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Connection Cities To The Sea And Looking To The Future From Ports: Rotterdam, Almeria, and Karasu

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ABSTRACT

In this study, it is embarked on an insightful exploration of how maritime infrastructure acts as a critical nexus between urban centers and the global maritime trade network, focusing on the exemplary cases of Rotterdam, Almeria, and Karasu ports. The analysis begins with the Port of Rotterdam, renowned for its advanced technological integration and status as Europe's largest port, serving as a pivotal hub in international trade. The article dissects Rotterdam's strategies in sustainability, digitalization, and infrastructure development that have bolstered its efficiency and global connectivity, positioning it as a model for future port development. The examination then shifts to Almeria, a port with a distinct context and operational scale, emphasizing its role in regional development, tourism, and agricultural export. Despite its smaller size compared to Rotterdam, Almeria demonstrates how ports can leverage unique geographic and economic strengths to enhance their contribution to local and regional economies. Building on the insights gleaned from Rotterdam and Almeria, the article proposes a set of strategic recommendations for Karasu Port. Recognizing Karasu's potential as a burgeoning maritime node on the Black Sea, the recommendations focus on enhancing its operational efficiency, sustainability, and digital infrastructure. The goal is to align Karasu's development with the successful practices observed in Rotterdam and Almeria, ensuring it becomes a critical link in the maritime trade network while fostering economic growth for the city of Karasu and its hinterland. In conclusion, the article emphasizes the importance of ports like Rotterdam, Almeria, and Karasu in connecting cities to the sea and their pivotal roles in shaping the future of global trade and urban development. Through the lens of these three ports, we explore the transformative impact of maritime infrastructure on economic growth, sustainability, and digital innovation.

Keywords: Maritime infrastructure, sustainability, digitalization, global trade, port development

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Şehirlerin Denizle Bağlantısı Ve Limanlardan Geleceğe Bakış: Rotterdam, Almeria ve Karasu

ÖZ

Bu çalışmada, Rotterdam, Almeria ve Karasu limanları örneklerine odaklanarak, denizcilik altyapısının kent merkezleri ile küresel deniz ticareti ağı arasında nasıl kritik bir bağ işlevi olduğu vurgulanmıştır. Analiz, gelişmiş teknolojik entegrasyonu ve Avrupa'nın en büyük limanı olma statüsüyle tanınan ve uluslararası ticarete önemli bir merkez olarak hizmet veren Rotterdam Limanını ilk olarak ele almaktadır. Rotterdam'ın sürdürülebilirlik, dijitalleşme ve altyapı geliştirme stratejilerini inceleyerek verimliliğini ve küresel bağlanabilirliğini artırmış ve onu gelecekteki liman gelişimi için bir model olarak konumlandırmıştır. Çalışma daha sonra, bölgesel kalkınma, turizm ve tarımsal ihracattaki rolü vurgulanarak, farklı bir bağlam ve operasyonel ölçeğe sahip bir liman olan Almeria'ya geçmektedir. Rotterdam'a kıyasla daha küçük olmasına rağmen Almeria, limanların yerel ve bölgesel ekonomilere katkılarını artırmak için benzersiz coğrafi ve ekonomik güçlerden nasıl yararlanabileceğini göstermektedir. Rotterdam ve Almeria'dan elde edilen bilgiler ışığında, bu çalışma Karasu Limanı için bir dizi stratejik öneride bulunmayı hedeflemiştir. Karasu'nun Karadeniz'de gelişmekte olan bir denizcilik düğümü olma potansiyelini göz önünde bulunduran öneriler, limanın operasyonel verimliliğini, sürdürülebilirliğini ve dijital altyapısını geliştirmeye odaklanmıştır. Amaç, Karasu'nun gelişimini Rotterdam ve Almeria'da gözlemlenen başarılı uygulamalarla uyumlu hale getirmek, Karasu şehri ve hinterlandı için ekonomik büyümeyi teşvik ederken deniz ticaret ağında kritik bir bağlantı haline gelmesini sağlamaktır. Sonuç olarak bu çalışmada, Rotterdam, Almeria ve Karasu limanların kentleri denize bağlamadaki önemini ve küresel ticaret ve kentsel gelişimin geleceğini şekillendirmedeki kilit rollerini vurgulamaktadır. Bu üç limanın merceğinden, denizcilik altyapısının ekonomik büyüme, sürdürülebilirlik ve dijital inovasyon üzerindeki dönüştürücü etkisi ortaya konulmuştur.

Anahtar Kelimeler: Denizcilik altyapısı, sürdürülebilirlik, dijitalleşme, küresel ticaret, liman geliştirme

1 Introduction

Ports have historically served as crucial lifelines connecting cities to global trade networks (Santos et al., 2018). Their strategic locations and advanced infrastructures facilitate the movement of goods, foster economic activity, and play a vital role in shaping urban development. In an era marked by increasing globalization and growing maritime trade, understanding the strategies employed by successful ports becomes essential for ensuring their continued relevance and fostering sustainable growth (Schipper, 2019). This study embarks on an insightful exploration of how maritime infrastructure acts as a critical nexus between urban centres and the global maritime trade network, focusing on the exemplary cases of Rotterdam, Almería, and Karasu ports.

Ports are not merely gateways for international trade; they are dynamic entities that influence the economic, social, and environmental fabric of the cities they serve. The analysis presented in this article is guided by a conceptual framework that emphasizes the multifaceted relationship between ports, cities, and the global maritime trade network (Parola et al., 2017). This framework is anchored on three key pillars: Connectivity and Infrastructure, Specialization and Innovation, and Sustainability and Community Integration.

This study embarks on an insightful exploration of how maritime infrastructure acts as a critical nexus between urban centres and the global maritime trade network, focusing on the exemplary cases of Rotterdam, Almeria, and Karasu ports. By examining these ports, the study aims to identify key strategies that drive their success and propose actionable recommendations for the development of Karasu Port.

The study is structured as follows: First, it provides a comprehensive background on the importance of maritime infrastructure in global trade and urban development. Next, it delves into the specific cases of Rotterdam and Almeria, highlighting their unique strategies and success stories. The methodology section outlines the mixed-method comparative case study approach used to gather. The results section presents the findings from Rotterdam and Almeria, followed by tailored recommendations for Karasu Port. Finally, the conclusion summarizes the key insights and offers suggestions for policymakers and future research.

By setting this framework, the study not only contributes to the literature on port development but also provides practical implications for enhancing the efficiency and sustainability of maritime infrastructure.

1.1 Connectivity and Infrastructure

The first pillar underscores the critical role of efficient port infrastructure and robust multimodal transportation networks, including road, rail, and inland waterways. These elements are essential in facilitating the seamless movement of goods and connecting ports to regional and global trade routes. Ports serve as essential nodes in the global trade network, supporting economic development not just at the city level but also regionally and globally (Liang & Liu, 2020). This pillar explores how ports like Rotterdam have developed state-of-the-art infrastructure that enhances their connectivity, making them pivotal points in the global supply chain.

1.2 Specialization and Innovation

The second pillar highlights the importance of strategic specialization in attracting diverse businesses and investment. Ports can achieve this by focusing on specific cargo types, developing innovative services like logistics hubs or free trade zones, or leveraging technological advancements to optimize operations. This part explores the impact of digital transformation in port operations, including the adoption of smart technologies, IoT (Internet of Things), and blockchain for improved efficiency, security, and transparency in the logistics chain (Zhuang et al., 2014). For instance, the Port of Almería's focus on specialized agricultural exports has positioned it as a key player in the Mediterranean trade routes, demonstrating the power of niche markets in port success.

1.3 Sustainability and Community Integration

The third pillar emphasizes the growing significance of incorporating sustainable practices into port operations and fostering positive relationships with surrounding communities. This includes implementing eco-friendly initiatives, minimizing environmental impact, and engaging in collaborative projects that contribute to urban development and community well-being. This pillar introduces models of green port initiatives and the importance of incorporating renewable energy, waste management, and emission reduction strategies (Felicio et al., 2023). The Port of Karasu, for example, has made significant strides in sustainability by integrating renewable energy sources and establishing programs aimed at reducing emissions, thereby setting a benchmark for other ports aiming to balance economic and environmental objectives.

The conceptual framework for this study is anchored on three key pillars: Connectivity and Infrastructure, Specialization and Innovation, and Sustainability and Community Integration (Parola et al., 2017). This framework guides the analysis of the ports and their impact on urban and economic development. Existing literature on port development underscores the importance of efficient infrastructure and strategic specialization (Zhuang et al., 2014). Studies by Schipper (2019) and Santos et al. (2018) highlight the transformative role of ports in facilitating global trade and promoting sustainable growth. Furthermore, research by Dooms et al. (2013) and Liang & Liu (2020) emphasizes the significance of multimodal connectivity and technological innovation in enhancing port efficiency. By integrating insights from these studies, this research builds on a robust conceptual foundation to examine the success stories of Rotterdam and Almería, and to propose recommendations for Karasu Port. By examining these three pillars through the lens of the ports of Rotterdam, Almería, and Karasu, this study provides a comprehensive understanding of how successful ports navigate the complexities of modern maritime trade. The findings aim to offer valuable insights for policymakers, port authorities, and stakeholders involved in the maritime industry, contributing to the development of strategies that ensure ports remain vital components of the global trade network while promoting sustainable urban growth.

In conclusion, as ports continue to evolve in response to global trade demands, their role in connecting cities to the world becomes increasingly significant. By focusing on connectivity, specialization, innovation, and sustainability, ports can not only enhance their operational efficiency but also contribute positively to the broader economic and social landscapes they inhabit. This study sheds light on the best practices and innovative strategies that drive port success, offering a roadmap for future developments in the maritime sector.

2 Research Methodology

The research methodology adopted for our exploration into the transformative role of ports in urban and economic development, with a particular focus on Rotterdam, Almeria, and Karasu, is a Mixed-Method Comparative Case Study with Prescriptive Analysis (Perkins, 2014; Fiet, 2007). This approach is meticulously designed to harness the strengths of both qualitative and quantitative research paradigms, offering a rich, multidimensional understanding of how ports like Rotterdam and Almeria have become pivotal in global trade networks, and how their best practices can inform the future development of Karasu Port. At the core of our methodology is the case study analysis, which allows for an in-depth examination of Rotterdam and Almeria ports. These case studies are not randomly chosen; rather, they are selected for their exemplary roles in showcasing the integration of sustainability practices, technological advancements, and their significant contributions to both local and global economies. Through qualitative data—such as operational strategies, sustainability initiatives—we glean insights into the complex dynamics that govern these ports. Complementing this, quantitative data provides a solid backbone of evidence, offering metrics like cargo throughput, efficiency improvements, and economic impacts that help quantify the success and challenges faced by these ports.

The comparative aspect of our methodology comes into play as we juxtapose the findings from Rotterdam and Almeria. This comparison is not merely a side-by-side evaluation but a deep dive into understanding how differing scales, geographic contexts, and strategic focuses influence port operations and their broader implications. By comparing these ports, we identify a spectrum of best practices and challenges that are critical in shaping port development strategies. This comparative analysis is instrumental in distilling actionable insights that are not only relevant but also adaptable to varying contexts, such as that of Karasu Port.

Building upon the comparative case study, our methodology integrates a prescriptive analysis component. This segment of the research is forward-looking and aims at bridging the gap between current states and desired futures. Drawing from the comparative study, we formulate specific, tailored recommendations for Karasu Port. These recommendations are not generic prescriptions but are informed by the nuanced understanding developed through our case studies and comparative analysis. They consider Karasu's unique geographic, economic, and operational context, proposing strategies for infrastructure development, sustainability practices, and digital transformation. The prescriptive analysis is the culmination of our mixed-method approach, synthesizing insights from qualitative and quantitative data to offer a roadmap for Karasu Port's development that is evidence-based, contextually aware, and aligned with global best practices.

The mixed-method nature of our methodology is pivotal (Table 1), allowing for a comprehensive exploration that captures the complexity of port operations and their multifaceted impacts. Qualitative data brings depth to our understanding, highlighting the nuances of port management, and the socio-economic fabric of the surrounding urban and regional environments. Quantitative data, on the other hand, lends rigor and measurability, enabling us to benchmark successes, identify gaps, and project future scenarios with greater confidence. Together, these methods provide a holistic view, ensuring that our analysis is grounded in reality while being attuned to the aspirations and potential of Karasu Port.

Table 1: *Research Methodology*

Stage	Action	Output
Case Study Analysis	In-depth examination of Rotterdam & Almeria ports	Understanding of each port's operations, strategies, and impact on urban & economic development, sustainability, and digitalization
Comparative Analysis	Juxtapose findings from Rotterdam & Almeria	Spectrum of best practices, challenges, and opportunities for port development
Prescriptive Analysis	Formulate tailored recommendations for Karasu Port development	Evidence-based, contextually aware roadmap for Karasu Port's development, focusing on urban & economic development, sustainability, and digitalization

In conclusion, the Mixed-Method Comparative Case Study with Prescriptive Analysis methodology is a comprehensive approach that leverages the strengths of both qualitative and quantitative research to offer deep insights into the operations and strategies of Rotterdam and Almeria ports. It facilitates a nuanced comparison of these ports, drawing lessons that inform prescriptive recommendations for Karasu Port. This methodology not only enriches our understanding of the existing landscape of maritime infrastructure but also charts a course for future developments, ensuring that ports continue to play a crucial role in connecting cities to the sea and driving forward the engines of global trade and urban development. Through this approach, the research aspires to contribute valuable knowledge to the field of maritime infrastructure and urban planning, offering actionable strategies that can adapt to the evolving demands of global trade and sustainability imperatives.

3 Results and Discussion

On this section, the detailed Mixed-Method Comparative Case Study with Prescriptive Analysis presented separately by explaining and giving examples of Port of Rotterdam, Port of Almeria. Afterwards, the possible distinction and the role of Karasu Port has discussed. As Europe's largest port, Rotterdam is renowned for its advanced technological integration and strategic importance in global trade. Official reports from the Port of Rotterdam Authority (Dooms et al., 2013) and research studies (Heijman et al., 2017) highlight the port's success in implementing state-of-the-art infrastructure and sustainable practices. Examples include the use of automated terminals, shore power connections, and extensive multimodal transportation networks.

Although smaller in scale, Almeria is a crucial hub for agricultural exports and tourism in the Mediterranean region. Reports by the Spanish Port Authority (Pérez-Mesa et al., 2019) emphasize Almeria's role in facilitating the export of regional agricultural products and its strategic investments in cruise tourism infrastructure. Concrete examples include the port's specialized facilities for handling perishable goods and the development of tourist-friendly amenities.

These ports were selected based on their distinct operational contexts and their successful strategies, which offer valuable lessons for the development of Karasu Port.

4.1 Rotterdam: A Beacon of Efficiency and Global Connectivity in the Maritime Landscape

The Port of Rotterdam stands as a testament to the transformative power of strategic development and continuous innovation within the global maritime trade network. Renowned for its advanced technological integration and position as Europe's largest port (Figure 1), Rotterdam serves as a pivotal hub, facilitating the seamless flow of goods across continents. Delving deeper into the port's success story reveals a multifaceted interplay of factors that have propelled it to the forefront of global maritime operations.

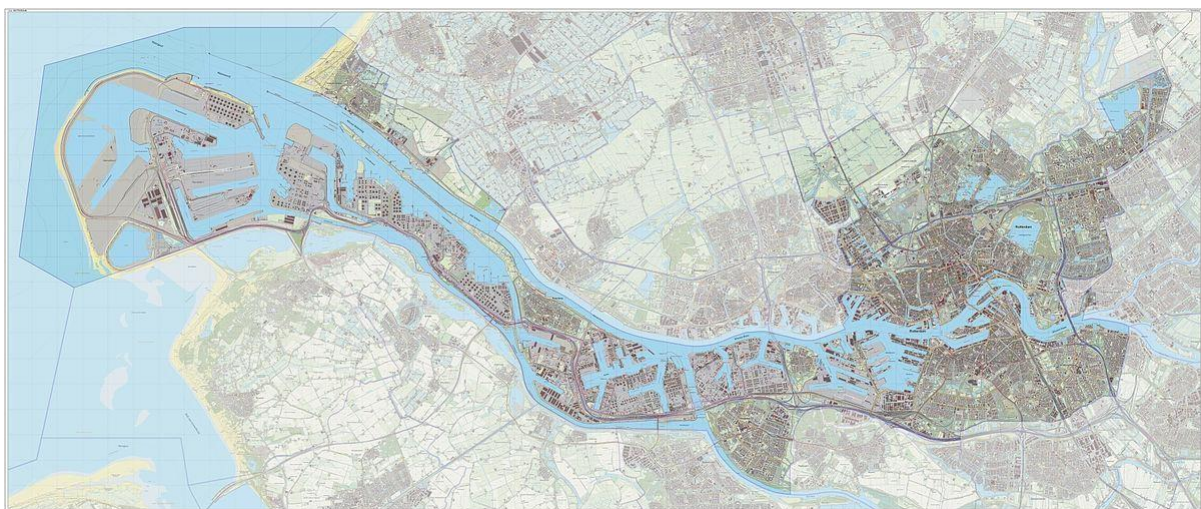


Figure 1: Port of Rotterdam

4.1.1 The Cornerstone of Success: Infrastructure and Connectivity

Rotterdam's pre-eminence is firmly rooted in its robust infrastructure and unparalleled connectivity. World-class port facilities boast an impressive capacity to handle diverse cargo types, from towering container terminals to specialized facilities for bulk cargo handling (Figure 2). This exceptional infrastructure is further complemented by an extensive network of multimodal transportation linkages. Arteries of road, rail, and inland waterways extend outwards from the port, seamlessly connecting it to major European markets and facilitating the efficient movement of goods far beyond the immediate vicinity. Rotterdam's strategic location at the mouth of the Rhine River further amplifies its connectivity, granting direct access to the heart of Europe's industrial and economic powerhouse (Ducruet & Notteboom, 2024). This confluence of factors positions Rotterdam as a central node within the intricate web of global trade, ensuring the swift and efficient movement of goods across vast distances (van Dorsser et. al., 2018).

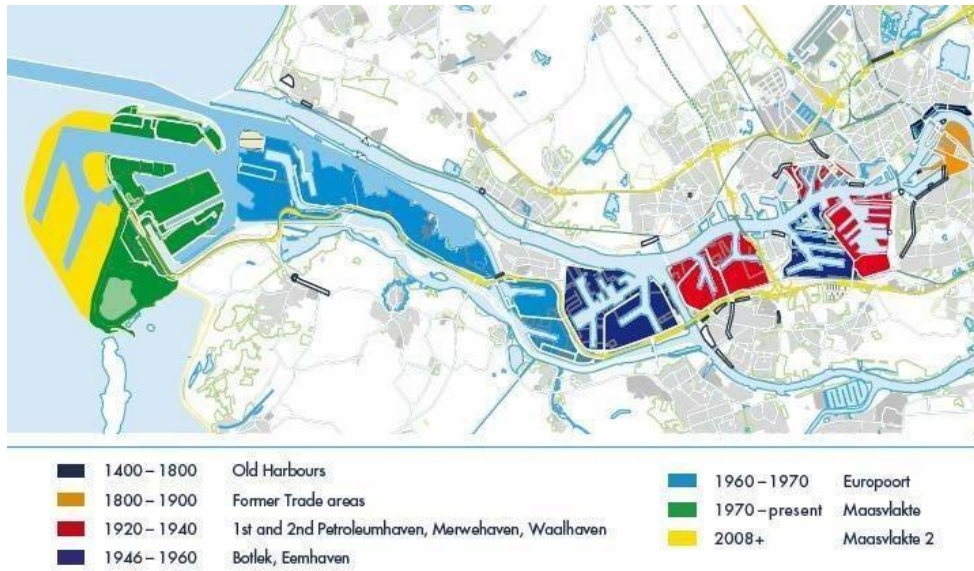


Figure 2: Port of Rotterdam development history

4.1.2 Embracing Innovation and Specialization: A Recipe for Growth

Beyond its impressive infrastructure, Rotterdam's success hinges on its unwavering commitment to innovation and strategic specialization. Recognizing the ever-evolving needs of the global market, the port has adopted a diversified approach, catering to a wide range of cargo types (Figure 3). While remaining a leader in bulk cargo handling, Rotterdam has simultaneously carved out a niche in containerized freight, establishing itself as a crucial gateway for international trade. This strategic diversification allows the port to cater to the diverse demands of a globalized economy, ensuring its continued relevance in the face of shifting market dynamics (Witte et. al., 2018). Furthermore, Rotterdam embraces technological advancements as a cornerstone of its growth strategy. Continuous investments in automation and digitalization have revolutionized port operations, streamlining processes, enhancing efficiency, and optimizing resource utilization. These cutting-edge technologies not only expedite cargo handling but also contribute to cost reductions and improved overall competitiveness (Heijman et. al., 2017).

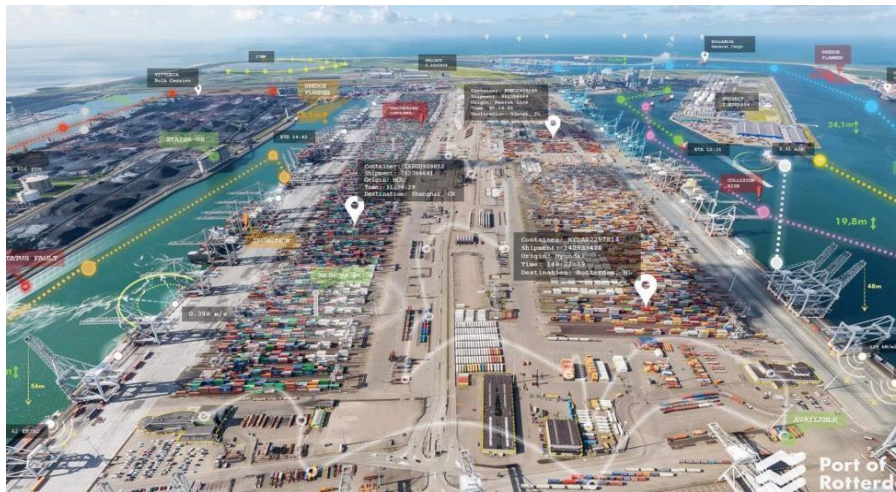


Figure 3: Port of Rotterdam network

4.1.3 Sustainability and Community Integration: Navigating the Future with Responsibility

Rotterdam's leadership extends beyond operational excellence, recognizing the growing imperative of sustainability within the maritime industry. The port has embarked on a commendable journey towards eco-friendly practices, implementing various initiatives to minimize its environmental footprint. Shore power connections for docked vessels significantly reduce air pollution, while investments in renewable energy sources contribute to a cleaner energy mix. These proactive measures demonstrate Rotterdam's commitment to responsible growth, ensuring its long-term viability in an increasingly sustainability-conscious world (Zheng et. al., 2020).

However, Rotterdam's success transcends mere economic prosperity. The port actively fosters strong ties with the surrounding community, recognizing the importance of mutual benefit and shared value creation. Collaborative projects promote urban development, revitalize waterfront areas, and create opportunities for local businesses. This commitment to community engagement ensures that the port's growth is not only economically productive but also socially responsible, fostering a sense of shared ownership and collective prosperity (Dooms et. al., 2013).

In conclusion, the Port of Rotterdam stands as a shining example of success within the global maritime landscape. Its unwavering commitment to infrastructure development, strategic specialization, technological innovation, and sustainable practices has cemented its position as a pivotal hub for international trade. By recognizing the importance of community engagement and environmental responsibility, Rotterdam has charted a course for sustainable growth, ensuring its continued relevance and leadership in the ever-evolving world of maritime trade. Rotterdam's success story serves as a valuable blueprint for other ports, offering crucial insights into the multifaceted strategies that pave the way for long-term prosperity and responsible integration within the global economic fabric.

4.2 Almeria: A Beacon of Regional Development, Illuminating the Power of Local Strengths

While the colossal scale and global reach of Rotterdam command undeniable attention, the Port of Almeria, nestled on the south-eastern coast of Spain, presents a contrasting yet equally captivating narrative within the tapestry of maritime success stories (Figure 4). Operating on a smaller scale compared to its European counterpart, Almeria demonstrates the remarkable potential of capitalizing on local strengths and fostering deep-rooted connections with the surrounding community to achieve significant regional development and economic prosperity (Alvarez Fanjul et. al., 2018).

Unlike Rotterdam's focus on global dominance, Almeria thrives by embracing its unique identity and strategic location. Situated along the picturesque shores of the Mediterranean Sea, the port enjoys unparalleled access to major trade routes, serving as a vital gateway for both inbound and outbound goods. Furthermore, its proximity to fertile agricultural production areas empowers Almeria to act as a crucial link between local farmers and international markets. This strategic positioning allows the port to play a central role in facilitating the export of agricultural

products, fostering economic growth within the region and establishing Almeria as a prominent player in the global agricultural trade landscape(Pérez-Mesa et. al., 2019).



Figure 4: Port of Almeria

Beyond its advantageous geographical location, Almeria's success story is intricately woven with the dynamism of the burgeoning cruise tourism industry. Recognizing the immense potential of this sector, the port has strategically invested in infrastructure and facilities specifically catering to cruise liners. This proactive approach has positioned Almeria as a sought-after destination for international tourists, injecting significant revenue into the local economy and contributing to the creation of employment opportunities within the region. By embracing the burgeoning cruise tourism industry, Almeria not only diversifies its economic portfolio but also fosters cultural exchange and promotes the region's unique heritage to a global audience(López-Bermúdez et. al., 2020).

However, the essence of Almeria's success transcends mere economic benefits. The port recognizes the fundamental importance of fostering strong, collaborative relationships with the local community. This commitment manifests in various initiatives aimed at supporting local businesses, promoting sustainable development, and contributing to infrastructure projects that enhance the overall well-being of the region (Figure 5). By actively engaging with the community and prioritizing shared prosperity, Almeria ensures that its growth is not solely measured in economic terms but also translates into tangible improvements in the lives of its residents. This collaborative approach fosters a sense of ownership and responsibility, ensuring the port's long-term sustainability and continued integration within the social fabric of the region(Molina et. al., 2019).

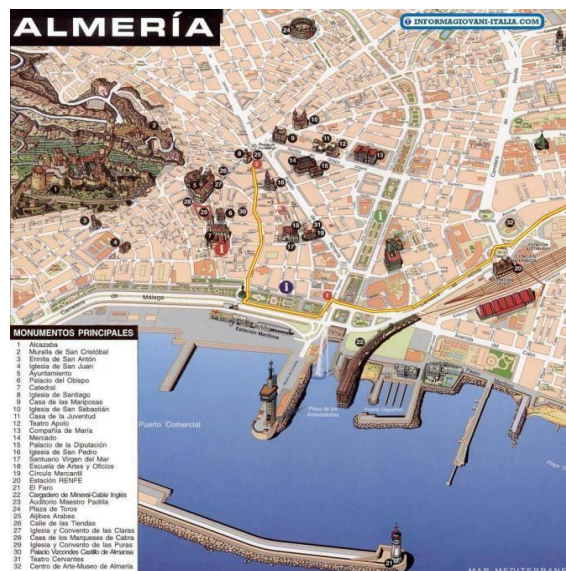


Figure 5: Port of Almeria and the city connections

In conclusion, the Port of Almeria stands as a testament to the transformative power of leveraging local strengths and nurturing community partnerships. By strategically capitalizing on its geographical position, proximity to agricultural production areas, and the burgeoning cruise tourism industry, Almeria has carved out a distinct niche within the

global maritime landscape, contributing significantly to regional development and economic prosperity. Furthermore, the port's unwavering commitment to fostering strong ties with the local community underscores the crucial role of collaborative engagement in ensuring sustainable growth and shared success. Almeria's compelling narrative offers valuable insights for ports of all sizes, highlighting the importance of identifying unique strengths, embracing innovative strategies, and prioritizing community well-being as cornerstones for achieving sustainable and impactful development.

4.3 Charting a Course for Success: Recommendations for Karasu Port

Drawing upon the invaluable insights gleaned from the success stories of Rotterdam and Almeria, this study formulates a set of strategic recommendations tailored to empower Karasu Port (Figure 6), a burgeoning maritime node on the Black Sea, to embark on a trajectory of sustainable and impactful growth.



Figure 6: Port of Karasu, Sakarya

4.3.1 Enhancing Operational Efficiency: Building a Solid Foundation

As the cornerstone of any successful port, investing in infrastructure upgrades is paramount for Karasu. Modernizing existing facilities, expanding cargo handling capacity, and incorporating advanced technologies will streamline operations, enhance efficiency, and position the port to cater to the evolving demands of the global maritime trade. Additionally, improving multimodal connections is crucial. Upgrading road, rail, and inland waterway networks will ensure seamless freight movement beyond the immediate port vicinity, facilitating efficient hinterland connections and fostering stronger regional integration. Furthermore, exploring potential for expansion should be considered. Strategically planned expansion projects can accommodate future growth, cater to increasing cargo volumes, and solidify Karasu's position as a key player within the Black Sea region (Ateş & Esen, 2022).

4.3.2 Identifying Strategic Specialization: Charting a Unique Course

To carve out a distinct niche within the competitive maritime landscape, identifying strategic areas of specialization is essential for Karasu. A comprehensive analysis of the region's strengths and potential is crucial in this endeavour. Capitalizing on Karasu's proximity to agricultural production areas, for instance, could position the port as a vital export hub for regional agricultural products. Alternatively, leveraging its strategic location on the Black Sea, Karasu could evolve into a gateway to Central Asia, facilitating trade between the region and international markets. This targeted approach, informed by a deep understanding of regional strengths and potential, will enable Karasu to attract

targeted investments, attract specific businesses, and establish itself as a leader in its chosen niche (Kılıç & Akpınar, 2022).

4.3.3 Embracing Sustainability: Navigating the Future Responsibly

In an era of increasing environmental consciousness, embracing sustainability is no longer an option but a necessity for any forward-thinking port. Karasu must prioritize the implementation of eco-friendly practices throughout its operations. Utilizing renewable energy sources, such as solar or wind power, can significantly reduce the port's carbon footprint and contribute to a cleaner environment. Additionally, minimizing waste generation through efficient waste management practices and promoting recycling initiatives are crucial steps towards sustainable port development. By prioritizing environmental responsibility, Karasu not only aligns itself with global sustainability commitments but also demonstrates its commitment to responsible growth and attracts environmentally conscious businesses and investors.

4.3.4 Engaging with the Community: Building Bridges for Shared Prosperity

A successful port thrives not only in isolation but also in collaboration with the surrounding community. Fostering partnerships with local stakeholders such as businesses, government agencies, and community organizations is essential for ensuring mutually beneficial growth. Supporting community development initiatives through infrastructure projects, job creation programs, and educational opportunities allows the port to contribute to the overall well-being of the region. Furthermore, promoting transparency in port operations by actively engaging with the community and addressing concerns builds trust and fosters a sense of shared ownership. By prioritizing community engagement, Karasu ensures that its growth translates into tangible benefits for its residents, fostering a sense of shared prosperity and securing long-term community support (Ülger & Tanrıvermiş, 2023).

Sharing strategic similarities with the established Port of Rotterdam, a global trade leader, and the Port of Almeria, a key player in regional agricultural exports, the Port of Karasu possesses a geographically advantageous location, positioning it as a potential future gateway for trade. This trio of ports share significant development potential, with Karasu uniquely situated to learn from both Rotterdam's cutting-edge technological advancements and Almeria's successful strategy of catering to a specialized market (agricultural exports). Moreover, incorporating practices observed in both Rotterdam and Almeria, such as fostering strong community engagement and prioritizing sustainability initiatives, can be instrumental in shaping a well-defined development trajectory for Karasu, propelling it towards a more prominent role in the global trade landscape.

In conclusion, by implementing these strategic recommendations, Karasu Port has the potential to emulate the success stories of Rotterdam and Almeria, carving its own path towards sustainable and impactful growth. By prioritizing operational efficiency, identifying strategic specialization, embracing sustainability, and engaging with the community, Karasu can establish itself as a vital hub within the Black Sea region, contributing to regional economic development and shaping a brighter future for both the port and its surrounding community.

4 Conclusions

The analysis presented in this study underscores the multifaceted relationship between ports, cities, and the global maritime trade network. By drawing insights from the success stories of Rotterdam and Almeria, and acknowledging the unique context of Karasu Port, this research proposes a set of strategic recommendations for fostering a thriving connection between the port and the city.

The Port of Rotterdam is a major hub for global trade, handling an estimated 14.5 million TEUs (Twenty-foot Equivalent Units) annually. This signifies its prominent role in facilitating international commerce. Furthermore, the port boasts a significant cargo throughput of 469 million tonnes in 2022, highlighting its capacity for large-scale freight movement (Port of Rotterdam Authority, 2022). The Port of Almeria plays a crucial role in regional agricultural exports. While its annual TEU volume is around 0.5 million, significantly lower than Rotterdam, it excels

in bulk cargo movement, achieving a throughput of 3 million tonnes in 2022 (Spanish Port Authority, 2022). This suggests the port caters to the specific needs of the surrounding agricultural sector. The Port of Karasu currently handles a relatively modest cargo volume, approximately 0.1 million TEUs annually. This indicates that the port is not yet a major player in global trade. However, its potential for expansion is acknowledged, with strategic investments and development initiatives likely to propel its growth in the future.

- **Enhancing Connectivity and Accessibility:** Investing in infrastructure development beyond the immediate port vicinity is crucial. Upgrading road networks, expanding public transportation options, and exploring the potential for a dedicated port shuttle service can facilitate seamless movement of people and goods between the city and the port. Additionally, establishing efficient logistics corridors that connect Karasu to regional and national transportation networks will further enhance accessibility and solidify the port's position as a key node within the broader trade landscape.
- **Promoting Urban Regeneration and Waterfront Development:** Strategic urban planning initiatives can transform the waterfront area into a vibrant hub that fosters economic activity and community engagement. Revitalizing the waterfront with mixed-use development projects, including public spaces, recreational facilities, and commercial establishments, can create a dynamic and attractive destination. Furthermore, integrating the port into the city's urban fabric through pedestrian-friendly walkways, bicycle paths, and green spaces can foster a sense of connection and encourage community interaction with the maritime environment.
- **Fostering Collaboration and Knowledge Sharing:** Building strong partnerships between port authorities, city officials, businesses, and educational institutions is essential for sustainable development. Collaborative initiatives can promote knowledge sharing, facilitate skills development, and encourage innovation within the maritime sector. Additionally, fostering collaboration with international partners can provide valuable insights and best practices for port-city integration, enabling Karasu to learn from successful examples around the world.
- **Investing in Sustainable Practices:** Implementing eco-friendly initiatives throughout the port and city is crucial for ensuring long-term sustainability and responsible growth. Promoting green building practices, utilizing renewable energy sources, and implementing efficient waste management systems can significantly reduce the environmental footprint of both the port and the city. Furthermore, collaborative efforts to address environmental challenges, such as air and water pollution, can foster a shared commitment to a sustainable future for both the port and the surrounding community.

The study presented in this study underscores the multifaceted relationship between ports, cities, and the global maritime trade network. By drawing insights from the success stories of Rotterdam and Almeria and acknowledging the unique context of Karasu Port, this research proposes a set of strategic recommendations for fostering a thriving connection between the port and the city. The findings align with the existing literature on port development. Similar to the conclusions drawn by Schipper (2019) and Santos et al. (2018), this study highlights the critical role of infrastructure, specialization, and sustainability in port success. The practical examples from Rotterdam and Almeria provide concrete evidence supporting the theoretical insights offered by Zhuang et al. (2014) and Dooms et al. (2013). For policymakers, the recommendations emphasize the importance of investing in advanced infrastructure, promoting strategic specialization, embracing sustainable practices, and fostering community engagement. These strategies can enhance the operational efficiency of Karasu Port and contribute to regional economic development. Future studies should explore the impact of port development on social and cultural factors, conduct longitudinal analyses to assess the long-term outcomes of implemented strategies, and investigate the applicability of the proposed recommendations in different geographic and economic contexts.

By implementing these recommendations and fostering a collaborative approach, Karasu has the potential to create a thriving connection between the port and the city. This synergy can contribute to regional economic development, create employment opportunities, and enhance the overall quality of life for residents. As Karasu embarks on this journey of transformation, continuous monitoring, evaluation, and adaptation will be essential to ensure the long-term success of these initiatives and the sustainable development of both the port and the city.

4.1 Study Limitations

While providing valuable recommendations for Karasu Port, this study's scope is limited by focusing on specific cases, using existing status-quo, and having a future-oriented perspective. Further research in diverse contexts, considering social and cultural factors, is crucial for a more comprehensive understanding of port-city connections.

4.2 Competing Interests

There is no conflict of interest in this study.

4.3 Authors' Contributions

Süleyman Nurullah Adahi ŞAHİN: Developing ideas or hypotheses for the research and/or article, taking responsibility for the explanation and presentation of the results, taking responsibility for the creation of the entire manuscript or the main part.

Abdulkadir ÖZDEN: Supervising, editing and correction of spelling of manuscript.

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