Smart future

Smart Port Development at Port of Kaohsiung

Technological Innovation & Promotion

Port of Kaohsiung, Taiwan International Ports Corporation, Ltd.

Dec. 10, 2025

CONTENTS

Diversified Business Framework of TIPC

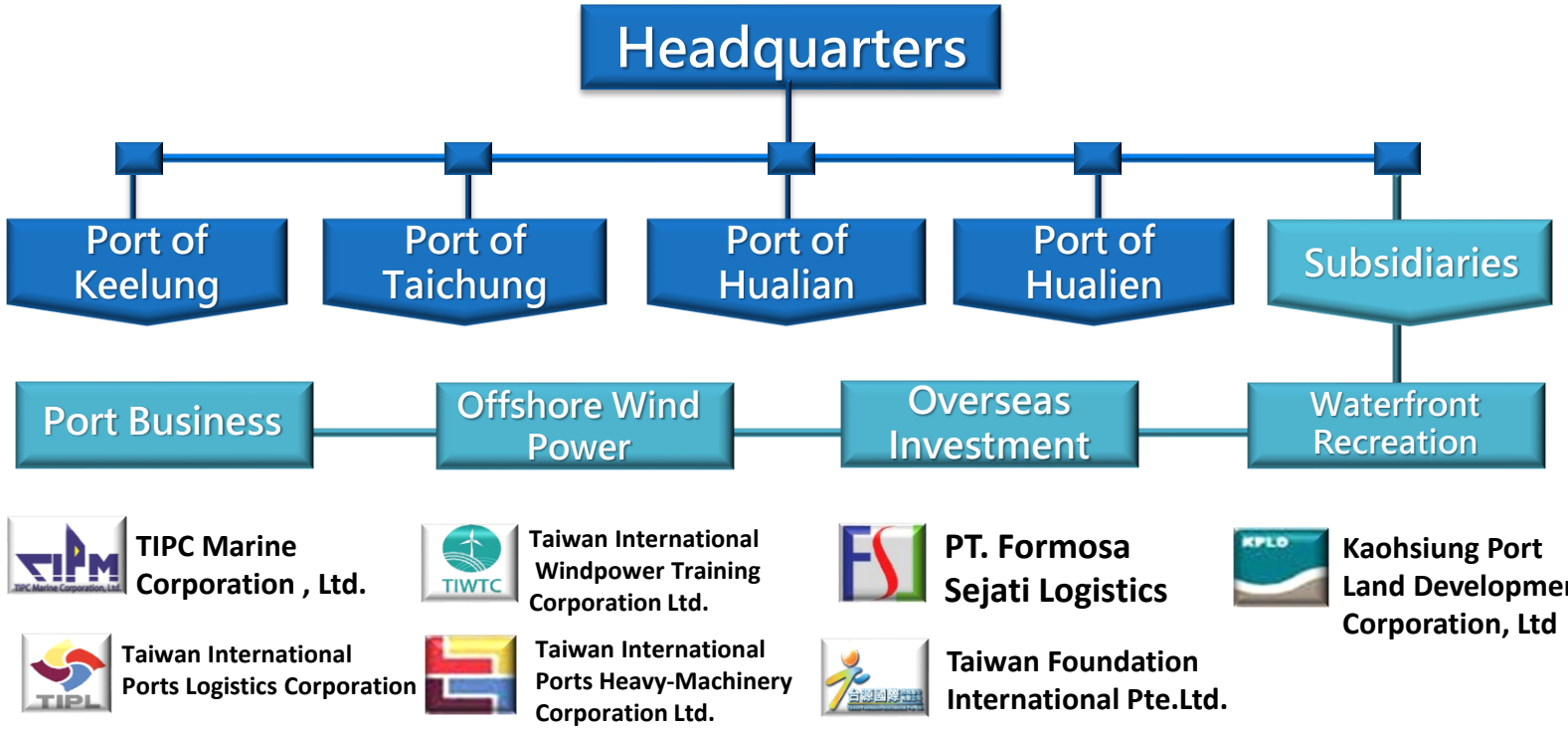
With an business-oriented management approach,

TIPC strengthens its core businesses and expands diversified service portfolios.

TIPC 臺灣港務股份有限公司 TAIWAN INTERNATIONAL PORTS CORP., LTD.

Responsible for the operation of Taiwan port group

ESTABLISHED ON MARCH 1, 2012



Capital Amount NT$ 700 billion

Operation Revenue NT$ 228.3 billion (2024)

No. of Employees 2,040 pp. (Sep., 2025)

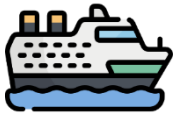
Taiwan Port Group Position and Development (2022-2026)

Internal： coordination

External： competitiveness

Taipei

Keelung



- Oceanic container shipping port
- Home Port of International Cruise Lines

Taichung

Suao

- Energy and industrial development base
- Tourism and recreation port

Hualien

- Tourism and recreation port

Penghu

Budai

Anping

- Tourism and recreation port

Kaohsiung

- Intercontinental transshipment hub

- 7 International Commercial Ports
- 2 Domestic Commercial Ports (Mandated by MPB)

Provide Diversified Services for the Maritime-Port Industrial Ecosystem

Maritime-Port Industrial Ecosystem

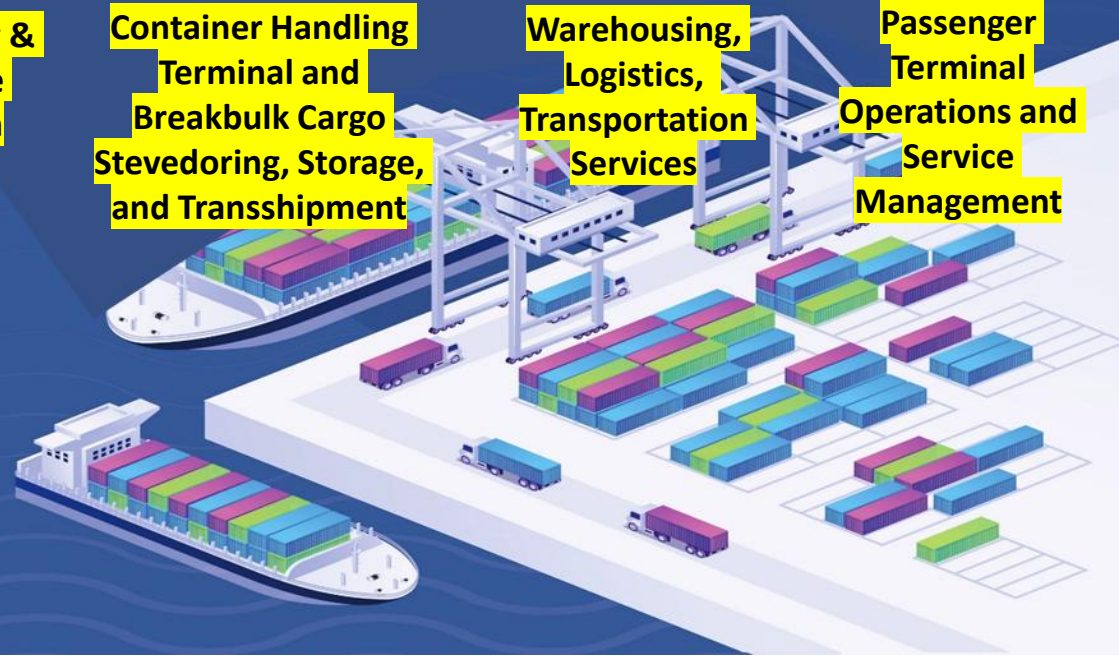
Port Core Services

船舶進出作業服務
Vessel Entry & Departure Operation Services

貨櫃裝卸基地散雜貨裝卸儲轉
Container Handling Terminal and Breakbulk Cargo Stevedoring, Storage, and Transshipment

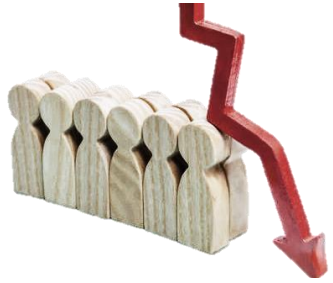
倉儲物流運輸服務
Warehousing, Logistics, Transportation Services

旅運場站服務管理
Passenger Terminal Operations and Service Management



Challenges in the New Era of Global Maritime Industry

- Taiwan’ s ports occupy a strategic position as global maritime hubs, thus we must leverage technology to enhance operational safety and efficiency.

Port manpower shortage	New Business Diversification	Emerging Technologies	Low Carbon and Decarbonization	Sustainability and Resilience
				

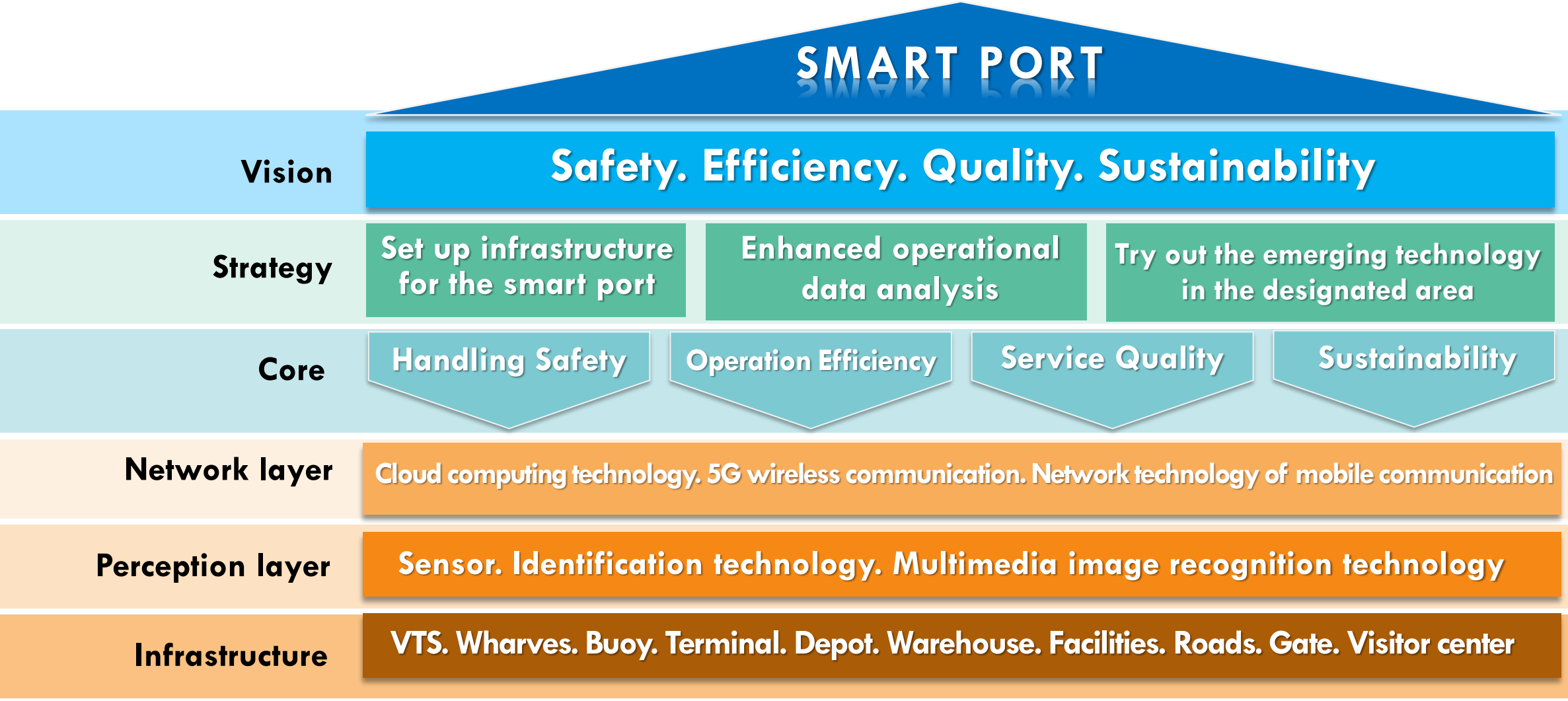
Port Transformation – From Labor-Intensive to Automation

Source : National Archives Administration, NDC

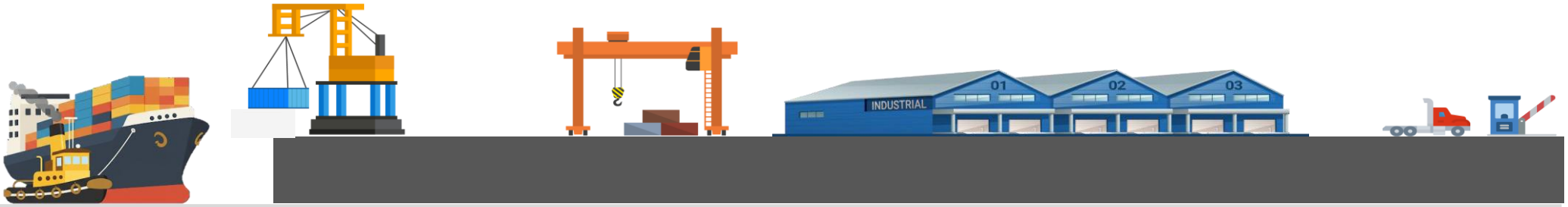
Port Transformation – Smart technology brings innovation to ports

Smart Port Development Framework

TIPC promoted the development of smart ports in 2018 and initiated the "Taiwan Port Group Trans-SMART 2.0 Upgrade Project "in 2021



Diversified Service Solutions for Smart Ports

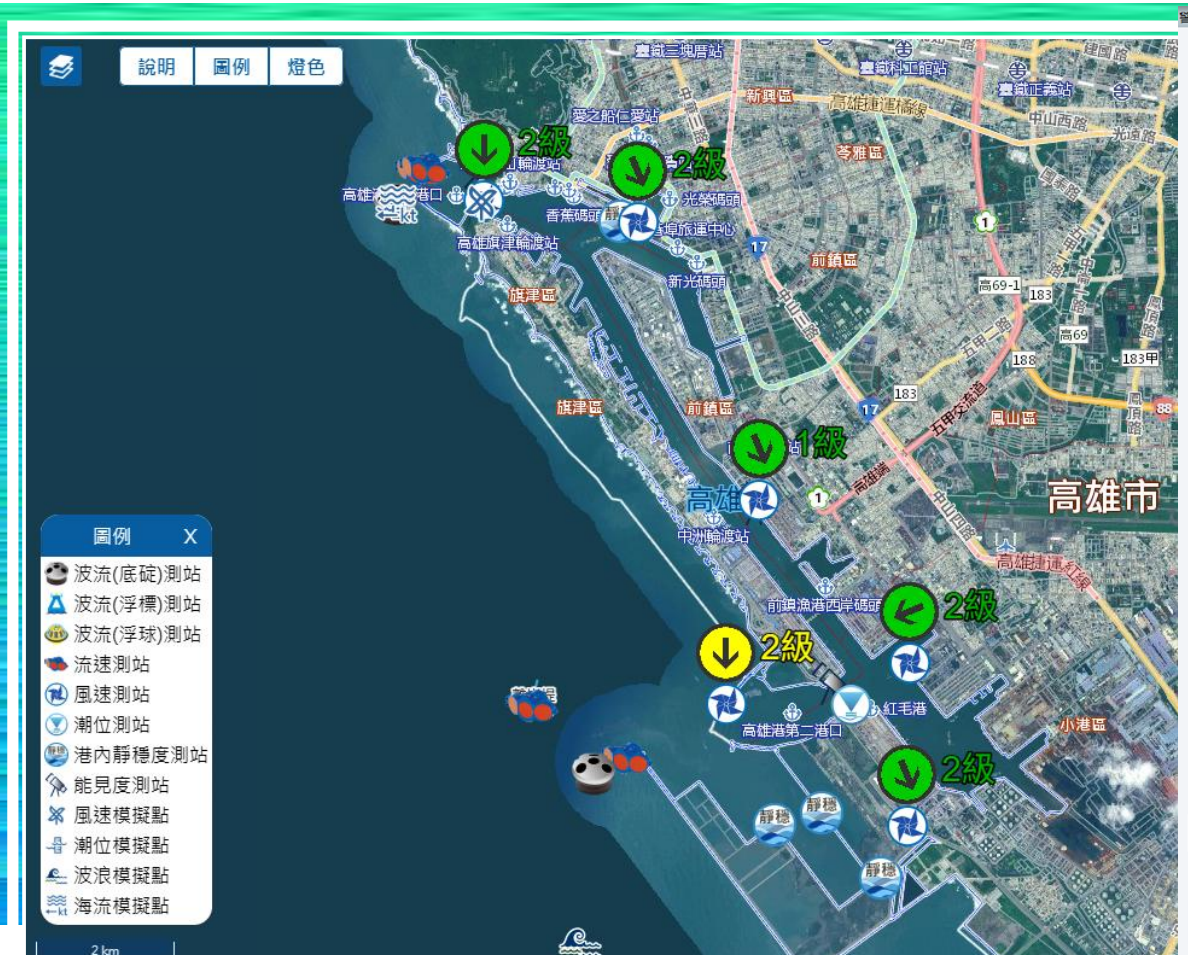


Vessel traffic management	berthing operations	hinterland storage, passenger facilities	gate control
The Marine Meteorological Information System	Bridge crane operations AI vision verification project	Kaohsiung Port Cruise Terminal Smart Operations Management Platform	Automatic Gate Sentry post Control System / E-vehicle lane construction
Ship Navigation Aid System	AI Solutions for Berthing Issues and Site Safety		
Unidentified vessel navigation video surveillance at the dike	Highly Automated Container Terminal(Kaohsiung Port Container Terminal 7)		Smart Traffic Monitoring System at Port of Kaohsiung
Smart Berth Allocation System	Smart Energy Management System , Port 3D GIS Platform , Dynamic management of dangerous goods storage, Port structure maintenance and management, Port area environmental quality monitoring and management		Smart Bridge Monitoring and Surveillance
Unmanned Surface Vehicle (USV) Environmental Cleanup and IoT Oil Spill Detection Project			
Port Situation Room Construction	Port Works Digitalization Application Service	Port Planting Digitalization Management	

Waterside smart services | Landside smart services | Intelligent operations management | Innovative technology trials

The Marine Meteorological Information System： improve work safety

- Monitor **port wind force**, **waves**, **tide level**, **ocean currents**, and **visibility**, simulate sea conditions of 36-hour forecasting, establish a data monitoring and early warning mechanism to provide operational management references for shipping and port operators.



警戒燈色：無 低 中 高 即時觀測及預測資訊尚未經嚴密品管，僅做為相關業務之參考，不得做為法律爭訟之用。

風力(一港口)

1分鐘平均風速 | 10分鐘平均風速 | 15分鐘平均風速

日期 時間	平均風速○	平均風向	測站位置
11/19 16:21	2 級(3.0m/s)	北北西	10號碼頭
11/19 16:21	1 級(1.4m/s)	北北西	63-64碼頭
11/19 16:20	2 級(2.7m/s)	北	一港口信號臺
11/19 17:00	2 級(3.2m/s)	北北西	一港口信號臺(模擬)

風力(二港口)

日期 時間	平均風速○	平均風向	測站位置
11/19 16:21	2 級(3.4m/s)	北	二港口北堤綠燈塔
11/19 16:21	2 級(1.9m/s)	東北東	76-77碼頭
11/19 16:21	2 級(2.6m/s)	北北西	第六貨櫃中心港警大樓

海流 (連結即時海流資料展示系統)

日期 時間	表面流速	表面流向	測站位置
11/19 15:40	0.84 節(kt)	南	一港口南堤外約200公尺處
11/19 15:40	0.31 節(kt)	南南東	紅毛港南星燈塔外500公尺處
11/19 17:00	0.19 節(kt)	北北西	一港口南堤外約200公尺處(模擬)
11/19 16:10	0.25 節(kt)	西南西	(水平海流)一港口測站一

波浪

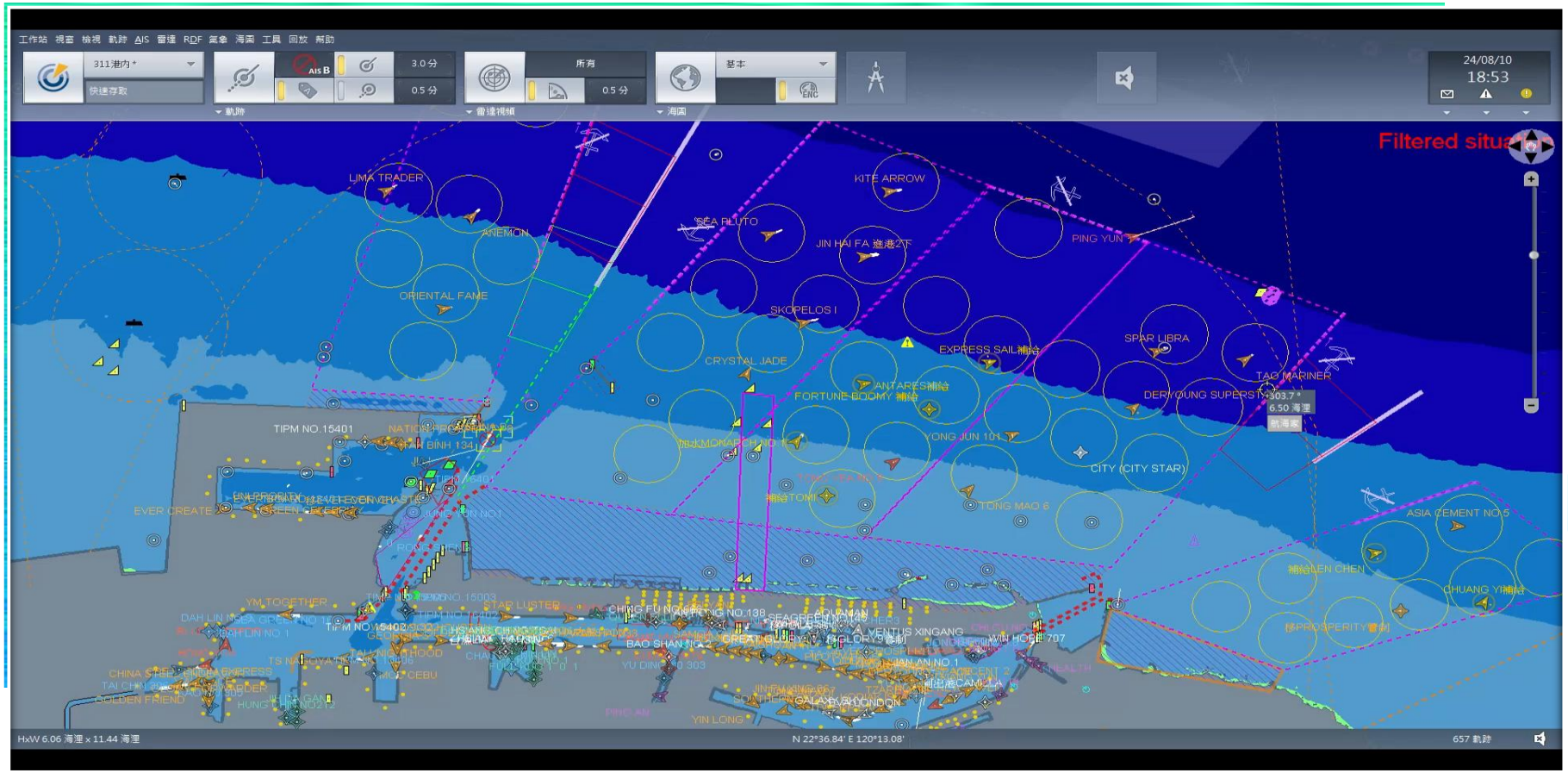
日期 時間	示性波高(Hs)	週期(Tp)	主波向	測站位置
11/19 15:40	0.86 公尺	5.6 秒	西北西	一港口南堤外約200公尺處
11/19 15:40	0.86 公尺	7.1 秒	西北西	紅毛港南星燈塔外500公尺處

Real-time search via mobile device

Warning Message Push Notification

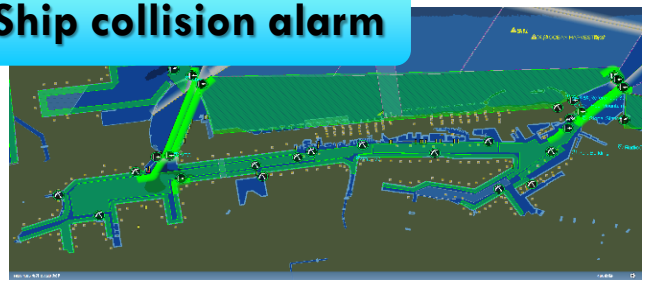
Ship Navigation Aid System: ensure the safety of navigation

Integrate radar signals and ship AIS dynamics to analyze ship navigation trajectories and provide six real-time warning functions, including yaw, overspeed, collision, dragging anchor, and entering dangerous areas, thereby improving ship navigation safety.

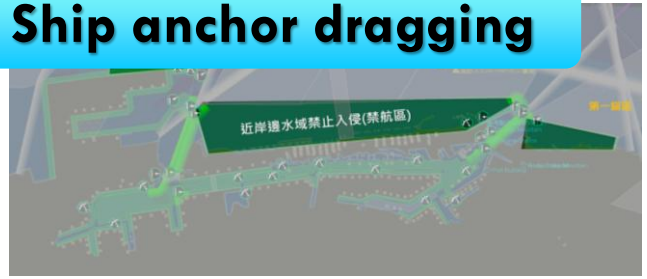


Ship over speeding alarm

Ship collision alarm



Ship anchor dragging



Smart Berth Allocation System: upgrade berth allocation arrangement efficiency

- **Build smart berth allocation dynamic board, displaying real-time information on vessel berth availability, integrating the latest information on berth depths, channel control and port activities and linking to CCTV monitoring of vessel berthing status for shipping and port operators to improve the quality of port services.**

船席指泊智慧化

Get real-time information on vessel berthing and departure times

靠泊碼頭服務水深

Provide the latest information of berth depths, tide level and mooring information

航道管制.港區活動公告

One-stop integrated information on vessel navigation waterway control and port area events

Automatic Gate Sentry Post Control System：improve vehicle traffic efficiency

AI-OCR/eTag
Automated identification

Success rate of identification
99%

Pass through control stations without stopping

2024

18.88 million vehicles entered and exited.

Automated customs clearance: 6 million container transactions

Significantly reduce waiting time

(4 mins 10s.)

CO_2

Annual carbon reduction equivalent to approximately 15.5 Da-an Forest Parks

Smart Traffic Monitoring System: easing traffic congestion

- Port of Kaohsiung utilizes AI image recognition and big data analysis of external traffic flow data to provide real-time traffic conditions for each container center, simulate and predict truck driver travel time for container handover operations, and provide real-time route planning and travel time prediction.

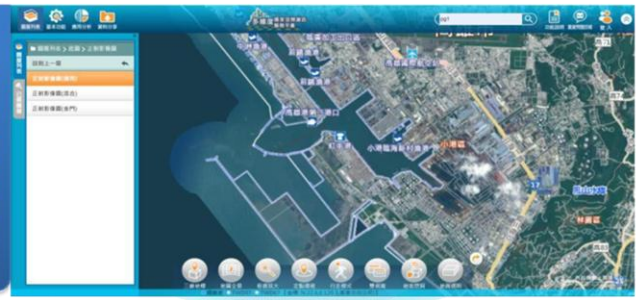
simulate → predict → announce

Port 168 System: Traffic Information Sharing Service

Port 3D GIS Platform: improve construction safety

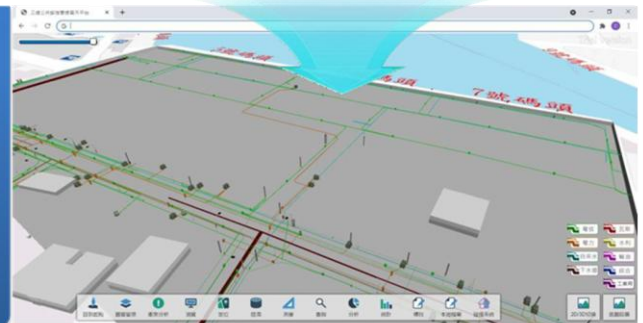
- 3D pipeline simulation modeling was implemented in the port area, and a 3D map data management platform was developed to provide management functions such as pipeline location query, conflict analysis, and attribute data, thereby upgrading the safety and execution efficiency of port public works construction.

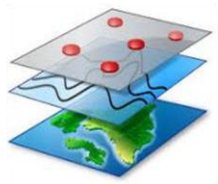
基礎底圖



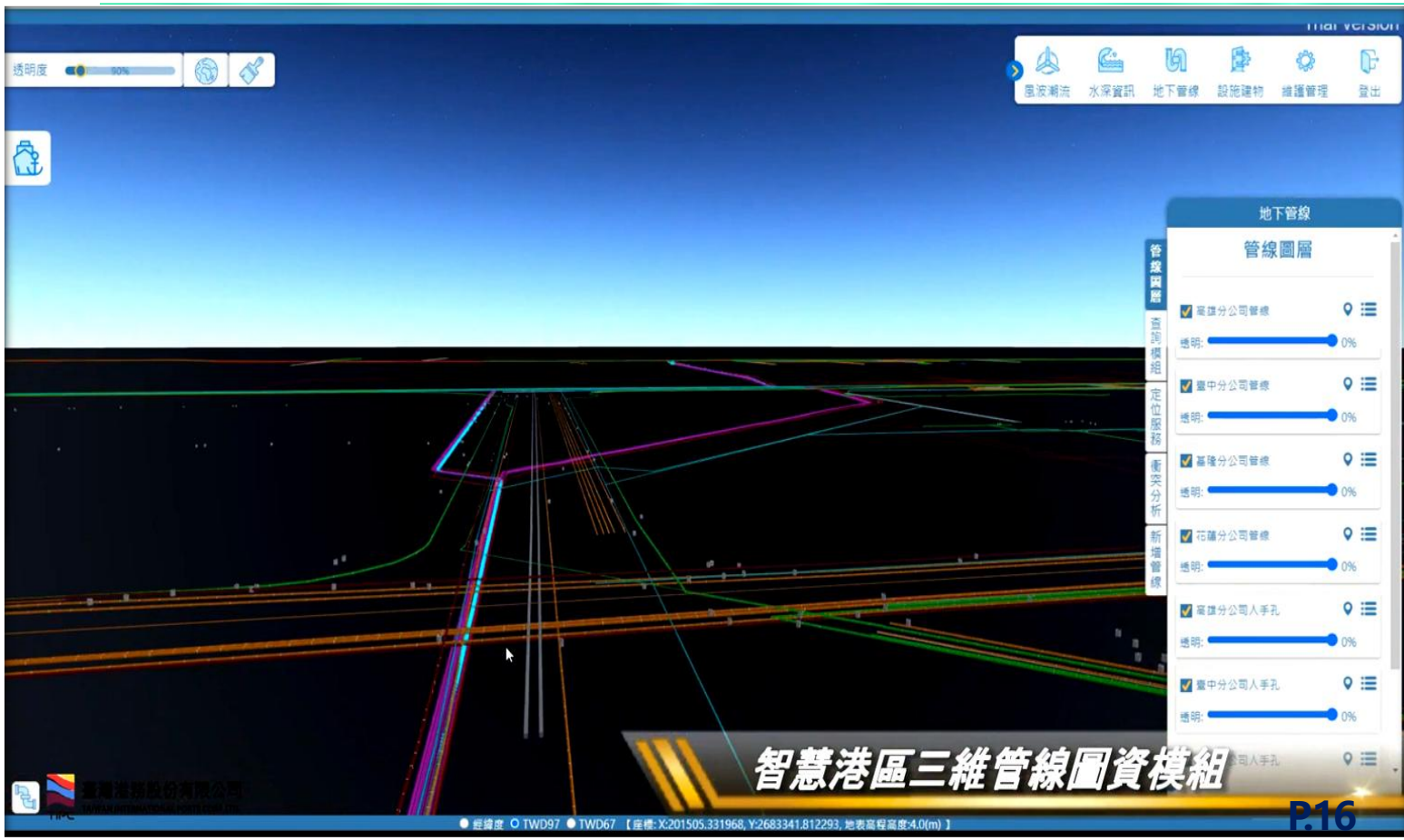
主題圖層

管線圖層





電信管線
電力管線
自來水管線
瓦斯管線
輸油管線...



Build the most advanced container terminal in Taiwan: highly automated container yards

自動化 x 智慧化

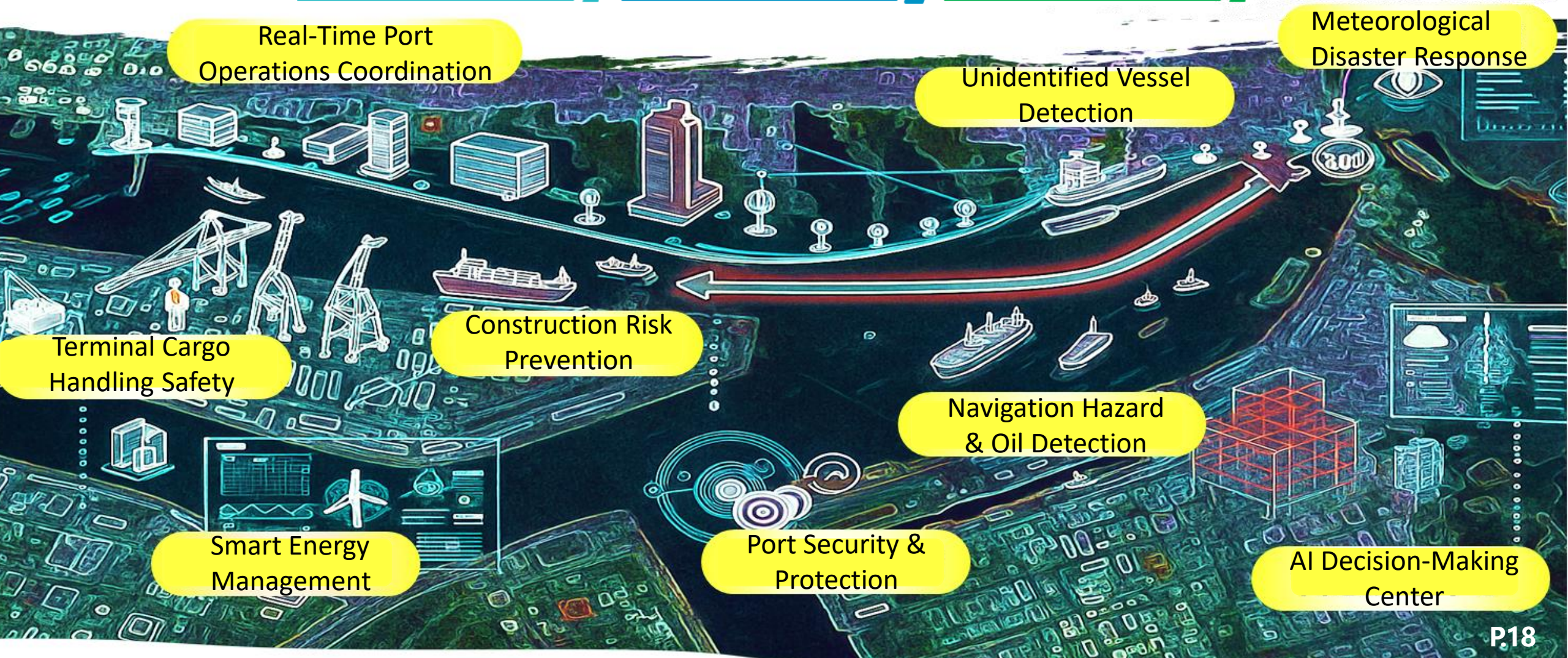
- 船邊作業遠端遙控
- 高度自動化櫃場
- 智慧化通關管理
- 全區即時智慧化用電監控

Planning AI Port Application Services

Safe & High-Quality

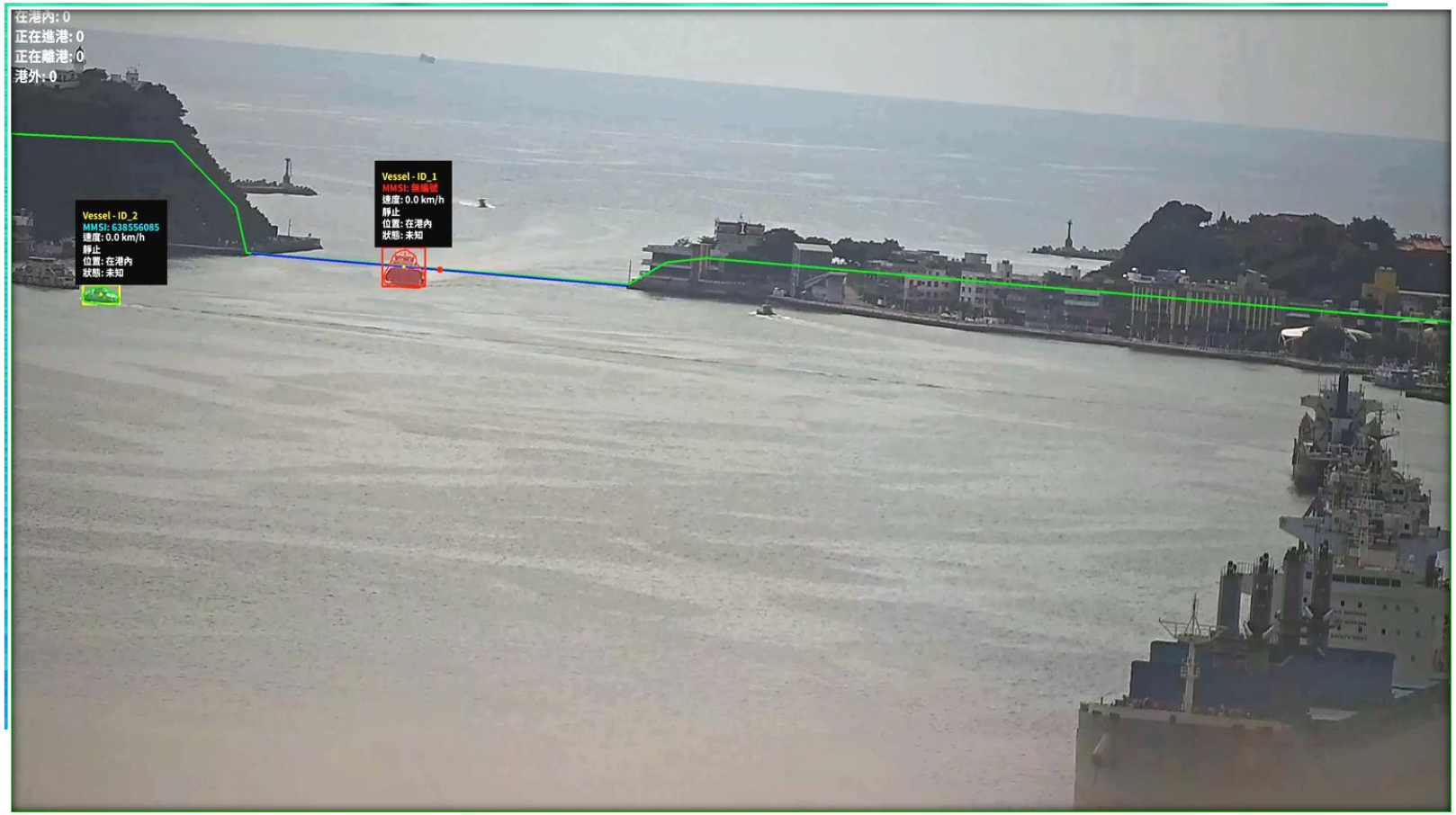
Time-Saving & Efficient

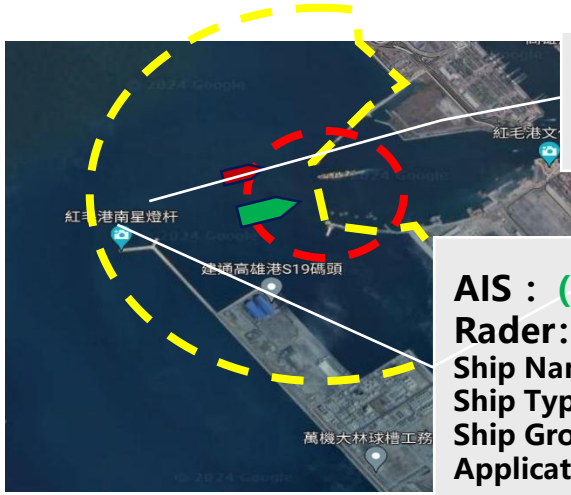
Low-Carbon & Sustainable



Unidentified vessel navigation video surveillance at the dike: protect the safety of ports

Prioritizing trials at Port of Kaohsiung, AI image recognition was used to identify the navigation dynamics of vessels entering the breakwater, instantly detecting abnormal events such as unidentified vessels entering the port and improving the safety of the port waters.





AIS : (X)
Radar: (X)
Suspected 20-meter-long fishing boat

AIS : (O)
Rader: (O)
Ship Name: Guangzheng No. 6
Ship Type: Passenger/Cargo
Ship Gross Tonnage: 198
Application for Port Entry: Yes

Under normal circumstances, merchant ships have AIS, which allows for data comparison.

CCTV、AIS

⊕

AI detection technology

⊕

Cross-lens Re-ID object recognition technology

Enhancing Terminal Cargo-Handling Safety

Prioritizing trials at Port of Kaohsiung, AI video detection is applied to verify workers' proper use of personal protective equipment (PPE) during cargo-handling operations and to establish warning zones, forming the first line of safety defense. 。

Applied Technology

Multimodal AI Detection

Depth Anything Technology

Re-ID Object Recognition

AI-based detection ensures workers are fully equipped with PPE, strengthening occupational safety management, eliminating blind spots, reducing oversights, and lowering labor inspection costs.。

Automated detection of crane operation movements at loading/unloading sites provides alerts for potential conflicts involving personnel, vehicles, and machinery.

Kaohsiung Port Cruise Terminal Operation Management Platform – Enhancing Service Quality

Kaohsiung Port Cruise Terminal, a new landmark of modern architecture, integrates a BIM digital twin model for centralized monitoring along with 10 smart applications to enable comprehensive smart management and elevate passenger service quality.

Intelligent Management◆Optimized Efficiency◆Innovative Technology◆Sustainable Operation◆Safety, comfort and Convenience

2025 APIGBA AWARD

System Category - Platinum Award

Existing Building Renovation Category - Gold Award

Big Date

- Reduce operating costs
- Reduce labor costs

Analysis

- Energy saving benefits
- Management benefits

Application

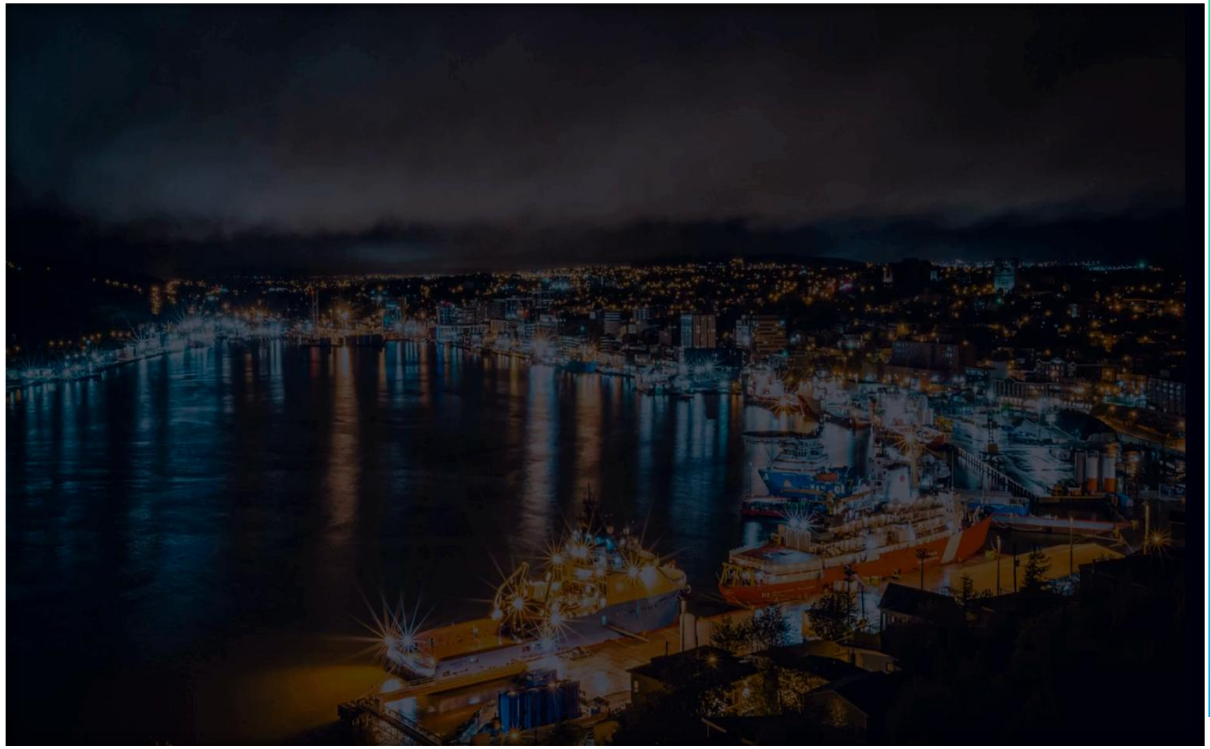
- Equipment integration
- Data monitoring

Maintenance efficiency

- Equipment life extension
- Predictive maintenance
- Green energy and carbon reduction

Build Smart Energy Management System： effective energy dispatch and management

Smart meters for water and electricity, intelligent lighting, and smart HVAC systems have been installed across terminal operation areas. A Smart Energy Management System (SEMS) has been established to enable full-time monitoring of energy usage, intelligent demand management, and optimized contract capacity. The initiative is expected to reduce overall energy consumption by 7%–10%.

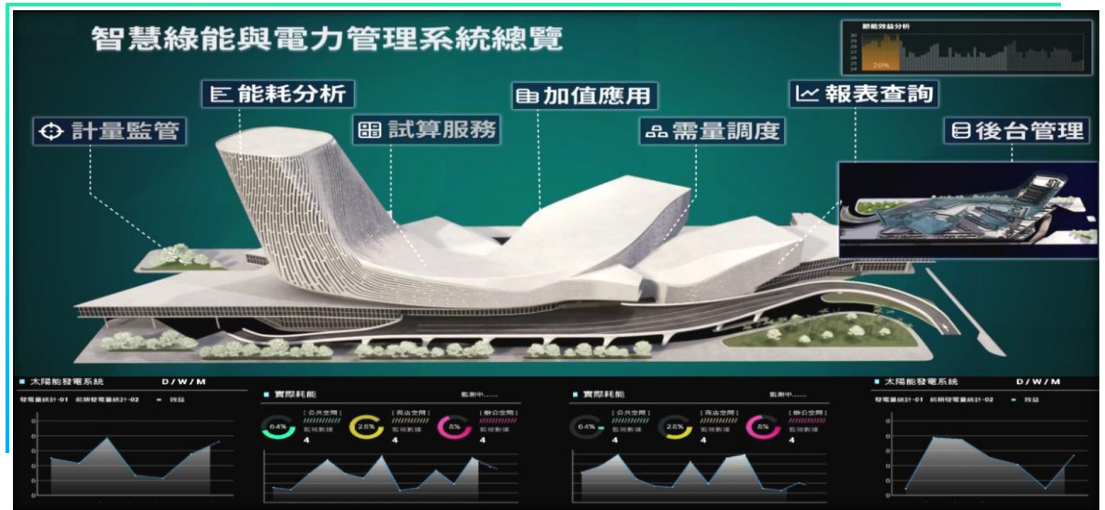


Energy Management Integrated with Solar Power — Strengthening Port Grid Resilience

Port of Kaohsiung is taking the lead in deploying energy-storage and power-generation systems, introducing a smart microgrid to enhance commercial port grid resilience. Taiwan’s port group will complete storage and generation installations between 2025–2026, advancing toward energy transition.

Kaohsiung Port Cruise Terminal: Smart Building Management

■ In 2024, a smart microgrid—combined with AI applications—was completed to enable real-time monitoring of energy usage, demand-side dispatching, and improved power reliability and green-energy efficiency for the cruise terminal.

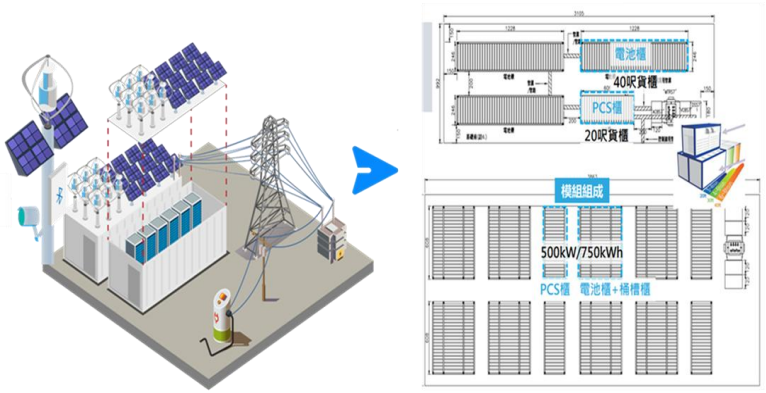


Port of Kaohsiung: build smart microgrid

■ In 2026, Port of Kaohsiung will complete the installation of a 7,000 kW solar PV system and 4 MW energy storage facilities, promoting self-generation and self-consumption within the port area.。

■ Annual power generation is expected to exceed 9 million kWh, reducing carbon emissions by 4,498 tons per year.

太陽能光電系統示意圖



多重微電網智慧調度管理

17 PARTNERSHIPS FOR THE GOALS

INTRODUCE INNOVATION AND ENHANCE PARTNERSHIPS

Port related industries + TIPC + ICT companies / Local governments

Cross-Sector Collaboration in the Maritime and Port Industry Digital Transformation Incentive Program

Promote digital innovation within the maritime and port ecosystem, providing NT$40 million in annual rewards, with over 30 innovative proposals submitted, driving industry investments totaling NT$290 million.

Cargo Management & Terminal Operations

- Automated Gate Access
- Intelligent Energy Monitoring
- Reefer Container Monitoring
- Smart Cargo Handling&Distribution

Emerging Technology Applications

- Blockchain
- Fully automated Container Yard

Smart Logistics &Transportation Management

- Intelligent Warehouse Management
- Paperless Cargo Bills of Lading
- Carbon Emission Management Platform

Passenger Services & Tourism

- Berth Management
- Ticketing Service System


TIPC
臺灣港務股份有限公司
Toward the Sustainability of Maritime and Port Starting from Digital Transformation
Act NOW for a sustainable future