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Elena Valionienė, Erika Župerkienė

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PORT-CITY CULTURAL INTERACTION'S INFLUENCE ON THE SUSTAINABLE COASTAL DEVELOPMENT

Elena Valionienė^{1,2}, <https://orcid.org/0000-0002-0846-9239>

¹Klaipeda University, elena.valioniene@ku.lt

²Lithuanian Maritime Academy, e.valioniene@lajm.lt

Erika Župerkienė³, <https://orcid.org/0000-0002-1505-0962>

³ Klaipeda University, erika.zuperkiene@ku.lt

Abstract

In the context of sustainability, ports are often emerging points of contention involving stakeholders from the maritime industry, local government, and communities. Effective communication and the nurturing of maritime culture can act as a powerful fusion for facilitating information exchange between ports and cities. A well-established communication channel is crucial for sharing knowledge, actions, experiences, and cultural values, thus contributing to the successful development of a port. The research posits that incorporating cultural elements can provide an additional dimension to sustainable development and resilience research, particularly within the realm of port organizational resilience and sustainable progress. Particular emphasis is given to small and medium-sized ports, as they are disproportionately impacted by the influence of ports on their surrounding social communities due to the intricate connections among culture, heritage, and environmental factors. This investigation focuses on cultural interactions between ports and cities with the aim of understanding their effects on sustainable development in medium-sized port cities and their coastal regions. The research objectives include defining port-city interaction, situating it within the context of sustainable development in coastal areas, outlining the cultural aspect of such interactions, and suggesting pathways to enhance the sustainability of coastal regions through improved cultural exchanges. The research employs a theoretical approach, systematically exploring concepts, theories, and existing knowledge to provide a strong foundation for the investigation. The results underscore the significance of integrating culture into port-city dynamics to bolster sustainable development and resilience in coastal regions. To achieve this integration, adopting cooperative or entrepreneurial business models for port authorities and enhancing municipal participation in port governance structures are suggested. Culture, as dynamic influencer, shapes communication, organizational environments, and contributes to achieving Sustainable Development Goals. Evolution paths of port-city interactions not only enhance socio-environmental aspects but also pave the way for long-term sustainability and excellence in coastal regions.

Keywords: port-city interaction, cultural interaction, sustainable development, coastal regions, resilience of ports.

JEL classificatory: L25, L32, M14.

Résumé

Dans le cadre de la durabilité, les ports sont souvent des points de controverse impliquant les parties prenantes de l'industrie maritime, les autorités locales et les communautés. Une communication efficace et le développement de la culture maritime peuvent former une combinaison puissante pour faciliter l'échange d'informations entre les ports et les villes. Un canal de communication bien établi est essentiel pour partager les connaissances, les actions, les expériences et les valeurs culturelles, contribuant ainsi au succès du développement d'un port. La recherche postule que l'intégration d'éléments culturels peut apporter une dimension supplémentaire à la recherche sur le développement durable et la résilience, surtout dans le domaine de la résilience organisationnelle des ports et du progrès durable. Une attention spécifique est accordée aux ports de petite et moyenne taille, étant donné qu'ils sont particulièrement affectés par l'influence des ports sur les communautés sociales environnantes en raison des liens complexes entre la culture, le patrimoine et les facteurs environnementaux. Cette étude se focalise sur les interactions culturelles entre les ports et les villes dans le but de comprendre leurs impacts sur le développement durable des villes portuaires de taille moyenne et de leurs régions côtières. Les objectifs de la recherche sont de définir l'interaction port ville, de la replacer dans le contexte du développement durable des zones côtières, de mettre en avant l'aspect culturel de ces interactions et de proposer des pistes pour renforcer la durabilité des régions côtières via l'amélioration des échanges culturels. La recherche adopte une approche théorique, explorant de façon systématique les concepts, les théories et les connaissances existantes pour poser des bases solides à l'enquête. Les résultats soulignent l'importance de l'intégration de la culture dans la dynamique des villes portuaires pour renforcer le développement durable et la résilience des régions côtières. Pour atteindre cette intégration, il est proposé d'adopter des modèles d'entreprise

coopératifs ou entrepreneuriaux pour les autorités portuaires et de renforcer la participation des municipalités dans les structures de gouvernance portuaire. La culture, en tant que facteur d'influence dynamique, modèle la communication et les environnements organisationnels, contribuant à l'atteinte des objectifs de développement durable. Les trajectoires d'évolution des interactions ville-port améliorent non seulement les aspects socio-environnementaux, mais ouvrent également la voie à la durabilité à long terme et à l'excellence dans les régions côtières.

Mots-clés: interaction port ville, interaction culturelle, développement durable, régions côtières, résilience des ports.

Classification JEL: L25, L32, M14.

Introduction

Culture has become crucial in shaping policies for sustainable development and resilience. It drives urban projects that promote cultural diversity and leverage creative initiatives for environmental sustainability and organizational strength. Within Europe, culture plays a strategic role in sustainable development policies (CCIs, 2018; KEA, 2017). Cities can align cultural preservation with climate change strategies by using established national and regional frameworks (Daldanise, Clemente, 2022). Cultural methods provide valuable insights, models, and holistic perspectives for decision-makers and citizens in climate change adaptation and sustainable urban development, especially in coastal and port cities. Research has explored the links between consumer behaviour, climate change, and culture across arts, social sciences, and humanities, with climate change stories prominent in recent research (Tyszczyk, Smith, 2018). These stories are shared across various media, including social networks, news, literature, theatre, and museums (Painter et al., 2016).

The maritime transportation sector is crucial for economic growth and is deeply connected to the culture and heritage of coastal regions. In evaluating sustainable and resilient organizational ecosystems, the cultural aspect is as important as technological and economic factors. Research has shown that different governance patterns and business models significantly affect the efficacy and appeal of ports (Valionienė, Župerkienė, 2023). A key factor in a port's attractiveness is its interaction with cities, crucial for regional coastal development and sustainability (Valioniene, 2020). Therefore, examining the relationship between ports and cities is imperative. This study includes an assessment of cultural and heritage aspects, which develop through port-city interactions, enhancing coastal regions holistically. Ports influence the well-being and quality of life in cities, while also presenting spatial, social, and environmental challenges. They transform cities from a socio-economic-technological framework to a socio-cultural one, significantly contributing to social and cultural development. Despite the focus on logistical, technological, and economic interactions in port governance, the cultural element remains underexplored. Yet, this cultural interaction is vital for sustainable coastal development.

The research idea postulates that the cultural component can serve as an additional dimension within the frameworks of sustainable development and resilience enhancement research, specifically within the domain of port organizational resilience and sustainable development. This notion hinges on the establishment of a well-functioning relationship between the governance of the port and the local governance of the port city. Notably, substantial attention is directed towards small and medium-sized ports, as these entities are particularly susceptible to the influence of the port on the surrounding social communities, owing to the intricate interconnections among culture, heritage, and environmental conditions. Several factors underscore the need for an analysis of the interaction between small and medium-sized ports and city governance. Firstly, as it is presented in the research of Z. H. Munim and H. J. Schramm (2018) medium-sized port cities exhibit robust infrastructural integration with port activities, leading to a strong dependence of the residents' quality of life on the quality of port operations in the context of economical growth. Furthermore, medium-sized port cities typically possess more limited financial resources for supporting and compensating the disadvantages associated with port activities. Moreover, these smaller cities and ports tend to be less attractive to potential investors, resulting in slower development of technological innovations aimed at improving the quality of life for residents compared to their cosmopolitan counterparts. Consequently, these disadvantages can manifest as active resistance to new port projects, and in some instances, even transform into proactive measures aimed at impeding the progress of such projects and diminishing their prospects. This often culminates in conflicts involving various stakeholders in the port-city interface.

The subject of this study centres on the cultural interaction between ports and cities. The overarching research goal is to explore the impact of port-city cultural interactions on the sustainable development of medium-sized port cities and their associated coastal regions. To this end, the research is guided by specific objectives, which include elucidating the concept of port-city interaction and situating this interaction within the broader context of sustainable development in coastal regions. Furthermore, the study aims to delineate the cultural component

within the framework of port-city interaction and, subsequently, to propose potential trajectories for the development of port-city cultural interactions that could enhance the sustainability of coastal regions.

The research methodology employed in this study adheres to the methodological principles of a theoretical approach. This approach encompasses the systematic exploration of concepts, theories, and existing knowledge within the chosen domain, thereby providing a robust foundation for the investigation.

1. Port-city interaction's role in the field of sustainable development of coastal regions

Ports are main export and import node for the implementation of goals of international trade and integration to the global supply by keeping high level of connectivity and creation benefits for national economy. But also, ports are some organizational ecosystems which are highly complex and have complex environment, starting from their microenvironment, and going through the mezzo, macro, mega and giga environment because port organizational ecosystems are multilayered complex organizational ecosystems combining a big amount of private and public capital players with the aim to be highly involved in global supply chain (Valionienė, Župerkienė, 2023). From this perspective it is useful to develop the functioning of these organizational ecosystems for the gaining of maximal benefit for the national and regional economies. Problem will arise in the cases than the port cities are not capitals and centres of countries and port cities are in a distance from main transport corridors or from the central governance because the potential conflict of interests will arise between the benefits and negative impact on national and regional levels. It is very important in small and middle-sized port cities developments where material and human resources are limited and where social role of society is very high and expectations from port activities are also high not only in the economic domain, but also in the environmental and cultural heritage domains (Notteboom et al., 2022). These domains and their integration become more actual in the climate change context and in the context of environmental challenges in the form of high uncertainties (Lees et al., 2023). And this integration allows to analyse the problem of coastal regional development and keeping resilience which is strongly related with the conditions of living quality in the areas nearby the port including natural not hazard functioning of surrounding natural ecosystems. It is important to mention that the sustainability and resilience are like direct two-sided patterns of human behaviour and organizational functioning: sustainability for the keeping the stability in surrounding environment and the resilience to keep balance inside organizations in the conditions of uncertainties in the external environment. These conditions could be found also in the newest research on the interaction between urban territories and ports where question about sustainable and resilient development of coastal regions are investigated, and usually only negative impact of port activities is analysed (Oniszczyk-Jastrząbek et al., 2018) especially on the regional level where relationships between port and port city's communities are stronger. So, ports become a line of confrontation and many projects develops slower or not develops at all because the strong negative position of communities or opposite.

Numerous cities worldwide maintain a symbiotic relationship with their port complexes, which have historically shaped their development (Daldanise, Clemente, 2022). Cities' economic vitality is closely linked to ports, providing employment and access to global markets (Hein, 2016). Harbour areas, close to urban activities, offer dynamism and potential conflicts, requiring collaboration between the port and city to mitigate social and environmental issues (Juggie, 2014). Recently, there has been a growing divergence between ports and cities due to globalization and containerization. Factors include terminal relocation, labor requirements, security concerns, labor internationalization, and improved inland accessibility. Ports now seek more space and waterways, resulting in terminal relocations where mid-sized cities and ports operate. Automation reduces labor needs, aligning ports with global supply chains and distancing them from urban areas, which results in environmental challenges (Notteboom et al, 2022). Ports need public trust and support for expansion, known as a social license to operate (Girard, 2013; Moeremans, Dooms, 2021). Paradoxically, the same processes causing detachment between ports and cities have opened opportunities to rejuvenate neglected port areas, deepening interdependence between communities and maritime businesses (Girard, 2013) because port activities significantly impact environmental ecosystems, accounting for about 60% of all negative impacts (Miola et al., 2009).

Detailed point of view, presented in research of A. Oniszczyk-Jastrząbek et al. (2018), allows to make some assumptions for the future research on the sustainability of port development. First of them, that activities could be optimised by their negative impact's nature: for example, the port expansion projects could be developed together with the waste management problems' solving with the integrated infrastructural decisions on waste management because these activities have almost the same negative impact measured by the same criteria. But

infrastructural development strongly relies with the need to rejuvenate city's infrastructure if the logistical connectivity and waste management and disposal problems are solving as the example. Second assumption is related with living conditions citizens, especially in the field of air pollution and congestions in the city, but these problems effectively could be solved in cooperation with the municipalities because their fields of interests are interconnected in this field. And third assumption is related with the pressures from global business and public organizations in the form of green logistics, circular economy principles, strict environmental regulations, intensive evolutions of port and digital technologies influencing progress of automation etc.

As it could be seen these three assumptions are related with the complexity of port organizational ecosystem's environment: first assumption is located inside the ecosystem in the micro and mezzo environment of port ecosystem. Second one is transmitted to the regional level or national level and defined in the macro environment. Third assumption is going to the mega and giga environment because describe problem on the global supply chain level (Valionienė, Župerkienė, 2023). And based on the pressures for the sustainable development and resilience of port organizational ecosystem also are going from the local business working in the port, from the surrounding territories and citizens, from the national economies, from the international business community and other global conditions such as climate change, sustainable development in all areas of human life, social responsibility, global digitization and automation, and other global processes. And the nature of the citizens and global communities are very clear, because air and water pollution decrease the quality of life in port cities and negatively influence the diversity of natural ecosystems and in this way the negative impact is felt in not only in port cities but in all coastal region and worldwide. And these assumptions allow to describe the importance of port and city interactions not only for the integrated and sustainable infrastructure development, but also for the protection of natural ecosystems and citizens wellbeing and ensuring the sustainability of development the green logistical supply chain's connectivity for the economic benefit ensuring on the national level.

For the development of the port and city interaction the sustainable development goals and ideas should be revised. The sustainable development goals refer to the wide area of human life and activities and 17 goals are published in the United Nations' prepared sustainable development goal declarations. It could be seen at least half of SDGs could be directly related with port organizational ecosystem activities, other have indirectly relationship with the influences of port activities on social systems of environment. And all of them are placed in other documents, which are prepared on the base of SDG action 2030 plan according to circular economy principles and are detailly explained in the blue economy framework and green port conception, including circular green logistics phenomenon (United Nations, 2015). Main principles of blue economy present the importance of port and city interaction for the implementation of SDG in maritime transportations and for the resilience enhancement of the whole coastal region. Principle „to recognize that the maritime and land based economies are interlinked and that many of the threats facing marine environments originate on land“ (WWF Baltic ecoregion programme, 2016). be as start point for justification of the need to develop port-city interaction. This point of view enables not only port and city cooperation on the creation and development legislative field, but also in the sharing knowledge, information, practices for all stakeholders including citizens and nongovernmental organizations. Other principles of blue economy also create preconditions for the port and city interaction's development:

- create a level economic and legislative playing field with an adequate incentive and rules;
- set clear, measurable, internationally consistent goals and targets;
- assess and communicate the performance;
- develop and apply standards, guidelines and best practices that support a Sustainable Blue Economy;
- plan, manage and effectively govern the use of marine space and resources, applying inclusive methods and the ecosystem approach;
- actively cooperate, *sharing information, knowledge, best practices, lessons learned, perspectives, and ideas*, to realize a sustainable and prosperous future for all.

Such type of recognition of these principles enables not only port and city cooperation on the creation and development legislative field, but also the sharing knowledge, information, practices for all stakeholders including citizens and nongovernmental organizations. And as it could be seen in these main principles of blue economy the sustainable development of maritime business and transportation is related with the recognition, creation, setting, assessing, development and application, planning, managing, governing, cooperating, and

communicating actions. And these actions could be called as the predictors for the port-city interaction's development for the enhancing resilience of coastal regions on the base of implementation of SDG.

Combining previous research definitions of port-city interaction (Verhoeven, 2010; Warsewa, 2017; Sacco et al., 2018; Hein et al., 2021; Vroomars et al., 2022) shows that the port organizational ecosystem, driven by port authority (PA), is interlinked with surrounding natural and social urban ecosystems through territorial and functional principles. This relationship can be measured by its impact on coastal region stability. The interaction is visualized in Figure 1, illustrating ports as organizational ecosystems within the context of adaptive complex systems theory. This theory describes maritime transport ecosystems as networks of interconnected business and public units working cooperatively to ensure high logistical connectivity in global supply chains, maximizing benefits and creating added value for stakeholders. Ports and cities, as ecosystem stakeholders, have individual and shared interests. Previous research indicates that effective governance and sustainable development in maritime transport are highly dependent on strong port-city relationships, which enhance coastal region resilience. The added value results from effective port-city interaction and integrated development.

According to J. Vroomars et al. (2022), a conflictual relationship serves as a prerequisite for changing development strategies and fostering effective symbiotic relationships, as depicted in Figure 1. This figure illustrates an overlap of interests between the port and city in development projects where expansions are planned, typically arising when the port seeks hinterland expansion and the city seeks foreland expansion. This intersection provides an opportunity for interaction between the city and the port. In symbiotic relationships, conflicts may arise whenever developments encroach upon shared interests, necessitating discussions to mitigate risks. By aligning their development directions and creating an integrated strategy, as proposed by J. Birkman et al. (2016), J. H. Juggie (2016), and J. M. P. Sanches (2019), conflicts between the port and city can be minimized, ultimately enhancing the resilience of coastal regions. Effective cooperation between the port and city supports sustainable development of regional business and social ecosystems in harmony with the environment, aligning with strategic frameworks such as the blue economy, sustainable development goals, and national and international environmental regulations.

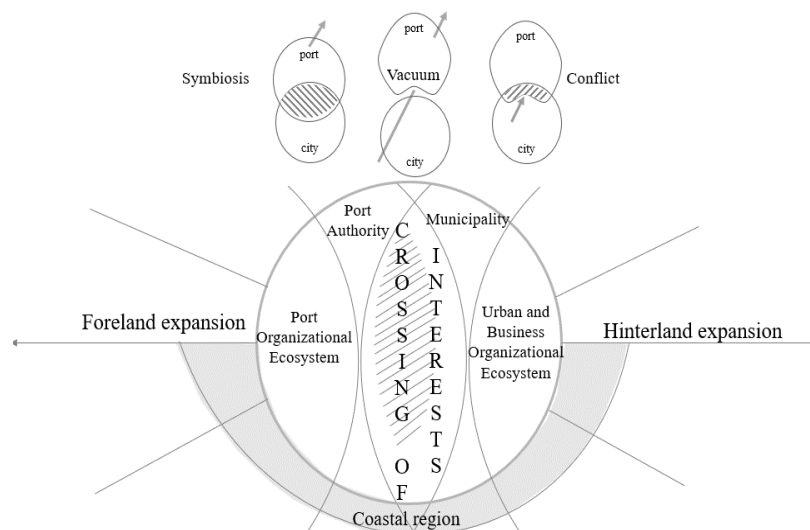


Figure 1. Definition of port and city interaction in the context of sustainable development (Comtois, 2014; Juggie, 2014; Vroomars et al., 2022)

By resuming the effective communication and cooperation between ports and cities play a critical role in addressing conflicts and promoting sustainable development goals (SDGs) within the framework of the blue economy. By adopting modern and comprehensive models for port sustainability and resilience, conflicts can be resolved while incorporating the interests of port cities and their inhabitants. Conversely, enhancing the infrastructure and social aspects of port cities should consider the needs of the port's organizational ecosystem, its businesses, and residents. Through improved communication and experience-sharing mechanisms, conflicts between citizens and port activities can be minimized, fostering better collaboration for sustainable development. Cultural interactions between ports and cities serve as channels for exchanging information and knowledge, aligning with the principles of the blue economy. This interaction not only enhances feedback mechanisms but also promotes the sharing of information crucial for sustainable development. The

interconnectivity within the port organizational ecosystem emphasizes the importance of communication functions in fostering effective collaboration. Evaluation of these interactions can be facilitated through established indicators that encompass various aspects such as recognition, creation, assessment, governance, and cooperation between ports and cities.

2. Explanation of the culture component in the port-city interaction's context

Researchers emphasize the vital role of effective communication and maritime culture in facilitating information exchange between ports and cities (Merk, Dang, 2013; Sanches, 2019; Kowalewski, 2021; Vroomars et al., 2022). Cultural aspects are evident in studies exploring global sustainable development regulations (Hanson et al., 2011; Chiu et al., 2014; Jugovic et al., 2021; Krosnicka et al., 2021), port governance patterns (Serry, Loubet, 2019; Valionienė, 2020; Loubet, Serry, 2022; Notteboom et al., 2022), business excellence (Valionienė, Župerkienė, 2023), and consumer behaviour (Girard, 2013). Viewing the port as an organizational ecosystem highlights the cultural element as a crucial link through organizational culture and maritime heritage, with each unit contributing to a comprehensive ecosystem understanding.

Indicators identified by Merk and Dang (2013) include port and port-city development, transportation, research, spatial planning, environment, and communication. Effective port and city interactions involve enhancing port functions in municipalities, reacting to uncertainties collectively, diversifying the economy in maritime regions, establishing coordination committees for sustainability, and fostering cooperation in maritime activities. Communication is underscored as a foundational pillar for successful interactions, encompassing cultural events, dissemination channels, collaboration with maritime institutions, water tourism development, and projects promoting maritime culture on various levels.

Analysing the Sustainable Development Goals (SDGs) reveals the essential role of the cultural component in sustainable port-city development, influencing coastal sustainability and resilience across all goals (United Nations, 2015). Specifically, four SDGs outlined in Table 1 hold significance for small and medium-sized ports within this research context. The SDGs provide direct guidance for implementing sustainable development projects, highlighting the importance of the cultural and heritage component. The interplay between SDG orientations for cooperation between municipalities and ports and the SDG's cultural component underscores the cultural aspect's importance in fortifying port-city interaction for the resilience of port activities and coastal regions.

Table 1. Aims of sustainable development goals representing cultural components and their importance

Sustainable development goals	Aims and actions
SDG 8 Decent work and economic growth	Emphasizing policies supporting productive activities, decent work creation, entrepreneurship, and innovation
SDG 9 Industry, innovation, and infrastructure	Connects ports and cities through resilient infrastructures, industrialization, and environmentally friendly technologies
SDG 11 Sustainable cities and communities	Addresses urban transformations, emphasizing cultural and natural heritage for minimizing the impacts of urban agglomerations
SDG 14 Life below water	Underscores the sustainable management of ports and logistical activities

Source: United Nations, 2015.

Additionally, the "Agenda 2030" by the "Association Internationale Villes Et Ports (AIVP)" further emphasizes the cultural component in sustainable development. Ten goals within this agenda, linked to 46 actions, underscore the significance of port culture and identity. This includes fostering a sense of belonging within the city-port community and promoting cultural and recreational services for residents near ports, strengthening the port-city interface. Effective interaction between port and city authorities, as outlined in the document, facilitates support for institutions to develop projects and strategic plans that promote sustainable development by reinforcing the port-city interface through community engagement with culture and regional heritage (AIVP, 2020).

Culture, viewed through the lens of C. Hein (2016) and M. Kowalewski (2021), is a versatile element ingrained within organizational and social networks, serving as a vital asset for sustainable development. Beyond traditional stereotypes, culture encompasses visual representations, symbols, and narratives, significantly shaping human behaviour and influencing daily life, business practices, and community interactions, fostering cooperation for sustainable growth. Trends focusing on climate change adaptation and scientific integration manifest in creative cultural endeavours for sustainable urban progress, leveraging collaborations with artists

and musicians to promote sustainable choices and citizen engagement in environmental policymaking (WCCF, 2018). These actions emphasize the pivotal role of culture in decision-making processes for coastal region sustainability, particularly in small to medium-sized cities with robust community-business relationships.

Research by Guo et al. (2020), Cerreta et al. (2021), and Vroomars et al. (2022) underscores the importance of culture in decision-making for port-city planning, particularly in medium-sized port-cities where local communities actively participate in governance processes. Culture emerges as a driving force behind collective actions within communities, businesses, and governance structures, influencing sustainable development outcomes.

Studies by Sacco et al. (2018), Tyszczyk and Smith (2018), and Lees et al. (2023) highlight the impact of integrating cultural and natural values on coastal sustainability. This integration enhances the connections between ecological and social functions within ecosystems, promoting environmentally conscious lifestyles and fostering a culture of sustainability and consumption. The cultural aspect in governmental interactions shapes individuals' understanding of their environment, influencing decisions and behaviours in the region.

In summary, culture plays a pivotal role in connecting individuals to their surroundings and fostering cohesion, community, and collective actions. This underscores the mutually reinforcing nature of port and city interaction, serving as a tool for integrating natural and cultural values among port, foreland and hinterland, municipal representatives, and the broader regional society. These integrated values illuminate the connections between ecological and social functions of the landscape, promoting environmentally friendly practices and lifestyles (Appadurai, 2013; Sanches, 2021). Ultimately, these factors contribute to the promotion of sustainable development, not only within ports and cities but across entire coastal regions.

3. Port-city cultural interaction's development scenarios for the sustainable coastal development

The study of port city cultures invites researchers to reconceptualize 'culture' beyond its association with bounded communities and systems of thought. We argue that culture is not solely located in the collective social identities of port cities and citizens but also in the spatial and infrastructural characteristics shaped by port authorities. These authorities are responsible for the development and utilization of port infrastructure, including connecting infrastructures with port cities, driving sustainable usage within the context of coastal resilience. Given the social histories of spatial and infrastructural developments in port cities, it is crucial to expand the concept of 'infrastructure' to encompass social, regulatory, and technological features. This holistic approach is necessary as culture is viewed as a hybrid component traversing social networks, connecting internal organizational and external social cultures within the port community. Culture is embedded in material and spatial practices, where creativity and responsibility play essential roles as elements of a culture of sustainability, serving as a key resource for future development and ensuring coastal resilience. In addressing the challenges of port city futures, culture must be considered to include all material and spatial practices, visual representations, symbols, values, and popular narratives relating to past, present, and future port-city transformations. This inclusion could be presented in the business model of PA under the different levels of expanded functions' realisation (Fig. 2).

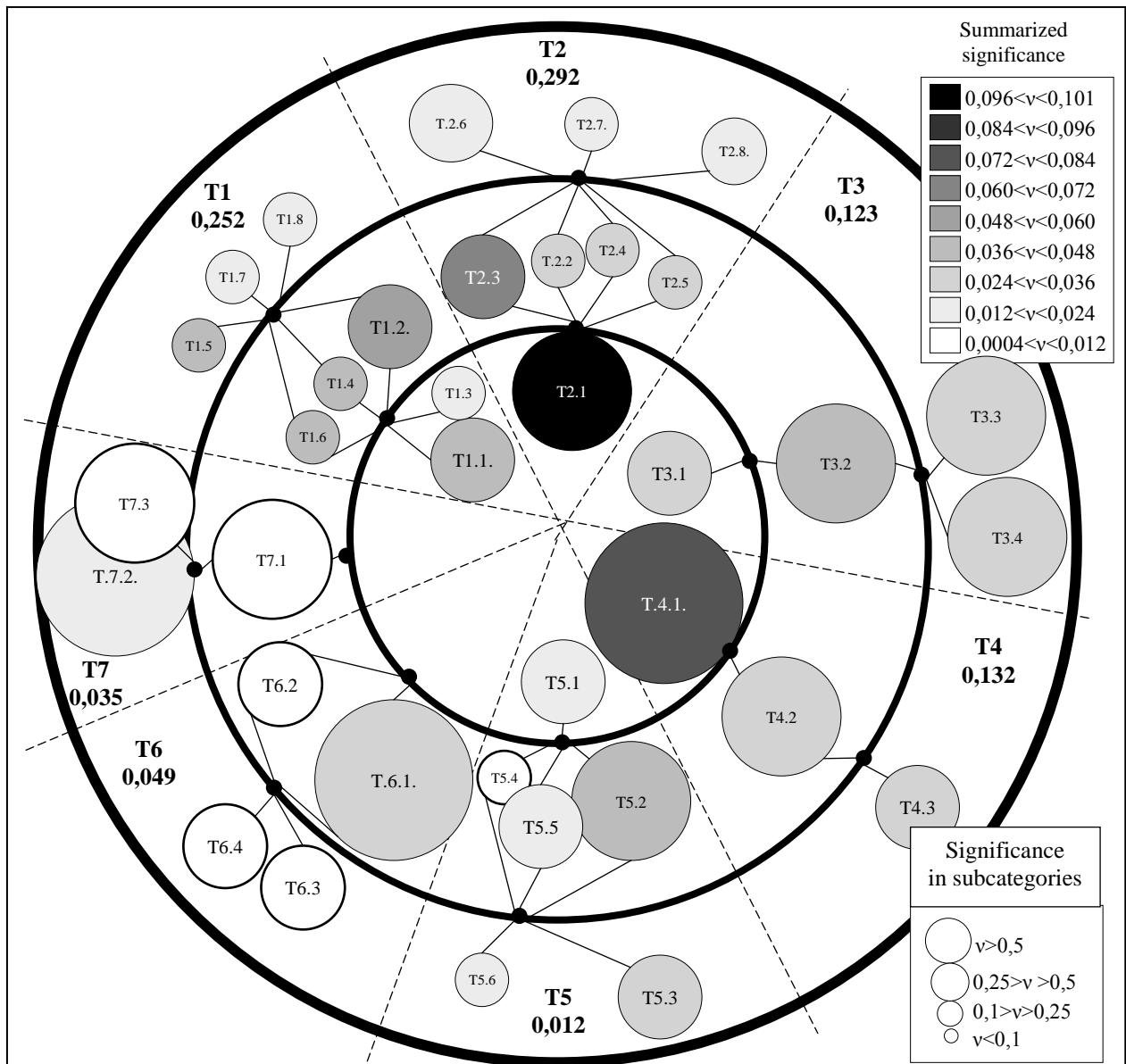


Fig 2. Empirical business model of port authorities according to mapped functions by their significance (Valionienė, Župerkienė, 2023)

Based on the research by E. Valioniene (2020), the business model of Port Authorities (PA) was developed using various approaches. This model is composed of three hierarchical levels (refer to Fig. 2): the local business model, also known as the fundamental or conservative business model (inner circle in Fig. 2); the regional business model, also referred to as the cooperative business model (middle circle in Fig. 2); and the global business model, also known as the entrepreneurial business model (outer circle in Fig. 2). In constructing this model, the core functions of the PA were categorized into six groups across these three levels: T1 - infrastructure development, T2 - revenue assurance from asset exploration, T3 - policy implementation, T4 - revenue assurance from regulatory activities, T5 - concession policy implementation, T6 - economic dimensions of community interaction, and T7 - social dimensions of community interaction. It is important to mention that collections of parameters were constructed on the basis of previous researches and theoretical approaches.

As presented in Figure 2, different activities are assigned to each category and classified according to the PA business model parameters. The study was conducted between 2019 and 2020, utilizing a combined methodology that incorporated multi-criteria decision-making techniques such as the Analytical Hierarchy Process (AHP) and Grey Relational Analysis (GRA) to evaluate the significance of all PA business model's functional parameters. All of them are presented in circles in figure 2. There could be seen two types of weights:

the circle size indicating the significance within each category (T1 to T7) and the circle colour signifying the cumulative weight across all parameters, where the weight value ranges from 0 to 1.

In the context of infrastructure development (T1), the convergence of interests creates an opportunity to strengthen interactions based on sustainable development principles within regional contexts (T1.5). This entails a collaborative approach between two organizational ecosystems, each operating within their respective spheres of activities and interests. While municipalities have broad access to communities through local governance functions that encompass various projects like infrastructure development, spatial planning, and urban area enhancements, the port ecosystem functions under an entrepreneurial model that consolidates all three levels of business models depicted in Figure 2. The entrepreneurial nature of the PA model expands capabilities through communication and cooperation channels (T6 and T7) from economic and social standpoints, promoting comprehensive development extensions in the communication realm and establishing a basis for cultural interconnectedness.

It is also important to mention that in the majority of success stories, the port governance model included municipal representatives in the management structures, or the ports operated under the municipality port governance pattern. This implies that representatives of local authorities need to be included in the governance of the port organizational ecosystem for the creation of co-development projects. It signifies that culture in these entrepreneurial models could be connected through participative authority functionality.

As found in the research on port governance effectiveness and port attractiveness (Valionienė, 2020), the communication factor is an important element for the implementation of the entrepreneurial PA's business model, and participative, active, and effective communication (T6 and T7 categories in figure 2) plays a special role in increasing maritime attractiveness for all stakeholders, including the society of coastal regions. It means that successful port development could be possible by creating a properly working communication channel for the knowledge, actions, experience, and culture sharing through the cooperative and/or entrepreneurial business models because components of cultural communications are located in categories T6 and T7 which have no implementations in the fundamental conservative PA business model. Maritime culture and cultural components from their economical (T.6.1.) and social (T.7.2) perspectives could be effectively working elements transferred through the communication channel only in cases where port-city interaction also includes these components. Analysis of the entrepreneurial business model of PA as a driving entity in the port organizational ecosystem found that communication is an important component in the business model, which could be used for transferring maritime culture, sustainable development, co-development of coastal regions' knowledge, maritime training, general education practices, and also engagement of citizens. In the entrepreneurial model of PA, these functions are located at the expanded functional level in subcategories 7.3, 7.2, and 6.1., 6.4 (Fig. 2), representing these opportunities and describing the effectively working communication channel:

- understandable communication for citizens on the sustainable use of marine and land space and resources, justified by results of a scientific approach of the ecosystem approach;
- active communication and transfer of information about port activities, environment monitoring results, and new innovative port projects;
- organizing events on maritime culture and heritage.

In conclusions it could be said that a theoretical analysis of port-city cultural interaction justified that it is an important and powerful tool which enabling to seek the business and societal excellence and environmentally friendly actions, which are the main part of sustainable development. Also, it was identified that the effective working communications channel is not only the part of entrepreneurial business model, but also as an effectively working channel for the cultural components transferring between port, city and communities, which could strengthen the interaction. An especially these findings are actual for small and middle-sized port cities because the relationship between business, municipality and society is very strong here. And as it was mentioned before for the successful development of port infrastructure huge amount of investments are required and the strong interaction between port and city working together in symbiosis are the main component of attractiveness for the direct national and foreign investors. But for the implementation of symbiotic cooperation model between PA and municipality the cultural interaction is an important strengthening component and could be implemented by

Conclusions

The analysis concludes that in exploring the concept of port-city interaction within the broader context of sustainable development, effective communication and maritime culture play essential roles in facilitating information exchange. Cultural interactions between ports and cities, encompassing global sustainable development regulations, port governance patterns, and business practices, significantly influence decision-making processes and sustainable behaviours in coastal regions. Leveraging culture as a tool for sustainable urban development, including creative cultural actions and citizen involvement, demonstrates the potential impact of culture on fostering sustainability in small and medium-sized cities with intensive logistics operations. Integrating culture into port-city interactions is crucial for enhancing sustainability and resilience in coastal regions, aligning with the overarching goal of the research to delineate the cultural component within these interactions. Recognizing the importance of culture in building resilient port-city interfaces is key for ensuring long-term sustainability in coastal areas.

The study successfully outlined dynamic trajectories for the development of port-city cultural interactions, contributing significantly to the discourse on coastal sustainability. By emphasizing the multifaceted influence of culture in shaping spatial and infrastructural domains guided by port authorities, the research provides a comprehensive foundation for sustainable port-city interactions. These proposed trajectories, integrating material practices, spatial considerations, and societal narratives, offer a roadmap for fostering enduring sustainability and excellence in coastal regions. By intertwining cultural insights with developmental pathways, the study advances the understanding and implementation of sustainable practices in port-city interactions. Additionally, the research suggests that establishing strong and effective interactions can be achieved by implementing cooperative or entrepreneurial business models for Port Authorities and enhancing the participation of municipalities' representatives in port governance structures, aligning with the research's focus on enhancing sustainable development in medium-sized port cities and their associated coastal regions.

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