



human capital in the Italian port sector.

structure, demographics and skill
needs for the future.

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executive summary.



research
institute.

introduction

The report focuses on the dimension of human capital and labor market dynamics within the Italian port and maritime system. Given the strategic role of the sector for the country's economic competitiveness and the challenges posed by the convergence of digitalization, environmental sustainability, and intermodality, the analysis examines in detail the demographic composition of employment, the extent of recruitment difficulties, and the evolution of professional skill needs for the 13 key profiles that emerged from the mapping of the sector.

1. quantitative profile

The quantitative survey, conducted using Istat data on the total pool of 13 professional profiles (amounting to approximately 1.07 million employed nationwide in 2024), outlines a sector marked by strong structural imbalances.

From a gender perspective, there is a clear male prevalence (85.94%), with female representation limited to 14.06%. Education levels appear medium-low: 49.37% hold a upper secondary school diploma, 41.43% have at most a middle school diploma or compulsory education, while the share of graduates stands at 9.19%. The age group distribution reflects a workforce in an advanced stage of aging, with the 45-54 age bracket representing the largest share (32.6%), followed by 35-44 years (23.1%) and 55-64 years (21%). Young people under 35 make up only 21.4% overall (with barely 4.3% between 15 and 24 years old), highlighting an urgent need for generational turnover. The employment component is 86.9% Italian and 13.1% foreign, with a geographical concentration skewed toward the North (31.4% in the Northwest and 25.5% in the Northeast, compared to 19.3% in the Center, 16.8% in the South, and 7% in the Islands).

On the occupational mismatch side, hiring forecasts from the Excelsior Information System (Unioncamere - Ministry of Labor) for 2025 highlight severe recruitment difficulties for both highly specialized technical figures and vehicle drivers. Port traffic organization technicians record a 100% difficulty rate due to a complete lack of suitable candidates on the market. High recruitment difficulty also affects port firefighters (62.5%), freight forwarders and distribution technicians (60.9%), and industrial and management engineers (59.7%). Among drivers, heavy truck and lorry drivers show the highest absolute demand (over 232,000 expected hires), but record a recruitment difficulty rate of 56.7% (equal to over 131,000 unfilled or hard-to-fill positions). Marked difficulties are also found for motorboat and launch drivers (50.5%), forklift drivers (45.4%), deckhands (44.5%), and ship captains and officers (36.7%). Less complex, on the other hand, are hirings for freight transport administrative management clerks (27.9%), warehouse management clerks (27.8%), and porters and freight handlers (23.2%).

2. the 13 profiles

The analytical section investigates the transformation of duties and the evolution of skills for each professional role, integrating the Istat Classification of Professions (CP 2021) codes with the INAPP Labor Atlas, descriptors from the U.S. Department of Labor O*NET database, and European and international regulatory frameworks (including Port Community System, EMSWe, e-CMR, IMO GHG Strategy, EU Fit for 55 Package, ISO 14001, and ISO 45001).

- 2.1 Industrial and management engineers (CP 2217): evolving from conventional layout planning toward predictive analytics and simulation via Digital Twins, integration of quay AGVs/ASCs, and decarbonization through Life Cycle Assessment (LCA) and CSRD compliance.
- 2.2 Ship captains and officers (CP 3161): integrating nautical navigation with IBS integrated bridges, ECDIS electronic charting, dynamic positioning (DP) systems, predictive telemetry, and the management of alternative fuel systems (LNG, hydrogen, methanol) within the EU ETS/CII framework.
- 2.3 Port traffic organization technicians (CP 3165): transitioning from tactical coordination to integrated, data-driven port management via PCS, NSW, TOS software, and VTS/AIS monitoring, coordinating cold ironing connections and standard maritime communication phrases (SMCP).
- 2.4 Freight forwarders and distribution technicians (CP 3341): shifting from a bureaucratic role to strategic multimodal planning, managing electronic customs clearance (AIDA/PCS), digital transport documents (e-BL, e-CMR), and Scope 3 emissions calculations for green routing.
- 2.5 Warehouse management clerks and assimilated roles (CP 4312): moving beyond paper tracking thanks to advanced WMS, RFID, automated inventory with drones, and management of reverse logistics procedures and sustainable packaging.
- 2.6 Freight transport administrative management clerks (CP 4313): focusing on digital and interoperable verification of e-CMR and e-BL via TMS/ERP software with AI/OCR, and collecting emissions data for CSRD reporting.
- 2.7 Firefighters and assimilated roles (CP 5614): integrating reconnaissance drones, thermal imaging cameras, and digital IMDG databases with firefighting protocols dedicated to lithium batteries, LNG/hydrogen leaks, and the use of PFAS-free foams.
- 2.8 Heavy truck and lorry drivers (CP 7423): pairing driving with digital interaction with automated port gates (Fast Track), e-CMR apps, smart tachographs v2, ADAS, and eco-driving techniques on alternative fuel vehicles.
- 2.9 Forklift drivers (CP 7444): operating via WMS-connected touch terminals, anti-collision sensors, and fork cameras, adopting energy efficiency logics on lithium battery or hydrogen fuel cell forklifts.
- 2.10 Deckhands (CP 7451): using radio-controlled winches and capstans, handheld terminals for safety checks, and supporting cold ironing operations, ensuring separate waste collection (MARPOL / PRF Directive) and use of eco-friendly products.
- 2.11 Boiler operators and other ship equipment operators (CP 7452): managing digital control panels (IAS), predictive telemetry, and heat recovery boilers, applying safety standards for new gaseous and eco-friendly vectors and closed-circuit water treatment.
- 2.12 Motorboat and launch drivers (CP 7453): operating electric or hybrid small craft via GPS chartplotters and AIS, applying navigation styles aimed at minimizing fuel consumption, noise, and wake.
- 2.13 Freight handlers, porters and assimilated roles (CP 8131): evolving into operators assisted by RF handhelds, barcode/RFID readers, and ergonomic exoskeletons, working safely alongside autonomous vehicles and cobots and managing packaging sorting for recycling.