manufacturing activities on the island can cause water pollution from waste, chemicals, and wastewater. An important solution when urbanization is carried out is to strictly manage the treatment and recycling of waste, promote water cleanliness, and apply environmental protection measures.

Fourth, islands are sensitive to climate change, natural disasters, and policies.

Islands are often highly sensitive to climate change, especially rising sea levels, storms, and climate change. The issue of climate change in islands has received special attention, which is also a factor that makes islands more noteworthy (IPCC, 2023) (Petzold J M. A., 2019) (Petzold J R. B., 2015). However, the relationship between climate change and urbanization in islands has not been mentioned much even though this creates special challenges in risk management and urban development.



Small islands are also often portrayed as vulnerable to external pressures, from colonization, geopolitical forces, rising sea levels, natural disasters, and resource scarcity, as well as internal pressures, including underemployment, population decline or overpopulation, resource diversification, and household livelihoods (G, 2018).

Fifth, the islands are home to a high level of biodiversity and many unique species.

Biodiversity in islands and coastal areas is of interest to many scientists (Güneralp B, 2013) (F, 2022) (A V. , 2008). Coastal areas and islands as well as large river systems are also the areas with high species richness and endemism (EO, 2002). In particular, tropical islands are known to have unique naturally varying ecosystems including tropical rain forests, open forests and grass savannas, freshwater lakes and streams, swamps and mudflats, forests mangroves and coastal forests, and seagrasses. Scientists also confirm that coral reefs are considered centers with the highest level of biodiversity on the planet (A V. , 2008). However, the process of urbanization with high levels of resource consumption has put great pressure on these ecosystems.

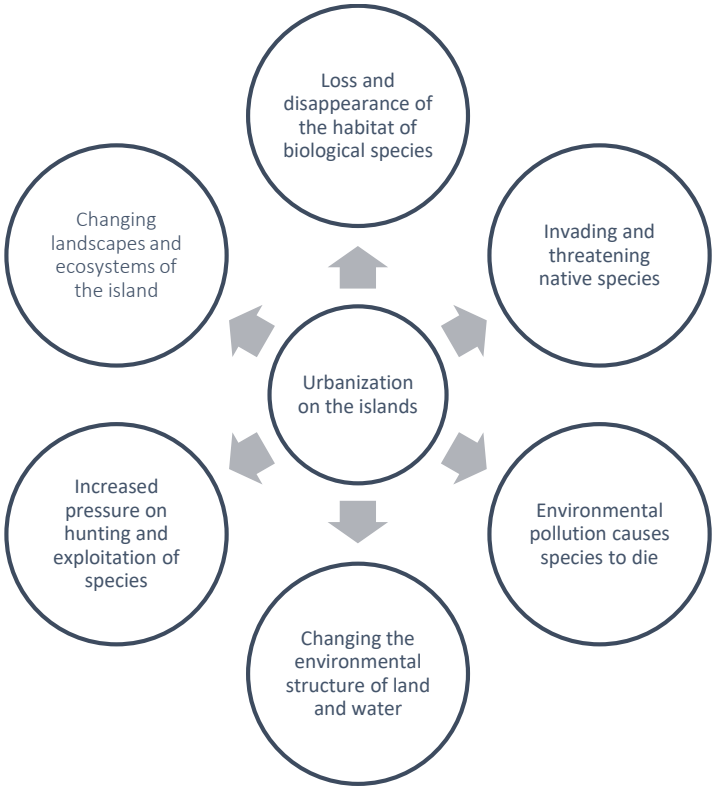


Figure 1: Impact of urbanization on the biological environment on the island

Sixth, the islands have unique cultures that need to be preserved and promoted when urbanization is carried out.

The islands, which were less affected by invasion, mass immigration, or political interference, have very unique cultures. Each island often has its distinct history, traditions, and language, enriching the world's cultural landscape. The unique elements of culture, such as traditional architecture, folk art, or special languages, can be considered part of world heritage. Preserving and maintaining these elements is important to creating a culturally rich and diverse world. Being aware of the value of the islands, UNESCO has had in-depth research programs on island culture. Typically, the study "Islands as Crossroads: Sustaining Cultural Diversity in Small Island Developing States" has researched the island cultures in the Pacific to preserve and recognize the culture of the islands (UNESCO, 2011). Research also confirms that the uniqueness of island culture has great significance for tourism development, but is also an important factor in resisting assimilation when the urbanization process takes place. The uniqueness

helps preserve and develop local customs, traditions, and principles. This is important for maintaining cultural identity and creating links between current and past generations.

To ensure that urbanization does not cause too great a loss of unique cultural characteristics, urban management needs to solve the challenge of preserving and stimulating the positive development of the local culture. Positive interaction between local communities, urban management, and non-native groups can create a sustainable development environment while preserving cultural uniqueness. Opportunities and challenges with island culture are shown as follows:

(1) Impact on the landscape and cultural heritage on the island:

New construction and landscape changes: New construction and changes to the urban landscape can affect unique cultural elements such as traditional architecture, and historical and cultural areas, causing loss and changes to the local identities.

(2) Enhance cultural exchange but also threaten to lose cultural identity:

Increased transportation and cultural exchange: Urbanization can create new opportunities for cultural exchange and increase cultural diversity, as island communities become exposed to more outsiders and adaptive to new cultural elements.

Pressure on tradition: Urban development can create pressure on the traditional cultural elements of island communities. Rapid changes and market pressures can lead to a loss of tradition and unique character.

(3) Create opportunities to develop tourism and promote culture:

Increased tourism: Part of the urbanization process can be the growth of the tourism industry. If managed properly, tourism can provide an opportunity to preserve and showcase the island's unique culture to the world.

3.2 Requirements for Future Island City Development

The documentary research has shown that a coastal city in general, and an island city in particular, must first be an urban area with the correct urban structure and function. The difference is that the island city has an organic interactive relationship with the marine space, an economy associated with the ocean, and a typical urban lifestyle associated with (salty) water, creating a marine cultural space; a marine environment that directly impacts the operations of the city. However, in the world of Vietnam, the sustainability issue for island cities is still a difficult problem that needs to be solved. Based on the review of documents, from the general perspective of geographical science, we can see the requirements for future island city development as follows:

(1) Island cities need to prioritize compactness and convenience in planning island cities to save space, reduce pressure on resources, and reduce carbon emissions.

Because the land area on islands and peninsulas is very small, priority should be given to planning compact, spatially multi-functional cities. On the other hand, large cities are the main factor behind the sustainability crisis. The sprawling reduces the affordability, livability, and sustainability of a city. This expansion will also require strategic investments in infrastructure, including transportation, energy systems, water and sanitation, housing, and climate resilience measures for coastal cities.

Promoting compact integrated development is a comprehensive approach to urban planning that enhances the efficiency, liveability, and sustainability of cities while contributing to the implementation of the 2030 Agenda. At the heart of Sustainable Development Goal 11 is the aspiration for livable and affordable cities and communities, characterized by inclusiveness, connectivity, resilience, safety, cleanliness, and a human-centered approach. Compact mixed-use developments are perfectly aligned with this objective by optimizing land use and integrating diverse functions within a limited space, thereby improving accessibility, resilience, and sustainability.

Table 1. Contribution to the sustainability of multifunctional integrated cities (Compact Cities)

Characteristics of Compact Cities	**Environmental benefits**	**Social benefits**	**Economic benefits**
Inner-urban traveling is shorter	Less CO_2 Less pollution from cars	More accessibility, less cost	Higher productivity due to shorter travel time (for workers, and civil servants)
Less dependence on cars and motorbikes	Less CO_2 Less pollution from cars	Lower transportation costs Greater mobility for those without a car	Improving human health due to more cycling and walking. Developing green jobs
Increased clean energy sources from local sources (Wind energy and solar energy)	Less energy consumption per capita and less CO_2 emissions	Reduction of household energy costs	Developing green jobs and technology Self-reliance on energy sources Reduction of energy costs for households
Optimized use of land resources, increased opportunities for rural-urban linkage	Preservation of agricultural land and natural biodiversity. Lower CO_2 emissions due to shorter distances for food to travel	Higher quality of life due to more recreational activities	Rural economic development (such as urban agriculture and renewable energy)

Source: *(UNI habitant - 2023)*

In the grand tapestry of urban planning, compact mixed-use developments have emerged as a compelling thread that ties the Sustainable Development Goals together. Fixing carbon emissions is an important goal for the islands in the future. Attention needs to be paid in many ways:

First, multi-use layouts help reduce the distance between home, work, school, and amenities, encouraging walking, cycling, and public transport, as well as reducing the dependence on personal vehicles. This helps ease traffic congestion, reduce carbon emissions, and improve air quality. Furthermore, compact mixed-use developments often incorporate green space and sustainable infrastructure, improving environmental sustainability and enhancing the resilience of urban areas.

Second, developing a compact city is a key to achieving carbon neutrality by improving energy and resource consumption. Compact, integrated, pedestrian-friendly, mixed-use cities consume less land and household energy and are more profitable for cities, residents, and businesses.

(2) Island city development needs to pay attention to the sustainability and resilience of cities in the face of natural disasters by wisely and reasonably using nature and modernizing cities with smart technology to develop smart cities.

Islands and coastal islands are sensitive areas to natural disasters and crises and sustainable development needs to consider the importance of cities and local economic development. These sectors contribute significantly to national and regional GDP by acting as a catalyst for economic recovery, stimulating overall economic growth, and infusing innovation into various sectors.

Enhanced sustainability associated with the management and protection of natural resources and the environment in and around the city will affect such factors as air quality, water resources, green spaces, and biodiversity, thereby impacting the resilience, sustainability, and livability of the city.

Additionally, to strengthen cities' capacity they need to utilize comprehensive and innovative digital infrastructure and solutions that will enhance city efficiency and connectivity through the deployment of innovative technologies such as smart city technology, data analytics, Internet connectivity, and digital platforms. Integrated transport modes and networks within cities provide mobility and connectivity through road and rail networks, public transport, and walking and cycling paths.

The resilience of cities and their ability to adapt, respond, and recover from shocks and stresses, disasters and environmental challenges requires strategies to mitigate climate change, prevent natural disasters, use energy efficiently, apply waste management properly, and implement comprehensive urban planning throughout all the steps and should take into account the physical infrastructure, construction environment, governance, technological solutions, and environmental management of the city. This is expressed according to the philosophy: "Relying on Nature - Suitable for land - Harmony of people".

(3) Island city development needs to pay attention to the design of green cities and ecological cities - Responding to climate change.

Green cities need to pay attention to three aspects: Green initiatives; green parks; and Strategically integrating wild natural environments into urban areas.

Firstly, green initiatives in buildings or households in limited island city space have been implemented through Green initiatives that have been carried out in some countries that need to be learned and implemented (Hong Kong, China). These initiatives provide recreational areas, improve air quality, and promote community engagement through gardening activities, aiming to increase the proportion of green space per person.

Second, increase tree cover in public areas. Pedestrian public social spaces in compact walkable mixed-use areas, such as squares, courtyards, and parks, promote social interaction by increasing the number of pedestrians as well as the number and variety of living, working, and playing activities in green areas.

Third, the strategic integration of wild natural environments into public spaces and neighborhoods will support outdoor living while enhancing the protection of the biodiversity and ecological environment of the islands, which serves for responsible and sustainable tourism development.

(4) Sustainable island city development must be associated with the protection of biodiversity, biosphere, and coastal ecosystems.

Maintaining biodiversity in cities is the basis for providing and maintaining the growing ecological services of cities (especially cultural, supply, and regulation services), promoting physical and mental health, and maintaining human connection with nature [10]. The quality as well as the quantity of urban nature is important to people and contributes to their well-being. Increasing biodiversity in urban environments is an important path to creating more liveable cities.

Urban conservation strategies are increasingly becoming part of the global urban agenda. The New Urban Agenda, a declaration from the third two-decade United Nations Habitat Conference on human settlements, calls for universal access to green spaces as well as conserving species in cities.

To protect the ecosystem and biodiversity of the islands during the urbanization process, it is necessary to use a combination of different measures:

Protecting biodiversity in islands during urbanization requires special attention to keep the natural environment and local species from being unduly impacted. Below are some measures that islands can take to protect biodiversity in the context of urbanization:

First, manage green spaces by preserving and expanding green areas, parks, and gardens to maintain the habitat for local species. Build and maintain a system of parks and public green areas.

Second, conservation of endemic species: Building special conservation areas to protect endemic species of animals and plants. In addition, carry out educational and propaganda programs for residents and tourists to raise awareness of the importance of preserving local and endemic species.

Third, it is necessary to control invasive species: Implement strict control measures to prevent the invasion of alien species, which can harm local biodiversity.

Fourth, it is essential to closely research and monitor biodiversity: Conduct local research to assess the status of biodiversity and monitor changes over time.

Fifth, establish a monitoring system to track environmental and biodiversity indicators. These measures require close cooperation between communities, local governments, and environmental conservation organizations to ensure a balance between urban development and biodiversity protection.

Urbanization of islands in particular requires attention to protecting coastal areas, coral reefs, and other biosphere systems to keep the marine environment healthy. Protecting *coastal ecosystems and the biosphere* during urbanization is extremely important in maintaining ecological balance and supporting the sustainable development of cities.

(5) Sustainable island city development requires maintaining and protecting freshwater sources according to ecological principles.

Water supplies for small islands usually originate from groundwater, surface water if available, desalination of seawater, or rainwater collection in limited quantities. However, freshwater resources on small island nations are becoming increasingly scarce due to limited supplies, climate change, rising sea levels, extreme events related to climate change, and population growth (Small C, 2003). In addition, islands often face major challenges in water resources due to limited land area and heavy dependence on groundwater resources. To ensure a stable water source on the islands, it is necessary to implement sustainable measures for water management and use.

Specific measures that need to be taken include:

Build a rainwater collection system: Islands often receive significant rainfall, so installing a rainwater collection system can be an important source of water.

Use a water pipe system to transfer rainwater from the surface of the island to tanks or reservoirs.

Manage land use to minimize water use and loss: Develop intentional urban planning to ensure a balance between urban development and protection of important water resource areas, such as groundwater and coastal conservation areas. Limit the loss of large areas of land through urban development and minimize the impact of construction projects on water sources.

Optimize water use: Apply water-saving technology in infrastructure and construction. Use water-saving equipment and systems in households, businesses, and public facilities. Promote educational campaigns to increase awareness of the importance of saving water and reducing wastewater.

Wastewater treatment and reuse: Build a wastewater treatment system to reuse water for purposes such as watering plants, cooling, or for industrial needs. Optimize wastewater treatment to minimize toxic impacts on the environment.

Implement sustainable water management and resources: Develop a sustainable water management plan, including monitoring water quality and water availability. Build drought-resistant infrastructure and manage water resources intelligently.

Community and international cooperation: Cooperate with communities and international organizations to share experiences and funding to improve water management. Participate in international projects on water resource management to learn and apply effective methods.

(6) Sustainable island city development needs to be community-centered, associated with preserving local features to create a unique and sustainable urban area.

Urbanization in Asia as well as Vietnam is strongly threatening local culture, causing the loss of "*the soul and identity of the city*" because cultural identity is the summation of traditional experiences that have existed in harmony with the nature of many generations of islanders to adapt, survive and develop their livelihood and maintain the longevity of their habitat. The impact aspects include:

Degradation of local culture: Construction and urban development can lead to the loss of traditional areas and historical sites, thereby reducing the unique cultural value of the island. Changes in architecture and urban planning could alter the island's cultural landscape.

Cultural dissolution and loss of cultural identity: Urbanization often brings about cultural interference as island communities encounter off-islanders and urbanizing elements. Cultural interference can create diversity and creativity, but can also pose challenges in preserving and maintaining traditional cultural values.

Changes in lifestyle and community values: Urbanization often comes with changes in lifestyle, education, and community values. This change can affect educational curricula, and living standards, and create new forms of entertainment.

Urbanization requires strict cultural preservation, creating the soul and nuance for the city in the following aspects:

Protecting cultural heritage: Identifying, preserving, and protecting the island's historical relics, ancient architecture, and unique cultural traditions. Develop policies and measures to prevent the destruction and replacement of important cultural monuments.

Sustainable development: Build and develop urban projects sustainably, integrating with the natural and cultural landscape of the island. Use traditional architecture and construction techniques to preserve cultural identity and reduce negative impacts on the environment.

Encourage sustainable tourism: Develop a sustainable tourism industry, focusing on introducing and preserving local culture. Support community tourism activities and cultural experiences to generate income for local communities.

Promote local arts and culture: Support local arts and culture events to increase cultural awareness and shape the identity of the community. Encourage creativity and community participation in cultural activities.

Education and awareness raising: Organize educational programs to increase awareness of the value of cultural heritage and its important role in urban development. Support educational activities about the island's traditional culture and history.

Enhance community cooperation: Create opportunities for local communities to participate in the urban planning and management process. Support community projects and initiatives that aim to preserve and promote cultural heritage.

Cultural preservation not only preserves local identity but also creates a developed and sustainable living environment. Urban development in the islands can highlight local cultural and historical characteristics while preserving and respecting these values.

(7) Sustainable island city development needs to be associated with ensuring national defense, security, and territorial integrity.

In the past and an increasingly tense context with territorial sovereignty disputes, it has been proven that island city construction and development not only plays an important role in providing basic services to the people but also ensures security, defense, and territorial integrity. The existence of island cities has affirmed the sovereignty of a country or territory. In island cities, there are legal regulations so that outside countries cannot interfere. Local communities and local knowledge play an important role in governance, ensuring national defense and security and asserting sovereignty over seas and islands. Illustrative of these interests is the case of the Knights Hospitaller, who exploited the limited spatial reach of the Maltese archipelago to maintain authoritarian internal rule while implementing a policy of pro-foreign support with high intervention. Later, the exploitation of the political benefits of island city development was evident in the formation of diverse urban areas such as Lagos, Mumbai, São Vicente, Stockholm, and Tenochtitlan.

In addition, depending on the specific conditions in different coastal cities and island cities, military bases and centers can be established to control airspace and sea areas, check the activities of ships and boats, ensure national defense and security, build the economy, protect the sovereignty and territorial integrity of the Fatherland. Illustrative of this benefit is the case of Copenhagen's first castle (later Denmark's royal palace) built on the offshore island of Slotsholm which was expanded and fortified in the 12th century, or Tokyo's Edo castle, Belize's George Fort, St Petersburg's Zayachy Island.

Vietnam's history of building and defending the country has shown that most of the attacks that invaded Vietnam were launched from the sea. In addition, in recent times, the situation of disputes over sea and island sovereignty in the East Sea has become fierce and drastic, with many potential risks of causing instability, directly threatening peace, stability, independence, sovereignty, territorial integrity, national security at sea and from the sea direction. Therefore, developing island cities to ensure national defense, security, and territorial integrity is the traditional task of the Vietnamese people.

4. CONCLUSION

Island city development brings both opportunities and challenges in forming sustainable, independent yet inclusive cities. In the context of increasingly important island city development, ensuring national defense, security and territorial integrity on island city areas requires attention and sustainable investment. By considering the unique geographical features of islands, policymakers, planners, and stakeholders can design innovative solutions that improve quality of life, protect natural resources, and promote economic prosperity. Through integrated planning, sustainable infrastructure, community engagement, and policy innovation, island cities can become models of excellence in urban development. By embracing emerging trends, adopting best practices, and learning from successful case studies, island cities can overcome the complexities of urbanization and achieve a harmonious balance according to the philosophy of "Relying on Nature - Suitable for land - Harmony of people".

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