



交通部運輸研究所

INSTITUTE OF TRANSPORTATION, MOTC

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中華民國 114 年年報

ANNUAL REPORT 2025



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壹

所長的話

Message from the Director General

交通部肩負全國交通行政與交通事業之推動，業務涵蓋陸、海、空運輸，以及觀光、氣象與郵政等多元領域，與國家發展及民衆日常生活息息相關。面對全球數位轉型、極端氣候與淨零碳排等重大挑戰，交通系統已成為支撐國家競爭力與社會韌性之關鍵基礎。交通部秉持「人本交通 智慧安全」之核心施政價值，規劃以「安全共融」、「智慧便捷」、「永續韌性」為未來施政三大主軸，以「法制與技術規範」為基石、「AI 與科技創新」為驅動力，來實現人本交通的願景。在此框架下，積極推動「打造安全平權人本交通」、「建構高效韌性交通網絡」、「引領智慧交通創新應用」及「推動綠色運輸永續發展」等重點工作，致力建構安全、便捷、智慧且永續之交通環境。

本所長期扮演交通部重要智庫角色，持續以「前瞻政策規劃」、「創新科技應用」、「運輸規範訂定」、「交通人才培育」等四大核心任務，配合國家整體發展方向與交通政策需求，規劃推動研究發展藍圖，聚焦於四大研究主軸：「落實運輸安全與人本價值」、「引領運輸科技與產業創新」、「打造便捷及韌性交通網絡」及「推動淨零碳排邁向環境永續」。透過系統性與前瞻性之研究、規劃與決策支援，協助交通部精進施政品質與治理效能。此外，亦持續協助交通部擔任 APEC 運輸工作小組、行政院永續會永續運輸工作分組、交通部交通費率審議會，以及桃園航空城聯外運輸工作小組等幕僚工作。

回顧過去一年，本所持續整合產官學研資源，深化跨領域合作，在「落實運輸安全與人本價值」、「引領運輸科技與產業創新」、「打造便捷及韌性交通網絡」、「推動淨零碳排邁向環境永續」等四大研究主軸，陸續完成重大施政規劃並協助推動相關計畫，包括：

一、在「落實運輸安全與人本價值」方面：完成「研擬道路交通標誌標線號誌設置參考指引－複雜道路情境」、「無人機空拍應用於路段交通衝突分析－路側交通衝突」、「道路交通安全檢查制度導入研究－試辦道路安全檢查」、「鐵路臨軌工程導入安全管理系統之研究」、「海上自主水面船舶（MASS）安全管理模式之風險評估

The Ministry of Transportation and Communications (MOTC) oversees the promotion of transportation administration and transportation-related services throughout the country. Its responsibilities span land, maritime, and air transportation, together with tourism, weather, and postal services, all of which play a vital role in national development and everyday life. Amid global trends of digital transformation and pressing challenges such as extreme weather and the transition to net-zero emissions, transportation systems have emerged as a vital pillar supporting national competitiveness and societal resilience. Upholding the policy of "People-Centered Transportation and Smart Safety," the MOTC has established three major directions for future transportation governance: "safety and inclusiveness," "smart convenience," and "sustainable resilience." Supported by a strong foundation of "legal and technical regulations" and empowered by "AI-driven technological innovation," the Ministry strives to realize the vision of people-centered transportation. Within this framework, the Ministry is promoting a series of priority initiatives, including "enhancing transportation safety and equity," "strengthening efficient and resilient transportation networks," "fostering innovative smart mobility applications," and "advancing green transportation for sustainable growth." These initiatives are designed to create a safe, smart, and sustainable transportation environment.

For many years, the Institute has served as an important think tank for the Ministry. Building upon its four core missions – "visionary policy planning," "innovative technology deployment," "transportation standards formulation," and "transportation talent development" – it advances a comprehensive research and development agenda aligned with national development goals and transportation policy requirements. Its research is organized around four major themes: "implementing transportation safety and humanistic value," "guiding transportation technology and industrial innovation," "creating a convenient and resilient transportation network," and "promoting net-zero carbon emissions toward environmental sustainability." Through comprehensive and forward-looking research, planning, and decision support, the Institute supports the MOTC in improving policy implementation and strengthening governance performance. Furthermore, assistance will be offered to the MOTC in serving as the APEC transportation working group, the National Council for Sustainable Development's sustainable transportation working group, the MOTC's transportation rate review committee, the Taoyuan Aerotropolis' connecting transportation system work group, and other staff members' work.

Over the past year, the Institute of Transportation has steadily consolidated resources across the public sector, industry, academia, and research communities to foster deep interdisciplinary partnerships. Focusing on its four research axes of "implementing transportation safety and humanistic value," "guiding transportation technology and industrial innovation," "creating a convenient and resilient transportation network," and "promoting net-zero carbon emissions toward environmental sustainability." They consist of:

- (1) In terms of implementing transportation safety and humanistic values, the proposals were completed. They include: The Institute completed a number of key research projects, including "Guidelines for the Setting of Road Traffic Signs, Lines, Markings, and Signals – Complex Situations on Roads"; "Traffic Conflict Analysis for Road Segments with UAV Aerial Applications – Roadside Traffic Conflicts"; "Research on the Introduction of Road Traffic Safety Audit System – Pilot Implementation of Road Safety Inspections"; "Research on the Implementation of a Safety Management System for Railway

與因應對策」、「高齡者交通安全多元體驗學習計畫—軟體建置及活動規劃」、「科技技術應用於道路交通安全規劃」、「推動區域運輸發展研究中心服務升級3.0計畫(114-115年)」、「需求反應式公共運輸服務(DRTS)營運成本、補貼制度及收費制度之研究—收費與補貼制度探討」,以及「共享運具連結公共運輸之研究—示範場域建置與推動」。

二、在「引領運輸科技與產業創新」方面:完成「構建5G智慧交通數位神經中樞—全系統整合實作與推廣應用」、「先進空中交通創新服務前瞻規劃與前驅市場商業驗證」、「人工智慧號誌控制精進—多任務強化學習」、「人工智慧服務於運輸研究決策支援應用」、「運輸包容性服務需求探討及功能設計規劃」、「電動大客車智慧充電管理系統推廣與功能擴充—系統導入輔導與共享充電服務機制規劃」、「港區設施智慧化巡查技術研發」、「船舶特高頻資料交換系統之技術發展」、「港區海象觀測與船舶偵測之雷達監測技術研發」、「推動港灣設施維護管理E化」。

三、在「打造便捷及韌性交通網絡」方面:持續支援及辦理區域及整體運輸規劃,完成「運輸規劃支援系統維運技術服務(114年)」、「高速公路交織路段容量及服務水準研究—銜接系統交流道交織路段暨容量手冊研訂」、「環島城際鐵路網容量分析研究—容量參數資料建置」、「海運資料庫維護及議題分析案」、「我國貨櫃航運產業數位與永續雙軸轉型研究—方案架構及策略研擬」、「空運國際資料庫維護及議題分析」、「我國機場環境永續發展研究—國際發展趨勢蒐整及我國推動現況盤點」、「橋梁檢測輔助工具精進之研究—建立橋梁多時期劣化比對技術」、「應用新興材料研發橋基保護工法」、「應用影像智慧化技術判釋海岸公路及防波堤越波研究」、「鐵道系統強化調適能力之探討—作為與指引(高鐵與臺鐵)」、「建構運輸管理機關(構)之調適專業能力—精進課程規劃」,以及研提113年度「維生基礎設施領域成果報告」。

Construction Adjacent to Active Tracks"; "Risk Assessment and Response Strategies for the Safety Management Model of Maritime Autonomous Surface Ships (MASS)"; "Diverse Experiential Learning Program on Traffic Safety for Senior Citizens – Software Development and Activity Planning"; "Application of Technology in Traffic Safety Planning"; "Implement the service upgrade plan 3.0 for the regional transportation development research centers (2025–2026)"; "An Investigation of Operation, Subsidy and Fare System of Demand Responsive Transport Service (DRTS) Scheme – Fare and Subsidy System"; and "Shared Mobility Integration with Public Transportation – Development and Implementation of Demonstration Sites."

(2) In terms of guiding transportation technology and industrial innovation, major accomplishments under this research theme included the completion of "Construction of the 5G Intelligent Transportation Digital Nerve Center – Full-system integration implementation and promotion applications"; "Forward-Looking Planning and Pilot Market Validation of Innovative Advanced Air Mobility Services"; "Advancing AI Traffic Signal Control – Multi-Task Reinforcement Learning"; "AI-Driven Decision Support for Transportation Research"; "Exploration of Inclusive Transport Service Needs and Functional Design Planning"; "Promotion and Enhancement of the Smart Charging Management System for Electric Buses – System Deployment Support and Planning of Shared Charging Service Mechanisms"; "Smart Inspection Technology Development for Harbor Facilities"; "Technical Development of the Vessel VHF Data Exchange System"; "R&D of Radar Monitoring Technologies for Harbor Metocean Observation and Vessel Detection"; and "Promote the Digital Transformation of Port Facility Maintenance Management."

(3) In terms of creating convenient and resilient transportation networks: The Institute continued to support regional and integrated transportation planning and completed a series of key projects, including "Maintenance Service of the Transportation Planning Support System (2025)"; "Analysis of Traffic Capacity and Level of Service of Freeway Weaving Segments – Freeway System Interchange Weaving Sections and Capacity Manual Development"; "Capacity Analysis of the Round-island Intercity Railway Network – Establishment of Capacity Parameter Data"; "International Maritime Transportation Database Maintenance and Thematic Analysis"; "A Study on the Digital and Sustainable Twin Transition of Taiwan's Container Shipping Industry – Program Framework and Strategic Formulation"; "International Air Transportation Database Maintenance and Thematic Analysis"; "Environmental Sustainability Development of Taiwan's Airports – International Development Trends and Current Status of Implementation in Taiwan"; "Research on Enhancing Bridge Inspection Tools – Development of Multi-Temporal Bridge Deterioration Comparison Techniques"; "Development of Bridge Foundation Protection Methods Using Advanced Materials"; "Intelligent Image Recognition Analyses for Wave Overtopping on Coastal Highways and Seawalls"; "A Study of Enhancing the Adaptive Capacity of Railway Systems – Strategies and Guidelines for High-Speed Rail and Taiwan Railways"; "Constructing the professional adaptation capabilities of transportation management agencies – Advanced Curriculum Development"; as well as the proposal for "the reporting of the results in the field of critical infrastructure for 2024."

四、在「推動淨零碳排邁向環境永續」方面：配合交通部「環島自行車道升級暨多元路線整合推動計畫第二期（113-116年）」，完成「交通部自行車路線整合評估與精進（II）」，研提自行車路網整併暨第二條環島路線規劃，協助交通部推動運輸部門2050淨零轉型及氣候變遷法定工作，完成「運輸部門淨零排放與溫室氣體減量推動工作－精進淨零排放評估模型參數暨檢討113年行動方案成效」、「汽車貨運業因應淨零轉型策略規劃－行動計畫研擬」，以及研提第三期運輸部門溫室氣體減量行動方案（草案）及113年度「第二期運輸部門溫室氣體減量行動方案成果報告」。

展望未來，本所將秉持「行穩致遠、務實創新」之理念，持續強化智庫功能，深化交通基礎研究與前瞻規劃研究能量及AI科技應用能力，並密切關注國際發展趨勢，積極投入智慧運輸、淨零轉型、交通安全及韌性治理等關鍵議題研究。同時，致力打造「專業領航、尊重多元、追求卓越」之研究環境，持續強化與產官學研界之合作交流及國際鏈結，培育具國際視野與創新思維之交通研究人才。透過專業整合與創新驅動，支援交通部政策制定與施政推動，攜手打造安全、智慧、永續之現代化交通體系，為國家發展奠定穩固基礎。

(4) In terms of promoting net-zero carbon emissions toward environmental sustainability, in conjunction with the MOTC's Phase 2 (2024-2027) of the around-the-island cycling upgrade and diverse route integration promotion plan, the "MOTC's cycling route integration assessment and improvement (II)" was completed, proposing recommendations for bicycle network consolidation and the planning of a second cycling route around Taiwan. The Institute also supported the Ministry in advancing the transportation sector's 2050 net-zero transition and fulfilling climate change-related statutory obligations by completing the implementation of "Net-Zero Emissions and Greenhouse Gas (GHG) Reduction Initiatives in the Transportation Sector – Enhancing Parameters for the Net-Zero Emissions Assessment Model and Reviewing the Effectiveness of the 2024 Action Plan" and "Trucking Carrier strategy planning for net zero transformation – Development of Action Plans." Furthermore, the Institute drafted the Phase III GHG Reduction Sectoral Action Program in the transportation sector and prepared the "2024 annual reports on the implementation of the Phase II GHG Reduction Sectoral Action Program in the transportation sector."

Looking ahead, the Institute will remain committed to the principle of "Steady Progress toward Long-Term Goals, and Pragmatic Innovation." Building upon its role as a key think tank, the Institute will strengthen its capabilities in foundational transportation research, strategic foresight and planning, and AI-driven innovation. Meanwhile, it will monitor global trends and advance research in areas of strategic importance, including smart transportation, the net-zero transition, transportation safety, and resilient governance. The Institute is also dedicated to creating a research environment founded on "Professional Leadership, Respect for Diversity, and Pursuit of Excellence." By bolstering collaboration with stakeholders from government, industry, academia, and the research community, and by expanding international partnerships, it aims to nurture transportation researchers equipped with a global vision and innovative thinking. Through the integration of professional expertise and the power of innovation, the Institute will continue to support the MOTC in policymaking and program implementation, joining forces to create a safe, smart, and sustainable transportation system that serves as a cornerstone of national development.

交通部運輸研究所 所長

Director General
Institute of Transportation, MOTC

黃新薰

Hsin-Hsun Huang



貳

組織與職掌

Organization and Functions

一 沿革

臺灣地區自政府播遷來此，經歷長年的勵精圖治，各項建設莫不欣欣向榮，經濟發展更是突飛猛進。在此期間，有關運輸部門的投資比重及其成長速度，雖與時俱增，但仍不敢鬆懈以因應社會經濟快速發展及人民生活水準大幅提高的需要。因此運輸主管部門為解除擁擠、疏通瓶頸、提高容量，除當設法擴充及充分利用現有運輸設施外，更需妥善擬訂中長期運輸發展計畫，以肆應未來的需求。

由於運輸建設所需要的投資甚為龐大，且在整體經濟發展的考量下，可供運用的資金有限，因此對於投資決策的研提及優先順序的釐定，便須由一個統一的運輸規劃機構來承擔；其次，由於運輸事業係屬公用事業，政府對其費率、加入、退出、能量等，均有必要參與管理，而參與的方法是否適當、是否需要修正，亦須由一個統籌的運輸規劃機構進行研究；再次，各種運輸事業彼此均具有競爭性，如何減少其相互間的競爭性而加強其輔助性，以完成最具效益的整體運輸系統，更需由一個運輸規劃機構來統籌完成。交通部基於上述3項考慮，乃於民國59年8月1日成立運輸計劃委員會專司其事。成立以來已完成諸多的運輸研究規劃工作，舉其犖犖大者計有：臺灣地區整體運輸規劃、高速公路交流道連絡道路系統整體規劃、臺北地區大眾運輸系統初步規劃、臺北市區鐵路改善計畫、臺北都會區大眾捷運系統計畫及高雄都會區大眾運輸系統

I History

Since its relocation to Taiwan, the Central Government of the Republic of China has been actively engaged in infrastructure development. This effort has brought prosperity to Taiwan and transformed Taiwan into an economically dynamic force. Although investment in transportation has grown substantially over the years, continued efforts are needed to meet the demands arising from rapid socio-economic development and rising living standards. Therefore, government authorities have the responsibilities to develop strategies to better utilize existing transportation facilities and to prepare medium-range and long-range plans to satisfy future transportation demand.

The development of transportation infrastructure requires huge capital outlays, while available manpower and monetary resources are always limited. Under the circumstances, there is a need to charge a single transportation planning agency with the responsibilities of setting priorities and programming for investment. Furthermore, transportation services are mainly regarded as public utilities and, as such, are subject to government regulations in connection with fare structure, capacity, formation and dissolution of firms, etc. To ensure that regulations are stipulated and implemented to the best interest of the nation, there is also a need for a single transportation planning agency to review existing and pending regulations for possible revisions. Finally, transportation services can complement each other but they can also be entangled in a counterproductive struggle to serve the same sector of market. In order to develop an efficient, integrated transportation system, it is imperative that a planning agency be dedicated to the development and coordination of transportation services. Because of these various concerns, the MOTC established the Transportation Planning Board on August 1, 1970. Since its inception, the Transportation Planning Board had completed a number of planning projects. Notable examples of such projects include: Planning for Integrated Transportation Systems in the Taiwan Area; Planning for Integration of Freeway Interchanges and Connecting Highway Systems; Preliminary Planing of Public Transportation Systems in the Taipei Area; Planing of Railway Improvement in the Taipei City Area; Planing of MRT System in the Taipei Metropolitan Area; and long-range Development Plan of Kaohsiung Metropolitan Area Public Transportation System. In addition, the Transportation Planning Board was also instrumental in conducting studies to assist the government in the formulation and implementation of policy decisions.

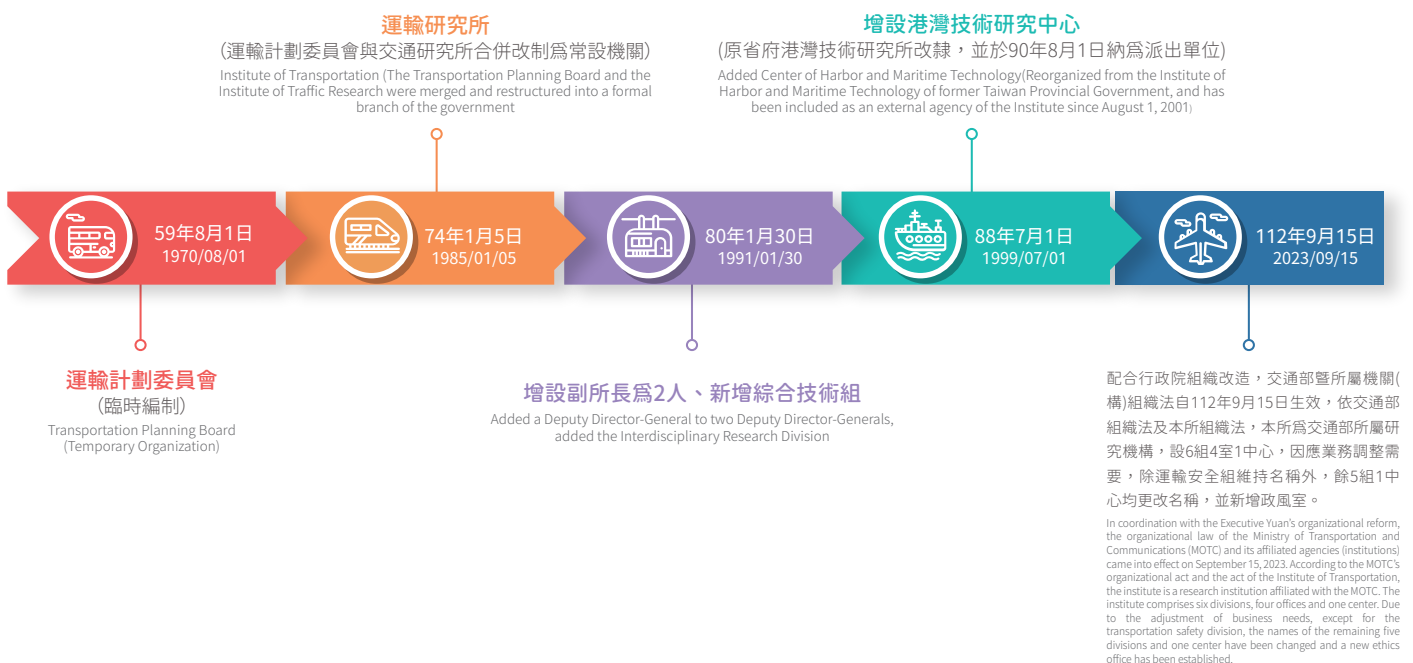
The Transportation Planning Board, however, was a provisional organization; it had very limited funding and manpower to tackle the increasingly complex transportation problems. Therefore, the Institute of Transportation was created on January 5, 1985 by merging the Transportation Planning Board with the former Institute of Traffic Research, which had the mandate to conduct traffic research and personnel



長期發展計畫等，皆已次第竣事。此外，該委員會並隨時配合政策需要，進行各項專案研究規劃，逐一付諸實施。

運輸計劃委員會係屬臨時編制單位，在行政運作上，在在受到經費及人力運用上的限制，委實無法因應日益遽增的運輸研究規劃業務。嗣乃奉令於民國74年元月5日，與原負責一般交通學術研究、交通幹部訓練、戰備器材管理運用及大陸交通資料蒐集研判等業務的交通研究所，合併改制為運輸研究所，成為政府常設機關，藉以健全編制，擴大規模，從而將經費與人力的運用納入常軌。民國80年元月30日，因業務大幅增加，奉准修改組織條例，增置副所長1人，並增設綜合技術組及加強中級研究規劃人力，以資因應。民國88年7月1日，因臺灣省政府功能業務與組織調整，原臺灣省政府交通處港灣技術研究所改隸本所，更名為港灣技術研究中心。民國90年8月1日，本所組織條例修正案，奉行政院核定施行，港灣技術研究中心與本所整併，並為本所之派出單位。配合行政院組織改造，交通部暨所屬機關（構）組織法自112年9月15日生效，依交通部組織法及本所組織法，本所為交通部所屬研究機構。本所設6組1中心4室，因應業務調整需要，除運輸安全組維持名稱外，餘5組1中心均更改名稱，並新增政風室。

training, manage battlefield equipment and supplies, and collect transportation information on Mainland China. Being a formal branch of the government, the Institute of Transportation is funded through a normal budgeting process. Because of the increased demand for its services, the organizational structure of the Institute was expanded, on January 30, 1991, by adding a Deputy Director-General, an Interdisciplinary Research Division, and intermediate level planners. And since July 1, 1999, due to the functional adjustments of Taiwan Provincial Government, the Institute of Harbor and Maritime Technology has become affiliated to the Institute of Transportation and renamed as Center of Harbor and Maritime Technology. It was originally affiliated to the Department of Transportation of the Taiwan Provincial Government. As part of the entire government agency reorganization, the Institute of Transportation's organization adjustment has been approved by the Executive Yuan, and since August 1, 2001 the organization level of the Center of Harbor and Maritime Technology has again been adjusted. According to the new arrangement, the Center is incorporated with the Institute of Transportation and becomes an external agency of the Institute of Transportation. In coordination with the Executive Yuan's organizational reform, the organizational law of the Ministry of Transportation and Communications (MOTC) and its affiliated agencies (institutions) came into effect on September 15, 2023. According to the MOTC's organizational act and the act of the Institute of Transportation, the institute is a research institution affiliated with the MOTC. The institute comprises six divisions, one center and four offices. Due to the adjustment of business needs, except for the transportation safety division, the names of the remaining five divisions and one center have been changed and a new ethics office has been established.



二 組織及人力

本所設有運輸計畫及陸運、運輸工程及海空運、運輸經營及管理、運輸安全、運輸科技及資訊、運輸能源及環境6個組與運輸技術研究中心等計7個業務單位，及秘書室、人事室、主計室、政風室等行政單位。本所114年底預算員額145人（含職員130人、聘用人員3人，技工、工友及駕駛12人）。

II Organization and Human Resources

The institute has seven business units: transportation planning and land transport division, transportation engineering and maritime and air transport division, transportation operations and management division, transportation safety division, transportation technology and information division, transportation energy and environment division, and transportation technology research center. Additionally, there are administrative units which include the secretariat, personnel office, accounting office, and ethics office. At the end of 2025, the institute's budgeted staff was 145 people (including 130 staff members, 3 contracted personnel, and 12 technicians, workers and drivers).

三 本所職掌

依據本所組織法第二條規定，本所掌理下列事項：

- 1、運輸政策之研究及建議。
- 2、運輸系統規劃之研究及發展。
- 3、運輸工程之研究及發展。
- 4、運輸經營與管理之研究及發展。
- 5、運輸安全之研究及發展。
- 6、運輸能源與環境之研究及發展。
- 7、運輸科技與資訊之研究及發展。
- 8、運輸技術之研究及發展。
- 9、國內外運輸研究之聯繫及合作。
- 10、其他有關運輸研究事項。

III Functions

The IoT is responsible for the following tasks:

1. Transportation policy research and recommendations.
2. Transportation system planning research and development.
3. Transportation engineering research and development.
4. Transportation operations and management research and development.
5. Transportation safety research and development.
6. Transportation, energy, and environmental research and development.
7. Transportation technology and information technology research and development.
8. Transportation technique research and development.
9. Contact and collaboration with domestic and international transportation institutions.
10. Other transportation research-related matters.

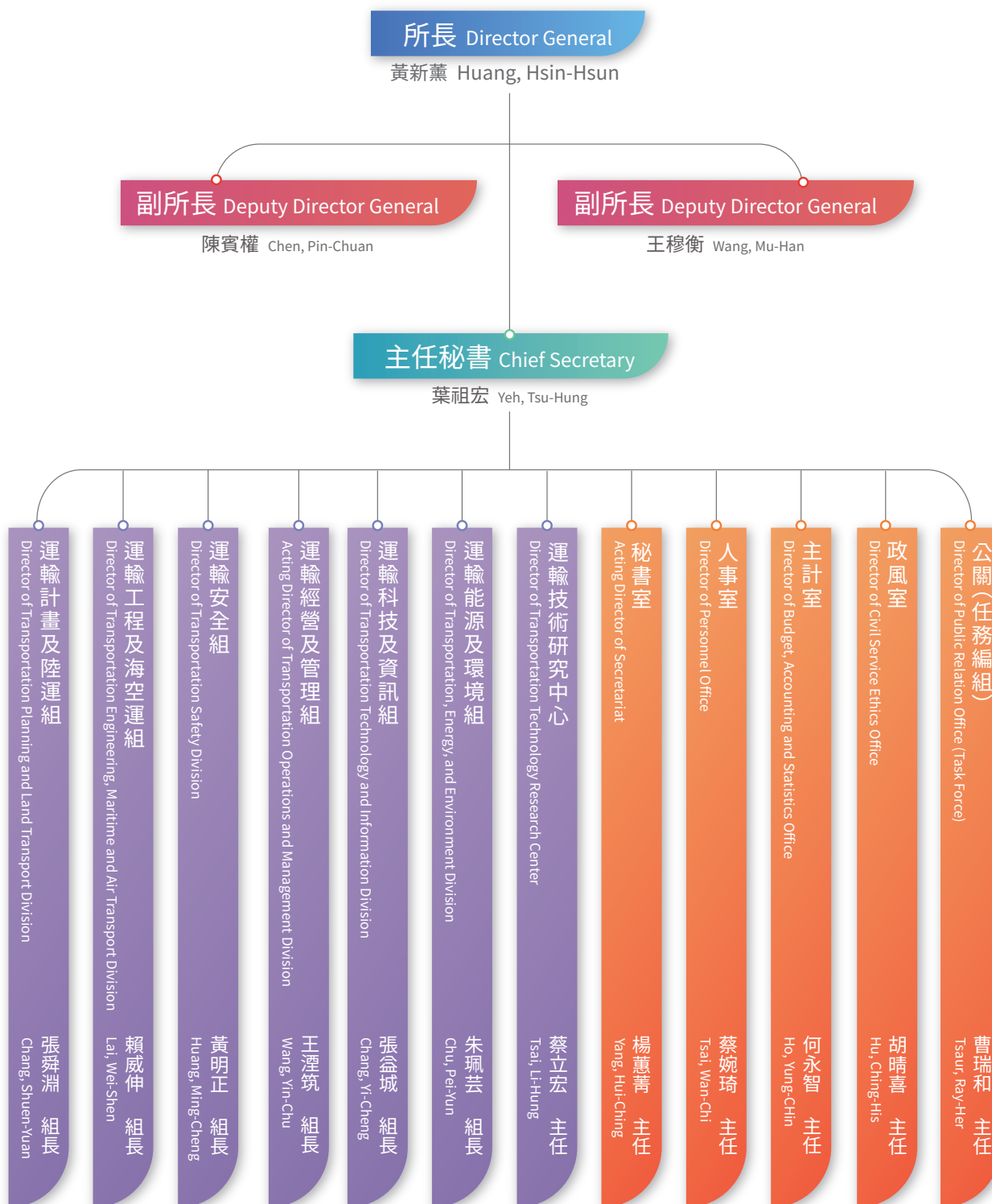


四 組織架構

本所組織架構如下圖：

IV Organization Framework

Organization of the Institute is shown below:





副所長 Deputy Director General
陳賓權 Chen, Pin-Chuan



所長 Director General
黃新薰 Huang, Hsin-Hsun



主任秘書 Chief Secretary
葉祖宏 Yeh, Tsu-Hung



副所長 Deputy Director General
王穆衡 Wang, Mu-Han



人事室 主任 Director of Personnel Office
蔡婉琦 Tsai, Wan-Chi



秘書室 主任 Acting Director of Secretariat
楊蕙菁 Yang, Hui-Ching



政風室 主任 Director of Civil Service Ethics Office
胡晴喜 Hu, Ching-His



主計室 主任
Director of Budget, Accounting and Statistics Office
何永智 Ho, Yung-CHin



公關室（任務編組）主任
Director of Public Relation Office (Task Force)
曹瑞和 Tsaur, Ray-Her



運輸技術研究中心 主任
Director of Transportation Technology
Research Center
蔡立宏 Tsai, Li-Hung



運輸計畫及陸運組 組長
Director of Transportation Planning and
Land Transport Division
張舜淵 Chang, Shuen-Yuan



運輸安全組 組長
Director of Transportation Safety Division
黃明正 Huang, Ming-Cheng



運輸工程及海空運組 組長
Director of Transportation Engineering,
Maritime and Air Transport Division
賴威伸 Lai, Wei Shen



運輸經營及管理組 組長
Acting Director of Transportation Operations
and Management Division
王湮筑 Wang, Yin-Chu



運輸科技及資訊組 組長
Director of Transportation Technology and
Information Division
張益城 Chang, Yi-Cheng



運輸能源及環境組 組長
Director of Transportation, Energy, and
Environment Division
朱珮芸 Chu, Pei-Yun



參

年度研究主軸

Annual Research Theme

依據本所配合交通部運輸發展政策以及國內交通需求，持續滾動規劃之研究發展路徑藍圖，包括「落實運輸安全與人本價值」、「引領運輸科技與產業創新」、「打造便捷及韌性交通網絡」及「推動淨零碳排放邁向環境永續」等四大研究主軸。

The research and development roadmap blueprint, planned on a rolling basis, is continued according to the transportation development policy of the MOTC and is reflective of the domestic demand for transportation. It encompasses four major research themes: "implementing transportation safety and humanistic value," "guiding transportation technology and industrial innovation," "creating a convenient and resilient transportation network," as well as "promoting net-zero carbon emissions toward environmental sustainability".

一 落實運輸安全與人本價值

上位政策

- ◆ 道路交通安全基本法
- ◆ 國家道路交通安全綱要計畫（113至116年）
- ◆ 國家鐵道安全計畫
- ◆ 2020運輸政策白皮書
- ◆ 臺灣2050淨零排放路徑及策略總說明
- ◆ 淨零排放關鍵戰略10

研究重點

1. 強化運輸安全管理

- (1) 提升道安改善專業人員及用路人能力
 - 與各級道路交通安全主管機關合作，推動重要道安改善計畫之成效評估作業，累積道安知識平台策略庫；持續推動道安人員培訓；協助交通部辦理重要道安課題分析，及輔導各級道安主管機關提升道安改善能量。
 - 持續精進與擴充「道路交通標誌標線號誌設置參考指引」之複雜道路情境內容，辦理教育訓練協助地方推廣應用，並研提「道路交通標誌標線號誌設置規則」之檢討修正機制。
 - 辦理高齡者交通安全數位學習輔助軟體之系統建置及體驗學習活動規劃，並辦理成果發表會，擴大研發成果之應用推廣。
- (2) 推動安全管理系統
 - 協助公路局完成汽車運輸業各項安全管理文件、教育訓練課程、行政機關工作及組織轉型規劃等整備工作；啟動安全管理人

I Implementing Transportation Safety and Humanistic Value

Overarching Policies

- ◆ Road Traffic Safety Basic Act
- ◆ National Road Traffic Safety Outline Plan (2024 to 2027)
- ◆ National Railway Safety Plan
- ◆ Transportation policy white paper
- ◆ Taiwan 2050 Net-Zero Emissions Pathway and Strategy Overview
- ◆ Net-zero emissions key strategy 10

Research Theme and Focus

1. Reinforce Transportation Safety Management

- (1) Strengthen the competencies of road safety practitioners and road users
 - Work closely with road traffic safety authorities at various levels to assess the effectiveness of key road safety enhancement programs and enrich the strategic database of the Road Safety Knowledge Platform. Continue delivering training programs for road safety professionals, assist the MOTC in addressing major road safety issues, and support local authorities in improving their road safety management and implementation capabilities.
 - Further enhance and broaden the content of the "Reference Guidelines for the Installation of Road Traffic Signs, Markings, and Signals" relating to complex road scenarios. Provide educational and training programs to encourage local implementation and formulate a review and amendment mechanism for the "Regulations Governing the Installation of Road Traffic Signs, Markings, and Signals."
 - Establish a digital learning platform to support traffic safety education for senior citizens, plan experiential learning activities, and host a results presentation event to facilitate the dissemination and practical application of research achievements.
- (2) Promote safety management systems
 - Support the Highway Bureau in establishing the necessary foundations for motor carrier safety management, including safety management manuals,

強化運輸安全管理

~113	114	115	116	117	118	119
					研提 2030 年運輸政策白皮書及先期規劃－運輸安全	
道安改善專業能力建構	道安改善專業人力及技術提升		道路交通安全產業永續運作機制建立			
研擬道路標誌標線號誌設置參考指引				協助交通部精進及推廣應用設置參考指引		
	推動汽車運輸業建立系統性安全管理制度			協助交通部公路局逐步擴大試辦規模		
研析國家鐵道安全計畫之安全績效與目標管理	臨軌工程導入安全管理系統	營運機構安全文化評估		協助交通部及鐵道局推動鐵道安全管理政策及措施		
海上自主水面船舶 (MASS) 安全管理模式之風險評估與因應對策		精進我國 NSM 評鑑制度之研究		協助交通部及航港局推動航安及安全管理制度		
道路交通安全檢查制度導入研究		推動全生命週期道路交通安全檢核制度		協助交通部推動道路交通安全檢核制度		
無人機空拍應用於路段交通衝突		無人機空拍影像分析機車、混合車流、行人交通衝突		推廣應用交通衝突分析工具		
新興科技導入學校交通安全教育之研發示範計畫	高齡者交通安全多元體驗學習計畫		交通安全教育宣導設計與評估方法之指引			
維運橋梁管理資訊系統 / 統計系統並精進相關功能，辦理公路橋梁檢測人員培訓						

完善公共運輸經營環境

~113	114	115	116	117	118	119
					研提 2030 年運輸政策白皮書及先期規劃－公共運輸	
DRTS 營運成本、績效、收費及補貼制度分析	客運經營環境變化分析與課題探討 / 檢討公運計畫推動成效 / 蒐集與觀察國內外公共運輸發展趨勢				國際自駕技術應用於汽車客運業分析與課題探討 / 檢討公運計畫推動成效 / 蒐集與觀察國內外公共運輸發展趨勢	
研提第五期公路公共運輸計畫			研提第六期公路公共運輸計畫			
推動區域中心 2.0 計畫	推動區域運輸發展研究中心服務升級 3.0 計畫				推動區域運輸發展研究中心服務升級 4.0 計畫	
研擬區域運輸發展研究中心服務升級 3.0 計畫			研擬區域運輸發展研究中心服務升級 4.0 計畫			
數位化及減碳趨勢下計程車產業觀察	平台經濟、包容性運輸及通用計程車政策相關課題研析		計程車電動化之營運課題探討與推動策略規劃		自駕車引入計程車產業之課題研析	
共享運具連結公共運輸營運管理因應策略規劃及示範場域建置與推動		共享運具連結公共運輸示範成效分析				

Reinforce Transportation Safety Management

~2024	2025	2026	2027	2028	2029	2030
					Prepare the 2030 Transportation Policy White Paper and Preliminary Planning-Transportation Safety	
Construction of professional capabilities for road safety improvement	Improvement of professional manpower and technology in road safety			Development of a sustainable operational mechanism for the road traffic safety industry		
Formulation of reference guidelines for the installation of road traffic signs, markings and signals			Assist the MOTC in improving and facilitating the adoption of the reference guidelines			
	Facilitate the establishment of a systematic safety management system for the motor vehicle transportation industry			Assist the Highway Bureau of the MOTC in progressively scaling up the pilot implementation		
Analysis of the safety performance and target management of the national railway safety plan	Implementation of Railway Trackside Construction Project Safety Management Systems	Evaluation of the safety culture of operating agencies		Assist the MOTC and the Railway Bureau in implementing railway safety management policies and measures		
Risk assessment and response strategies for the safety management model of maritime autonomous surface ships (MASS)		Study on Improving Taiwan's NSM Evaluation System		Assist the MOTC and the Maritime and Port Bureau in advancing maritime safety and safety management systems		
Research on the introduction of a road traffic safety audit system		Promote the implementation of a life-cycle-based road traffic safety audit system		Assist the MOTC in promoting the road traffic safety audit system		
UAV aerial photography application for road segment traffic conflicts		Analysis of motorcycle, mixed-traffic, and pedestrian conflicts using UAV aerial photography			Promotion and application of traffic conflict analysis tools	
R&D demonstration project for incorporating emerging technologies into school traffic safety education	Diversified experiential learning plan of traffic safety for the elderly		Guidelines for road traffic safety education promotion design and evaluation methodologies			
Operation and maintenance of the bridge management information/statistics system, with functional improvements and training for highway bridge inspection personnel						

Optimize the operating environment for public transportation

~2024	2025	2026	2027	2028	2029	2030
					Development of the 2030 Transportation Policy White Paper and Preliminary Planning – Public Transportation	
Assessment of DRTS operating costs, performance, fare structures, and subsidy schemes	Analysis of the evolving bus operating environment and issues/review of public transport program effectiveness/and collection of global and domestic public transport development trends				Analysis and issue exploration of the application of international autonomous driving technologies in the bus transport industry/review of public transport program effectiveness/and collection of global and domestic public transport development trends	
Proposal of the Fifth Highway Public Transportation Program				Proposal of the Sixth Highway Public Transportation Program		
Promote regional center plan 2.0	Promote regional transportation development research center service upgrade plan 3.0				Promote regional transportation development research center service upgrade plan 4.0	
Formulate regional transportation development research center service upgrade plan 3.0				Formulate regional transportation development research center service upgrade plan 4.0		
Industry observation in the taxi sector under the digital transformation and carbon reduction trend	Research on platform economy, inclusive mobility, and accessible taxi policy issues		Exploration of operational challenges and promotion strategies for taxi electrification		Study on issues related to introducing autonomous vehicles into the taxi industry	
	Planning of operational strategies for integrating shared mobility with public transport, including pilot sites development and implementation	Evaluation of demonstration outcomes of shared mobility integration with public transport				

員、查核人員及種子師資訓練課程；辦理成果說明會，強化與外界溝通，並協助公路局擴大試辦規模等相關作業。另盤點我國因應國際海事組織推動海上水面自主船舶（MASS）發展之相關作為，研擬對應策略、優先課題及行動方案，以支援未來 MASS 時代航運安全管理之建構與發展方向。

- 蒐集近年國內外臨軌工程事故（件）案例，系統性盤點我國及先進國家既有安全管理作法，協助鐵道局建構我國鐵路臨軌工程計畫的安全管理系统，並提出實施內容、作業指引與配套措施，據以導引相關單位有效執行自主式安全管理。

(3) 化被動改善為主動預防，防範事故於未然

- 參考各國道路安全檢核的發展經驗，研提我國道路安全檢核制度發展架構；研擬我國道路安全檢查表，選取不同型態路段試辦道路安全檢查。
- 無人機空拍影像及 AI 偵測技術應用於公車進出站與路外設施進出車流衝突，量化安全特性並深入分析，持續優化 AI 影像辨識追蹤技術及交通衝突分析軟體功能，並與道路管理機關合作分析易肇事地點。

2. 完善公共運輸經營環境

(1) 促進公共運輸發展

- 研析 DRTS 營運成本、績效評估、補貼及收費制度議題。
- 以永續角度建議 DRTS 合理成本計算方式及研提合宜補貼架構。
- 盤點汽車客運業經營環境變化及分析營運課題與挑戰。
- 持續觀察國內公車運量變化、國內外公共運輸發展趨勢、定期檢討公運計畫推動成效。
- 觀察國際自駕技術應用於汽車客運之趨勢，瞭解其應用及挑戰，進行議題探討研析，以因應未來自駕技術於汽車客運落地應用挑戰。

training programs, administrative procedures, and organizational transformation planning. Conduct training for safety management personnel, inspectors, and trainer instructors; organize outreach events to communicate project outcomes; and assist in scaling up pilot implementation activities. Examine Taiwan's preparations for the development of Maritime Autonomous Surface Ships (MASS) under the framework promoted by the International Maritime Organization (IMO). Based on this assessment, formulate strategic priorities, key research topics, and action plans to support the future development of maritime safety governance and regulatory systems.

- Compile domestic and international case studies of trackside construction incidents and systematically review safety management practices adopted in Taiwan and other advanced countries. Assist the Railway Bureau in establishing a national safety management framework for trackside construction projects, including implementation procedures, operational guidance, and supporting mechanisms.

(3) Promote a transition from corrective action to preventive safety management, thereby identifying and preventing risks

- Drawing on international best practices in road safety inspections, formulate a development framework for Taiwan's road safety inspection regime, establish inspection checklists, and conduct pilot inspections on various roadway types.
- Utilize UAV aerial imaging and AI-powered detection technologies to examine traffic conflicts involving bus stop operations and access movements at off-street facilities. Continue to enhance AI image recognition, object tracking, and traffic conflict analysis capabilities, while collaborating with road authorities to assess accident-prone locations.

2. Optimize the operating environment for public transportation

(1) Facilitate public transportation development

- Analyze key issues related to Demand Responsive Transport Service (DRTS), including operating costs, performance assessment, subsidy and fare systems.
- Develop recommendations for sustainable DRTS cost calculation methodologies and formulate an appropriate subsidy framework.
- Review changes in the operating environment of the bus transport industry and identify key operational challenges and policy issues.
- Maintain ongoing observation of domestic bus ridership trends, international and domestic public transportation developments, and the effectiveness of highway public transportation program implementation.
- Track international developments in the application of autonomous vehicle technologies to passenger transport services, assess potential opportunities and implementation challenges, and conduct policy studies to support future deployment.

- 研提第六期公路公共運輸計畫。
 - 研提 2030 年運輸政策白皮書及先期規劃—公共運輸。
- (2) 持續推動區域運輸發展研究中心
- 辦理區域運輸發展研究中心服務升級 3.0 (114–117 年)、4.0 計畫 (118–121 年)。
 - 藉由區域中心廣續深化中央政府、地方政府、產業界及學界合作，共同推動公共運輸及道路交通安全改善，並連結國家重大政策，包含環島高快速鐵路網、智慧交通、觀光旅遊、地方創生及淨零排放等。
- (3) 優化計程車發展
- 就平台經濟、包容性運輸及通用計程車推動成效，進行相關課題研析，提供精進策略。
 - 配合交通部推動計程車電動化政策研議因應策略，加速產業淨零轉型。
 - 研析國外自駕計程車發展經驗，探討國內推動應用可能面臨課題與因應之道。
- (4) 促進共享低碳運輸發展
- 完成 3 處共享運具連結公共運輸之示範場域建置，驗證透過兩者連結有助於提升場站接駁效率及促進軌道運輸轉乘使用。
 - 綜整兩年期成果，研提 12 項推動課題及具體做法，並據以滾動修訂指引內容。
- Formulate the Sixth Highway Public Transportation Program.
 - Prepare the 2030 Transportation Policy White Paper and Preliminary Planning for Public Transportation Development.
- (2) Continue to promote the Regional Transportation Development Research Center.
- Advance the Regional Transportation Development Research Center Service Upgrade 3.0 (2025–2028) and 4.0 plan (2029–2032).
 - Utilize the Regional Transportation Development Research Centers as a platform to strengthen collaboration among central and local governments, industry, and academia to advance public transportation development and road traffic safety improvements. The project also supports major national initiatives, including the round-island high-speed rail and highway network, smart transportation, tourism development, local revitalization, and net-zero emissions.
- (3) Promote the optimization of taxi services.
- Evaluate the impacts of the platform economy, inclusive mobility initiatives, and accessible taxi services, and develop strategies to improve service effectiveness and accessibility.
 - Formulate policy recommendations in support of the Ministry's taxi electrification initiative to facilitate the sector's transition toward net-zero emissions.
 - Review international autonomous taxi development experiences and assess potential implementation challenges, opportunities, and policy responses for Taiwan.
- (4) Promote the development of shared low-carbon mobility services.
- Establish three pilot sites integrating shared mobility and public transportation services to demonstrate improvements in transfer efficiency and increased utilization of rail transit systems.
 - Integrate and evaluate the outcomes of the two-year initiative, identify 12 key implementation priorities and corresponding actions, and revise the associated guidelines on a rolling basis.

二 引領運輸科技與產業創新

上位政策

- ◆ 行政院前瞻基礎建設計畫
- ◆ 2020 運輸政策白皮書
- ◆ 2021 交通科技產業政策白皮書
- ◆ 臺灣 2050 淨零排放路徑及策略總說明
- ◆ 淨零排放關鍵戰略 7

II Guiding Transportation Technology and Industrial

Overarching Policies

- ◆ Executive Yuan Forward-Looking Infrastructure Development Program
- ◆ 2020 Transportation policy white paper
- ◆ 2021 Transportation Technology Industry Policy White Paper
- ◆ Taiwan 2050 Net-Zero Emissions Pathway and Strategy Overview
- ◆ Net-zero emissions key strategy 7

整合智慧運輸服務

~113	114	115	116	117	118	119
構建 5G 智慧交通數位神經中樞— 全系統整合實作與推廣應用					研提 2030 年運輸政策白皮書 及先期規劃—智慧運輸	
運用科技精進國省 道路疏運計畫先期規 劃研究			運用科技發展區域路網智慧化疏運策略系列計畫			
人工智慧號誌控制— 匝道儀控與平面道路號 誌協控實作	人工智慧號誌控制精進— 多任務強化學習模型構建		人工智慧號誌控制模型落地 化暨通訊協定檢定制度探討		人工智慧號誌控制模型驗測	
運輸研究決策支援及專利應用		強化運輸研究決策支援及專利應用計畫			運輸研究決策支援系統精進與推廣	運輸研究成果專利應用與推廣
無人機偏鄉物流運送服 務驗證 (PoS)—服務模 式實作與系統驗證	無人機偏鄉物 流運送商業驗 證 (PoB)	無人機應用於橋樑檢測自動化研究				
無人機產業創新與推廣計 畫—深化於交通領域之 應用與國際交流	先進空中交通創新服務前瞻規劃與 前驅市場商業驗證					
交通行動服務 (MaaS) 跨域合作與應用優化之 研究	運輸包容性服 務需求探討及 功能設計規劃	運輸包容性服務功能開發實作—系統雛型開發與驗證實作			運輸包容性服務推廣與精進	
電動大客車數據分析與 應用計畫						
電動大客車智慧充電服 務驗證	電動大客車公共智慧 充電管理系統之推廣	電動大客車智慧充電系統共享 服務規劃研究與測試驗證			公共智慧充電管理系統應用 於多種充電之實作與推廣	

建立智慧港埠

~113	114	115	116	117	118	119
智慧航安與海氣象資訊應用探討 ◆海氣象資訊於船舶監控預警系統之應用 ◆整合船舶智慧航行管理系統		海氣象資訊於海事案件預防應用探討 ◆國際智慧港口之海氣象觀測應用調查 ◆國際智慧港口之海氣象海事案件調查		◆海氣象與 VDES 測試平台整合應用 ◆智慧港口環境數據即時監測預警		海氣象風險評估與 智慧港口應急應變 機制研究
港灣環境資訊系統、海氣象預測模擬系統維 運與精進 ◆海氣象資料分析及展示 ◆資料應用架構規劃建置		商港海氣象資訊 系統防災告警技 術精進	海氣象資訊於海事案件預防應用探討 ◆港口數位學生案列探討 ◆國外智慧港口資訊平臺案列探討	◆商港海氣象資訊平台探討 ◆商港海氣象資訊平台精進實作		
臺灣港群波浪觀測資料統計分析及 通訊技術精進 ◆水中無線通訊設備海域測試 ◆水中無線通訊系統建置		國內主要商港設計水位之探討 ◆基隆港 ◆花蓮港 ◆高雄港				
臺中港海洋陣列雷達訊號應用分析 ◆波浪觀測分析 ◆船舶觀測分析		陣列雷達應用於近岸海面流觀測盲区 之研究 ◆盲区觀測與模擬之整合評估 ◆模式盲区觀測與輔助模組建置		臺灣海洋雷達觀測網運作與技術發展 ◆海洋雷達船舶追蹤模組開發 ◆海洋雷達船舶追蹤整合技術研發		
		推動港灣設施維護管理 E 化 ◆精進與維護港灣設施維護管理系統及行動應用程式 (APP)				

Integrate intelligent transportation services

~2024	2025	2026	2027	2028	2029	2030
Construction of 5G intelligent transportation digital nerve center – Full-system integration implementation and promotion applications					Development of the 2030 Transportation Policy White Paper and Preliminary Planning – Smart Transportation	
Preliminary study on improving national and provincial highway congestion mitigation plans through the use of advanced technologies			Series of studies on technology-driven smart traffic management strategies for regional road network			
AI Traffic Signal Control – Implementation of ramp metering and coordinated control of surface road signals	Advancing AI Traffic Signal Control – Multi-Task Reinforcement Learning Model		Study on the deployment of AI traffic signal control models and the development and evaluation of communication protocol certification mechanisms		Validation of AI traffic signal control models	
Development of transportation research decision-support systems and application of patented technologies		Reinforce the development of transportation research decision-support systems and application of patented technologies			Refine and promote the transportation research decision-support system	Promotion and application of patents based on transportation research achievements
UAV rural logistics delivery service verification (PoS)–Service model implementation and system validation	UAV rural logistics delivery commercial validation (PoB)	Study on UAV-based automation for bridge inspection applications				
UAV industry innovation and outreach program–Expanding applications in transportation and fostering international exchange	Forward-looking Planning and Pilot Market Validation of Innovative Advanced Air Mobility Services					
Research on cross-domain cooperation and application optimization of transportation mobile services (MaaS)	Assessment of Inclusive Transportation Service Needs and Functional Planning	Implementation of inclusive transport service functionality development – Prototype system design and validation			Promotion and improvement of transport inclusivity services	
Electric bus data analysis and application project	Promotion of the public smart charging management system for electric buses		Research, planning, and pilot validation of shared service models for electric bus smart charging systems		Implementation and dissemination of public smart charging management systems for multi-type vehicle charging	
Smart charging service verification for electric buses						

Establish smart ports

~2024	2025	2026	2027	2028	2029	2030
Research on smart maritime safety and marine weather information applications - Use of marine weather information in ship monitoring and warning systems - Integration of smart ship navigation management systems		Exploration of marine weather data applications for maritime accident prevention - Survey of marine weather observation applications in international smart ports - Survey of maritime incidents related to marine weather in international smart ports - Integration and application of marine weather data with VDES test platforms - Real-time environmental monitoring and alert systems for smart ports				Study on marine weather risk assessment and smart port emergency response mechanisms
Maintenance and enhancement of marine weather forecasting and simulation system - Marine Weather data analysis and presentation - Design and implementation of a data application architecture framework		Improvement of disaster alert technologies for the commercial port marine weather information system	Exploration of marine weather data applications for maritime accident prevention - Case studies of port digital twins - Case studies of overseas smart port information platforms - Research on commercial port marine weather information platforms - Implementation and enhancement of the commercial port marine weather information platform			
Statistical analysis of wave and current observation data across Taiwan's port network and improvement of communication technologies - Sea trials of underwater wireless communication equipment - Establishment of an underwater wireless communication system		Investigation of design water levels for Taiwan's major commercial ports - Port of Keelung - Port of Hualien - Port of Kaohsiung				
Application Analysis of ocean radar array signals at Port of Taichung - Wave observation and data analysis - Vessel observation and data analysis		Research on applying phased-array radar to monitor blind spots of nearshore sea surface currents - Integrated assessment of observation blind spots and simulation results - Study on observation blind spots and the development of model-support modules		Operation and technical advancement of the Taiwan Ocean Radar Observation Network - Development of an ocean radar-based vessel tracking module - Development of integrated technologies for ocean radar vessel tracking		
		Promote the digital transformation of port facility maintenance management Upgrade and enhance the port facility maintenance management system and mobile app				

研究重點

1. 整合智慧運輸服務

(1) 構建先進科技智慧應用環境

- 路況資料蒐集與資料品質精進。
- 路況監控與預測模式開發。
- 建立跨單位協調機制與開發視覺化資訊平台。
- 優化管理決策支援系統並導入視覺化資訊（數位雙生）平台。

(2) 推動無人機科技產業發展

- 研擬我國先進空中交通創新服務推動方案。
- 推動無人機物流商業營運先導驗證，結合國內公民營物流業者，試驗導入無人機之新型態物流運輸服務。

(3) 發展 AI 整合應用技術

- 探討人工智慧的都市交通號誌控制應用，並針對號誌控制需求與縣市政府合作，規劃號誌控制實驗場域，推動 AI 號誌控制模型落地化。
- 配合都市交通控制通訊協定 3.5 版，發展都市交通控制通訊協定測試與驗證工具，建立通訊協定檢討制度。
- 整合內部 KM 資料與外部檢索資料，建置運輸研究決策支援 AI 應用平台。
- 完成運輸包容性服務需求探討及功能設計，以及生成式 AI 技術應用於跨域運輸資訊查詢與預約服務之實證。

(4) 支援大客車全面電動化

- 協助交通部與公路局推動智慧充電管理系統補助政策，並提供技術支援與輔導。
- 完善智慧充電管理系統，優化共享智慧充電管理機制。
- 推動國際合作與技術升級，與國際充電設施標準接軌，提升臺灣充電站技術水準與全球競爭力。

2. 建立智慧港埠

(1) 船舶監控預警技術開發

Research Theme and Focus

1. Integrate intelligent transportation services

(1) Create an advanced technology-enabled environment for intelligent transportation applications.

- Improve traffic condition data collection and enhance overall data quality.
- Develop models for real-time traffic monitoring and traffic condition forecasting.
- Establish mechanisms for cross-organizational coordination and develop visualized information platforms.
- Optimize management decision-support systems and incorporate digital twin-based visualization platforms.

(2) Promote the development of the UAV technology industry

- Formulate an implementation solution for Advanced Air Mobility innovative services in Taiwan.
- Partner with domestic public and private logistics providers to launch commercial pilots and validate new UAV logistics services.

(3) Advance AI integration technologies.

- Explore the application of AI in urban traffic signal control and, in collaboration with local governments, establish demonstration sites to facilitate the deployment of AI-driven signal control systems.
- Develop protocol testing and certification tools and establish a review process for Version 3.5 of the Urban Traffic Control Communication Protocol.
- Develop an AI-driven decision-support platform for transportation research by integrating internal knowledge bases and external information sources.
- Complete the needs assessment and functional design for inclusive transportation services, and validate the use of generative AI in cross-domain transportation information inquiry and booking services.

(4) Support full electrification of electric buses.

- Assist the MOTC and the Highway Bureau in promoting subsidy policies for smart charging management systems, while providing technical and advisory support.
- Refine smart charging systems and strengthen shared charging service mechanisms.
- Promote international collaboration and technological upgrades to align with international charging infrastructure standards, enhancing the technical level and global competitiveness of charging stations in Taiwan.

2. Establish smart ports

(1) Develop vessel surveillance and early-warning capabilities.

- 探討與整合臺灣港口海氣象觀測於船舶監控預警系統之應用。
- 研析最新 VDES (特高頻無線電數據交換系統) 國際標準規範。
- 探討船舶 VDES 訊號解碼技術與資料庫建置。
- 建置 VEDS 測試平台。
- 建置關聯式資料庫架構、資料分群與比對。
- 海氣象觀測技術研究與智慧港口需求分析。
- 調查海洋氣象條件對於國際智慧港口海事事故的影響。
- 結合 AI 演算法建置船舶異常行為預測。
- 精進 VDES 測試平臺功能。
- 建置海域圖資、船舶動態、異常行為監測等模組功能。
- 海氣象數據和 VDES 測試平台進行整合分析及規劃系統架構。

(2) 發展港區智慧環境監測與預警技術

- 進行風速計量測不確定性探討及商港強風特性分析，進行商港各測站關聯性探討及風力資料校正因子推算。
- 探討臺中港風速剖面資料蒐集及分析，建置短期風力預測模型，分析臺中港風力災害風險熱點。
- 蒐集並修正澎湖港、馬祖港福澳碼頭、基隆港、花蓮港、高雄港之歷年潮位觀測資料進行統計分析。
- 進行商港水中無線通訊設備測試與調校優化。
- 進行商港波浪觀測資料統計分析，導入新型底碇式波浪觀測儀，並進行水體濁度模組開發。

(3) 港灣環境資訊應用

- 蒐集馬祖海氣象資料，分析港區特性，選定港口建置數值模型，以水動力模式分析福澳港海流變化並精進之，建波浪模式模擬靜穩度，並延伸至馬祖各港，最後研究流場與泥沙變遷特性等研究。

- Integrate port marine weather observation data into vessel safety management systems.
- Examine emerging international standards for VHF Data Exchange System (VDES) technologies.
- Research vessel VDES signal processing and database development methodologies.
- Establish and operate a VDES testing platform.
- Develop data management architectures, clustering methods, and matching technologies.
- Research marine weather observation technology and analyze smart port requirements
- Assess the influence of marine weather on maritime incidents at leading international ports.
- Apply AI algorithms to vessel anomaly detection and prediction.
- Enhance the functionality and performance of the VDES platform.
- Develop vessel tracking, anomaly monitoring, and maritime GIS modules.
- Integrate marine weather data with the VDES platform and system architecture.

(2) Develop intelligent environmental monitoring and warning systems for commercial ports.

- Analyze anemometer measurement uncertainty, extreme wind characteristics, spatial correlation between monitoring stations, and site-specific wind calibration factors within commercial port environments.
- Investigate wind speed profile data collection and analysis at the Taichung Port, establish short-term wind power forecasting models, and identify risk hotspots for wind-induced disasters within the port area.
- Collect and correct historical tidal observation data from the Port of Penghu, Fuao Wharf at the Port of Matsu, the Port of Keelung, the Port of Hualien, and the Port of Kaohsiung to conduct comprehensive statistical analyses.
- Test and optimize underwater wireless communication equipment at commercial ports.
- Analyze wave and current observation data, implement advanced seabed-mounted wave-current monitoring instruments, and develop specialized water turbidity monitoring modules.

(3) Harbor environmental information applications

- Collect marine weather data for Matsu, analyze characteristics of the Port of Matsu, establish numerical models, refine hydrodynamic simulations of the Port of Fuao, develop wave stability models, extend analyses to other ports in Matsu, and study current patterns and sediment transport processes.

- 商港海氣象風力、波浪、能見度之告警機制與影響評估，進行智慧港口環境資訊平臺探討與優化。
- 持續維運「臺灣近岸海象預測系統2.0」(TaiCOMS 2.0)，新建並精進高雄、臺北及臺中海域之風浪及水動力模組。
- 優化港灣資訊平臺與示警模組，提升服務效能，提供即時海象資訊，增強颱風儀表版功能掌握港區動態，構建商港區環境資訊專區。
- 結合觀測與預測資料，提供港埠管理單位關鍵資訊，提升港區安全與營運效益。

(4) 雷達於近海觀測之研究

- 探討微波雷達觀測位址、氣候與非氣候因素等因子對觀測品質之影響。
- 分析海洋陣列雷達觀測流場。
- 分析海洋陣列雷達觀測波場。
- 分析海洋陣列雷達觀測船舶訊號。
- 評估陣列雷達應用於近岸海表面流觀測盲区同化模擬可行性。
- 發展陣列雷達應用於近岸海表面流觀測盲区同化模擬模式。

(5) 推動港灣設施維護管理 E 化

- 建置「港灣設施維護管理系統」及「巡查行動應用程式 (APP)」。
- 依港務單位使用需求，持續擴充系統及 APP 各項功能模組。
- 開發數值化、圖表化儀表板，主動呈現港灣設施資訊，俾掌握港灣設施之巡查、維修狀態。
- APP 可直接以影像方式記錄現場設施劣化狀況並上傳至系統，便於快速掌握設施損壞狀況並縮短資訊傳達時間。
- 配合應用單位巡查、檢測及維護實務需求，針對港灣設施巡查檢測技術問題、管理制度與劣化判定標準，制定港灣設施維護管理手冊並持續滾動檢討修訂。

- Develop marine weather early-warning mechanisms and impact assessment frameworks for wind, wave, and visibility conditions at commercial ports, and optimize the smart port environmental information platform.
- Continue the operation and enhancement of the Taiwan Coastal Operational Modeling System 2.0 (TaiCOMS 2.0), including the development and refinement of wind-wave and hydrodynamic models for the waters off the Port of Kaohsiung, the Port of Taipei, and the Port of Taichung.
- Optimize port information platforms and warning modules to deliver real-time oceanographic data, upgrade typhoon dashboard functionality, and establish dedicated environmental information services for commercial ports.
- Consolidate observational and forecasting data to provide critical marine intelligence for port authorities, thereby enhancing safety and operational efficiency across commercial ports.

(4) Conduct research on radar applications for nearshore observations.

- Investigate the effects of radar site location, atmospheric conditions, and non-climatic factors on meteorological observation quality.
- Analyze surface current fields observed by ocean radar arrays.
- Analyze wave fields observed by ocean radar arrays.
- Analyze vessel signatures detected by ocean radar arrays.
- Evaluate the feasibility of data assimilation modeling to fill blind spots in nearshore sea surface current observations using radar arrays.
- Develop a data assimilation simulation model to resolve observation blind spots in nearshore sea surface currents monitored by radar arrays.

(5) Promote the digital transformation of port facility maintenance management.

- Establish a "Port Facilities Maintenance Management System" and an "Inspection Mobile Application."
- Continuously expand the functional modules of the system and mobile application based on the operational requirements of port authorities.
- Develop digital and, graphical dashboards to proactively display harbor facility information, enabling precision management of facility inspection and maintenance statuses.
- Implement mobile-based image capture for real-time reporting of facility deterioration, enabling instant system uploads for rapid asset damage evaluation and reduced operational latency.
- To support the operational requirements of facility inspection, evaluation, and maintenance, establish a Port Facility Maintenance Management Manual covering port facility inspection technologies, management frameworks, and deterioration assessment standards, with periodic reviews and revisions to ensure its continued effectiveness and relevance.

三 打造便捷及韌性交通網絡

III Creating a Convenient and Resilient Transportation Network

上位政策

- ◆ 全國國土計畫
- ◆ 氣候變遷因應法
- ◆ 國家因應氣候變遷行動綱領
- ◆ 國家氣候變遷調適行動計畫
- ◆ 永續發展政策綱領、臺灣永續發展目標
- ◆ 2020運輸政策白皮書

Overarching Policies

- ◆ National Spatial Plan
- ◆ Climate Change Response Act
- ◆ National Framework for Climate Change Action
- ◆ National Climate Change Adaptation Action Plan
- ◆ Policy Guidelines for Sustainable Development and the Taiwan Sustainable Development Goals (TSDGs)
- ◆ Transportation policy white paper

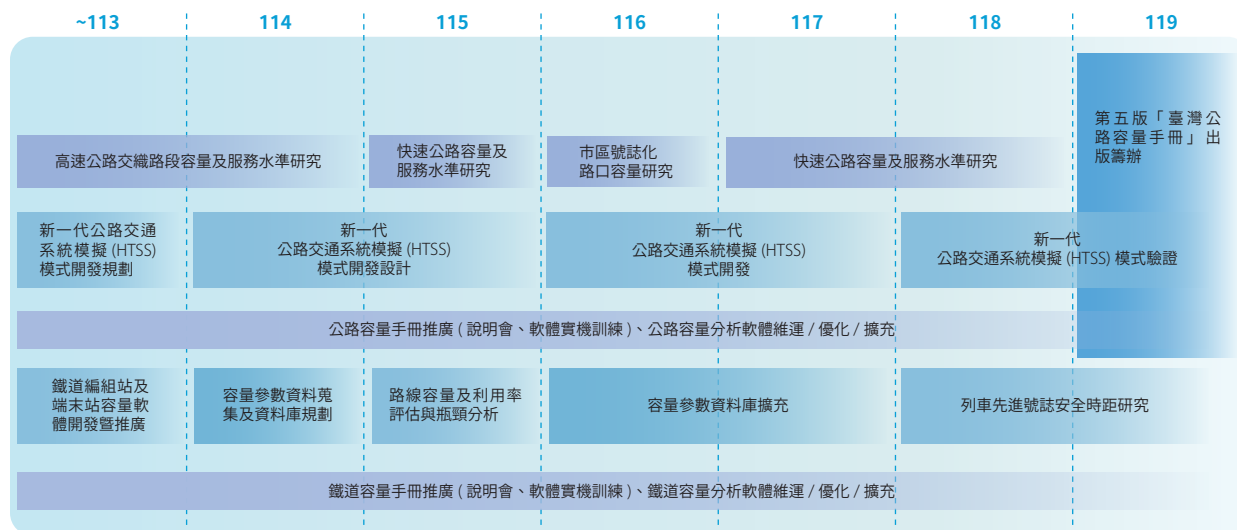
健全整體運輸規劃

~113	114	115	116	117	118	119
					研提 2030 年運輸政策白皮書及先期規劃—陸運	
東臺區域整體運輸規劃系列研究 (3/3)	全國交通路網與模式整合	全國旅次特性調查	第 6 期整體運輸規劃系列研究		區域供需預測分析	發展策略研析
臺灣地區整體運輸規劃—貨運需求模式架構分析	我國貨運需求模式系列研究		生活圈旅次特性補充調查	城際供需預測分析		
	貨運資料調查及模式架構分析	貨運模式建構與預測分析				
運輸規劃支援系統維護	新增視覺化互動式統計圖	優化互動式統計地圖	設計新增貨運模式成果查詢模組	設計整體運輸規劃模式成果查詢模組	強化數據庫資料查詢統計及圖臺查詢功能	
	城際運輸觀察		城際運輸觀察		城際運輸觀察	
			全國國土計畫之運輸部分空間發展策略			

Strengthen Integrated Transportation Planning

~2024	2025	2026	2027	2028	2029	2030
					Development of the 2030 Transportation Policy White Paper and Preliminary Planning – Land Transportation	
Series of study on Eastern Taiwan regional transportation plan (3/3)	The 6th Taiwan Comprehensive Transportation Planning Research Series					Development strategy Research and analysis
	Integration of national transportation network and transport demand models	National travel characteristics survey	Supplementary survey on travel characteristics in local areas	Intercity supply and demand Forecast analysis	Regional supply and demand Forecast analysis	
Comprehensive transportation planning in Taiwan – Freight demand models and framework analysis	Series of studies on freight demand models in Taiwan					
	Freight data survey and model framework analysis	Construction and predictive analysis of freight models				
Maintenance of transportation planning support system	Addition of interactive statistical visualization charts	Optimization of interactive statistical maps	Design of a new freight model results inquiry module	Design of an integrated transportation planning model results inquiry module	Strengthening of database query, statistical reporting, and map interface functions	
	Intercity transportation observation		Intercity transportation observation		Intercity transportation observation	
			Spatial Development Strategy for the Transportation Component of the National Spatial Plan			

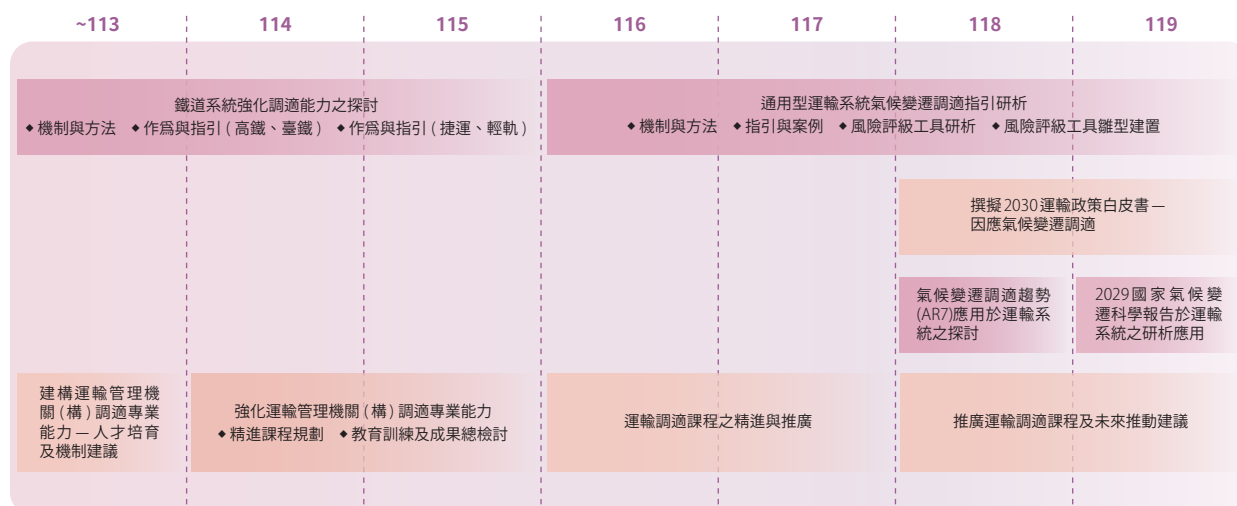
完善計畫審議評估工具



推動海空運雙軸轉型



強化運輸系統因應氣候變遷之調適能力及調適教育與人才培育



Strengthen tools for project appraisal and planning evaluation

~2024	2025	2026	2027	2028	2029	2030
	Study on the capacity and level of service of highway weaving sections	Study on expressway capacity and level of service	Study on the capacity of signalized urban intersections	Study on expressway capacity and level of service		Fifth version "Taiwan Highway Capacity Manual" Publication preparation
Development planning of the next-generation highway traffic system simulation (HTSS) model	Development design of the next-generation highway traffic system simulation (HTSS) model		Development of the next-generation highway traffic system simulation (HTSS) model		Verification of the next-generation highway traffic system simulation (HTSS) model	
	Dissemination of the Highway Capacity Manual (including briefing sessions and practical software training), and maintenance, optimization, and enhancement of highway capacity analysis software					
Development of rail capacity software function for classification yards and terminal stations	Data collection of capacity parameters and database design planning	Route capacity and utilization evaluation and bottleneck analysis	Capacity parameter database expansion		Research on signal close-in time in advanced railway signaling systems	
	Dissemination of the Railway Capacity Manual (including briefing sessions and practical software training), and maintenance, optimization, and enhancement of railway capacity analysis software					

Advancing the Twin Transition of Maritime and Air Transportation

~2024	2025	2026	2027	2028	2029	2030
					Development of the 2030 Transportation Policy White Paper and Preliminary Planning – Marine and Air Transportation	
	The maritime and air transport databases update, maintenance, and optimization, alongside the analysis of key transport issues					
Feasibility study on establishing an integrated port Collaborative decision-making system in Taiwan	Digital and Sustainable Twin – Transition of Taiwan's Container Shipping Industry		Study on digital innovation and development in the maritime and port sector			
Planning of a digitalization development blueprint and promotion guidelines for Taiwan's maritime and port industry	Study on Environmental Sustainability Development of Taiwan's Airports		Study on digital innovation development for airports			
Development of an airport airside operational simulation and assessment tool and software system						

Strengthen the climate change adaptation capabilities of transportation systems, while promoting adaptation education and talent cultivation

~2024	2025	2026	2027	2028	2029	2030
Research on enhancing the climate adaptation capacity of railway systems ◆ Mechanisms and methods ◆ Measures and guidelines (High speed rail, Taiwan Railways) ◆ Measures and guidelines (MRT, light rail)			Analysis of a general transport system climate change adaptation guideline ◆ Mechanisms and methods ◆ Guidelines and case studies ◆ Risk level assessment tool research and analysis ◆ Risk level assessment tool prototyping			
					Compile the 2030 Transportation Policy White Paper – Climate Change Adaptation	
					Analysis of AR7 climate change adaptation trends and their application to transport systems	Study on the application of the Climate Change Taiwan – National Scientific Report 2029 to transport systems
Building Adaptation Expertise for Transportation Management Agencies – Proposals for Talent Cultivation and Institutional Mechanisms	Reinforcing Adaptation Expertise for Transportation Management Agencies ◆ Refinement of training program planning ◆ Education and training programs and overall evaluation of outcomes		Improvement and promotion of transport adaptation training programs		Promotion and future policy recommendations for transport adaptation training programs	

研發防災調適技術



研究重點

1. 健全整體運輸規劃

(1) 啟動「第6期整體運輸規劃系列研究」

- 整合全國尺度運輸需求模式。
- 執行全國性旅次特性調查，並蒐集重要屏柵線交通量調查資料，及更新社會經濟發展趨勢。
- 預測分析未來年城際與區域運輸系統供需情形。
- 研提全國與區域運輸系統發展策略。
- 研提2030年運輸政策白皮書及先期規劃——陸運。

(2) 我國貨運需求模式系列研究

- 進行貨物運輸特性與流向調查及分析、構建城際貨運運輸需求模式。
- 利用貨運運輸需求模式進行貨物運輸系統供需預測分析、整合客貨運分析成果進行政策敏感度及運輸計畫影響程度分析。

(3) 運輸規劃支援系統維運

- 進行107-113年城際運輸消長觀察。

Research Theme and Focus

1. Strengthen Integrated Transportation Planning

(1) Launched the "6th Taiwan Comprehensive Transportation Planning Research Series."

- Establish an integrated national transportation demand forecasting model.
- Carry out nationwide travel characteristic surveys, gather traffic flow data from major screen lines, and update socioeconomic development projections.
- Assess future transportation supply and demand for intercity and regional transport networks.
- Formulate development strategies for national and regional transportation systems.
- Prepare the 2030 Transportation Policy White Paper and Preliminary Planning for Land Transportation Development.

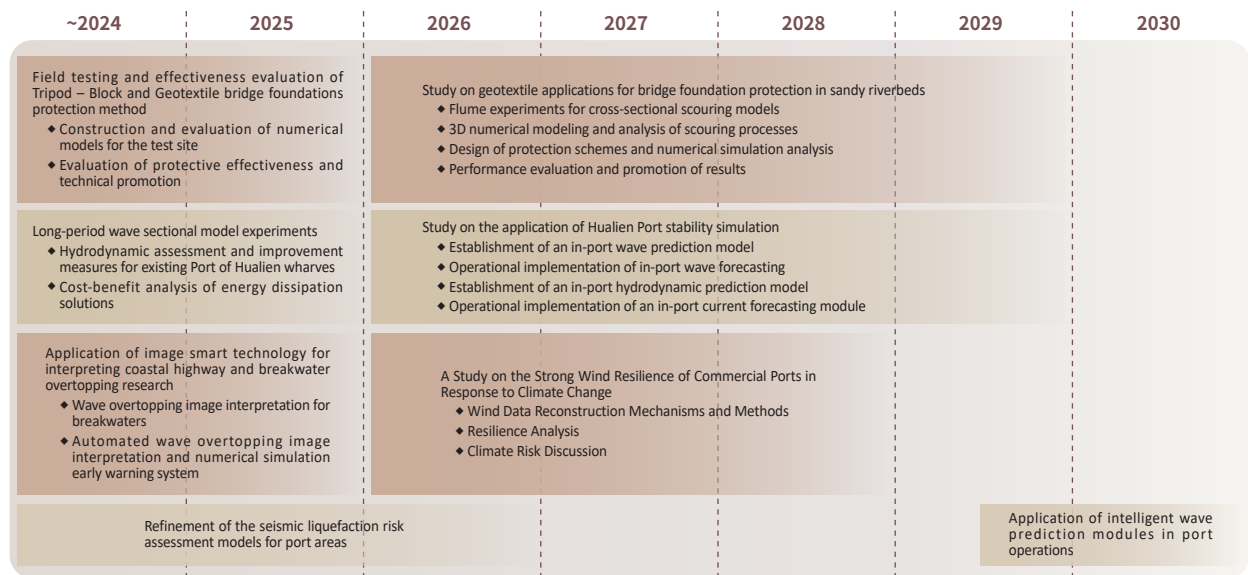
(2) Series of studies on freight demand models in Taiwan

- Analyze freight transportation characteristics and flows to develop intercity freight demand models.
- Use freight demand models to analyze and forecast supply and demand within the cargo transportation system, and integrate passenger and freight analysis results to assess policy sensitivity and transportation plan impacts.

(3) Transportation planning support system maintenance

- Observations of Inter-City Transportation Growth and Decline from 2018 to 2024.

Development of Disaster Prevention and Adaptation Technologies



- 優化國省道需求流率／容量（V/C）比數據視覺化地圖及歷年各運具屏柵線需供比視覺化地圖。

- Improve visualized mapping of Volume-to-Capacity (V/C) ratios on national and provincial highway networks and develop historical visualization maps of screen line (V/C) ratios across different transport modes.

2. 完善計畫審議評估工具

(1) 公路容量研究

- 建立高速公路交織路段、快速公路、高架道路之車流特性分析方法，並研提公路容量手冊新版章節內容。
- 發展臺灣公路容量研究與分析工具—HTSS 微觀車流模擬模式之改寫更新，逐步建置新一代 HTSS 之車輛運動模擬模型及非阻斷性車流與市區道路模擬功能。
- 推廣公路容量手冊之實務應用，持續維護及更新 THCS 及專區網站，並辦理教育訓練。

(2) 鐵道容量研究

- 蒐集環島城際鐵路網路線容量分析所需參數，建置及擴充容量參數資料庫，並辦理路線容量與利用率、路網中瓶頸指認與可行政改善方案等分析。

2. Strengthen tools for project appraisal and planning evaluation

(1) Study on highway capacity

- Establish analytical methods for evaluating traffic flow characteristics on freeway weaving segments, expressways, and elevated highways, and formulate revised content for future editions of the Taiwan Highway Capacity Manual.
- Enhance Taiwan's highway capacity research and analytical tool through rewriting and updating the the HTSS microscopic traffic flow simulation model, and gradually implement the next-generation HTSS of the vehicle movement, uninterrupted flow and urban traffic simulation modules.
- Facilitate the adoption of the Taiwan Highway Capacity Manual in professional practice by continuously maintaining and upgrading the THCS and its web portal, while providing educational and training activities.

(2) Study on railway capacity

- Gather the data and parameters necessary for capacity analysis of Taiwan's round-island intercity railway network, develop and enhance a capacity parameter database, and perform assessments of route capacity, utilization rates, network bottlenecks, and potential improvement strategies.

- 推廣鐵道容量手冊之實務應用，並辦理教育訓練。

3. 推動海空運雙軸轉型

(1) 海運數位與永續雙軸轉型

- 持續維運與優化海運國際資料庫及重要議題分析。
- 研擬我國航港產業數位化發展藍圖，制定產業數位推動指引。
- 以提升港口營運作業鏈效率觀點，評估建立我國港口協調整合決策系統之可行性，研擬共享平臺架構之規劃構想。
- 分析貨櫃航運具發展雙軸轉型潛力之潛在缺口，研擬結合技術應用及產業合作之轉型方案架構及重點策略，規劃行動方案及示範應用計畫。
- 從「航」及「港」產業的現況與挑戰出發，探討完備基盤設施及環境建成的重要策略及技術，達成永續雙軸轉型之目標。
- 研提 2030 年運輸政策白皮書及先期規劃—海運。

(2) 空運數位與永續雙軸轉型

- 持續維運與優化空運國際資料庫及重要議題分析。
- 完成機場模擬軟體開發及桃園機場多項實際案例分析，強化人機介面親和性，並依使用者回饋意見加以修正。
- 開發機場空側運作模擬評估工具及軟體系統。
- 蒐整國際趨勢、掌握國際標準機場及先進國家推動機場環境永續發展政策與機制，並盤點我國法規與各級機場發展現況，以利後續研訂我國機場環境永續發展政策綱領及推動指引。
- 研提 2030 年運輸政策白皮書及先期規劃—空運。

- Facilitate the adoption of the Railway Capacity Manual in professional practice while providing educational and training activities.

3. Advancing the Twin Transition of Maritime and Air Transportation

(1) Twin Transition of Digitalization and Sustainability in the Maritime Transportation Sector

- Continuous the maritime database update, maintenance, and optimization, alongside the analysis of key transport issues.
- Formulate a digital development blueprint for Taiwan's shipping and port industries and establish implementation guidelines to support sector-wide digital transformation.
- From the perspective of improving the efficiency of port operation chains, evaluate the feasibility of establishing an integrated Port Col-laborative Decision-Making system for Taiwan and develop a conceptual framework for a data-sharing platform.
- Identify gaps and opportunities in the container shipping industry's twin transition toward digitalization and sustainability, and develop strategic frameworks, action plans, and pilot initiatives that leverage technology and cross-industry collaboration.
- Evaluate the current conditions and challenges of the "shipping" and "port" sectors, and propose key infrastructure, environmental, and technological strategies to support long-term sustainable twin transition.
- Prepare the 2030 Transportation Policy White Paper and Preliminary Planning for Sea Transportation Development.

(2) Twin Transition of Digitalization and Sustainability in the Air Transportation Sector

- Continuous the air transport database update, maintenance, and optimization, alongside the analysis of key transport issues.
- Finalize the airport simulation software and apply it to a series of operational case studies at Taoyuan International Airport, while improving user-friendliness and incorporating feedback-driven system enhancements.
- Develop simulation and assessment tools, as well as a software platform, for evaluating airport airside operations.
- Monitor international developments and best practices in airport environmental sustainability, examine the policies and mechanisms adopted by benchmark airports and advanced economies, and review Taiwan's regulations and airport development conditions as a basis for formulating national sustainability policies and implementation guidelines for airports.
- Prepare the 2030 Transportation Policy White Paper and Preliminary Planning for Air Transportation Development.

4. 強化運輸系統因應氣候變遷之調適能力及調適教育與人才培育

(1) 強化運輸系統因應氣候變遷之調適能力

- 已完成蒐集文獻資料，研擬規劃鐵道系統（含高鐵、臺鐵、捷運、輕軌）調適指引章節架構，並研提高鐵與臺鐵、捷運與輕軌之調適指引及應用案例研析。
- 探討氣候變遷對鐵道系統跨系統界面衝擊影響，提出溝通協調機制之建議，後續進行研析並蒐集發展趨勢及相關案例，研提通用型運輸系統之機制與方法，並研提通用型運輸系統之調適指引。
- 研析第4期維生基礎設施領域調適行動方案（116～119年）、第5期維生基礎設施領域調適行動方案（120～123年）。
- 協助彙整各年度維生基礎設施領域調適成果報告。
- 撰擬2030年運輸政策白皮書－因應氣候變遷調適。

(2) 建構運輸管理機關（構）調適專業能力

- 蒐集國內外氣候變遷調適趨勢、相關課程與教材，以及運輸管理機關（構）對課程之回饋，據以檢討並優化運輸調適課程。
- 掌握交通部部屬機關（構）調適專業能力之人才培育情形，並研析「運輸調適課程培訓制度」。

4. Strengthen the climate change adaptation capabilities of transportation systems, while promoting adaptation education and talent cultivation.

(1) Strengthen the climate change adaptation capabilities of transportation systems

- Complete the collection of relevant literature and develop the structural framework of adaptation guidelines for railway systems (including high-speed rail, Taiwan Railways, metro, and light rail), and conduct analyses of adaptation guidelines and application cases across different rail systems.
- Investigate the impacts of climate change on inter-system interfaces within railway networks, propose coordination and communication mechanisms, and further develop a generalized transportation system adaptation framework based on international trends and case studies.
- Review the Phase IV (2027–2030) and Phase V (2031–2034) adaptation action plans for the critical infrastructure sector.
- Support the consolidation of annual adaptation achievement reports for the critical infrastructure sector.
- Prepare the 2030 Transportation Policy White Paper focusing on Climate Change Adaptation.

(2) Building Adaptation Expertise for Transportation Management Agencies

- Gather international and domestic trends in climate change adaptation, relevant curricula and teaching materials, and feedback from transportation management agencies, and use these insights to review and enhance adaptation training programs.
- Evaluate the current status of adaptation capacity development within agencies and institutions under the MOTC, and conduct research on the establishment of a "structured transportation adaptation training system."



- 依課程主題，辦理運輸調適課程（含講授式或互動式），將講師講授內容利用 AI 工具進行語音轉換，製作 e 化有聲教材。
- 擇適當課程主題，每年以 AI 工具輔助編撰 1 門課程之公版教材，並辦理試教，依課後回饋滾動修訂內容。
- 持續蒐集調適課程相關師資，更新調適專業師資庫。
- 透過問卷調查或訪談，蒐集歷年課程辦理、e 化教材、調適知識本之使用狀況及滿意度，並調查結果進行總評估，研提未來推動建議。

5. 研發防災調適技術

(1) 海陸災防調適試驗分析 — 應用新興材料研發橋基保護工法

- 為提升橋梁安全，109 年起研發鼎型塊 + 地工織布之改良工法，並在國道 3 號大甲溪橋現地鋪設。
- 以 UAV 結合攝影測量技術於重要降雨事件後進行觀測，據以分析與評估保護成效。
- 建置三維數值分析模型，以不同重現期降雨事件模擬，評估本工法之保護成效。
- 礫石河床橋基保護工法於 111 年獲智財局發明專利、臺灣創新技術博覽會發明競賽「銀牌獎」，112 年獲交通部創新提案制度審查「甲等獎」，113 年獲道路協會「論文獎」。

- Organize transportation adaptation training programs (lecture-based or interactive), and utilize AI technologies to convert instructional content into audio-based digital learning materials.
- Develop one standardized AI-assisted course module annually, conduct pilot instruction sessions, and iteratively refine the content based on post-training feedback.
- Maintain and continuously update the roster of qualified adaptation training instructors.
- Use questionnaires and interviews to assess the implementation effectiveness, usage patterns, and satisfaction levels of past training courses, digital learning materials, and adaptation knowledge resources, and provide comprehensive evaluation reports and future policy recommendations.

5. Development of Disaster Prevention and Adaptation Technologies

(1) Conduct experimental studies on integrated land-sea disaster prevention and adaptation technologies, focusing on innovative bridge foundation protection methods using advanced materials.

- Since 2020, an improved protection technique combining tribars and geotextiles has been developed and implemented at the National Freeway No. 3 Dajia River Bridge to enhance structural resilience.
- Performance evaluation of Tripod-Block and Geotextile bridge pier protection based on UAV-based photogrammetric observations following significant rainfall events.
- Establish a three-dimensional numerical modeling framework to simulate rainfall events under different return periods and assess the effectiveness of the proposed protection method.
- The gravel riverbed bridge foundation protection method has received multiple recognitions, including a patent for invention from the Intellectual Property Office (2022), a "Silver Award" at the Taiwan Innotech Expo, a "First-Class Award" from the MOTC innovation review mechanism (2023), and a "Thesis Award" from the China Road Federation (2024).



- 彙編施工技術說明書、設計標準圖說等技術文件，並辦理技術推廣活動，供橋管單位應用。

(2) 海陸災防及調適模擬分析

- 持續發展海岸公路與港區防波堤越波影像判釋技術。
- 利用倒傳遞神經網路建置花蓮港、高雄港波高預測模型，介接 TaiCOMS 2.0 波浪模擬與港內觀測資料，建立作業化花蓮港及高雄港港內波高預測模式，即時下載波高觀測資料並推估港內波高未來變化趨勢。
- 以 FUNWAVE 模式建置港區波浪模擬，精進港內波浪模擬模式並進行實務應用。
- 以 SCHISM 結合 WWM-III 建立耦合模式進行模擬研究，評估導入 SCHISM 模式之可行性。
- 運用人工智慧 AI 技術建置港區之港內靜穩、海流模擬技術。

- Prepare construction manuals and standardized design drawings, and implement technical promotion programs for bridge management authorities.

(2) Conduct modeling and analysis for land-sea disaster prevention and climate adaptation scenarios.

- Continue developing image interpretation technologies for wave overtopping along coastal highways and breakwater structures.
- Establish operational wave forecasting models for the Port of Hualien and the Port of Kaohsiung using a back-propagation neural network, integrating TaiCOMS 2.0 outputs with real-time observational data to predict harbor wave conditions.
- Utilize the FUNWAVE numerical model to enhance harbor wave simulation capabilities and support practical engineering applications.
- Develop an integrated SCHISM and WWM-III modeling framework to assess the feasibility of adopting SCHISM for harbor environment simulation.
- Apply AI technology to develop simulation models for harbor hydrodynamics, including wave and current field prediction.

四 推動淨零碳排邁向環境永續

上位政策

- 氣候變遷因應法
- 國家希望工程 — 綠色成長與 2050 淨零轉型
- 臺灣 2050 淨零排放路徑及策略總說明
- 淨零排放關鍵戰略 7
- 淨零排放關鍵戰略 10
- 2020 運輸政策白皮書
- 國家因應氣候變遷行動綱領
- 運輸部門溫室氣體減量行動方案
- 永續發展政策綱領、臺灣永續發展目標
- 能源轉型白皮書 — 運輸部門節能計畫
- 推動環島自行車道升級及多元路線整合計畫

IV Promoting Net-Zero Carbon Emissions Toward Environmental Sustainability

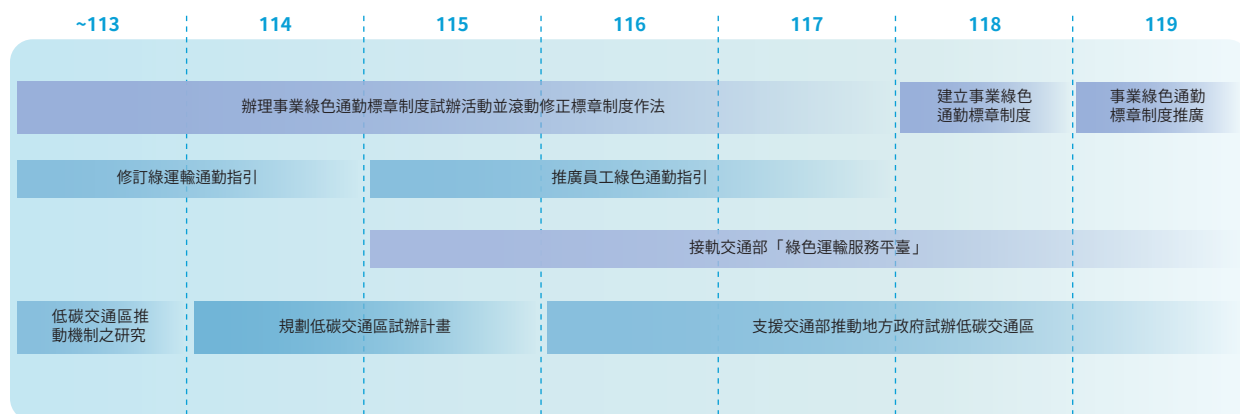
Overarching Policies

- Climate Change Response Act
- National Project of Hope: Green Growth and 2050 Net-Zero Transformation
- Taiwan 2050 Net-Zero Emissions Pathway and Strategy Overview
- Net-zero emissions key strategy 7
- Net-zero emissions key strategy 10
- Transportation policy white paper
- National Framework for Climate Change Action
- GHG Reduction Sectoral Action Program in the Transportation Sector
- Policy Guidelines for Sustainable Development and the Taiwan Sustainable Development Goals (TSDGs)
- Transportation Sector Energy-Saving Plan under the Energy Transition White Paper
- Upgrade the Round-Island Bicycle Network and promote multi-route integration

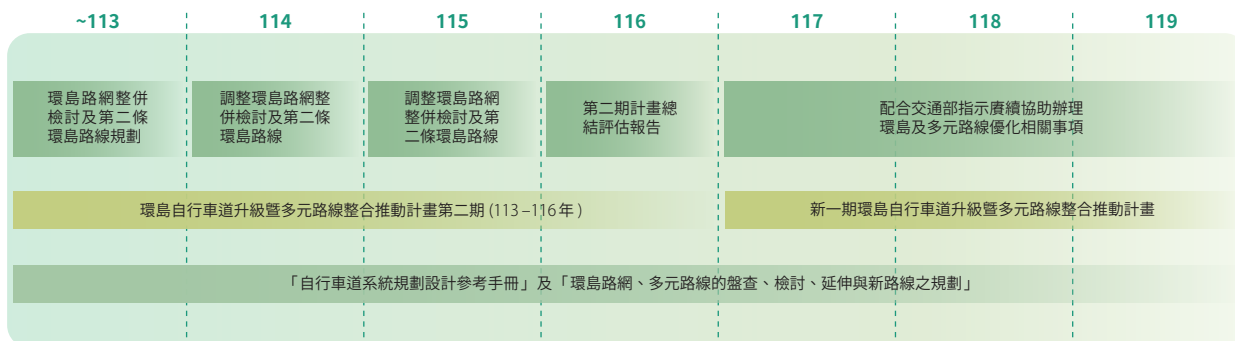
強化運輸部門淨零策略減碳效益評估模型及推動溫室氣體減量法定工作



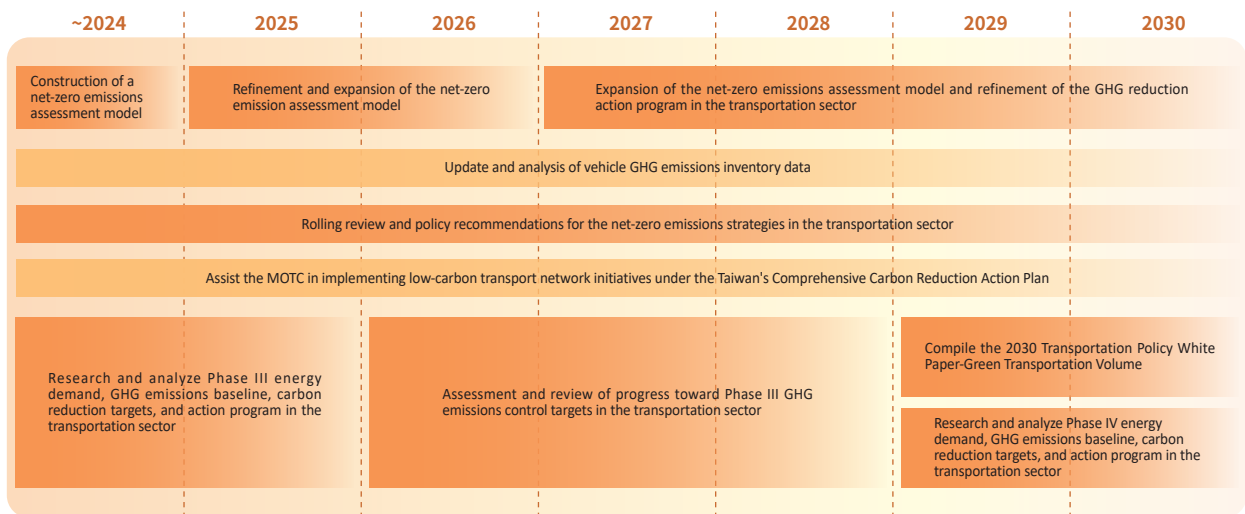
綠運輸相關機制及推廣



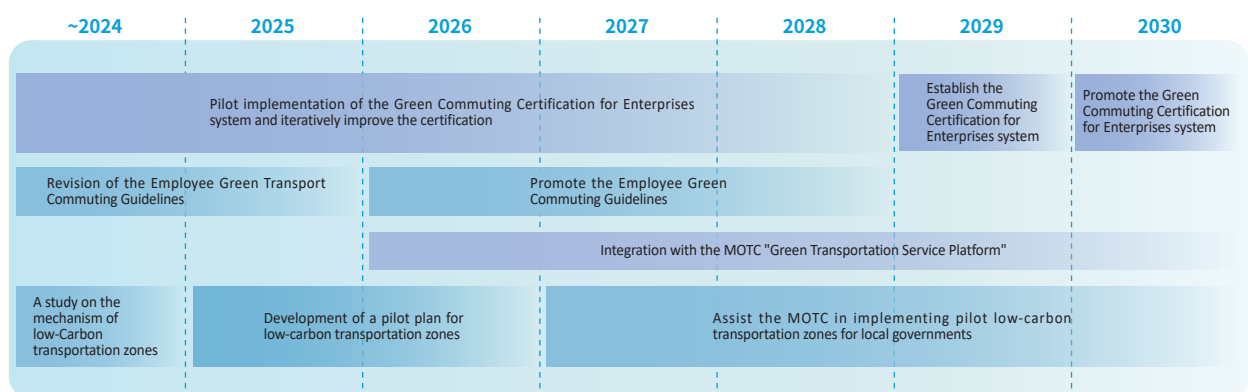
自行車路線規劃



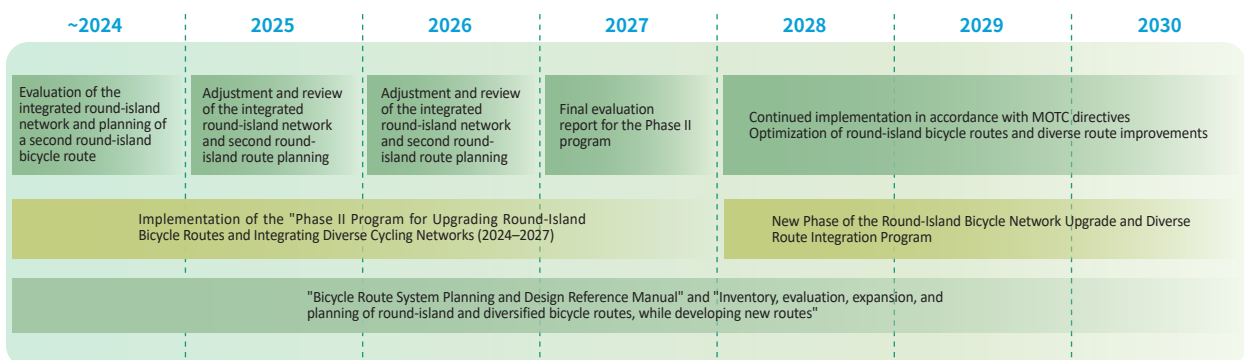
Enhance the model of assessing the carbon reduction of net-zero strategies in transportation sector and support statutory GHG reduction duties



Research and promote policy mechanisms for green transportation development



Promote integrated planning of bicycle route networks



研究重點

1. 強化運輸部門淨零策略減碳效益評估模型及推動溫室氣體減量法定工作

(1) 研析我國運輸部門減碳發展藍圖與推展法定工作

- 研析國內外綠運輸／淨零策略發展趨勢及國內應用建議。
- 協助交通部辦理臺灣總體減碳行動計畫低碳運輸網絡相關行動計畫推動工作。
- 編寫各年度運輸部門溫室氣體減量行動方案成果報告並檢討達成情形。
- 研析第4期運輸部門能源需求、溫室氣體排放基線及溫室氣體排放之減量目標，以及研提第4期溫室氣體減量行動方案草案。
- 撰擬2030年運輸政策白皮書－綠運輸。

(2) 強化運輸部門淨零策略減碳效益評估模型

- 提出下一階段模型功能及個別策略減碳評估工具擴充規劃，並逐年升級或擴充。
- 持續維護模型與個別策略減碳評估，更新與校估參數。
- 建立自行車道、共享機車與綠色通勤等個別策略減碳評估方法。
- 持續完成每年度運具別溫室氣體排放量之參數更新與最新年度排放量推估，建立資料檢核機制與辦理專家諮詢。

2. 綠運輸相關機制研議與推廣

(1) 落實與推廣綠運輸生活型態－事業綠色通勤標章制度

- 辦理事業綠色通勤標章制度試辦活動，蒐集試辦活動數據與分析，滾動修正標章制度作法。
- 建立事業綠色通勤標章制度並推廣。
- 滾動修訂並推廣員工綠色通勤指引。
- 辦理獲頒標章事業之綠色通勤成果發表會。

Research Theme and Focus

1. Enhance the model of assessing the carbon reduction of net-zero strategies in transportation sector and support statutory GHG reduction duties

(1) Develop a decarbonization blueprint for Taiwan's transportation sector and support related statutory duties.

- Analyze global trends in green mobility and net-zero strategies and propose domestic implementation strategies.
- Assist the MOTC in implementing low-carbon transportation network related initiatives under the Taiwan's Comprehensive Carbon Reduction Action Plan.
- Compile annual reports on the implementation of the GHG Reduction Sectoral Action Program in transportation sector and evaluate implementation outcomes.
- Estimate Phase IV energy demand and GHG emissions baseline, define reduction targets in transportation sector, and prepare the draft Phase IV GHG Reduction Action Program.
- Compile the 2030 Transportation Policy White Paper-Green Transportation Volume.

(2) Enhance the model of assessing the carbon reduction of net-zero strategies in transportation sector

- Plan future enhancements of model functionalities and the expansion of carbon reduction evaluation tools for individual strategies, with phased annual upgrades.
- Maintain and refine carbon reduction models and assessment tools, including periodic parameter updates and calibration.
- Develop assessment methodologies for carbon reduction of bicycle lanes, shared scooters, and green commuting measures.
- Continuously update emission factors by transport mode, estimate annual GHG emissions, establish data verification mechanisms, and conduct expert reviews.

2. Research and promote policy mechanisms for green transportation development.

(1) Promote green mobility lifestyles and implement the Green Commuting Certification System for Enterprises

- Conduct a pilot run of the Green Commuting Certification System for Enterprises, collect empirical data, analyze outcomes, and iteratively improve the certification framework.
- Establish and promote the Green Commuting Certification System for Enterprises.
- Regularly revise and promote the Employee Green Commuting Guidelines through an ongoing process.
- Host a Green Commuting Achievement Showcase for organizations that have received the Certificates.

- 與交通部「綠色運輸服務平臺」接軌，提供事業推動員工綠色通勤實質誘因。
- (2) 規劃低碳交通區試辦計畫及支援交通部推動地方政府試辦低碳交通區
- 勾勒中央對地方政府及相關單位推動低碳交通區的政策想像，並製作動畫影片。
 - 辦理問卷調查，蒐整民衆對政府推動低碳交通區政策意見進行初步分析，並研提低碳交通區推動政策之建議。
 - 辦理說明會，徵詢有意願參與試辦之地方政府及相關單位，並與該場域之地方政府及相關單位協作，研提具體可操作之試辦計畫。
 - 研提交通部推動低碳交通區試點實作計畫草案（116–119年），配合交通部指示辦理後續相關事宜。
- Connect with the MOTC's "Green Transportation Service Platform" to offer practical incentives that encourage employee to adopt green commuting.
- (2) Formulate pilot plans for Low-Carbon Transportation Zones and assist the MOTC in supporting local governments during implementation.
- Develop and communicate a policy framework for local governments in implementing Low-Carbon Transportation Zones, including the animation materials.
 - Conduct public opinion surveys to gather feedback on Low-Carbon Transportation Zone initiatives, analyze the findings, and provide policy recommendations.
 - Conduct the policy briefing, invite interested local governments and related organizations to participate in pilot projects, and collaboratively develop detailed and operational pilot implementation plans.
 - Draft Low-Carbon Transportation Zone Pilot Scheme (2027–2030) for the MOTC, and execute follow-up matters in accordance with the MOTC instructions.

3. Promote integrated planning of bicycle route networks.

Strengthen the linkage and integration of bicycle routes:

3. 推動自行車路線整合規劃

推動自行車路線串聯整合：

- 持續協助交通部辦理「環島自行車道升級暨多元路線整合推動計畫第二期（113–116年）」等相關事項。
 - 配合相關法規檢討修訂「自行車道系統規劃設計參考手冊」。
 - 精進「環島路網、多元路線的盤查、檢討、延伸與新路線之規劃」。
- Continue assisting the MOTC with the implementation of the "Phase II Program for Upgrading Round-Island Bicycle Routes and Integrating Diverse Cycling Networks (2024–2027)" and associated projects.
 - Review and revise the "Bicycle Route System Planning and Design Reference Manual" to align with evolving regulations and policy requirements.
 - Improve the "inventory, evaluation, expansion, and planning of round-island and diversified bicycle routes, while developing new routes."





肆

重點研究成果

Key Research Results

依據前述研究主軸與重點，本所配合研擬並執行114年度相關研究計畫，以協助運輸政策之推動，並提供研究成果做為中央及地方政府交通單位施政之參據，說明如下：

一 落實運輸安全與人本價值

(一) 無人機空拍應用於路段交通衝突分析 (2/2) — 路側交通衝突

1. 計畫概述

利用無人機空拍辨識人車流動的動態軌跡資料，並有系統地導入交通衝突分析及應用，即可協助道路管理機關儘早瞭解交通衝突熱區並加以改善，防範事故於未然。

本計畫承繼前期研究計畫所完成的交通衝突分析方法與軟體，將分析對象由路口擴大至路段，運用精確車流軌跡檔及分析軟體，量化車道及路側之交通衝突程度，來診斷路段交通安全問題，進而研提改善措施。此外，與縣市政府合作進行交通衝突分析，以優化分析軟體的應用能力。

2. 主要研究成果

- (1) 114年與新北市、桃園市、臺中市、內政部國土管理署合作「公車進出站衝突」、「路外設施進出車流衝突」兩項先導測試計畫共10處路段。
- (2) 持續優化AI影像辨識追蹤技術、交通衝突分析軟體功能，分析新北市、桃園市、公路局轄管共4處易肇事地點。

3. 應用與推廣

- (1) 與公路局及縣市政府合作辦理先導測試計畫及易肇事地點分析，以及於114年11月10日邀請中央與地方之道路及交通管理機關、顧問公司、區域運輸發展研究中心及公協學會等單位辦理成果發表會及教育訓練，以推廣交通衝突分析之應用。

According to the aforementioned research theme and focus, the institute collaborates in planning and implementing the relevant research projects for 2025, to assist in the promotion of transportation policies, and provides research outcomes as a reference for the administration of central and local government transportation authorities; the descriptions are as follows:

I Implementing Transportation Safety and Humanistic Value

(I) Traffic Conflict Analysis for Road Segments with UAV Aerial Applications (2/2) – Roadside Traffic Conflicts

1. Project Overview

Through the use of UAV-based aerial imaging to capture the movement trajectories of vehicles and pedestrians, combined with a systematic traffic conflict analysis framework, road management agencies can identify high-risk conflict locations at an early stage and implement preventive safety improvements.

Extending the achievements of previous research, this project expands traffic conflict analysis from intersection environments to roadway segments. Using precise trajectory datasets and advanced analytical software, it assesses the severity of lane-side and roadside traffic conflicts, identifies roadway safety concerns, and develops targeted mitigation strategies. The project also collaborates with local governments to apply traffic conflict analysis in real-world settings, further refining the functionality and effectiveness of the analysis platform.

2. Main Research Results

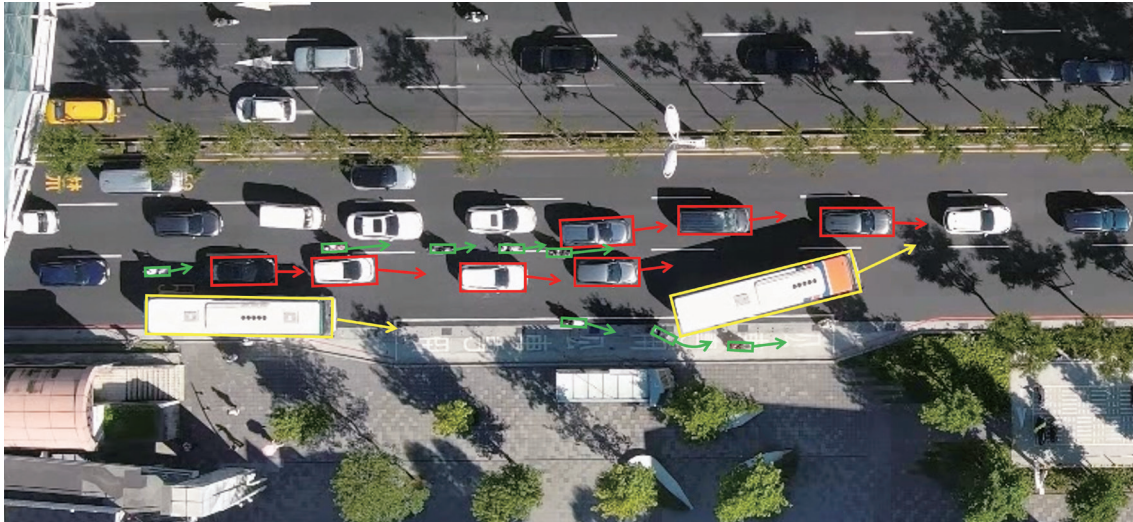
- (1) In 2025, ten roadway segments were selected for pilot studies conducted jointly with the governments of New Taipei City Department of Transportation, Taoyuan City Department of Transportation, Taichung City Department of Transportation, and the National Land Management Agency of the Ministry of the Interior (MOI), focusing on "Bus Stop Entry/Exit Conflicts" and "Traffic Conflicts Caused by Vehicles Entering or Exiting Roadside Facilities."
- (2) Ongoing improvements were made to AI-powered image tracking and recognition technologies and traffic conflict analysis software, while four accident-prone locations managed by local governments and the Highway Bureau of MOTC were analyzed.

3. Technology Application and Promotion

- (1) Pilot studies and accident-prone location analyses were undertaken in collaboration with the Highway Bureau of MOTC and local governments. A project results forum and an education and training workshop were also organized on November 10, 2025, to share findings and promote traffic conflict analysis among transportation authorities, consulting firms, research centers for regional transport development, and professional organizations.

(2) 完成車道交通衝突先導測試計畫及4處易肇事地點分析，將分析結果提供合作機關做為改善道路交通安全之參據。

(2) The project completed lane traffic conflict pilot studies and analyses of four accident-prone locations, providing the results to participating agencies to support roadway safety improvements.



「公車進出站衝突」空拍圖
Aerial view of "Bus Stop Entry/Exit Conflicts"

備註：辨識公車（黃色）進出站與汽車（紅色）與機車（綠色）行駛之橫移及衝突

Note: Detection of lane-changing movements and potential conflicts among buses (yellow), passenger vehicles (red), and motorcycles (green) during bus stop entry and exit operations.



「路外設施進出車流衝突」空拍圖
Aerial view of "Traffic Conflicts Caused by Vehicles Entering or Exiting Roadside Facilities"

備註：辨識汽車（紅色，包含從停車場駛出及原車道行駛）與機車（綠色）之橫移及衝突

Note: Detection of lane-changing movements and conflicts involving passenger vehicles (red), including vehicles exiting parking facilities and vehicles traveling in the adjacent lane, as well as motorcycles (green).

(二) 道路交通安全檢查制度導入研究 (2/2) — 試辦道路安全檢查

1. 計畫概述

國內目前針對易肇事地點，辦理交通工程檢討與改善，屬於事故發生後的改善與補救工作，道路安全檢查則是在事故發生之前，透過系統性檢查程序，發現道路的可能安全缺失，並加以更正，以避免導致事故或降低嚴重性，屬於事故發生前的預防作為。

本計畫透過不同型態路段的試辦檢查，驗證113年研提之道路安全檢查工具，並檢討修正完成道路安全檢查表及手冊第一版，同步規劃道路安全檢查人員培訓與認證機制，從機制面充實檢查人力，做為推動道路安全檢查的基礎；另一方面，持續研提公路法授權制定的「公路基礎設施安全管理規範」（草案），做為推動道路安全檢查的法規依據，並研擬相關推動規劃，透過檢查工具的出版、檢查人力的充實、制度規範的建立，以落實道路安全檢查制度的導入與推動。

2. 主要研究成果

- (1) 已完成19大類、共242項的道路安全檢查表，範疇涵蓋幾何設計、交通管制、照明、路面及行人安全等，同時編製實施手冊，提供各道路管理機關參考應用。
- (2) 完成研擬「公路基礎設施安全管理規範」草案及「檢核員培訓與認證作業要點」草案，做為推動道路安全檢查的依據。

3. 應用與推廣

- (1) 建立「公路基礎設施安全管理規範」、「檢核員培訓與認證作業要點」草案與「道路安全檢查實施手冊」，做為應用與推廣道路安全檢查的基礎。
- (2) 針對市區（臺北市復興北路）、省道（宜蘭縣台2線）、山區（新北市106市道）及國道（國3燕巢系統）完成實地試辦檢查，識別出如視距遮蔽、路口範圍過大、庇護空間不足等具體安全問題，驗證檢查工具與流程具實際應用價值。

(II) Research on the Introduction of Road Traffic Safety Audit System (2/2) – Pilot Implementation of Road Safety Inspections

1. Project Overview

While traffic engineering improvements at high-crash sites in Taiwan are generally reactive, road safety inspection (RSI) provides a proactive approach. RSI systematically identifies potential road hazards before crashes occur, enabling engineers to implement preventive measures that eliminate risks or mitigate crash severity.

By conducting pilot inspections across diverse road classifications, this project successfully validated the RSI tools developed in 2024, finalized the inaugural edition of the RSI Checklist and Manual. It also introduced training and certification protocols to strengthen inspector competency. Additionally, the project continued drafting the statutory "Road Infrastructure Safety Management Regulations" under the Highway Act to institutionalize RSI. Together, the delivery of these inspection tools, the training of certified talent, and the formation of a legal framework will accelerate the rollout and implementation of the RSI system.

2. Main Research Results

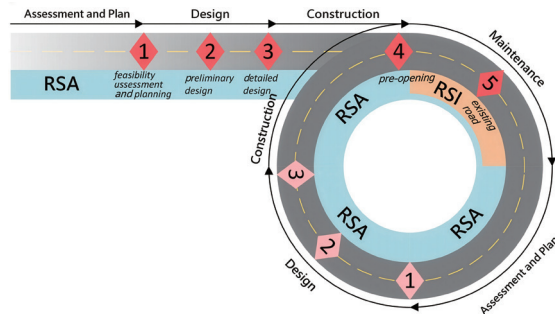
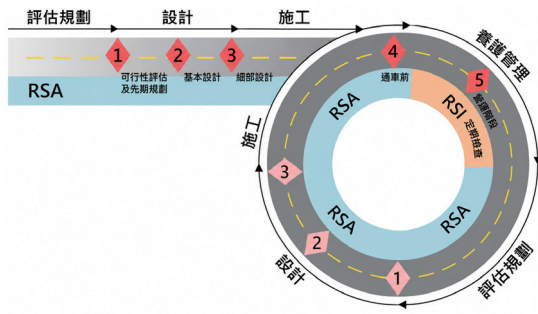
- (1) The project finalized a comprehensive RSI Checklist containing 242 inspection items across 19 categories, addressing key factors such as geometric design, traffic control, lighting, pavement condition, and pedestrian safety. An accompanying implementation manual was also developed to guide road management agencies in executing these inspections.
- (2) Draft versions of the "Highway Infrastructure Safety Management Specification" and the "Inspector Training and Certification Guidelines" were developed to support future RSI implementation.

3. Technology Application and Promotion

- (1) Together, the "Highway Infrastructure Safety Management Specification," the "Inspector Training and Certification Guidelines," and the "RSI Implementation Manual" form the foundation for the widespread adoption and promotion of RSI practices.
- (2) Pilot RSI inspections were successfully conducted on representative urban roads, provincial highways, mountain roads, and freeways. Locations included Fuxing North Road (Taipei City), Provincial Highway No. 2 (Yilan County), Route 106 (New Taipei City), and the Yanchao System Interchange on National Freeway No. 3. The inspections identified safety deficiencies such as restricted sight distance, oversized intersections, and inadequate pedestrian refuges islands, demonstrating the practical value of the RSI framework.

- (3) 114年11月4、6日分別辦理2場次道路安全檢查人才教育訓練，邀請道路管理機關、顧問公司、交通工程技師公會等進行講習，推廣道路安全檢查技術與觀念。

- (3) On November 4 and 6, 2025, two professional training workshops were held for road authorities, consultants, and the Taiwan Professional Transportation Engineering Association to promote RSI concepts, methodologies, and best practices.



道路安全檢查之定位
RSI Positioning

(三) 研擬道路交通標誌標線號誌設置參考指引 (2/3) — 複雜道路情境

1. 計畫概述

為改善我國現行道路標誌標線號誌之常見問題（例如：設置錯誤、設置方式不一致、自明性不足、空間配置不佳、安全設計應用不足等），本所依據交通部指示於113至115年辦理本計畫，以研提我國一致性之「道路交通標誌標線號誌設置參考指引」（以下簡稱本參考指引），協助道路管理機關規劃及設置相關設施，提供用路人更一致、更自明、更安全的道路交通環境。

此外，計畫將研提並試行「道路交通標誌標線號誌設置規則」修正機制，使其規定更符合用路人需求，並自114年起透過教育訓練提升交通工程相關從業人員之專業，以符道路管理機關之實需，並有效改善我國道路交通環境。

2. 主要研究成果

- (1) 延續第1年期(113年)盤點規劃之設置課題，持續精進並研擬本參考指引需完成之「複雜道路情境」內容，包含相關之設置圖例與應用解說。

(III) Guidelines for the Setting of Road Traffic Signs, Lines, Markings, and Signals (2/3) – Complex Situations on Roads

1. Project Overview

To address common issues in Taiwan's road traffic signs, markings, and signals (including installation errors, inconsistent practices, insufficient clarity, suboptimal roadway layouts, and an inadequate application of safety design concepts), the Institute has undertaken this project from 2024 through 2026 under the direction of the MOTC. The objective is to formulate unified Reference Guidelines for the Installation of Road Traffic Signs, Markings, and Signals (hereinafter referred to as the "Guidelines") to support road authorities in the design and deployment of traffic control facilities while creating a safer and more self-explanatory roadway environment.

The project will also propose and pilot a regulatory review mechanism for the Regulations for Road Traffic Signs, Markings, and Signals to better align regulatory requirements with user needs. Starting in 2025, educational and training programs will be provided to strengthen the professional capabilities of transportation engineering personnel and support the operational needs of road management agencies.

2. Main Research Results

- (1) Following the identification of priority installation issues during the first project year (2024), we will continue to develop and refine guidance for "complex situations scenarios," including design illustrations and implementation examples.

- (2) 籌組審議小組，處理設置規則法規檢討及研提建議修正草案供交通部參考，與新式標誌、標線、號誌試辦計畫及成效分析報告之審議等事宜，持續精進設置規則檢討修正機制。
- (3) 研提本參考指引教育訓練教材，並辦理2場次教育訓練與1場次成果說明會。

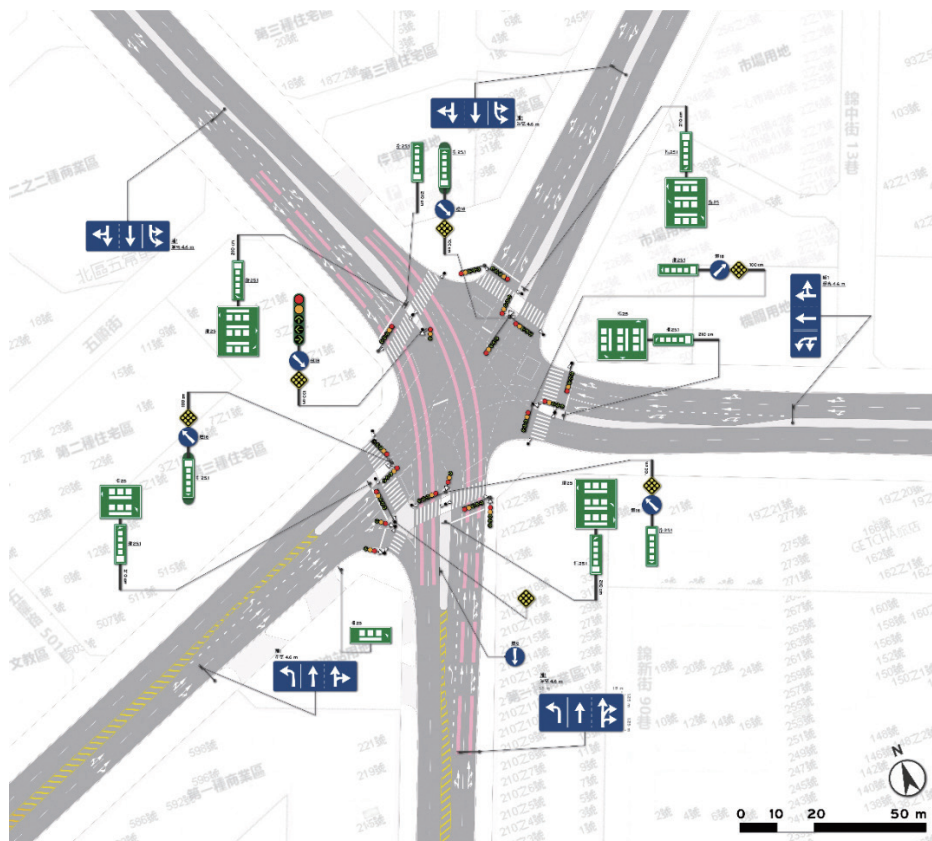
- (2) A dedicated review panel will be convened to assess existing regulations, formulate amendment proposals for the MOTC, review pilot applications of innovative signs, markings, and signals, and evaluate implementation outcomes to continuously improve the regulatory review and revision system.
- (3) The project will develop training materials based on the Guidelines and organize two education and training sessions along with a final project results briefing.

3. 應用與推廣

於114年5-6月辦理2場次教育訓練，邀請交通部高速公路局、公路局、各地方政府道路主管機關及相關工程顧問公司與會，協助其更了解113年研提「道路交通標誌標線號誌設置參考指引」一般道路情境之應用，透過系統化的教育訓練與技術交流，達到協助各道路管理機關設置及改善道路標誌、標線、號誌，提供用路人具自明性的道路環境，以達成提升道路交通安全和效率的目標。

3. Technology Application and Promotion

Two education and training sessions were held in May-June 2025, with participation from the MOTC Freeway Bureau, Highway Bureau, local government road agencies, and related engineering consulting firms. The workshops focused on the application of general road scenarios in the 2024 "Regulations for Road Traffic Signs, Markings, and Signals." Through systematic training and technical knowledge exchange, the sessions strengthened the capacity of road authorities to design and improve traffic signs, markings, and signals, promoting a more intuitive and self-explanatory road environment for users and enhancing overall traffic safety and operational efficiency.



道路交通標誌標線號誌設置參考指引—多岔路口情境圖例

Reference guidelines for the installation of road traffic signs, markings, and signals – Illustrative examples for complex multi-way intersections

(四) 鐵路臨軌工程導入安全管理系統之研究

1. 計畫概述

我國目前執行中之鐵道工程多為鄰近營運中鐵道之臨軌工程，為不影響既有鐵道營運，又能順遂推動工程進展，鐵道局委託本所辦理本計畫，可協助建構我國鐵路臨軌工程計畫的安全管理系統（Safety Management System，以下簡稱 SMS），據以導引施工廠商、監造單位、工程主辦機關（構）、營運機關（構）有效執行自主式安全管理，以期工程單位從規劃、設計、施工階段辨識危害因子，於危害未發之前就先予移除，降低災害及事故之發生。

2. 主要研究成果

- (1) 瞭解國內外鐵路臨軌工程計畫之既有安全管理作法。
- (2) 優先針對鐵道局在臺鐵之臨軌工程，研訂鐵路臨軌工程計畫導入 SMS 的實施內容與作業指引。
- (3) 研訂鐵路臨軌工程計畫導入 SMS 的配套措施與教育訓練教材供運用。

(IV) Research on the Implementation of a Safety Management System for Railway Construction Adjacent to Active Tracks

1. Project Overview

Most ongoing railway construction projects currently in Taiwan are adjacent-track construction. To ensure that ongoing railway operations are not disrupted while construction progresses smoothly, the Railway Bureau has commissioned this study to develop a Safety Management System (SMS) for adjacent-track railway projects. The system is intended to guide contractors, construction supervisors, project authorities, and railway operators in executing proactive safety management. It emphasizes early identification and elimination of hazards during the planning, design, and construction phases to minimize accidents and incidents.

2. Main Research Results

- (1) Understand existing safety management practices for trackside construction projects in Taiwan and abroad.
- (2) Develop implementation guidelines and operational procedures for introducing an SMS in Railway Bureau's trackside construction projects on Taiwan Railway network.
- (3) Formulate supporting measures and training materials to facilitate the adoption of an SMS in adjacent-track railway projects.



3. 應用與推廣

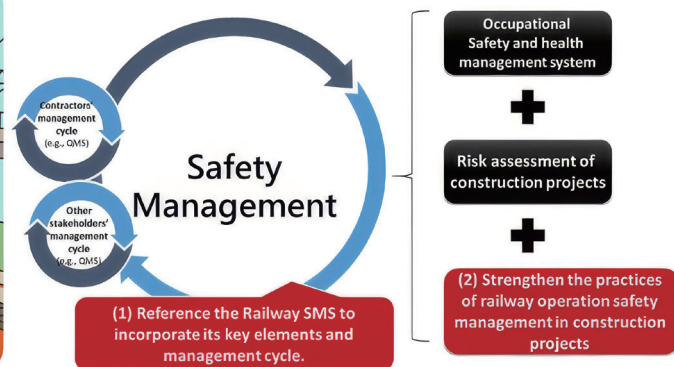
- (1) 於114年10-11月辦理三場次成果說明會暨教育訓練，邀請交通部、鐵道局、臺鐵公司及相關工程廠商與會，協助其更了解 SMS 於鐵路臨軌工程之應用，進一步強化臨軌工程的行車安全管理機制，包含導入 SMS 的實施內容、指引及配套措施等，期望藉由系統化的安全管理機制，降低臨軌工程對行車安全的影響，進一步提升鐵路運輸的整體安全水準。
- (2) 協助鐵道局建構我國鐵路臨軌工程計畫的安全管理系統，據以導引施工廠商、監造單位、工程主辦機關（構）、營運機關（構）有效執行自主式安全管理。
- (3) 藉由探討鐵道臨軌工程導入安全管理系統之可行性，進而建立相關實務作業指引及教育訓練教材，可做為鐵道局後續自辦臨軌工程或監理輔導之參考，支援精進安全管理系統。

3. Technology Application and Promotion

- (1) From October to November 2025, three project results briefings and training sessions were conducted for representatives from the MOTC, the Railway Bureau, the Taiwan Railway Corporation, and related engineering firms. These sessions promoted a deeper understanding of SMS applications in trackside construction, covering implementation procedures, operational guidance, and supporting mechanisms. The ultimate objective is to strengthen railway operational safety through a structured and proactive safety management approach.
- (2) The project supported the Railway Bureau in developing a comprehensive SMS framework for trackside construction projects, enabling contractors, construction supervisors, project authorities, and railway operators.
- (3) Through an assessment of the feasibility of implementing an SMS in trackside construction projects, practical operational guidelines and educational training materials were developed. These outputs provide valuable references for future Railway Bureau's construction projects and supervision activities, and contribute to the ongoing advancement of railway safety management systems.



註：以實際照片透過ChatGPT生成



臨軌工程導入行車安全管理系統概念

Implementing Railway Trackside Construction Project Safety Management Systems

（五）海上自主水面船舶（MASS）安全管理模式之風險評估與因應對策

1. 計畫概述

本研究係航港局委託本所辦理，為掌握我國海上自主水面船舶（MASS）自動化與商港智慧化發展趨勢，研析國內外安全管理制度與規範，並配合國際海事組織 2026 年實施非強制性之 MASS 規範，彙整國際發展與應用現況，以提出我國 MASS 安全管理與科技發展方向建議，支援海運安全政策。

2. 主要研究成果

- （1）瞭解國際海事組織、歐盟及先進國家之 MASS 的風險管理內容及內涵，以發掘安全管理中可能潛在威脅及影響。
- （2）瞭解國內外 MASS 安全管理之優先推動課題及管理措施內容。
- （3）完成 MASS 安全管理系統之風險評估、管理機制及所需航行安全管理行動方案。

（V）Risk Assessment and Response Strategies for the Safety Management Model of Maritime Autonomous Surface Ships (MASS)

1. Project Overview

Commissioned by the Maritime and Port Bureau, this research was conducted by the Institute to examine the latest development trends of Maritime Autonomous Surface Ships (MASS) and port automation both in Taiwan and internationally. It reviews international safety management systems and regulatory frameworks while taking into account the IMO's planned non-mandatory MASS framework scheduled for 2026. The study consolidates international developments and provides strategic recommendations for Taiwan's MASS safety management framework and technological development roadmap thereby supporting the formulation of future maritime safety policies.

2. Main Research Results

- （1）Analyze risk management approaches and frameworks for MASS developed by the IMO, the European Union, and advanced maritime nations to identify potential safety risks and operational impacts.
- （2）Review key issues, policy priorities and regulatory measures related to MASS safety management in Taiwan and other countries.
- （3）Develop risk assessment methodologies, safety management mechanisms, and operational action plans for MASS governance.

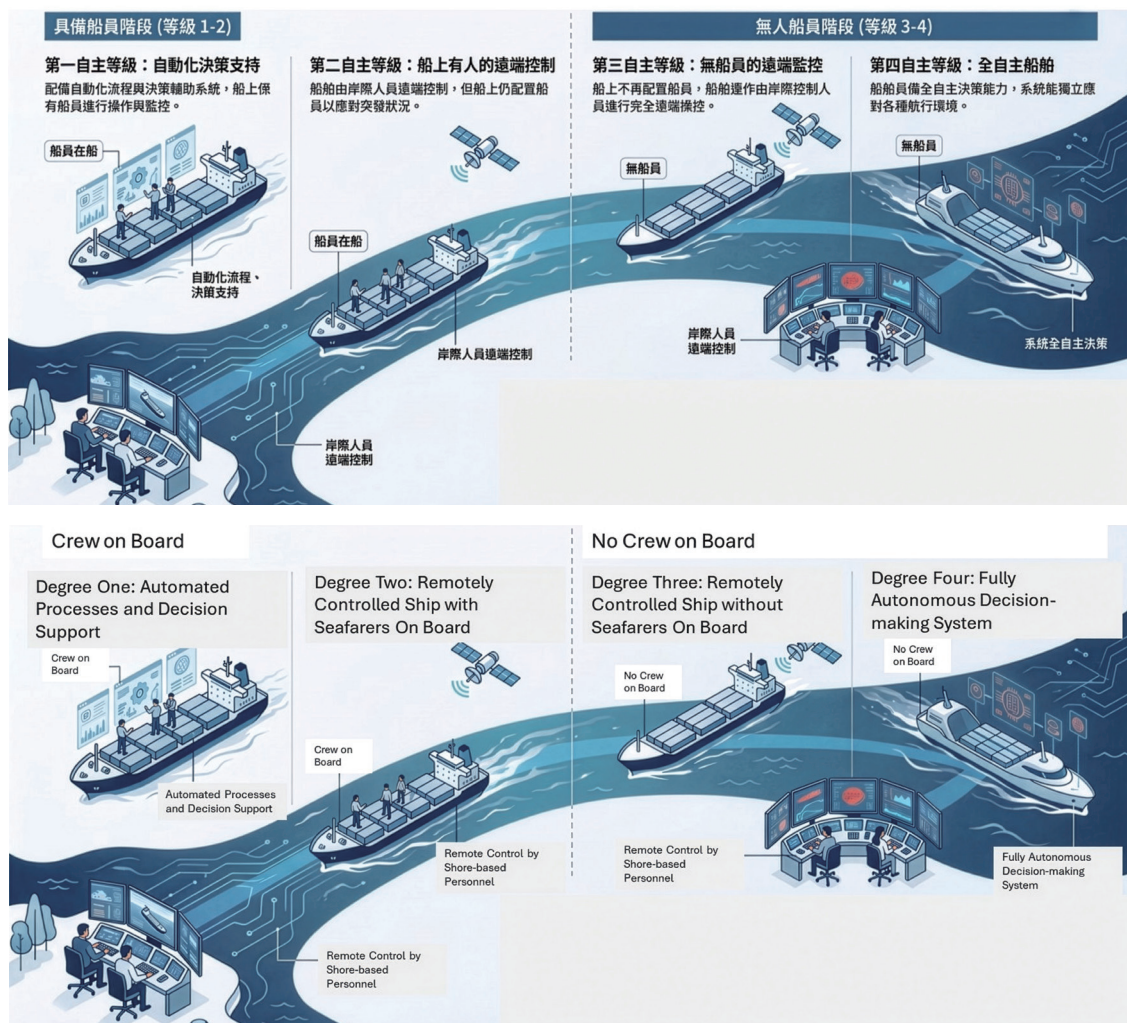


3. 應用與推廣

- (1) 本研究可提供交通部及航港局有關國際 MASS 安全管理之發展方向，使相關單位可及早研議執行之可行性，以提升海運安全施政績效。
- (2) 計畫成果可做為強化我國海事安全分析應用、發展方案處置與防範能力之參考，提升我國對於航行安全規劃與管理作為。
- (3) 計畫成果可提供交通部航政司、臺灣港務公司、縣市政府、學界、業界等參採，可提供航港局進一步對尚待改善之處進行改善，以提昇我國海事安全工作之應用效益。

3. Technology Application and Promotion

- (1) The findings provide the MOTC and the Maritime and Port Bureau with a basis for evaluating international MASS safety trends and assessing implementation feasibility, thereby enhancing maritime safety policy effectiveness.
- (2) The results support enhancements in maritime safety analysis, decision-making frameworks, and preventive management capabilities in Taiwan.
- (3) The study outcomes are intended for use by the MOTC's Department of Navigation and Aviation, the Taiwan International Ports Corporation, Ltd., local governments, academic institutions, and industry, assisting the Maritime and Port Bureau in identifying regulatory and operational gaps and formulating appropriate improvement strategies to enhance the effectiveness of Taiwan's maritime safety management system.



國際海事組織定義四種不同自主船等級

The IMO classifies autonomous ships into four distinct levels of autonomy

(六) 高齡者交通安全多元體驗學習計畫 (1/2) — 軟體建置及活動規劃

1. 計畫概述

配合行政院「高齡社會白皮書」中提升高齡者數位連結、強化道安宣導之發展方向，本計畫結合數位科技與高齡者生活型態，設計多元體驗式交通安全學習模式，並以行人、自行車及機車為主題，經由高齡者常見交通事故樣態分析與交通安全體驗學習需求問卷調查，歸納高齡者須學習的交通安全知識，進而規劃高齡者交通安全數位學習輔助軟體及交通安全體驗實作活動，期以提升高齡者參與意願與交通安全認知，進而促進健康自主、社會連結，降低交通事故風險。

2. 主要研究成果

- (1) 本計畫共開發8套交通安全教學輔助軟體，並導入平板操作與虛擬體驗方式，提供高齡者安全、直觀且具互動性的學習工具，並辦理3場軟體試體驗活動。
- (2) 本計畫結合交通路公路局監理所場地進行3場交通安全體驗實作活動，宣導內容包含「大型車視覺死角與內輪差」、「行人過馬路」、「幹支道觀念」等，讓高齡者透過實際操作與情境模擬，加深對道路風險與防禦行為的理解。

(VI) Diverse Experiential Learning Program on Traffic Safety for Senior Citizens (1/2) – Software Development and Activity Planning

1. Project Overview

In response to the Executive Yuan's "White Paper on an Aging Society," which promotes digital inclusion for older adults and enhanced road safety education, this project integrates digital technologies with senior living patterns to develop diverse experiential traffic safety learning programs. Targeting pedestrians, cyclists, and motorcyclists, the project analyzes common accident scenarios involving older adults and conducts needs assessments to identify key safety knowledge requirements, subsequently designing digital learning tools and practical experiential training activities to improve participation, safety awareness, health independence, and social engagement while minimizing traffic accidents.

2. Main Research Results

- (1) A total of eight traffic safety learning applications were developed, utilizing tablet-based interfaces and virtual simulation technologies to provide safe, intuitive, and interactive learning experiences for older adults. Three pilot sessions were conducted to test the software.
- (2) Three experiential road safety training events were held in collaboration with the Highway Bureau Motor Vehicles Offices, covering topics including "blind spots and off-tracking hazards of large vehicles," "pedestrian crossing safety," and "right-of-way rules at road intersections." These activities enhanced older adults' understanding of traffic risks through hands-on and scenario-based learning.



3. 應用與推廣

- (1) 本計畫辦理3場軟體試驗活動，體驗者對課程流程、講師說明及軟體提升觀念理解的效益上，皆給予超過90%的「滿意／同意」評價，顯示數位輔助學習對於高齡者具有顯著的教育價值。
- (2) 本計畫結合交通路公路局監理所場地進行3場交通安全體驗實作活動，學員對活動內容皆表達高度滿意與肯定，對課程內容實用性與收穫度給予96%的評價，且全數學員均表示願意再次參加或推薦課程。
- (3) 本計畫辦理2場次專家學者座談會，並初步研擬出國內推動高齡者交通安全教育宣導時，各單位間如何合作與配合等相關方案與策略。

3. Technology Application and Promotion

- (1) Three software pilot activities were conducted, with participants reporting "satisfaction or agreement" levels exceeding 90% in terms of course design, instructor explanation, and learning effectiveness, demonstrating the strong educational impact of digital-assisted traffic safety tools for older adults.
- (2) The project conducted three experiential traffic safety training sessions at the Highway Bureau Motor Vehicles Offices. Participants reported high satisfaction, with 96% evaluating the course content as practical and highly beneficial, and all participants indicating a willingness to rejoin or recommend the program.
- (3) Two expert seminars were organized, during which preliminary policy recommendations were formulated on cross-agency collaboration mechanisms for promoting traffic safety education for older adults.



本計畫辦理之高齡者交通安全教育軟體試驗活動

Pilot testing activities for older adult traffic safety education software were carried out under this project



（七）科技技術應用於道路交通安全規劃

1. 計畫概述

近年來，隨著全球交通安全治理趨勢轉向「以人為本」與「零死亡願景」（Vision Zero），我國亦積極回應聯合國「2021–2030年道路安全行動十年」倡議，於「國家道路交通安全綱要計畫（113–116年）」明確提出以「零交通事故死亡」為目標，故交通部於推動「智慧運輸系統發展建設計畫（114–117年）」納入改善道路交通安全補助。本計畫係辦理前述建設計畫內關於科技技術應用道路交通安全部分，彙析近3年「智慧運輸系統發展建設計畫」執行成果、分析事故、找出道安防治重點對象，研擬建議科技道安補助內容與路側動態警示牌面設置指引（草案），提供實際執行概念驗證（Proof of Concept, PoC）驗證標準流程參考，以利各縣市地方政府申請補助執行依據與共享標準化成果報告。

2. 主要研究成果

- (1) 確立科技道安發展藍圖（三階段策略），從「初階固定防護」（即時風險提示）、「中階動態防護」（事件觸發預測）到「高階適應性防護」（AI自我學習與調控）的演進過程。
- (2) 優化智慧運輸計畫之補助內容，說明提案需提供肇事資料、碰撞構圖與量化 KPI（如 PET、TTC）。
- (3) 研擬路側動態警示牌面設置指引之修正草案，規範牌面圖案（如來車、行人警示）、文字大小、警示燈閃爍頻率及設置距離，藉此提升全國設施的一致性與辨識度。
- (4) 執行2處概念性驗證（PoC），透過實際執行建立事故現況分析、技術盤點到績效評估的完整 PoC 程序。

3. 應用與推廣

- (1) 本計畫辦理2場次專家學者座談會及1場次縣市政府座談會，針對國內外技術盤點成果「科技道安發展藍圖」的初步構想，討論修訂後的補助原則與路側動態警示牌面設置指引草案，以及挑選概念性驗證的實驗項目。

(VII) Application of Technology in Traffic Safety Planning

1. Project Overview

With global road safety governance increasingly emphasizing "people orientation" and "Vision Zero," Taiwan has aligned with the UN "Decade of Action for Road Safety 2021–2030." Under the "National Road Traffic Safety Outline Plan" (2024–2027), the goal of "zero traffic fatalities" has been formally established. Accordingly, the MOTC has incorporated road safety improvement funding into the "Smart Transportation Systems Development Program" (2025–2028). This project supports the technology application component of the "Smart Transportation Systems Development Program" by reviewing three years of implementation results, analyzing crash data, identifying key risk factors, and proposing technology-based subsidy guidelines along with draft specifications for roadside dynamic warning signage. A standardized proof of concept (PoC) process is also proposed to guide local government applications and reporting.

2. Main Research Results

- (1) A three-phase development blueprint for technology-enabled road safety is defined, progressing from basic fixed protection (real-time risk alerts) to intermediate dynamic protection (event-triggered prediction), and ultimately to advanced adaptive protection (AI-driven self-learning and system adjustment).
- (2) Under the updated Smart Transportation Program subsidy mechanism, all proposals must now incorporate accident data, Collision Diagrams, and quantitative KPIs (such as PET and TTC).
- (3) To enhance national consistency and legibility, a draft revision of the roadside dynamic warning sign guidelines was established (e.g., oncoming vehicles, pedestrian warnings), standardizing design criteria for symbols, typography size, signal flash frequency, and placement distances.
- (4) Two PoC sites were implemented to establish a complete evaluation workflow, covering accident diagnosis, technology assessment, and performance evaluation.

3. Technology Application and Promotion

- (1) The project convened two expert consultation meetings and a local government forum to review the preliminary "technology-enabled road safety roadmap," update subsidy principles, draft warning sign guidelines, and finalize PoC demonstration sites.

- (2) 114年9月23日辦理1場成果發表會，將相關研究成果提供縣市政府、學界、業界等參採。
- (3) 本計畫成果可提供交通部後續辦理「智慧運輸系統發展建設計畫」補助之參考。

- (2) An achievement presentation was conducted on September 23, 2025, sharing outcomes with government agencies, academia, and industry stakeholders.
- (3) The findings provide a reference for the MOTC in the future implementation of the "Smart Transportation Systems Development Program" subsidy scheme.



科技技術導入於道路交通安全規劃之成果

Framework for Integrating Advanced Technologies into Road Traffic Safety Planning

(八) 推動區域運輸發展研究中心服務升級 3.0 計畫 (114—115 年)

1. 計畫概述

為落實公共運輸發展，鼓勵大專院校運用豐沛之基礎研發設施及研究資源，協助交通部相關政策之推動，以及補足地方政府於推動公路公共運輸時欠缺之人力及能力，交通部於 104 年起匡列經費，責成本所辦理「交通部補助學界成立區域運輸發展研究中心」計畫，並自 110 年起將輔導道安改善經由試辦再擴大納入各區域中心之工作項目，藉由區域運輸發展研究中心（以下簡稱區域中心）強化地方政府能力建構，促進學界與產業、政府部門的合作發展，落實在地公共運輸之永續發展。

本期計畫配合交通部公路局「公路公共運輸永續及交通平權計畫 (114—117 年)」及交通部「國家道路交通安全綱要計畫 (113—116 年)」之執行，深化中央政府、地方政府、產業界及學界合作，共同推動公共運輸及道路交通安全改善，並連結國家重大政策，包含環島高快速鐵公路網、智慧交通、觀光旅遊、地方創生及淨零排放等，以擴大計畫之實施範圍及成效。

(VIII) Implement the service upgrade plan 3.0 for the regional transportation development research centers (2025–2026)

1. Project Overview

To promote the development of public transportation, the Ministry of Transportation and Communications (MOTC) has, since 2015, allocated dedicated funding and commissioned the Institute to implement the "Subsidy Program for Establishing Regional Transportation Development Research Centers in Academia." The aim of this initiative is to encourage colleges and universities to leverage their abundant R&D facilities and research capabilities to support MOTC policy implementation, while also addressing the manpower and capacity limitations faced by local governments in advancing road-based public transportation. Through the establishment of Regional Transportation Development Research Centers (hereafter referred to as "regional centers"), the program seeks to enhance the capacity of local governments and promote collaboration among academia, industry, and government sectors, thereby facilitating the sustainable development of local public transport systems.

In alignment with the MOTC Highway Bureau's "Highway Public Transportation Sustainability and Mobility Equality Plan (2025–2028)" and the MOTC "National Road Safety Outline Plan (2024–2027)," this phase of the project further strengthens collaboration among central and local governments, industry, and academia to advance public transportation development and road traffic safety improvements. The project also supports major national initiatives, including the round-island high-speed rail and highway network, smart transportation, tourism development, local revitalization, and net-zero emissions, thereby maximizing its impact and implementation effectiveness.



2. 主要研究成果

- (1) 協助地方政府進行公共運輸案例研析：114年3月至114年12月共協助地方政府進行公共運輸案例研析計18案，六大區域中心共同就「偏（原）鄉公共運輸結合觀光服務升級」、「偏（原）鄉公共運輸多元及創新服務模式」及「幹支線公共運輸路網規劃」等三大課題進行規劃與實作，著重探討各地方政府偏鄉公共運輸服務與跨部會資源整合之可行性，並研議對應策略及具體改善行動方案，並擇定1個鄉鎮或縣市於115年推動執行示範計畫3個月。
- (2) 輔導地方政府研提公共運輸提案：114年共協助研提12案提案計畫書。
- (3) 跨域合作並整合跨部會資源：除推動公路公共運輸外，亦輔導區域內產業升級、落實服務創新及制度建構。
- (4) 競爭型計畫部分：配合國家重大政策，114年就區域特色研提2項次亮點計畫之示範計畫，並將於115年進行推廣執行計畫，並檢討各計畫示範成果，做為未來跨區擴大成果之推廣應用。成果摘要說明如下：

2. Main Research Results

- (1) Assist local governments in conducting public transportation case studies: Between March and December 2025, 18 public transportation case studies were completed to assist local governments in enhancing transportation services. The six Regional Transportation Development Research Centers jointly carried out planning and analysis activities focused on three areas: "Tourism-oriented public transportation enhancement in rural and Indigenous regions," "Innovative and diversified transit service models in rural and Indigenous regions," and "Trunk-and-feeder network development." The project assessed opportunities to integrate rural transportation services with resources from multiple government agencies and formulated practical recommendations and implementation strategies. One township or county/city will subsequently be selected to undertake a three-month pilot program in 2026.
- (2) Supporting local governments in developing public transportation proposals: A total of 12 proposal plans received assistance in 2025.
- (3) Promoting Cross-Sector Collaboration and Integrating Inter-Ministerial Resources: In addition to advancing road-based public transportation, the program also supported regional industrial upgrading, service innovation, and institutional development through cross-sector collaboration and resource integration.
- (4) Competitive projects: In alignment with major national policies, two regional highlight demonstration projects were proposed in 2025 based on regional characteristics. In 2026, these projects entered the implementation and promotion phase, during which their demonstration outcomes were reviewed to inform the future cross-regional expansion and application of successful models. The key results are summarized as follows:



- a. 中區區域中心執行競爭型「應用機制設計理論於運輸需求管理（TDM）之淨零排放探討－以台中 Go 服務為例」計畫，探討臺中市交通行動服務平台「台中 Go」，期提升民衆使用大眾運輸工具，研議導入綠色運輸的「交通減碳存摺」與「遊戲化激勵」機制，預計於 115 年推動執行示範計畫 3 個月，示範參與對象為臺中市政府交通局員工。
- b. 東部區域中心執行競爭型「建構整合多元運具之低碳旅遊服務機制：考量花東地方創生特色與淨零碳排目標」計畫，為促成幸福巴士永續經營，發展部落特色，使部落青年願意留在部落發展並傳承部落文化，規劃公共運輸連結地方創生之整合型計畫，預計於 115 年推動執行示範計畫 3 個月。

(5) 道安改善計畫部分：

- a. 配合交通部「道安提升行動小組」，114 年完成輔導臺南、苗栗、新竹市、新竹縣、嘉義市、彰化、新北、基隆、桃園等 9 縣市，於交通部道路交通安全聯繫會報提報該縣市「道路交通事故防制策略作為或提升精進成果」。
- b. 114 年共計協助地方政府完成 22 處工程改善專案路口績效評估指標建立及改善前指標資料蒐集。
- c. 114 年完成辦理 6 場「道安診斷的上、中、下游一貫性課程」，參與人次約 300 人，以提升並輔導縣市提升道安專業能力。

3. 應用與推廣

- (1) 為健全公車路網，提升公共運輸使用量，114 年 6 月 25 日本所與高屏澎區域中心、屏東縣政府及高雄區監理所共同簽署「屏東縣幹支線公共運輸路網規劃簽署合作備忘錄」，合作推動縣內公共運輸路網整合優化。

- a. Under a competitive research initiative, the Central Regional Center conducted the project "Applying Mechanism Design Theory to Transportation Demand Management (TDM) for Net-Zero Emissions: A Case Study of the Taichung Go Service." The project focuses on evaluating the "Taichung Go" MaaS platform as a tool for increasing public transit patronage. It further investigates innovative green mobility measures, including a "Transit Carbon Reduction Passbook" and "game-based incentive" mechanisms, to encourage low-carbon travel choices. A three-month demonstration program is planned for 2026, with employees of the Transportation Bureau of the Taichung City Government participating as the pilot user group.
- b. Under a competitive research initiative, the Eastern Regional Center conducted the project "Constructing a Low-Carbon Tourism Service Mechanism Integrating Multi-Modal Transportation: Considering Hualien-Taitung Regional Revitalization Characteristics and Net-Zero Carbon Targets." The project seeks to support the sustainable operation of the DRTS network while promoting Indigenous community development. By integrating public transportation services with local revitalization initiatives, the project aims to create employment and development opportunities that encourage Indigenous youth to remain in their communities and contribute to the preservation of local culture. A three-month pilot demonstration project is planned for implementation in 2026.

(5) Road safety improvement projects:

- a. In cooperation with the MOTC's "Road Safety Enhancement Task Force," guidance was provided in 2025 to nine counties and cities, including Tainan City, Miaoli County, Hsinchu City, Hsinchu County, Chiayi City, Changhua County, New Taipei City, Keelung City, and Taoyuan City, to present their "Road Traffic Accident Prevention Strategies or Improvement Results" at the MOTC Road Traffic Safety Liaison Committee.
- b. In 2025, the Institute assisted local governments in establishing performance evaluation indicators and collecting baseline data prior to improvements for 22 intersection improvement projects.
- c. In 2025, the Institute conducted six sessions of the "Road Safety Diagnosis Integrated Training Program Covering Upstream, Midstream, and Downstream Processes," with approximately 300 participants, to strengthen and support the development of road safety expertise among local governments.

3. Technology Application and Promotion

- (1) To improve the bus network structure and encourage greater use of public transportation, the Institute, the Kaohsiung-Pingtung-Penghu Regional Center, the Pingtung County Government, and the Kaohsiung Motor Vehicles Office signed the "Memorandum of Understanding on Pingtung County Trunk-and-Branch Public Transport Network Planning" on June 25, 2025. The partnership aims to facilitate the integration and optimization of public transport services throughout the county.

- (2) 為強化我國公共運輸系統與觀光資源整合，114年6月26日本所與觀光署共同簽署「公共運輸旅運服務升級合作備忘錄」，以促進公共運輸旅運服務之升級發展。
 - (3) 本所分別與各區域中心共同辦理6場「跨域整合首長論壇」，邀集區域內地方首長（如交通、觀光或教育）、業界相關代表及學者專家，共同集思廣益及經驗分享，針對公共運輸跨域合作相關課題，提出建議解決方向，達到中央與地方雙向溝通交流之目的及促成跨域合作機會。
- (2) To foster closer integration between Taiwan's public transport system and tourism resources, the Institute and the Tourism Administration signed the "Memorandum of Understanding on Public Transport and travel Service Enhancement" on June 26, 2025, promoting the upgrading and continued development of public transport and travel services.
 - (3) In collaboration with each regional center, the Institute organized six "Cross-Regional Integration Chief Forums," inviting the chief and deputy chiefs responsible for public transportation development, relevant industry representatives, scholars, and experts to brainstorm and share experiences. The forums addressed cross-regional collaboration issues in public transportation and proposed solution directions, achieving the goal of two-way communication between central and local governments and facilitating cross-regional partnerships.



114年6月25日本所與高屏澎區域中心、屏東縣政府及高雄區監理所共同簽署「屏東縣幹支線公共運輸路網規劃簽署合作備忘錄」

The Institute, the Kaohsiung–Pingtung–Penghu Regional Center, the Pingtung County Government, and the Kaohsiung Motor Vehicles Office signed the "Memorandum of Understanding on Pingtung County Trunk-and-Branch Public Transport Network Planning" on June 25, 2025



114年6月26日本所與觀光署共同簽署「公共運輸旅運服務升級合作備忘錄」

The Institute and the Tourism Administration signed the "Memorandum of Understanding on Public Transport and travel Service Enhancement" on June 26, 2025

(九) 需求反應式公共運輸服務 (DRTS) 營運成本、補貼制度及收費制度之研究 (2/2) — 收費與補貼制度探討

1. 計畫概述

我國目前需求反應式公共運輸服務 (DRTS) 主要服務偏遠地區居民，提供第一哩與最後一哩路小眾運輸服務，為協助解決交通部、公路局及縣市政府等相關單位執行幸福巴士、幸福小黃計畫之問題，本計畫綜整我國需求反應式公共運輸服務 (DRTS) 經營現況，針對需求反應式公共運輸服務 (DRTS) 之營運成本、收費制度、補貼制度、績效評估與永續經營等課題進行分析與檢討，以利偏鄉運輸永續發展。

本計畫執行期間自 113 年 10 月至 114 年 9 月，研究重點為探討 DRTS 收費與補貼制度，包含補貼制度精進、使用者付費機制討論、永續經營相關議題，並針對前期成果加強合理成本與績效評估流程之實務應用及可操作性，最後透過案例評析方式，進行補貼制度、合理成本、績效評估及永續發展四大面向之綜整性分析說明。

2. 主要研究成果

- (1) 完成國內外需求反應式公共運輸服務 (DRTS) 收費制度及其他資源挹注補助來源等相關文獻資料蒐集與評析。
- (2) 完成國內需求反應式公共運輸服務 (DRTS) 之補貼制度、財務永續與永續經營三大部分進行資料蒐集與分析，提出補貼制度精進方案及永續經營方案研提。
- (3) 完成合理成本計算適用性測試、待勤成本試算架構、階段性績效評估架構與等第標準、社會效益評估流程及行經偏鄉地區路線潛在觀光、客貨共載、教育及醫療資源盤點。

3. 應用與推廣

- (1) 完成需求反應式公共運輸服務 (DRTS) 於補貼制度、合理營運成本、績效評估及永續經營四大面向之探討及建立其機制，可針對路線各面向結果及其特性提出政策建議，可

(IX) An Investigation of Operation, Subsidy and Fare System of Demand Responsive Transport Service (DRTS) Scheme (2/2) – Fare and Subsidy System

1. Project Overview

Demand Responsive Transport Service (DRTS) primarily serve residents in remote and rural areas, providing first-mile and last-mile mobility solutions for niche transportation needs. To address challenges faced by the Ministry of Transportation and Communications (MOTC), the Highway Bureau, and local governments in implementing programs such as the Happiness Bus and Happiness Taxi initiatives, this project consolidates the current operational status of DRTS in Taiwan. The study analyzes and reviews key issues, including operation costs, fare system, subsidy framework, performance evaluation, and sustainability of DRTS, to support the long-term development of rural public transportation services.

The project period spans from October 2024 through September 2025. The study focuses on DRTS fare and subsidy systems, including subsidy system enhancement, user-payment approaches, and sustainable operation related issues. It also builds upon previous research outcomes to strengthen the practicality and implementation of reasonable cost and performance evaluation methodologies. Through case analyses, the project provides a comprehensive assessment covering subsidy mechanisms, reasonable costs, performance evaluation, and sustainable development.

2. Main Research Results

- (1) Completed the collection, compilation, and analysis of domestic and international literature related to DRTS fare structures, subsidy schemes, and other funding and resource support mechanisms.
- (2) Completed data collection and analytical assessments regarding DRTS subsidy mechanisms, financial sustainability, and sustainable operation models in Taiwan, and proposed recommendations for improving subsidy policies and long-term operational sustainability.
- (3) Completed testing of the applicability of reasonable cost calculation methods, established a framework for standby-cost estimation, developed phased performance evaluation criteria and rating standards, formulated a social benefit assessment process, and conducted an inventory of potential tourism, passenger-freight integration, educational, and healthcare resources associated with routes serving remote areas.

3. Technology Application and Promotion

- (1) Completed the discussion and development of mechanisms addressing four key dimensions of DRTS operations: subsidy systems, reasonable

operating costs, performance evaluation, and sustainable management. The findings provide policy recommendations tailored to route characteristics and performance outcomes, and offer practical references for the Highway Bureau and local governments in route planning, proposal review, evaluation, and service enhancement.

- (2) Expert and stakeholder consultation meetings were convened on December 4, 2024, May 26, 2025, and July 18, 2025, to discuss project outcomes and exchange perspectives on DRTS-related topics, including reasonable cost structures, performance evaluation frameworks, subsidy systems, and sustainable management.
- (3) Partial research results from the project were presented at the 4th Taiwan E-Intelligent Vehicle & Green Energy Technology Conference and selected as an Outstanding Paper.

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(十) 共享運具連結公共運輸之研究 (2/2) — 示範場域建置與推動

1. 計畫概述

為因應我國 2050 淨零排放及新興運輸服務模式蓬勃發展，如何藉由共享經濟模式，提升各類型共享運具之便利性與服務品質，透過與現有公共運輸系統無縫整合，做為民眾第一哩路及最後一哩路之接駁運具。

本計畫蒐集國內外共享運具管理規範、文獻與案例，分析其於運輸系統之定位與服務模式，並彙整整合公共運輸之相關規範與智慧化、創新加值議題。透過訪談營運業者及政府部門，研提因應策略與發展方向建議。另與地方政府合作辦理示範場域實證，驗證整合模式與推動成效，做為後續政策精進與擴大推動之參考。

2. 主要研究成果

- (1) 綜整前期計畫成果，蒐集國內外共享運具連結公共運輸之案例與文獻，做為示範場域優先建置項目、推動順序、權責分工及績效指標設定之依據；盤點三處示範場域既有共享運具站位配置、自行車道建設、系統維運、與既有公共運輸之整合情形。
- (2) 邀集地方政府、捷運業者、共享運具業者及使用者代表等利害關係人辦理六場次訪談，彙整具體可行建議；實施示範前後旅運需求特性、轉乘行為及共享運具使用意願之問卷調查，研提不同類型場域擴大服務範圍之策略建議與精進配套措施。

(X) Shared Mobility Integration with Public Transportation (2/2) – Development and Implementation of Demonstration Sites

1. Project Overview

In response to Taiwan's 2050 net-zero emissions target and the rapid development of emerging transportation service models, it is worth exploring how to leverage the sharing economy to enhance the accessibility, convenience and service quality of various types of shared mobility. By seamlessly integrating shared mobility with the existing public transportation system, it can serve as a first-mile and last-mile connection for public transport users.

The project reviewed domestic and international regulations, literature, and case studies related to shared mobility and analyzed its role and service models within transportation systems. It also reviewed regulations and emerging issues concerning public transportation integration, intelligent transportation applications, and innovative value-added services. Interviews with transportation operators and relevant government agencies were conducted to formulate recommendations regarding future development strategies and policy responses. Demonstration projects were undertaken in partnership with local governments to verify the effectiveness of integration models and implementation outcomes, providing a basis for future policy enhancement and wider-scale deployment.

2. Main Research Results

- (1) Based on the outcomes of the previous-phase project, the study compiled and analyzed domestic and international literature and case studies on shared mobility integration with public transportation. The findings informed decisions regarding demonstration-site priorities, implementation order, division of responsibilities, and KPI development. The project also reviewed the existing distribution of shared mobility stations, bikeway infrastructure, system maintenance arrangements, and levels of integration with public transportation across three demonstration sites.
- (2) Six stakeholder consultation sessions were conducted with local governments, metro operators, shared mobility operators, and user representatives to collect practical recommendations. Pre- and post-demonstration surveys were also administered to assess travel demand characteristics, transfer behavior, and user willingness to adopt shared mobility services. The study subsequently proposed strategies and supporting measures for expanding service coverage across different site types.



- (3) 與臺中市、臺北市政府及共享運具業者合作，辦理示範場域實證。實證分析結果顯示，導入共享運具服務有助於提升公共運輸場站接駁效率，並促進軌道運輸轉乘使用量之成長。另協助地方政府與業者滾動調整營運管理策略並修訂「共享運具連結公共運輸指引」。

3. 應用與推廣

- (1) 完成共享運具連結公共運輸示範場域建置及推動，並據以修訂指引內容，可供做為主管機關及相關業者後續規劃與推動之參考應用。
- (2) 分別於114年7月10日及10月27日辦理專家學者座談會，邀集專家學者、中央機關及地方政府代表，就政策定位、示範場域規劃、績效指標、需求調查及推動策略等議題交流討論。
- (3) 於114年11月27日舉辦計畫成果發表會，邀請中央及地方主管機關與共享運具業者參與，藉由成果交流與經驗分享，協助各單位掌握整合發展趨勢，強化公共運輸與共享運具之無縫銜接。

- (3) Demonstration projects were carried out in cooperation with the Taipei City Government, the Taichung City Government, and shared mobility operators. Results from the demonstration projects show that the introduction of shared mobility services can enhance first-mile and last-mile connectivity to public transportation hubs and increase rail transit ridership. The project supported local governments and service operators in the iterative adjustment of operational management strategies and the revision of the "Guidelines for Integrating Shared Mobility Services with Public Transportation."

3. Technology Application and Promotion

- (1) The construction and implementation of shared mobility–public transportation integration demonstration sites were completed. The findings were used to revise the relevant guidelines, serving as a reference for competent authorities and operators in subsequent planning and implementation.
- (2) Expert and scholar consultation workshops were held on July 10, 2025, and October 27, 2025, with participation from academic experts, central government agencies, and local governments to discuss policy orientation, demonstration site planning, KPIs, demand surveys, and implementation strategies.
- (3) A project achievement presentation conference was held on November 27, 2025, with participation from central and local competent authorities and shared mobility operators. The event facilitated the exchange of results and practical experience, supporting stakeholders in understanding integration trends and strengthening seamless connections between public transportation systems and shared mobility services.



114年11月27日辦理共享運具連結公共運輸之研究成果發表會
On November 27, 2025, a briefing was held to present the research outcomes on integrating shared mobility services with public transportation

二 引領運輸科技與產業創新

(一) 構建 5G 智慧交通數位神經中樞—全系統整合實作與推廣應用

1. 計畫概述

交通部依據「數位國家・創新經濟發展方案」、「臺灣 5G 行動計畫」等重要施政重點，責成本所、公路局與鐵道局共同擬具「推動 5G 提升智慧交通服務效能與安全計畫」（行政院 109 年 9 月 3 日院臺科會字第 1090098342 號函核定），計畫期程自 110 年至 114 年 8 月。其中由本所負責執行構建 5G 智慧交通數位神經中樞規劃與實作等系列計畫。本計畫係承續前期（112 至 113 年度）成果，於 114 年度廣續運用 5G 結合 AIoT 等創新技術，精進優化相關模式庫與知識庫（包括「大型活動交通影響分析模式」、「主動式 AI 號誌時制檢測及自動化調整模式」、「交通速率預測模式」、「路口綠燈使用率分析模式」以及「數位雙生建置」）共計 5 項，並完成智慧交通數位神經中樞全系統開發整合以及實際輔導落地移轉臺中市政府應用，計畫成果有助各交通管理單位執行最適交管決策，以提升車流運作效率及交通安全。

2. 主要研究成果

- (1) 整合所研發的相關關鍵技術，應用數位雙生（Digital Twins）模型，完成智慧交通數位神經中樞系統功能擴充與精進。透過數位雙生模型以視覺化呈現各項交通監控與預測成果，所發展之交通管理相關模式庫已可預測車流即將壅塞，並於 30 分鐘前提出示警，以利交通管理單位即時採行應變作為。
- (2) 優化緊急救援車輛智慧優先號控功能（使車輛順利通過路口機率提升約 40%），臺中市政府並已持續向交通部爭取補助經費擴大建置，落實交通安全並提升運輸服務水準。
- (3) 建立可依即時交通狀況動態調整之號誌時制最佳化決策流程。經由實作後之事前與事後成效評估，可於實施範圍有效縮短交通壅塞時間達 13.4%。

II Guiding Transportation Technology and Industrial Innovation

(I) Construction of the 5G Intelligent Transportation Digital Nerve Center – Full-system integration implementation and promotion applications

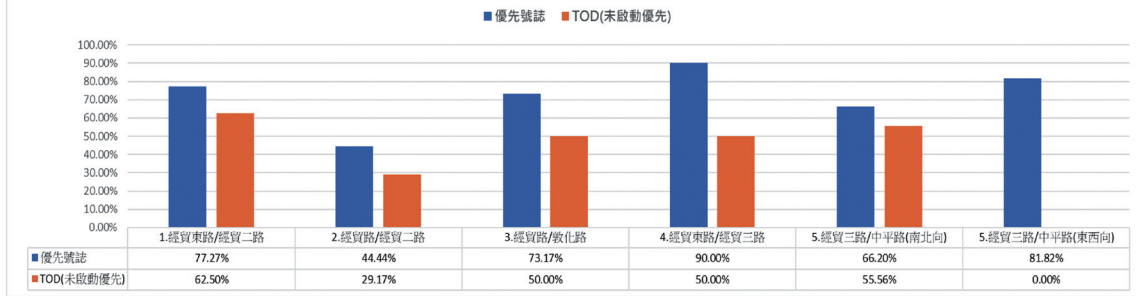
1. Project Overview

In line with key national policy initiatives such as the Digital Nation and Innovative Economic Development Program and the Taiwan 5G Action Plan, the Ministry of Transportation and Communications (MOTC) has commissioned the Institute of Transportation (IOT), along with the Highway Bureau and the Railway Bureau, to jointly propose the "Project for Promoting 5G to Enhance the Efficiency and Safety of Intelligent Transportation Services," which was approved by the Executive Yuan on September 3, 2020 (Official Letter No. 1090098342). The project period spans from 2021 to August 2025. The IOT is responsible for the planning and implementation of the "Construction of the 5G Intelligent Transportation Digital Nerve Center". This project is a continuation of the previous phase (2023–2024) and, in 2025, further utilizes 5G and AIoT technologies to optimize the model library and knowledge base. Five major modules were refined, including the "Large-Scale Event Traffic Impact Analysis Model," the "Active AI Signal Timing Detection and Automated Adjustment Model," the "Traffic Speed Prediction Model," the "Intersection Green Signal Utilization Analysis Model," and the "Digital Twin System." The project also completed the full-system development and integration of a intelligent transportation digital nerve center and supported its deployment and technology transfer to the Taichung City Government for implementation. The results provide transportation authorities with advanced tools for optimal traffic management decision-making, contributing to improved traffic efficiency and road safety.

2. Main Research Results

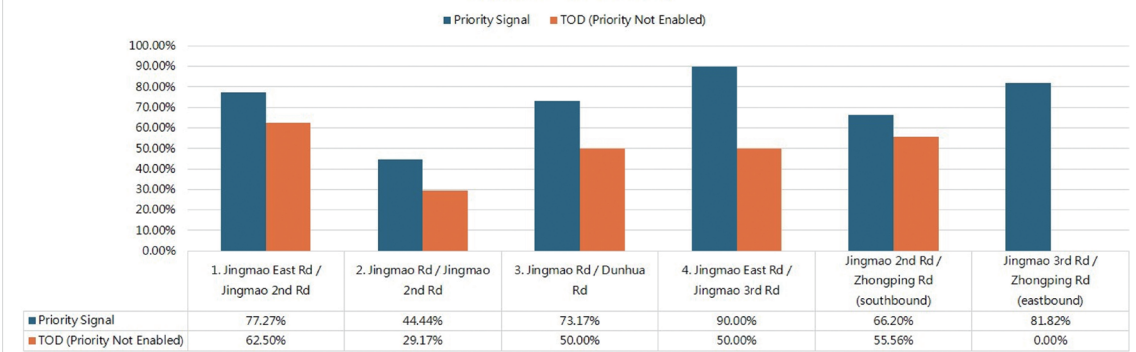
- (1) Integrated key technologies developed in the project to enhance and expand the functions of the Intelligent Transportation Digital Nervous System using a Digital Twin model. This model visualizes various traffic monitoring and forecasting results. The developed traffic management model library is capable of predicting upcoming traffic congestion and can issue early warnings 30 minutes in advance, enabling traffic authorities to take timely countermeasures.
- (2) Optimized the smart priority signal control for emergency response vehicles, improving their success rate in passing through intersections by approximately 40%. The Taichung City Government has subsequently sought additional funding from the MOTC to expand the deployment of the system, supporting traffic safety objectives thereby enhancing traffic safety and overall transportation service quality.
- (3) Developed an optimized signal timing decision framework that dynamically adjusts signal control strategies according to real-time traffic conditions. Before-and-after evaluations demonstrated that the implemented measures reduced traffic congestion duration within the project area by 13.4%.

優先號誌/TOD(未啟動優先)緊急車輛抵達路口為綠燈之機率(2024/05~10)



【計算說明】抵達路口為綠燈之機率：通過路口為綠燈次數/通過路口總次數

Green Signal Arrival Probability for Emergency Vehicles under Signal Priority / TOD without Priority Activation (2024/05-10)



Calculation Note:
Probability of arriving at an intersection during a green signal = Number of times passing through the intersection during a green signal / Total number of times passing through the intersection

實施緊急救援車輛優先號控功能之驗證成效

Performance verification results of the emergency response vehicle priority signal control function



數位雙生模型展示路段速率預估畫面

Display interface of the digital twin model for roadway speed forecasting

3. 應用與推廣

- (1) 於115年2月12日舉辦「構建5G 智慧交通數位神經中樞—全系統整合實作與推廣應用」成果交流座談會，邀請中央及地方交通管理與實務應用單位參加，以案例情境方式說明智慧交通數位神經中樞系統功能擴充成果，以推廣本計畫重要研究成果與應用經驗。
- (2) 本計畫為後續能持續推廣供各地方政府應用，亦同步研擬各應用服務推廣機制，期使各縣市可爭取更多經費發展必要之交通管理服务，以提升交通管理效能。

(二) 先進空中交通創新服務前瞻規劃與前驅市場商業驗證

1. 計畫概述

近年來隨著先進空中運輸 (Advanced Air Mobility, AAM) 與城市空中運輸 (Urban Air Mobility, UAM) 概念逐漸成熟，全球各國民航主管機關與產業陸續啟動以電動垂直起降飛行載具 (electric Vertical Take-off and Landing aircraft, eVTOL) 及無人機 (Unmanned Aircraft Systems, UAS) 執行載客、緊急醫療及貨物運送等應用情境之新型態運輸服務規劃。

先進空中交通創新服務不僅為民眾及產業帶來發展契機，也為政府機關帶來了新的挑戰，本計畫配合我國基礎條件與需求特性，透過前瞻規劃與先導實作，據以評估導入相關服務之可行性與後續推動議題。考量目前 AAM 載客運輸服務仍處技術發展階段，本計畫將重點鎖定於發展條件分析與示範廊道規劃，藉此盤點關鍵議題，為導入新興運輸服務奠定基礎。

在實作驗證方面，無人機物流配送被視為 AAM 現階段技術較為成熟，具可行性之應用，本所自 109 年起持續推動無人機物流場域實作驗證，本期計畫延續歷年計畫成果，與國內物流業者合作，驗證無人機整合現有物流運輸網絡之新型態物流運輸模式，藉以累積實作經驗及測試數據，提供產業界及主管機關後續推動之參據，並做為國內無人機與相關資訊系統之技術驗證平臺。

3. Technology Application and Promotion

- (1) On February 12, 2026, a results-sharing forum titled "Construction of the 5G Intelligent Transportation Digital Nerve Center—Full-system integration implementation and promotion applications" was held. Key representatives from central and local transportation management and operational agencies were invited to participate. Through scenario-based demonstrations, the expanded functionalities of the Intelligent Transportation Digital Nerve Center system were presented to promote key research outcomes and application experiences from this project.
- (2) To support the broader adoption of project outcomes by local governments, the project also developed promotion and implementation mechanisms for each application service. These efforts are intended to assist local governments in obtaining additional resources to develop essential traffic management services and improve traffic management performance.

(II) Forward-Looking Planning and Pilot Market Validation of Innovative Advanced Air Mobility Services.

1. Project Overview

As Advanced Air Mobility (AAM) and Urban Air Mobility (UAM) concepts continue to mature, civil aviation authorities and industry participants worldwide have begun planning next-generation transportation services utilizing electric Vertical Take-off and Landing (eVTOL) aircraft and Unmanned Aircraft Systems (UAS) for passenger transportation, emergency medical response, and cargo delivery applications.

While advanced air mobility services present significant opportunities for economic and industrial development, they also introduce new regulatory and operational challenges for government agencies. This project evaluates the feasibility of introducing such services in Taiwan through forward-looking planning and pilot demonstrations that take into account domestic infrastructure conditions and transportation demand characteristics. Considering that passenger-oriented AAM services are still under technological development, the project focuses primarily on development readiness assessments and demonstration corridor planning to identify key implementation considerations and establish a foundation for future deployment.

In terms of pilot validation, UAV-based logistics has been identified as one of the most mature and viable AAM applications currently available. Since 2020, the Institute has carried out a series of UAV logistics demonstration projects. Building on previous achievements, this phase collaborates with domestic logistics companies to evaluate innovative logistics models integrating UAVs with existing freight transportation networks, generating operational experience and testing data to support future industry development and government policymaking, while also serving as a technology validation platform for domestic UAV and information system applications.

2. 主要研究成果

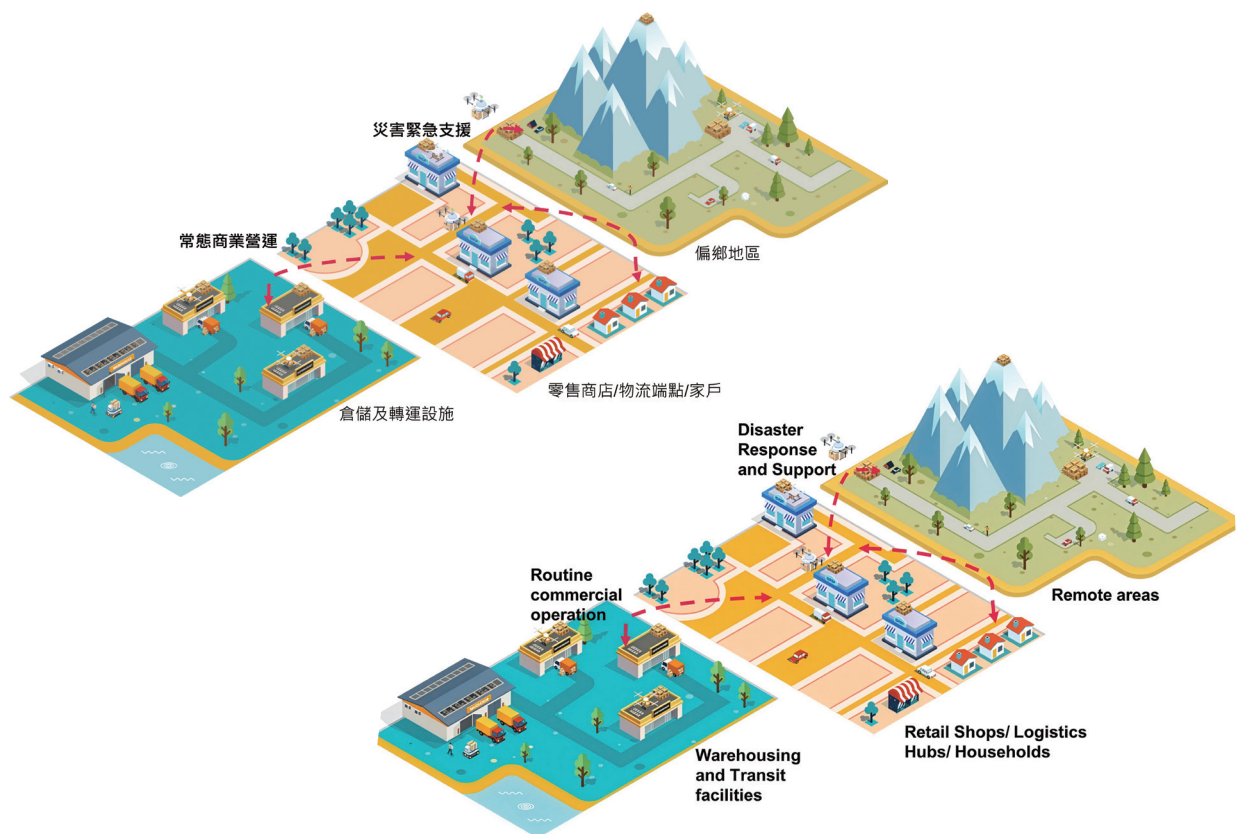
本期計畫執行期間為114年8月至115年12月，114年工作成果如下：

- (1) 完成美國、歐盟、中國大陸、日本、澳洲等主要國家地區推動先進空中交通相關推動策略、試驗計畫、研究報告及技術標準之蒐集、分析與比較。
- (2) 與中華郵政及統一超商 foodomo 平臺合作，規劃無人機提供運送郵件包裹與送餐等服務之營運模式，並擇定於屏東縣及花蓮縣進行實作，預計115年5月開始進行場域驗證。

2. Main Research Results

This project is being implemented from August 2025 to December 2026. The major achievements accomplished during 2025 are summarized below:

- (1) Completed the collection, review, and comparative analysis of advanced air mobility policies, pilot initiatives, research studies, and technical standards adopted by leading countries and regions, including the United States, the European Union, China, Japan, and Australia.
- (2) Working in partnership with Chunghwa Post and 7-ELEVEN's foodomo platform, the project designed UAV logistics operating models for postal, parcel, and meal delivery services. Pingtung County and Hualien County were selected as demonstration locations, with field trials planned to begin in May 2026.



無人機物流營運模式示意圖

Conceptual illustration of the UAV logistics operating model

3. 應用與推廣

114年9月26日於交通部例行記者會發布「運研所完成無人機偏鄉物流服務驗證協助交通部成為希望與幸福的傳遞者」新聞稿，推廣本所無人機物流相關研究計畫之成果。

3. Technology Application and Promotion

On September 26, 2025, the Institute published a news release at the MOTC's routine press conference titled "Institute of Transportation Completes UAV Logistics Validation in Remote Areas, Helping the MOTC Deliver Hope and Happiness," highlighting the outcomes of its UAV logistics R&D efforts.

(三) 人工智慧號誌控制精進 — 多任務強化學習

1. 計畫概述

本計畫聚焦於人工智慧 (AI) 於智慧交通管理之應用，發展智慧號誌控制系統，以提升交通運作效率並降低都市壅塞，延續過往 AI 號誌控制計畫成果，進一步改善傳統強化學習模型需依不同時段與時相分別建模之限制，目標為建構具高適應性與韌性的智慧交通管理系統。

2. 主要研究成果

- (1) 開發多任務強化學習 (MTRL) 號誌控制模型，於臺南市關廟區「台86-19甲」路口驗證，顯著降低路口各方向停等車輛數，尤以左轉保護時相之車道改善效果最為明顯。
- (2) 完成都市交通控制通訊協定3.5版之修訂作業，並已經交通部於114年11月27日交科字第114003156號函頒公告。

3. 應用與推廣

- (1) 本計畫透過與地方政府合作進行實地測試與場域驗證，支援未來交通管理決策。
- (2) 藉由舉辦通訊協定研討說明會，促進產官學界對新版通訊協定標準之理解與採用，以利各單位未來順利導入都市交通控制協定3.5版。

(III) Advancing AI Traffic Signal Control – Multi-Task Reinforcement Learning

1. Project Overview

This project focuses on applying AI technologies to smart transportation management by developing advanced traffic signal control system that improve traffic efficiency and reduce urban congestion. Building on previous AI-based signal control projects, the study aims to address the limitations of traditional reinforcement learning approaches, which require separate models for different time periods and signal phases. Ultimately, the project seeks to establish a more adaptive, scalable, and resilient smart traffic management system.

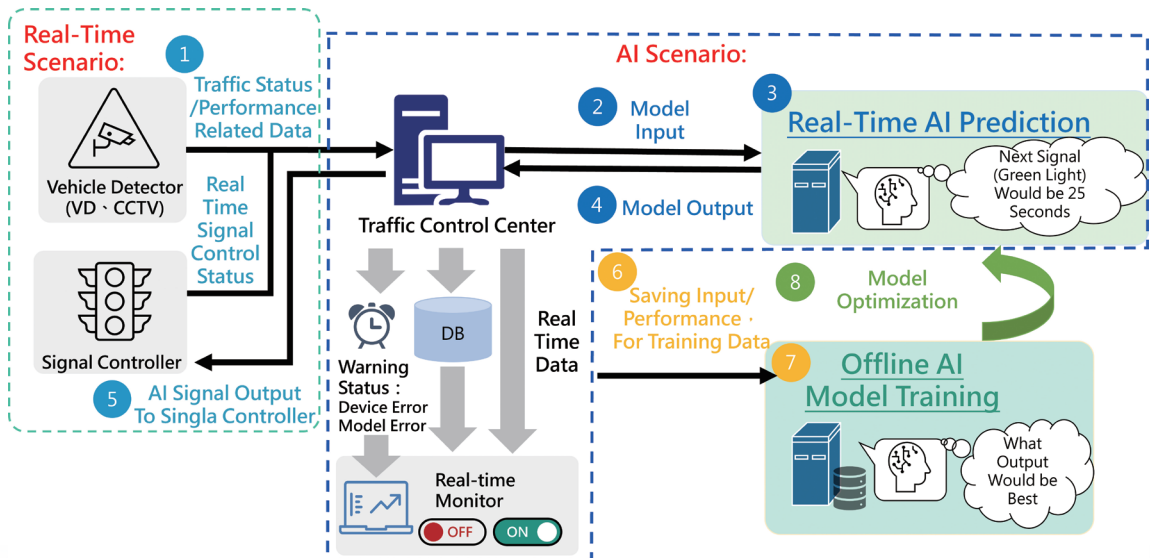
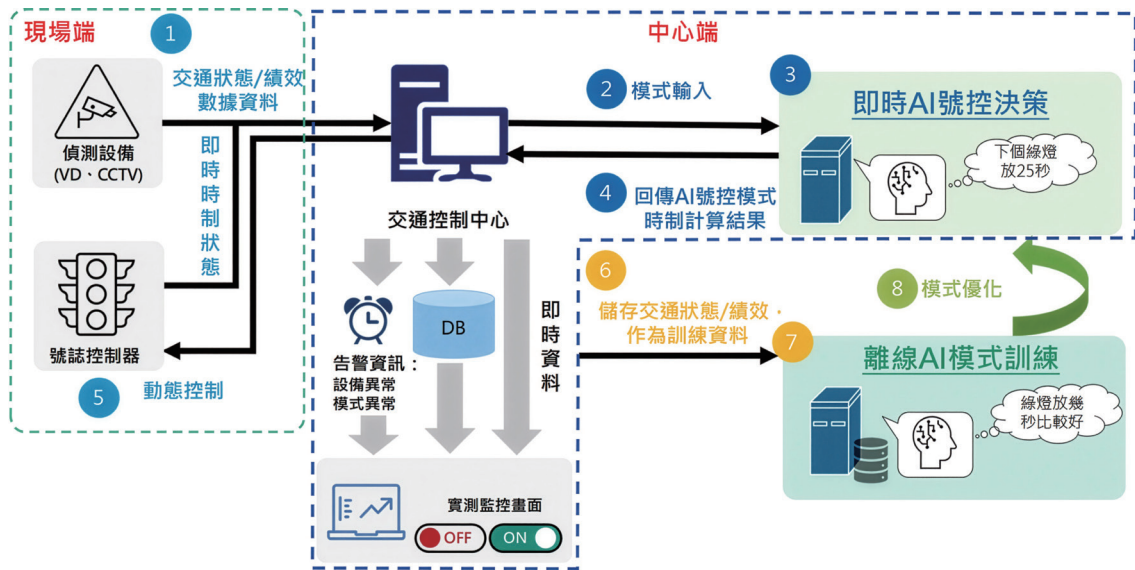
2. Main Research Results

- (1) A Multi-Task Reinforcement Learning (MTRL)-based traffic signal control model was developed and tested at the intersection of "Provincial Highway 86 and County Highway 19A" in Guanmiao District, Tainan City. The evaluation results demonstrated a significant reduction in queue lengths across all traffic movements, with the greatest improvements observed on approaches operating under protected left-turn signal phases.
- (2) The revision of Version 3.5 of the Urban Traffic Control Communication Protocol was completed and officially promulgated by the Ministry of Transportation and Communications (MOTC) through Official Letter on November 27, 2025.

3. Technology Application and Promotion

- (1) The project conducted field trials and on-site validation in collaboration with local governments to support future traffic management and operational decision-making.
- (2) Seminars and information sessions on the Urban Traffic Control Communication Protocol were conducted to enhance understanding and promote adoption of the revised standard among government agencies, relevant traffic control device industry stakeholders, and academic institutions, thereby facilitating the future implementation of Version 3.5 of the Urban Traffic Control Communication Protocol.





臺南關廟區「台86-19甲」路口實驗場域協控作業流程圖

Workflow Diagram of Coordinated Signal Control Operations at the Experimental Site of the Provincial Highway 86-County Highway 19A intersection in Guanmiao District, Tainan City



(四) 人工智慧服務於運輸研究決策支援應用

1. 計畫概述

為應對日益複雜的決策環境與資訊快速增長的挑戰，推動生成式人工智慧（Generative AI）及大型語言模型在運輸研究與決策支援中的應用確有必要。

本計畫探索生成式 AI 技術於運輸領域的應用價值，提升本所的決策支援能力與行政效能，可激發交通運輸領域的創新思維。

2. 主要研究成果

- (1) 整合 Microsoft Azure AI 服務，並採用混合雲架構以兼顧資料安全與運算彈性，完成平台系統架構設計。
- (2) 整合運研所既有知識管理（KM）資料與外部檢索資料，完成知識庫對話功能。

(IV) AI-Driven Decision Support for Transportation Research

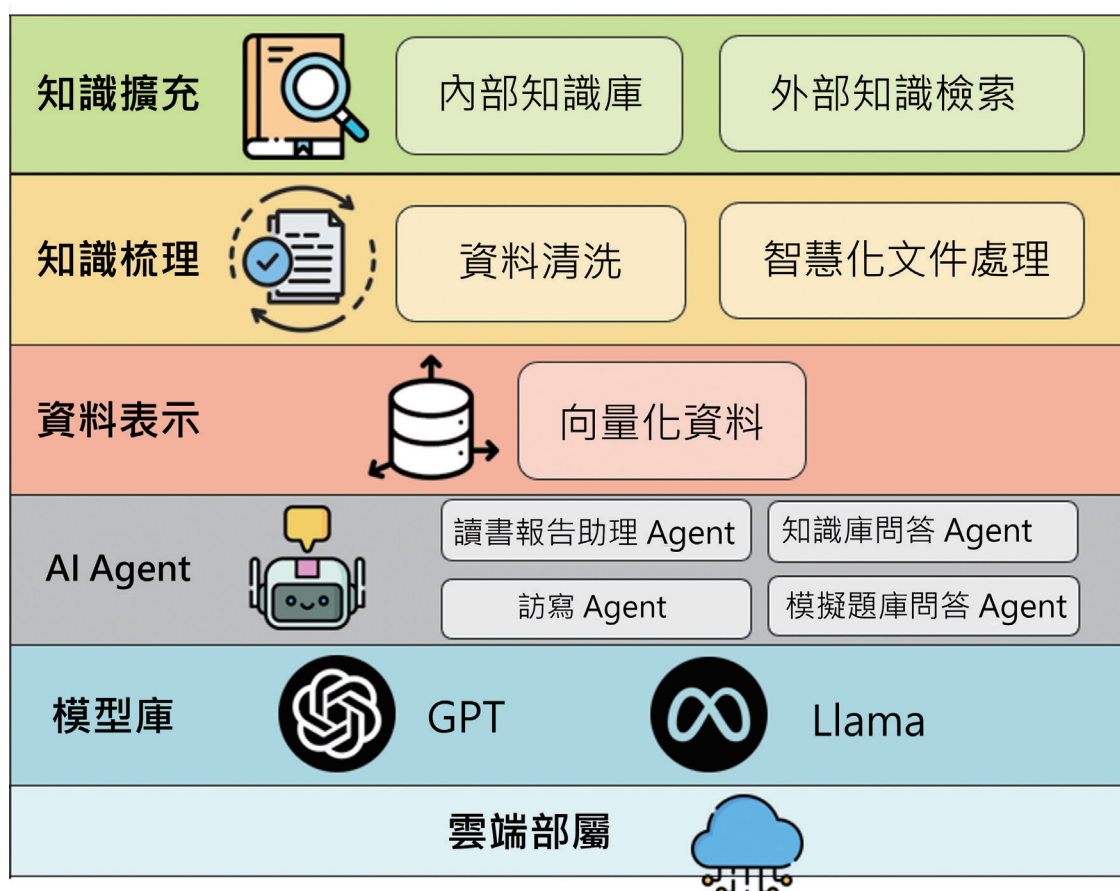
1. Project Overview

As transportation research and policy decision-making become increasingly complex and information continues to grow rapidly, there is a growing need to apply Generative AI (GenAI) and Large Language Models (LLMs) to support transportation research and decision-making.

The project explores the application of GenAI technologies in transportation to enhance the Institute's decision-support capabilities and administrative efficiency while fostering innovation in transportation research.

2. Main Research Results

- (1) Microsoft Azure AI services were integrated into the platform, and a hybrid cloud architecture was adopted to ensure both data security and computing flexibility, resulting in the successful establishment of the platform architecture.
- (2) The Institute's existing Knowledge Management (KM) resources were integrated with external information sources to implement an AI-powered knowledge retrieval and conversational AI service.



系統架構

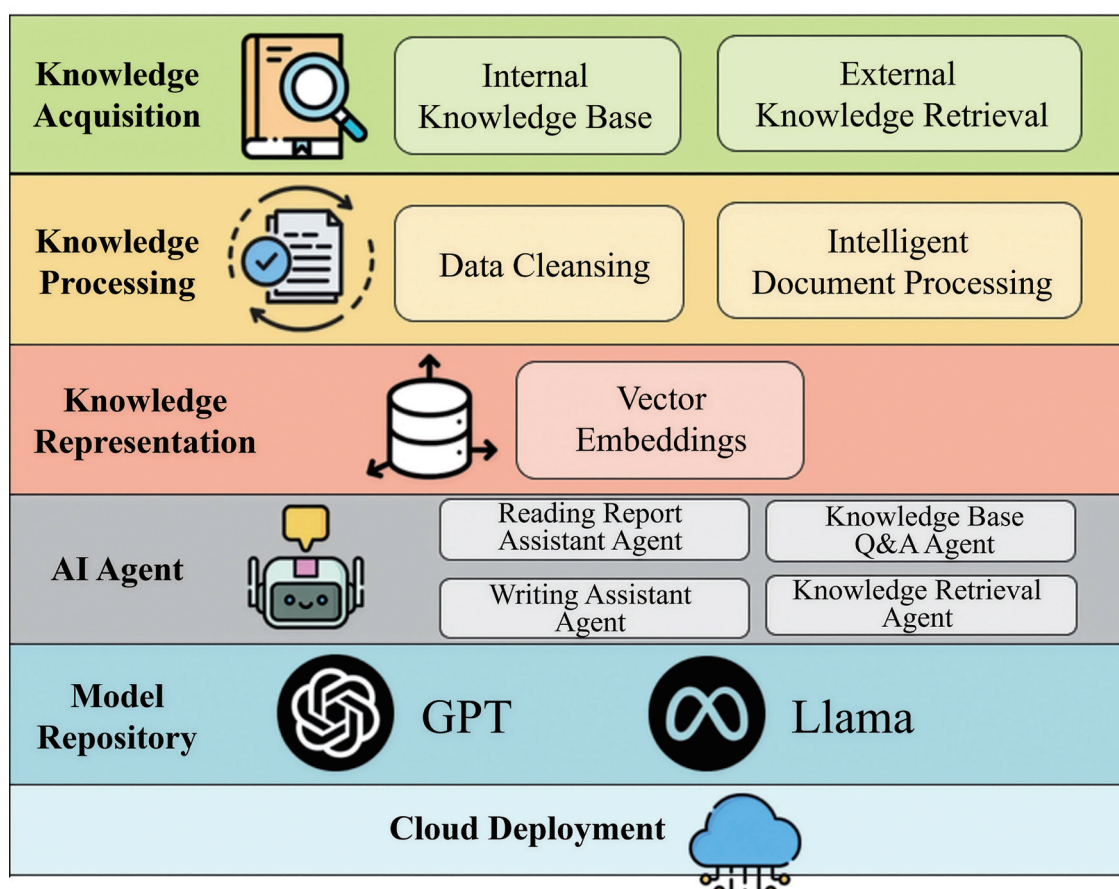


3. 應用與推廣

- (1) 舉辦「運輸研究決策支援 AI 應用服務」操作教學課程，引導同仁於業務中導入 AI 輔助，計 50 人參加。
- (2) 截至 114 年底，本所已有 69 位人員取得帳號，使用頻率與人數呈現穩定成長趨勢。

3. Technology Application and Promotion

- (1) The Institute organized an operational training program on the "Transportation Research Decision Support AI Application Service" to encourage the adoption of AI-assisted tools in routine business operations. A total of 50 staff members participated.
- (2) By the end of 2025, 69 staff members had been granted access accounts, and both the number of users and system usage showed steady growth.



System Architecture

（五）運輸包容性服務需求探討及功能設計規劃

1. 計畫概述

現行運輸資訊分散於不同平臺或網頁，使用者經常須轉換多個介面查詢交通資訊與預約服務，對高齡者、城際旅客、觀光旅客而言，使用門檻較高且不便。本所因應上述課題，於114年度運用雲端大語言模型（LLM）進行「交通 AI 代理人（AI Agent）」技術驗證。本計畫發展「AI Go」服務架構，透過簡單友善的自然語言互動方式，免除使用者目前在下載與學習公共運輸 APP 方面之數位落差，做為未來提供民眾交通一站式運輸資訊服務的重要技術基盤。

2. 主要研究成果

- (1) 實現 AI 自動化查詢公共運輸資訊：運用 Google Gemini 技術，使用者可透過自然語言輸入旅次起迄點，模型可解析語意，並自動化整合 API 回傳即時公車動態與靜態資訊，優化旅運規劃體驗。
- (2) 發展 AI 自動化計程車預約服務：運用 Microsoft Azure OpenAI 技術，使用者可透過自然語言叫車，模型可自動解析上車點、目的地、手機等必要資訊，並自動化完成計程車預約服務，補足公共運輸「最後一哩」接駁需求。

3. 應用與推廣

115 年 1 月 6 日於交通部例行記者會發布「跨域公共運輸資訊整合服務新紀元運研所完成 AI 驅動技術驗證」新聞稿。

(V) Exploration of Inclusive Transport Service Needs and Functional Design Planning

1. Project Overview

Currently, transportation information is scattered across different platforms and websites, requiring users to switch between multiple interfaces to search for travel information or make reservations. This process can be inconvenient and challenging, particularly for elderly users, intercity travelers, and tourists. To address these issues, the Institute conducted a technology validation project for a Transportation AI Agent in 2025 using cloud-based large language model (LLM) technology. The project developed the "AI Go" service framework, enabling users to access transportation information through intuitive natural language interactions. By eliminating the need to download and learn how to use multiple public transportation apps, the framework helps bridge the digital divide and provides an important technological foundation for future one-stop transportation information services.

2. Main Research Results

- (1) Developed an AI-powered public transportation information inquiry service using Google Gemini technology. Users can input trip origins and destinations using natural language, and the system automatically understands user intent and integrates APIs to deliver both static and real-time bus information, improving the convenience of trip planning.
- (2) An AI-powered taxi booking service was also developed using Microsoft Azure OpenAI technology. Users can request a taxi through natural language interaction; the system automatically identifies essential information such as pickup location, destination, and contact number, completes the reservation process, and helps bridge "last-mile" public transportation gaps.

3. Technology Application and Promotion

On January 6, 2026, the Institute published a news release at the MOTC's routine press conference titled "A New Era of Cross-Domain Public Transportation Information Integration Services – The Institute of Transportation Has Completed AI-Driven Technology Validation."





AI Go 自動化查詢公共運輸資訊及預約計程車示意圖

Illustration of the AI Go platform's automated public transportation information inquiry and taxi reservation capabilities



(六) 電動大客車智慧充電管理系統推廣與功能擴充 (1/2) — 系統導入輔導與共享充電服務機制規劃

1. 計畫概述

依據行政院2030年市區公車全面電動化之目標，交通部、經濟部與環境部持續協同辦理相關推動策略，本所自110年起陸續辦理電動大客車智慧充電管理系統之規劃、建置，於示範場域進行電動大客車智慧充電管理系統服務驗證，協助業者建立符合營運調度之場站充電管理策略並已有具體成效。

現況客運業者均以自行於鄰近車輛行駛路線端點站之調度站申請設置充電樁，滿足營運所需之充電需求；本所於113年已成功開發適用於跨站點應用之電動大客車智慧充電管理系統，後續將擴充應用至跨客運業者，達成相互備援以確保大眾運輸服務品質。

2. 主要研究成果

- (1) 完成電動大客車智慧充電管理系統共享充電服務示範場域規劃。
- (2) 完成電動大客車智慧充電管理系統之成果推廣與國際交流合作。

(VI) Promotion and Enhancement of the Smart Charging Management System for Electric Buses (1/2) – System Deployment Support and Planning of Shared Charging Service Mechanisms

1. Project Overview

In line with the Executive Yuan's objective of achieving full electrification of urban buses by 2030, the Ministry of Transportation and Communications, the Ministry of Economic Affairs, and the Ministry of Environment have continuously collaborated on promotional strategies. Since 2021, the Institute has carried out the planning and implementation of a smart charging management system for electric buses and validated its performance at demonstration sites. The system has enabled operators to establish charging management strategies that support operational scheduling needs and has produced measurable benefits.

Currently, bus operators independently apply to install charging piles at dispatch stations near route terminals to meet their operational charging needs. In 2024, the Institute successfully developed a Smart Charging Management System for Electric Buses capable of supporting cross-station operations. Future efforts will expand its application across different bus operators to achieve mutual backup capabilities and helping maintain service quality in public transportation operations.

2. Main Research Results

- (1) Completed the planning of demonstration sites for the shared charging service of the smart charging management system for electric buses.
- (2) Completed the outcome promotion and international collaboration for the electric bus smart charging management system.

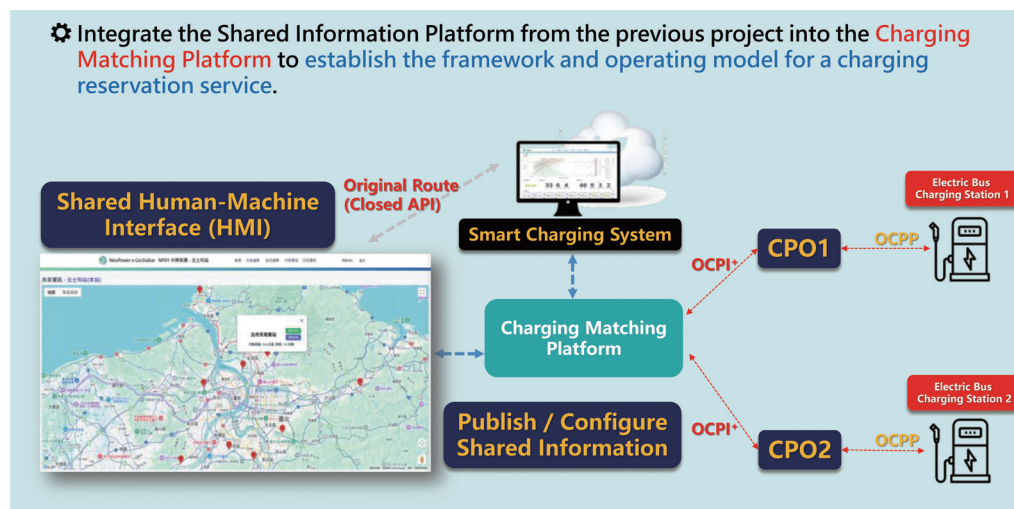


3. 應用與推廣

- (1) 於2025年智慧城市展暨淨零城市展辦理「智慧淨零—2025電動大客車智慧充電論壇」，邀請中央及地方交通主管機關與產業界代表等，計有超過110名國內外人士報名參加，針對電動大客車智慧充電與未來發展執行面相關議題進行交流討論，做為後續全面推廣之重要參據。
- (2) 於「中華民國運輸學會2025年會暨學術論文國際研討會」，本所針對「電動公車智慧充電管理系統之推廣應用與共享服務規劃」進行專題與談。

3. Technology Application and Promotion

- (1) The Institute hosted the "Smart Net-Zero: 2025 Smart Charging Forum for Electric Buses" during the 2025 Smart City Summit & Expo and Net Zero City Expo. The forum brought together representatives from central and local transportation authorities, industry stakeholders, and international participants, with more than 110 attendees registered. Discussions focused on smart charging technologies for electric buses and practical considerations for future implementation and development, providing valuable references for nationwide promotion efforts.
- (2) At the "2025 International Conference and Annual Meeting of the Chinese Institute of Transportation," the Institute delivered a featured discussion on the "Promotion and Application of the Smart Charging Management System for Electric Buses and the Planning of Shared Charging Services."



系統功能與架構擴充
System functions and structural expansion

(七) 港區設施智慧化巡查技術研發

1. 計畫概述

考量我國商港區域幅員廣大，人力有限，如何快速掌握港區各項設施使用狀況，並確保環境及設施安全穩定，實為重要施政課題。近年無人移動載具技術日益成熟，具備高度移動性及遠距自動導控功能，若能搭配現代化之感測與高速通訊技術，則可即時獲取大量空間觀測資訊。

同時，人工智慧技術透過適當的訓練程序與學習策略，能對大量數據進行快速的分析與判斷，若能有效整合無人載具影像與各式空間資訊，針對特定應用標的導入適當的影像辨識學習技術，並以港區實際案例進行驗證，便能建立智慧港區之示範管理方案。因此，本所應用無人飛行載具研發港區影像智慧監測技術，俾快速且高效率的針對人員不易巡查之區域詳實紀錄影像，並結合適當的機器學習以自動化辨識設施類型之損壞及異常情形，針對港區重要設施進行巡查與管理，達到應用創新科技，提升智慧化管理之目標。

2. 主要研究成果

- (1) 建立港區無人移動載具之多維度空間資訊蒐集技術。
- (2) 完成港區高解析空間影像蒐集與三維地形模型建構。
- (3) 分析各種無人飛行載具，並評估其飛行能力及可應用之範圍。
- (4) 開發人工智慧（AI）影像辨識技術，針對重要設施（如岸邊設施、港區道路設施及港區變電箱等設施）啟動自動化巡查及管理。
- (5) 發展港區多來源感測資料之整合及智慧化演算技術。
- (6) 建置空間資訊整合分析平台，發展以高速傳輸方式將影像資料即時回傳平台，且進行自動判讀之完整資料處理流程，建立港區智慧化管理行動機制。

(VII) Smart Inspection Technology Development for Harbor Facilities

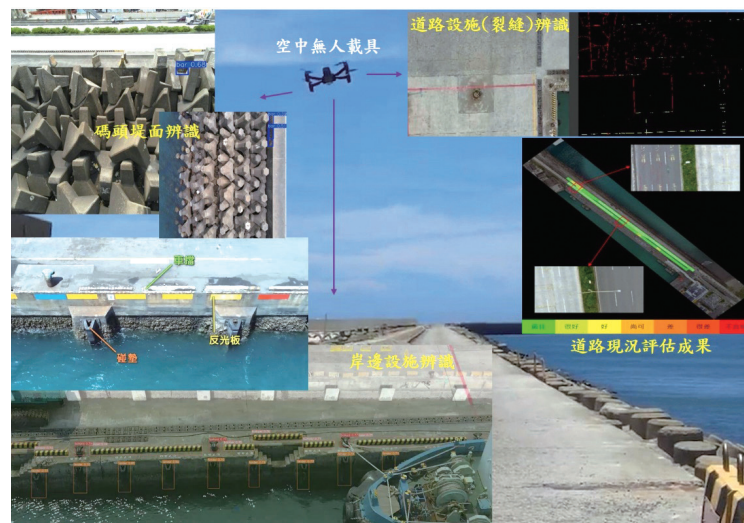
1. Project Overview

Considering the vast area of commercial ports in Taiwan and the limited manpower available, it is crucial to quickly grasp the usage status of various port facilities and to inspect the usage environment, safety, and stability of port facilities. With the continued advancement of unmanned vehicle technologies, these platforms now offer enhanced mobility and remote autonomous operation capabilities. Combined with modern sensing and high-speed communication technologies, they can efficiently collect substantial amounts of spatial observation data in real time.

AI technologies can perform rapid analysis and decision-making based on large datasets when supported by appropriate training methodologies and learning mechanisms. By integrating imagery from unmanned vehicles with spatial information datasets and applying image recognition technologies to specific operational targets, validated through port-area demonstration cases, a smart port management framework can be developed. To support this objective, the Institute has developed smart image monitoring technologies for port areas using unmanned aerial vehicles. The approach enables efficient image collection in locations that are difficult to inspect manually and applies machine learning techniques to automatically detect facility damage and abnormal conditions. The system supports the inspection and management of critical port facilities and promotes smarter management practices through technological innovation.

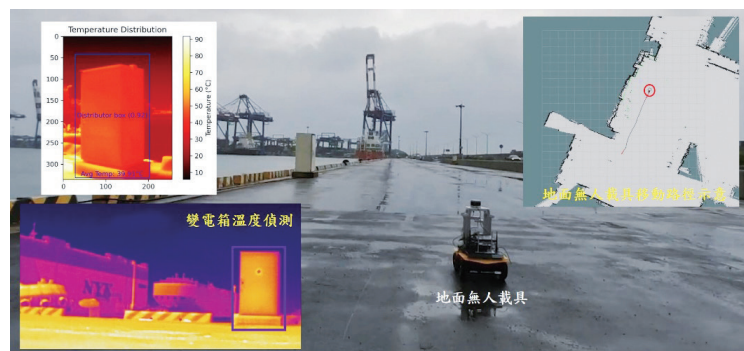
2. Main Research Results

- (1) Established multidimensional spatial data collection technologies for unmanned vehicles operating within port environments.
- (2) Completed high-resolution spatial image acquisition and three-dimensional terrain model development for port areas.
- (3) Conducted analyses of various unmanned aerial vehicle platforms and assessed their operational capabilities and potential application ranges.
- (4) Develop artificial intelligence (AI) image recognition technologies to automate the inspection and management of key port facilities, including waterfront infrastructure, roadway facilities, and electrical distribution cabinets.
- (5) Establish smart technologies for the integration and analysis of multi-source sensing data collected within port environments.
- (6) Establish a spatial information integration and analysis platform that supports real-time image transmission, automated image interpretation, and end-to-end data processing, enabling a smart operational mechanism for port management.



應用空中無人載具發展港區設施（岸邊及道路設施）影像辨識技術

Apply unmanned aerial vehicle technologies to develop image recognition capabilities for port facilities, including waterfront and roadway infrastructure



應用地面無人載具偵測港區變電箱溫度

Apply ground-based unmanned vehicles to monitor the temperature of electrical distribution cabinets within port areas

3. 應用與推廣

- (1) 114年11月於第47屆海洋工程研討會暨國際能源論壇發表論文「應用於港區巡檢之無人載具影像串流與物件辨識架構設計－以臺北港為例」。
- (2) 114年11月9日辦理「港區無人機智慧化巡查技術研發成果」教育訓練暨成果推廣，分享本所研發之港區無人載具及操控邏輯技術、影像自動化偵測技術（以臺北港為例）及系統平台功能操作等研究成果。
- (3) 研究成果可協助臺灣港務股份有限公司瞭解如何以自動化方式掌握港區之使用狀況與異動，並在人力持續簡化的長期趨勢之下，確保港區營運管理品質，並落實智慧化管理。

3. Technology Application and Promotion

- (1) In November 2025, a paper titled "Design of An Unmanned Vehicle Framework for Real-Time Image Streaming and Object Recognition in Port Inspections: A Case Study of the Port of Taipei" was presented at the 47th Ocean Engineering Conference and International Energy Workshop.
- (2) On November 9, 2025, an education training session and achievement presentation for "R&D Outcomes of Smart Port UAV Inspection Technology" were conducted. The event shared the Institute's research findings, including port unmanned vehicle and control logic technology, and automated image detection technology (taking the Port of Taipei as an example), and system platform functional operations.
- (3) The research results can assist Taiwan International Ports Corporation in understanding how to grasp port usage and changes in an automated manner, ensuring the quality of port operation and management in the long term under the trend of continuous manpower simplification, and implementing smart management.

(八) 船舶特高頻資料交換系統之技術發展

1. 計畫概述

本計畫以我國船舶特高頻資料交換系統(VDES)的開發與應用評測為核心，旨在應對近二十年來因船舶自動識別系統(AIS)普及所導致VHF數據鏈路負載過重問題。AIS雖能提供即時資訊，但隨著大量部署與擴展應用，其通訊壓力日益增加，加上傳統系統存在通訊範圍受限、頻率利用效率低及易受干擾等瓶頸，導致海上事故仍時有所聞。VDES為AIS的擴充版本，解決既有通訊限制，透過有效的船舶間與岸端資料交換，提升航行安全及海上作業與航運效率，本計畫目標在於建立船舶資料解析與整合能力，並建構專屬資料庫與測試平台，以優化資訊交換效率。研究從蒐集國際航標協會(IALA)、國際電信聯盟(ITU)及國際海事組織(IMO)等國際規範標準(如ITU-R M.2092等)展開，逐步推展至系統訊號擷取及編解碼程式開發。透過實海域船對船、船對岸測試驗證，發展出符合國際標準且具備高穩定性的通訊解決方案，為我國海域船舶航安監測及管理提供前瞻性技術支撐。

2. 主要研究成果

- (1) 完成彙整國外VDES系統發展與應用技術，整合新一代船舶通訊設備與電子海圖資料庫，並結合現有的VDES設備與電子海圖顯示與資訊系統(ECDIS)，完成VDES測試站的基礎建置，提供國內發展需求與可行性應用參考。
- (2) 系統性研析完成VDES相關國際標準與技術規範，涵蓋ITU、IALA及IMO等重要文件，建立我國VDES系統開發基礎，完成訊號擷取、接收與編解碼技術開發，使VDES資料封包解析可符合國際規範，並成功整合現行AIS系統，提升船舶通訊資料處理與交換能力。
- (3) 完成VDES解碼資料庫平台建置，可即時整合AIS、特定應用訊息(ASM)與數據交換(VDE)資料，支援船舶動態監測及定向指令傳送，透過實海域船對船與船對岸鏈路測試，已驗證系統在實際環境下之穩定性、正確性與整合效能，成果可做為推動智慧航安監測與VDES應用之重要參考。

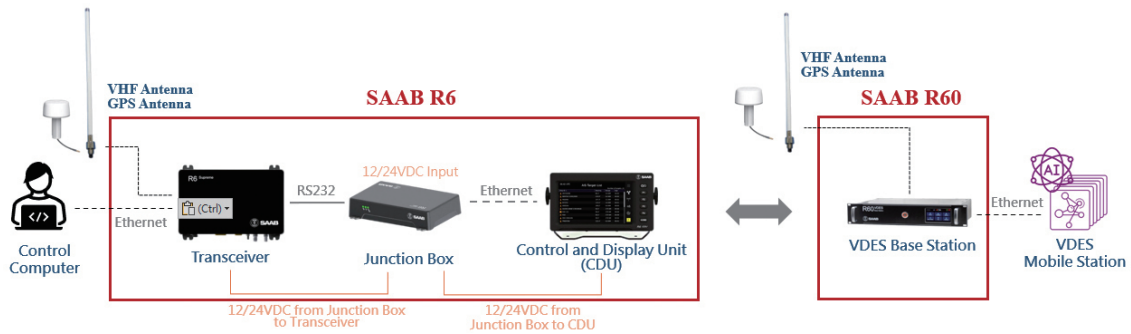
(VIII) Technical Development of the Vessel VHF Data Exchange System

1. Project Overview

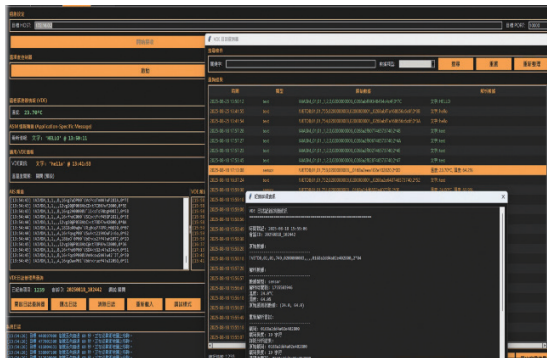
This project centers on the development and performance evaluation of Taiwan's Vessel VHF Data Exchange System (VDES). The primary objective is to address the increasing congestion of VHF data links resulting from the widespread use of the Automatic Identification System (AIS) over the past two decades. While AIS provides essential real-time vessel information, increasing deployment density and expanding application requirements have substantially increased communication loads. Furthermore, traditional systems are constrained by limited communication coverage, low spectrum efficiency, and vulnerability to interference, which continue to pose challenges to maritime safety. VDES extends the capabilities of AIS by overcoming existing communication limitations and facilitating more effective data exchange between vessels and shore-based stations. These enhancements improve navigational safety, maritime operational efficiency, and shipping performance. The project aims to establish vessel data processing and integration capabilities, as well as a dedicated database and testing platform to optimize information exchange efficiency. The study began with a comprehensive review of international standards issued by organizations such as the International Association of Marine Aids to Navigation (IALA), the International Telecommunication Union (ITU), and the IMO, and progressed to the development of signal acquisition, encoding, and decoding technologies. Through ship-to-ship and ship-to-shore field testing in actual maritime environments, the project developed a highly stable communication solution that complies with international standards, providing advanced technological support for vessel traffic safety monitoring and maritime management in Taiwan's waters.

2. Main Research Results

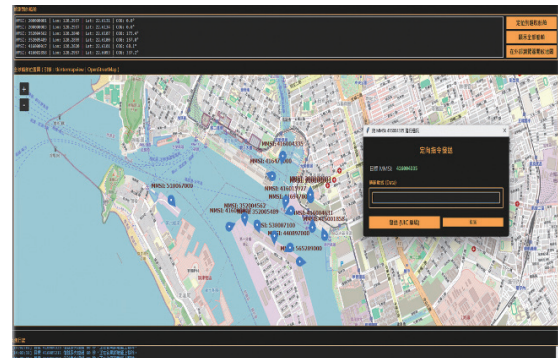
- (1) The project completed the consolidation of foreign VDES system development and application technologies, integrating next-generation ship communication equipment and electronic chart databases. Combined with existing VDES equipment and the Electronic Chart Display and Information System (ECDIS), this establishes the foundation for a VDES testing station to provide a reference for evaluating domestic demand and feasibility.
- (2) A comprehensive review of international VDES standards and technical specifications was completed, covering major documents issued by the ITU, IALA, and IMO. The project established the technical foundation for domestic VDES development and completed the development of signal acquisition, reception, encoding, and decoding technologies. VDES data packet parsing was implemented in accordance with international standards, and integration with the existing AIS system was successfully achieved to improve vessel communication data processing and exchange capabilities.
- (3) A VDES decoded-data database platform was established to support the real-time integration of AIS, Application-Specific Message (ASM), and VHF Data Exchange (VDE) data. The platform enables vessel movement monitoring and directed message transmission. Field validation through ship-to-ship and ship-to-shore testing confirmed the system's operational stability, accuracy, and integration effectiveness under real-world conditions, providing a foundation for future VDES applications and smart maritime safety management.



VDES 系統設備架構
Architecture of the VDES system equipment



即時解碼與功能操作
Real-time decoding and system operation functions



系統資料視覺化介面開發
Development of the system data visualization platform interface

3. 應用與推廣

- (1) 114年2月於港灣季刊130期發表「船舶特高頻資料交換系統與海氣象資訊之發展應用」。
- (2) 114年9月18日辦理專家學者座談會議，廣邀交通部航港局、中央氣象署、臺灣港務股份有限公司、海洋委員會海巡署、國家海洋研究院、產業研發機構及大專院校等專家學者，針對 VDES 技術發展及國際推動趨勢進行交流研討。
- (3) 114年11月27日於第47屆海洋工程研討會發表海報「基於 VDES 數據的注意力增強深度學習之船舶軌跡預測系統」。

3. Technology Application and Promotion

- (1) In February 2025, the paper "Development and Applications of the Vessel VHF Data Exchange System and Marine Weather Information" was published in Issue No. 130 of the Harbour Technology Quarterly Journal.
- (2) An expert consultation meeting was held on September 18, 2025, with participation from experts representing the Maritime and Port Bureau, MOTC; the Central Weather Administration; Taiwan International Ports Corporation, Ltd.; the Coast Guard Administration of the Ocean Affairs Council; the National Academy of Marine Research; research institutes; and universities and colleges. Participants exchanged views on VDES technological developments and international implementation trends.
- (3) On November 27, 2025, the poster "Vessel Trajectory Prediction System Based on Attention-Enhanced Deep Learning Using VDES Data" was presented at the 47th Ocean Engineering Conference.

(九) 港區海象觀測與船舶偵測之雷達監測技術研發

1. 計畫概述

港區海象觀測與船舶偵測受大氣、地形、水深及近岸結構物等因素影響，變化複雜多樣，傳統海象觀測設備如浮標及底碇波流儀，僅能提供單點資訊，且海上佈放與維護不易，相較之下，微波雷達及高頻雷達等岸基遙測技術進行港區海象觀測與船舶偵測，可獲取平面波流場資料，並能於岸基進行維護作業，降低人員職業安全風險與提升觀測效益。自2001年起美國國家研究委員會（National Research Council）建議發展高經濟效益之岸基雷達遙測系統，對海洋進行長期且高解析度觀測，以深入了解商港近海環境，並彌補港區觀測資料之差距。本所已於臺中港建置高頻海洋陣列雷達觀測系統，並於臺北港建置微波雷達觀測系統，研發雷達監測技術，建構商港平面海象觀測網絡，利用不同雷達設備擷取回波訊號，可分別演算約40公里遠域及約3公里近域之平面波浪、海流與船舶偵測資訊，輔助現行港區觀測作業，強化觀測資料品質管理，支援港灣營運及船舶操航安全。

2. 主要研究成果

- (1) 研發海洋陣列雷達監測技術，確保海表面流場與波浪資訊之即時監測能力，並透過跨領域研究機制推動數據智慧化，完善港灣設施的防災數據體系。
- (2) 發展商港智慧環境監測技術及預警模式，利用臺中港海洋陣列雷達訊號，進行海洋陣列雷達船舶辨識技術研發，船舶辨識資料分析與驗證、結合機器學習分析船舶辨識與可行性。
- (3) 投入臺中港外海進行漂流浮標軌跡追蹤試驗，蒐集海流與波浪等海象資料，並實測結果與高頻陣列雷達演算資料進行比對分析，優化觀測效能。
- (4) 舉辦「2025海象雷達遙測工作坊」，促進航港單位與產官學研單位海洋陣列雷達監測技術交流，持續發展港區海象監測與分析技術。

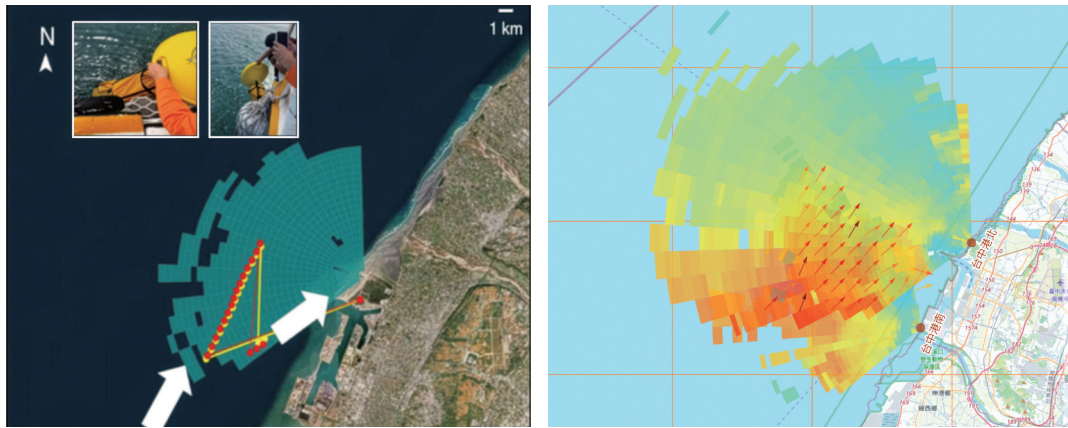
(IX) Research and Development of Radar Monitoring Technologies for Harbor Metocean Observation and Vessel Detection

1. Project Overview

Metocean observation and vessel detection in port areas are highly complex and dynamic due to atmospheric conditions, topography, water depth, and nearshore structures. Conventional observation tools like buoys and bottom-founded current meters are limited to point-source information and are difficult to deploy and maintain at sea. Compared to these traditional methods, land-based remote sensing technologies, such as microwave and high-frequency radars, offer a superior solution. They capture full-plane wave and current field data, and because maintenance is conducted safely on shore, they help minimize occupational hazards while boosting overall observation efficiency. Recognizing these advantages, the National Research Council recommended the development of cost-effective shore-based radar observation systems as early as 2001 to support long-term, high-resolution monitoring of coastal environments and improve data availability for commercial ports. The Institute has deployed a high-frequency ocean radar array observation system at the Port of Taichung and a microwave radar observation system at the Port of Taipei. These systems support the establishment of a harbor metocean observation network. By processing the echo signals collected from different radar systems, wave, current, and vessel detection information can be obtained over ranges of approximately 40 km offshore and 3 km nearshore. The resulting data enhance observation data quality management and support port operations and navigational safety.

2. Main Research Results

- (1) Developed ocean radar array monitoring technologies to enhance real-time observation capabilities for sea-surface currents and wave conditions. Through cross-disciplinary research efforts, the project advanced smart data applications and strengthened the disaster prevention data infrastructure supporting port facilities.
- (2) Developed smart environmental monitoring and warning technologies and early warning models for commercial ports. Utilizing ocean radar array data collected at the Port of Taichung, the project carried out research on vessel detection and identification technologies, including data analysis, validation, and machine learning-based vessel identification analysis and feasibility assessments.
- (3) Drifting buoy tracking experiments were conducted in offshore waters near the Port of Taichung to collect ocean current and wave data. The measured results were compared with outputs generated by the high-frequency radar array system to verify performance and improve observation performance.
- (4) The "2025 Metocean Radar Remote Sensing Workshop" was held to promote technical exchange on ocean radar array monitoring technologies among maritime agencies, government organizations, industry representatives, academic institutions, and research organizations, supporting the ongoing development of harbor metocean monitoring and analysis technologies.



海洋雷達校正試驗驗證及流場展示成果圖

Ocean radar calibration and validation test results, including current field visualization displays



2025 年海象雷達遙測工作坊情形

Activities and proceedings of the 2025 Metocean Radar Remote Sensing Workshop

3. 應用與推廣

- (1) 114年11月28日於第47屆海洋工程研討會發表論文「探討高頻陣列雷達海象觀測方向波譜之風湧浪分離方法與特性分析」。
- (2) 114年11月28日於第47屆海洋工程研討會發表論文「國家整合海洋雷達觀測網」。
- (3) Validation and Quality Assessment of High Frequency Radar Ocean Current Observations in Taiwan, 2025 ICEO&SI Conference, July 4, 2025.
- (4) 114年8月6日舉辦「微波及陣列雷達檢校與維護」教育訓練課程。
- (5) 114年9月23日舉辦「2025年海象雷達遙測工作坊」。

3. Technology Application and Promotion

- (1) On November 28, 2025, presented the paper "Wind Wave and Swell Separation for HF Phased-Array Radar Directional Wave Spectra: Methods and Characteristics Analysis" at the 47th Ocean Engineering Conference.
- (2) Presented the paper titled "National Integrated Ocean Radar Observation Network" at the 47th Ocean Engineering Conference on November 28, 2025.
- (3) Validation and Quality Assessment of High Frequency Radar Ocean Current Observations in Taiwan, 2025 ICEO&SI Conference, July 4, 2025.
- (4) Conducted an educational training course on "Calibration, Verification, and Maintenance of Microwave and Phased-Array Radars" on August 6, 2025.
- (5) "2025 Metocean Radar Remote Sensing Workshop" was held on September 23, 2025.

（十）推動港灣設施維護管理 E 化

1. 計畫概述

港灣設施（包含碼頭、防波堤、道路、橋梁等）數量眾多，由於長期處於嚴峻海洋環境，導致構件出現劣化與損壞，弱化其使用性能和設施使用年限。

本計畫協助臺灣港務股份有限公司、金門縣港務處及連江縣港務處，客製化建置並維運「港灣設施維護管理系統」及「巡查行動應用程式（APP）」，執行過程依使用者建議，持續擴充各項功能模組，自上線至今，已納管國際及國內商港多種類型之港灣設施，並取代過去紙本表單記錄方式和人工填寫及校對等繁重作業，成功推動我國港灣設施維護管理 E 化，確保港灣設施之使用安全及永續發展。

2. 主要研究成果

- （1）港灣設施維護管理系統已建置多項功能模組，可完整支援港灣設施維護管理各項流程（包含設施基本資料建立、巡查檢測工作執行、劣化記錄及維修維護送審等）。
- （2）系統可透過數值化、圖表化儀表板，主動呈現港灣設施資訊，俾掌握所轄港灣設施之巡查、維修狀態，有助管理者掌握設施動態及支援維護管理決策。

(X) Promote the Digital Transformation of Port Facility Maintenance Management.

1. Project Overview

Port facilities (including wharves, breakwaters, roads, and bridges) are exposed to harsh marine environments throughout their service life. Such conditions can lead to deterioration and damage of structural components, affecting operational performance and shortening facility service life.

The project supports Taiwan International Ports Corporation, Ltd., the Kinmen and Lienchiang County Harbor Bureaus through the customized development, deployment, and maintenance of a Port Facility Maintenance Management System and an Inspection Mobile App. System functions have been continuously enhanced based on user requirements. Since implementation, the system has been applied to a wide range of facilities at both international and domestic commercial ports, replacing paper-based workflows and reducing the administrative burden associated with manual recordkeeping and verification. These efforts have promoted the digital transformation of port facility maintenance management in Taiwan and enhanced facility safety and sustainability.

2. Main Research Results

- （1）Numerous functional modules have been incorporated into the Port Facility Maintenance Management System to support the complete maintenance management workflow, including facility data management, inspection operations, deterioration recording, and repair and maintenance approval procedures.
- （2）The system utilizes digital and graphical dashboards to provide real-time facility information, allowing managers to track inspection and maintenance activities and supporting informed maintenance management decisions.





港灣設施維護管理系統儀表板
Port Facility Maintenance Management System dashboard

(3) 巡查行動應用程式 (APP) 可直接以影像方式記錄現場設施劣化狀況並上傳至系統，便於快速掌握設施損害狀況並縮短資訊傳達時間。

(3) The Inspection Mobile Application (APP) allows field personnel to record facility deterioration through photographs and upload the information directly to the system, enabling rapid identification of damage conditions and more efficient information sharing.



巡查行動應用程式 (APP) 介面
Inspection Mobile Application (APP) interface

- (4) 配合應用單位巡查、檢測及維護實務需求，針對港灣設施巡查檢測技術問題、管理制度與劣化判定標準，制定港灣設施維護管理手冊並持續滾動檢討修訂。

3. 應用與推廣

- (1) 114年10月30日、11月11日及11月13日完成3場次教育訓練，參與單位包括臺灣港務股份有限公司、金門縣'與連江縣港務處等，並彙整參與者回饋意見，做為後續系統及 APP 功能擴充及精進之參據。
- (2) 持續協助港灣設施維護管理單位落實相關工作，以確保港灣設施功能及營運之安全，並提升港埠服務品質與競爭力，達到永續經營之目標。

- (4) To support the operational requirements of facility inspection, evaluation, and maintenance, establish a Port Facility Maintenance Management Manual covering port facility inspection technologies, management frameworks, and deterioration assessment standards, with periodic reviews and revisions to ensure its continued effectiveness and relevance.

3. Technology Application and Promotion

- (1) Three training programs were conducted on October 30, November 11, and November 13, 2025. Participants included representatives from Taiwan International Ports Corporation, Ltd., the Harbor Bureau, Kinmen County, and the Harbor Bureau of Lienchiang County. Feedback collected during the training sessions has been incorporated as a reference for future system and mobile application enhancements.
- (2) Ongoing support is provided to port facility maintenance agencies to facilitate the effective implementation of maintenance management activities, thereby ensuring facility safety and operational reliability while enhancing port service quality, competitiveness, and sustainable development.



教育訓練上課情形

Education and training implementation status



三 打造便捷及韌性交通網絡

(一) 運輸規劃支援系統維運技術服務 (114 年)

1. 計畫概述

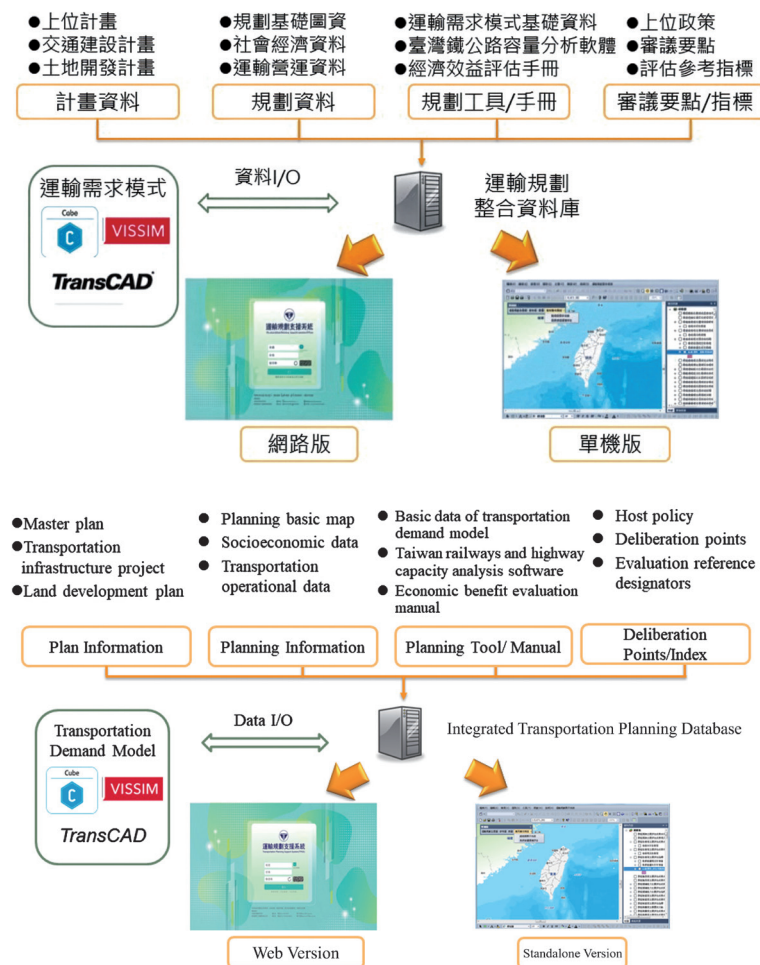
本所長期辦理臺灣地區整體運輸規劃，累積了許多運輸規劃作業所需資料，為能有效保存資料，觀察全臺運輸市場趨勢，協助政策評估，自96年起辦理「運輸部門中長程計畫審議決策支援系統與整合資料庫建置之研究」案，完成運輸規劃支援系統之建置，包含運輸規劃整合資料庫、運輸規劃支援系統(網路版)及運輸規劃圖展示及出圖作業系統(單機版)，如下圖。

III Creating a Convenient and Resilient Transportation Network

(I) Maintenance Service of the Transportation Planning Support System (2025)

1. Project Overview

The institute has been conducting overall transportation planning for the Taiwan area for a long time and has accumulated a wealth of data required for transportation planning operations. To effectively preserve this data, observe trends in the transportation market across Taiwan, and assist with policy evaluations, we have been handling "Research on the Establishment of a Medium- and Long-term Plan Review Decision Support System and Integrated Database for the Transportation Department" since 2007. This project has resulted in the establishment of a transportation planning support system, which mainly includes: 1. An integrated transportation planning database; 2. A transportation planning support system (web version); 3. A transportation planning map display and printing system (standalone version).



運輸規劃支援系統架構

Structure of the transportation planning support system

2. 主要研究成果

- (1) 本系統以內政地理資訊圖資雲整合服務平臺（TGOS）所提供豐富多樣之底圖為圖臺，與自行數位化產製交通建設計畫、重大土地開發計畫圖資，結合社會經濟、運輸營運、運輸需求模式資料，計畫評估工具等，提供公部門、學術單位快速查詢、取得運輸規劃作業所需相關圖資及數據。
- (2) 整合高公局國道、公路局省道之交通量及文化部、水利署、農業部、國家公園、國土署等單位 Open Data，透過底圖疊合、查詢點位視覺化，提供使用者快速查詢、取得所需相關資訊。
- (3) 114 年完成國省道需求流率／容量（V/C）比數據視覺化地圖及歷年各運具屏柵線需供比視覺化地圖。

3. 應用與推廣

- (1) 114 年 6 月 25 日及 10 月 22 日辦理「運輸規劃支援系統」教育訓練。
- (2) 114 年度使用本系統圖資資料，協助交通部完成由經濟部、國發會及國科會等部會共同規劃之「首都圈黃金廊帶」、「中部精密智慧新核心」、「東部慢活城鄉」推動方案之交通運輸路網配套措施，並由經濟部及相關部會共同推動執行，完善「均衡台灣」產業園區交通運輸路網。

2. Main Research Results

- (1) The system uses the diverse base maps provided by Taiwan Geospatial One Stop (TGOS) as its mapping platform, combining these with our self-produced digital maps of transportation construction projects, major land development project maps, socio-economic data, transportation operation data, transportation demand model data, and project evaluation tools. It enables the public sector and academic institutions to quickly query and obtain relevant maps and data necessary for transportation planning operations.
- (2) It integrates traffic volumes from the Freeway Bureau of the Ministry of Transportation and Communications, the provincial road data from the Highway Bureau, and open data from the Ministry of Culture, the Water Resources Agency, the Ministry of Agriculture, national parks, and the National Land Surveying and Mapping Center. Through map overlay and query point visualization, it provides users with quick access to the required information.
- (3) In 2025, the project completed the data visualization maps for national and provincial highway volume-to-capacity (V/C) ratios, as well as the historical multi-year visualization maps for transport mode screen line demand-supply ratios.

3. Technology Application and Promotion

- (1) On June 25 and October 22, 2025, educational training sessions for the "Transportation Planning Support System" were conducted.
- (2) In 2025, spatial data maintained by this system were used to support the MOTC in developing transportation network improvement measures associated with the "Golden Corridor of the Capital Region," "Central Precision Smart Innovation Hub," and "Eastern Slow-Living Urban – Rural Development" programs jointly planned by the MOEA, the National Development Council, the National Science and Technology Council, and other agencies. The resulting transportation initiatives are being implemented collaboratively to enhance industrial park connectivity under the "Balanced Taiwan" policy framework.



(二) 高速公路交織路段容量及服務水準研究

(3/3) — 銜接系統交流道交織路段暨容量手冊研訂

1. 計畫概述

本所分別於民國79年、90年及110年陸續出版並更新「臺灣地區公路容量手冊」，惟其中第七章「高速公路交織路段」之分析方法，仍沿用美國運輸研究委員會（Transportation Research Board, TRB）於1985年公路容量手冊所提出之分析架構；然該方法於後續美國公路容量手冊版本中已多次修訂，顯示原有分析模式有再檢討之必要。

由於過去國內長期未系統性蒐集高速公路交織路段之本土實測資料，亦缺乏對交織路段車流特性之實證分析，致使現行容量與服務水準分析方法之適用性尚未獲得充分驗證，爰辦理本計畫，針對高速公路交織路段之車流運作特性、容量估算及服務水準分析方法進行深入探討。

本計畫於民國114年完成銜接系統交流道交織路段之研究工作，並於兩處路段辦理交織路段現場調查。其中以國道3號南下霧峰至霧峰系統路段為例，其調查拍攝畫面如下圖所示。本研究除分析114年度銜接系統交流道交織路段之調查成果外，亦一併彙整民國112年及113年典型與非典型交織路段之研究成果，據以研擬符合國內高速公路實際車流特性之交織路段分析方法，做為後續修訂「公路容量手冊」第七章「高速公路交織路段」之依據。

(II) Analysis of Traffic Capacity and Level of Service of Freeway Weaving Segments (3/3) – Freeway System Interchange Weaving Sections and Capacity Manual Development

1. Project Overview

The institute published and updated the "Taiwan Highway Capacity Manual" (THCM) in 1990, 2001, and 2021. However, Chapter 7, "Freeway Weaving Segments," still adopts the analysis method from the 1985 Highway Capacity Manual (HCM) by the U.S. Transportation Research Board (TRB), which classifies weaving segments into three types. Still, the chapter focuses only on one of them. Since the 1985 TRB method has been found unsuitable for the U.S. context, later versions of the HCM have updated their methodologies. As subsequent editions have introduced substantial revisions, a comprehensive review of the existing methodology is warranted.

Because Taiwan has historically lacked a systematic database of field observations for freeway weaving sections and corresponding empirical analyses of traffic flow characteristics, the applicability of current capacity and level-of-service methodologies has not been fully verified. This project therefore examines traffic operations, capacity estimation methods, and level-of-service assessment approaches for freeway weaving sections.

Research on system interchange weaving sections was completed in 2025, including field surveys conducted at two weaving-section locations. The southbound section between Wufeng Interchange and Wufeng System Interchange on National Freeway No. 3 was selected as one of the survey sites, and the captured survey footage is shown in the figure below. The study integrates findings from the 2025 investigation of system interchange weaving sections with research results from 2023 and 2024 covering both typical and atypical weaving configurations. The resulting analysis framework is intended to support future revisions to Chapter 7, "Freeway Weaving Sections," of the Taiwan Highway Capacity Manual.



國道3號南下霧峰至霧峰系統路段空拍畫面

Aerial footage of the southbound section between Wufeng Interchange and Wufeng System Interchange on National Freeway No. 3

2. 主要研究成果

- (1) 完成國內外高速公路交織路段之文獻回顧，並據以擬定研究方法。
- (2) 完成2處現場調查，分別為國3南下霧峰～霧峰系統、國3南下寶山～新竹系統，並透過無人機及影像辨識技術取得車流軌跡資料，以了解車流行為。
- (3) 完成交織路段之分析方法，並完成臺灣公路容量手冊「高速公路交織路段」第七章初稿。

3. 應用與推廣

- (1) 於2025年會暨學術論文國際研討會發表「高速公路匝環道容量分析初探」論文。
- (2) 辦理專家學者座談會討論高速公路交織路段分析程序。

(三) 環島城際鐵路網容量分析研究 (1/2) — 容量參數資料建置

1. 計畫概述

本所自民國92年起即持續推動鐵道容量分析相關研究，所建構之傳統暨區域鐵路容量分析方法與工具已漸趨完備，惟過往研究尚未針對環島路網進行整體容量分析；同時，容量分析所需參數之蒐集與整理流程繁複，影響實務應用之效率，爰辦理本計畫，針對環島城際鐵路網容量分析所需參數進行蒐集與彙整，建置容量參數資料庫，並進行實務分析。

本計畫於民國114年針對臺鐵環島路網，系統性蒐集容量分析所需之各項基礎資料，並將原始資料轉化為容量分析之輸入參數，進行環島鐵路路網之初步容量分析，辨識路網中之關鍵瓶頸區段與場站。此外，亦規劃容量參數資料庫之整體架構、系統功能、使用者介面等設計，未來資料庫與容量分析軟體整合應用架構下圖所示，相關研究成果將做為第2年期研究之重要基礎。

2. Main Research Results

- (1) The project conducted a comprehensive review of domestic and international studies on freeway weaving sections and established the research framework and methodology for this project.
- (2) Completed field surveys at two freeway weaving-section locations: the southbound Wufeng–Wufeng System Interchange section and the southbound Baoshan–Hsinchu System Interchange section on National Freeway No. 3. UAVs and image recognition technologies were employed to obtain vehicle trajectory data for traffic behavior analysis.
- (3) Developed an analysis methodology for freeway weaving sections and completed the preliminary draft of Chapter 7, "Freeway Weaving Sections," of the Taiwan Highway Capacity Manual.

3. Technology Application and Promotion

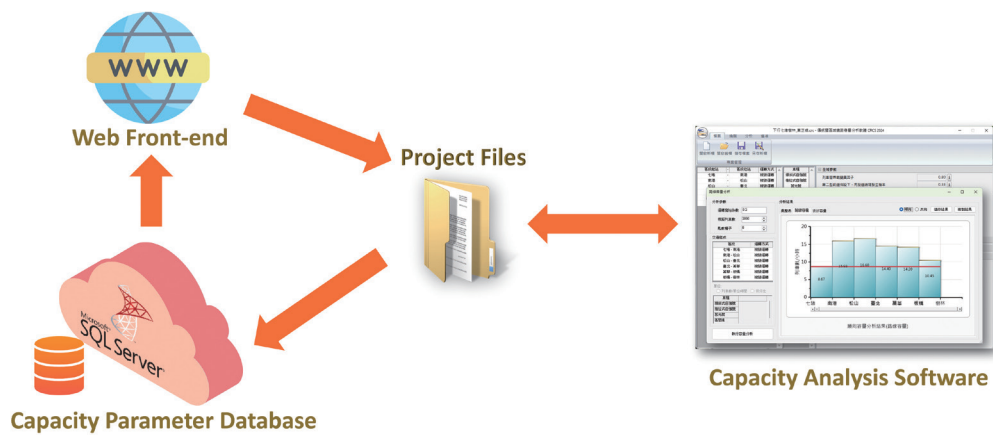
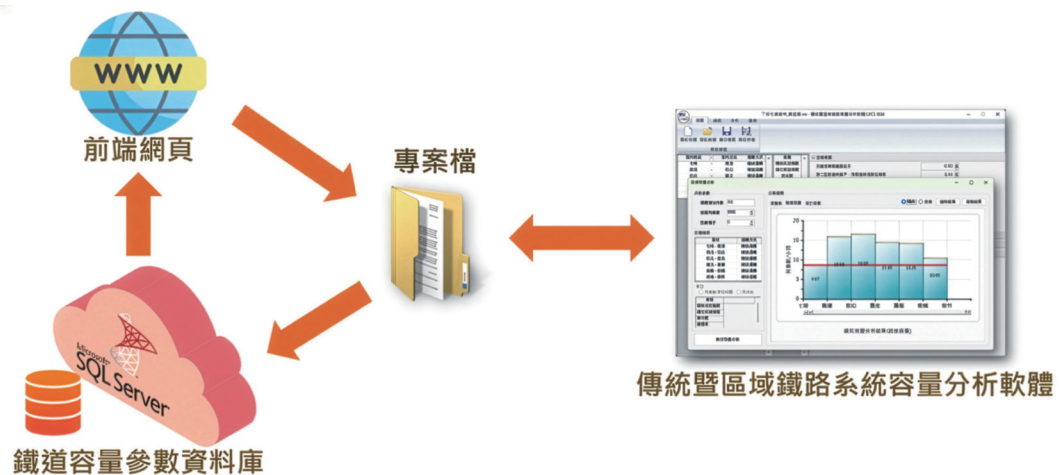
- (1) Presented the paper "A Preliminary Analysis of Freeway Ramp Loop Capacity" at the 2025 International Conference and Annual Meeting of the Chinese Institute of Transportation.
- (2) Convened an expert consultation meeting to discuss the analytical procedures and methodologies applicable to freeway weaving sections.

(III) Capacity Analysis of the Round-island Intercity Railway Network (1/2) – Establishment of Capacity Parameter Data

1. Project Overview

The Institute has been conducting railway capacity analysis research since 2003. Although capacity analysis methodologies and tools for conventional railway systems have been progressively developed, a comprehensive capacity assessment of Taiwan's round-island intercity railway network has not yet been undertaken. Furthermore, the collection and preparation of capacity analysis parameters involve extensive effort and complex procedures. Consequently, this project focuses on collecting and organizing the parameters required for round-island intercity railway network capacity analysis, establishing a dedicated capacity parameter database, and supporting practical analytical applications.

In 2025, the project systematically collected the data required for capacity analysis of the Taiwan Railways round-island network and transformed the raw data into input parameters for capacity analysis. A preliminary network capacity analysis was then performed to identify critical bottleneck segments and stations within the network. The project also completed the planning and design of the capacity parameter database, including its overall system architecture, functional modules, and user interface. The proposed integration framework between the database and capacity analysis software as shown in the figure below. The outcomes of this research will serve as an important basis for the second phase of the research program.



容量參數資料庫與容量分析軟體整合應用架構示意圖

Illustration of the integrated application framework for the capacity parameter database and capacity analysis software

2. 主要研究成果

- (1) 完成環島城際鐵路網容量分析所需參數蒐集，並辦理路線容量之初步分析。
- (2) 完成設計容量參數資料庫功能架構。

3. 應用與推廣

- (1) 於114年10月29日及10月31日辦理2次教育訓練。
- (2) 相關成果可提供交通部、鐵道局、臺鐵公司及各地方政府藉由鐵道容量參數資料庫取用一致的參數，並掌握環島鐵路網容量現況，做為推動相關城際鐵道建設計畫之決策參據。

2. Main Research Results

- (1) Completed the collection of capacity analysis parameters for the round-island intercity railway network and conducted preliminary route capacity analyses.
- (2) Completed the design of the functional framework for the capacity parameter database.

3. Technology Application and Promotion

- (1) Two training sessions were conducted on October 29 and October 31, 2025.
- (2) The project results enable the MOTC, the Railway Bureau, the Taiwan Railway Corporation Ltd., and local governments to utilize consistent railway capacity parameters through the capacity parameter database and to better understand the current capacity status of the round-island railway network. These outputs can serve as an important reference for planning and decision-making associated with future intercity railway infrastructure projects.

(四) 海運國際資料庫維護及議題分析

1. 計畫概述

高品質政策之形成與評估，需要高品質的科學化分析；而高品質的數據，則為政策擬定所不可或缺之元素。貨櫃運輸為我國海上運輸重心，且海上貨櫃運輸具有全球性，海運國際資料庫透過長期蒐集全球海洋貨櫃運輸之主航線及區域航線資料，配合資料統計分析及繪圖等功能之建置與精進，並於各年年終依據當年各月資料變化，進行議題式分析，以掌握全球航運市場之概況與趨勢。此外系統也可應當前政策或業務的需求，例如因應 COVID 疫情、地緣政治、美中貿易戰等，從貨櫃航運供給面的角度提供具體而客觀的量化數據，以為支持。

2. 主要研究成果

- (1) 收錄 114 年各月全球貨櫃定期航線資料，並更新全球港口相關數據。
- (2) 優化資料庫及單機版軟體，大幅提升介面友善度、專案存檔與權限控管等功能。
- (3) 完成資料庫雲端化可行性評估。
- (4) 完成「全球海運聯盟重組」議題之分析。

3. 應用與推廣

- (1) 於 114 年 11 月 24 日舉辦「114 年度海運國際資料庫議題分析成果交流座談會」，邀請交通部、航港局、臺灣港務股份有限公司、海運公司、中華海運研究協會等海運業產官學界與會，分享議題分析成果。
- (2) 本計畫分析成果投稿「航貿週刊」，投稿題目「Gemini Cooperation 航線部署分析」。
- (3) 本計畫成果可供航政機關、港務公司及海運業者等進行策略規劃及評估參考。

(IV) International Maritime Transportation Database Maintenance and Thematic Analysis

1. Project Overview

High-quality policy formulation and evaluation require scientifically rigorous analysis, which in turn depends on high-quality data. Container shipping is the backbone of Taiwan's maritime transport. Since it is global in nature, the International Maritime Database has been developed through long-term data collection of main and regional global container routes. The database supports statistical analysis, visualization, and annual thematic studies based on monthly data trends to monitor global maritime market developments. In addition, the system can meet current policy or business needs, such as those related to COVID-19, geopolitics, and the US-China trade war, by providing concrete and objective quantitative data from the perspective of container shipping supply as support.

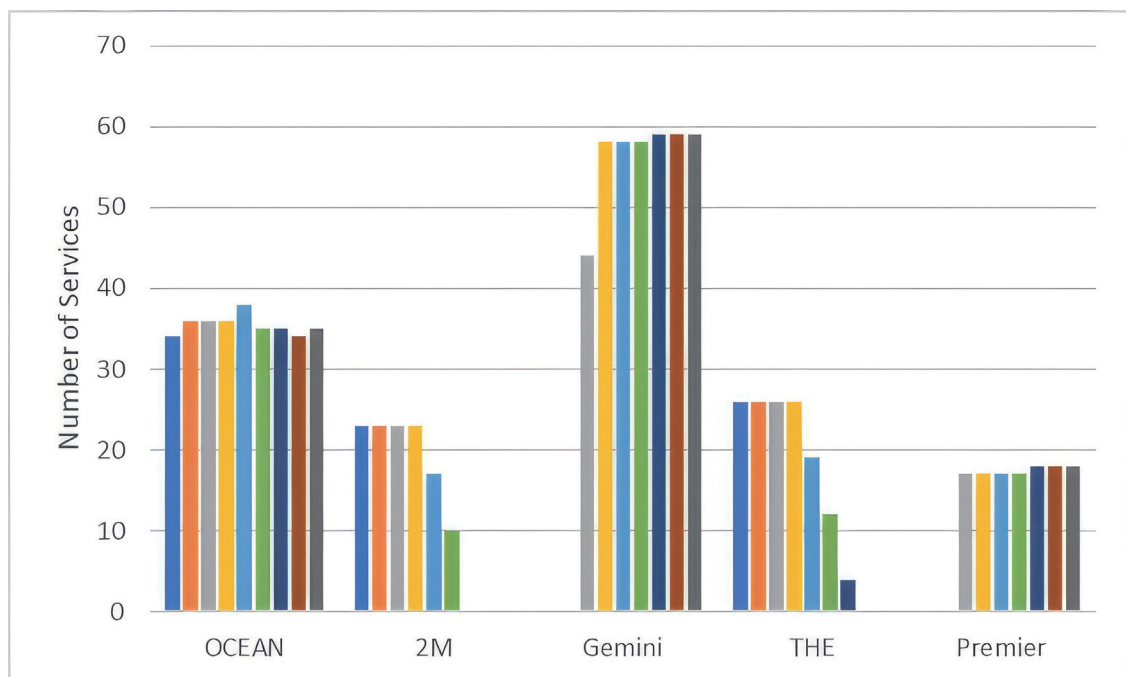
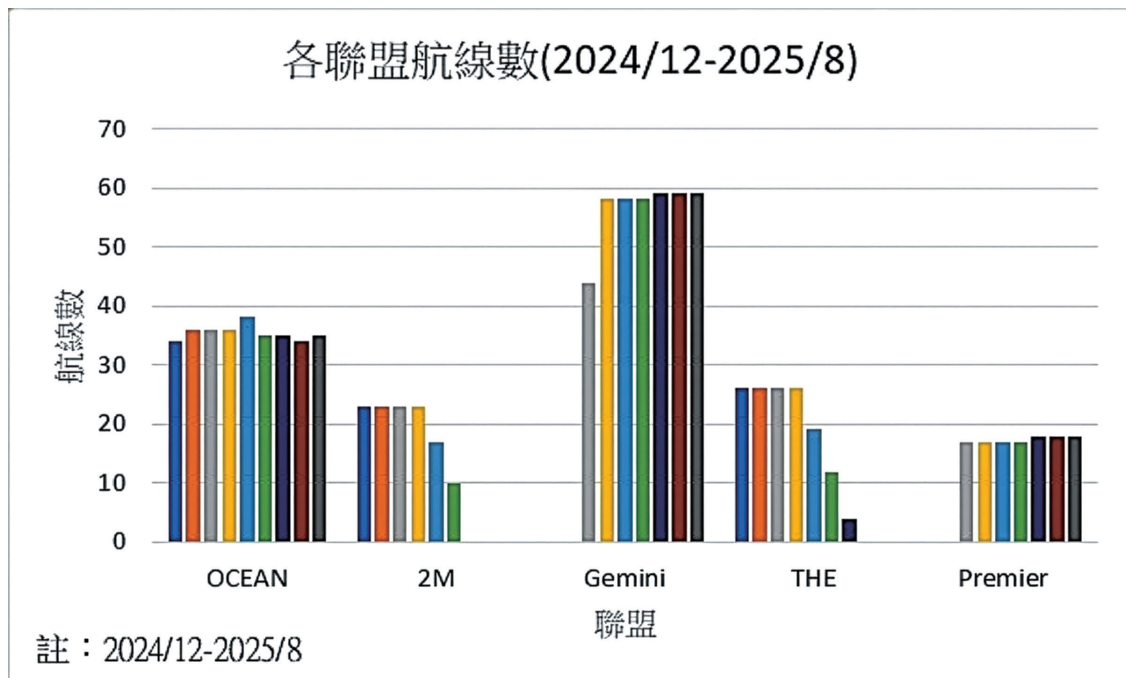
2. Main Research Results

- (1) Updated the database with monthly global container liner service data for 2025 and relevant global port information.
- (2) Optimized the database and standalone application by improving user interface design, project file storage, and authorization management functions.
- (3) Completed an evaluation of the feasibility of migrating the database to a cloud-based environment.
- (4) Completed an analysis of the "Global Shipping Alliance Restructuring" issue.

3. Technology Application and Promotion

- (1) The "2025 International Maritime Transportation Database Analysis Results Exchange Forum" was held on November 24, 2025. Participants included representatives from the MOTC, the Maritime and Port Bureau, the Taiwan International Ports Corporation Ltd., shipping companies, the Chinese Maritime Research Institute, and academic institutions. The event provided a platform for sharing research findings and exchanging views on maritime industry developments.
- (2) Research outcomes from the project were submitted as an article entitled "Analysis of Route Deployment under Gemini Cooperation" to the Shipping Digest.
- (3) The project results provide valuable references for strategic planning and decision-making by maritime administrations, port companies, and shipping industry stakeholders.





各聯盟航線數變化 (2024/12-2025/8)
Changes in Various Shipping Alliance Service Routes (December 2024–August 2025)



（五）我國貨櫃航運產業數位與永續雙軸轉型研究（1/2）— 方案架構及策略研擬

1. 計畫概述

在全球航運產業積極推動「永續＋數位」雙軸轉型的趨勢下，本所在民國112–113年已完成研提「我國航港產業數位化發展藍圖」，並制定「航港產業數位化發展指引」，以推動產業數位化進程。本研究希冀進一步延伸至「雙軸轉型」，在數位化基礎上落實環境永續，藉由科技優化營運模式，協助企業達成 ESG 目標，提升國際競爭力。

然而，雙軸轉型並非一蹴可幾，此議題涉及組織文化調整、資訊系統升級、數據治理強化、營運模式重塑等多層次挑戰，且中小企業因缺乏資源，轉型進度較為緩慢，政府更應提供技術支援、試點計畫與標準化指引，降低轉型門檻，並透過小規模試點測試解決方案的可行性，以確保推動的實效性。因此本研究以「試點先行、逐步擴展」的策略做為推動主軸，透過蒐集國際貨櫃航運永續數位轉型的趨勢、現況與案例，評估我國產業雙軸轉型的潛力，並研擬具體策略與行動方案，規劃小規模的試點，以驗證技術方案與制度配套的可行性與成效，降低轉型風險，做為航港監管機關與港口營運單位推動試點計畫的參考。

2. 主要研究成果

- （1）蒐集雙軸轉型定義文獻，整理國內外碳排與永續發展所推動的法規制度，並就國內外主要永續規範對貨櫃航運業進行衝擊評估分析，有利於做為後續研究論述之基礎。
- （2）提出評估我國貨櫃航運產業雙軸轉型能量之方法，完成訪談評估作業及研析，運用數位與永續落點完成集群分析及落點圖，從意願、能力、環境等三面向，完成評估分析做為方案架構研擬基礎。
- （3）研擬貨櫃航運產業雙軸轉型方案架構及公私部門策略建議，包括願景、目標、3項策略與2項手段，協助強化產業轉型成熟度透明度、縮小轉型落差，並促進供應鏈協作與整體韌性。

（V） A Study on the Digital and Sustainable Twin Transition of Taiwan's Container Shipping Industry (1/2) – Program Framework and Strategic Formulation

1. Project Overview

As the global shipping industry accelerates the adoption of "sustainability and digitalization" initiatives, the Institute completed the "Digital Development Blueprint for Taiwan's Maritime and Port Industry" and the "Guidelines for Digital Development of the Maritime and Port Industry" during 2023–2024 to facilitate the industry's digital transition. Building upon these achievements, this study expands the scope to a "twin transition" framework by integrating environmental sustainability with digitalization. Through technology-enabled optimization of operational models, the study seeks to support enterprises in achieving ESG objectives and strengthening international competitiveness.

Nonetheless, twin transition does not occur overnight; it encompasses adjustments to organizational culture, information technology modernization, enhanced data governance, and business model innovation. Its implementation requires a phased approach. SMEs, in particular, often face resource constraints that slow the transition. Accordingly, government support through technical assistance, pilot initiatives, and standardized implementation guidance is recommended to lower adoption barriers and verify practical solutions. The study adopts a "pilot-first, phased expansion" approach. International trends, best practices, and case studies relating to sustainable digital transition in the container shipping industry were reviewed to evaluate Taiwan's twin transition potential. Based on these findings, implementation strategies, action plans, and pilot projects were proposed to validate technological solutions and supporting institutional arrangements, providing practical references for maritime authorities and port operating organizations.

2. Main Research Results

- （1）The study completed a literature review defining the twin transition and compiled domestic and international regulations relating to carbon reduction and sustainable development. It also assessed the impacts of major international sustainability requirements on the container shipping industry to establish the analytical foundation for subsequent research.
- （2）An evaluation methodology was developed to assess the twin transition capacity of Taiwan's container shipping industry. Interview surveys, cluster analysis, and digital-sustainability positioning maps were completed to evaluate industry readiness from the perspectives of willingness, capability, and the environment, supporting the development of the project's implementation framework.
- （3）Formulated a twin transition framework and strategic recommendations for the public and private sectors, including a vision, objectives, three strategic pillars, and two implementation measures. The proposed framework is intended to improve the transparency of transformation maturity, reduce transformation gaps, and enhance supply chain collaboration and resilience across Taiwan's container shipping industry.

3. 應用與推廣

- (1) 建構一套適用於我國貨櫃航運體系的雙軸轉型成熟度評量模型，將雙軸轉型轉化為可量化、可分群、可追蹤的決策工具，透過量表調查、深度訪談、次級資料交叉驗證，完成30家業者的實際落點分析，為後續分級輔導、差異化政策工具設計奠定基礎。
- (2) 完成「我國貨櫃航運產業數位與永續雙軸轉型研究 (1/2) — 方案架構及策略研擬」，研究成果撰文「貨櫃航運業雙軸轉型衡量指標之發展與評估」，已於114年9月10日投稿2025年運輸年會暨學術論文國際研討會。
- (3) 114年9月26日完成貨櫃航運雙軸轉型工作坊，吸引來自貨櫃航運業的管理階層及從業人員參與，藉以建構我國貨櫃航運雙軸轉型方案架構及策略，協助產業降低轉型不確定性與成本及培育轉型能力。

3. Technology Application and Promotion

- (1) Developed a twin transition maturity assessment model specifically designed for Taiwan's container shipping ecosystem. The model converts the twin transition into a measurable, classifiable, and trackable decision-support tool. Through questionnaire surveys, in-depth interviews, and secondary data validation, maturity assessments were completed for 30 industry participants, providing a basis for future differentiated policy measures and tiered assistance programs.
- (2) Completed the "A Study on the Digital and Sustainable Twin Transition of Taiwan's Container Shipping Industry (1/2) – Program Framework and Strategic Formulation" project. A paper entitled "Development and Evaluation of Twin Transition Assessment Indicators for the Container Shipping Industry" was prepared based on the research results and submitted to the 2025 International Conference and Annual Meeting of the Chinese Institute of Transportation on September 10, 2025.
- (3) A Container Shipping Industry Twin Transition Workshop was held on September 26, 2025, bringing together management personnel and industry practitioners. The workshop supported the development of Taiwan's twin transition framework and strategies while helping industry stakeholders reduce transformation uncertainty and costs, and strengthen their transformation capabilities.



我國貨櫃航運產業數位與永續雙軸轉型方案架構及策略

Digital and Sustainable Twin-Transition Framework and Strategies for Taiwan's Container Shipping Industry

（六）空運國際資料庫維護及議題分析

1. 計畫概述

旅客於全球間之移動有賴航空運輸，桃園、香港、仁川、成田、上海浦東、新加坡樟宜等亞太地區門戶機場，多年來積極提升軟硬體設施及服務品質，期於區域樞紐機場競賽中佔有一席之地，持續掌握國際空運市場發展趨勢及鄰近競爭機場變化情形，有助發展桃園機場為區域樞紐機場。

「空運國際資料庫」長期蒐集全球重要機場營運相關資料，其一為全球200餘座機場之客貨運量、航網航班、營運及基礎設施等基本資料；其二為桃園機場、亞太地區主要機場及北美重要門戶機場之旅客起迄路徑資料，藉由大數據資料分析進行空運議題探討，以掌握航空市場變化及趨勢，並可因應業務需要，提供旅客需求端數據，供政策研擬參據。

2. 主要研究成果

- (1) 更新我國及全球計207座重要機場之客貨運量、航網航班、基礎設施等資料，及檢索桃園、香港、仁川、東京成田、東京羽田、上海浦東、新加坡、洛杉磯、舊金山、西雅圖、曼谷、胡志明市、河內、吉隆坡、馬尼拉、雅加達等亞太、北美地區主要機場之旅客移動路徑資料，進行旅客移動路徑變化分析。
- (2) 完成資料異動與登入／登出活動紀錄功能、整合不同移動型態與不同移動性質查詢功能、新增航線大圈距離計算功能。
- (3) 透過大數據分析檢索機場資料，就政策與產業面議題進行議題式分析，包括「東南亞與北美往返市場之客量變化分析」、「高雄機場新航線市場探討」，研析成果供交通部航政司、民航局、桃園機場公司及航空公司策略研擬評估參考。

3. 應用與推廣

- (1) 114年11月12日舉辦「114年度空運國際資料庫議題分析成果交流座談會」，邀請交通部、民航局、桃園機場公司、航空公司等空運業產官學界與會，介紹資料庫內容功能，並分享議題分析成果。

(VI) International Air Transportation Database Maintenance and Thematic Analysis

1. Project Overview

Air transportation plays a vital role in global passenger mobility. Major gateway airports in the Asia-Pacific region, including Taoyuan, Hong Kong, Incheon, Narita, Shanghai Pudong, and Singapore Changi, continue to enhance their infrastructure and service quality to strengthen their competitiveness as regional hub airports. Keeping abreast of international aviation market trends and developments at competing airports provides important support for the development of Taiwan Taoyuan International Airport as a regional aviation hub.

The "International Air Transportation Database" maintains long-term operational data for major airports around the world. It contains two principal datasets: basic operational information for more than 200 airports, including passenger and cargo volumes, route networks, flight services, operations, and infrastructure; and passenger origin-destination itinerary data for Taiwan Taoyuan International Airport, major Asia-Pacific airports, and key North American gateway airports. These data support big data analyses of aviation trends and provide passenger demand information for transportation policy formulation.

2. Main Research Results

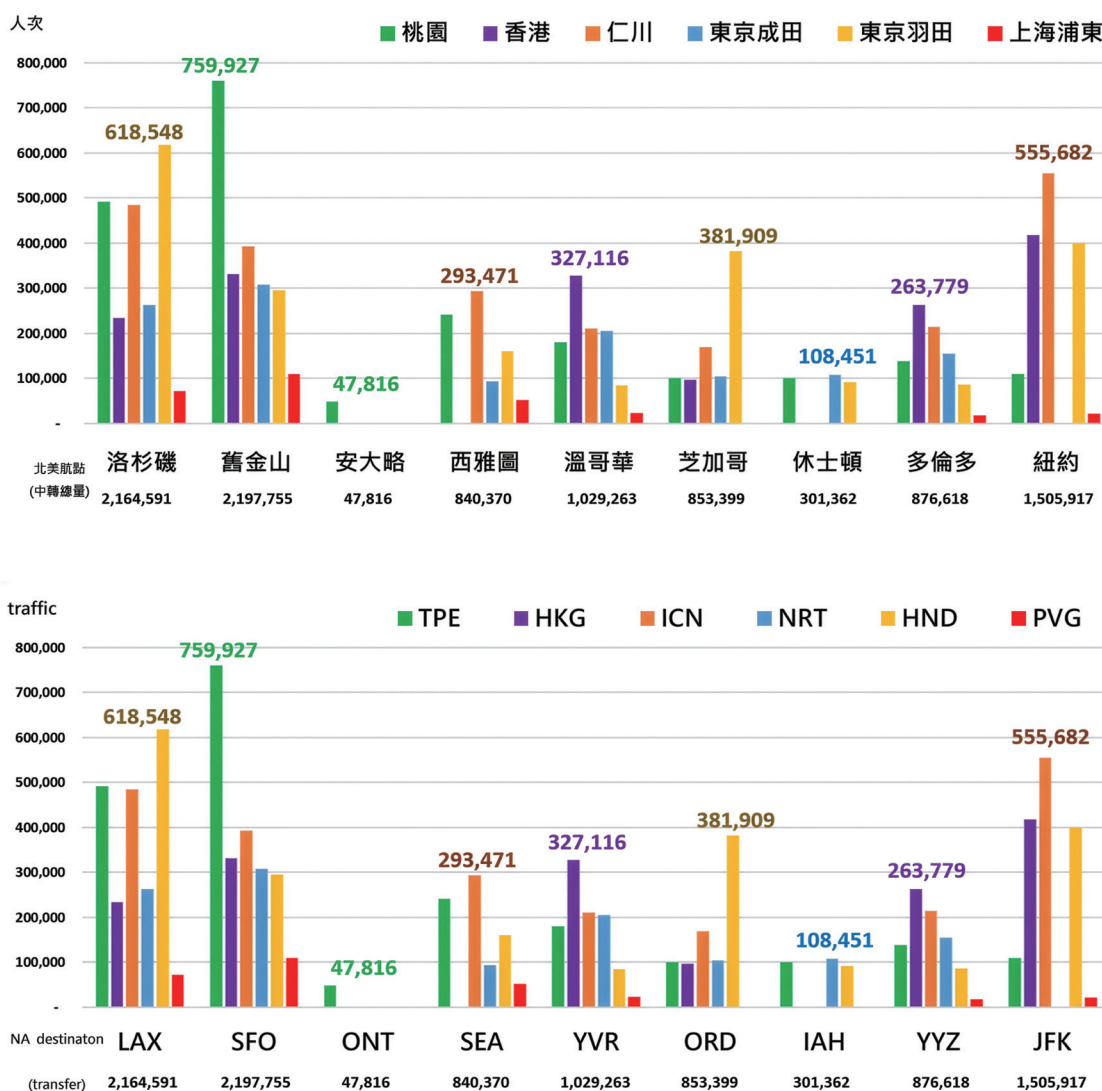
- (1) Updated data for 207 major airports in Taiwan and around the world, covering infrastructure, passenger and cargo volumes, and route networks. Collected and analyzed passenger movement path data for key airports in the Asia-Pacific, North America, and Europe—such as Taoyuan, Hong Kong, Incheon, Tokyo Narita, Shanghai Pudong, Singapore, Bangkok, Manila, Kuala Lumpur, Ho Chi Minh City, Los Angeles, San Francisco, Seattle, Paris Charles de Gaulle, and Vienna—to study changes in travel patterns.
- (2) Enhanced the database by adding data modification records, login/logout activity logs, integrated query functions for multiple travel modes and travel purposes, and a new great-circle route distance calculation function.
- (3) Completed issue-oriented analyses based on airport big data, including "Passenger Traffic Trends between Southeast Asia and North America" and "Analysis of New Route Markets at Kaohsiung International Airport." The analysis results will be provided to the Department of Navigation and Aviation, the Civil Aviation Administration, the Taoyuan International Airport Corporation, Ltd., and airlines for strategic planning and evaluation.

3. Technology Application and Promotion

- (1) Held the "2025 International Air Transportation Database Analysis Results Exchange Forum" on November 12, 2025, with participants from the MOTC, the Civil Aviation Administration, the Taiwan Taoyuan International Airport Corporation Ltd., airlines, industry representatives, and academia to introduce database functions and present analytical findings.

- (2) 本計畫分析成果投稿「2026 8th Asia Pacific Information Technology Conference (APIT 2026)」，投稿題目「From Passenger Movement Data to Air Transport Market Information: A Big Data Analysis Application」。
- (3) 本計畫成果提供民航管理機關、機場公司及航空業者航線拓展參考應用。

- (2) The analysis results of this project were submitted to the "2026 8th Asia Pacific Information Technology Conference (APIT 2026)" under the title "From Passenger Movement Data to Air Transport Market Information: A Big Data Analysis Application."
- (3) The project results serve as a reference for civil aviation authorities, airport companies, and airlines in planning and evaluating future route development and network expansion strategies.



2024年東南亞旅客經桃園及鄰近機場往北美中轉旅客量統計

Statistics on Southeast Asia–North America Transfer Passengers via Taiwan Taoyuan International Airport and Neighboring Hub Airports, 2024

(七) 我國機場環境永續發展研究 (1/2) — 國際發展趨勢蒐整及我國推動現況盤點

1. 計畫概述

本計畫為2年期(114–115年)研究,第一年期工作重點為蒐整機場環境永續發展之國際發展趨勢及盤點我國推動現況,以瞭解國際發展趨勢,掌握國際標竿機場及先進國家推動各級機場環境永續發展政策與機制,提升我國民航機場在環境永續發展之研究能量,做為第2年期研訂我國機場環境永續政策綱領與推動指引之依據。

本計畫參考國際組織在定義之環境永續項目,涵蓋面向包含環境韌性及綠色環保,涵蓋項目包括氣候變遷與調適、能源使用管理、碳排放管理、水資源管理、噪音監測管理、空氣品質管理、廢棄物管理等範疇。

配合前述工作目標,本計畫檢視 ICAO、ACI、IATA 等國際組織在綠色環保及環境韌性構面之管理機制、目標、策略或建議,針對歐美日等先進國家之推動政策、現況與未來規劃進行了解,亦整理荷蘭、新加坡等國際標竿機場之推動政策與成果;另一方面,蒐整我國淨零排放、綠運輸、氣候變遷、國家關鍵基礎設施安全防護相關計畫或規定,檢視民航局、機場公司之相關政策與執行成果,並輔以相關利害關係人意見蒐集與訪談,以及產官學界專家座談,以釐清我國機場環境永續發展之優先要項、政策綱領研訂方向、推動指引框架等關鍵議題,凝聚共識並聚焦於策略層級之初步構想,為後續政策綱領與推動指引研訂、環境永續發展程序評估奠定良好基礎。

(VII) Environmental Sustainability Development of Taiwan's Airports (1/2) – International Development Trends and Current Status of Implementation in Taiwan

1. Project Overview

This two-year project (2025–2026) focuses during its first year on reviewing international trends in airport environmental sustainability and assessing Taiwan's current development status. The research examines the policies and implementation mechanisms adopted by leading international airports and advanced countries to provide a foundation for developing Taiwan's airport environmental sustainability policy framework and implementation guidelines in the second year.

Based on environmental sustainability concepts established by international organizations, the project addresses two key dimensions: environmental resilience and green environmental protection. The study covers climate change mitigation and adaptation, energy management, carbon emissions management, water resource management, noise management, air quality management, and waste management.

The project reviewed the management mechanisms, objectives, strategies, and recommendations issued by ICAO, ACI, IATA, and other international organizations, and examined the policies, implementation status, and future plans of advanced countries in Europe, the United States, and Japan. It also analyzed sustainability initiatives implemented at benchmark airports in the Netherlands and Singapore. Domestically, the project reviewed Taiwan's policies on net-zero emissions, green transportation, climate change, and critical infrastructure protection, together with relevant initiatives undertaken by the Civil Aviation Administration and airport companies. This effort was supplemented by stakeholder interviews, opinion collection, and workshops featuring experts from industry, government, and academia. These initiatives clarified the key priorities for airport environmental sustainability in Taiwan, including the direction for policy development and the framework for implementation guidelines. Through stakeholder consensus-building and the formulation of preliminary strategic concepts, the project established a solid foundation for developing policy guidelines, implementation frameworks, and environmental sustainability assessment procedures.

2. 主要研究成果

- (1) 完成蒐整國際發展趨勢，包含 ICAO、IATA 及 ACI 在環境永續之管理機制、目標、策略或建議等。
- (2) 完成蒐整先進國家環境永續機場政策規劃，包括歐盟、荷蘭、法國、英國、日本及新加坡之推動政策、成果與未來規劃等。
- (3) 完成蒐整荷蘭史基浦、日本成田、韓國仁川、新加坡樟宜、香港赤鱗角等國際標竿機場之環境永續推動政策與發展成果。
- (4) 完成蒐整我國淨零排放、綠運輸、氣候變遷、國家關鍵基礎設施安全防護相關計畫或規定，以及民航局、機場公司在機場環境永續之願景、政策、目標、策略、行動綱領、法規與規範及措施等規劃。
- (5) 完成盤點我國各民用機場、軍民合用機場環境永續執行現況，並納入民航局、機場公司已完成之推動成果，包含國際航空碳減量、國內航空產業溫室氣體排放管理、氣候調適減緩及航空站溫室氣體減量藍圖等。
- (6) 完成利害關係人－民航局、桃園機場公司、臺北國際航空站實體訪談、機場利害關係人－民航六業業者線上問卷訪談，並完成研提第2年期（115年）可參採納入要項共8大項議題，其中包含國際趨勢要項共27項、國內推動要項13項及後續工作要項16項。

2. Main Research Results

- (1) Completed a review of international environmental sustainability trends, including management mechanisms, objectives, strategies, and recommendations developed by ICAO, IATA, and ACI.
- (2) Completed a review of environmental sustainability policies in advanced countries, including the European Union, the Netherlands, France, the United Kingdom, Japan, and Singapore, covering policy implementation, achievements, and future development plans.
- (3) Completed a review of sustainability policies and implementation achievements at benchmark international airports, including Amsterdam Airport Schiphol, Narita International Airport, Incheon International Airport, Singapore Changi Airport, and Hong Kong International Airport.
- (4) Completed a review of Taiwan's plans and regulations related to net-zero emissions, green transportation, climate change, and critical national infrastructure protection, together with the visions, policies, objectives, strategies, action plans, regulations, and implementation measures adopted by the Civil Aviation Administration and airport companies for airport environmental sustainability.
- (5) Completed a review of the implementation status of environmental sustainability initiatives at Taiwan's civil and joint civil-military airports. The review incorporated achievements by the Civil Aviation Administration and airport companies, including international aviation carbon reduction initiatives, GHG emissions management for the domestic aviation sector, climate adaptation and mitigation measures, and airport GHG reduction roadmaps.
- (6) Completed stakeholder engagement through in-person interviews with the Civil Aviation Administration, the Taoyuan International Airport Corporation Ltd., and the Taipei Songshan Airport, as well as online surveys of stakeholders from six sectors of the civil aviation industry. The study identified eight major topics for consideration in the second-year (2026) project, including 27 international trend items, 13 domestic implementation items, and 16 follow-up work items.

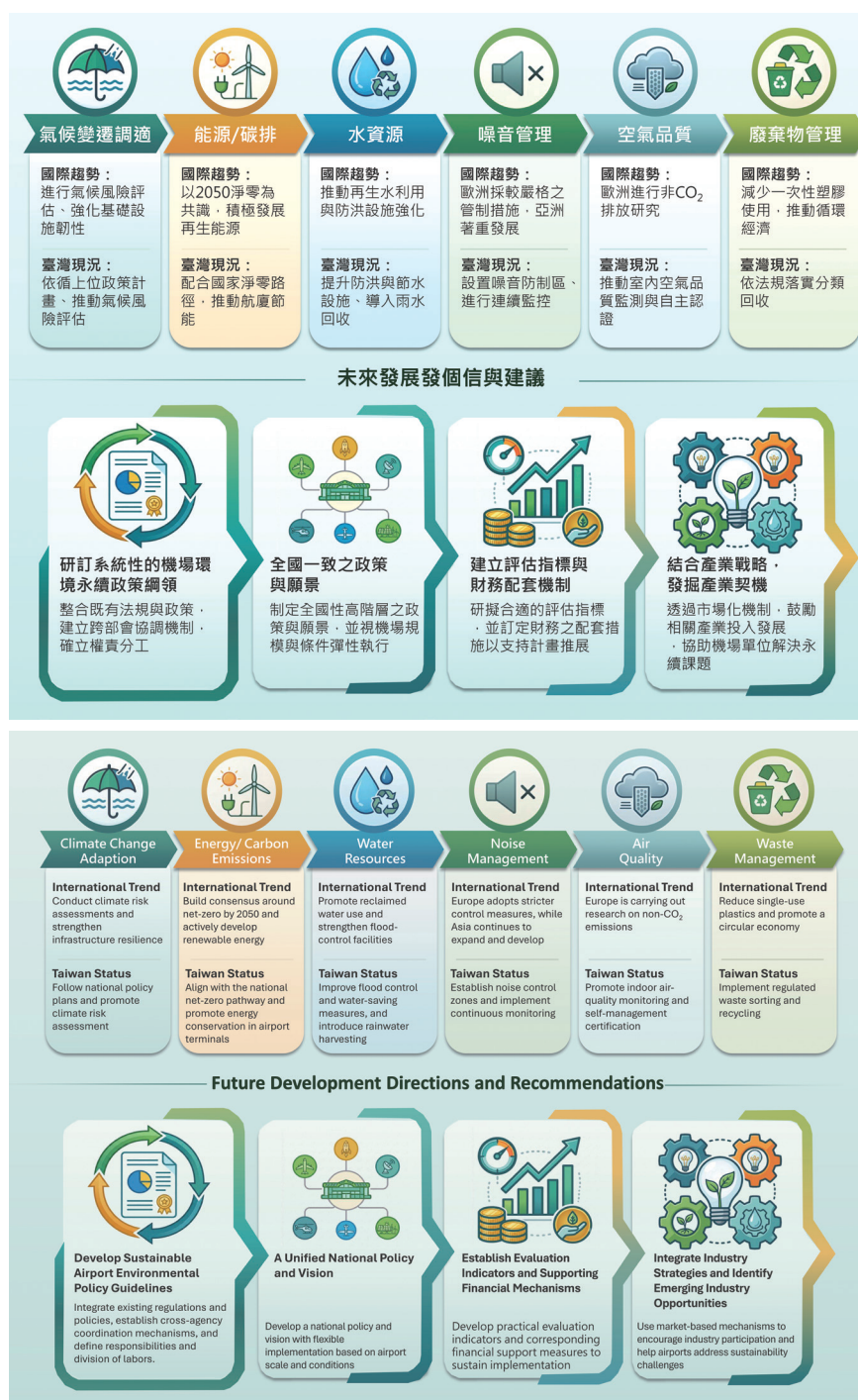


3. 應用與推廣

114年10月29日完成召開專家學者座談會，已初步凝聚產官學界對於我國機場未來朝環境永續轉型政策之研訂方向與未來定位，並型塑推動願景，俾可做為後續規劃機場環境永續政策綱領與推動指引之參據。

3. Technology Application and Promotion

Convened an expert consultation workshop on October 29, 2025, to build preliminary consensus among government, industry, and academia on the policy direction, future positioning, and vision for Taiwan's airport environmental sustainability transition. The outcomes will provide references for developing future policy guidelines and implementation guidance.



機場環境永續國際趨勢、我國發展現況及未來發展建議
International Trends in Airport Environmental Sustainability, Taiwan's Current Status, and Future Development Recommendations

(八) 橋梁檢測輔助工具精進之研究 (2/2) — 建立橋梁多時期劣化比對技術

1. 計畫概述

依據「公路養護規範」及「公路橋梁檢測及補強規範」之規定，前述橋梁檢測可概分成「定期檢測」、「特別檢測」及「詳細檢測」等3類。其中定期檢測係為及早發現損傷情形而定期針對橋梁實施之全面性檢測，其作業方式係以徒步、搭乘橋梁檢測車或高空作業車儘可能接近橋梁結構物後，再以目視或必要儀器判定橋梁狀況。隨著科技不斷發展，近年來各項可應用於橋梁檢測之儀器、設備及技術不斷推陳出新，舉凡檢測手臂、無人飛機等，皆有長足進步，雖然藉由前述先進設備可協助拍攝影像，但由於大量的影像如仍透過人眼逐一檢視，將是繁重費時之工作，因此，高解析度影像若是能藉由人工智慧化影像辨識取代人工目視判斷，將可協助提升橋梁檢測作業之品質及效率。

2. 主要研究成果

- (1) 開發橋梁檢測專用無人機，可於橋梁下方無 GNSS 訊號環境中，依預設航線進行高精度自主飛行，並搭載高畫素數位相機進行近距離拍攝，以取得高解析影像用於偵測細微之混凝土裂縫。
- (2) 利用前期 AI 影像辨識模式開發完成智慧橋檢系統，並結合橋梁檢測3D 影像模型作業程序，能於三維模型中呈現各橋梁構件與劣化位置，協助使用者更精準掌握劣化範圍與程度，此外開發之劣化區變化分析技術，可進一步提供各類劣化樣態之長期追蹤與惡化趨勢判斷，有效支援後續維護決策。

3. 應用與推廣

- (1) 114年10月23日、27日、31日分北中南舉辦3場「橋梁檢測輔助工具精進研發成果教育訓練」，邀集各橋梁管理機關、檢測廠商及工程顧問公司等單位參與，分享運用無人載具（UAV）拍攝橋梁影像後，透過智慧橋檢系統進行構件劣化辨識的最新成果。

(VIII) Research on Enhancing Bridge Inspection Tools (2/2) – Development of Multi-Temporal Bridge Deterioration Comparison Techniques

1. Project Overview

According to the "Highway Maintenance Specifications" and "Highway Bridge Inspection and Strengthening Specifications," bridge inspections fall into three categories: regular, special, and in-depth. Regular inspections are comprehensive checks conducted periodically to detect early signs of damage. These inspections are typically carried out on foot, or by using bridge inspection vehicles or aerial work platforms to get as close as possible to the bridge structure, followed by visual assessments or, if needed, the use of instruments to evaluate its condition. With continuous technological advancement, recent years have seen rapid development of instruments, equipment, and techniques applicable to bridge inspections, such as robotic arms and drones, which have significantly improved capability. While these advanced tools can assist in capturing visual data, manually reviewing large volumes of images remains a time-consuming and labor-intensive task. Therefore, if high-resolution imagery can be analyzed using AI-based image recognition instead of manual visual inspection, it would greatly enhance the quality and efficiency of bridge inspection operations.

2. Main Research Results

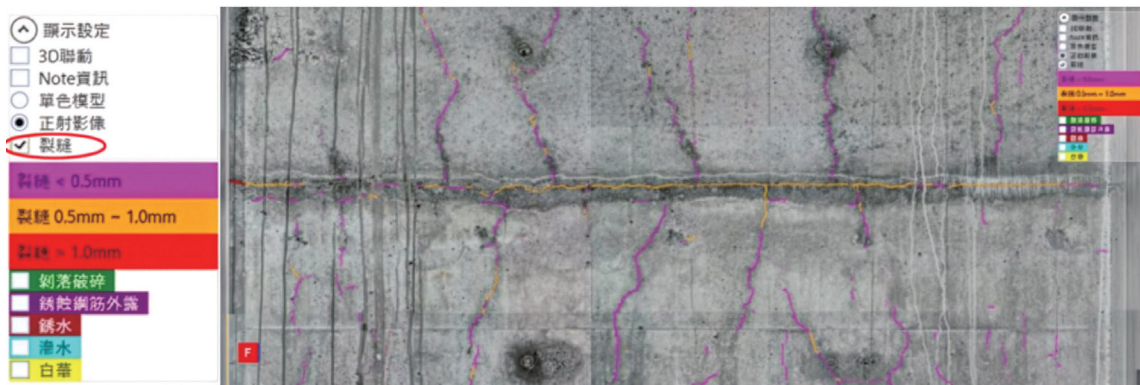
- (1) Developed a dedicated bridge inspection UAV capable of autonomous high-precision flight beneath bridges without GNSS signals. The UAV follows predefined flight paths and uses a high-resolution digital camera to capture close-range images for detecting fine concrete cracks.
- (2) Completed the development of a smart bridge inspection system based on the AI image recognition model developed in the previous phase. Integrated with a 3D bridge model, the system displays bridge components and deterioration locations in three-dimensional space and includes deterioration trend analysis to support long-term condition monitoring and maintenance decision-making.

3. Technology Application and Promotion

- (1) Conducted three "Education and Training Workshops on Advanced Bridge Inspection Support Tools" in northern, central, and southern Taiwan on October 23, 27, and 31, 2025, respectively. Representatives from bridge management agencies, inspection firms, and engineering consulting companies participated to learn about the latest applications of UAV-based bridge imaging and AI-assisted deterioration identification.

- (2) 本計畫成果投稿「ISRS 國際遙測學術研討會」，投稿題目「Reference-Free UAV Image Quality Assessment Using Deep Learning」。
- (3) 本計畫成果投稿「ACRS 國際遙測研討會」，投稿題目「Image Quality Assessment for UAV-based Infrastructure Inspection: An AI Pre-selection Strategy」。

- (2) The research outcomes of this project were submitted to the International Symposium on Remote Sensing (ISRS), with the paper titled "Reference-Free UAV Image Quality Assessment Using Deep Learning."
- (3) The research outcomes of this project were submitted to the Asian Conference on Remote Sensing (ACRS), with the paper titled "Image Quality Assessment for UAV-based Infrastructure Inspection: An AI Pre-selection Strategy."



以不同顏色顯示橋梁裂縫辨識結果

Visualized the bridge crack identification outcomes using a multi-color coding scheme



(九) 鐵道系統強化調適能力之探討 (2/3) — 作為與指引 (高鐵與臺鐵)

1. 計畫概述

鐵道系統（含高鐵、臺鐵、捷運、輕軌）為國家重要維生基礎設施，伴隨氣候變遷及極端氣候事件頻率增加，於規劃、設計、營運階段納入調適思維更顯重要，為使鐵道系統設施權責機關（構）具體落實調適行動，透過本計畫辦理鐵道系統全生命週期強化調適能力之研究，以提升鐵道系統韌性，減少氣候變遷衝擊所造成的傷害。

本所於前期計畫完成「公路系統因應氣候變遷調適指引」，配合行政院112年10月4日核定之「國家氣候變遷調適行動計畫（112–115年）」有關強化運輸系統調適能力之政策，廣續辦理鐵道系統強化調適能力探討，並研擬鐵道系統全生命週期調適指引，提供鐵道系統權責主管機關（構）具體落實因應氣候變遷調適能力之參考應用。

2. 主要研究成果

- (1) 完成蒐集國內外相關文獻資料與案例，研擬規劃鐵道系統（含高鐵、臺鐵、捷運、輕軌）調適指引章節架構，訪談鐵道系統權管機關（構），瞭解國內鐵道系統面臨氣候變遷之主要氣候驅動因子，以及相關之應處作為。
- (2) 完成研提鐵道系統氣候變遷調適指引（高鐵與臺鐵），並透過高鐵及臺鐵案例演練，具體展示指引的作業流程。

3. 應用與推廣

- (1) 完成「鐵道系統氣候變遷調適作為與指引之初探」論文，發表於「中華民國運輸學會2025年年會暨學術論文國際研討會（114年12月4、5日）。
- (2) 完成「鐵道系統強化調適能力之探討 (2/3) —作為與指引 (高鐵與臺鐵)」1場次（114年9月9日）專家座談會，與鐵道系統領域專家研討本計畫研議鐵道系統強化調適能力有關指引架構與內容，並凝聚後續推動之共識。

(IX) A Study of Enhancing the Adaptive Capacity of Railway Systems (2/3) – Strategies and Guidelines for High-Speed Rail and Taiwan Railways

1. Project Overview

Railway systems—including high-speed rail, Taiwan Railways, metro, and light rail—are critical national infrastructure. With the increasing frequency of climate change and extreme weather events, it has become essential to integrate climate adaptation considerations into the planning, design, and operation phases. This project aims to strengthen climate adaptation across the entire lifecycle of railway systems, enabling responsible authorities and agencies to implement concrete adaptation actions. The goal is to enhance the resilience of the railway network and reduce the risks and damages caused by climate-related impacts.

We completed the previous project "Climate Change Adaptation Guidelines for the Highway System" in alignment with the policy to strengthen the adaptive capacity of the transportation system, as outlined in the "National Climate Change Adaptation Action Plan (2023–2026)" approved by the Executive Yuan on October 4, 2023, we are continuing efforts to enhance the resilience of the railway systems. This includes developing climate adaptation strategies and drafting a life cycle adaptation guideline for the railway systems, providing competent authorities and agencies with a practical reference for implementing climate change adaptation measures.

2. Main Research Results

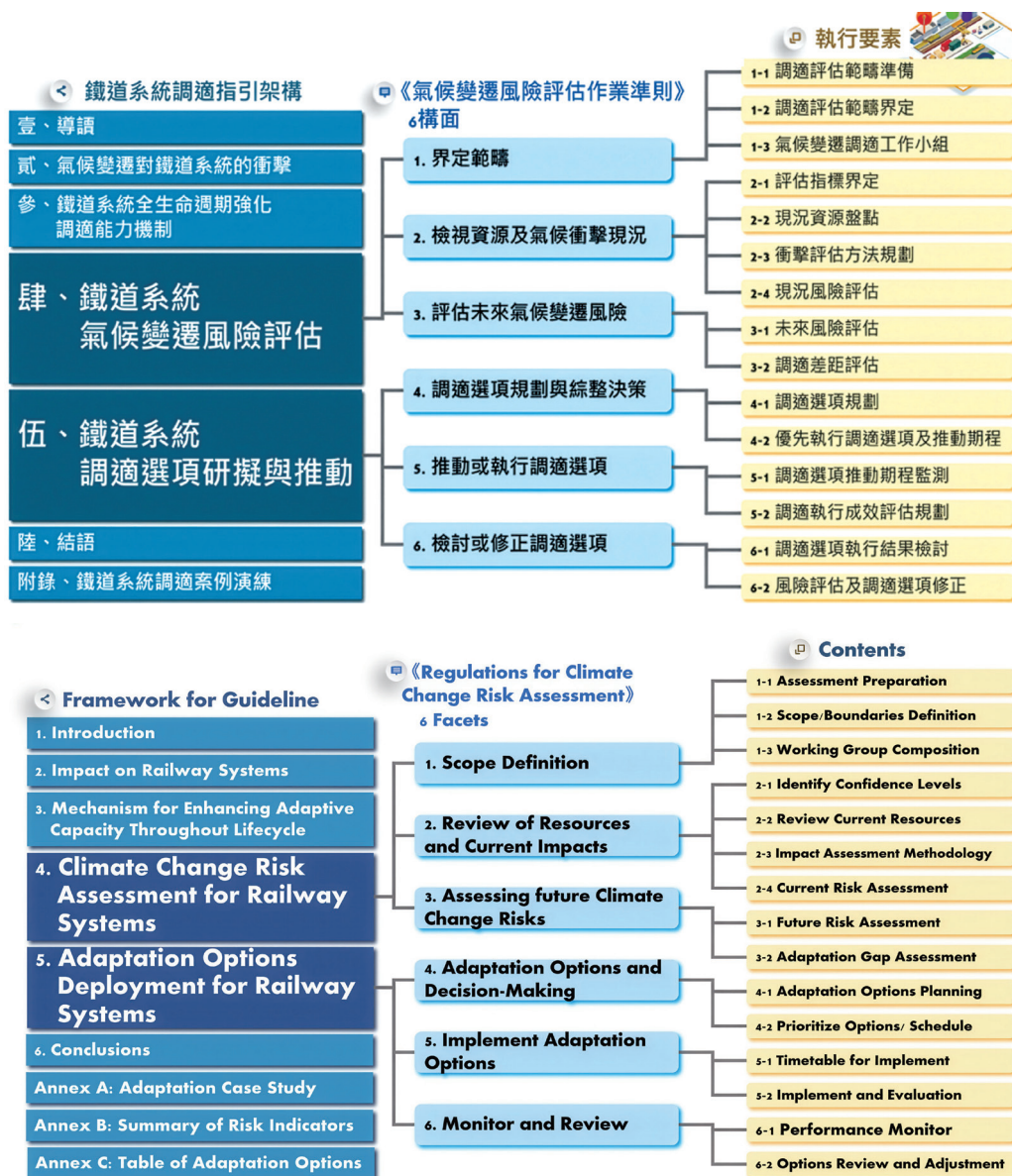
- (1) The project completed a comprehensive review of domestic and international literature and best practices, developed the framework for railway climate adaptation guidelines covering high-speed rail, Taiwan Railways, metro, and light rail systems, and engaged railway authorities through interviews to identify Taiwan's primary climate risk drivers and corresponding adaptation practices.
- (2) Completed the Climate Change Adaptation Guidelines for Railway Systems for high-speed rail and Taiwan Railways. Case studies were conducted to demonstrate the implementation process and practical application of the guidelines.

3. Technology Application and Promotion

- (1) Completed the research paper titled "Preliminary Study on Adaptation Mechanisms and Methods for Railway Systems", which was presented at the 2025 Annual Conference and International Symposium of the Chinese Institute of Transportation (December 4–5, 2025).
- (2) Held an expert consultation workshop on September 9, 2025, under the project "A Study of Enhancing the Adaptive Capacity of Railway Systems (2/3) – Strategies and Guidelines for High-Speed Rail and Taiwan Railways." Experts in the railway sector discussed the proposed framework and contents of the climate adaptation guidelines and established consensus on future implementation.

- (3) 完成「鐵道系統強化調適能力之探討 (2/3) — 作為與指引 (高鐵與臺鐵)」1 場次 (114 年 10 月 31 日) 教育訓練暨成果分享，邀請國內鐵道系統權責機關 (構) 及工程顧問公司等單位參與、會中提供與會單位瞭解國外鐵道系統調適發展趨勢及案例，協助將調適知識應用於所管業務之推動。
- (4) 完成鐵道系統氣候變遷調適指引 (高鐵與臺鐵)，提供鐵道系統權管機關 (構) 推動調適業務之參考應用。

- (3) Completed an educational training and research dissemination session on October 31, 2025, for the project "A Study of Enhancing the Adaptive Capacity of Railway Systems (2/3) – Strategies and Guidelines for High-Speed Rail and Taiwan Railways." Competent railway authorities, operating entities, and engineering consulting firms in Taiwan were invited to attend. The session introduced international trends and case studies in railway adaptation, thereby assisting participating agencies in integrating climate adaptation knowledge into their respective operations.
- (4) Completed the Climate Change Adaptation Guidelines for Railway Systems (High-Speed Rail and Taiwan Railways), providing practical guidance for railway authorities in implementing climate adaptation measures.



鐵道系統調適指引架構

Framework of the Railway System Climate Change Adaptation Guidelines

(十) 建構運輸管理機關（構）之調適專業能力 (1/2) — 精進課程規劃

1. 計畫概述

依據112年2月公布施行之「氣候變遷因應法」第17條第7項，明定政府應推動調適能力建構之事項，強化氣候變遷調適之教育與人才培育。本所於112-113年已辦理「建構運輸管理機關（構）之調適專業能力」2年期計畫，規劃及辦理運輸調適課程及工作坊。考量各運輸管理機關（構）對法定調適工作仍尚未熟悉，透過本計畫，持續強化培養運輸管理機關（構）人員調適專業能力。

本計畫114年為第1年期計畫，針對前期規劃之運輸調適課程進行滾動檢討，並辦理30小時運輸調適課程及工作坊，以提升運輸管理機關（構）人員對於所屬設施因應氣候變遷之調適專業能力。另研議運輸調適課程公版教材編撰機制，以拓展運輸調適知識之推廣。

2. 主要研究成果

- (1) 蒐集國內外氣候變遷調適發展趨勢、相關課程與教材、國內法令及作業規定，並透過問卷調查與訪談方式，蒐集交通部部屬機關（構）對本所112-113年辦理之調適課程及工作坊之回饋意見，以及未來課程需求與辦理方式建議。綜整前述資料並召開調適課程規劃專家學者座談會，據以完成運輸調適課程規劃之滾動檢討。
- (2) 辦理運輸調適課程4場次及工作坊2場次，邀請交通部暨部屬機關（構）、高鐵公司、捷運公司、地方政府及運輸相關顧問公司，計約174人次參加。為瞭解學員對課程內容吸收程度，於課程前後進行測驗，結果也顯示參訓學員課後對調適認知有明顯提升。
- (3) 研議運輸調適課程公版教材之編撰機制，並就教材編撰流程進行操作試辦，依據試辦成果辦理檢討，優化公版教材編撰機制。

(X) Constructing the professional adaptation capabilities of transportation management agencies (1/2) – Advanced Curriculum Development

1. Project Overview

Article 17, Paragraph 7 of the "Climate Change Response Act," which came into effect in February 2023, requires the government to promote climate adaptation capacity building, including education and professional training on climate change adaptation. During 2023-2024, The Institute carried out the two-year project "Building Adaptation Expertise for Transportation Management Agencies," which developed and delivered transportation climate adaptation training courses and workshops. As many transportation management agencies are still in the early stages of implementing their statutory climate adaptation responsibilities, this project continues to strengthen the professional capacity of transportation personnel through ongoing education and training.

In the first year of the project, the transportation climate adaptation curriculum developed previously was reviewed and updated, and 30 hours of training courses and workshops were delivered to enhance the climate adaptation capacity of transportation management agencies responsible for transportation infrastructure. The project also examined a standardized approach for preparing transportation climate adaptation training materials to support broader knowledge dissemination.

2. Main Research Results

- (1) Completed a review of domestic and international climate adaptation trends, relevant training courses and teaching materials, and applicable domestic laws and operational regulations. Feedback on the courses and workshops conducted during 2023-2024 was collected from agencies under the MOTC through questionnaires and interviews, together with suggestions regarding future training needs and delivery formats. Consolidated the research findings and convened an expert workshop on transportation climate adaptation curriculum planning to review and update the training program on an ongoing basis.
- (2) Conducted four transportation climate adaptation training courses and two workshops, inviting 174 participants from the MOTC and its affiliated agencies, the Taiwan High Speed Rail Corporation, rapid transit corporations, local governments, transportation management agencies, and transportation consulting firms. Pre- and post-training assessments were administered to evaluate participants' understanding of the course content. The results showed a clear improvement in climate adaptation knowledge following the training.
- (3) Developed a standardized process for preparing transportation climate adaptation training materials and conducted a pilot implementation to validate and optimize the preparation mechanism.

3. 應用與推廣

- (1) 完成「優化運輸系統氣候變遷調適課程形成及推廣機制」論文，發表於2025臺灣災害管理研討會暨「114年國家科學及技術委員會自然科學及永續研究發展處防災科技學門計畫成果發表會」（114年12月11-12日）。
- (2) 完成辦理「因應氣候變遷調適系列課程」4場次教育訓練（114年7月30日、8月28日、9月18日及10月30日），第1場次課程內容包含規劃階段調適融入項目與時機－運輸工程開發行為氣候變遷風險評估實務、臺灣運輸產業的氣候相關財務揭露（TCFD）管理與機會佈局；第2場次課程內容為運輸系統熱危害風險評估與調適實務評估實務；第3場次課程內容包含調適案例分享（I）－高速公路工程計畫試操作「公路系統規劃階段調適指引」、調適案例分享（II）－極端氣候下機場所需氣象風險資訊；第4場次課程內容包含淡江大橋氣候變遷調適案例分享、建構運輸機關（構）氣候韌性：ISO/CNS 14090條文解析與要求。另於114年6月25日辦理「運輸系統氣候變遷風險評估之GIS應用與實務操作」工作坊及10月13日辦理「運輸系統辦理跨領域風險評估」工作坊。

3. Technology Application and Promotion

- (1) Completed the thesis "Optimizing the Development and Promotion Mechanism for Climate Change Adaptation Training in Transportation Systems," which was presented at the 2025 Conference for Disaster Management in Taiwan and the "2025 NSTC Department of Natural Sciences and Sustainable Development Disaster Prevention Technology Program Results Presentation" on December 11-12, 2025.
- (2) The project conducted four educational training sessions under the "Climate Change Adaptation Training Series" throughout the year. The curriculum for each session was carefully designed to address specific transport sectors and regulatory frameworks: session 1 (July 30) covered integrating climate adaptation into the planning stage – climate change risk assessment practices for transportation infrastructure development, Task Force on Climate-related Financial Disclosures (TCFD) management, and strategic opportunities for Taiwan's transportation industry; session 2 (August 28) focused on heat hazard risk assessment and climate adaptation practices for transportation systems; session 3 (September 18) featured a climate adaptation case study (I) – trial application of the "Guidelines for Climate Change Adaptation during the Highway System Planning Stage" and a climate adaptation case study (II) – meteorological risk information required for airports under extreme climate conditions; session 4 (October 30) included a climate change adaptation case study of the Danjiang Bridge and the building of climate resilience for transportation management agencies: the interpretation and requirements of ISO/CNS 14090. In addition, a "GIS Applications and Practical Operation for Climate Change Risk Assessment of Transportation Systems" workshop was conducted on June 25, 2025, and another workshop on "Cross-Disciplinary Risk Assessment for Transportation Systems" was held on October 13, 2025.



「因應氣候變遷調適系列課程」教育訓練剪影
Pictures of the "Climate Change Adaptation Training Series"

(十一) 應用新興材料研發橋基保護工法

1. 計畫概述

為提升橋梁安全，109年起開始研發礫石河床橋基保護工法，進行室內、現場試驗及數值模擬評估及驗證保護成效，以及研擬工法之施工技術說明書，辦理技術推廣活動，供橋管單位應用。

2. 主要研究成果

- (1) 以 UAV 結合攝影測量技術於重要降雨事件後進行觀測，據以分析與評估保護成效。
- (2) 彙編施工技術說明書、設計標準圖說等技術文件，予相關人員參考應用。
- (3) 礫石河床橋基保護工法於 111 年獲智財局發明專利、臺灣創新技術博覽會發明競賽「銀牌獎」，112 年獲交通部創新提案制度審查「甲等獎」，113 年獲道路協會「論文獎」。

3. 應用與推廣

- (1) 114 年 12 月 31 日邀請交通部高速公路局、公路局、國營臺灣鐵路股份有限公司及縣市政府等橋梁維護管理機關（構）與技師公會，辦理「鼎型塊織布橋基保護工法研發與應用」研究成果推廣活動。
- (2) 已落實應用於高公局國 3 大甲溪橋年度橋梁維護業務工作。

(XI) Development of Bridge Foundation Protection Methods Using Advanced Materials

1. Project Overview

To improve bridge safety, research on a bridge foundation protection method for gravel riverbeds has been conducted since 2020. The effectiveness of this method has been comprehensively evaluated and verified through a combination of laboratory experiments, in-situ testing, and numerical simulations. The research findings have been compiled into a construction technical specifications, and technology promotion for application by bridge management agencies.

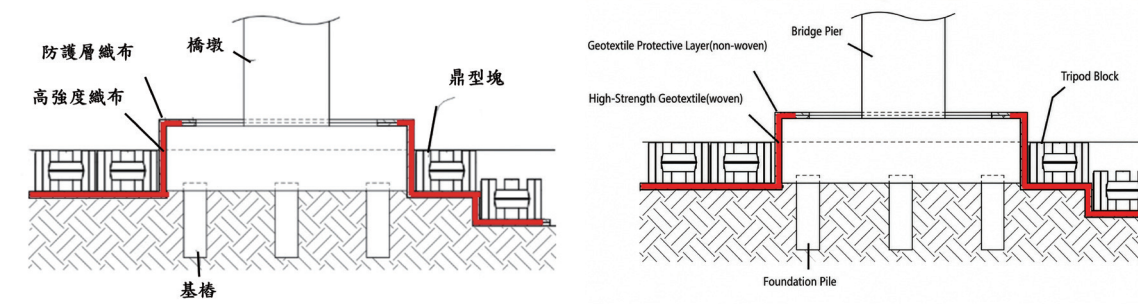
2. Main Research Results

- (1) Performance evaluation of Tripod-Block and Geotextile bridge pier protection based on UAV-based photogrammetric observations following significant rainfall events.
- (2) Technical reference documents, including construction technical specifications and standard design drawings, were completed to support future implementation.
- (3) The gravel riverbed bridge foundation protection method has received multiple recognitions, including a patent for invention from the Intellectual Property Office (2022), a "Silver Award" at the Taiwan Innotech Expo, a "First-Class Award" from the MOTC innovation review mechanism (2023), and a "Thesis Award" from the China Road Federation (2024).

3. Technology Application and Promotion

- (1) On December 31, 2025, a research results promotion event on the "Tripod-Block and Geotextile Bridge Foundation Protection Method" was held, with participation from the Freeway Bureau, the Highway Bureau, the Taiwan Railway Corporation, local governments, bridge maintenance and management agencies, and professional engineers' associations.
- (2) The technology has been applied to the annual bridge maintenance program for the Dajia River Bridge on National Freeway No. 3 managed by the Freeway Bureau.





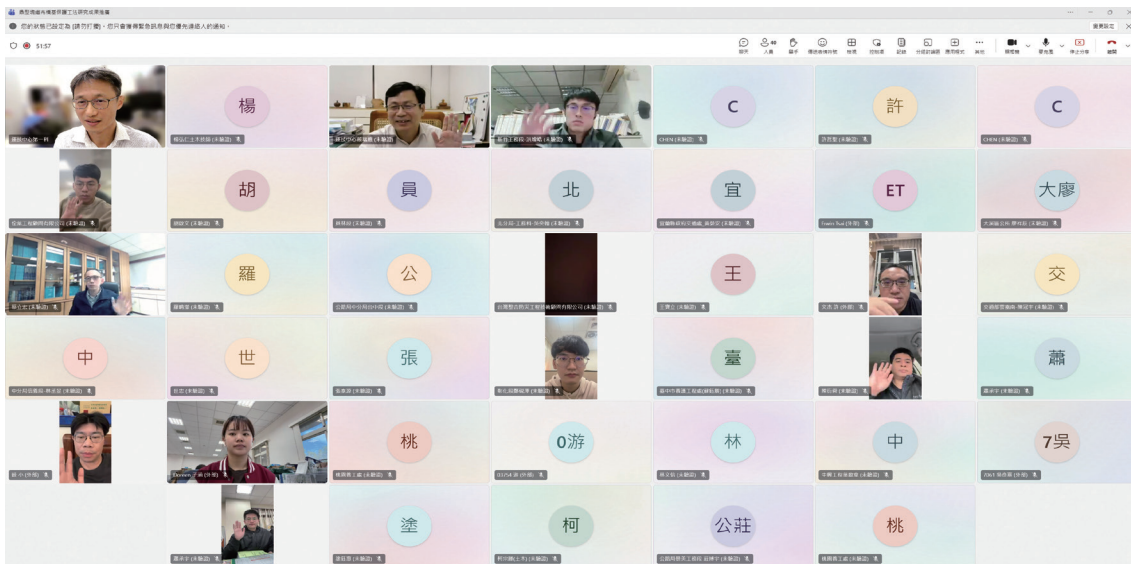
鼎型塊織布橋基保護工法鋪設斷面示意圖

Installation cross-section diagram of the tripod-block and geotextile bridge foundation protection method



鼎型塊織布橋基保護工法施工流程

Construction procedure for the tripod-block and geotextile bridge foundation protection system



「鼎型塊織布橋基保護工法研發與應用」研究成果推廣活動剪影

Pictures from the promotion event of the "Research and Application of the Tripod-Block and Geotextile Bridge Foundation Protection Method"

(十二) 應用影像智慧化技術判釋海岸公路及防波堤越波研究

1. 計畫概述

花蓮台11線浪襲路段在颱風季節易遭受大浪襲擊，造成公路溢淹、路基淘刷，影響用路人安全；花蓮港東防波堤有人員進行施工、巡查作業，或有釣客從事釣魚活動等，如遇颱風大浪可能產生浪襲風險。本所於106至110年陸續建置臺東及花蓮海岸公路浪襲預警系統，研擬改善對策提供公路局參採應用，惟越波及浪襲仍無現場觀測資訊，故本計畫藉由攝影機及影像判釋技術的應用，提供越波、浪襲示警資訊，並做為本所精進浪襲預警系統之參據。

本計畫於111-112年，於花蓮縣豐濱鄉台11線人定勝天路段設置影像設備及安裝波浪溯升計，蒐集海岸公路影像，發展波浪溯升、浪襲之影像判釋技術，並以波浪數值模式進行波浪溯升模擬，發展越波機器學習模型，做為精進本所建置之花蓮海岸公路浪襲預警系統之依據。113-114年於花蓮港區蒐集東防波堤影像，建立港區防波堤越波影像判釋方法，並以數值模式建立越波機器學習模型，提供越波之影像示警、模型預警資訊，供花蓮港務分公司於東堤作業及設施管理之安全示警應用。

2. 主要研究成果

- (1) 「花蓮海岸公路浪襲預警系統」已提供花蓮工務段於颱風期間做為決策支援應用，花蓮工務段基於本研究成果資料於114年6月於本路段北方易浪襲位置加拋消波塊（較白消波塊即為加鋪），降低浪襲機率，因消波塊亦有可能因波浪淘刷而流失，故浪襲影像判釋及數值模擬預警仍有其必要性，可於颱風期間提高用路人行車安全。
- (2) 「花蓮港東堤越波示警及預警系統」已本系統已提供臺灣港務股份有限公司花蓮港務分公司，花蓮港東防波堤因113年康芮颱風影響受損目前正施工中，可實際應用於施工作業安全管理及防災。

(XII) Intelligent Image Recognition Analyses for Wave Overtopping on Coastal Highways and Seawalls

1. Project Overview

Wave-prone section along the Hualien Section of Provincial Highway No. 11 are highly susceptible to severe wave attacks during typhoon seasons, often resulting in road overtopping and subgrade scouring that compromise traffic safety. Similarly, at the east breakwater of the Port of Hualien, construction and inspection personnel, as well as recreational fishers, face elevated exposure to wave overtopping hazards during typhoons and high-wave events. From 2017 to 2021, the Institute gradually established a wave attack early warning system for the coastal highways of Taitung and Hualien, developing improvement strategies for the Highway Bureau's reference. However, on-site observation data for overtopping and wave attacks is lacking. This project utilizes cameras and image interpretation technology to provide warning information for wave overtopping and wave attacks, serving as a critical reference for the Institute to refine its wave impact warning system.

From 2022 to 2023, this project installed imaging equipment and wave run-up gauges along Provincial Highway No. 11 Ren-Ding-Sheng-Tian section in Fengbin Township, Hualien County. The project collected coastal highway images and developed image interpretation technology for wave run-up and wave attacks. Wave run-up simulations using numerical wave models and the development of overtopping machine learning models will refine the wave attack early warning system for Hualien's coastal highways. Between 2024 and 2025, collected images of the east breakwater at the Port of Hualien, established a method for interpreting breakwater overtopping images at the port, and built a machine learning model for overtopping by using numerical models. This provides an overtopping image warning and model early warning information for Hualien Harbor safety warning applications in east breakwater operations and facility management.

2. Main Research Results

- (1) The "Hualien Coastal Highway Wave Attack Warning System" has been provided to the Hualien Maintenance Division of the Eastern Region Branch Office, Highway Bureau, MOTC, for decision-support applications during typhoon seasons. Based on the data from this research, the Hualien Maintenance Division deployed additional tetrapods at wave-prone locations north of this highway segment in June 2025 (the whiter tetrapods indicate the newly added ones) to mitigate the risk of wave attacks. However, as tetrapods are susceptible to displacement or loss due to wave scouring, wave overtopping image recognition and numerical simulation warnings remain essential. These tools continue to play a critical role in enhancing motorist safety during typhoons.
- (2) The "Wave Overtopping Early Warning System for the Hualien Port East Breakwater" has been deployed by the Port of Hualien, Taiwan International Ports Corporation, Ltd., and is currently supporting construction safety and disaster prevention efforts following damage caused by Typhoon Kong-rey in 2024.

3. 應用與推廣

- (1) 於中國土木水利工程學刊第三十七卷第五期發表論文「應用影像判釋技術分析台11線波浪潮升之研究」，供各界參考。
- (2) 114年12月4日、5日於公路局東區養護工程分局花蓮工務段、花蓮港務分公司，辦理「浪襲影像判釋及數值模擬技術研發成果教育訓練」各1場次，介紹研究成果，以簡單易懂網頁呈現，協助管理人員獲得浪襲數值模擬預警及影像即時示警資訊，將技術推廣並落實應用，提供公路及港區防災決策支援，增進公路用路人與港區使用者安全。

3. Technology Application and Promotion

- (1) The research paper "Application of Image Interpretation Techniques for Analyzing Wave Run-up on Provincial Highway No. 11" was published in the Journal of the Chinese Institute of Civil and Hydraulic Engineering (Vol. 37, No. 5).
- (2) The project conducted two educational training sessions on December 4 and 5, 2025, at the Hualien Maintenance Division for the Eastern Region Branch Office of the Highway Bureau, MOTC, and the Port of Hualien, respectively, for the project "Research and Development of Wave Attack Image Recognition and Numerical Simulation Technologies." The sessions introduced research outcomes through a user-friendly web interface, enabling management personnel to access wave numerical simulation forecasting and real-time image alerts. By promoting and implementing this technology, the project provides vital disaster prevention decision support for highways and port areas, thereby enhancing the safety of motorists and port users.



「浪襲影像判釋及數值模擬技術研發成果」教育訓練剪影—花蓮工務段場次
Pictures from training sessions on "Wave Attack Image Recognition and Numerical Simulation Technologies" – Hualien Maintenance Division session



「浪襲影像判釋及數值模擬技術研發成果」教育訓練剪影—花蓮港務分公司場次
Pictures from training sessions on "Wave Attack Image Recognition and Numerical Simulation Technologies" – Port of Hualien session

四 推動淨零碳排邁向環境永續

(一) 運輸部門淨零排放與溫室氣體減量推動工作 (1/2) — 精進淨零排放評估模型參數暨檢討 113 年行動方案成效

1. 計畫概述

為配合國家推動溫室氣體減量政策，並協助交通部辦理「氣候變遷因應法」相關法定工作，本所 112–113 年已辦理「運輸部門淨零排放與溫室氣體減量推動工作暨評估模型強化」2 年期計畫，研析運輸部門未來年能源消費量及溫室氣體排放量之趨勢變化，第三期運輸部門溫室氣體排放基線、能源需求及減量目標；辦理關鍵戰略管考作業、研提改善建議，並與交通部合作辦理社會溝通會議；研提事業綠色通勤標章制度與具體推動作法，並編撰公私部門員工綠運輸通勤指引。

本計畫 114 年為第 1 年期計畫，持續維護更新運輸部門 2050 淨零排放評估模型功能，新增建置自行車道與推動共享電動機車 2 項策略減碳效益評估工具，以及訂修第 3 期運輸部門溫室氣體減量行動方案；完成彙編 113 年「運輸部門溫室氣體減量行動方案成果報告」。蒐研國際間淨零碳排相關政策與策略、能源消耗與減碳趨勢，以及運具電動化政策與推動措施，並派員出席聯合國氣候變化綱要公約第 30 屆締約方大會（COP30）；賡續協助交通部辦理關鍵戰略管考作業並研提改善建議；與交通部合作辦理關鍵戰略公正轉型社會溝通會議；辦理事業綠色通勤標章制度試辦活動與成果發表。

IV Promoting Net-Zero Carbon Emissions Toward Environmental Sustainability

(I) Net-Zero Emissions and Greenhouse Gas Reduction Initiatives in the Transportation Sector (1/2) – Enhancing Parameters for the Net-Zero Emissions Assessment Model and Reviewing the Effectiveness of the 2024 Action Plan

1. Project Overview

To support the national GHG reduction policy and assist the MOTC in implementing the statutory requirements of the "Climate Change Response Act", the Institute completed the two-year project "Promotion of Net-Zero Emissions and GHG Reduction in the Transportation Sector and Enhancement of Assessment Models" during 2023–2024, which assessed future energy consumption and GHG emission trends, developed the emission baseline, energy demand projections, and reduction targets in the transportation sector for the Phase III Action Program, supported the monitoring of key strategies, facilitated social communication, established a Green Commuting Certification for Enterprises system, and prepared green commuting guidelines for employees in both the public and private sectors.

In 2025, the first year of the current project, the 2050 Net-Zero Emissions Assessment Model was updated and enhanced with new evaluation tools, which calculate carbon reduction benefit of bicycle infrastructure and shared electric scooters, while the Phase III Transportation Sector GHG Reduction Action Program was revised and the 2024 "annual reports on the implementation of the GHG Reduction Sectoral Action Program in the transportation sector" was completed. The project reviewed international net-zero policies, energy consumption and carbon reduction trends, and vehicle electrification initiatives. It also participated in COP30, continued to support the MOTC in monitoring key strategies, co-hosted public forums on a just transition through social dialogue, and conducted a pilot run of the Green Commuting Certification System for Enterprises and held a results showcase with an awards presentation.

2. 主要研究成果

- (1) 完成彙提「第二期運輸部門溫室氣體減量行動方案113年成果報告」，並於114年12月9日奉行政院核定。
- (2) 完成研擬「第三期運輸部門溫室氣體減量行動方案（草案）」，送環境部報請行政院於115年2月26日核定。
- (3) 完成淨零排放評估模型計量模組參數校估與個別減碳效益評估方法研析，及建立自行車與共享運具等個別策略減碳效益評估方法。
- (4) 完成113年度運具排放清冊資料更新。
- (5) 彙析每月國內外運輸淨零新聞及發展趨勢資料，並完成交通部淨零轉型報導（電子報）（114年第1、2期）彙編。
- (6) 完成「事業綠色通勤標章制度」與具體作法更新，並完成綠色通勤指引修訂。
- (7) 辦理「事業綠色通勤標章制度」試辦活動及成果發表會，共20家企業機構獲頒金級或綠級標章。

3. 應用與推廣

- (1) 透過交通部、環境部、經濟部等部會執行相關措施，運輸部門溫室氣體排放量已較基準年（94年，3,796.8萬公噸）下降：
 - a. 108年、109年運輸部門溫室氣體排放量分別為3,699.8萬公噸及3,727.4萬公噸，且105～109年運輸部門排放量合計為187.040百萬公噸 CO₂e，低於第一期全期管制目標189.663百萬公噸 CO₂e，顯示運輸部門推動溫室氣體減量工作已見成效。

2. Main Research Results

- (1) Compiled and submitted the 2024 annual reports on the implementation of the Phase II GHG Reduction Sectoral Action Program in the transportation sector, which was consequently officially approved by the Executive Yuan on December 9, 2025.
- (2) Completed the drafting of the "Phase III GHG Reduction Sectoral Action Program in the transportation sector" and submitted it to the MOENV for forwarding to the Executive Yuan, where it was approved on February 26, 2026.
- (3) Completed parameter calibration for the quantitative modules of the net-zero emissions assessment model, developed methodologies for evaluating the carbon reduction benefits of individual measures, and established assessment methods to evaluate the impacts of individual carbon reduction strategies such as cycling and shared mobility.
- (4) Updated the 2024 vehicle GHG emissions inventory database.
- (5) Compiled and analyzed monthly international and domestic news and trends related to transportation sector net-zero initiatives, and published the MOTC Net-Zero Transition Newsletter (Issues 1 and 2, 2025).
- (6) Updated the "Green Commuting Certification System for Enterprises," refined its operating procedures and review criteria, and revised the Employee Green Commuting Guidelines.
- (7) Implemented a pilot run of "Green Commuting Certification System for Enterprises" and held an result showcase and award presentation, during which 20 enterprises and organizations were awarded either the Gold or Green Certificates.

3. Technology Application and Promotion

- (1) Through the implementation of relevant measures by the MOTC, MOENV, Ministry of Economic Affairs and other ministries, GHG emissions in the transportation sector have decreased compared to the base year (37.968 million metric tons, 2005):
 - a. In 2019 and 2020, GHG emissions in the transportation sector were respectively 36.998 and 37.274 million metric tons CO₂e. Furthermore, the total emissions from 2016 to 2020 amounted to 187.040 million metric tons of CO₂e, which is lower than the phase I overall sectoral periodic regulatory target of 189.663 million metric tons. This demonstrates that the efforts to reduce GHG emissions in the transportation sector have yielded positive results.



- b. 依據經濟部能源署114年8月公布之「2024年燃料燃燒之二氧化碳排放量統計與分析」推算，運輸部門113年溫室氣體排放量約為35.517百萬公噸 CO₂e，已達成113年度目標（低於36.67百萬公噸 CO₂e），未來運輸部門仍需持續進行溫室氣體減量，以確保可達成第三期階段管制目標。
- (2) 辦理「事業綠色通勤標章制度」試辦活動成果發表會，試辦活動計有醫療、運輸、金融、能源、資訊等20家事業單位參與，其員工人數規模近1.2萬人；各參與單位透過提供通勤補助、員工通勤接駁車、設置自行車停車設施、電動車停車位與充電設施，以及內部獎勵與表揚措施，藉以鼓勵員工改變原有使用汽機車通勤的習慣。經專家學者評審，計8家獲頒金級標章及12家獲頒綠級標章。試辦活動之問卷調查分析顯示，回復的有效樣本中約有16%的員工於活動期間從私人小客車或機車改採用綠運輸通勤。
- (3) 參與交通部「運具電動化及無碳化」與「淨零綠生活（低碳運輸網絡面向）」社會溝通會議，與會各界專家學者與利害關係人之人數達163人。本所就「共享運具推廣之公私協力」與「事業綠色通勤標章制度推動」2項議題蒐集專家學者與相關利害關係人之意見，做為後續研提交通部相關政策及施政之參考應用。
- b. Based on the "2024 Statistics and Analysis of Carbon Dioxide Emissions from Fuel Combustion," published by the Energy Administration, MOEA, in August 2025, GHG emissions in the transportation sector in Taiwan were estimated at 35.517 million metric tons of CO₂e in 2024, meeting the annual target of remaining below 36.67 million metric tons of CO₂e. Continued emission reduction efforts will be required to achieve the Phase III GHG reduction target.
- (2) An result showcase and award presentation was held for the pilot run of "Green Commuting Certification System for Enterprises." Twenty organizations from the healthcare, transportation, finance, energy, and information technology sectors participated, together employing nearly 12,000 people. These organizations encouraged greener commuting by offering commuting subsidies, employee shuttle buses, bicycle parking, EV parking and charging facilities, and internal incentive and recognition programs. Following expert review, eight organizations were awarded the Gold Certificates, while 12 organizations received the Green Certificates. Survey results from the pilot showed that about 16% of respondents changed their commuting mode from private cars or motorcycles to green transportation during the program.
- (3) Participated in the MOTC's forums on "Vehicle Electrification and Decarbonization" and "Net-Zero Green Living (Low-Carbon Transportation Network)" which addressed a just transition through social dialogue and were attended by 163 experts, scholars, and stakeholders. Gathered input from experts, scholars, and stakeholders on the "public-private collaboration for promoting shared mobility services" and the "promotion of the Green Commuting Certification System for Enterprises," providing valuable references for the MOTC's future policy development.



114年「事業綠色通勤標章制度」試辦活動成果發表會成果展示區
Exhibition area at the 2025 "Green Commuting Certification System for Enterprises"
pilot program result showcase and award presentation

(二) 汽車貨運業因應淨零轉型策略規劃(2/2)－ 行動計畫研擬

1. 計畫概述

在《巴黎協定》與聯合國永續發展目標推動下，全球逾 130 國提出淨零排放目標，我國亦於《氣候變遷因應法》確立 2050 淨零目標。運輸部門為重要排放來源，其中汽車貨運約占運輸排放三成。隨經濟發展與電子商務需求增加，貨運服務量持續成長，使減碳轉型面臨營運壓力與成本挑戰，亟需系統性策略與政策工具，加速汽車貨運業邁向淨零轉型。

本計畫蒐集國際貨運減碳技術與市場發展趨勢，分析相關政策與減量措施對汽車貨運淨零路徑的影響；彙整各國主管機關與業者之行動計畫與公私協力模式，結合碳盤查、碳標籤、碳定價及減量方法學，釐清轉型所需配套。最後，依我國既有政策架構擬定汽車貨運業淨零轉型策略與行動方案，並盤點可能的公正轉型需求，做為後續政策推動參考。

(II) Trucking Carrier strategy planning for net zero transformation (2/2) – Development of Action Plans

1. Project Overview

Under the momentum created by the Paris Agreement and the United Nations Sustainable Development Goals (SDGs), more than 130 countries have committed to net-zero emissions. Taiwan has also incorporated its 2050 net-zero target into the Climate Change Response Act. The transportation sector is one of the country's major sources of emissions, and trucking accounts for roughly 30% of transportation-related GHG emissions. With continued economic growth and increasing demand from e-commerce, the trucking carrier industry has expanded steadily, making decarbonization more challenging due to rising operating pressures and costs. A comprehensive strategy and effective policy tools are therefore needed to expedite the industry's net-zero transition.

This project reviewed international trends in freight carbon reduction technologies and market developments, assessed how policies and emission reduction measures influence the trucking industry's net-zero pathway, and examined action plans and public-private partnership models adopted by governments and industry worldwide. It also evaluated carbon inventories, carbon labeling, carbon pricing, and emissions reduction methodologies to identify the key supporting mechanisms for the transition. Finally, the project formulated net-zero transition strategies and action plans for Taiwan's trucking carrier industry in line with the existing policy framework, while identifying potential just transition needs to support future policy implementation.



2. 主要研究成果

- (1) 系統性彙整美、歐、日等國的貨運減碳政策、法制規範及財政工具，做為建立我國政策推動的參考依據。
- (2) 深入盤點我國汽車貨運業的結構與排放特性，並透過訪談釐清業者在購置成本、充電設施普及性及資訊透明度上的憂慮與轉型障礙。
- (3) 提出協助汽車貨運業淨零轉型策略與行動方案，包含法規制度、技術設備、營運管理與財政誘因四大構面，並規劃人力培訓、綠色標章、資訊平台等具可行性的執行重點與行動計畫。

3. 應用與推廣

- (1) 已完成全球主要國家政府汽車貨運業淨零轉型之行動方案、路徑規劃及我國汽車貨運業因應策略藍圖，並以議題式歸納，篩選出可優先推動措施，提出個別行動方案操作流程，以做為主管機關未來施政之參考。
- (2) 分別於114年6月26日及10月28日辦理專家學者座談會，確立將「標章獎勵機制」、「人力培訓機制」「物流精進策略」、「資訊介接整合」四大推動面向作為建議優先推動事宜，並據此盤點可操作流程、整合目標與成效、利害關係人、公正轉型等相關重大議題研析。

2. Main Research Results

- (1) Systematically reviewed freight carbon reduction policies, regulatory frameworks, and fiscal tools in the United States, Europe, and Japan to inform the development of Taiwan's policy framework.
- (2) Conducted an in-depth analysis of the structure and emissions characteristics of Taiwan's trucking carrier industry, and interviewed stakeholders to identify concerns and barriers related to vehicle purchase costs, charging infrastructure availability, and information transparency.
- (3) A net-zero transition strategy and action framework for the trucking carrier industry was developed, encompassing regulatory systems, technology deployment, operational management, and fiscal incentives, along with actionable measures such as training programs, green certification, and digital information platforms.

3. Technology Application and Promotion

- (1) A global benchmarking review of government action plans and transition pathways for the trucking carrier industry was completed, together with Taiwan's strategic roadmap. Priority initiatives were identified through issue-based analyses, and standardized implementation workflows were proposed for policymaking reference.
- (2) Expert consultations held on June 26 and October 28, 2025, established a consensus on four priority domains: "incentive-based label system," "human resource development system," "logistics optimization strategies," and "information integration." These discussions further clarified implementation pathways, stakeholder roles, performance outcomes, and just transition considerations.



114年10月28日辦理汽車貨運業因應淨零轉型策略規劃專家學者座談會
An expert workshop focusing on the net-zero transition strategy for the trucking carrier industry was convened on October 28, 2025

(三) 交通部自行車路線整合評估與精進

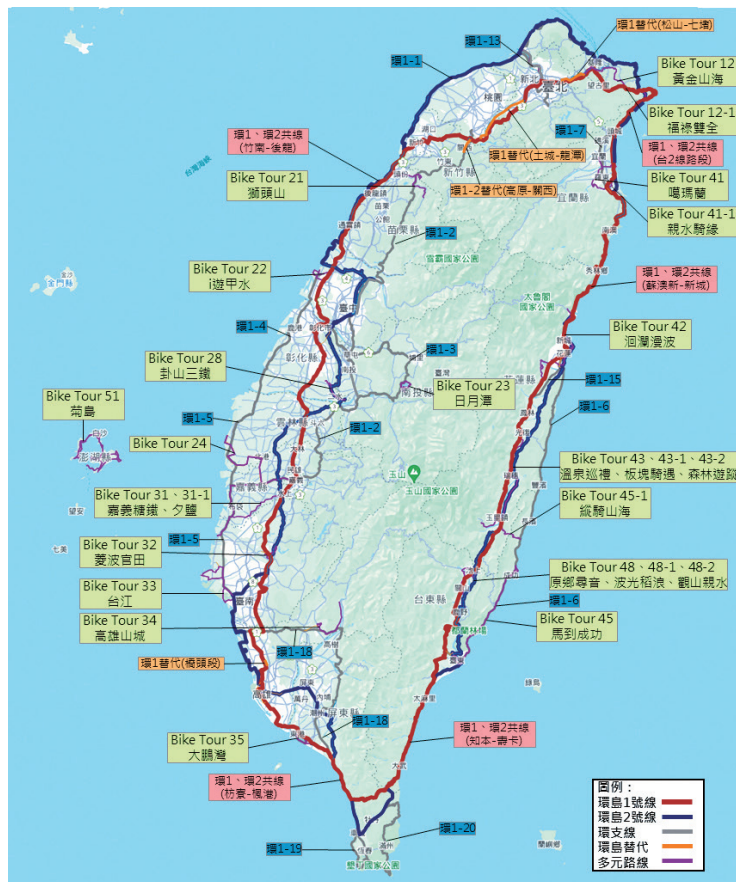
1. 計畫概述

交通部於 104～107 年完成環島 1 號線及 25 條環支線，於 109～112 年完成 16 條多元路線及 13 條串聯路線，為持續提升自行車騎乘安全性，交通部接續辦理「環島自行車道升級暨多元路線整合推動計畫第二期（113～116 年）」之推動，該計畫已於 112 年 10 月 16 日奉行政院核定。配合交通部「環島自行車道升級暨多元路線整合推動計畫第二期（113～116 年）」4 年期計畫辦理，本所已於 113 年配合辦理「交通部自行車路線整合評估與精進(I)」，並於 114 年廣續配合辦理「交通部自行車路線整合評估與精進(II)」，完成自行車路網整併暨第二條環島路線規劃，(如下圖所示)，並針對 115～116 年工作項目預為規劃，以提供公路局及觀光署推動之參據。

(III) An Integrated Evaluation and Enhancement of Cycling Routes by The Ministry of Transportation

1. Project Overview

From 2015 to 2018, the MOTC completed the development of Cycling Route No. 1 and 25 associated loop routes. Between 2020 and 2023, an additional 16 diversified routes and 13 connector routes were established. To further enhance cyclist safety, the MOTC initiated the "Phase II National Cycling Route Upgrade and Diversified Route Integration Project (2024–2027)" officially approved by the Executive Yuan on October 16, 2023. In alignment with this four-year plan, the institute undertook "An Integrated Evaluation and Enhancement of Cycling Routes by The Ministry of Transportation (I)" and continued with phase (II) in 2025. This work completing the preliminary planning of the second national cycling route loop and pre-planning future tasks for 2026–2027 to support implementation by the Highway Bureau and the Tourism Administration.



環島 2 號線構想圖

2. 主要研究成果

- (1) 完成「自行車道系統規劃設計參考手冊(2025年修訂版)」。
- (2) 完成「環島1號線優化改善檢討報告」。
- (3) 完成「自行車路網整併暨第二條環島路線規劃」。

3. 應用與推廣

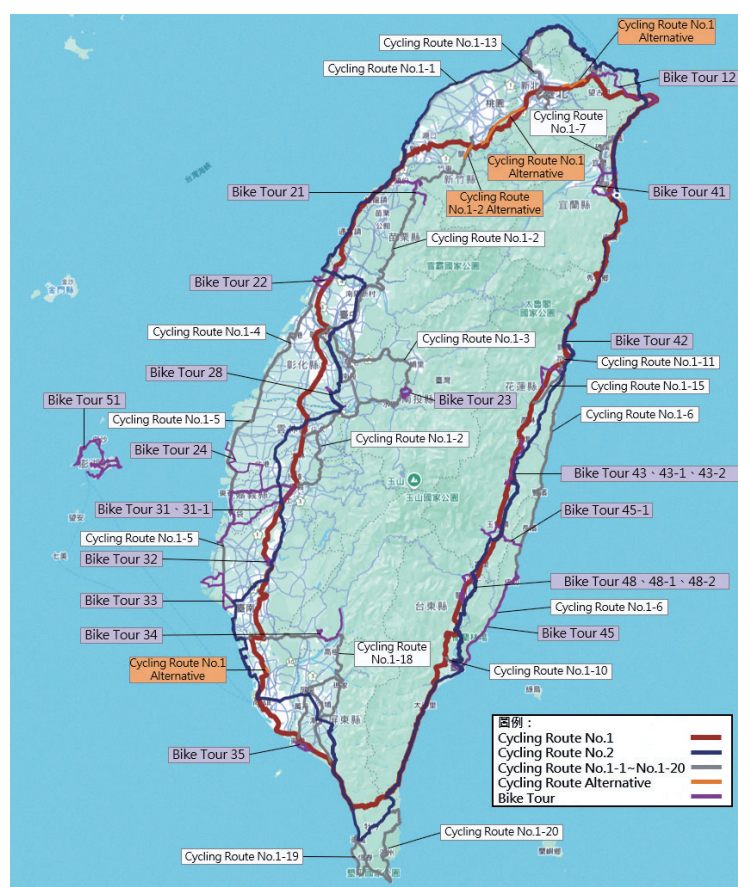
- (1) 於114年10月16日、22日、11月10日、28日辦理北、中、南、東4場教育訓練。
- (2) 於2025年會暨學術論文國際研討會發表「以慢速旅遊打造第二條自行車環島路線—路線規劃與路網整併之實務探討」論文。
- (3) 本研究成果可提供自行車道路權責機關改善相關設施建置之依據；並做為自行車道路主管機關審查計畫之參考應用。

2. Main Research Results

- (1) Completion of the "2025 Revised Cycling Route System Planning and Design Manual."
- (2) Completion of the "Taiwan Cycling Route No. 1 Optimization Review Report."
- (3) Completion of cycling network consolidation and second round-island route planning.

3. Technology Application and Promotion

- (1) Four training workshops were held in the northern, central, southern, and eastern regions on October 16, October 22, November 10, and November 28, 2025.
- (2) The paper "Developing a Second Round-Island Cycling Route through Slow Tourism: Route Planning and Cycling Network Consolidation in Practice" was presented at the 2025 International Conference and Annual Meeting of the Chinese Institute of Transportation.
- (3) The research findings can serve as a reference for responsible authorities in improving bicycle infrastructure and as a basis for project evaluation by bicycle-related regulatory agencies.



Conceptual map of Cycling Route No. 2



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大事紀要 Memorabilia

日期 Date

重要記事 Event

1月3日

王穆衡副所長率員參加交通部道安記者會發布「道路交通標誌標線號誌設置參考指引：一般道路情境」，針對具代表性之18種一般道路情境，提供詳細的設置圖例和運用解說，會後並由交通部函送地方政府推動辦理，以協助道路管理機關規劃及設置相關設施。

Deputy Director General Wang Mu-Han attended the MOTC road safety press conference to announce the "Developing Guidelines for the Setting of Road Traffic Signs, Lines, Markings, and Signals," which provide installation illustrations and guidance for 18 representative roadway scenarios. The guidelines were subsequently distributed by the MOTC to local governments for implementation.



為強化理論及實務結合之教育模式，提升學生將理論知識實踐應用之技能，培養學以致用專業人才，林繼國前所長率團拜會國立高雄科技大學海事資訊科技系，研商「教學與應用合作計畫」，期透由計畫協助學生預先瞭解實務生態，連結學習與應用，增加未來職場競爭力，並就本所運輸設施防災技術研究成果，包含港灣海氣象觀測業務，陸運及港埠設施防災與檢測技術研發，船舶航行安全技術研發及港灣環境資訊整合應用等，舉辦演講活動及進行現場水工模型試驗演示。

1月17日

To foster a collaborative program for teaching and practical application, former Director General Lin Chi-Kuo visited the Department of Maritime Information and Technology at the National Kaohsiung University of Science and Technology. Designed to offer students firsthand exposure to industry practices, this program bridges classroom learning with real-world applications to boost their future career competitiveness. As part of this collaboration, future activities will include presentations and live hydraulic model demonstrations based on the Institute's research achievements in transportation infrastructure disaster prevention technologies. These areas encompass marine meteorological and oceanographic observations for ports, disaster prevention and structural inspection for land and port facilities, vessel navigation safety technology R&D, and the integrated application of port environmental data.



日期 Date

重要記事 Event

1月21日

林繼國前所長主持本所於花蓮縣太魯閣國家公園辦理「無人機偏鄉物流運送服務驗證計畫」飛行展示暨交流座談會，邀請原住民族委員會、衛生福利部、太魯閣國家公園管理處、交通部公路局及當地部落團體代表參加，除實際演練中橫公路至大禮部落無人機物流運送服務，並座談交流無人機應用於偏鄉地區災害緊急運補及日常物資運送之應用需求與潛力。

Former Director General Lin Chi-Kuo hosted the flight demonstration and exchange forum for the "UAV Logistics Service Validation Project for Remote Townships" at Taroko National Park in Hualien County. Representatives from the Council of Indigenous Peoples, the Ministry of Health and Welfare, the Taroko National Park Headquarters, the Highway Bureau, MOTC, and local tribal communities were invited to participate. In addition to a live demonstration of UAV logistics services from the Central Cross-Island Highway to Dali Village, a seminar was held to discuss the application needs and potential of utilizing UAVs for emergency disaster relief and routine supply operations in remote areas.



2月10日

本所蘇振維前副所長率運計組及運工組同仁拜訪臺中港務分公司並現場勘查臺中港聯外道路系統交通運轉情形。

Former Deputy Director General Su Cheng-wei led colleagues from the Transportation Planning and Land Transport Division and Transportation Engineering, Maritime and Air Transport Division to visit Port of Taichung, and conduct an on-site inspection of the traffic operation of the port's external transportation system.



日期 Date

重要記事 Event

2月11日

本所與逢甲大學共同舉辦「運用科技精進連續假期疏運計畫先期規劃研究」西部國道客運疏運管理作為座談會，邀請中華民國公共汽車客運商業同業公會全國聯合會、國道客運業者、示範路網各級道路交通管理機關共同與會，探討現行疏運作業下國道客運所面臨的問題，並據以研提具體可行的改善方案。

In collaboration with Feng Chia University, the Institute organized a seminar on "Preliminary Planning for Technology-Enhanced Transportation Management During Long Weekends." Stakeholders from The Guild of Highway and City Bus Companies in Taiwan, R.O.C., and national highway bus operators jointly examined current operational challenges and discussed practical solutions for improving highway bus services.



2月14日

林繼國前所長率運安組同仁出席「部長與六都交通局長之座談會」，與六都交通局長就道安等相關政策議題交換意見。

Former Director General Lin Chi-Kuo attended the "Minister's Forum with the Directors General of the Transportation Departments of the Six Special Municipalities," together with colleagues from the Transportation Safety Division, to exchange views on road safety initiatives and other key transportation policy issues.

嘉義縣政府與本所完成「通用計程車預約整合系統」研發成果授權簽約。

The Chiayi County government and the Institute completed the signing of the technology licensing agreement for the R&D outcomes of the "Accessible Taxi Services Reservation Integration System."

日期 Date

重要記事 Event

2月21日

召開交通部交通費率審議會第30次委員會議，由召集人陳彥伯政務次長主持，審議「臺鐵票價合理化方案」，經委員討論後同意臺鐵公司提報方案。

The 30th meeting of the Traffic Fare Review Committee, MOTC, chaired by Political Deputy Minister Chen Yen-Po, reviewed and approved the Taiwan Railway Fare Rationalization Plan submitted by the Taiwan Railway Corporation, Ltd.

林繼國前所長與逢甲大學蘇昭銘院長共同主持召開「運用科技精進連續假期疏運計畫先期規劃研究」成果交流座談會，邀請產、官、學、研各界先進共同與會，展示本計畫多項關鍵研究成果，並就「科技驅動下的假期疏運挑戰與創新應用」及「跨部門合作與智慧疏運策略的推動與落實」課題進行交流，凝聚跨單位合作共識。

Former Director General Lin Chi-Kuo and Dean Su Jau-Ming of Feng Chia University jointly chaired the achievement exchange seminar for the "Preliminary Planning Study on Applying Technology to Enhance Transportation Management During Long Weekends," presenting key research achievements and discussing "Smart Transportation Management Strategies and Cross-sector Collaboration."



日期 Date

重要記事 Event

2月26日

王穆衡副所長與交通部公路局張舜清副局長共同主持召開「推動汽車運輸業建立系統性安全管理制度共識營」，邀請中央、地方汽車運輸業主管機關參加，研商汽車運輸業建立系統性安全管理制度之推動方向及面臨困境，約30人參加。

Deputy Director General Wang Mu-Han and Deputy Director General Chang Shun-Ching of the Highway Bureau jointly chaired a consensus workshop on establishing a systematic safety management system for the motor vehicle transportation industry, with approximately 30 representatives from central and local authorities participating.



本所於交通部例行記者會發布「無人機結合 AI 影像分析，診斷道路交通衝突」新聞稿，由王穆衡副所長率運安組同仁，解說計畫重點及成果。本次新聞已獲中時、工商、自由、奇摩、翻報、U-CAR 等媒體刊登。

3月14日

The Institute released the press statement "Combining UAVs with AI Image Analysis to Diagnose Road Traffic Conflicts" at the MOTC's regular press conference. Deputy Director General Wang Mu-Han and staff from the Transportation Safety Division presented the project's objectives and achievements. The news was reported by China Times, Commercial Times, The Liberty Times, Yahoo, TurnNews, and U-CAR.



日期 Date

重要記事 Event

3月18日

3月21日

3月21日

本所奉示協助籌辦「2025 智慧城市展暨淨零城市展－交通願景館」參展事宜，並首次統合「智慧交通」與「低碳運輸」豐碩成果，建置「淨零移動 ∞ 智慧共行」交通願景館，3月18日當天上午蕭美琴副總統蒞臨交通願景館會場展攤參觀勉勵，接著下午交通部陳世凱部長蒞臨開幕致詞，並勉勵所屬單位攜手中央、地方政府與產業夥伴，共同勾勒臺灣以人為本永續交通願景。本次展覽，以「莫比烏斯環」作為展館的設計靈感，象徵交通、科技、永續與城市發展的無限連結，並策劃「低碳」、「綠色」、「科技」三大主題展區，結合22個參展單位(中央11個、地方6個、業者5個)，共計27項展出項目，整體參出內容非常豐富且吸睛，並已受到多家媒體競相報導。

The Institute assisted the MOTC in organizing the "Transportation Vision Pavilion at the 2025 Smart City Summit & Expo and Net Zero City Expo." Under the theme "Net-Zero Mobility ∞ Smart Co-Actuon," the pavilion showcased the integration of Taiwan's achievements in smart transportation and low-carbon transportation. On March 18, Vice President Hsiao Bi-Khim visited the pavilion and offered encouragement; later that day, MOTC Minister Chen Shih-Kai attended the opening ceremony and delivered remarks, encouraging agencies under the MOTC to collaborate with central and local governments and industry partners in jointly shaping Taiwan's vision for people-centered and sustainable transportation. Drawing inspiration from the Möbius strip, the Transportation Vision Pavilion represented the infinite integration of transportation, technology, sustainability, and urban development. The exhibition comprised three thematic zones – Low Carbon, Green, and Technology – featuring 27 exhibits presented by 22 participating organizations (11 central government agencies, six local governments, and five private-sector organizations), and received widespread media attention.



日期 Date

重要記事 Event

3月18日

本所為推廣「電動大客車智慧充電管理系統」，特於2025年智慧城市展暨淨零城市展辦理「智慧淨零—2025電動大客車智慧充電論壇」，邀請交通部公共運輸及監理司、交通部公路局、各縣市交通局、中華民國公共汽車客運商業同業公會全國聯合會及各客運業者、臺灣電動車輛電能補充產業技術推動聯盟、電動大客車製造業者，以及電能管理系統業者等，計有超過110名國內外人士報名參加。

To promote the "Electric Bus Smart Charging Management System," the Institute organized the "2025 Smart Net Zero Forum – Smart Charging Management System for Electric Buses" at the 2025 Smart City Summit & Expo and Net Zero City Expo. The forum brought together representatives from the MOTC's Department of Public Transportation and Supervision, the Highway Bureau, local transportation departments, The Guild of Highway and City Bus Companies in Taiwan, R.O.C., national highway bus operators, the Taiwan EV Energy Facility Alliance, electric bus manufacturers, and energy management system suppliers, attracting over 110 participants from Taiwan and abroad.



國際公共交通聯合會 (UITP) 亞太區主席董寶才先生與行政及財務經理陳翠樺先生拜會本所，由林繼國前所長率員接見，雙方就公共運輸相關議題進行交流。UITP 分享全球公共運輸趨勢與發展（疫後載客率恢復情形、運具電動化、駕駛及維修人力短缺、交通需求管理及交通行動服務），本所則分享臺灣推動公共運輸發展重點工作（公路公共運輸計畫、TPASS、偏鄉幸福巴士、共享運具及2030客運車輛電動化計畫），會中並就雙方未來進一步交流與合作事項進行討論與建立初步共識。

3月21日

The International Association of Public Transport (UITP) Asia-Pacific Region Chair Shuan Tan and Administration and Finance Manager Loris Chan visited the Institute, where they were welcomed by a delegation led by former Director General Lin Chi-Kuo for discussions on public transportation development issues. During the meeting, UITP presented global public transportation trends (including ridership recovery after the pandemic, vehicle electrification, workforce shortages, transportation demand management, and MaaS). The Institute shared Taiwan's major public transportation initiatives (including the Highway Public Transportation Program, TPASS, DRTS, shared mobility services, and the 2030 Bus Electrification Program), while both sides explored opportunities for future collaboration.



日期 Date

重要記事 Event

4月8日
4月15日
4月22日
5月23日
5月27日
6月6日
6月10日
6月17日

本所依交通部指示持續辦理114年度交通部金路獎「用路人資訊類」國道組、省道組複評。由本所林繼國前所長擔任召集人，率交通工程、視覺設計等領域專家學者、機關代表委員實地考評，並給予受評各單位改善建議。

The Institute continued to support the MOTC by conducting the secondary review for the 2025 Golden Road Awards in the "Road User Information Category" for both national highway and provincial highway entries. Led by former Director General Lin Chi-Kuo, an evaluation committee comprising specialists in transportation engineering, visual design, and representatives from government agencies carried out field inspections and provided recommendations to improve the nominated projects.



本所於交通部道安記者會發布「新興科技導入學校交通安全教育之研發示範計畫」計畫成果，由陳世凱部長主持記者會，林繼國前所長率運安組同仁解說計畫重點及成果。本次新聞已獲中央社、聯合新聞網、工商時報、自由電子報、奇摩新聞、pchome 新聞、大紀元等媒體刊登。

4月10日

At an MOTC road safety press conference, the Institute presented the achievements of the "Demonstration Project on the Development and Application of Emerging Technologies for School Traffic Safety Education." Minister Chen Shih-Kai presided over the event, while former Director General Lin Chi-Kuo and staff from the Transportation Safety Division introduced the project's major outcomes and achievements. The announcement received extensive media coverage from the CNA, United Daily News, Commercial Times, The Liberty Times, Yahoo News, PChome News, and The Epoch Times.

日期 Date

重要記事 Event

4月15日

本所召開桃園航空城核心計畫「聯外運輸系統」工作小組第33次會議，除廣續追蹤列管計畫辦理進度及決議事項外，並共同研商交通部交辦事項，包括「台31線北延路廊與國1甲銜接規劃」、「2-1-30M道路調整路線」等案，俾使各計畫順利推動，以利航空城聯外運輸達成預期效益。

The Institute convened the 33rd Working Group Meeting on the "External Transportation System" under the Taoyuan Aerotropolis Core Project. In addition to continuing to monitor the implementation progress of tracked projects and follow up on previous resolutions, the Working Group also deliberated on matters assigned by MOTC. These included the Planning for the Connection between the Northern Extension Corridor of Provincial Highway No. 31 and National Freeway No. 1A and the Realignment of the 2-1-30M Road, with the aim of facilitating the smooth implementation of related projects and enabling the aerotropolis external transportation system to achieve its intended benefits.

5月13日

本所於國際會議廳辦理「道路交通標誌標線號誌設置參考指引教育訓練」第1場次，由林繼國前所長致開訓詞，廣邀位於北部、中部、宜花及馬祖等地之中央或地方政府交通工程單位、顧問公司設計人員、公（協）會等團體，進行指引內容的說明與應用實務交流，共計124人參與。

The Institute organized the first "Education and Training Program on the Guidelines for the Setting of Road Traffic Signs, Lines, Markings, and Signals" at the International Conference Hall. Former Director General Lin Chi-Kuo delivered the opening speech, and 124 transportation representatives from central and local governments in northern and central Taiwan, Yilan, Hualien, Taitung, and Matsu, together with consultants and professional associations, were invited to exchange practical experiences on applying the guidelines.

6月3日

本所響應觀光署舉辦「2025世界自行車日—全臺環騎響應活動」，並於第3段（鶯歌～龍潭）響應騎乘。

The Institute joined the Tourism Administration's "2025 World Bicycle Day Taiwan-wide Cycling Connection" by participating in the Section 3 ride from Yingge to Longtan.



日期 Date

重要記事 Event

6月10日

本所假交通部舉辦「港區智慧巡查技術升級」例行記者會，併同發布新聞稿，另於6月15日於行政院院長臉書「部部向前行，一週重要大事」刊登本技術。本所與國立臺灣大學合作應用無人機研發港區影像智慧監測技術，可快速且高效率的針對人員不易巡查之區域詳實紀錄影像，並結合機器學習自動辨識設施類型與損壞或異常情形，提供臺灣港務股份有限公司未來之應用。

The Institute presented its "Smart Port Inspection Technology Upgrade" at a routine MOTC press conference and released an accompanying press statement. The technology was later featured in the Executive Yuan Premier's Facebook post, "Major Events of the Week," on June 15. The Institute partnered with National Taiwan University to develop a smart port image monitoring system based on UAV technology. The system enables rapid and efficient image collection in areas that are difficult to access for manual inspections and incorporates machine learning to automatically identify facility types and detect damage or abnormal conditions, supporting future applications by Taiwan International Ports Corporation Ltd.



6月12日

5

6月13日

林繼國前所長率隊訪視中區區域中心「梨山幸福巴士2.0」推動成果，透過梨山幸福巴士 APP 平台預約接駁服務，實地體驗偏鄉交通服務改善成果，並參與中區區域中心辦理「梨山幸福巴士多元運輸服務精進座談會」。

Former Director General Lin Chi-Kuo led a team to visit the Central Regional Center to inspect the achievements of the Lishan DRTS 2.0 initiative. During the visit, the delegation experienced the reservation service via the Lishan DRTS app and attended the Lishan DRTS Diversified Transportation Service Enhancement Forum to exchange views on improving transportation services in remote townships.



日期 Date

重要記事 Event

6月18日

本所與中華民國防蝕工程學會假臺中集思新烏日會議中心舉辦「大氣腐蝕及防蝕技術應用研習會」，吸引產官學研各界超過70位相關領域專業人士與會研討。透過本次實務經驗與技術支援的深度交流，期能協助業界精進防蝕規劃設計、施工及後續維護能力，進而提升基礎設施品質，達成設施減損、延長使用壽命之核心目標。

The Institute co-hosted the "Seminar on Atmospheric Corrosion and Corrosion Protection Technology Applications" with The Corrosion Engineering Association of ROC at the GIS Taichung Xinwuri Convention Center. The seminar brought together more than 70 experts and professionals from the public sector, industry, academia, and research organizations. By facilitating comprehensive exchanges on engineering practice and technical support, the seminar sought to enhance corrosion protection planning, design, construction, and maintenance capabilities, thereby improving infrastructure quality, reducing deterioration, and prolonging facility service life.



6月20日

林繼國前所長率隊訪視東部區域中心112至113年「地方創生觀光旅運規劃－幸福巴士分流與整合」推動成果，瞭解地震後太魯閣國家公園觀光恢復情形，同時就114至115年協助事項邀集相關單位交流討論。

Former Director General Lin Chi-Kuo led a team to visit the Eastern Regional Center to review the achievements of the 2023–2024 "Regional Revitalization Tourism Transportation Planning – DRTS Diversion and Integration Program," assess the recovery of tourism in Taroko National Park after the earthquake, and discuss follow-up collaboration with relevant organizations for 2025–2026.



日期 Date

重要記事 Event

6月25日

本所辦理「因應氣候變遷調適系列課程」第1場次教育訓練，講授「氣候變遷調適及風險評估概論」和「風險評估應用工具與平台介紹」理論，並辦理「GIS實務應用與案例操作」實際演練工作坊。透過調適課程及工作坊培訓，強化運輸管理機關（構）人員調適專業知能。本次訓練包括交通部相關部屬機關（構）、地方政府、捷運公司及運輸相關顧問公司等約40餘人參加。

Conducted the first session of the "Climate Change Adaptation Training Series," including lectures on the Introduction to "Climate Change Adaptation and Risk Assessment" and "Risk Assessment Tools and Platforms," followed by a practical workshop on "GIS Practical Applications and Case-Based Exercises." Through the adaptation training course and workshop, the Institute aimed to strengthen the adaptation expertise of personnel in transportation management agencies. Approximately 40 participants from the MOTC's affiliated agencies, local governments, rapid transit corporations, and transportation consulting firms attended this training.



本所與高屏澎區域運輸發展研究中心、屏東縣政府及高雄區監理所共同簽署「屏東縣幹支線公共運輸路網規劃簽署合作備忘錄（MOU）」，合作推動屏東縣內公車路網整合優化，結合行政院通勤月票 TPASS，以鼓勵民衆使用公共運輸。

The Institute signed an MOU with the Kaohsiung-Pingtung-Penghu Regional Transportation Development Research Center, the Pingtung County Government, and the Kaohsiung Motor Vehicles Office to advance the planning of Pingtung County's trunk and branch public transportation network. The initiative focuses on optimizing the countywide bus network and integrating it with the Executive Yuan's TPASS monthly travel pass program to promote public transportation use.

6月26日

本所林繼國前所長與交通部觀光署周署長共同簽署「公共運輸旅運服務升級合作備忘錄（MOU）」，交通部陳彥伯政務次長出席致詞並擔任見證人，期能串聯「各區域運輸發展研究中心」與「區域觀光圈」進行全面性策略合作，強化臺灣公共運輸系統與觀光資源之深度整合。

Former Director General Lin Chi-Kuo and the Director General of the Tourism Administration signed an MOU on "Upgrading Public Transport and Travel Services," with the MOTC Political Deputy Minister Chen Yen-Po serving as witness. The agreement establishes strategic partnerships between the "Regional Transportation Development Research Centers" and "Regional Tourism Circles" to deepen the integration of transportation and tourism across Taiwan.

日期 Date

重要記事 Event

7月1日

辦理「區域運輸發展研究中心服務升級3.0計畫」(114-115年)第1次諮議委員會議，六大區域中心就本期工作重點及預期成果說明重點報告後，由各諮議委員提供指導意見，俾督導六大區域中心納入參考辦理。

The Institute hosted the first Advisory Committee meeting for the "Service Upgrade Plan 3.0 for Regional Transportation Development Centers" (2025-2026). The six regional centers presented their major work items and expected achievements, after which advisory committee members offered recommendations to guide future implementation.



本所辦理「因應氣候變遷調適系列課程」第2場次教育訓練，講授「規劃階段調適融入項目與時機－運輸工程開發行為氣候變遷風險評估實務」、「臺灣運輸產業的氣候相關財務揭露(TCFD)管理與機會佈局」。透過調適課程培訓，強化運輸管理機關(構)人員調適專業知能。本次訓練包括交通部相關部屬機關(構)、地方政府、捷運公司及運輸相關顧問公司等約20餘人參加。

7月30日

The Institute organized the second session of the "Climate Change Adaptation Training Series," featuring lectures on "Integrating Adaptation into the Planning Stage – Practical Climate Change Risk Assessment for Transportation Infrastructure Development" and "Task Force on Climate-related Financial Disclosures (TCFD) and Identifying Opportunities for Taiwan's Transportation Industry." Through the adaptation training course, we aimed to strengthen the adaptation expertise of personnel in transportation management agencies. Approximately 20 participants from the MOTC's affiliated agencies, local governments, rapid transit corporations, and transportation consulting firms attended this training.



日期 Date

重要記事 Event

8月6日

本所於交通部8月份道安記者會發布「臨近路口道安檢查表」開發成果，由陳世凱部長主持記者會，黃新薰所長率運安組同仁解說該表用途及應用推廣情形。

During the MOTC's August road safety press conference, the Institute unveiled the achievements of the "Intersection Proximity Road Safety Inspection Checklist." Minister Chen Shih-Kai chaired the event, while Director General Huang Hsin-Hsun and staff from the Transportation Safety Division presented the checklist and demonstrated its intended applications and promotion.



「APEC 第55次運輸工作小組會議 (TPTWG55)」於本 (114) 年8月6日－8日在韓國仁川舉行。我國代表團奉交通部指示由本所葉祖宏主任秘書率團與會，並由本所統籌我國出席代表團工作。我國代表團出席代表於空運、海運與陸運等相關專家小組會議分享我國發展成果。

8月6日

8月8日

The "55th APEC Transportation Working Group Meeting (TPTWG55)" was held in Incheon from August 6 to 8, 2025. In accordance with the assignment from the Ministry of Transportation and Communications (MOTC), the Taiwanese delegation was led by the Institute's Secretary General, Yeh Tsu-Hung, with the Institute serving as the coordinator for Taiwan's overall participation. During the meeting, Taiwan's representatives presented the nation's achievements in the Air (AEG), Maritime (MEG), and Land (LEG), and Intermodal and Intelligent Transportation Systems (IIEG) expert group sessions.



(我國參加 TPTWG55 成員合照)
(Group photo of Taiwan's delegation at TPTWG55)

日期 Date

重要記事 Event

8月28日

本所辦理「因應氣候變遷調適系列課程」第3場次教育訓練，講授「運輸系統熱危害風險評估與調適實務」。透過調適課程培訓，強化運輸管理機關（構）人員調適專業知能。本次訓練包括交通部暨相關部屬機關（構）、地方政府、高鐵公司、捷運公司及運輸相關顧問公司等約20餘人參加。

The Institute organized the third session of the "Climate Change Adaptation Training Series," delivering a lecture on "Heat Hazard Risk Assessment and Adaptation Practices for Transportation Systems." Through the adaptation training course, we aimed to strengthen the adaptation expertise of personnel in transportation management agencies. Approximately 20 participants from the MOTC, its affiliated agencies, local governments, Taiwan High Speed Rail Corporation, rapid transit corporations, and transportation consulting firms attended this training.

9月11日

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9月13日

本所協助交通部以「邁向淨零・永續同行」為主題，策劃參與台灣永續能源研究基金會主辦之「2025亞太永續博覽會」，統籌相關單位展出永續運輸推動成果，展出交通部在低碳運具、低碳場站及低碳生活等三大面向之推動成效。黃新薰所長主持「啟航淨零：臺灣海運減碳策略與路徑藍圖」高峰論壇之「海運減碳推動策略與未來路徑」專題論壇。本次博覽會交通部展館約有1,900餘人參觀。

The Institute supported the MOTC's participation in the "2025 SDG Asia," organized by the Taiwan Institute for Sustainable Energy, under the theme "Toward Net Zero, Advancing Sustainability Together." It coordinated participating agencies in presenting sustainable transportation achievements, demonstrating the MOTC's accomplishments in three areas, including low-carbon vehicles, low-carbon transportation hubs, and low-carbon lifestyles. Director General Huang Hsin-Hsun presided over the thematic session "Maritime Carbon Reduction Promotion Strategies and Future Pathways" during the "Setting Sail Toward Net Zero: Taiwan's Maritime Carbon Reduction Strategy and Roadmap" summit. More than 1,900 visitors toured the MOTC pavilion at the expo.



日期 Date

重要記事 Event

9月18日

本所辦理「因應氣候變遷調適系列課程」第4場次教育訓練，講授「高速公路工程計畫試操作『公路系統規劃階段調適指引』」、「極端氣候下機場所需氣象風險資訊」。透過調適課程培訓，強化運輸管理機關（構）人員調適專業知能。本次訓練包括交通部暨相關部屬機關（構）、地方政府、高鐵公司、捷運公司及運輸相關顧問公司等約40人參加。

The Institute organized the fourth session of the "Climate Change Adaptation Training Series," delivering lectures on "Pilot Application of the Guidelines for Climate Change Adaptation during the Highway System Planning Stage" and "Meteorological Risk Information Required for Airports under Extreme Climate Conditions." Through the adaptation training course, we aimed to strengthen the adaptation expertise of personnel in transportation management agencies. Approximately 40 participants from the MOTC, its affiliated agencies, local governments, Taiwan High Speed Rail Corporation, rapid transit corporations, and transportation consulting firms attended this training.



9月26日

本所於交通部例行記者會發布「運研所完成無人機偏鄉物流服務驗證協助交通部成為希望與幸福的傳遞者」新聞稿，由王穆衡副所長主持。本次新聞已獲中央社、聯合、自由、工商、大紀元、人間福報等媒體刊登。

The Institute published a news release at the MOTC's routine press conference titled "Institute of Transportation Completes UAV Logistics Validation in Remote Areas, Helping the MOTC Deliver Hope and Happiness." The event was presided over by Deputy Director General Wang Mu-Han. The news release received coverage from the CNA, United Daily News, The Liberty Times, Commercial Times, The Epoch Times, The Merit Times, and other media organizations.

10月1日

本所蘇振維前副所長主持「114年國慶焰火施放活動交通疏運規劃現勘會議」，與南投縣政府、交通部公運司及部屬相關疏運單位現場勘查及研商討論疏運規劃。

Former Deputy Director General Su Cheng-wei presided over the "2025 National Day Fireworks Transportation Evacuation Plan Site Inspection Meeting," joining representatives from the Nantou County Government, the MOTC Department of Public Transportation and Supervision, and related transportation management agencies in conducting field inspections and discussing transportation evacuation plans.



日期 Date

重要記事 Event

10月13日

本所辦理「因應氣候變遷調適系列課程」第5場次教育訓練，講授「運輸系統辦理跨領域風險評估」課程及辦理實務操作之工作坊。透過調適課程及工作坊培訓，強化運輸管理機關（構）人員調適專業知能。本次訓練包括交通部暨相關部屬機關（構）、捷運公司及運輸相關顧問公司等約20人參加。

The Institute organized the fifth session of the "Climate Change Adaptation Training Series," delivering the course "Cross-disciplinary Risk Assessment for Transportation Systems" together with a practical workshop. Through the adaptation training course and workshop, we aimed to strengthen the adaptation expertise of personnel in transportation management agencies. Approximately 20 participants from the MOTC and its affiliated agencies, rapid transit corporations, and transportation consulting firms attended this training.

10月16日

10月22日

11月10日

11月28日

本所於北、中、南、東舉辦4場次之「環島2號線暨自行車環島路線（含替代路線）及多元路線標誌標線設置原則」說明會，針對相關標誌標線設置原則、布設實例研析及常見錯誤範例等進行說明，參與人數每場次約40-60餘人，讓各自行車路線之規劃執行單位能熟悉各類自行車路線標誌標線之設置原則及相關規範，以利各自行車路線之指示系統能有一致的識別與設置標準。

The Institute held four briefing sessions across northern, central, southern, and eastern Taiwan on the "Installation Principles for Signs and Markings for Round-island Route 2, Round-island Cycling Routes (Including Alternative Routes), and Diverse Cycling Routes." With approximately 40-60 attendees at each session, the program covered signage and pavement marking standards, practical installation examples, and common mistakes, enabling agencies responsible for cycling route planning and implementation to apply consistent standards for cycling wayfinding systems.



日期 Date

重要記事 Event

本所與各區域運輸發展研究中心共同辦理 114 年跨域整合首長論壇（10 月 17 日東區、11 月 7 日雲嘉南區、11 月 13 日北區、11 月 13 日桃竹苗區、11 月 17 日高屏澎、11 月 28 日中區），由王穆衡副所長率隊參加，針對各場次專題報告與座談交流，進行中央與地方雙向溝通，促進政策共識與跨域合作契機。

The Institute, in collaboration with the Regional Transportation Development Research Centers, co-organized the 2025 Cross-Regional Integration Chief Forum, which featured six regional sessions: the Eastern Region (October 17), the Yunlin–Chiayi–Tainan Region (November 7), the Northern Region (November 13), the Taoyuan–Hsinchu–Miaoli Region (November 13), the Kaohsiung–Pingtung–Penghu Region (November 17), and the Central Region (November 28). Deputy Director General Wang Mu-Han led the Institute's delegation in participating in the sessions. Through thematic presentations and panel discussions, the delegation successfully facilitated two-way communication between central and local governments, fostering policy consensus and unlocking opportunities for cross-regional collaboration.

10 月 17 日

11 月 7 日

11 月 13 日

11 月 17 日

11 月 28 日



10 月 17 日與東區區域中心共同辦理 114 年跨域整合首長論壇

October 17 – 2025 Cross-Regional Integration Chief Forum with the Eastern Regional Transportation Development Research Center



11 月 7 日與雲嘉南區域中心共同辦理 114 年跨域整合首長論壇

November 7 – 2025 Cross-Regional Integration Chief Forum with the Yunlin–Chiayi–Tainan Regional Transportation Development Research Center



11 月 13 日與北區區域中心共同辦理 114 年跨域整合首長論壇

November 13 – 2025 Cross-Regional Integration Chief Forum with the Northern Regional Transportation Development Research Center

日期 Date

重要記事 Event

10月17日

11月7日

11月13日

11月17日

11月28日



11月13日與桃竹苗區域中心共同辦理114年跨域整合首長論壇

November 13 – 2025 Cross-Regional Integration Chief Forum with the Taoyuan-Hsinchu-Miaoli Regional Transportation Development Research Center



11月17日與高屏澎區域中心共同辦理114年跨域整合首長論壇

November 17 – 2025 Cross-Regional Integration Chief Forum with the Kaohsiung-Pingtung-Penghu Regional Transportation Development Research Center



11月28日與中區區域中心共同辦理114年跨域整合首長論壇

November 28 – 2025 Cross-Regional Integration Chief Forum with the Central Regional Transportation Development Research Center

日期 Date

重要記事 Event

10月29日
10月31日

本所與鐵道局共同辦理2場次之「傳統暨區域鐵路系統容量分析技術」教育訓練，推廣鐵道容量分析模式及軟體特色等，並透過應用範例讓參加人員進一步熟悉軟體操作，包括鐵道局、各縣市政府、大學相關科系及各大顧問公司等30餘人報名參加，透過意見交流回饋，做為後續研究與分析軟體精進優化之依據。

The Institute, in collaboration with the Railway Bureau, delivered two training sessions on "Capacity Analysis of Conventional Railway Systems." The program introduced railway capacity analysis methodologies and software capabilities, with practical exercises enabling participants to gain proficiency in software operation. More than 30 representatives from the Railway Bureau, local governments, universities, and engineering consulting firms attended. Participant feedback has been incorporated as a reference for future research and continued enhancement of the analysis software.



10月30日

本所辦理「因應氣候變遷調適系列課程」第6場次教育訓練，講授「淡江大橋氣候變遷調適案例分享」、「建構運輸機關（構）氣候韌性：ISO/CNS14090條文解析與要求」。透過調適課程培訓，強化運輸管理機關（構）人員調適專業知能。本次訓練包括交通部相關部屬機關（構）、地方政府、捷運公司及運輸相關顧問公司等約20餘人參加。

The Institute conducted the sixth session of the "Climate Change Adaptation Training Series," which included presentations on the "Climate Change Adaptation Case Study of the Danjiang Bridge" and "Building Climate Resilience for Transportation Management Agencies: Interpretation and Requirements of ISO/CNS 14090." Through the adaptation training course, we aimed to strengthen the adaptation expertise of personnel in transportation management agencies. Approximately 20 participants from the MOTC's affiliated agencies, local governments, rapid transit corporations, and transportation consulting firms attended this training.

10月31日

本所辦理「鐵道系統強化調適能力之探討（2/3）— 作為與指引」教育訓練暨成果分享，透過國內外案例演示及調適指引實務操作，強化鐵道系統管理機關（構）人員調適專業知能。本次訓練包括交通部暨相關部屬機關（構）、高鐵公司、臺鐵公司、阿里山林鐵、地方捷運局、捷運公司及工程顧問公司等約20餘人參加。

The Institute organized the "Exploration of Reinforced Adaptability of Railway Systems (2/3) – Strategies and Guidelines for High-Speed Rail and Taiwan Railways" training and results-sharing session. The program incorporated domestic and international case demonstrations and hands-on application of adaptation guidelines, thereby strengthening the climate adaptation competencies of personnel from railway system management agencies. The training brought together approximately 20 participants from the MOTC and its subordinate agencies, Taiwan High Speed Rail Corporation, Taiwan Railways Corporation Ltd., Alishan Forest Railway, local MRT authorities, rapid transit corporations, and engineering consulting firms.

日期 Date

重要記事 Event

10月31日

本所由蘇振維前副所長率隊，於交通部例行記者會說明「浪襲影像判釋示警及數值模擬預警，提升海岸公路及港區安全」計畫研發成果及其落實應用情形，並發布新聞稿，獲台灣新生報、ETtoday 新聞雲、自由時報、經濟日報等媒體刊登。

Led by former Deputy Director General Su Cheng-wei, the Institute reported the outcomes and practical implementation of the "Wave Overtopping Image Interpretation Warning and Numerical Simulation Forecasting System for Coastal Highway and Port Safety Enhancement" at the MOTC routine press briefing. A press release was also issued, receiving coverage from Taiwan Shin Sheng Daily News, ETtoday, The Liberty Times, and Economic Daily News.



(海岸公路浪襲及防波堤越波影像判釋成果)

(Image-based analytical results of coastal highway wave overtopping and breakwater overtopping)

11月4日

11月6日

本所辦理2場次道路安全檢查人才教育訓練，黃新薰所長致歡迎詞，邀請各級政府道路管理機關、顧問公司、相關公（協、學）會、區域運輸發展研究中心參加，共計約60人與會。

The Institute organized two training sessions for road safety inspection professionals. Director General Huang Hsin-Hsun delivered welcoming remarks, with participation from representatives from road management agencies at all levels of government, consulting firms, professional associations, and regional transportation development research centers, totaling approximately 60 participants.



日期 Date

重要記事 Event

11月5日

本所辦理「114年度港灣環境資訊網使用者說明會」，介紹港灣環境資訊網6項功能與精進內容，並持續推廣海氣象多元應用服務，以滿足港埠管理、海事工程業者及港區使用者實務需求，做為港埠營運管理決策支援並提高施工作業安全及效率，出席單位交通部航港局、中央氣象署、觀光署、連江縣港務處、金門縣港務處、經濟部水利署、海洋委員會國家海洋研究院、臺灣港務股份有限公司、引水人辦事處以及水域遊憩活動等共66位人員參加。

The Institute held the "2025 Harbor Environmental Information System User Briefing Session," introducing six system functions and recent enhancements, and promoting the application of marine meteorological services. The system supports port operations, marine engineering, and port-user decision-making, while enhancing construction safety and operational efficiency. A total of 66 participants from the MOTC, Central Weather Administration, Tourism Administration, Harbor Bureau of Lienchiang County, Harbor Bureau of Kinmen County, Water Resources Agency, MOEA, National Academy of Marine Research, Ocean Affairs Council, Taiwan International Ports Corporation Ltd., pilot associations, and water recreation operators attended.



11月10日

本所辦理「無人機空拍應用於路段交通衝突分析」合作研究計畫成果說明暨教育訓練，黃新薰所長致歡迎詞，邀請中央與地方之道路及交通管理機關、顧問公司、區域運輸發展研究中心及公協學會等單位，現場合計93人參與。

The Institute conducted the results briefing and training session for the cooperative research project "UAV Aerial Imaging for Traffic Conflict Analysis on Road Segments." Director General Huang Hsin-Hsun delivered the welcome remarks. The session brought together central and local road and traffic management agencies, consulting firms, regional transportation development research centers, and professional associations, with a total attendance of 93 participants.



日期 Date

重要記事 Event

11月17日

本所假財團法人張榮發基金會國際會議中心舉辦「港區無人機智慧化巡查技術研發成果」教育訓練暨成果推廣，分享港區無人載具及操控邏輯技術、影像自動化偵測技術（以臺北港為例）及系統平台功能操作等研發成果，並說明目前國內外無人載具技術發展及 AI 新興科技應用於設施巡查上的應用趨勢，藉由成果交流與技術推廣，展現在港區智慧巡查與 AI 應用上的研發能量，參與單位包含交通部航港局、臺灣港務股份有限公司、國家海洋研究院、國震中心與臺大土木合設 AI 研究中心、中國土木水利工程學會代表，超過 50 位人員參加。

The Institute held the "R&D Outcomes of Smart Port UAV Inspection Technology" training and dissemination event at the Chang Yung-Fa Foundation International Convention Center. The program presented achievements in UAV operation and control logic for port environments, automated image detection (using the Port of Taipei as a case study), and system platform functionalities. It also highlighted emerging domestic and global developments in UAV and AI applications for infrastructure inspection. The event demonstrated the Institute's R&D capacity in smart port inspection and AI-enabled applications. More than 50 representatives from the Maritime and Port Bureau, MOTC, Taiwan International Ports Corporation Ltd., National Academy of Marine Research, NTUCC-NCREE AI Research Center, and the Chinese Institute of Civil and Hydraulic Engineering participated.



11月18日

本所舉辦「研擬道路交通標誌標線號誌設置參考指引（2/3）－複雜道路情境」成果說明會，由蘇振維前副所長致歡迎詞，邀請各級政府道路管理機關、顧問公司、相關公（協、學）會、區域運輸發展研究中心、交通相關民團等單位參加，共計 80 人與會。

The Institute conducted the results briefing session for "Developing Guidelines for the Setting of Road Traffic Signs, Lines, Markings, and Signals(2/3)- Complex Situations on Roads" Former Deputy Director General Su Cheng-wei delivered the welcome remarks. The event brought together road management agencies at all levels of government, consulting firms, professional associations, regional transportation development research centers, and transportation-related civil organizations, with a total of 80 participants in attendance.



日期 Date

重要記事 Event

本所辦理 114 年「事業減碳通勤優良單位標章制度」試辦活動成果發表會，試辦活動計有醫療、運輸、金融、能源、資訊等 20 家事業單位參與，其員工人數規模近 1.2 萬人；各參與單位透過提供通勤補助、員工通勤接駁車、設置自行車停車設施、電動車停車位與充電設施，以及內部獎勵與表揚措施，藉以鼓勵員工改變原有使用汽機車通勤的習慣。經專家學者評審，計 8 家獲頒金級標章及 12 家獲頒綠級標章。試辦活動之間卷調查分析顯示，回復的有效樣本中約有 16% 的員工於活動期間從私人小客車或機車改採用綠運輸通勤。

The Institute held an achievement showcase and award presentation for the pilot "Green Commuting Certification for Enterprises system." Twenty organizations from the healthcare, transportation, finance, energy, and information technology sectors participated, together employing nearly 12,000 people. These organizations encouraged greener commuting by offering commuting subsidies, employee shuttle buses, bicycle parking, EV parking and charging facilities, and internal incentive and recognition programs. Following expert review, eight organizations were awarded the Gold Certificates, while 12 organizations received the Green Certificates. Survey results from the pilot showed that about 16% of respondents changed their commuting mode from private cars or motorcycles to green transportation during the program.

11月21日



本所蘇振維前副所長率領運技中心同仁參加「114年災害防救科技韌性成果展」，當日與中央氣象署共同負責交通部攤位，展示本所「土工織布橋梁基礎保護工法」及「商港海氣象資訊展示系統」計畫成果。

Former Deputy Director General Su Cheng-wei led staff from the Transportation Technology Research Center to participate in the "2025 Disaster Prevention and Resilience Technology Exhibition." The Institute jointly managed the MOTC's exhibition booth with the Central Weather Administration, showcasing research outcomes including the "Geotextile Bridge Foundation Protection Methods" and the "Commercial Port Marine Weather Information Display System."



本所 11 月 20 日完成「都市交通控制通訊協定」3.5 版初稿並陳報交通部，交通部已於 11 月 27 日正式函頒。

11月27日

On November 20, the Institute completed the draft of version 3.5 of the "Urban Traffic Control Communication Protocol" and submitted it to the Ministry of Transportation and Communications (MOTC). The protocol was officially promulgated by the MOTC on November 27.

日期 Date

重要記事 Event

11月27日
S
11月28日

本所與國立中興大學土木工程學系、社團法人台灣海洋工程學會共同舉辦第47屆海洋工程研討會暨國際能源論壇，以「探索海洋・智慧治理」為主題，聚焦智慧監測、永續工程、海洋能源與氣候調適等重要議題，活動吸引約600人參與，發表137篇論文及展示78篇競選海報，涵蓋波浪與水動力學、海洋及海岸規劃管理、海洋資源開發與保育、港灣與海域工程、海洋能與離岸風力、海岸防災與保護之自然解方、氣候變遷對海洋環境及工程衝擊、海洋雷達技術發展、水下文化資產等多元領域，並舉辦一場國際能源論壇。研討會由本所黃新薰所長致詞並邀請臺灣港務股份有限公司王錦榮總經理、日本東京大學佐竹健治教授、交通部公路局北區公路新建工程分局陳永傑分局長專題演講，促成產、官、學、研跨界交流，強化我國港灣及海洋科技研發能量，提升研究成果之實用性與國際能見度，並促進產業技術發展與政策應用，展現港灣工程與能源議題的前瞻視野。

The Institute, in collaboration with the Department of Civil Engineering at National Chung Hsing University and the Taiwan Society of Ocean Engineering, organized the 47th Ocean Engineering Conference and International Energy Workshop under the theme "Exploring the Ocean and Smart Governance." The event addressed key themes including smart monitoring, sustainable engineering, ocean energy development, and climate adaptation. The conference brought together approximately 600 participants and featured 137 academic papers and 78 poster competition entries. The program spanned multiple disciplines, including wave and hydrodynamics, marine and coastal planning and management, marine resource development and conservation, harbor and coastal engineering, ocean energy and offshore wind power, nature-based coastal disaster risk reduction, climate change impacts on marine environments and engineering systems, marine radar technology, and underwater cultural heritage. An international energy workshop was also convened. The conference began with opening remarks by Director General Huang Hsin-Hsun of the Institute, followed by keynote speeches delivered by General Manager Wang Chin-Jung of Taiwan International Ports Corporation Ltd., Professor Kenji Satake of The University of Tokyo, and Director Chen Yung-Chieh of the Northern Region New Construction Branch Office, Highway Bureau, MOTC, to present keynote speeches. The event brought together experts from industry, government, academia, and research institutions, fostering cross-disciplinary dialogue and strengthening Taiwan's R&D capacity in port and marine engineering. It improved the practical value and international visibility of research outcomes, encouraged industrial innovation and policy application, and highlighted forward-looking perspectives on port engineering and marine energy development.



本所協助交通部籌辦與中華民國運輸學會合辦「2025年年會暨學術論文國際研討會」，並於會議首日下午由本所統籌辦理「重大交通政策未來研究課題專題研討」場次；本屆大會邀請陳世凱部長、伍勝園政務次長分別於晚宴及大會開幕式致詞。

12月4日

The Institute supported the MOTC and the Chinese Institute of Transportation in organizing the "2025 International Conference and Annual Meeting of the Chinese Institute of Transportation." As part of the program, the Institute organized and coordinated the "Future Research Priorities for Major Transportation Policies" forum on the afternoon of the conference's first day. Minister Chen Shih-Kai and Political Deputy Minister Wu Sheng-Yuan were invited to deliver remarks at the banquet and the opening ceremony, respectively.

日期 Date

重要記事 Event

12月5日

本所於公路局東區養護工程分局花蓮工務段、臺灣港務股份有限公司花蓮港務分公司，辦理「浪襲影像判釋及數值模擬技術研發成果教育訓練」，介紹海岸公路及港區防波堤浪襲影像判釋、波浪數值模式結合機器學習建立數值預警模組等研究成果，並整合於預警系統，提供於交通管制、封路決策、東防波堤工程作業、人員巡查、釣客活動等安全管理實務應用，提升災防管理效能。

The Institute organized the "Research and Development of Wave Attack Image Recognition and Numerical Simulation Technologies" at the Hualien Branch for the Eastern Region Branch Office of the Highway Bureau, MOTC, and the Port of Hualien. Participants were introduced to key research achievements, including image interpretation techniques for wave overtopping along coastal highways and port breakwaters, as well as a numerical forecasting module that combines wave simulation models with machine learning. By integrating these technologies into an early warning system, the project provides practical support for traffic management, road closure decision-making, east breakwater construction safety, personnel inspections, and recreational fishing activities, ultimately improving disaster prevention and safety management performance.



本所與交通部公共運輸及監理司辦理運輸部門淨零轉型社會溝通會議－「共享綠運輸・淨零旗艦行」論壇，由陳彥伯政務次長擔任主席，並由各主責單位說明「運具電動化及無碳化」行動計畫、「淨零綠生活」行動計畫（低碳運輸網絡部分）推動成果，以及「商用車輛電動化及無碳化減碳旗艦行動計畫」、「永續航空燃油（SAF）減碳旗艦行動計畫」、臺灣海運減碳策略及路徑藍圖等專題報告外，並就「共享運具推廣之公私協力」與「減碳通勤之推廣與優良單位標章制度推動」2項議題進行交流。本次論壇邀集政府部門（中央政府、地方政府）、學界、研究單位、公私協會、公民團體，以及一般大眾與會，現場約160餘位參加，共同就運輸部門淨零政策進行探討與交流。

12月9日

Cooperating with the Department of Public Transportation and Supervision, MOTC, the Institute held the Transportation Sector Net-Zero Transition Social Communication Forum – "Shared and Green Transportation; Advancing the Net-Zero Flagship Initiative," with Deputy Minister Chen Yen-Po serving as chair. The forum featured presentations by lead agencies on the achievements of the "Vehicle Electrification and Decarbonization" and the "Low-Carbon Transportation Network" under the "Net-Zero Green Living Action Plan," as well as sessions covering the "Commercial Vehicle Electrification and Decarbonization Flagship Action Plan," the "Sustainable Aviation Fuel (SAF) Decarbonization Flagship Action Plan," and Taiwan's maritime carbon reduction strategy and roadmap. The event also concluded with in-depth discussions on "Strengthening Public-Private Partnerships to Expand Shared Mobility Services" and "Promoting Green Commuting Certification System for Enterprises system." Over 160 participants representing central and local government agencies, academic institutions, research organizations, public and private associations, civil society groups, and the general public attended the forum to engage in discussions on transportation sector net-zero policies and future directions.



日期 Date

重要記事 Event

12月12日

參加國立成功大學舉辦「114年度水利海洋規劃試驗成果業務交流會」，與國立成功大學、國立臺灣大學、經濟部水利署水利規劃試驗分署進行業務交流。

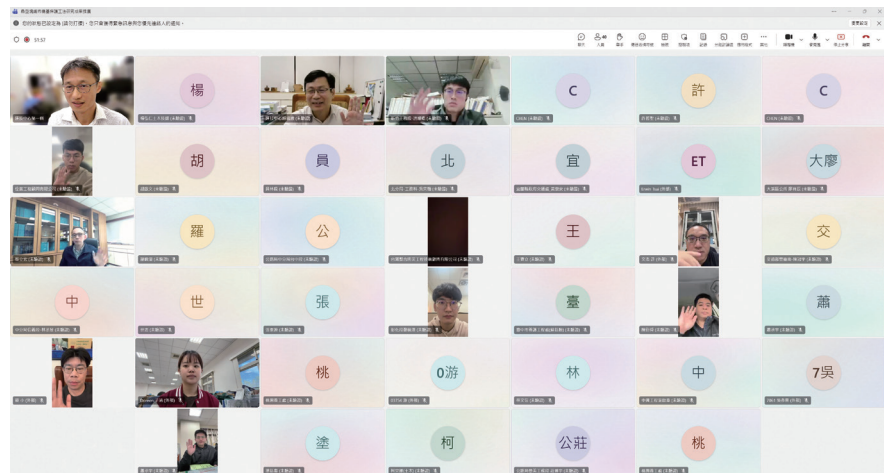
The Institute attended the "2025 Water Resources and Ocean Engineering Planning and Experimental Research Achievement Exchange Conference" organized by National Cheng Kung University, where it conducted technical exchanges with National Cheng Kung University, National Taiwan University, and the Water Resources Planning Branch of the Water Resources Agency, MOEA.



12月31日

本所舉辦「鼎型塊織布橋基保護工法研發與應用」研究成果視訊推廣活動，邀請交通部高速公路局、公路局、國營臺灣鐵路公司、各縣市政府等橋梁維管機關，以及相關技師公會共同參與。會中深入分享研發成果與現地試驗案例，旨在協助產官學界強化橋梁基礎防護技術，進而保障國民通行安全與設施韌性。

The Institute held an online promotion event entitled "R&D Achievements and Applications of the Tripod-Block and Geotextile Bridge Foundation Protection Method," bringing together bridge maintenance authorities from the Freeway Bureau, Highway Bureau, Taiwan Railway Corporation, local governments, and professional engineering associations. Through in-depth presentations of its R&D milestones and field demonstrations, the Institute fostered a collaborative dialogue to advance bridge foundation protection technologies across public, private, and academic sectors. This initiative highlights the Institute's commitment to fortifying infrastructure resilience and ensuring public transit safety.





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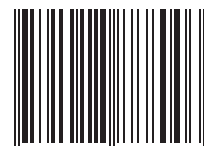
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