BEST4.0
Deliverable D.1.2.2
I4.0 Mapping report
and clustering of SMEs

February, 2025

Program	Interreg Italy-Croatia
Project ID	ITHR0200326
Project name	BEST4.0 - Blue Economy Sectors Digital Transformation towards Industry 4.0
Period 2 - Activity 1.2	Desk analysis and mapping of the 9 elements of I4.0 compared to the identified Blue Economy SMEs needs in each area
Deliverable D.1.2.2	4.0 Mapping report and clustering of SMEs
Deliverable coordinator	LP

Table of contents:

List of Abbreviations

I4.0	Industry 4.0
SMEs	Small and Medium Enterprises
BEST4.0	Blue Economy Sectors Digital Transformation 4.0
LP	Lead Partner
PP	Partner
WP	Work Package
DIH	Digital Innovation Hubs
EDIH	European Digitial Innovation Hub
AR	Augmented Reality
VR	Virtual Reality
IoT	Internet of Things
AI	Artificial Intelligence
GVA	Gross Value Added

1. EXECUTIVE SUMMARY

Objective

This report maps the Blue Economy activities along the Adriatic coasts of Italy and Croatia, examining their alignment with Industry 4.0 (I4.0) principles. The study identifies clusters of small and medium enterprises (SMEs) based on their innovation needs, highlights regional differences, and outlines strategic milestones for future cross-border cooperation.

Scope of the Study

This document covers:
- A general overview of the Blue Economy and I4.0 integration across the Adriatic.
- A breakdown of Blue Economy activities, I4.0 adoption, and SME clustering by each PPs.
- Key recommendations and milestones for cross-border initiatives to be implemented in WP2.

2. GENERAL OVERVIEW

2.1 The Blue Economy in the Adriatic Region

According to "The UE Blue Economy Report 2024" a delineation of the Blue Economy largely depends on the sectors included, and the extent to which indirect upstream and downstream effects can be identified and measured.

Generally the term Blue Economy includes economic activities that are:

(a) marine-based, including those undertaken in the ocean, sea and coastal areas, such as capture fisheries and aquaculture, offshore oil and gas, offshore wind energy, ocean energy, desalination, shipping and maritime transport, and marine and coastal tourism; and

(b) marine-related activities which use products and/or produce products and services for the ocean and marine-based activities; for example, seafood processing, marine biotechnology, shipbuilding and repair, port activities, maritime communication, maritime equipment, maritime insurance and maritime surveillance.

Out of all economic sectors related to the Blue Economy, seven sectors can be considered 'established': Marine living resources, Marine non-living resources, Marine renewable energy, Port activities, Shipbuilding and repair, Maritime transport and Coastal tourism and four more are gaining relevance even if they're more linked to public sector: desalination,

blue biotechnology, Maritime defense, security and surveillance; Research and Infrastructure (submarine cables, robotics).

The Adriatic coast, shared by Italy and Croatia, is an important hub for the Blue Economy, encompassing various maritime sectors that drive economic and environmental sustainability:

Marine Living Resources: Fisheries and aquaculture play a vital role in coastal communities. Sustainable practices and technological innovation can enhance productivity while preserving biodiversity

Marine Non-Living Resources: This includes the extraction of raw materials such as sand, gravel, and offshore hydrocarbons. Sustainable resource management is crucial to minimize ecological damage.

Marine Renewable Energy: Offshore wind and wave energy projects are gaining momentum, aligning with EU decarbonization goals. Italy and Croatia can leverage their extensive coastlines for energy transition.

Port Activities: Adriatic ports are key nodes in European trade. Investments in automation, digitalization, and green logistics can enhance efficiency and sustainability.

Shipbuilding and Repair: A traditional sector in both nations, shipbuilding can integrate Industry 4.0 technologies such as smart manufacturing and advanced materials to improve global competitiveness.

Maritime Transport: The Adriatic Sea is a crucial route for passenger and freight transport. Innovations such as low-emission fuels and digital navigation systems are necessary to align with EU sustainability goals.

Coastal Tourism: A major economic driver, coastal tourism in the Adriatic can be enhanced through eco-tourism initiatives, smart infrastructure, and cultural heritage promotion 【6】.
 Germany, Spain, Italy and France are the largest contributors to the EU Blue Economy established sectors, accounting together for 61% of GVA and 55% of employment. However, Greece ranks third in terms of employment, contributing 12% of the EU's Blue Economy jobs, after Spain and Germany, though it only generates 4% of the EU's Blue Economy GVA.

The contribution of the Blue Economy to national economies varies widely across Member States In terms of employment, shares range from 1% in Greece to 0.2% in Austria. When it comes to GVA, the range extends from 6% in Croatia to 0.1% in Luxembourg.

The Blue Economy is crucial not only for economic growth but also for environmental sustainability in the Adriatic region:

Economic Growth: The Blue Economy sectors collectively contribute significantly to regional GDPs, create jobs, and stimulate innovation. For instance, the Mediterranean's blue economy is valued at approximately €4.7 trillion, highlighting its potential for inclusive prosperity

Environmental Sustainability: Sustainable practices in these sectors are essential to protect marine ecosystems from degradation due to pollution, overfishing, and climate change. Initiatives aimed at preserving marine biodiversity are increasingly recognized as vital for long-term economic stability

Opportunities for Italy and Croatia Aligned with Industry 4.0 Principles

Both Italy and Croatia have significant opportunities to advance their Blue Economy sectors by integrating Industry 4.0 principles:

Digital Transformation: Implementing digital technologies can enhance operational efficiencies across maritime transport, fisheries management, and tourism services. Initiatives like BEST 4.0 aim to support SMEs in adopting innovative solutions that improve productivity while reducing environmental impact

Research and Innovation: Collaborative research projects can foster innovation in marine biotechnology and sustainable fishing practices. By leveraging existing marine resources responsibly, both countries can develop new products that meet market demands while ensuring ecological integrity.

Sustainable Tourism Development: Emphasizing eco-friendly tourism can attract a growing segment of environmentally conscious travelers. Investments in infrastructure that supports sustainable practices will enhance the attractiveness of coastal regions while preserving natural resources

2.2 Industry 4.0 Overview

Industry 4.0 refers to the fourth industrial revolution, characterized by the integration of smart key technologies (pillars) such as IoT, AI, big data, and automation into manufacturing and business processes. It enables real-time data exchange, increased efficiency, and enhanced decision-making through cyber-physical systems and digital transformation.

The nine pillars considered regarding tihis report are:

1. Cloud Computing: is an elastic execution environment that enables networked, on-demand access to a shared set of configurable computing resources (e.g., network, servers, storage devices, applications, and services) in the form of tiered services of granularity;

2. Internet of Things: refers to the extension of the internet to the world of concrete objects and places, which acquire their own digital identity so that they can communicate with other objects on the network and be able to provide services to users.

3. Cyber Security: this term refers to and groups together different methods of protecting equipment and information systems from harmful cyber-attacks such as: computers, servers, mobile devices, electronic systems, computer networks, software, etc. It is the study of the vulnerability of a system IT and definition and implementation of a set of security measures to protect against attempted data breaches through cyber-attacks.

4. Augmented reality: is an interactive experience that enhances the real world with computer-generated perceptual information. Using software, apps, and hardware, augmented reality overlays digital content onto real-life environments and objects.

5. Big Data: are data sets so large in volume, velocity and variety that they require specific technologies and analytical methods to extract value or knowledge. These datasets are so voluminous that traditional data processing software cannot handle them. The term is therefore used in reference to the ability (specific to data science) to analyze or extrapolate and relate an enormous amount of heterogeneous, structured and unstructured data, in order to discover the links between different phenomena and predict future ones.

6. Simulation: the term simulation means reproducing the behavior of a system. In general, we talk about simulation both when a concrete model is used and when an abstract model is used that reproduces reality through the use of computers. The model of reality allows you to evaluate and predict the dynamic unfolding of a series of events or processes following the imposition of certain conditions by the analyst or user.

7. Digital Twin: is a digital model of a physical product, system or process, real or predicted, that serves as an indistinguishable digital counterpart used for practical purposes such as: simulation, integration, testing, monitoring and maintenance. The digital twin exists throughout the entire lifecycle of the physical entity it represents and can exist before the physical entity, such as in virtual prototyping. A digital twin of an existing entity can be used in real time and regularly synchronized with the corresponding physical system. The concept of digital twin can be applied to the entire production process, in this way it is possible to extend the benefits of virtualization by applying extended reality and spatial computing to all business processes.

8. Artificial Intelligence: or AI, is a technology that allows computers and machines to simulate the intelligence and problem-solving ability of human beings, artificial intelligence includes machine learning and deep learning. These disciplines involve the development of AI algorithms, modeled on the decision-making processes of the human brain, which can "learn" from available data and make increasingly accurate classifications or predictions over time. Today, generative
AI can learn and synthesize not only human language, but also other types of data, including images, videos, software code, and even molecular structures.

9. Autonomous robot / Advanced automation: is a robot that acts without recourse to human control. it is a robot capable of perceiving its environment, interpreting what it has perceived, making decisions and implementing them. All without any human supervision, even when the environment is totally or partially unknown, and when the robot's activities must adapt to unexpected events, i.e. it must be able to effectively manage uncertainty. The trend of industrial robotics is to become collaborative: the evolution of robots is going from traditional industrial applications (industrial robotic arms) to those of service robotics, in which the robot is called to interact directly with human beings and to operate in environments with human scale.

The integration of these nine pillars into Blue Economy sectors has the potential to drive sustainable growth by:
- Enhancing Efficiency: Streamlined operations reduce waste and improve resource utilization.
- Fostering Innovation: Advanced technologies enable new business models and product offerings.
- Improving Sustainability: Real-time monitoring and analytics support environmentally friendly practices.
- Strengthening Competitiveness: Organizations that leverage these technologies can respond more swiftly to market demands.

Together, these pillars create a robust framework for a future where industries not only thrive economically but also contribute positively to environmental sustainability and societal well-being.

Below are some examples of possible practical applications
- Cloud Computing: Enables seamless data sharing among maritime stakeholders, enhancing efficiency in research, logistics, and port operations.
- Internet of Things (IoT): Facilitates real-time monitoring of vessels, ports, and fisheries, improving operational safety and resource management.

- Cybersecurity: Ensures the protection of critical maritime infrastructure, safeguarding digital transactions and smart shipping systems.
- Augmented Reality: Enhances port management, vessel maintenance, and marine education through immersive digital simulations.
- Big Data: Provides actionable insights for fisheries, marine conservation, and maritime trade through advanced analytics.
- Simulation: Aids in designing efficient shipping routes, sustainable marine structures, and disaster response strategies.
- Digital Twin: Creates virtual replicas of maritime assets to optimize performance, predict maintenance needs, and enhance decision-making.
- Artificial Intelligence (AI): Improves predictive analytics, automates shipping operations, and enhances environmental monitoring.
- Advanced Automation: Streamlines port logistics, shipbuilding, and aquaculture, increasing efficiency while reducing environmental impact.

2.3 Cross-border Cooperation in the Adriatic

Italy and Croatia's cross-border cooperation is pivotal for advancing the Blue Economy and Industry 4.0 (I4.0), particularly through the Interreg Italy-Croatia Programme 2021-2027. This collaboration aims to enhance innovation, sustainability, and economic growth in the Adriatic region by leveraging shared resources and strategic goals.

Opportunities for Regional Clusters
Shared Standards and Data Exchanges:
Establishing common standards for maritime operations can enhance interoperability among regional players, facilitating smoother data exchanges critical for decision-making and operational efficiency.
Joint Innovation Initiatives:
Collaborative projects can drive innovation by pooling resources for research and development in emerging technologies relevant to the blue economy, such as marine biotechnology and sustainable shipping solutions.
Strengthening Regional Clusters:
By fostering clusters that focus on specific niches within the blue economy, both countries can benefit from shared knowledge, reduced costs through economies of scale, and enhanced competitiveness on a global scale.

Cross-Border Supply Chains:

Developing integrated supply chains will not only improve logistics but also create new business opportunities for SMEs in both nations, particularly in sectors like fisheries, tourism, and renewable marine energy

3. REGIONAL ANALYSIS: ITALY AND CROATIA

3.1 PROJECT AREA 1: LP CNA FERRARA

3.1.1 Overview of Blue Economy Activities

According to the report "Ossermare – Osservatorio dell'Economia del Mare 2024", the Emilia-Romagna region plays a significant role in Italy's Blue Economy, contributing 4.6 billion euros in direct added value (2.9% of the regional economy) and supporting over 96,800 jobs. The economic impact is particularly strong in tourism, research, maritime logistics, and shipbuilding.

Key Blue Economy Sectors in Emilia-Romagna:

1. Tourism and Hospitality (33.9% of the Blue Economy's value)

The region's coastal areas, especially Rimini and Ravenna, are major tourism hubs, generating substantial economic activity from accommodation, food services, and recreational activities.

Rimini ranks among Italy's top five provinces in terms of the Blue Economy's impact on employment (16.2% of total jobs).

Coastal tourism is complemented by water sports and leisure activities, further boosting the region's economic profile.(4,5%)

2. Maritime Research, Regulation, and Environmental Protection (28.1%)

The region invests heavily in marine environmental research, sustainability initiatives, and regulatory frameworks to protect its coastal ecosystems.

3. Shipbuilding and Nautical Industry (16.4%)

Emilia-Romagna has a strong presence in shipbuilding, with Rimini ranking 8th among Italian provinces for export specialization in this sector.

Forlì-Cesena and Rimini are among Italy's top provinces for exports in the nautical industry.

4.Maritime Transport and Logistics (8.3%)

The region plays a key role in cargo and passenger movement, with the Port of Ravenna serving as a strategic hub for goods transportation.

5.Fisheries and Seafood Processing (9.0%)
Emilia-Romagna's fisheries sector contributes significantly to the regional economy, although imports surpass exports in this category.
Rimini ranks among the top 10 provinces in Italy for export specialization in the fishing industry.

Regional Specialties and Strengths:
Rimini: A major tourism and hospitality center, with significant contributions from shipbuilding and fisheries exports.
Ravenna: A crucial maritime logistics hub, supporting goods movement and industrial maritime services.
Forlì-Cesena: A growing center for shipbuilding and marine-related exports.
Overall, Emilia-Romagna's Blue Economy is characterized by strong synergies between tourism, maritime industries, and research, with a high economic multiplier effect that integrates these sectors into the broader regional economy

3.1.2 Industry 4.0 Adoption in Blue Economy Sectors

CNA Ferrara has selected 20 companies to interview, focusing mainly on the shipbuilding industry. This choice is motivated by the fact that the 2024 report on blue economy released by National CNA focuses on the crucial role of small and micro enterprises in the development of recreational boating. However, the survey is not limited to this, also taking into account the tourist vocation of the territory, with a focus on the Adriatic coast of Emilia-Romagna, and niches of excellence recognized at the national level.

Sector	Relevant I4.0 Pillars	Adoption Level	Challenges
Shipbuilding	Cloud, Cybersecurity Simulation	Moderate	Cost, time, production process
Maritime Transport	Cloud, Cybersecurity	Moderate	Cost, time, lack of in-house expertise
Marine Defense	Cloud, Cybersecurity, AI, IoT, Simulation	High	Funding, time

Sector	Relevant I4.0 Pillars	Adoption Level	Challenges
Port Activities		Low	Standardization, production process
Coastal Tourism	Big Data, Cloud Computing, AR/VR	Moderate	Cost, time, technical expertise

3.1.3 SME Clustering by I4.0 Needs
- **Cluster A: Tourism-focused SMEs**:

Digital Platforms and Big Data: Tourism companies need to develop or enhance online platforms to facilitate bookings and customer interaction. Using big data to analyze tourist preferences is essential for personalizing offerings.

Digital Marketing: Investing in digital marketing strategies allows tourism businesses to reach a broader audience and improve online visibility.

- **Cluster B: Logistics/ Maritime Transport SMEs**

Data Management: Companies need integrated systems for managing logistics data that can enhance planning and operational efficiency.

Tracking Systems: Implementing blockchain-based solutions for tracking goods can increase transparency and security in logistics operations.

- **Cluster C Shipbuilding**

Computer-Aided Design (CAD), Rendering,: Companies in the shipbuilding sector need advanced design tools to improve product quality and reduce development times.

VR/AR and Simulations: Utilizing augmented reality and virtual reality technologies to simulate construction operations can optimize processes and reduce errors.

- **Cluster D Port Activities and Infrastructures**

Digital Infrastructure: There is a need to invest in digital infrastructure that supports interoperability among different actors in the logistics chain, thereby facilitating the flow of information and goods.

Environmental Sustainability: The adoption of green and digital technologies can help reduce the environmental impact of port activities, promoting sustainable practices.

3.1.4 Regional Recommendations
Emilia-Romagna offers a robust support system for Blue Economy SMEs aiming to adopt Industry 4.0 (I4.0) technologies. Below are tailored recommendations encompassing potential funding sources, digital transformation initiatives, and regional training programs:

Funding Sources

-Ecosystem for Sustainable Transition in Emilia-Romagna (ECOSISTER): This initiative, funded under the National Recovery and Resilience Plan (NRRP), aims to enhance the region's leadership in applied research, supporting sustainable and digital industrial development. SMEs can engage with ECOSISTER to access funding opportunities and collaborate on projects aligned with green and digital transitions.

-PR-FESR 2021/27 – Funding initiatives to support, for instance, internationalization and international promotion projects carried out by SMes, to support development, consolidation and establishment in the regional territory of innovative startups of strategic importance for the development and strengthening of the production systems identified in the 2021-2027 Smart Specialization Strategy, through support for investment plans along the entire value chain , from idea generation, to acceleration up to scale-up

Digital Transformation Initiatives

-BEST 4.0 Project: This initiative focuses on applying Industry 4.0 principles to the blue economy by assisting SMEs along the Adriatic coast in innovating products and processes. It aims to assess the innovation needs of 160 SMEs, providing a catalog of innovative solutions and creating a cross-border network of Digital Innovation Hubs (DIHs). Emilia-Romagna SMEs can participate to receive tailored support for digital transformation.

-Digital Agenda of Emilia-Romagna 2020-2025: The region's strategic plan emphasizes digital transformation across various sectors, including the blue economy. It focuses on infrastructure development, ensuring access rights, and enhancing digital skills among the workforce. SMEs can align with this agenda to benefit from regional digital initiatives.

Regional Training Programs

ESF and Interprofessional Funds (FART, Fondimpresa, ecc.)

Workers can access training courses for updating or specialization funded by the European Social Fund (ESF) or Interprofessional Funds and organized by accredited vocational training centers.

3.1.5 Milestones for WP2 Implementation

Milestone 1 .Creation of a Cross-Border DIH Network

Define common operating models, governance structures, and service offerings for the DIHs.
Develop an online platform for knowledge-sharing, matchmaking, and funding access.
Pilot a joint helpdesk service for Blue Economy SMEs seeking I4.0 solutions.

Milestone 2. Launch of the Cross-Border I4.0 Catalogue

Compile a digital toolkit featuring best practices, case studies, and technological roadmaps.
Identify and document scalable Industry 4.0 solutions tailored for Blue Economy SMEs.

Milestone 3 . SME Digital Transformation Pilots

Select 80 SMEs for tailored support in adopting I4.0 solutions.
Implement pilot projects in AI, IoT, automation, and digital twins for Blue Economy processes.
Develop a mentoring and funding support program for SMEs.

Milestone 4. Capacity Building & Training Programs

Organize joint training programs and boot camps on I4.0 principles.
Set up a train-the-trainer model to enhance long-term digital adoption.

3.2 PROJECT AREA 2: PP 2 CNA ANCONA

3.2.1 Overview of Blue Economy Activities

The Marche region in Italy, located along the Adriatic Sea, has a vibrant and diverse Blue Economy, with activities ranging from marine resources to maritime defense. Here's a summary of key Blue Economy sectors and regional specialties for each activity:

1. Marine Living Resources

● **Fisheries**: The Marche region has a strong tradition in fisheries, especially in coastal towns like Ancona, San Benedetto del Tronto, and Porto Recanati. Local fisheries primarily target anchovies, sardines, mussels, and squid. The region also supports seafood processing industries that contribute to both local and international markets.

● **Aquaculture**: Sustainable aquaculture practices are growing, with fish farms producing sea bream, sea bass, and mussels. Aquaculture is regulated to prevent overfishing and ensure sustainable harvesting.

2. Marine Non-Living Resources

● **Marine Sand and Gravel Extraction**: Coastal areas in the Marche region are used for sand and gravel extraction, supporting the construction industry. These resources are harvested from the seabed, though extraction activities are carefully regulated to prevent ecological damage.

3. Marine Renewable Energy

● **Offshore Wind Energy**: The region has significant potential for offshore wind energy due to favorable wind conditions along its Adriatic coastline. The Marche region is exploring

offshore wind farm projects to contribute to Italy's renewable energy goals and reduce dependence on fossil fuels.

● **Wave and Tidal Energy**: There are emerging efforts to investigate wave and tidal energy potentials along the coast, although this sector is still in its infancy in the region.

4. Port Activities

● **Port Services and Logistics**: Ports like Ancona, San Benedetto del Tronto, and Porto Recanati are critical for post-shipping activities, including warehousing, distribution, and customs services. These ports handle both cargo and passengers, making the post-activity sector a vital part of the region's economy.

5. Shipbuilding and Repair

● **Shipbuilding**: Ancona is home to some of Italy's major shipbuilding yards, where commercial vessels, luxury yachts, and ferries are built. The region is well-known for its high-quality maritime construction, especially for the ferry and luxury yacht industries.

● **Ship Repair and Maintenance**: Alongside shipbuilding, Marche also has a developed sector for ship repair and maintenance. Facilities in Ancona and San Benedetto del Tronto specialize in servicing and maintaining both private and commercial vessels.

6. Maritime Transport

● **Ports and Ferries**: Ancona Port is a major hub for maritime transport, connecting Italy to various Adriatic countries, including Albania, Croatia, and Greece. The port handles a variety of freight and passenger ferries. Other smaller ports in San Benedetto del Tronto and Porto Recanati support regional transport and logistics.

7. Coastal Tourism

● **Tourism Hubs**: The Marche region is known for its coastal towns, which serve as tourism hubs. Senigallia, Numana, and Porto Recanati are among the most popular destinations, offering a mix of beach tourism, cultural tourism, and eco-tourism. The Conero Riviera is famous for its cliffs, beaches, and natural parks, while the Monte Conero region offers opportunities for hiking and marine activities.

● **Sailing and Marine Sports**: The region is also a center for sailing, with numerous marinas and water sport activities such as kayaking, windsurfing, and diving.

8. Blue Biotechnology

● **Marine Biotechnology**: The Marche region is exploring marine biotechnology through research into marine organisms and their potential applications in pharmaceuticals, cosmetics, and food industries. The region's universities and research institutions, such as the University of Ancona, are key players in this field, studying bioactive compounds from marine life for medical and industrial applications.

9. Maritime Defense

● **Naval Facilities**: The Marche region plays a role in maritime defense, with the Port of Ancona serving as a strategic point for the Italian Navy and coast guard operations. The region's maritime security is supported by surveillance systems, patrol vessels, and collaborations with national defense agencies to protect its coastal and maritime interests.

10. Research and Infrastructure

● **Marine Research**: The Marche region is home to a number of research institutions focused on marine science, including the National Institute of Oceanography and Applied Geophysics (OGS), which conducts research on marine environments, climate change, and oceanic resources.

● **Infrastructure Development**: The region has a strong focus on infrastructure development to support the Blue Economy, including investments in port facilities, marinas, and offshore energy installations. The development of smart ports and logistics centers in Ancona is a key priority for regional economic growth.

Regional Specialties:
- **Ancona Port**: A key logistics and transport hub with strong maritime defense, shipbuilding, and renewable energy projects.
- **San Benedetto del Tronto:** Known for its fisheries, seafood processing, and maritime transport.
- **Coastal Tourism:** Popular coastal tourism spots include Senigallia, Porto Recanati, and Numana.
- **Conero Riviera:** A prime eco-tourism and coastal tourism destination, famous for its cliffs and natural parks.
- **Marine Biotechnology Research:** Supported by local institutions studying marine organisms for biotechnology applications.

The Marche region's Blue Economy integrates sustainable resource management, marine innovation, and a deep connection to the Adriatic Sea's maritime heritage.

3.2.2 Industry 4.0 Adoption in Blue Economy Sectors

Sector	Relevant I4.0 Pillars	Adoption Level	Challenges
Coastal Tourism	Big Data, Cloud Computing, AR	Moderate	Data accessibility, tech costs

Fisheries	IoT, Big Data, Cybersecurity	Low	High costs for investments, skills gaps
Maritime Transport	Autonomous Robots, System Integration	Moderate	Regulatory, Infrastructure
Shipbuilding	IoT, Big Data, Simulation	High	High Costs, knowledge barriers
Marine Defense	Big Data, AR	High	Access to tech, funding
Port Activities	Cloud Computing, System Integration	Moderate	Standardization, infrastructure
Marine renewable energy	IoT, Technology's implementation, Big data	Low	Limited technological readiness, high costs
Research and infrastructure	Big Data, AI technologies	Moderate	High costs, limited commercialization pathways
Marine non-living resources	IoT, Big data	Low	High costs of infrastructure, regulatory

3.2.3 SME Clustering by I4.0 Needs

- **Cluster A**: Traditional Resource-Based SMEs (Fisheries and Aquaculture) needing real-time monitoring of environmental conditions (e.g., water quality, fish stock levels), predictive analytics for stock management and sustainable harvesting, Automation to increase efficiency and reduce labor costs, digital upskilling for workers to adopt and manage new technologies.
- **Cluster B**: Industrial and Infrastructure-Based SMEs (Shipbuilding and Maintenance) needing virtual modeling for ship design, maintenance, and performance simulation, 3D printing, sensors for monitoring machinery and vessel health, automation in assembly lines for precision and efficiency, cybersecurity for protection of sensitive design and operational data.
- **Cluster C**: Logistics and Transport SMEs (Ports and Maritime Transport) needing Real-time cargo tracking and port operations optimization, supply chain analysis to improve efficiency and reduce delays, enhancing safety and operational procedures for port staff, strengthening digital systems against cyber threats.
- **Cluster D**: Renewable Energy SMEs (Marine Energy) needing simulation tools for modeling of energy infrastructure for site selection and design, real-time monitoring of

energy production and equipment status, forecasting energy generation based on environmental data, automation and robotics for maintenance of offshore energy platforms.

- **Cluster E**: Tourism-Focused SMEs needing digital platforms for Online booking, marketing, and customer engagement tools, virtual tours of marine ecosystems and historical sites, real-time monitoring of weather and water conditions for tourist safety, upskilling staff to use digital platforms and enhance customer experiences.

- **Cluster F**: Emerging Innovation SMEs (Blue Biotechnology and Marine Research)needing advanced analytics for studying bioactive compounds and marine ecosystems, robotic systems for high-throughput testing and experiments, sensors to track marine organism growth and environmental conditions, cybersecurity safeguarding intellectual property and sensitive research data.

- **Cluster G**: Environmental Management SMEs (Marine Non-Living Resources and Sustainability) needing technologies for monitoring environmental impacts of resource extraction, optimize resource management and ensuring compliance with regulations, automation.

3.2.4 Regional Recommendations

To support the adoption of Industry 4.0 (I4.0) technologies among SMEs in the Marche Region's Blue Economy, targeted initiatives and resources are essential. SMEs should prioritize investments in IoT for real-time monitoring, Big Data for predictive maintenance and resource optimization, automation for enhanced efficiency in seafood processing and shipbuilding, and AR/VR for maintenance and safety training. These efforts should be complemented by sustainability-oriented technologies such as renewable energy solutions and eco-friendly IT products. Funding opportunities are available through national programs like the **Piano Nazionale Transizione 4.0** and **Fondo di Garanzia per le PMI**, as well as EU initiatives such as **Horizon Europe**, the **European Maritime, Fisheries and Aquaculture Fund (EMFAF)**, and the **Digital Europe Program**. Additionally, regional funding from **Regione Marche** offers co-financing for digital transformation projects. To build a digitally skilled workforce, SMEs should leverage training programs in collaboration with institutions like the **University of Ancona** and government-supported initiatives through **Regione Marche** and **Unioncamere Marche**. These efforts can be enhanced by partnerships with technology providers, knowledge-sharing networks, and online platforms like Digital Innovation Hubs. Collaboration within regional innovation clusters and public-private partnerships will further drive the adoption of I4.0 technologies, while investments in broadband connectivity and shared digital infrastructure will address critical gaps. To inspire cultural shifts and broader adoption, promoting success stories of SMEs that have

successfully integrated I4.0 technologies is essential. By aligning with these strategies, SMEs can enhance their competitiveness, sustainability, and growth potential, positioning themselves as leaders in the Blue Economy.

3.2.5 Milestones for WP2 Implementation

- **Milestone 1**: Identify and engage cross-border stakeholders, formalize collaboration through MoUs, and assess existing resources and capabilities to establish a strong foundation for the DIH network..
- **Milestone 2**: Design a shared digital platform and launch pilot projects in key Blue Economy sectors (e.g., fisheries, renewable energy) to demonstrate I4.0 technology applications and value.
- **Milestone 3**: Implement cross-border training programs to upskill the workforce in I4.0 technologies, establish a governance structure for the network, and ensure efficient decision-making and resource allocation.
- **Milestone 4**: Secure long-term funding through EU programs and public-private partnerships, scale the network to include additional regions and sectors, and promote knowledge-sharing through conferences and digital repositories.

3.3 PROJECT AREA 3: PP3 CETMA

3.3.1 Overview of Blue Economy Activities

The Blue Economy in Apulia plays a crucial role in the regional economic landscape, leveraging its strategic coastal position along the Adriatic and Ionian Seas.

The region boasts a well-developed maritime industry that encompasses a diverse range of activities, including tourism, fisheries, aquaculture, shipbuilding, and port logistics. Apulia's extensive coastline, spanning over 800 kilometers, supports vibrant coastal tourism hubs, sustainable marine resource management, and a growing blue technology sector.

Tourism and Coastal Economy: Apulia is a leading coastal tourism destination in Italy, attracting millions of visitors annually. Key locations such as Gallipoli, Polignano a Mare, Otranto, and Vieste serve as major hubs for nautical tourism, sailing, and recreational boating. The expansion of marinas and sustainable tourism initiatives has strengthened Apulia's position in the Mediterranean tourism industry. Investments in marine protected

areas and ecotourism further contribute to the preservation of coastal ecosystems while boosting economic activities.

Fisheries and Aquaculture: The fisheries sector is deeply rooted in Apulia's economic and cultural heritage. Major fishing ports, including Taranto, Molfetta, and Manfredonia, support a significant portion of Italy's seafood industry. The region is known for the production of mussels, clams, and high-value fish species, with aquaculture playing an increasing role in ensuring sustainable seafood supply. Innovation in sustainable fisheries management and traceability systems is helping to improve the sector's long-term viability.

Maritime Logistics and Ports: Apulia serves as a crucial maritime logistics center in Southern Italy, with key ports such as Bari, Brindisi, and Taranto acting as strategic trade and transport hubs. These ports facilitate commercial shipping, ferry routes, and industrial maritime activities, connecting Italy to the Balkans, Greece, and other Mediterranean destinations. The Port of Taranto, in particular, has seen significant investments in port infrastructure and container handling capacity, enhancing its role in international logistics and sustainable maritime transport.

Shipbuilding and Marine Technology: The region has a long-standing tradition in shipbuilding and marine engineering, with shipyards and technology firms specializing in the construction and maintenance of yachts, commercial vessels, and naval equipment. Companies in Brindisi and Taranto focus on innovative marine technologies, eco-friendly ship design, and underwater robotics, reinforcing Apulia's contribution to the blue technology sector.

Sustainability and Innovation in the Blue Economy: Apulia is actively investing in blue economy innovation, with research institutions and companies developing renewable marine energy projects, circular economy solutions for port waste management, and digital tools for marine monitoring. The region's commitment to sustainability is reflected in projects aimed at reducing coastal erosion, promoting marine biodiversity, and implementing eco-friendly tourism models.

With a combination of strong traditional maritime industries and emerging blue technologies, Apulia is well-positioned to strengthen its role as a leading hub in the Mediterranean's Blue Economy.

3.3.2 Industry 4.0 Adoption in Blue Economy Sectors

The Blue Economy in Apulia is progressively aligning with Industry 4.0 pillars, though the rate of adoption varies across different sectors. Maritime logistics and shipbuilding have integrated **Big Data, IoT, and System Integration** to improve operational efficiency, enhance predictive maintenance, and optimize resource allocation. Ports, particularly in

Taranto and Brindisi, are adopting **Cloud Computing and AI-driven logistics** solutions to streamline supply chain management and ensure sustainable maritime operations.

The fisheries and aquaculture sector is increasingly utilizing Big Data and Simulation to monitor marine resources, predict fish stock levels, and optimize sustainable fishing practices. However, the adoption of **Autonomous Robots and Augmented Reality (AR)** in these industries remains limited due to high implementation costs and the lack of specialized digital expertise among small and medium-sized enterprises (SMEs).

Despite these advancements, several challenges hinder the widespread adoption of Industry 4.0 technologies in Apulia's Blue Economy. Many SMEs struggle with digital transformation, primarily due to **limited financial resources, cybersecurity concerns, and fragmented IT infrastructure.** The absence of integrated Cloud Computing platforms and resistance to change within traditional industries further slows digital adoption.

To overcome these challenges, stronger government incentives, training programs, and industry partnerships are necessary to support the integration of IoT-driven monitoring systems, AI-powered maritime analytics, and blockchain solutions. Investing in digital skills and fostering collaboration between maritime technology firms, academic institutions, and public authorities will be crucial for accelerating the transition towards a fully digitalized and Industry 4.0-compliant Blue Economy in Apulia. In addition, it should be noticed that most of the interview companies are Start-ups or very small companies, with few employees and with a low level of digitalization of internal processes.

Sector	Relevant I4.0 Pillars	Adoption Level	Challenges
Coastal Tourism	Big Data, AI, Augmented Reality	Low	Tech costs, Implementation time, Data accessibility,
Fisheries	IoT, Big Data, Simulation	Low to Moderate	Cost, Technical expertise
Shipbuilding	IoT, Digital Twin, Simulation, Autonomous Robots, AI	Moderate	Cybersecurity issues, Technical expertise
Port Activities	Cloud Computing, IoT, Augmented Reality	Moderate	Cost, Knowledge barriers

Sector	Relevant I4.0 Pillars	Adoption Level	Challenges
Marine Renewable Energy	IoT, Big Data, Simulation, AI, Cloud Computing	Low to Moderate	Access to tech, Funding

3.3.3 SME Clustering by I4.0 Needs

-   Cluster A: Logistics, Transport and Tourism SMEs (Ports, Maritime Transport, Coastal Tourism) needing digital platforms for Online booking, marketing, and customer engagement tools, virtual tours of marine ecosystems and historical sites, real-time monitoring of weather and water conditions for tourist safety, upskilling staff to use digital platforms and enhance customer experiences. This cluster also include port operations optimization, enhancing safety and operational procedures for port staff.

-   Cluster B: Industrial SMEs and new technology (Shipbuilding, Naval Design and New products) needing virtual modeling for ship design, maintenance, and performance simulation, 3D printing, sensors for monitoring machinery and vessel health, automation in assembly lines for precision and efficiency, cybersecurity for protection of sensitive design and operational data.

-   Cluster C: Renewable Energy and Marine resources including fishing SMEs (Marine Energy, Renewable Energy, Fisheries) needing simulation tools for modeling of energy infrastructure for site selection and design, real-time monitoring of production and equipment status, forecasting based on environmental data, automation and robotics for maintenance or production automation.

3.3.4 Regional Recommendations

Funding Opportunities - Small and medium-sized enterprises (SMEs) should proactively utilize funding opportunities available through EU programs like Horizon Europe and national innovation funds. These resources can provide essential financial support for digital transformation initiatives, including the possibility to get found to enlarge facilities/factories or to create pilot sites to test, on a larger scale, their innovations.

Digital Transformation Training Programs - Addressing the skills gaps is essential to ensure the successful adoption of Industry 4.0 technologies. To achieve this, University, Research and Technology Center, and regional training centers should develop training programs that emphasize the practical use of advanced technologies. These programs

should cover areas such as simulation and optimization techniques, IoT applications, artificial intelligence, cybersecurity practices, enabling SMEs to build the capabilities needed for a digital future.

Demo case and good practice - The implementation of demo cases and the establishment of good practices are essential to promote the effective integration of Industry 4.0 technologies across key sectors. Demo cases serve as real-world examples, showcasing the practical application and benefits of technologies such as IoT, AI, and augmented reality in areas like fisheries, tourism, shipbuilding, and renewable energy. These pilot projects provide a hands-on framework for experimentation, enabling stakeholders to identify challenges, assess outcomes, and refine processes. Simultaneously, documenting and disseminating good practices derived from these demo cases creates a repository of proven methodologies, fostering knowledge transfer and encouraging adoption across industries. Together, these initiatives build a foundation for sustainable innovation and cross-sector collaboration.

3.3.5 Milestones for WP2 Implementation
- Milestone 1: Establishing a joint innovation hub for Blue Economy digitalization.
- Milestone 2: Launching a bilateral workforce training program in I4.0 applications for the Blue Economy.
- Milestone 3: Create a shared list of services: create a presentation with different type of services that can support SMEs to access I4.0 technologies, training, and collaboration opportunities.
- Milestone 4: Selection of new technologies and available enduser, launching a bilateral workforce for demo implementation and I4.0 applications for the Blue Economy.

3.4 PROJECT AREA 4: PP4 AREA

3.4.1 Overview of Blue Economy Activities
Area Science Park is based in Trieste, in the Friuli Venezia Giulia region, and although the region has only 93 Km of coastline representing the 1,1% of the over 8,000 Km of Italy's coastline, they constitute a particular maritime and lagoon ecosystem that supports significant economic activities such as aquaculture, fishing, tourism, shipbuilding and nautical services.

At the end of 2023, in Italy there were 227.975 companies operating in the marine economy. In Friuli Venezia Giulia they amounted to 4.030: 1.849 in Trieste, 1.281 in Udine, 785 in Gorizia and 115 in Pordenone; in Italy 1.040.172 people were employed in the marine economy (2022); in Friuli Venezia Giulia 28.792 workers were directly or indirectly employed in the Blue Economy, divided into the 4 provinces: 7.432 in Udine, 6.538 in Gorizia, 13.467 in Trieste and 1.355 in Pordenone (source: "L'economia del mare in Friuli Venezia Giulia 2024", Camera di Commercio di Udine e Pordenone – Ufficio Statistica).

The nautical sector in this northeastern Italian region is a thriving industry that benefits from its strategic position along the Adriatic Sea and its proximity to central Europe: it is home of the Port of Trieste (one of the most important deep-water ports in the Mediterranean for international shipping and logistics) the Port of Monfalcone (known for its industrial cargo handling and shipbuilding) and the Port of San Giorgio di Nogaro; the region has a strong tradition in shipbuilding, with companies like Fincantieri, building luxury yachts and high standard cruise ships for national and international clients; marinas and nautical tourism along its costs (in 2022 more than 15.000 berths were available – in "L'economia del mare in Friuli Venezia Giulia 2024"); a developed ecosystem of suppliers and service providers supporting the nautical industry, including marine engineering and design, maintenance and refitting services for yachts and ships, production of marine equipment and components.

The maritime sector in all its components generates the 7.2% of the PIL of Friuli Venezia Giulia, contributing to its export for almost 3,5bn of euros (16% of total export). Fonte: mareFVG – Report "Innovazione, sostenibilità e competenze", 2024.

Institutions like the University of Trieste, the University of Udine, SISSA – Scuola Internazionale Superiore di Studi Avanzati and technical schools contribute to maritime research, innovation and training collaborating with local industries on advanced projects, such as green shipping technologies. Among these institutions, great importance has the "OGS – National Institute of Oceanography and Applied Geophysics" and "mareFVG", the "Maritime Technology Cluster Friuli Venezia Giulia" which acts as a meeting point for the regional maritime technology sector and a point of reference for businesses, universities, research centres and training bodies.

The importance of the Blue Economy is also recognized in the strategies and programmatic documents of the Regional Administration. In addition to the establishment of the "mareFVG" cluster, it is worth mentioning the initiative "WAI-TP-Waterborne Adriatic Ionian Technological Platform" promoted by Friuli Venezia Giulia and the "Smart Specialization Strategy of the Friuli Venezia Giulia Region" (2022).

- "WAI-TP-Waterborne Adriatic Ionian Technological Platform" aims at setting up a macro-regional cluster for the Adriatic-Ionian Region to aggregate the quadruple helix players in the maritime technologies sector (mainly shipbuilding and nautical industry, yachting, maritime transport, offshore, logistics and marine robotics).

Regarding the Smart Specialization Strategy, a specific study group ("Blue growth, logistics and sustainable mobility") has identified three development trajectories for the maritime sector:

- GREEN MOBILITY: technologies, systems and solutions for the production and operation of maritime vehicles and for commercial and tourist ports.
- SMART MOBILITY: technologies, systems and intelligent solutions for ships, shipyards, ports and their land connections.
- SEA MADE IN FVG: technologies, systems and solutions for the competitiveness and resilience of the territory.

The nautical sector in this northeastern Italian region, is a thriving industry that benefits from its strategic position along the Adriatic Sea and its proximity to central Europe: it is home to the Port of Trieste (one of the most important deep-water ports in the Mediterranean for international shipping and logistics) and the Port of Monfalcone (known for its industrial cargo handling and shipbuilding); has a strong tradition in shipbuilding, with companies like Fincantieri, building luxury yachts and pleasure vessels for national and international clients; marinas and nautical tourism along its costs; a developed ecosystem of suppliers and service providers supporting the nautical industry, including marine engineering and design, maintenance and refitting services for yachts and ship, production of marine equipment and components.

Institutions like the University of Trieste and technical schools in the region contribute to maritime research, innovation, and training. They collaborate with local industries on advanced projects, such as green shipping technologies.

3.4.2 Industry 4.0 Adoption in Blue Economy Sectors

Concerning the WP1 activities, AREA collaborated in synergy with MareFVG, the regional maritime technology cluster, to identify and assess 20 companies operating in the Blue Economy. Together they decided to focus on specific sectors in order to analyze a more homogeneous target and identify common needs. The two sectors that have been chosen are coastal tourism (marinas) and shipbuilding.

Sector	Relevant I4.0 Pillars	Adoption Level	Challenges
Coastal tourism (Marinas)	CRM, APP, 5G	Low/Moderate	Technical skills, costs, time for adoption
Shipbuilding	Simulation and Optimization, VR/AR, Big Data, AI, Cybersecurity	Moderate	Costs, time for adoption

3.4.3 SME Clustering by I4.0 Needs

Cluster A - **Shipbuilding**

- Simulation and Optimization: Companies in the shipbuilding and nautical sector need advanced design tools such as to improve product quality and reduce development times; luxury and performance yachts need specific performance technicalities to optimize weights and shapes of the product.
- VR/AR: Utilizing augmented reality and virtual reality technologies to simulate component construction operations can optimize processes and reduce errors; to use these technologies for presenting in detail the final product can be considered an impactful marketing tool.
- Big Data: this technology is especially necessary in the design of cruise ships as there is a lot of data that needs to be managed and structured.
- Artificial Intelligence or AI: can learn and synthesize data, making designers' work faster. They can create efficient and comprehensive digital models capable of developing analyzes and predictions.
- Cybersecurity: the massive use of digital technologies with the production of significant quantities of data makes the introduction of cybersecurity increasingly necessary even in small businesses such as nautical design companies. Client companies, especially large ones, are careful in choosing reliable suppliers.

Cluster B: Coastal Tourism

- CRM (Customer Relationship Management tools): tourism-focused SMEs need digital platforms for customer management, booking, marketing and engagement tools, virtual
- APPs: marinas and ports can use personalized apps for real-time monitoring of weather and water conditions for tourist safety, webcams to remotely control their vessels, information about social events organized.
- 5G: high quality connectivity can improve the service for customers, considering the large use of connected devices onboard.

3.4.4 Regional Recommendations

To support the adoption of Industry 4.0 among SMEs in Friuli Venezia Giulia region, these are the targeted recommendations that have been chosen, based on the analysis of the technological maturity assessment done and sector-specific challenges:

Digital Transformation Training Programs - Addressing skills gaps is critical for successful I4.0 adoption. Innovation agencies, technology parks and regional training centers should design programs that focus on the practical application of simulation and optimization, IoT, AI, cybersecurity, and data analytics.

Funding Sources - SMEs should actively leverage EU funding opportunities, such as Horizon Europe, the European Regional Development Fund (ERDF), and national innovation funds. These programs can provide financial support for digital transformation projects, particularly in areas like port modernization, sustainable fisheries, and shipbuilding automation. Regional development agencies should establish dedicated advisory centers to assist SMEs in navigating funding applications.

Digital Transformation Initiatives - SMEs in sectors like tourism, logistics, shipbuilding, fisheries and fish processing and preserving should adopt tailored digital transformation strategies. This includes deploying IoT for real-time monitoring in fisheries, AR for enhancing tourist experiences, and automation in shipbuilding production. Establishing regional pilot projects focused on these technologies can provide practical implementation frameworks and encourage cross-sector collaboration.

These recommendations aim to accelerate the adoption of Industry 4.0, foster regional economic growth, and ensure the competitiveness of SMEs in the Blue Economy sectors.

3.4.5 Milestones for WP2 Implementation

Milestone 1: Establish a cross-Border DIH network: prepare a list of European Digital Innovation Hubs (EDIHs) and regional Digital Innovation Hubs (DIHs).

Milestone 2: Create a shared list of services: create a presentation with different types of services that can support SMEs to access I4.0 technologies, training, and collaboration opportunities.

These milestones aim to strengthen cooperation, align technological advancements, and drive sustainable growth in Blue Economy sectors across borders.

3.5 PROJECT AREA 5: PP5 CCE

3.5.1 Overview of Blue Economy Activities

Split-Dalmatia County is a significant hub of the Blue Economy, with key sectors including tourism, maritime logistics, fisheries, shipbuilding, and the IT industry. Tourism is the region's leading sector, focusing on sustainability and the application of digital technologies to enhance visitor management, with the level of digital readiness and technological strategies assessed as moderately advanced. Maritime logistics, centered around the Port of Split, shows progress in adopting Industry 4.0 principles, particularly through the digitalization of logistics tracking processes.

Fisheries and aquaculture, traditional sectors of the region, face challenges in digitalization, with a basic level of technological readiness. Shipbuilding, another traditional economic pillar, is undergoing modernization, including the adoption of automation and digital production management systems. The IT sector plays an increasingly important role, providing technological support to other Blue Economy sectors through the development of specialized digital solutions.

3.5.2 Industry 4.0 Adoption in Blue Economy Sectors

Analysis of Split-Dalmatia County's Blue Economy Sectors Alignment with Industry 4.0 Pillars

Sector	Relevant I4.0 Pillars	Adoption Level	Challenges
Coastal Tourism	Big Data, Cloud Computing, AR	Moderate	Limited data accessibility, high technology costs
Fisheries and Fish Processing and preserving industry	IoT, Big Data, Cybersecurity	Low	Lack of investment, skills gaps, and tech adoption
Maritime Transport	Autonomous Robots, System Integration	Moderate	Cybersecurity concerns, insufficient regulation
Shipbuilding	IoT, Big Data, Simulation	Low to Moderate	High costs, limited knowledge of advanced systems

Port Activities	Cloud Computing, System Integration	Moderate	Infrastructure challenges, standardization issues
IT Sector	Big Data, AI, Cloud Computing	High	Scaling solutions to other sectors, skills mismatch

3.5.3. SME Clustering by I4.0 Needs

In Split-Dalmatia County, SMEs can be grouped into distinct clusters based on their Industry 4.0 innovation needs.

Cluster A consists of **tourism-focused SME**s aiming to enhance the visitor experience through digital technologies. These businesses require advancements in augmented reality (AR), cloud computing, and big data to improve service delivery and manage visitor interactions more effectively.

Cluster B includes logistics SMEs, particularly those involved in maritime transport and port activities. Their primary innovation needs revolve around the implementation of IoT, enhanced cybersecurity, and system integration to ensure better port and transport security while addressing challenges such as regulatory compliance and infrastructure standardization.

Cluster C is comprised of **fisheries, aquaculture and fish processing and preserving SMEs** seeking solutions for efficiency and environmental sustainability. These businesses need big data analytics, IoT-enabled tracking systems, and environmental monitoring technologies to modernize their operations and align with sustainability goals.

Cluster D focuses on **shipbuilding SMEs** that are in the process of modernizing their production processes. These businesses require Industry 4.0 solutions such as IoT, simulation technologies, and automation to improve manufacturing precision and reduce operational costs.

Cluster E includes **IT-focused SMEs** that provide digital transformation solutions to other Blue Economy sectors. These companies are at the forefront of innovation, offering expertise in artificial intelligence (AI), big data, and cloud computing to support the digitalization of regional industries.

These clusters reflect the diverse technological needs of SMEs in the region, shaped by their respective industries and levels of technological maturity.

3.5.4 Regional Recommendations

To support the adoption of Industry 4.0 among SMEs in Split-Dalmatia County, several targeted recommendations can be made based on the analysis of their technological maturity and sector-specific challenges:

1.   **Funding Sources -** SMEs should actively leverage EU funding opportunities, such as Horizon Europe, the European Regional Development Fund (ERDF), and national innovation funds. These programs can provide financial support for digital transformation projects, particularly in areas like port modernization, sustainable fisheries, and shipbuilding automation. Regional development agencies should establish dedicated advisory centers to assist SMEs in navigating funding applications.

2.   **Digital Transformation Initiatives -** SMEs in sectors like tourism, logistics, shipbuilding, fisheries and fish processing and preserving should adopt tailored digital transformation strategies. This includes deploying IoT for real-time monitoring in fisheries, AR for enhancing tourist experiences, and automation in shipbuilding production. Establishing regional pilot projects focused on these technologies can provide practical implementation frameworks and encourage cross-sector collaboration.

3.   **Regional Training Programs -** Addressing skills gaps is critical for successful I4.0 adoption. Regional training centers should design programs that focus on the practical application of IoT, AI, cybersecurity, and data analytics. Partnerships with local universities and technology hubs can enhance access to expertise and resources. Dedicated workshops for SMEs in fisheries and aquaculture can focus on sustainability through digital tools, while shipbuilding SMEs would benefit from training in simulation technologies and automation systems.

These recommendations aim to accelerate the adoption of Industry 4.0, foster regional economic growth, and ensure the competitiveness of SMEs in the Blue Economy sectors.

3.5.5 Milestones for WP2 Implementation

To establish effective cross-border cooperation, key milestones must focus on fostering collaboration, sharing resources, and aligning policies to accelerate Industry 4.0 adoption in Blue Economy sectors.

Milestone 1: Establish Cross-Border DIH Network: Set up interconnected Digital Innovation Hubs (DIHs) to provide SMEs access to I4.0 technologies, training, and collaboration opportunities.

Milestone 2: Create a Shared IoT Marine Data Platform: Develop a platform for collecting and analysing marine data to support fisheries, logistics, and environmental monitoring.

Milestone 3 Launch a Joint Training Program: Implement cross-border workforce training focused on I4.0 applications like IoT, AI, and simulation for Blue Economy sectors.

Milestone 4: Harmonize Data and Cybersecurity Policies: Develop common frameworks for secure data sharing and cybersecurity across borders.

Milestone 5: Pilot I4.0 Projects: Conduct pilot initiatives in shipbuilding, tourism, logistics fisheries and fish processing and preserving to demonstrate the benefits of advanced technologies and encourage adoption by SMEs.

These milestones aim to strengthen cooperation, align technological advancements, and drive sustainable growth in Blue Economy sectors across borders.

3.6 PROJECT AREA 6: PP6 IDA

3.6.1 Overview of Blue Economy Activities

Istrian County stands as an important player in the regional Blue Economy, leveraging its unique geographical position, rich maritime heritage, and diverse ecosystem. The county's economic activities within the Blue Economy are predominantly concentrated in three core sectors: tourism, maritime logistics, and fisheries, each playing a pivotal role in its economic and social development.

1. Tourism is the cornerstone of Istrian County's Blue Economy, with the region being one of Croatia's most prominent tourist destinations. Istria is renowned for its scenic coastal towns such as Poreč, Rovinj, and Pula, which serve as hubs for nautical tourism, luxury resorts, and eco-tourism initiatives. The region also capitalizes on its cultural and natural attractions, including historic sites, crystal-clear waters, and protected marine parks like the Brijuni Islands. Istria's tourism strategy increasingly emphasizes sustainability, with investments in green marinas, eco-friendly accommodations, and marine conservation projects to protect biodiversity while enhancing the visitor experience.

2. Maritime logistics and port activities are integral to the county's Blue Economy, supported by its strategic location along the northern Adriatic Sea. The Port of Pula and nearby smaller harbors facilitate efficient cargo handling, ship repair, and maintenance, catering primarily to regional trade. While smaller in scale compared to larger Croatian ports like Rijeka, Istria's ports focus on niche services, such as specialized shipbuilding and servicing vessels used in tourism and fishing industries. The potential for modernizing logistics infrastructure, incorporating digitalization, and improving intermodal transport connectivity remains a priority to boost competitiveness in this sector.

3. Fisheries and aquaculture represent another cornerstone of Istrian County's Blue Economy. The region is recognized for its high-quality seafood production, with an emphasis on sustainable practices. Small-scale coastal fisheries dominate, providing fresh fish, shellfish, and other seafood to local and international markets. Aquaculture, particularly the cultivation of sea bass, sea bream, and mussels, is expanding, supported by Istria's favorable environmental conditions and growing demand for traceable, eco-certified products. The sector also benefits from regional culinary traditions that celebrate seafood, integrating fisheries into the broader gastronomic tourism industry.

3.6.2 Industry 4.0 Adoption in Blue Economy Sectors

Sector	Relevant I4.0 Pillars	Adoption Level	Challenges
Coastal Tourism	Big Data, Cloud Computing, AR	Moderate	Seasonal demand, high costs of digital technologies, limited infrastructure
Fisheries	IoT, Big Data, Cybersecurity	Low	Traditional methods, small-scale operations, limited investment in digitalization
Maritime Transport	System Integration, Automation	Moderate	Aging infrastructure, insufficient investment in advanced systems
Shipbuilding	IoT, Simulation, Robotics	Low	High modernization costs, lack of qualified workforce in I4.0 technologies
Port Activities	Cloud Computing, System Integration	Moderate	Limited modernization of smaller ports, need for standardization
Marine Renewable Energy	IoT, AI, Big Data	Low	Early-stage development, funding shortages, lack of expertise
Aquaculture	IoT, Data Analytics	Low to Moderate	Small-scale operations, high tech costs, limited automation

3.6.3 SME Clustering by I4.0 Needs

Cluster	Description	I4.0 Needs
Cluster A	Tourism SMEs focused on enhancing visitor experiences through digital tools	AR for immersive experiences, Cloud Computing for booking systems, Big Data for demand forecasting
Cluster B	Port and logistics SMEs requiring security and operational efficiency enhancements	IoT for real-time tracking, Cybersecurity for data protection, System Integration for seamless workflows
Cluster C	Fisheries and aquaculture SMEs aiming for sustainability and productivity	IoT for real-time monitoring, Data Analytics for environmental and stock assessments, Big Data for supply chain transparency
Cluster D	Shipbuilding SMEs needing modernization in design and production	Simulation tools for design, IoT for smart production systems, Robotics for automated processes
Cluster E	Renewable energy SMEs exploring marine-based energy solutions	IoT for sensor networks, Big Data for resource optimization, AI for predictive maintenance
Cluster F	Marine services SMEs focusing on maintenance and auxiliary maritime operations	Digital Twins for predictive maintenance, AR for training and repair, System Integration for resource management

3.6.4 Regional Recommendations

1. National Funding programs

- Vouchers for Digitalization: Offered under the National Recovery and Resilience Plan to support SMEs' digital transformation initiatives.

- Grants for Digitalization: Funding for investments in digital tools and equipment to enhance production processes and organizational practices.

2. European Union Funding programs

- InvestEU Program: Provides financial support for innovation, digitalization, and sustainable development in SMEs.

- LIFE Programme: Finances projects focused on sustainable, eco-friendly innovations close to market deployment.

- European Regional Development Fund (ERDF): Supports technological, organizational, and skill development in SMEs.

- European Social Fund (ESF): Aids vocational and professional training to improve workforce skills for digital transformation.

- EIC Accelerator: Provides grants of up to €2.5 million for innovative SMEs with market-creating technologies.

- EIC Scaling Club: Offers exclusive networking and knowledge-sharing opportunities for SMEs in advanced tech sectors.

- ESM Fund 2025: Launching in 2025, this fund supports SMEs with financial aid for sustainable and innovative projects.

3. Regional Initiatives

- Istrian County Digital Transformation Grants: Covers up to 50% of costs for digitalization projects; new calls are expected in 2025.

- BSO:Istrian Development Agency (IDA): Supports SMEs with access to regional EU-funded projects and training tailored for Industry 4.0 needs.

4. Digital Transformation Initiatives

- IN4BLUE Project: Supports the sustainable transformation of blue economy sectors in the Adriatic region.

- SMARTY Project: Promotes interregional cooperation to drive the adoption of Industry 4.0 solutions by SMEs.

- BEST4.0 Project: Focuses on the digital transformation of SMEs in the blue economy sectors.

5. Training and Capacity Building

- Digital Skills Development: National initiatives to upskill the workforce under Croatia's "Digital Croatia Strategy for the period until 2032."

- Learning Factory for Digital Competitiveness: Practical learning environments to help SMEs enhance Industry 4.0 readiness.

- EIC STEP Scale-Up Scheme: Provides investments ranging from €10 to €30 million to scale up SMEs in strategic sectors.

3.6.5 Milestones for WP2 Implementation

Milestone 1: Establish a Cross-Border DIH Network

- Create interconnected Digital Innovation Hubs (DIHs) in Istrian County and neighboring Italian regions to provide SMEs with access to Industry 4.0 technologies, expert guidance, and funding opportunities.

Milestone 2: Develop a Shared IoT Platform for Marine Data

- Design and launch a cross-border IoT platform to collect, share, and analyze real-time marine data to benefit fisheries, maritime logistics, and environmental monitoring.
- Incorporate pilot use cases such as IoT-enabled sustainable aquaculture or logistics optimization to encourage stakeholder engagement.

Milestone 3: Implement Joint Workforce Training Programs

- Organize cross-border training programs tailored to SMEs, focusing on Industry 4.0 applications such as IoT, AI, simulation, and robotics for Blue Economy sectors.
- Establish a pool of cross-border trainers to ensure consistent skill development.

Milestone 4: Harmonize Data Sharing and Cybersecurity Policies

- Develop shared frameworks for secure data sharing, interoperability, and cybersecurity standards aligned with EU guidelines.
- Facilitate policy workshops to align cross-border data governance practices and build trust among stakeholders.
- Standardize protocols for data collection and storage to ensure seamless integration between DIHs.

Milestone 5: Pilot I4.0 Projects in Blue Economy Sectors

- Launch pilot initiatives to showcase the benefits of Industry 4.0 technologies in key sectors such as shipbuilding, coastal tourism, fisheries, aquaculture, and maritime logistics.

3.7 PROJECT AREA 7: PP7 DIH AFC

3.7.1 Overview of Blue Economy Activities

The Šibenik-Knin County region plays a significant role in the Blue Economy sectors in Croatia, leveraging its strategic location along the Adriatic Sea and its abundant natural resources to support a wide range of maritime and coastal activities. This region serves as a hub for maritime logistics, coastal tourism, fisheries, and aquaculture, all of which are deeply embedded in the local economy and culture. Small and medium-sized enterprises (SMEs) in the region play a crucial role by driving innovation, enhancing operational efficiency, and adopting sustainable practices. Notable activities include the optimization of maritime transport through digital solutions, eco-tourism initiatives that focus on preserving natural heritage, and the application of Industry 4.0 principles to modernize traditional industries. Fisheries and aquaculture are particularly significant for the local economy, with growing efforts to integrate advanced monitoring tools, IoT solutions, and sustainable resource

management practices. This ensures the long-term viability of marine resources while meeting the demands of local and international markets. Port services are another vital activity, benefiting from the region's strategic position and serving as key nodes for trade, logistics, and tourism. Shipbuilding, a traditional industry in the area, continues to thrive also. Coastal tourism flourishes in Šibenik-Knin County due to its picturesque destinations, historical landmarks, and pristine natural beauty. There is significant potential to elevate the tourist experience by embracing digitalization, such as augmented reality (AR) applications that bring historical sites to life and big data analytics to personalize and optimize visitor experiences. The combination of these diverse and interconnected activities underscores the region's critical role in Croatia's Blue Economy and its potential to set benchmarks in sustainable and innovative maritime and coastal development.

3.7.2 Industry 4.0 Adoption in Blue Economy Sectors

The adoption of Industry 4.0 principles by SMEs in PP2 DIH is progressing, with varied levels of integration across sectors. The following table summarizes the alignment of Blue Economy sectors with relevant I4.0 pillars:

Sector	Relevant I4.0 Pillars	Adoption Level	Challenges
Coastal Tourism	Big Data, AR, Cloud	Moderate	Limited technical expertise
Fisheries	IoT, Big Data, Cybersecurity	Low	Investment gaps, skills shortage
Maritime Transport	Autonomous Robots, IoT	High	Regulatory compliance issues
Port Activities	System Integration, Cloud	High	Infrastructure standardization

3.7.3 SME Clustering by I4.0 Needs

SMEs in the PP2 DIH region are categorized into clusters based on their innovation needs:

● **Cluster A:** Tourism SMEs requiring digital experience enhancements through AR and cloud technologies.

● **Cluster B:** Logistics SMEs focusing on cybersecurity and IoT for safe and efficient port management.

● **Cluster C:** Fisheries SMEs seeking analytics and IoT solutions for environmental monitoring and operational efficiency.

These clusters highlight the diverse technological needs and priorities of SMEs, underscoring the need for tailored support and innovation strategies.

3.7.4 Regional Recommendations

To accelerate I4.0 adoption among SMEs in the PP2 DIH region, the following recommendations are proposed:

● **Funding Opportunities:** Access to EU funds and regional grants to support technological upgrades in tourism and fisheries.

● **Training Programs:** Workshops and training initiatives focused on digital tools like IoT and big data analytics.

● **Collaborative Platforms:** Establishing shared innovation hubs for cross-sector collaboration.

● **Technology Accessibility:** Providing affordable access to advanced technologies, especially for smaller SMEs.

3.7.5 Milestones for WP2 Implementation

The milestones for fostering cross-border cooperation and I4.0 integration include:

1. **Establishing a Joint Innovation Hub:** Creating a digital innovation hub to promote Industry 4.0 adoption in Blue Economy sectors.

2. **Developing a Cross-Border IoT Platform:** Facilitating shared marine data for fisheries and logistics.

3. **Launching Workforce Training Programs:** Initiating bilateral training programs to enhance digital skills for SME employees.

4. **Formulating Data Sharing Policies:** Creating standardized policies for data sharing and cybersecurity in the region.

These milestones aim to create a sustainable, technology-driven ecosystem that supports the digital transformation of SMEs in the PP7 DIH region.

3.8 PROJECT AREA 8: PP8 PFRI

3.8.1 Overview of Blue Economy Activities

Primorsko-Goranska County serves as a significant hub of the Blue Economy in Croatia, with its industries spanning coastal tourism, maritime logistics, fisheries, aquaculture, shipbuilding, and the IT sector. Leveraging its strategic location along the northern Adriatic

coast, the region has emerged as a center for sustainable development, driven by innovation and the application of Industry 4.0 principles.

Tourism is the county's leading economic sector, with a focus on eco-tourism and digital solutions to enhance visitor management. Digital readiness in the tourism sector is moderately advanced, supported by investments in technologies like big data, augmented reality (AR), and cloud computing.

Fisheries and aquaculture are traditional sectors that face challenges in adopting digital tools and sustainable practices. Technological readiness remains basic, with opportunities to modernize through IoT-enabled tracking systems and data-driven environmental monitoring.

The shipbuilding industry is undergoing gradual modernization, including the adoption of automation, simulation technologies, and IoT for precision manufacturing. These advancements aim to reduce operational costs and improve environmental sustainability.

The IT sector is playing an increasingly pivotal role in the region, providing specialized digital solutions to support other Blue Economy sectors. With high levels of technological readiness, IT companies offer expertise in artificial intelligence (AI), big data, and cloud computing.

3.8.2 Industry 4.0 Adoption in Blue Economy Sectors

The alignment of Primorsko-Goranska County's Blue Economy sectors with Industry 4.0 pillars reveals varying levels of adoption:

Sector	Relevant I4.0 Pillars	Adoption Level	Challenges
Coastal Tourism	Big Data, Cloud Computing, AR	Moderate	Limited data accessibility, high costs
Fisheries and Aquaculture	IoT, Big Data, Cybersecurity	Low	Investment gaps, skills shortages
Maritime Transport	Autonomous Robots, System Integration	Moderate	Cybersecurity concerns, regulation issues
Shipbuilding	IoT, Big Data, Simulation	Low to Moderate	High costs, lack of advanced system knowledge
Port Activities	Cloud Computing,	Moderate	Infrastructure gaps, standardization issues

	System Integration		
IT Sector	Big Data, AI, Cloud Computing	High	Scaling solutions to other sectors, skills mismatch

3.8.3 SME Clustering by I4.0 Needs

In Primorsko-Goranska County, SMEs can be grouped into distinct clusters based on their Industry 4.0 innovation needs. These clusters highlight the diverse technological requirements of SMEs, shaped by their respective industries and technological maturity.

SME Clusters and Innovation Needs

Cluster	Key Characteristics	Innovation Needs
Cluster A: Tourism SMEs	Tourism-focused SMEs aiming to enhance visitor experiences through technology.	Augmented reality (AR), big data analytics, and cloud computing for visitor management.
Cluster B: Logistics SMEs	Maritime transport and port activity SMEs focused on improving operational efficiency.	IoT systems, enhanced cybersecurity, and system integration for transport security and compliance.
Cluster C: Fisheries and Aquaculture SMEs	Traditional SMEs prioritizing sustainability and operational efficiency.	IoT-enabled tracking systems, big data for environmental monitoring, and process automation.
Cluster D: Shipbuilding SMEs	Modernizing SMEs seeking to improve precision and reduce costs.	Simulation technologies, IoT, and automation for production efficiency.
Cluster E: IT and Innovation SMEs	Digital transformation enablers providing solutions to other sectors.	Advanced AI, big data analytics, and scalable cloud solutions.

3.8.4 Regional Recommendations

To support the adoption of Industry 4.0 among SMEs in Primorsko-goranska county ,several targeted recommendations can be made based on the analysis of their technological maturity and sector-specific challenges:

Funding Sources

SMEs should actively leverage EU funding opportunities such as Horizon Europe and the European Regional Development Fund (ERDF). Dedicated advisory centers can assist SMEs in navigating funding applications.

Digital Transformation Initiatives

SMEs in tourism, logistics, shipbuilding, and fisheries should adopt tailored digital strategies. This includes deploying IoT for real-time monitoring, AR for enhancing tourist experiences, and automation in production processes.

Regional Training Programs

Addressing workforce skills gaps is critical. Regional training centers should focus on practical applications of IoT, AI, and data analytics. Partnerships with universities and technology hubs can enhance access to resources and expertise.

Innovation Hubs

Establish regional innovation hubs to foster collaboration among SMEs, academic institutions, and technology providers. These hubs can also serve as platforms for knowledge sharing and pilot project implementation.

3.8.5 Milestones for WP2 Implementation

To establish effective cross-border cooperation and accelerate Industry 4.0 adoption, key milestones include:

✓ Milestone 1

Establish a cross-border Digital Innovation Hub (DIH) network to provide access to technologies and training.

✓ Milestone 2

Create a shared IoT marine data platform for fisheries, logistics, and environmental monitoring.

✓ Milestone 3

Implement a joint training program focused on IoT, AI, and simulation for Blue Economy sectors.

✓ **Milestone 4**
Develop harmonized data and cybersecurity policies to ensure secure cross-border data sharing.

✓ **Milestone 5**
Conduct pilot projects in tourism, logistics, fisheries, and shipbuilding to demonstrate Industry 4.0 benefits.

4. CONCLUSION

The I4.0 mapping report has provided a comprehensive analysis of the Blue Economy in the Adriatic region, specifically focusing on Italy and Croatia, and its alignment with Industry 4.0 (I4.0) principles. This study has identified regional strengths, challenges, and opportunities for digital transformation across key sectors, offering strategic recommendations for enhancing cross-border cooperation and fostering sustainable growth.

Key Regional Insights and High-Impact Areas for Digital Transformation
Italy
Emilia-Romagna (CNA Ferrara
Strengths: Strong presence in shipbuilding, maritime transport, and coastal tourism.
Challenges: High costs of digital transformation, lack of in-house expertise, and cybersecurity concerns.
High-Impact Digital Areas: Adoption of cloud computing, IoT, and cybersecurity in shipbuilding and maritime logistics; big data and augmented reality (AR) in tourism.
Marche (CNA Ancona)
Strengths: Established fisheries, port activities, and shipbuilding industries with growing interest in marine biotechnology.
Challenges**:** High implementation costs, fragmented digital infrastructure, and workforce skill gaps.
High-Impact Digital Areas**:** Big data analytics for fisheries and marine conservation, AI-driven shipbuilding, and IoT-based port logistics.
Apulia (CETMA)
Strengths: Key hub for shipbuilding, port logistics, and marine renewable energy.
Challenges**:** Low levels of digitalization, financial constraints, and limited regional adoption of I4.0 technologies.
High-Impact Digital Areas: AI-powered maritime analytics, blockchain for fisheries, and simulation tools for shipbuilding.

Friuli Venezia Giulia (AREA)

Strengths: Home to major ports and shipbuilding companies, strong maritime research ecosystem.

Challenges: High costs of digital transformation and workforce training limitations.

High-Impact Digital Areas: Cybersecurity for maritime operations, VR/AR for ship design, and AI-driven logistics optimization.

Croatia

Split-Dalmatia (CCE)

Strengths: Robust tourism industry, growing IT sector, and emerging maritime logistics capabilities.

Challenges: Limited data accessibility, regulatory constraints, and high costs of digital adoption.

High-Impact Digital Areas: Big data for visitor management in tourism, IoT for maritime security, and system integration for ports.

Istrian County (IDA)

Strengths: Leading in sustainable tourism, specialized port services, and fisheries.

Challenges: Aging infrastructure, low digitalization in small businesses, and high costs of modernization.

High-Impact Digital Areas: IoT-enabled tracking for aquaculture, AI-based energy optimization, and digital twins for port operations.

Šibenik-Knin (DIH AFC)

Strengths: A well-integrated coastal economy with fisheries, logistics, and tourism as key drivers.

Challenges: Investment gaps in digital infrastructure, regulatory bottlenecks, and skill shortages.

High-Impact Digital Areas: AR-enhanced tourism experiences, IoT-driven fisheries management, and AI-based maritime transport solutions.

Primorsko-Goranska (PFRI)

Strengths: Emerging leader in shipbuilding and IT services, strong regional innovation ecosystem.

Challenges: Low technology adoption in traditional sectors, financial barriers for SMEs.

High-Impact Digital Areas: AI for predictive maintenance in shipbuilding, automation in port logistics, and cybersecurity for marine operations.

The mapping of Blue Economy activities along the Adriatic coasts of Italy and Croatia highlights the strategic importance of digital transformation in enhancing economic

sustainability, environmental protection, and cross-border cooperation. The regional analysis reveals:

- Diverse Blue Economy Sectors: Italy and Croatia exhibit a rich and varied Blue Economy, encompassing traditional sectors such as fisheries, shipbuilding, and tourism, as well as emerging industries like marine biotechnology and renewable marine energy.

- Industry 4.0 Readiness: The level of Industry 4.0 adoption varies by sector and region. While larger ports and shipyards demonstrate moderate to high integration of digital technologies, smaller-scale fisheries, aquaculture, and tourism SMEs face challenges related to investment costs, skill gaps, and regulatory constraints.

- Digital Gaps and Opportunities: Common challenges include the high cost of implementing digital solutions, a lack of skilled workforce, and regulatory fragmentation. However, opportunities exist to leverage cloud computing, AI, IoT, and automation to improve efficiency, sustainability, and competitiveness.

- Potential for Growth through Cooperation: Cross-border collaboration can help bridge technological gaps, harmonize regulations, and foster innovation clusters that enhance the global competitiveness of the Adriatic's Blue Economy.

High-Impact Areas for Digital Transformation

Based on the regional findings, the following areas present the highest impact potential for digital transformation:

- Smart Ports and Maritime Logistics: Investing in IoT, AI-driven analytics, and automation for optimizing port operations and enhancing trade efficiency.
- Sustainable Fisheries and Aquaculture: Deploying IoT-enabled monitoring systems, big data analytics, and blockchain for traceability and sustainability.
- Shipbuilding and Maintenance: Utilizing simulation, digital twins, and advanced robotics to improve production efficiency and reduce costs.
- Coastal Tourism and Marine Recreation: Enhancing tourist experiences through AR/VR applications, smart destination management, and digital booking platforms.
- Renewable Marine Energy: Developing offshore wind and wave energy projects with AI-based predictive maintenance and monitoring.

Benefits of Cross-Border Cooperation

The cooperation between Italy and Croatia offers several strategic benefits:

- Innovation and Knowledge Sharing: A shared approach to Industry 4.0 integration fosters innovation and facilitates knowledge transfer between research institutions, businesses, and policymakers.
- Harmonized Standards and Policies: Aligning regulatory frameworks on cybersecurity, data sharing, and environmental sustainability ensures seamless collaboration and accelerates digital adoption.
- Joint Investment and Funding Opportunities: Coordinated participation in EU funding programs, such as Horizon Europe and Digital Europe, enhances access to financial resources for SMEs and regional projects.
- Resilient and Sustainable Growth: By leveraging shared resources, both nations can implement sustainable solutions that benefit the environment while driving economic prosperity.

Key Milestones for WP2 Implementation

To achieve a successful transition towards a digitally enhanced Blue Economy, the following milestones should be prioritized:

Establishing a Cross-Border Digital Innovation Hub (DIH) Network

Define governance structures, operational models, and service offerings.

Develop an online knowledge-sharing and matchmaking platform.

Launch a pilot helpdesk for SMEs seeking I4.0 solutions.

Developing a Shared I4.0 Solutions Catalogue

Identify best practices and scalable digital solutions tailored for Blue Economy SMEs.

Compile a repository of technological roadmaps and case studies.

Implementing Digital Transformation Pilot Projects

Select SMEs to participate in pilot initiatives for AI, IoT, automation, and digital twin applications.

Monitor outcomes and scalability potential for broader industry adoption.

Launching Joint Training and Capacity-Building Programs

Organize workshops and training sessions on Industry 4.0 applications in maritime sectors.

Implementing pilot use cases in sustainable fisheries, logistics optimization, and smart ports.

Final Considerations

The Adriatic Blue Economy stands at a crucial juncture where digital transformation and cross-border cooperation can drive sustainable and inclusive growth. Italy and Croatia have a unique opportunity to set a benchmark for integrating Industry 4.0 into maritime industries, ensuring long-term competitiveness, environmental responsibility, and economic

resilience. By following the outlined milestones, stakeholders can build a digitally advanced, sustainable, and globally competitive Blue Economy ecosystem in the Adriatic region.

BEST4.0 project could play a significant role in this transition. By fostering cross-border cooperation between business support organizations, DIHs, development agencies, and innovation centers, BEST4.0 will facilitate the adoption of innovative business solutions, I4.0 applications and capacity building paths by SMEs of Blue Economy in targeted areas

Annexes
Company data sheets

Scan the QRcode or click on the link to see a short presentation of all the answers collected from the PPs by interviewing companies in the assessment phase
https://forms.office.com/e/PsayiBPZGJ?origin=lprLink