IOT

中華民國113年年報

ANNUAL REPORT 2024

交通部運輸研究所

INSTITUTE OF TRANSPORTATION, MOTC

IOT

中華民國113年年報

ANNUAL REPORT 2024

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交通部主管全國交通行政及交通事業，涵蓋運輸、觀光、氣象、郵政等領域，為積極有效發揮施政效能，肩負推動國家重大交通建設、提供優質便利民行服務的重任，交通部努力推動重點工作包括落實運輸安全與人本價值、引領運輸科技與創新、打造便捷及韌性交通網、推動觀光產業永續與發展、精進郵政與氣象服務、推動淨零碳排邁向環境永續。

本所長期扮演交通部智庫角色，肩負「前瞻智庫、落實應用、能量構建」三大任務，並以「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」及「推動淨零碳排邁向環境永續」等為當前四大研究主軸，並且因應國內外情勢與國家整體發展需求，持續針對交通運輸系統進行前瞻性與整體性之研究發展、規劃、審議及建議等業務。本所全體同仁皆秉持「專業領航、追求卓越」之精神與團隊共識，採取「以終為始」的目標及成果導向，以求落實每項研究成果皆

The Ministry of Transportation and Communications (MOTC) is in charge of national transportation administration and related enterprises, which encompass transportation, tourism, meteorology, postal services, and other areas. In order to fully leverage administrative effectiveness, the MOTC is responsible for promoting national major transportation projects and providing high-quality, convenient public transportation services. The MOTC's promotion focuses on implementing transportation safety and humanistic values, guiding transportation technology and innovation, creating a convenient and resilient transportation network, promoting the sustainability and development of the tourism industry, improving postal and meteorological services, and advancing net-zero carbon emissions toward environmental sustainability.

The Institute of Transportation has long served as the Ministry of Transportation and Communications' think tank. It is responsible for three key missions: "prospective think tanks, application implementation, and energy construction." In addition, "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" are currently the four research axes. In response to domestic and international situations, as well as overall national development demands, prospective and overall research development, planning, review, suggestions, and other activities will be carried out, with an emphasis on the transportation

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所長的話

Message from the Director General

能支援交通部施政之目標。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、行政院2050淨零排放路徑評估專案工作組、交通部交通費率審議會，以及桃園航空城聯外運輸系統工作小組等幕僚工作。

回顧過去一年，本所在「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」及「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：**完成研提「道路交通標誌標線號誌設置參考指引－一般道路情境」、「公路公共運輸永續及交通平權計畫（114-117）」、「無人機空拍應用於路段交通衝突分析－車道交通衝突」、「新興科技導入學校交通安全教育之研發示範計畫－成效評估與推廣應用」、「應用人工智慧分析技術探勘高風險路段－空間特性分析」、

system. All personnel at the Institute of Transportation conform to the ethos and team consensus of "professional leadership and the pursuit of excellence." The goal and outcome orientation with the objective and outcome-oriented "begin with the end in mind," the goal is to ensure that each research outcome supports the MOTC's policy implementation. 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 Executive Yuan's project work group for 2050 net-zero emission path evaluation, 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 progressively completed major policy implementation planning and has been instrumental in promoting pertinent plans in the 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:** "reference guidelines for road traffic signs and markings-general road situations," the "highway public transportation sustainability and traffic equality plan (2025–2028)," "the application of drone aerial photography in road section traffic conflict analysis-lane traffic conflict,"

「道路交通安全檢查制度導入研究－建構道路安全檢查工具」、「『區域運輸發展研究中心服務升級2.0計畫』（112-113年）－道安改善計畫」、「應用影像智慧化技術判釋海岸公路及防波堤越波研究－防波堤越波影像判釋」、「港區影像智慧辨識技術之研究－空間資料環境分析及優化影像檢監測應用技術」、「鼎型塊織布橋基保護工法之現地試驗與成效評估－試驗場址數值模型建置及評估」，以及「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－合理成本與營運績效探討」。

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－功能擴充與精進」、「電動大客車智慧充電服務驗證－智慧充電管理系統精進與優化」、「電動大客車數據分析與應用計畫－資料視覺化與AI應用」、「運用科技精進連續假期疏運計畫先期規劃研究」、「我國人工智慧車聯網之號誌控制－匝道儀控與平面道路號誌協控實作」、「交通行動服務（MaaS）跨域合作與應用優化之研究－應用精進與提升包容性」、「無人機偏鄉物流服務運送驗證計畫－服務模式實作與系統驗證」、「橋梁檢測輔助工具精進之研究－研訂橋梁檢測3D影像模型作業程序」、「鐵路供需診斷數位分身軟體平台之建置－鐵路數位分身軟體平台雛型架構之研發」、「港灣構造物巡查檢測作業精進－新興科技應用於防波堤設施巡查檢測作業」、「港灣環境資訊系統維護與精進（3/4）－海氣象資料分析及展示」及「海氣象預測模擬系統之維運與精進（3/4）－精進高雄海域模組」，並以「電動公車服務數位創新加值計畫－驅動智慧城市能源管理新思維」為題獲得行政院「第7屆政府服務獎」數位創新加值項獎項。

三、**在打造便捷及韌性交通網方面：**持續辦理區域及全國整體運輸規劃，完成「東臺區域整體運輸規劃系列研究－陸路運輸系統發展策略研析」、「臺灣地區整體運輸規劃－貨運需求模式架構分析」、「城際鐵道容量分析暨應用研究－編組站及端末站之容量軟體擴充暨案例實作」、「高速公路交織路段容量及服務水準分析之研究－非典型路段」、「電動車公共充電樁設施設置需求評估之研究」、「海運國際資料庫維護及議題分析」、「我國航港資訊整合與數位化發展架構之研究－研訂航港產業數位化發展指引」、「空運國際資料庫維護及議題

and "the R&D demonstration plan for emerging technology introduced to school traffic safety," "the application of artificial intelligence analysis technology to explore high-risk road sections-analysis of spatial characteristics," "introductory research on road traffic safety inspection systems-construction of road safety inspection tools," "service upgrade 2.0 Plan (2023–2024) for regional centers for transportation research and development-road safety improvement plans," "research on the application of smart imaging technology to interpret coastal highways and breakwater wave overtopping-interpretation of breakwater overtopping images," "research on port area smart image recognition technology-environmental analysis of spatial data and optimization of image detection and monitoring application technology," "site and effectiveness assessment of tripod-shaped weaving bridge foundation protection techniques-the establishment and assessment of test site numerical models," as well as "research on the operating cost, subsidy system, and charging system of demand-responsive transportation service (DRTS) – a discussion of reasonable costs and operational performance."

(2) **In terms of guiding transportation technology and industrial innovation,** "construction of 5G smart transportation digital neve-functional expansion and improvement," "verification of electric bus smart charging services – improvement and optimization of smart charging management systems," "electric bus data analysis and application plans-data visualization and AI applications," "research on pre-planning of consecutive holiday traffic divergence plans through the use of technology," "signal control for artificial intelligence vehicle-to-everything-ramp control in Taiwan – co-managed implementation of ramp instrumentation control and road signs," "research on mobility as a service (MaaS) cross-domain collaboration and application optimization – enhancement of applications and inclusiveness," "remote town drone logistic services and transportation verification plan – service model implementation and system verification," "the establishment of bridge detection assistive tool improvement-operational procedures for the establishment of bridge detection 3D image models," "the research and development of railway supply and demand for diagnosis of digital agent software platforms," "harbor structure inspection and testing operation improvement – the application of emerging technology in breakwater facility inspection and testing operations," "the maintenance and improvement of harbor environmental information systems (3/4) – marine meteorological data analysis and display," and "the maintenance and improvement of the marine meteorological forecast and simulation system (3/4) – improvement of the Kaohsiung sea water modules." Furthermore, the topic "digital innovation of electric bus service value-added plan driven by a new mindset in smart city energy management" received the "7th Government Service Awards: value-added services of digital innovation."

(3) **In terms of creating convenient and resilient transportation networks, overall regional and national transportation planning will continue to be done. The projects that were completed include:** "a research series on overall transportation planning in the eastern region – the research and analysis of land transportation system development strategies," "Overall transportation planning in Taiwan – an analysis of the freight demand model framework," intercity railway capacity analysis, and applied research – capacity software extension and case implementation at marshaling yards and terminals." "research on analysis of capacity and service level of freeway interweaving road sections – non-typical road sections," "research on the assessment of electric bus public charging pile facility installation demand," "analysis of the maintenance of international ocean freight database maintenance and the issues," "research on Taiwan's maritime and port information integration and digital development architecture – research and the establishment of guidelines for the maritime and port industry's digitalization development," "The maintenance of air freight international databases and the analysis of issues," "The planning and installation of international

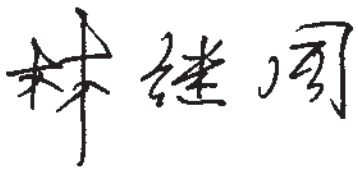
分析」、「國際機場運作模擬分析軟體系統規劃與建置－整合軟體建置與實例測試」、「鐵道系統強化調適能力之探討－機制與方法」、「建構運輸管理機關（構）之調適專業能力－人才培育及機制建議」，以及研提112年度「維生基礎設施領域成果報告」。

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(I)」，研提第二條環島路線之初步規劃、「自行車道系統規劃設計參考手冊（2024修訂版）」(初稿)，協助交通部推動運輸部門2050淨零轉型及氣候變遷因應法法定工作，完成「運輸部門淨零排放與溫室氣體減量推動工作暨評估模型強化－精進減碳評估方法暨研訂第3期減量目標」、「低碳交通區推動機制之研究－推動指引」、「共享運具連結公共運輸之研究－營運管理因應策略規劃」、「汽車貨運業因應淨零轉型策略規劃（1/2）－策略架構建立」，以及研提第二期運輸部門溫室氣體減量行動方案112年成果報告。

時光荏苒，本所已走過了40個春秋，特於114年1月3日舉辦「卓越40－永續新紀元」40週年發展回顧與展望活動，陳世凱部長、林國顯常務次長、歷任所長及交通運輸界產官學研代表齊聚一堂。陳世凱部長致詞期勉本所，在40年累積之堅實基礎上持續「專業領航追求卓越」；林國顯常務次長及本人分別頒發歷任所長貢獻獎及張淞顧問交通卓越貢獻獎。此外，本人針對未來展望規劃進行報告，並舉行「運輸研究領航館」啟動儀式及卓越40特展，讓交通運輸界產官學研代表一起回顧交通歷史記憶，串聯交通世代、凝聚各界共識，共同擘劃運輸前瞻未來。

展望未來，本所將持續扮演及強化交通部智庫角色，透過精進交通基礎研究、前瞻科技創新應用研發及運輸政策規劃等核心任務，以提升重大政策研擬與決策支援實力；此外，亦將持續關注國際趨勢，強化海、空運輸規劃能力，以及運輸安全、公共運輸、智慧運輸、綠運輸、防災與調適等研究，以支援運輸施政與科技創新應用並促進產業發展，奠立我國運輸服務優質升級之堅實基礎。

交通部運輸研究所　所長林繼國



airport operation simulation analysis software systems – the integration of software installation and case testing," "a discussion of strengthened adaptability capabilities of railway systems – mechanisms and methods," "the development of professional adaptability competency of transportation management agencies (institutions) – talent cultivation and mechanism recommendations," as well as the proposal for "the reporting of the results in the field of critical infrastructure for 2023."

(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 (I)" was completed. The initial planning of the second around-the-island route and the "reference manual for bike lane system planning design (2024 revised edition)" (initial draft) were proposed to assist the MOTC's promotion of the transportation sector's net-zero emissions, as well as statutory work in response to climate change. The "transportation sector's net-zero emissions, greenhouse gas reduction promotion work, and assessment model improvement – improving carbon reduction assessment methodologies and setting Phase 3 reduction goals," "research on low-carbon transportation zone promotion mechanisms-promotional guide," "research on shared transportation modes linked to public transportation – the planning of operational management response strategies," and "strategic planning of the trucking carrier industry in response to net-zero transformation (1/2) – the establishment of a strategic framework" were completed. In addition, the "reporting on the results of the phase 2 transportation sector's greenhouse gas reduction action plan for 2023" was proposed.

With the passage of time, the Institute of Transportation has been in operation for forty years. On January 3, 2025, the "40th Year of Excellence – A New Era of Sustainability" 40-year development retrospective and forecast event was conducted. Minister Chen Shih-Kai, Deputy Minister Lin Kuo-Shian, past directors-general, and representatives from the transportation sector, industry, government, academia, and research were in attendance. Minister Chen Shih-Kai spoke at the ceremony, encouraging the Institute of Transportation to maintain "professional leadership and pursuit of excellence" based on its firm foundation built over four decades. Deputy Minister Lin Kuo-Shian, and I presented the Director-General's Contribution Award to former directors-general, as well as the "Transportation Outstanding Contribution Award" to consultant Chang Tan. In addition, I provided a report on future prospect planning and presided over the inauguration of the "Pilot Transportation Research Pavilion" and the 40th Year of Excellence Special Exhibition. This enabled representatives from industry, government, academia, and research to recall the history of transportation, connect different generations of transportation, and achieve consensus from all sides, thereby planning a prospective future for transportation.

Looking ahead, the Institute of Transportation will continue to maintain and strengthen the MOTC's role as a think tank. Major policy formulations, decision-making, and support strengths can be enhanced by improving infrastructure research, the application of innovations, and the R&D of prospective technologies, transportation policy planning, and other core tasks. Furthermore, emphasis will be placed on international trends, thereby strengthening sea and air transport planning capabilities, as well as transportation safety, public transportation, smart transportation, green transportation, disaster prevention and adaptation, and other related studies. This will support the administration of transportation policy, technological innovation and applications, and future industrial development. This will, in turn, lay the groundwork for high-quality upgrades to Taiwan's transportation services.

Director General
Institute of Transportation, MOTC

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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，雖亦因之與時俱增，但仍始終趕不上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

I History

Since i t s 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. However, although the investments in transportation have experienced substantial growth over the years, they lag consistently behind the overall growth of the economy and the rise in living standards. Consequently, transportation infrastructure is inadequate and traffic congestion is worsening. 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

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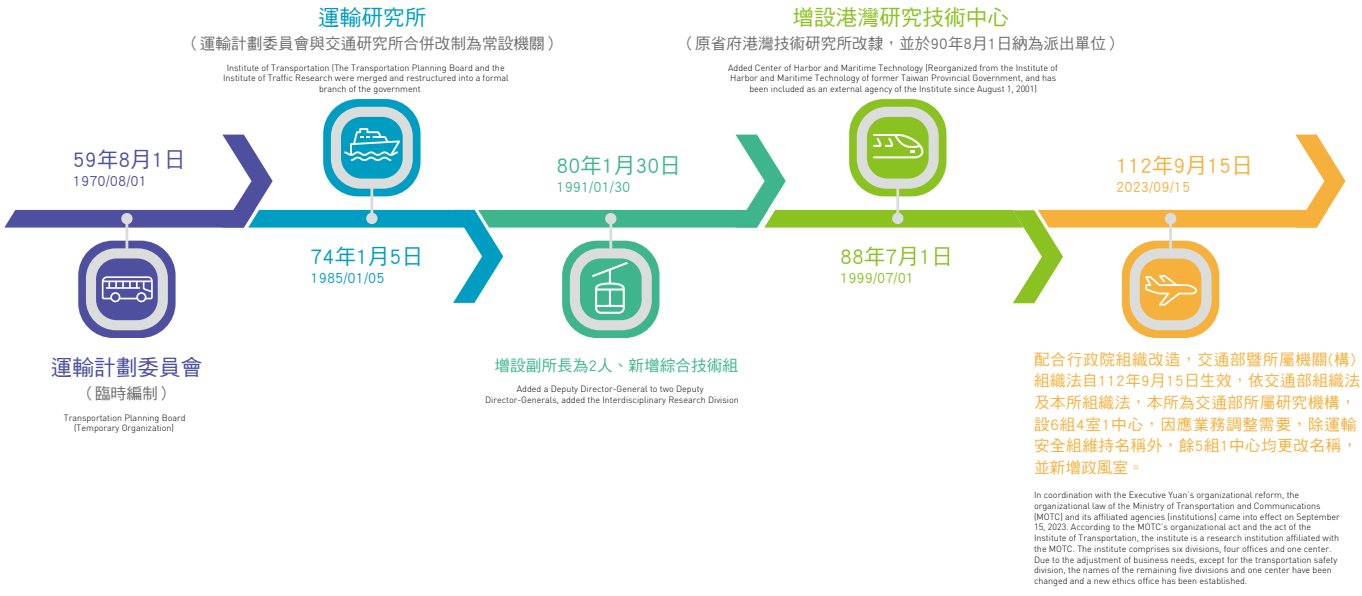
組織與職掌
Organization and Functions

量等等，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，更須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長期發展計畫等等，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。

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.

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。

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 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 intermediatelevel 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 Execute 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113年底預算員額148人（含職員130人、聘用人員3人，技工、工友及駕駛15人）。

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。

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 2024, the institute's budgeted staff was 148 people (including 130 staff members, 3 contracted personnel, and 15 technicians, workers and drivers).

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.

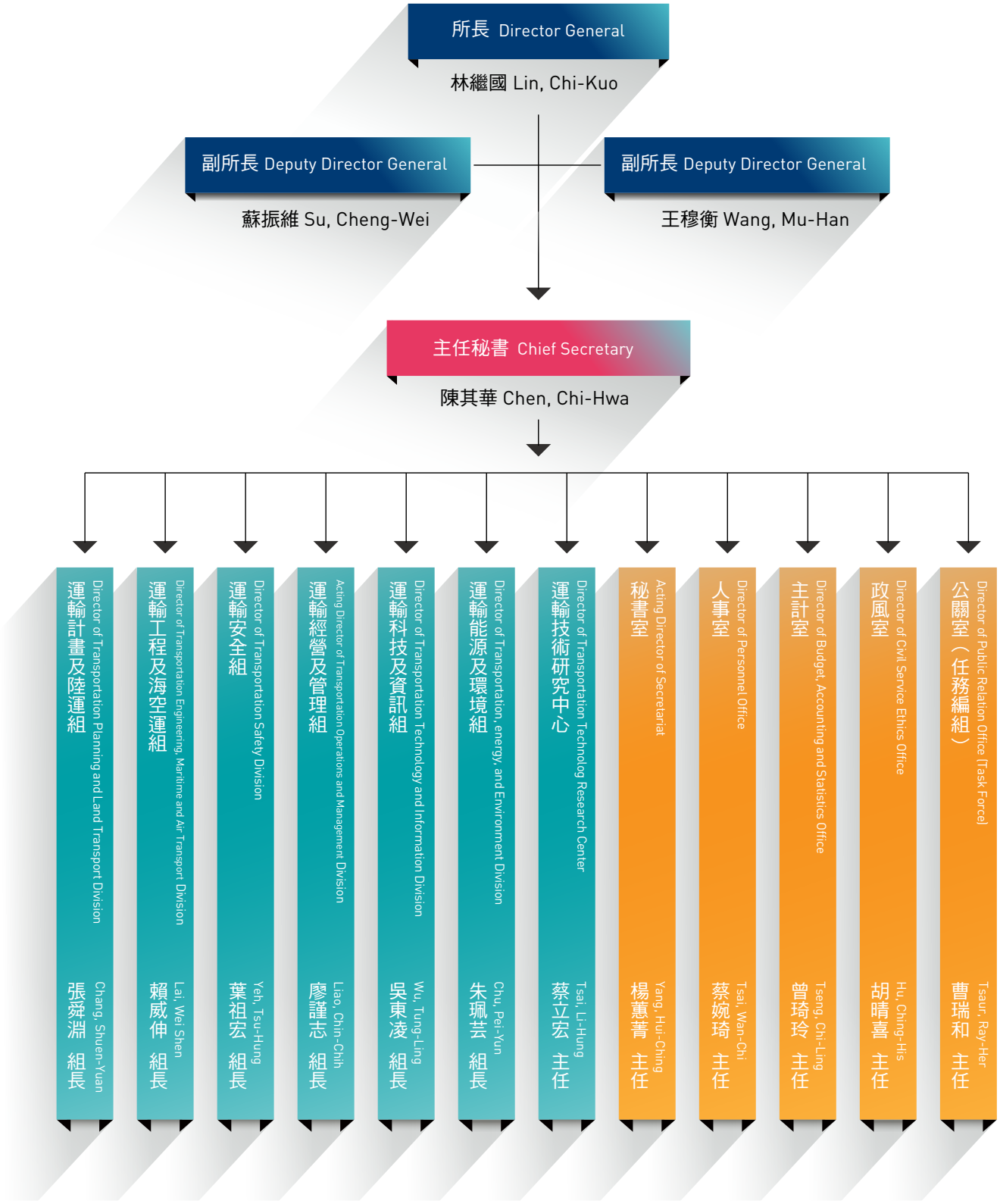
10 Other transportation research-related matters.

四 組織架構

本所組織架構如下圖：

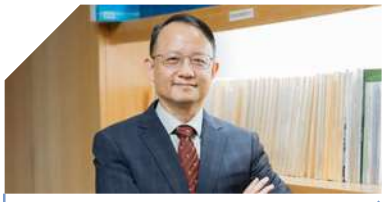
IV Organization Framework

Organization of the Institute is shown below:



所長 Director General
林繼國 Lin, Chi-Kuo

副所長 Deputy Director General
蘇振維 Su, Cheng-Wei



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

主任秘書 Chief Secretary
陳其華 Chen, Chi-Hwa

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
曾琦玲 Tseng, Chi-Ling

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 Technolog 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
葉祖宏 Yeh, Tsu-Hung

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
廖謹志 Liao, Chin-Chih

運輸科技及資訊組 組長
Director of Transportation Technology and Information Division
吳東凌 Wu, Tung-Ling

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

參 03 IOT

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，113年之七項研究主軸與重點如下：

一 強化運輸規劃與審議支援

辦理運輸規劃研究，精進計畫評估工具，以健全整體運輸發展為願景，研究重點如下：

1. 因應環境變遷滾動辦理整體運輸規劃

（1）持續辦理區域及全國整體運輸規劃，105年開始辦理區域整體運輸規劃，目前已完成北臺、南臺及中臺區域整體運輸規劃，於113年辦理東臺區域（宜花東）整體運輸規劃系列研究之第3年期計畫，依據前2年期完成之東臺區域運輸需求模式與需求預測分析，進行東臺區域陸路運輸系統發

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. There were seven main schemes and key points of 2024, and they are described as follows:

I Enhance the Transportation Planning and Reviewing Support

Organize transportation planning and research and better project evaluation tools to normalize transportation developments. Highlights of the research are as follows:

1. Transportation Planning on a Rolling Basis Reflective of Environmental Changes

(1) Continuing the regional and nationwide transportation planning. Since 2016, regional transportation planning has been carried out. The transportation planning for Northern, Southern, and Central Taiwan have been completed. In 2024, the third year of the transportation planning series for Eastern Taiwan (Yilan, Hualien, Taitung) was conducted. The strategies for the development of the land transportation system in Eastern Taiwan were proposed based on the results of demand forecasts using the transportation demand model built in the project of the year 2023. In addition,

03
年度研究主軸與重點
Annual Research Theme and Focus

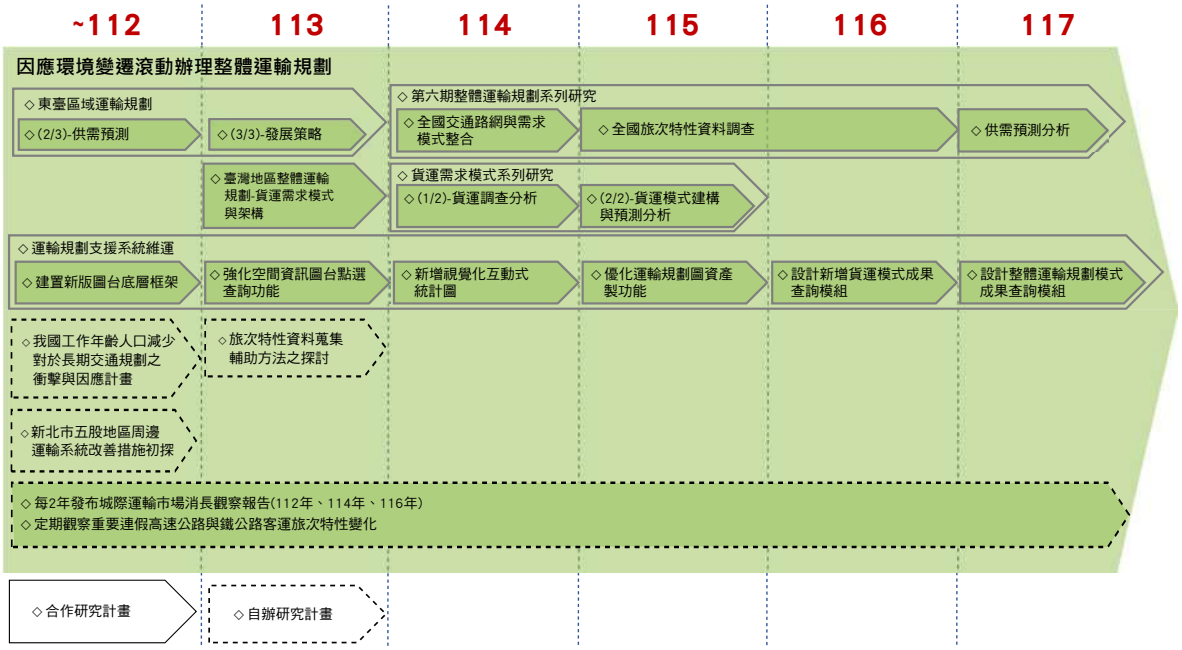
展策略研析。另考量貨運車輛於道路上占有一定比例交通量，其增減將影響路網旅行時間與交通指派的結果，貨運交通量亦為道路容量之規劃參據之一，須針對貨物運輸精進規劃作業，爰辦理貨運需求模式架構分析，以做為後續貨運需求模式建立之基礎。

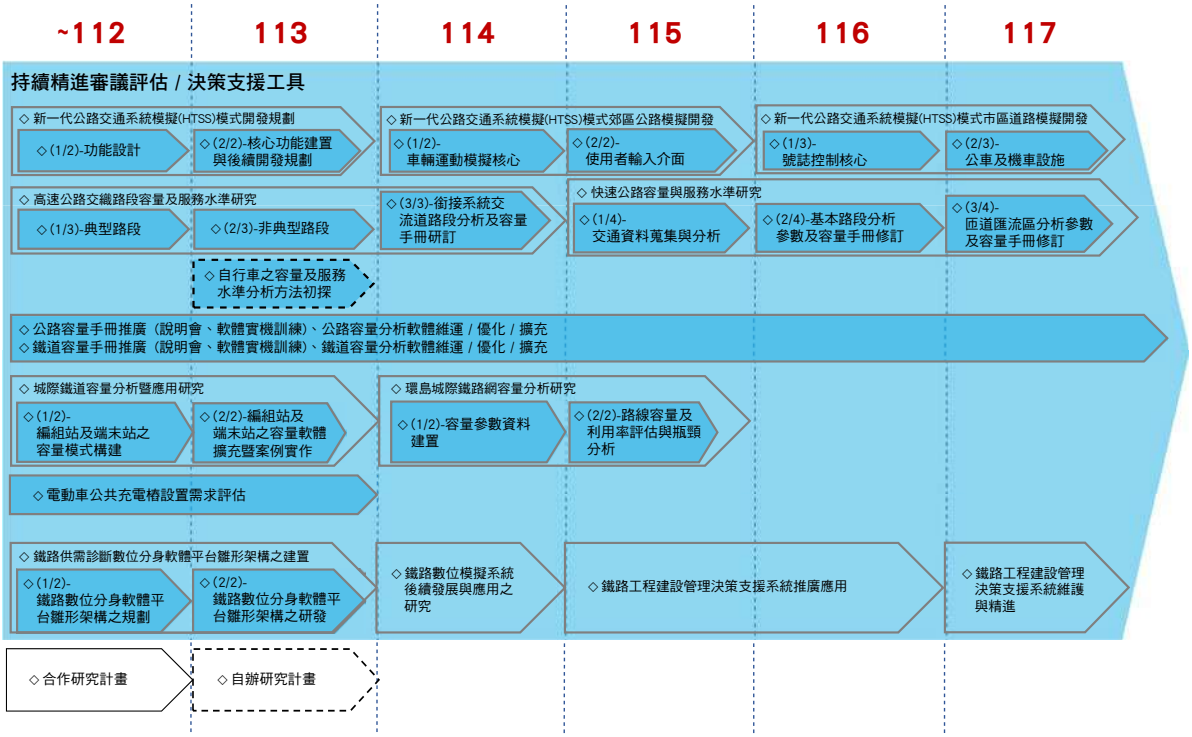
（2）持續維護與更新運輸規劃支援系統，完成空間資訊圖臺點選查詢功能及強化運輸規劃圖層套疊產製功能；強化數據庫資料查詢統計功能，新增中臺區域運輸需求模式成果查詢功能，113年應用系統圖資，協助完成由國發會、經濟部、交通部及國科會共同規劃之「桃竹苗大矽谷推動方案」，並由國發會及相關部會共同推動執行，以促進桃竹苗區域產業及安居生活的平衡發展。

considering that freight vehicles account for a certain proportion of traffic volume on roads, their increase or decrease will affect the travel time on the network and the results of traffic assignment. Freight traffic volume is also one of the references for road capacity planning. Therefore, it is necessary to improve planning efforts for freight transportation. For this reason, an analysis of the freight demand model framework is being conducted, serving as the foundation for the subsequent establishment of a freight demand model.

(2) Continue to maintain and update the transportation planning support system, complete the spatial information map point-and-click query function and strengthen the transportation planning layer overlay production function; strengthen the database data query and statistical function, and add the Central Taiwan regional transportation demand model results query function. In 2024, the system map data was used to assist in the completion of the "Taoyuan-Hsinchu-Miaoli Silicon Valley Promotion Plan" jointly planned by the National Development Council, the Ministry of Economic Affairs, the MOTC, and the National Science and Technology Council. The National Development Council and relevant ministries and commissions jointly promote and implement it to promote the balanced development of industry and housing in the Taoyuan-Hsinchu-Miaoli region.

主軸1：強化運輸規劃與審議支援





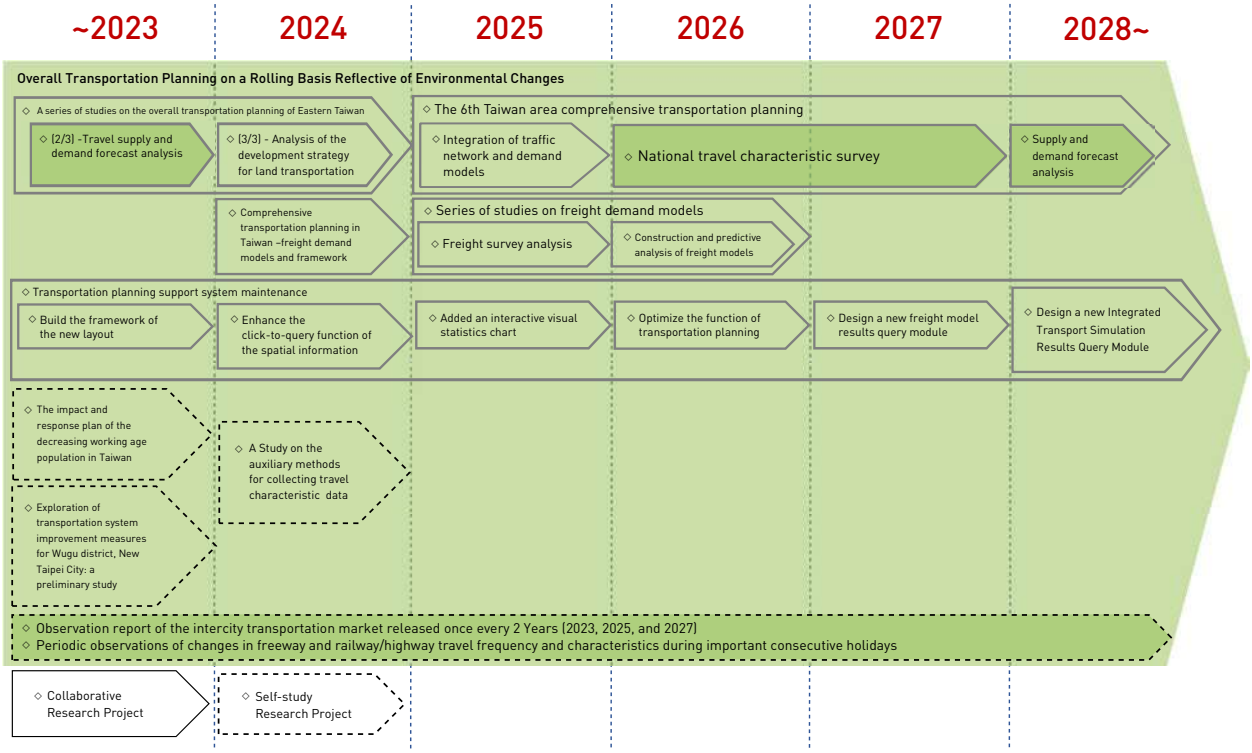
2. 持續精進審議評估 / 決策支援工具

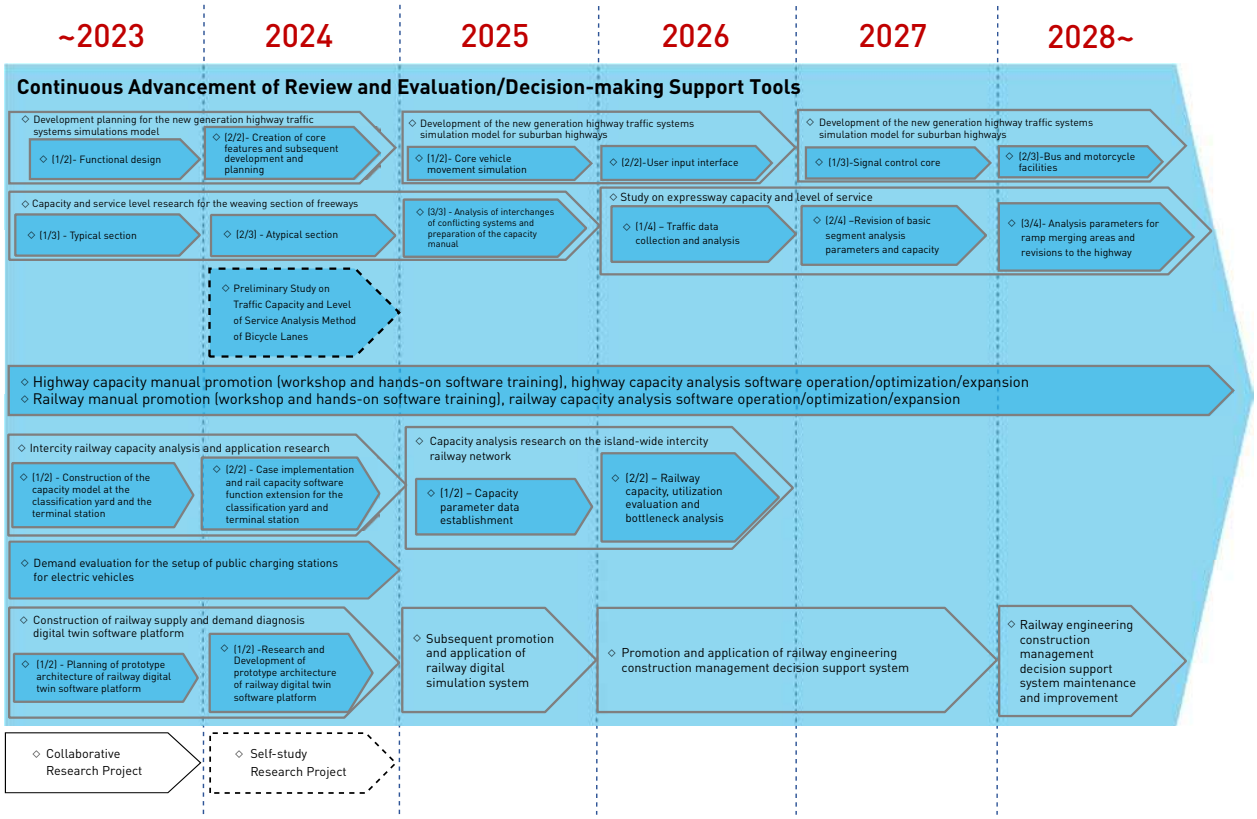
（1）113年延續112年高速公路交織典型路段初步分析模式，進行非典型交織路段之分析研究，並做為114年辦理銜接高速公路交織路段研究及未來臺灣公路容量手冊增修編訂之基礎。

2. Continuous Advancement of Review and Evaluation/Decision-making Support Tools

(1) In 2024, the preliminary analysis model for typical freeway weaving segments developed in 2023 will be extended to conduct analysis and research on non-typical weaving segments. This will serve as the foundation for the 2025 study on connecting freeway weaving segments and the future updates and revisions of the Taiwan Highway Capacity Manual.

1: Enhance the Transportation Planning and Reviewing Support





（2）基於公路交通設施容量及服務水準分析及研究工具發展之需要，本所於1990年代初期開發公路交通系統模擬（HTSS）模式。由於早期的開發環境使得模式維護面臨困難，爰113年提出新一代HTSS模式開發規劃，後續將逐年分階段開發，除保留既有HTSS之模擬邏輯，亦將優化輸入及輸出介面及功能，使其更具使用者親和性、滿足分析人員的需求。

（3）延續過去本所進行之鐵道容量分析系列研究，於113年完成編組站及端末站之容量分析軟體功能擴充、研析號誌安全時距公式以考量道岔以及列車進出調車場的影響，做為後續114年蒐集環島城際鐵路網之路線容量參數及路線容量初步分析之基礎。

（4）完成鐵路數位分身軟體平臺建置，整合本所過去數十年鐵路運轉相關研究成果，113年提供數位化的協作環境，不僅可協助鐵路系統自動排點，也可讓各種假設條件與規劃得以在與臺鐵現況一致的路軌數位模型中測試分析。

(2) In order to meet the needs of highway transportation facility capacity, service level analysis, and research tool development, the institute developed the Highway Traffic Systems Simulation (HTSS) Model in the early 1990s. As the early development environment made model maintenance difficult, a new generation HTSS model development plan was proposed in 2024. The model will be developed in phases, year by year. In addition to retaining the simulation logic of the existing HTSS, the input and output interfaces and functions will also be optimized to make it more user-friendly and meet the needs of analysts.

(3) Continuing past railway capacity analysis research, a study extended the software functions for capacity analysis at the classification yard and terminal station and developed formulas for signal close-in time that account for effects such as turnouts and entry/exit operations at the classification yard in 2024. These will serve as the basis for collecting capacity parameters and conducting a preliminary capacity analysis of the intercity railway network in 2025.

(4) Completed the construction of the railway digital twin software platform, integrating the research results related to railway operations of the institute over the past few decades. In 2024, it provided a digital collaborative environment that not only assisted in the automatic scheduling of railway systems but also allowed various assumptions and plans to be tested and analyzed in a digital track model consistent with the current situation of Taiwan Railways.

二 提升海空運競爭優勢

海空運為我國對外重要連結之運輸模式，建立海空運樞紐為我國海空運發展之願景，研究重點如下：

1. 掌握國際海空運發展趨勢進行前瞻性策略研提

（1）發展海空運決策輔助系統，以海運而言，航港產業有其特殊性，靠港過程中涉及眾多利害關係人及複雜作業流程，除了建立適當的系統進行準確且一致性的訊息傳遞外，其中關鍵課題不僅為技術問題，更須先達成訊息交換之共識，參與誘因及系統信任程度等；空運部分亦有須提升機場空側營運效能及工程應變決策能力之需求，爰113年就海空運領域分別辦理港口協調整合決策系統及機場空側模擬分析系統等研究，透過研究瞭解我國現行作業流程及實務做法，提供前述領域相關決策輔助工具。

（2）近年航空需求持續升級，透過導入新興技術強化旅客服務與設施競爭力，提供更即時便利服務，成為我國機場未來轉型重要關鍵；另一方面，我國地方核心機場、離島基本運輸機場，在有限資源下如何維持穩定營運，以智慧轉型策略補足人力缺口，也是未來維持競爭力重要課題，爰113年辦理「國際推動機場智慧化趨勢及我國發展課題探討」，蒐整國際發展趨勢、標竿機場發展經驗與我國各級機場推動狀況，並透由民航主管機關（構）及專家學者訪談，預劃我國機場數位創新發展方向，以利加速機場智慧化發展。

II Improve the Competitive Advantage of Maritime and Air Transport

Maritime and air transport are key modes of connection between Taiwan and the rest of the world. Establishing maritime and air transport hubs is a core vision for the development of these sectors. Highlights of the research are as follows:

1. Keeping Track of Development Trends for International Maritime and Air Transport to Facilitate Stipulation and Introduction of Forward-looking Strategies

(1) Development of Decision Support Systems for Maritime and Air Transportation. For maritime transport, the port and shipping industry have their unique characteristics. The port call process involves numerous stakeholders and complex operational procedures. In addition to establishing appropriate systems to ensure accurate and consistent information exchange, key challenges go beyond technical issues. It is essential first to reach a consensus on information exchange and consider participation incentives and the level of trust in the system. As for air transport, there is also a need to enhance the efficiency of airside operations and the capacity for engineering contingency decision-making at airports. Therefore, in 2024, studies on "Port Coordination and Integrated Decision Systems" and "Airport Airside Simulation and Analysis Systems" will be conducted separately for maritime and air transport. These studies aim to understand Taiwan's current operational procedures and practices and to provide relevant decision support tools in the aforementioned domains.

(2) In recent years, aviation demand has continued to rise. Introducing emerging technologies to enhance passenger services and facility competitiveness and to provide more immediate and convenient services has become a key factor in the future transformation of Taiwan's airports. On the other hand, maintaining stable operations under limited resources is a critical issue for local core airports and basic transportation airports in offshore islands. Adopting smart transformation strategies to address manpower shortages will be essential for sustaining competitiveness. Accordingly, in 2024, the study "Exploration of International Smart Airport Development Trends and Taiwan's Development Challenges" will be conducted. This study will collect information on international trends, benchmark airport development experiences, and the status of smart airport initiatives at all levels in Taiwan. It will also include interviews with civil aviation authorities and academic experts to preliminarily plan Taiwan's digital innovation development direction, aiming to accelerate the smart transformation of airports.

（3）海運數位化為航港產業長期關注的議題，然與其他產業相較之下，航港產業的數位化發展較為緩慢，有必要對相關策略進行深入研究，爰113年辦理「我國航港資訊整合與數位化發展架構之研究」，完成航港產業數位化發展藍圖與發展指引之研擬，藉以擘劃我國航港產業數位化發展方向，推動我國航港產業加速數位化進程。

2. 精進海空運資料庫功能進行主題式研析

（1）持續進行國際海空運資料庫維護更新，透過數據量化分析，提供決策應用。海運部分，進行資料庫前端單機版軟體改版，更精準而有彈性地提供航港局及港務公司政策評估所需之全球貨櫃航線數據；在空運部分，優化資料庫起迄航程查詢功能，增加使用者查詢彈性。

（2）因應內外在環境激烈變化，定期辦理國際海空運期刊研讀與研討，並掌握國際先進技術及產業發展情勢，進行研究與資料蒐集，提供重要海空運議題之研析，支援交通部及部屬機關（構）進行政策研擬，包括：我國及南向國家對外航線部署分析、主航線部署型態之變化分析、亞太傳統航空公司北美客運市場探討、民用航空運輸業者因應疫情相關作為、永續航空燃料應用趨勢之初探。

(3) Digitalization in maritime transport has long been a focal issue in the port and shipping industry. However, compared with other industries, the development of digitalization in this sector has been relatively slow, highlighting the need for in-depth research on relevant strategies. Therefore, in 2024, the study "Research on Taiwan's Maritime Information Integration and Digital Development Framework" will be carried out to formulate a digital development blueprint and strategic guidelines for the port and shipping industry. This will help chart the course for Taiwan's maritime digital transformation and accelerate its progress.

2. Enhancing the Functionality of Maritime and Air Transport Databases for Thematic Analysis

(1) Database Maintenance and Functional Upgrades.

- Maritime Transport: The international maritime transport database will be continuously maintained and updated. Through quantitative data analysis, the database will support decision-making. A revised standalone version of the front-end software will provide the Maritime and Port Bureau and port corporations with more precise and flexible access to global container route data for policy evaluation.
- Air Transport: The origin–destination route query function will be optimized to improve user query flexibility.

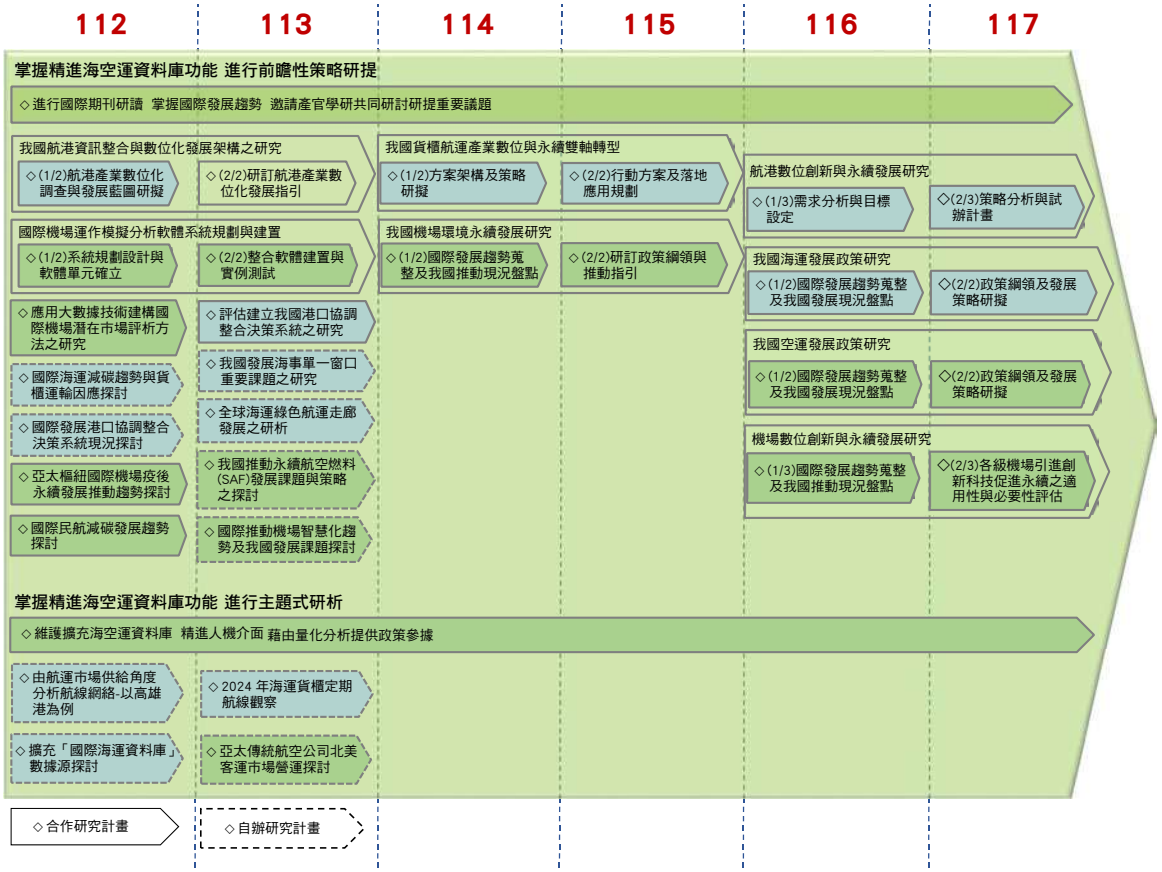
(2) Thematic Research and Analysis on Key Maritime and Air Transport Issues.

To respond to rapidly changing internal and external environments, regular reading and discussion sessions on international maritime and air transport journals were held. These sessions aim to keep abreast of advanced international technologies and industry trends, support research and data collection, and provide thematic analyses on critical maritime and air transport topics.

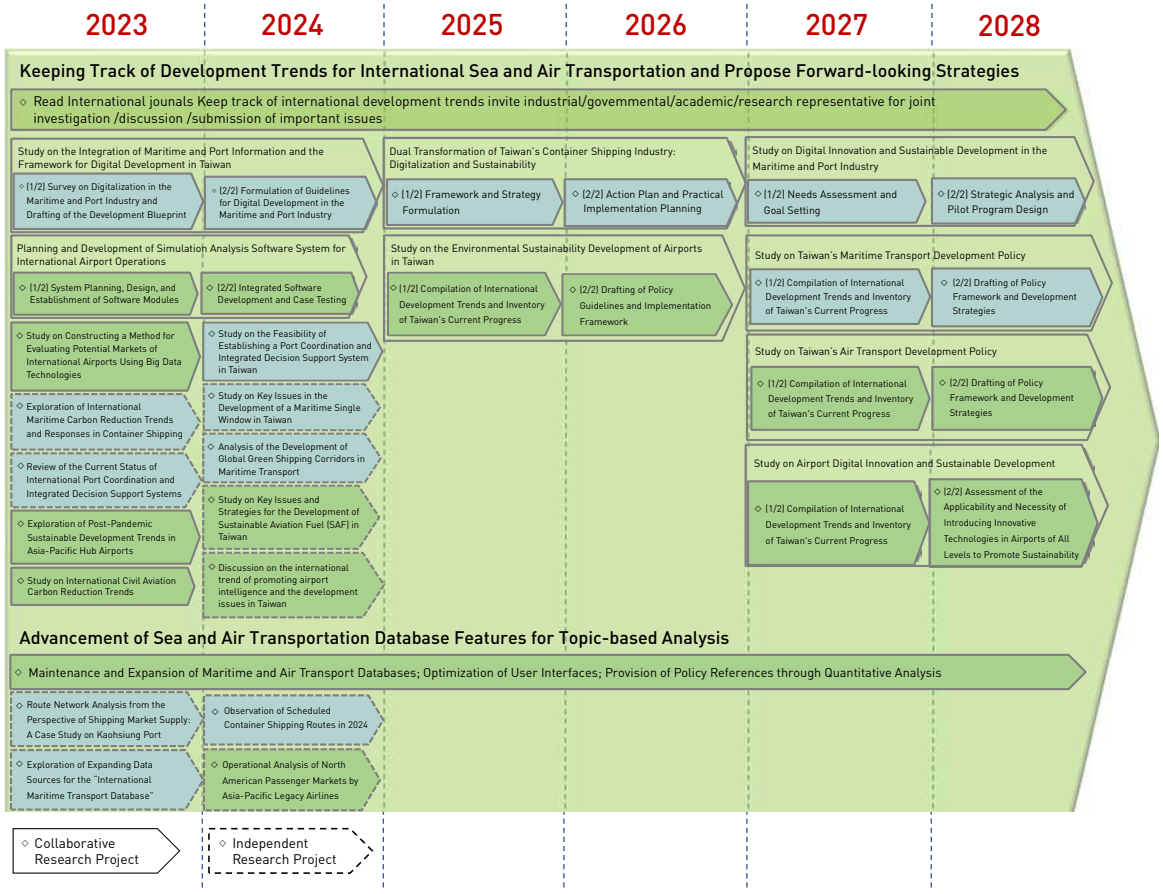
These include:

- Analysis of Taiwan's and New Southbound countries' international route deployment.
- Changes in major route deployment patterns.
- Analysis of the North American passenger market of Asia Pacific full-service airlines.
- Civil aviation operators' responses to the COVID-19 pandemic.
- Preliminary exploration of sustainable aviation fuel (SAF) application trends.

主軸 2：提升海空運競爭優勢



2: Improve the Competitive Advantage of Maritime and Air Transport



三 優化公共運輸服務及產業轉型

促進陸路運輸發展，改善經營環境及提升經營績效，以優化陸路運輸產業為願景，研究重點如下：

1. 優化公路公共運輸經營環境

（1）研提第五期公運計畫「公路公共運輸永續及通平權計畫（114-117年）」，以延續第四期公運計畫「公路公共運輸服務升級計畫（110-113年）」之執行成效，主要工作包括：分析國內外公共運輸發展情勢，界定新一期公運計畫之政策主軸；研擬推動策略與行動方案；規劃各推動策略所需分年經費；研擬績效指標項目並設定分年目標值；依據行政院審查意見增修計畫內容。

（2）賡續辦理區域運輸發展研究中心服務升級2.0計畫，透過開設交通運輸專業人才培訓課程、提供地方政府諮詢並輔導解決公共運輸問題，以彌補地方政府推動公路公共運輸所欠缺之人力及能力，協助地方政府發展公共運輸。

（3）辦理TPASS行政院通勤月票推動成效評估與精進建議，以瞭解TPASS行政院通勤月票實施後之成效，做為下一階段補助策略之參考依據，主要工作包括研擬TPASS推動成效評估指標，並透過公務統計數據、電子票證資料分析與問卷抽樣調查，產製各項評估指標值，衡量112年7月至113年6月TPASS推動成效，同時提出TPASS後續推動之精進建議，俾利適時調整相關政策作為，以利資源之有效運用並提高推動成效。

（4）彙整國內需求反應式公共運輸服務（DRTS）經營現況，以公路局推動之幸福巴士及幸福小黃為對象，並就其營運成本、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，協助解決公路局及主管機關執行幸福巴士及幸福小黃之問題。

III Optimize Public Transportation Services and Industrial Transformation

Promote land transportation, improve the operating environment, and boost operational performance in order to optimize the land transportation industry. Highlights of the research are as follows:

1. Optimization of the highway public transport's operating environment

(1) Propose the 5th Highway Public Transportation Plan, "Highway Public Transportation Sustainability and Traffic Equity Plan (2025-2028)", in order to continue the implementation achievements of the 4th Highway Public Transportation Plan, "Highway Public Transportation Service Upgrade Plan (2021-2024)". The main tasks include: Analyzing domestic and international public transportation development trends; Defining the primary policies for the new Highway Public Transportation Plan; Formulating strategies and action plans; Planning the annual budget allocations required for each strategy; Developing the key performance indicators and setting annual target values; and amending the plan's content in accordance with the review feedback from the Executive Yuan.

(2) The Service Upgrade Plan 2.0 for Regional Transportation Development Centers will continue to be implemented to strengthen local governments' capacity to promote public road transportation. This will be achieved through the provision of specialized transportation training programs, professional consultation services, and targeted guidance to address specific public transportation challenges. The initiative seeks to mitigate the existing gaps in human resources and technical expertise at the local level, thereby facilitating more effective planning and development of regional public transportation systems.

(3) Conduct the Effectiveness Evaluation and Improvement Suggestion of TPASS, the Commuter Monthly Pass promoted by the Executive Yuan, in order to understand the outcomes achieved after the implementation of TPASS, serving as a reference for subsidy strategies in the next phase. The main tasks include formulating effectiveness evaluation indicators for TPASS's implementation; analyzing official statistical data, electronic ticketing data, and questionnaire sampling surveys to derive the values for these evaluation indicators to measure the effectiveness of TPASS during July 2023 to June 2024; and concurrently proposing improvement suggestions for TPASS's subsequent promotion in order to adjust relevant policies timely, ensuring the effective utilization of resources and the enhancement of implementation outcomes.

(4) Consolidated the current operational status of Demand Responsive Transport Services (DRTS) in Taiwan, focusing on the Happiness Bus and Happiness Taxi programs promoted by the Highway Bureau. The analysis and review covered issues such as operation costs, fare structures, subsidy mechanisms, performance evaluation, and sustainability, to assist the Highway Bureau and relevant authorities in addressing challenges related to the implementation of these services.

（5）賡續檢討修訂汽車客運業路線別成本計算制度，113年辦理汽車客運業統一會計科目之檢討與建議，以配合未來汽車客運業成本制度修訂參考應用。

2. 推動智慧運輸及包容性服務

（1）為能循序擴展國內MaaS服務，規劃未來MaaS服務的發展與永續機制，113年就MaaS服務如何與其他區域MaaS服務進行合作為背景進行探討，制定相關推行方式與應用課題，藉以擬定MaaS服務未來進行跨域合作之參考方針，此外亦透過臺中市敬老愛心點數為媒介，探討Taichung go與MeN Go服務合作之操作方式並進行實作，驗證所規劃之跨域合作方式與課題，並制定我國未來在包容性運輸服務願景下，相關單位之推動策略。

（2）精進通用計程車特約制度及系統軟體以落實「人本交通」政策，113年持續與6個直轄市政府合作提供預約式通用計程車服務，強化地方政府推動通用計程車策略與作法，累計完成約85萬趟次服務，平台會員數達74,000人，並且將研發成果「通用計程車預約整合系統」以授權方式提供地方政府申請應用，已分別與衛生福利部、全國六個直轄市及屏東縣政府簽訂非專屬無償授權契約，提供加值應用。

（3）因部分國家（如芬蘭、日本）已針對MaaS導入偏鄉地區解決其運輸問題執行偏鄉MaaS相關試辦計畫，故參考日本模式及經驗，尋找我國偏鄉地區可連結在地觀光、地方創生、異業整合之機會，提出可能推動MaaS之優先次序分類、願景、發展策略及未來潛在試辦場域，作為未來於偏鄉地區發展MaaS之參考。

（4）透過蒐集國內外共享運具管理規範和連結公共運輸的相關文獻及案例，分析共享運具於運輸系統之定位及服務模式，彙整共享運具整合公共運輸服務之相關規範及智慧化營運議題，並訪談營運業者及政府部門，據以研提共享運具連結公共運輸整合因應發展策略，做為後續推動共享運具連結公共運輸營運管理及發展低碳永續交通運輸環境之指引或相關應用之參考。

(5) Continued reviewing and revising the cost calculation system by route for the motor vehicle passenger transport industry. In 2024, the report "Uniform Accounting Accounts for the Bus Carrier Industry" was compiled, providing review results and recommendations to serve as a reference for future amendments to the cost accounting system of the industry.

2. Promote intelligent transportation and inclusive services.

(1) A development and sustainability framework is being planned to gradually expand domestic MaaS (Mobility as a Service). In 2024, the focus will be exploring how MaaS services in Taiwan can collaborate with other regional MaaS systems. This includes establishing implementation approaches and identifying key application issues to formulate strategic guidelines for future cross-domain MaaS collaboration. Using Taichung City's senior and charity point system as a medium, a pilot integration of the "Taichung Go" and "MeN Go" services will be conducted to test the practical operation and validate the proposed collaboration model. Based on this, strategic recommendations will be developed for government agencies to promote inclusive transportation services in the future.

(2) To advance the General Taxi Charter System and software in line with the "Human-Oriented Transportation" policy, in 2024, the Institute of Transportation continued its collaboration with six municipalities to provide reservation-based general taxi services. This initiative aimed to strengthen local governments' strategies and approaches for promoting general taxis. As of the end of the year, approximately 850,000 trips had been completed, and the number of registered platform members reached 74,000. Furthermore, the research outcome, the "General Taxi Reservation Integration System," was made available for local governments through a non-exclusive, royalty-free licensing arrangement. Licensing agreements have been signed with the Ministry of Health and Welfare, the six special municipalities nationwide, and the Pingtung County Government to support value-added applications.

(3) Given that certain countries (such as Finland and Japan) have already implemented pilot projects related to Mobility as a Service (MaaS) in rural areas to solve transportation issues, this study referenced the Japanese model and experience. It explores opportunities for integrating local tourism, regional revitalization, and cross-industry collaboration in Taiwan's rural areas. The study proposes a priority classification, vision, development strategies, and potential future pilot areas for rural MaaS implementation, providing a reference for future MaaS development in Taiwan's rural regions.

(4) By collecting and analyzing domestic and international regulations and case studies on shared mobility management and its integration with public transportation, this study aims to examine the role and service models of shared mobility within the transportation system. It will also consolidate relevant regulations and smart operation issues related to integrating shared mobility with public transport. Through interviews with operators and government agencies, development strategies for integrating shared mobility with public transportation will be proposed. These strategies will serve as guidance or reference for promoting the management and operation of shared mobility in connection with public transportation and advancing a low-carbon, sustainable transportation environment.

3. 協助汽車運輸業綠色及數位轉型

（1）以電動大客車數據平臺所累積之數據資料為基礎，規劃分析應用指標與分析主軸；進行營運數據分析指標案例探討與應用，研提營運面與政策面之建議，以精進電動大客車之營運與管理；並於113年新增示範站點，以天母東路站，進行智慧充電管理系統多場站功能之效益評估與數據分析及驗證系統之可複製性與效益；並擴充電動大客車之「多場站」間智慧充電管理機制與功能開發；以及考量擴大推廣導入智慧充電之影響，與「臺灣電動車輛電能補充產業技術推動聯盟」制定智慧充電產業標準，納入交通部公路局補助電動大客車作業要點。

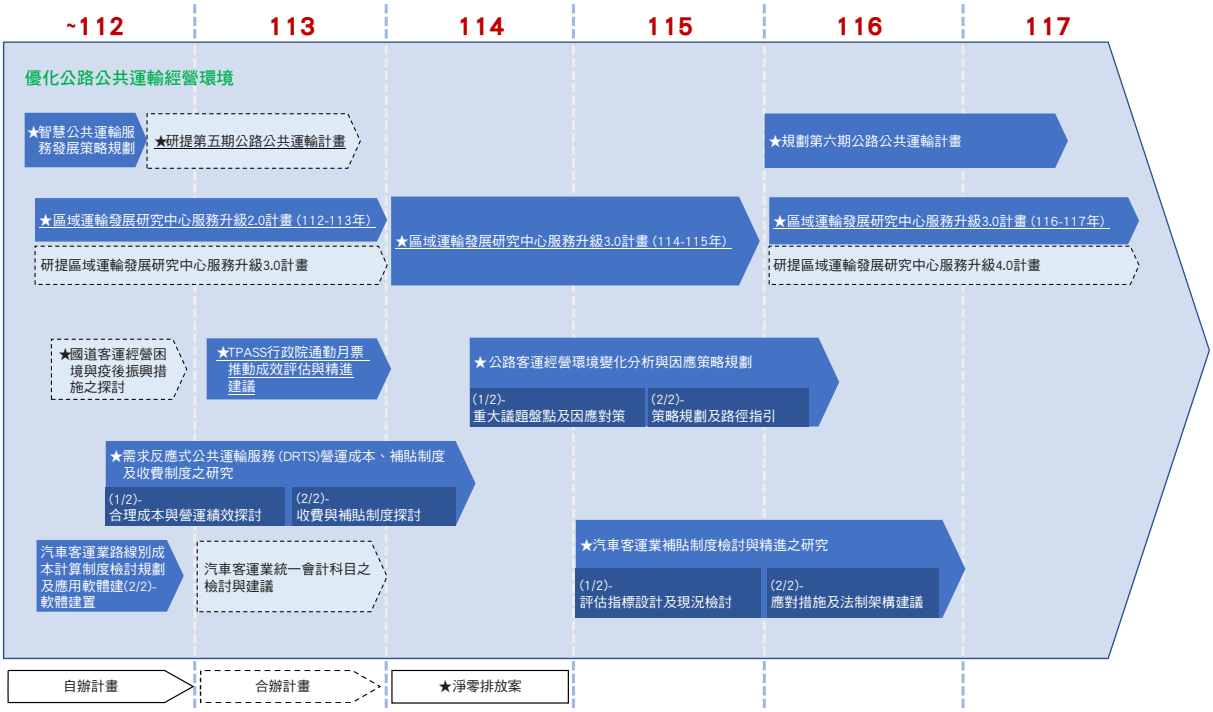
（2）因應國際貨運淨零排碳趨勢，協助我國汽車貨運業邁向淨零轉型，以達成2050年溫室氣體減量目標。透過分析國際標竿國家相關法規政策與因應策略，並結合國內產業意見及永續金融利害關係方訪談，進行落差評估，據此建立政策架構，提出具體策略、行動方案及配套措施，並滾動檢討淨零排放路徑，作為政策規劃參考應用。

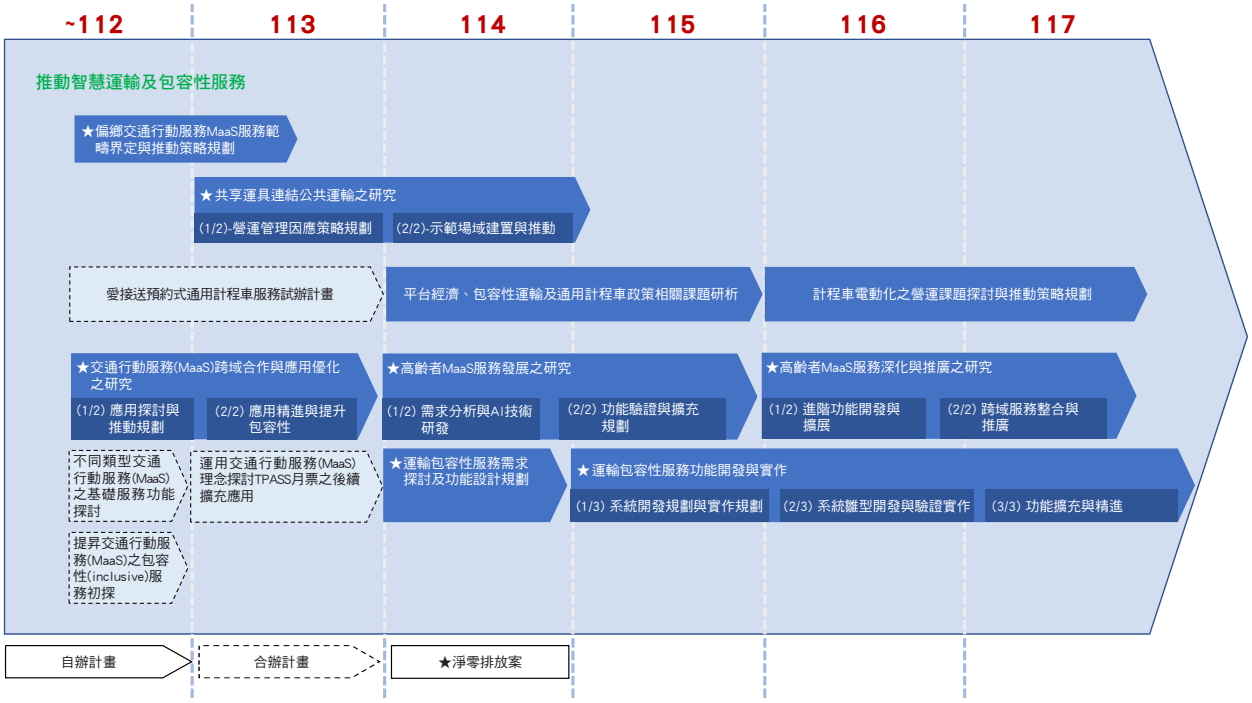
3. Assistance in the green and digital transformation of the automobile transport industry

(1) Based on the data accumulated from the electric bus data platform, key analytical indicators and core analytical themes will be developed. Case studies and applications of operational data analysis will be conducted to provide recommendations on both operational and policy aspects, aiming to enhance the operation and management of electric buses. In 2024, a new demonstration site will be established at Tianmu East Road Station to evaluate the effectiveness of a multi-depot smart charging management system. This includes data analysis and system validation to assess its replicability and overall benefits. Furthermore, the smart charging management functions and mechanisms across multiple bus depots will be expanded. The potential impact of large-scale implementation will be considered to support broader adoption. In collaboration with the "Taiwan Electric Vehicle Charging Industry Promotion Alliance," industry standards for smart charging will be developed and incorporated into the Ministry of Transportation and Communications' subsidy guidelines for electric bus operations.

(2) In response to the net-zero carbon emission trend in international freight, we will assist our country's automobile freight industry in moving towards net-zero transformation to achieve the 2050 greenhouse gas reduction target. By analyzing the relevant regulations, policies and response strategies of international benchmark countries, and combining domestic industry opinions and interviews with sustainable finance stakeholders, we conduct a gap assessment, establish a policy framework based on this, propose specific strategies, action plans and supporting measures, and review the net zero emission path on a rolling basis as a reference for policy planning.

主軸 3：優化公共運輸服務及產業轉型

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推動智慧運輸及包容性服務
★偏鄉交通行動服務MaaS服務範疇界定與推動策略規劃
★共享運具連結公共運輸之研究
(1/2)-營運管理因應策略規劃
(2/2)-示範場域建置與推動
愛接送預約式通用計程車服務試辦計畫
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
★交通行動服務(MaaS)跨域合作與應用優化之研究
(1/2) 應用探討與推動規劃
(2/2) 應用精進與提升包容性
★高齡者MaaS服務發展之研究
(1/2) 需求分析與AI技術研發
(2/2) 功能驗證與擴充規劃
★高齡者MaaS服務深化與推廣之研究
(1/2) 進階功能開發與擴展
(2/2) 跨域服務整合與推廣
不同類型交通行動服務(MaaS)之基礎服務功能探討
運用交通行動服務(MaaS)理念探討TPASS月票之後續擴充應用
★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與實作
(1/3) 系統開發規劃與實作規劃
(2/3) 系統雛型開發與驗證實作
(3/3) 功能擴充與精進
提昇交通行動服務(MaaS)之包容性(inclusive)服務初探
自辦計畫
合辦計畫
★淨零排放案


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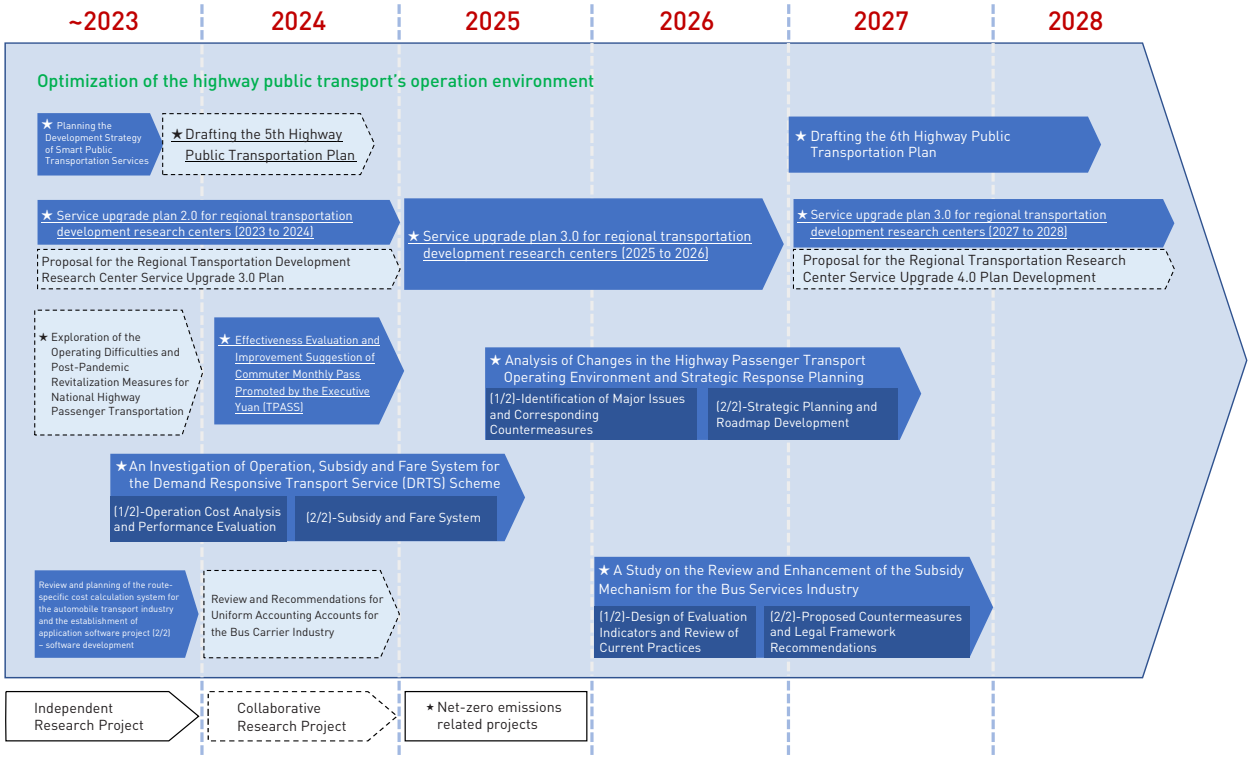
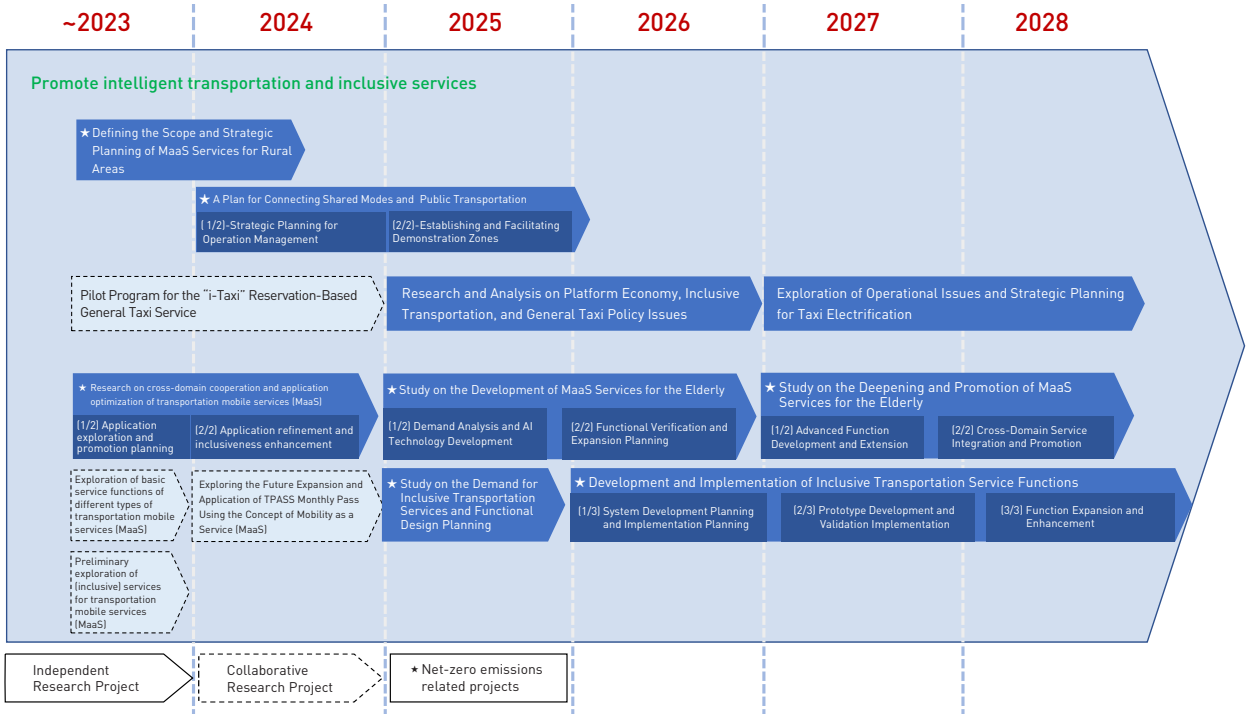
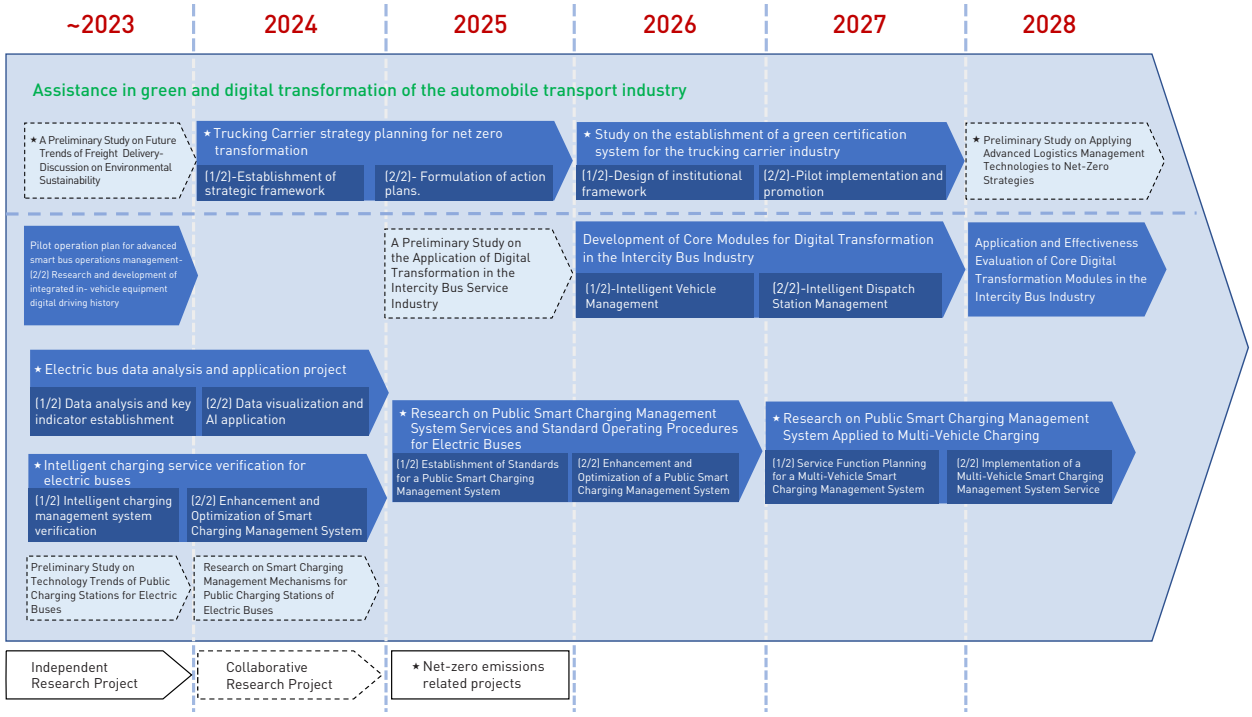
協助汽車運輸業綠色及數位轉型
★物流前瞻發展趨勢初探-環境永續
★汽車貨運業因應淨零轉型策略規劃
(1/2)-策略架構建立
(2/2)-行動方案研擬
★建立汽車貨運業綠色認證制度之研究
(1/2)-制度架構設計
(2/2)-示範及推廣應用
★國際運輸物流前瞻管理技術應用於淨零策略初探
先進公車智慧化營運管理先導運行計畫(2/2)-整合車載設備之駕駛數位履歷管理系統研發
數位轉型在汽車客運業服務應用之初探
汽車客運業數位轉型核心模組之開發
(1/2)-車輛管理智慧化
(2/2)-調度站管理智慧化
汽車客運業數位轉型核心模組應用及成效評估
★電動大客車數據分析與應用計畫
(1/2)數據研析與關鍵指標建立
(2/2)資料視覺化與AI應用
★電動大客車公共智慧充電管理系統服務及充電標準作業機制之研究
(1/2)公共智慧充電管理系統標準建置
(2/2)公共智慧充電管理系統精進與優化
★公共智慧充電管理系統應用於多車種充電之研究
(1/2)多車種智慧充電管理系統服務功能規劃
(2/2)多車種智慧充電管理系統服務建置
★電動大客車智慧充電服務驗證
(1/2)智慧充電管理系統實證
(2/2)智慧充電管理系統精進與優化
電動大客車公用充電站技術趨勢初探
電動大客車公共充電站智慧充電管理機制研究
自辦計畫
合辦計畫
★淨零排放案

3. Optimize Public Transportation Services and Industrial Transformation







四 營造潔淨且具韌性的運輸環境

因應氣候變遷持續推動綠運輸永續發展，以建立潔淨的交通生活環境為願景，研究重點如下：

1. 運輸部門淨零排放工作推動與效益評估

（1）編寫112年運輸部門第二期溫室氣體減量行動方案執行成果報告及研提改善建議，並於113年12月17日奉行政院核定；研擬運輸部門第二期溫室氣體減量行動方案之年度目標及檢討改進規劃（112-114年）。

（2）因應國際淨零排放趨勢，配合環境部研議第三期（115-119年）溫室氣體階段管制目標，透過評估模型推估運輸部門第三期溫室氣體排放基線、能源需求及減碳目標，做為行政院協商六大部門第三期減碳目標之基礎。環境部已於113年12月30日依氣候變遷因應法第10條規定公告「第三期溫室氣體階段管制目標草案」，公布我國2030年溫室氣體淨排放量減量目標為「較基準年（2005年）減量28±2%」，以及運輸部門2030年階段管制目標為20%。

IV Build up a Clean and Resilient Transportation Environment

In response to climate change, efforts continue to promote the sustainable development of green transportation, with the vision of creating a clean and eco-friendly transportation environment. Highlights of the research are as follows:

1. Promotion of Net-Zero Emission and Efficacy Assessment of Transportation Department

(1) Compiled the 2023 Implementation Results Report for the Phase Two Greenhouse Gas Reduction Action Plan in the Transportation Sector, including proposed recommendations for improvement. The Executive Yuan approved the report on December 17, 2024. Additionally, annual targets and a review and enhancement plan for 2023–2025 were developed.

(2) In response to the global trend toward net-zero emissions, Ministry of the Environment (MOENV) conducted the procedure of determining the phase-three periodic regulatory goals (2026–2030). In accordance with the procedure, we used assessment evaluation models to estimate the baseline of greenhouse gas (GHG) emissions of the transportation sector, as well as the energy demand and carbon reduction targets. These estimates had been included in the Executive Yuan's discussions to negotiate the phase-three carbon reduction targets with six sectors. On December 30, 2024, the MOENV announced the proposed "Bill for Phase Three Greenhouse Gas Regulatory Goals" in accordance with Article 10 of the Climate Change Adaptation Response Act. The Bill proposed that the national GHG net emissions in 2030 should be at a level of 28±2% lower than the emissions in the base year (2005), with which, the sector-based target of the transportation sector in 2030 is set at 20% lower than the base year.

（3）就行政院112年4月21日核定之淨零轉型關鍵戰略行動計畫，配合交通部關鍵戰略7「運具電動化及無碳化」與環境部關鍵戰略10「淨零綠生活」之管考作業，提報半年度執行情形報告與年度執行成果報告。

（4）因應行政院111年3月30日發布「臺灣2050淨零排放路徑及策略總說明」，並於112年4月21日核定淨零轉型關鍵戰略行動計畫，將低碳交通區納入運具電動化及無碳化及淨零綠生活之行動措施，研擬交通部補助低碳交通區試辦作業要點（草案）及地方政府低碳交通區推動指引，提供交通部及地方政府推動低碳交通區之參據。

（5）分析路口交通環境特性對空氣品質影響，透過路口實際調查資料，結合空氣污染模擬模式，分析不同交通管理策略下的空污減量效益，及研擬改善指引，供相關權責機關參考推動。

2. 整合串聯自行車路線並優化資訊系統

（1）持續整合串聯自行車路線，辦理環島及多元路網優化改善及微調新增串聯路線，並檢視已完工路線，研提待改善建議予權責單位辦理改善，此外，辦理「環島2號線及路網整併」規劃，並研擬後續推動方向，以提升自行車騎乘環境友善性。

（2）研擬「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」及製作「交通部自行車路網標誌、標線說明影片」，並於113年6月辦理北中南東4場次說明會。

（3）為加強騎士騎乘安全，開發「自行車路線事故分析平台」（整併至交通部道安資訊平臺），篩選「112年全國自行車路線事故熱區」排行前20資料，並函送「112年全國自行車路線事故熱區」資料予各權責單位辦理後續改善事宜。

（4）研擬「自行車路線完工檢視表」、「臺鐵兩鐵車站導覽圖樣版」及「三貂嶺生態友善隧道前後路段之替代路線研議」，並提供予公路局、觀光署、鐵道局及臺鐵公司參考應用。

(3) In accordance with the Executive Yuan's approval of the Net-Zero Transition Key Strategic Action Plan on April 21, 2023, in which the Ministry of Transportation and Communications (MOTC) hosts the Key Strategy 7, "Electrification and Decarbonization of Vehicles," and the MOENV hosts Key Strategy 10, "Net-Zero Green Living," related monitoring and evaluation scheme was conducted. The semi-annual progress report and annual performance report were submitted according to the scheme.

(4) On March 30, 2022, Taiwan officially published "Taiwan's Pathway to Net-Zero Emissions in 2050". It announced key strategic action plans, including the "Low-Carbon Transportation Zones" within the "Carbon Free Electric Vehicles" and "Green Lifestyle" net-zero transition initiatives on April 21, 2023. To support the Ministry of Transportation and Communications (MOTC) and guide local governments in developing "Low-Carbon Transportation Zones", the Institute of Transportation proposed a subsidy draft for the MOTC to pilot these zones and provided guidelines for local governments' reference.

(5) Analyze the impact of intersection traffic environmental characteristics on air quality by integrating field survey data with air pollution simulation models. Assess the air pollution reduction benefits under different traffic management strategies and develop improvement guidelines for reference and implementation by relevant authorities.

2. Integration and Connection of Cycling Routes and Optimization of the IT System

(1) Continued efforts are being made to integrate and connect bicycle routes, including optimizing and fine-tuning the round-island and diversified cycling networks. Completed routes are reviewed, and suggestions for improvement are proposed to the responsible authorities. In addition, planning for the "Round-Island Route 2 and Network Consolidation" is underway, along with the formulation of future implementation strategies to enhance the cyclist-friendly environment.

(2) The "Guidelines for the Installation of Signs and Markings for Round-Island and Diversified Bicycle Routes (including alternative routes)" are being developed, along with the production of an informational video on the MOTC bicycle network and pavement markings. Four explanatory meetings were held across the northern, central, southern, and eastern regions in June 2024.

(3) To enhance cyclist safety, the "2023 Bicycle Route Accident Analysis Platform" has been developed (integrated into the MOTC Road Safety Information System). The top 20 accident-prone areas along national bicycle routes in 2023 have been identified, and this data has been forwarded to the relevant authorities for subsequent improvement actions.

(4) The "Bicycle Route Completion Checklist," a "Template Design for Taiwan Railways' Bike-and-Rail Station Guide Maps," and a proposal for "Alternative Routes for the Sections Before and After the Sandiaoling Eco-Friendly Tunnel" have been developed and provided to the Highway Bureau, the Tourism Administration, the Railway Bureau, and the Taiwan Railway Corporation for reference and application.

（5）研擬「自行車道系統規劃設計手冊」初稿，並請內政部國土署、交通部、公路局、觀光署、鐵道局、臺鐵公司及各縣市政府表示意見

3. 建立鐵公路系統強化調適能力指引

（1）研析國外鐵道系統強化調適發展方向及趨勢，蒐整新科技應用情形與鐵道系統調適等相關案例。

（2）訪談鐵道系統權責機關（構）並探討影響國內鐵道系統韌性強度之因素，並就所研提鐵道系統因應氣候變遷強化調適之機制與方法，邀請調適專家及鐵道系統權責機關（構）召開專家座談會藉以凝聚共識。

（3）為說明前揭調適機制與方法之可操作性，以臺北捷運系統為案例，透過Dr.A氣候變遷災害風險調適平台提供之危害、自然脆弱度之圖層資料，與臺北捷運車站出入口之點位套疊，藉以辨識在未來升溫情境下，臺北捷運車站出入口暴露在溢淹下之風險程度。

4. 建構運輸管理機關（構）調適專業能力

（1）蒐集國內外氣候變遷調適發展趨勢、相關課程／教材、國內法令及相關作業規定，並研析國內外可應用運輸調適相關資訊，以及辦理調適課程規劃專家學者座談會，規劃運輸調適課程。

（2）規劃辦理運輸調適教育訓練課程4場次及工作坊2場次，透過講師講授及分組實務演練，提升運輸管理機關（構）人員調適知能。

（3）製作運輸系統因應氣候變遷調適知識本，提供運輸管理機關（構）人員全面調適知識框架及快速查找調適資訊的工具書，使調適業務人員能依循國家調適框架執行各項程序，以確實推動調適工作。

（4）研議運輸管理機關（構）調適專業人才培育機制，引導機關（構）厚植人員氣候變遷調適能力，自主培訓專業人員。

(5) A draft of the "A Study of Integration and Evaluation of the Bicycle Lane Network System" has been prepared and distributed to the National Land Management Agency Ministry of the Interior, the MOTC, the Highway Bureau, the Tourism Administration, the Railway Bureau, the Taiwan Railway Corporation, and all local governments for their feedback.

3. Establishment of Guidelines for Climate Change Adaptive Capabilities of Railway/Highway Systems

(1) Analyze the development directions and trends of international railway systems in strengthening adaptation and compile relevant case studies on the application of new technologies and railway system adaptation.

(2) Conduct interviews with competent authorities of the railway system to explore factors affecting the resilience of Taiwan's railway systems. Based on the proposed mechanisms and methods for enhancing climate change adaptation in railway systems, convene expert forums with adaptation specialists and relevant authorities to build consensus.

(3) To demonstrate the operability of the aforementioned adaptation mechanisms and methods, take the Taipei Metro system as a case study. Utilize hazard and natural vulnerability map layers provided by the Dr.A Climate Change Disaster Risk Adaptation Platform and overlay them with the locations of Taipei Metro station entrances and exits, to identify the level of flood risk exposure under future warming scenarios.

4. Construction the Professional Adaptability of Transportation Governing Authority (Agency)

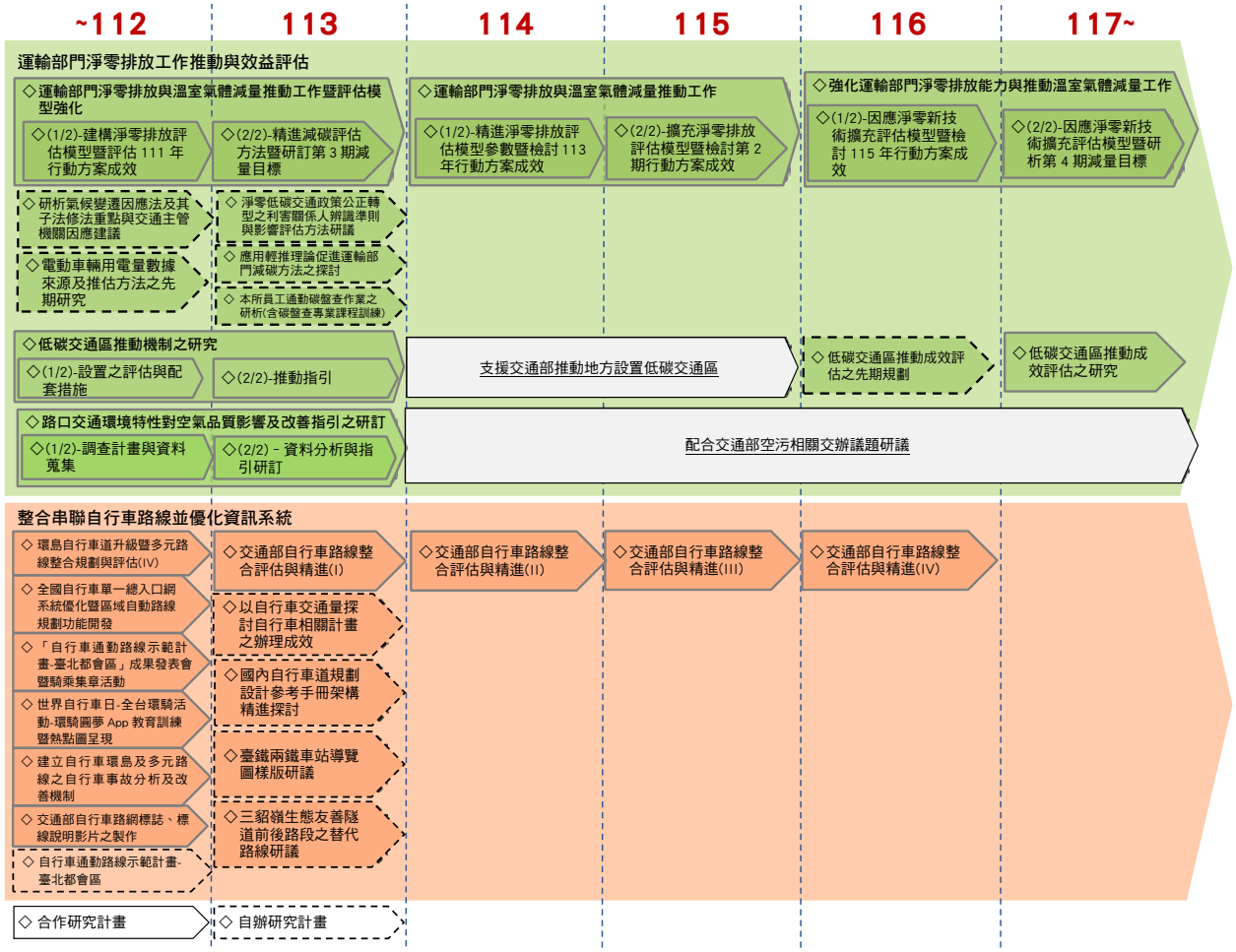
(1) Collect information on domestic and international climate change adaptation trends, relevant courses and teaching materials, national laws, and related operational regulations. Analyze applicable transportation adaptation practices domestically and internationally, and organize expert panel discussions to plan transportation adaptation training programs.

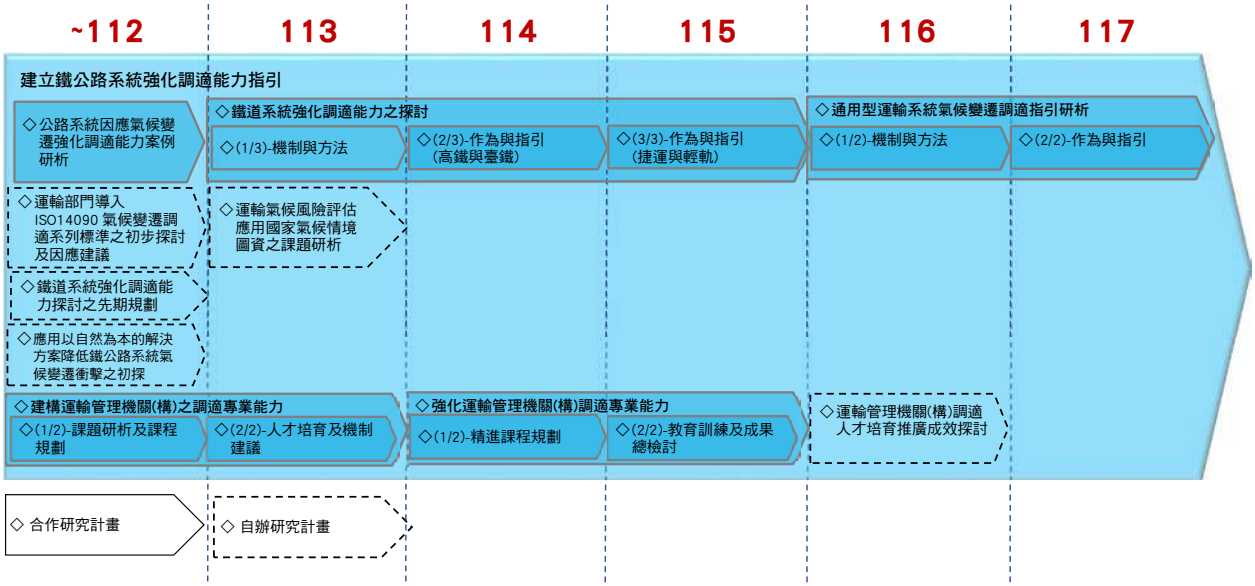
(2) Hold four adaptation training sessions and two workshops for transportation agencies. The events combined expert lectures and group-based practical exercises to improve transportation personnel's adaptation knowledge and skills

(3) Develop a climate change adaptation handbook for transportation systems, offering a comprehensive knowledge framework and a quick-reference guide for transportation agency personnel. This handbook will help adaptation staff follow national adaptation frameworks and procedures, thereby supporting the effective implementation of adaptation efforts.

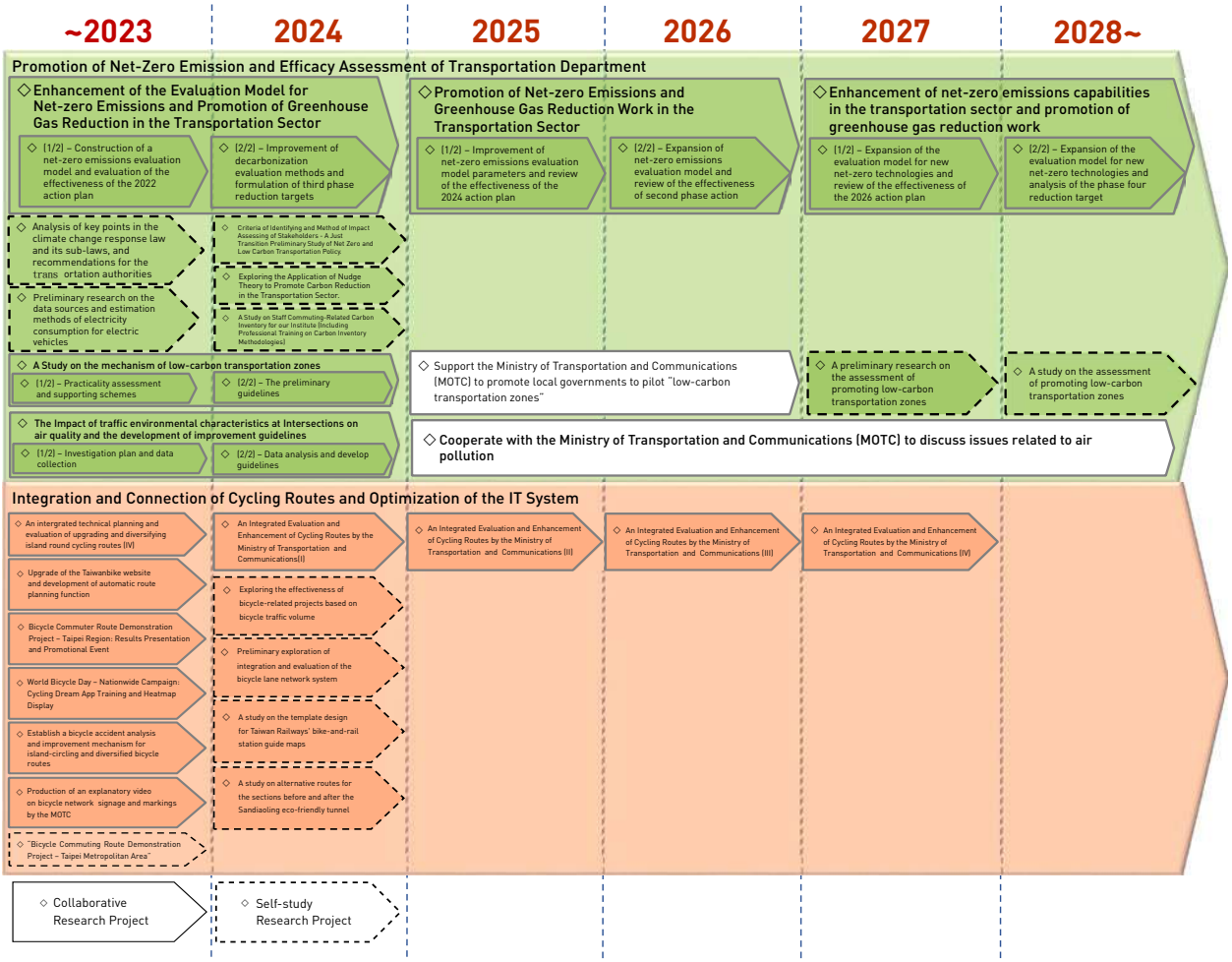
(4) Propose a mechanism for developing professional climate adaptation talent within transportation agencies to strengthen internal capacity and support agencies in independently training their own adaptation professionals.

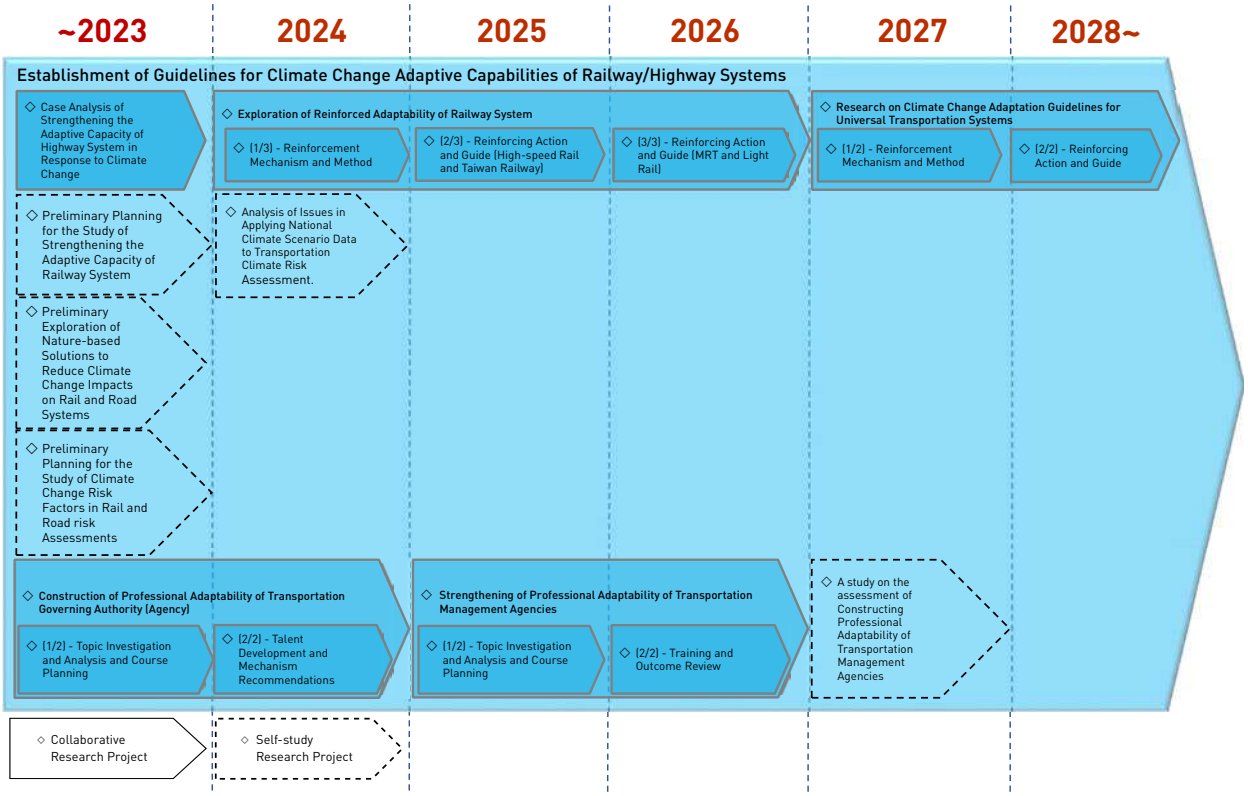
主軸 4：營造潔淨且具韌性的運輸環境





4. Build up a Clean and Resilient Transportation Environment





五 深化運輸安全管理

改善運輸安全，強化主動預防式之安全機制，以建構安全與人本的交通運輸環境為願景，重點如下：

1. 完備鐵路運輸安全管理系統（SMS）、海事安全及其他安全政策法制研議

（1）為協助鐵道局推動鐵道監理之績效目標管理，112-113年進行2年期計畫。113年研擬國家及營運機構之風險課題與控管機制，持續透過實證分析滾動檢討國家安全績效指標與目標值，進一步研析國家鐵道及營運機構之風險課題與控管機制，並綜整研提國家鐵道安全績效指標階段性作法，支援國家鐵道安全計畫及安全監督配套措施修正之參考應用。

（2）為協助航港局提前辦理自主船（MASS）監管工作，於113-114年辦理為期2年計畫。113年蒐集國際先進國家在自主船航行安全、監管制度及管理發展方面的規範與應用，並配合國際海事組織（IMO）於2032年即將實施的自主船規範（MASS Code），系統性彙整其核心內容及實務應用現況。另分析我國MASS自動化技術、安全管理模式及監管架構之發展方向，以提供政策規劃依據，支援我國未來海運安全管理與監理制度。

（3）為協助各級道安從業人員提升專業知能，於113年推動道安改善專業能力建構計畫。從道安改善工具層面，導入先進國家事故資料蒐集、分析、道安改善策略成效評估及知識平台之經驗，提出道安知識平台及事故多重肇因之概念架構；在人才培訓部分，針對國內第一線人員需求，提出專業輔導及諮詢組織永續運作的藍圖，以及國內大專院校交通相關科系專業課程教學與從業人員在職訓練課程架構。

V Enhancing Transportation Safety Management

The vision is to build a people-oriented and secure transportation environment to improve transport safety and strengthen proactive safety mechanisms. Key initiatives include:

1. The railway transportation safety management system (SMS), maritime safety, and other safety policy and legal research were completed.

(1) A two-year project from 2023 to 2024 is underway to support the Railway Bureau in implementing performance-based railway supervision. In 2024, the focus is on identifying and analyzing national and operator-level risk issues and control mechanisms. Through empirical analysis, national safety performance indicators and targets are continuously reviewed. Recommendations for phased implementation are proposed to support revisions to the Railway State Safety Program and supervision measures.

(2) To assist the Maritime and Port Bureau in preparing for the regulation of Maritime Autonomous Surface Ships (MASS), a two-year project (2024–2025) is being implemented. In 2024, international regulations and MASS safety and supervision applications will be collected and analyzed. This supports future alignment with the International Maritime Organization's (IMO) MASS Code, set to take effect in 2032. Domestic MASS automation technologies, safety management, and regulatory development will also be studied to provide policy recommendations.

(3) To enhance the expertise of traffic safety personnel, a professional capacity-building program is underway in 2024. It introduces international practices in accident data collection, analysis, evaluation of safety strategies, and knowledge platform development. A concept for a traffic safety knowledge system and a framework for identifying multi-factor accident causes are proposed. It also outlines sustainable consulting mechanisms and training frameworks for university-level programs and on-the-job personnel training.

（4）配合行政院核定國家道路交通安全綱要計畫（113-116年）的推動，借助區域運輸發展研究中心在道安分析、改善技術與溝通協調之能量，輔導各地方政府執行各項道安改善工作，使能契合綱要計畫的政策方向，並確實降低事故發生，引領安全習慣養成與建構人本道路交通環境。透過各中心提供地方提報「年度道路交通安全執行計畫」諮詢，協助地方政府建構交通安全人員能力，辦理地方道安改善計畫成效評估，以及輔導地方政府辦理「道安提升行動小組」改善道路交通安全。

2. 評估車輛安全輔助系統功能

透過蒐集、分析裝載主動預警輔助系統之試運行大型車輛駕駛行為資料及感受，了解相關主動預警輔助系統於我國交通環境中實際應用時對駕駛及其行為的相關影響，以為後續政策研擬應用。113年持續進行大型車輛裝設主動預警輔助系統設備安裝，比較使用前、後駕駛員感受與行車安全指標，提供成效評估分析。

3. 改造交通安全知能與行為

依據國小、國中、高中之學習主題，包括行人步行演練、自行車騎乘演練、機車騎乘情境等模組，設計多重情境體驗，如以行人角色通過多個路口，培養危險感知能力及正確穿越路口行為，並辦理教學觀摩與成效評估，涵蓋包括高中、國中及國小共19校。

4. 轉型與推廣交通安全工程設計技術

（1）針對道路與交通工程設計與改善策略、國內目前道路檢查或巡查作業機制、國外道路安全檢查與檢核制度進行文獻回顧，研擬國內道路安全檢查表初稿及手冊初稿，並邀集專家學者、政府部門與民間團體進行座談會，進行多方的溝通與交流討論，據以檢討相關內容。

（2）盤點國內現行之「道路交通標誌標線號誌設置規則」涉及之18種一般道路情境設置課題，研擬通用性之「道路交通標誌標線號誌設置參考指引」，包含設置圖例及運用解說，以協助道路管理機關規劃及設置標誌標線號誌設施，提供用路人更一致、更自明、更安全的道路交通環境。

(4) In support of the Executive Yuan's National Road Traffic Safety Program (2024–2027), regional transportation research centers will assist local governments in implementing safety improvement projects. These efforts aim to align with policy goals, reduce accidents, and foster safe road use habits. Services include annual plan consultations, capacity building, effectiveness evaluations, and guidance in forming "Traffic Safety Improvement Task Forces."

2. Functional Evaluation of Advanced Driver Assistance Systems (ADAS)

By collecting and analyzing data on the driving behavior and perceptions of large vehicles equipped with an active warning assistance system during trial operations, we aim to understand the impact of such systems on drivers and their behavior within Taiwan's traffic environment. This will serve as a foundation for future policy development and application. In 2024, the installation of active warning assistance systems on large vehicles will continue, comparing drivers' perceptions and road safety indicators before and after usage to provide an effectiveness evaluation analysis.

3. Transforming Traffic Safety Knowledge and Behavior

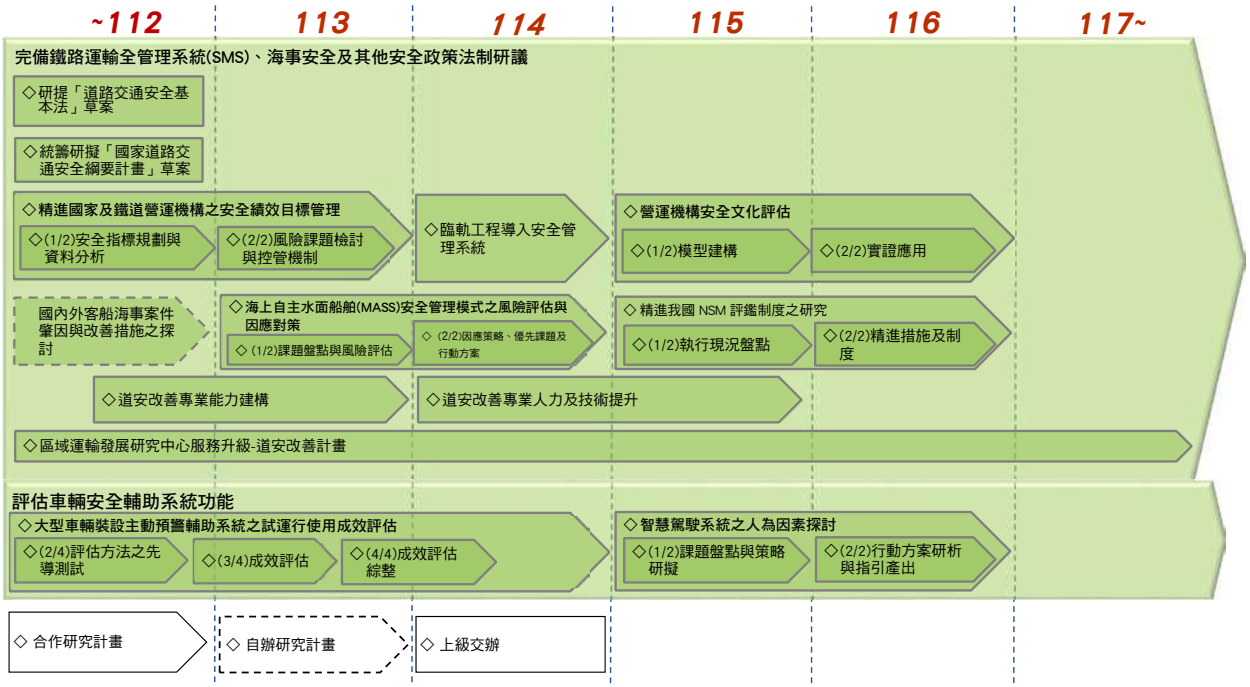
Experiential modules, including pedestrian crossing practices, cycling simulations, and motorcycling scenarios, are designed based on primary to high school learning themes. These help cultivate hazard perception and proper road behavior. Demonstration teaching and evaluations will be conducted at 19 participating schools.

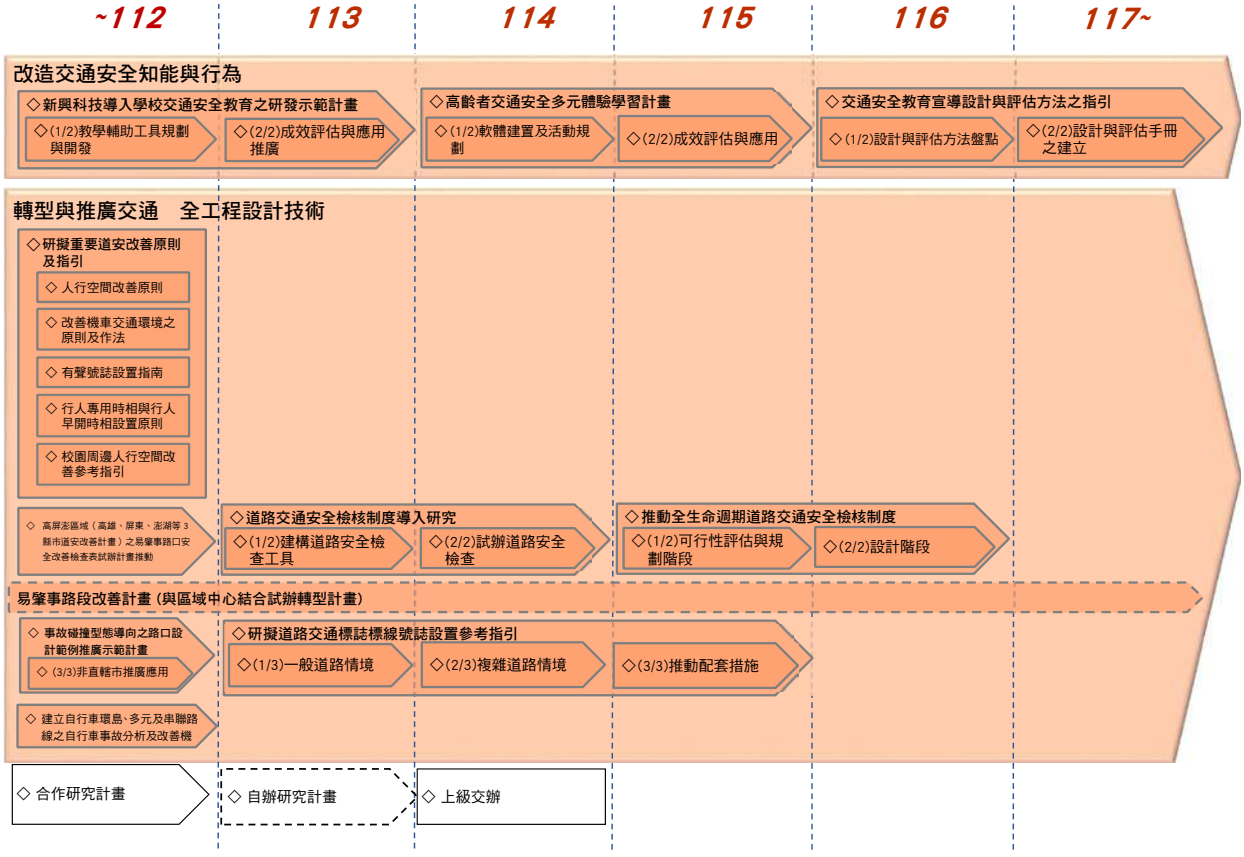
4. Transforming and Promoting Traffic Safety Engineering Techniques

(1) A review of domestic and international road engineering design and inspection mechanisms is underway. Drafts of safety checklists and manuals are being developed, accompanied by stakeholder workshops to gather feedback for refinement.

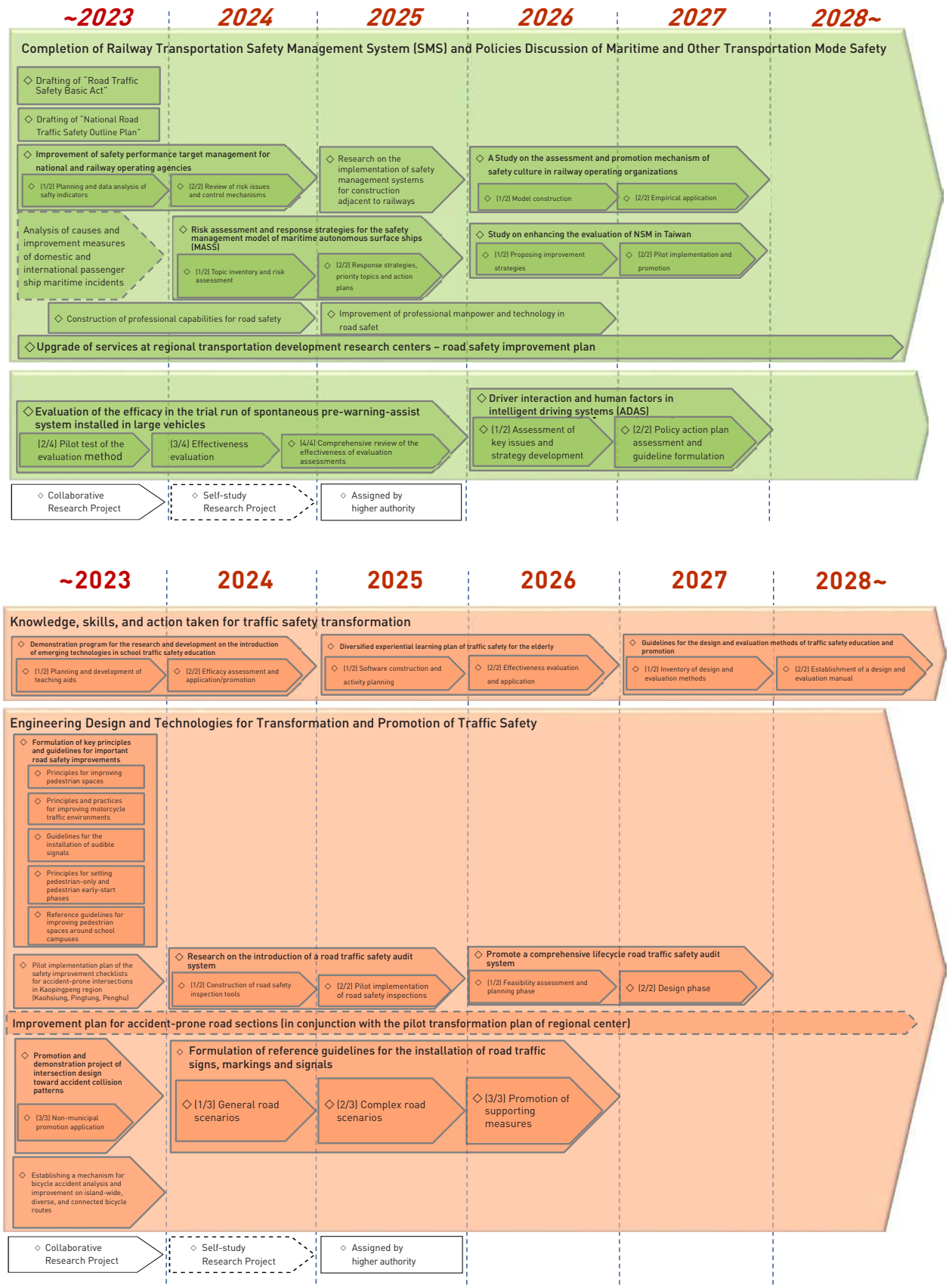
(2) A comprehensive guideline is being drafted based on 18 common road scenarios covered in Taiwan's current traffic signs, markings, and signals regulations. Illustrated examples and application instructions will support road authorities in planning and implementing more consistent, intuitive, and safer traffic control measures.

主軸 5：深化運輸安全管理





5: Deepen Transportation Safety Management



六 推動交通科技創新應用與產業發展

運用科技創新技術，促進交通運輸產業發展，以建立人本且永續的智慧交通生活環境為願景，研究重點如下：

1. 推動交通科技創新應用

（1）以數位轉型及智慧運輸等全新數位治理觀念為基礎，辦理「構建5G智慧交通數位神經中樞－功能擴充與精進」，擴大與提升緊急救援車輛智慧優先號控功能實作範圍及成效、發展人工智慧交通管理及公共運輸管理相關決策支援模式庫與知識庫，並結合臺中市試驗場域交通即時資訊的蒐集，運用數位雙生技術進行系統功能擴充與精進，有助交通管理單位執行最佳交管決策，以提升運輸服務水準。

（2）應用人工智慧與物聯網（AIoT）科技，探討如何運用科技提升連續假期之疏運成效，以中部地區區域路網為示範路網範圍，盤點既有設備狀況及分析資料品質，研析示範路網疏運管理所需模式庫／知識庫功能模組，舉辦跨單位共識營／座談會確認規劃內容符合需求及凝聚跨單位合作共識，研提精進疏運執行之分年推動策略方案及各相關單位之分工，期能提升整體車流運作效率，縮短用路人旅行時間。

（3）發展人工智慧（AI）多目標強化學習（Reinforcement Learning, RL）在都市交通號誌控制，以及高速公路交流道區域之匝道儀控與鄰近平面道路號誌協控應用，透過模擬模式建構、強化學習號誌控制模型發展與訓練，以及與高速公路局、縣市政府合作進行實測與量化績效分析，逐步構建我國在人工智慧號誌控制的實力。

VI Promote the Innovative Application of Transportation Technology and Industrial Development

Utilize innovative technologies to drive the development of the transportation industry, with the vision of establishing a human-centric and sustainable smart mobility environment. The research focuses are as follows:

1. Promote the Innovative Application of Transportation Technology

(1) Based on new concepts of digital governance, such as digital transformation and intelligent transportation, this initiative carries out the project "Constructing the 5G Intelligent Transportation Digital Nerve Center – Functional Expansion and Enhancement." It aims to broaden and improve the implementation scope and effectiveness of intelligent priority control for emergency rescue vehicles, develop decision-support model libraries and knowledge bases related to AI-based traffic and public transportation management, and integrate real-time traffic information collected from the Taichung pilot site. By applying digital twin technologies, the system's functions are expanded and refined, assisting traffic management agencies in making optimal decisions to enhance transportation service quality.

(2) By applying Artificial Intelligence and the Internet of Things (AIoT), the initiative explores how technology can improve traffic management effectiveness during long holidays. Taking the regional road network in central Taiwan as a demonstration area, it includes assessing the condition of existing equipment, analyzing data quality, and evaluating the required model library and knowledge base modules for traffic dispersion management. Inter-agency consensus-building workshops and forums are held to ensure the planning aligns with practical needs and fosters cross-agency collaboration. A phased strategy and division of responsibilities among relevant agencies are proposed to enhance overall traffic flow efficiency and reduce travel time for road users.

(3) Develop multi-objective artificial intelligence (AI) reinforcement learning (RL) applications for urban traffic signal control and coordinated control between ramp metering at freeway interchanges and adjacent surface road signals. This includes building simulation models, developing and training RL-based signal control models, and collaborating with the Freeway Bureau and local governments to conduct field tests and quantitative performance evaluations, thereby gradually building national capabilities in AI-based traffic signal control.

（4）在推動無人機空拍與AI人工智慧影像辨識等先進技術部分，延續前期計畫成果與經驗，持續就遙控無人機空拍技術、影像AI自動辨識及交通衝突分析軟體進行優化，並將分析對象由路口延伸至路段，進行「汽機車混流衝突」與「左轉車道配置與行車動線」兩項先導測試計畫，以提供道路管理機關更完整的道路交通衝突分析工具。

（5）與國道客運業者合作蒐集ADAS警示、駕駛行為、行車影像、駕駛環境等真實駕駛資料，及開發輕量化影像辨識技術，從大量的ADAS警示當中找出真正影響行車安全的行車異常事件，以及整合空間特性分析，找出行車異常事件好發情境，提供業者做為行前教育及安全管理應用；另綜整計畫發展成果，開發以影像辨識為核心之安全管理與風險分析平台，有效降低導入影像辨識技術的人力、技術及經費門檻，可提供業者應用以提升營運安全。

2. 推動無人機科技產業發展

（1）在推動無人機偏鄉物流運送部分，延續前期計畫成果與經驗，113年因應0403地震災情衍生之需求，以無人機災害緊急物資運補及偏鄉日常物資運送為情境，擇定花蓮太魯閣地區大禮部落及中橫公路，以及澎湖縣馬公市為驗證場域，導入2家業者4型無人機進行服務驗證。

（2）在無人機產業創新與推廣部分，擘劃城市空中交通發展願景，於2024智慧城市展辦理「領航未來－城市空中交通國際論壇」，並提出我國發展城市空中交通發展策略及路徑圖。為推動無人機於交通領域之創新應用，於基隆港試辦無人機結合人工智慧影像辨識應用於橋式起重機檢測工作；在人才培育方面，持續舉辦「領航盃－無人機於交通領域創意應用競賽」，並透過工作坊與專題演講活動，鼓勵基層人才投入無人機應用領域，為產業發展奠定堅實基礎。

(4) In advancing technologies such as UAV aerial photography and AI-based image recognition, building upon previous project outcomes and experience, continuous optimization is made on remote-controlled UAV aerial photography technology, AI automatic image recognition, and traffic conflict analysis software. The scope of analysis has been extended from intersections to road segments, conducting two pilot testing projects on "mixed flow conflicts between cars and motorcycles" and "left-turn lane configuration and traffic flow patterns," providing road management agencies with more comprehensive tools for road traffic conflict analysis.

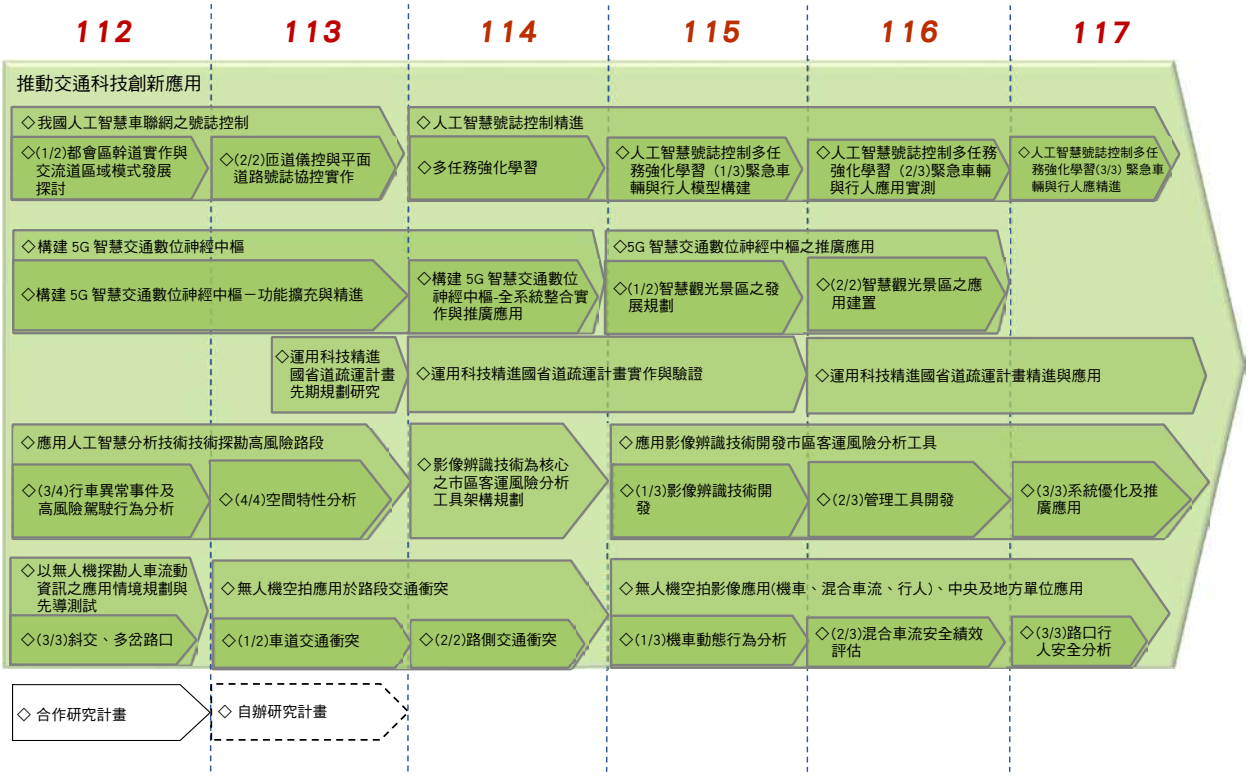
(5) In collaboration with national highway bus operators, real driving data such as ADAS alerts, driver behavior, driving video, and driving environment are collected. Lightweight image recognition technology is developed to identify driving anomalies affecting traffic safety from a large volume of ADAS alerts. Spatial characteristic analysis is integrated to identify high-risk scenarios for driving anomalies, providing operators with tools for pre-trip education and safety management applications. Furthermore, by consolidating project development outcomes, a safety management and risk analysis platform centered on image recognition is developed, effectively lowering the barriers in manpower, technology, and funding for implementing image recognition technology, thereby enhancing operational safety for operators.

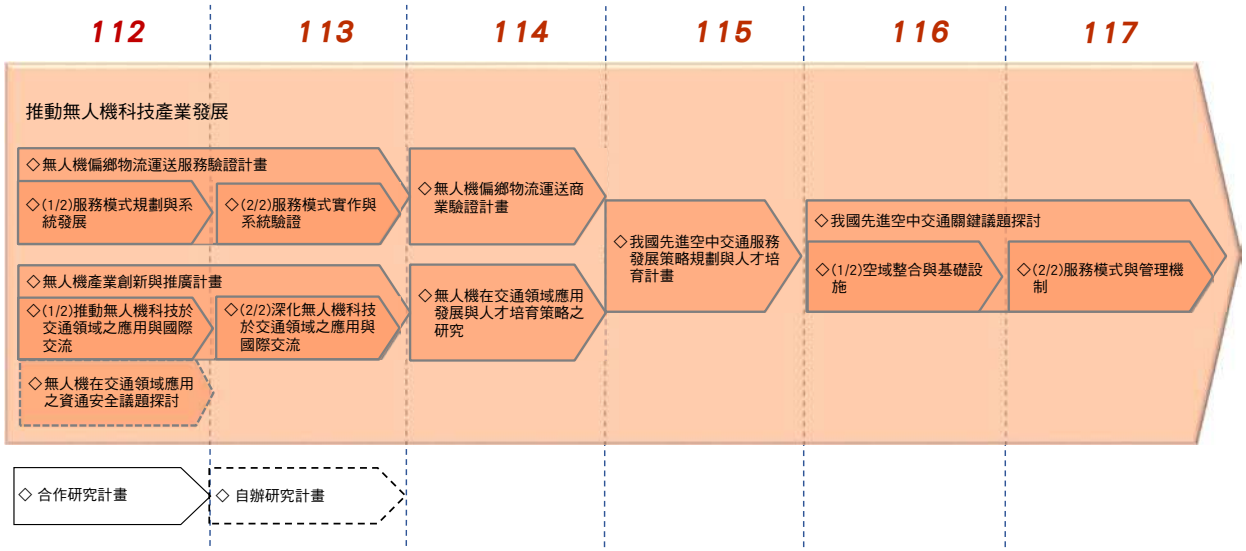
2. "Promote the Development of the UAV Technology Industry"

(1) Regarding the promotion of UAV rural logistics delivery, building upon the achievements and experience of previous phases, UAVs were deployed in response to emergency logistics needs resulting from the April 3 earthquake in 2024. The project focused on two primary scenarios: emergency supply delivery during disasters and routine daily logistics in remote regions. Verification sites included Dali Village in the Taroko area, the Central Cross-Island Highway in Hualien County, and Magong City in Penghu County. Four UAV models from two domestic suppliers were introduced to conduct Proof of Service (PoS) verifications at the designated sites.

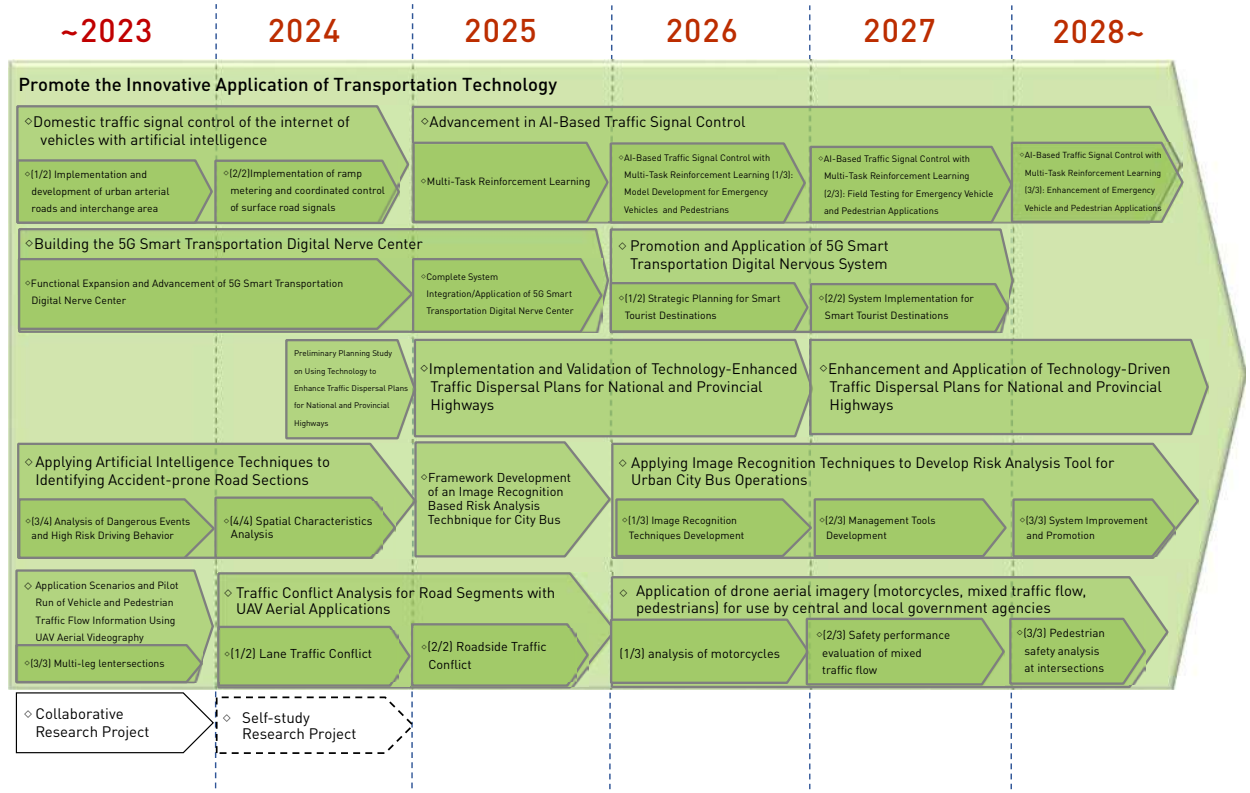
(2) In terms of UAV industry innovation and promotion, the Institute formulated a vision for the development of Urban Air Mobility (UAM) and organized the "Navigating the Future—Urban Air Mobility International Forum" during the 2024 Smart City Summit & Expo. The forum served as a platform to present Taiwan's strategic roadmap for UAM development. A pilot program was launched at the Port of Keelung to advance innovative applications of UAVs in transportation. UAVs integrated with artificial intelligence-based image recognition were tested for quay crane inspection tasks. In talent cultivation, the "Navigator Cup—Creative Application Competition of UAVs in Transportation" continued to be held, accompanied by workshops and keynote speeches. These initiatives aim to foster grassroots talent and strengthen the foundation for long-term industry development in UAV applications.

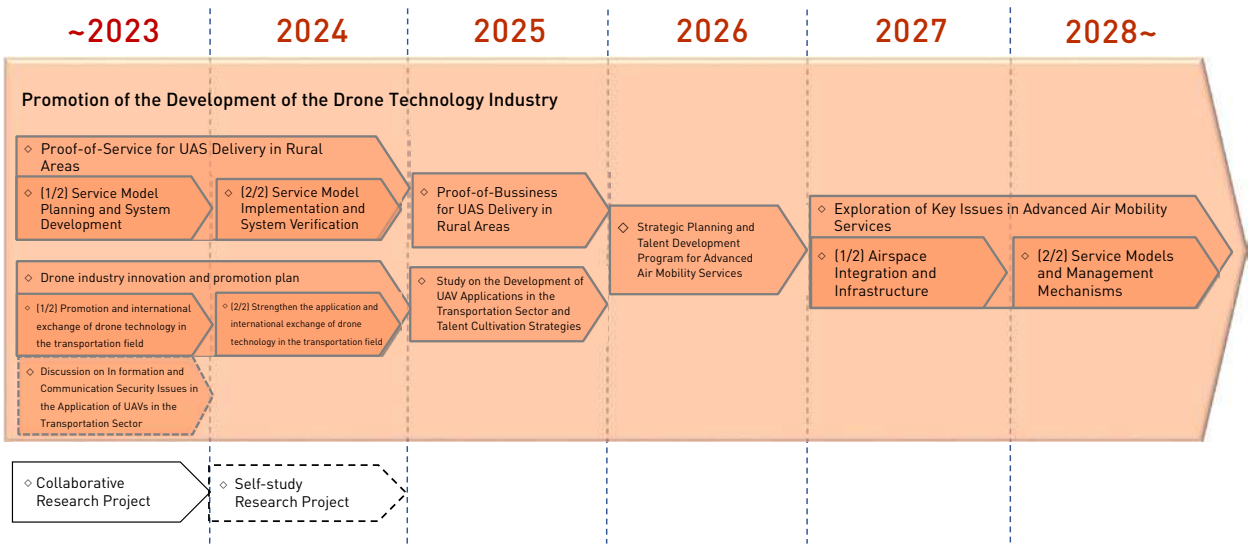
主軸 6：推動交通科技創新應用與產業發展





6. Promote the Innovative Application of Transportation Technology and Industrial Development





七 精進交通設施維護管理與災防技術

結合新興科技，強化運輸系統之抗災能力及管理效能，以提升海陸運輸安全並串聯運輸技術之跨域整合、溝通及協調，研究重點如下：

1. 研發及精進鐵公路及商港災防技術

（1）公路災防部分，研發地工織布橋基保護工法，提供高速公路局大甲工務段執行國3大甲溪橋基保護應用並協助觀測成效，以及建置大甲溪石岡壩至河口段二維數值水理模型，做為評估保護成效參據。

（2）商港災防部分，辦理船舶特高頻資料交換（VHF Data Exchange System, VDES）測試站建置，包含於彰化芳苑燈塔（王功燈塔）設置一處固定測試訊號站及另一移動裝置，探討訊號解讀及資訊應用，未來將能藉由連接陸地、海洋、空中和太空衛星等相關訊號，有助於促進我國海域航行安全並提升搜救效能，協助航港局推動智慧航安相關計畫。

（3）針對花蓮港區防波堤發展越波影像判釋方法，並以波浪數值模式模擬波浪，發展越波機器學習模型，做為後續越波影像判釋示警、模型預警資訊作業化之基礎，有助於花蓮港務分公司於花蓮港東堤作業及工程施工、釣客活動及人員巡查等安全示警與管理應用。

VII Enhancement of Maintenance Management and Disaster Prevention Technologies for Transportation Infrastructure

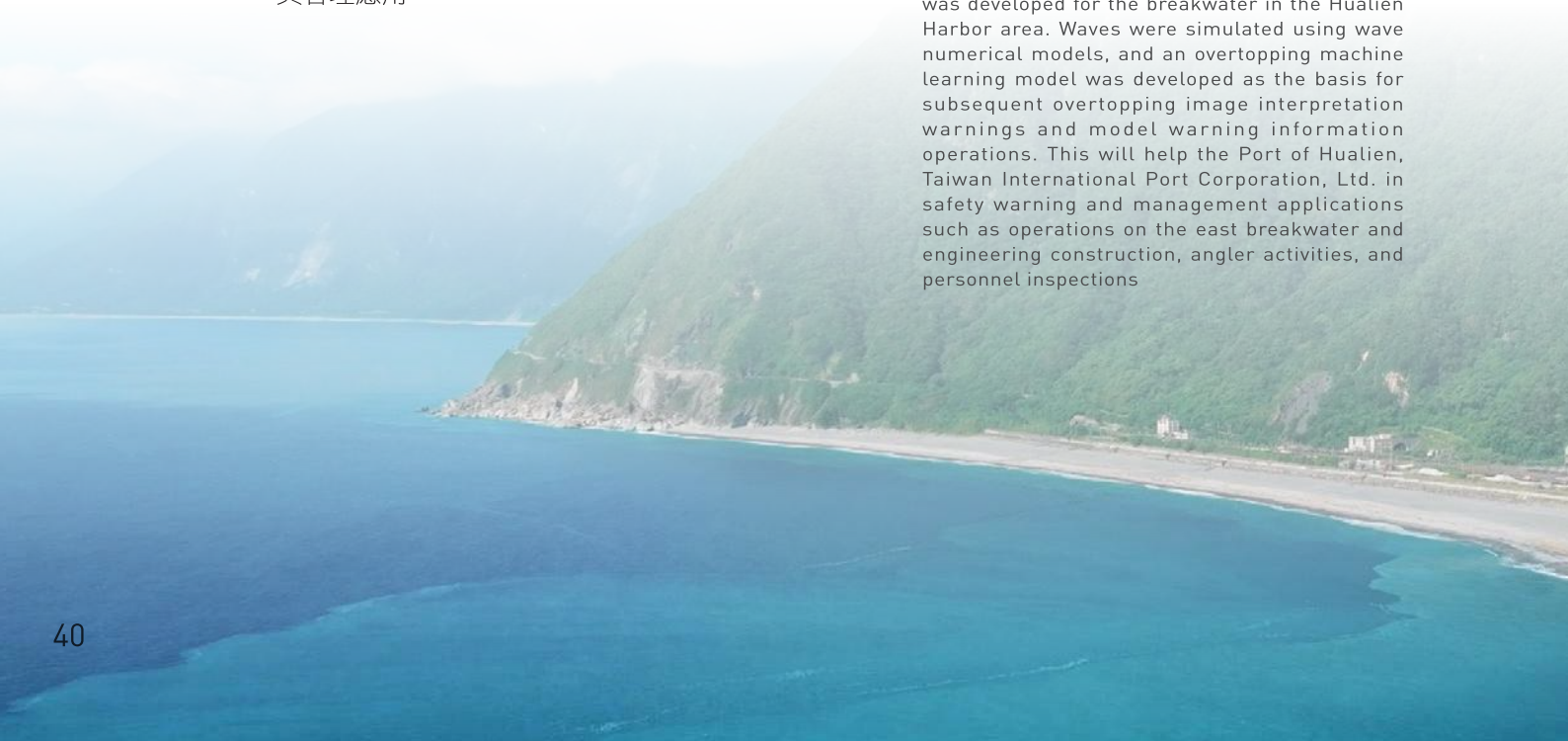
By integrating emerging technologies, the disaster resilience and management efficiency of the transportation system are strengthened, aiming to improve the safety of maritime and land transportation. This also facilitates cross-disciplinary integration, communication, and coordination of transportation technologies. The key research focuses are as follows:

1. Research and Advancement of Disaster Prevention Technologies for Railways, Highways, and Commercial Ports

(1) In the field of highway disaster mitigation, the Geotextile Protection Construction Method was developed and provided to the Dajia Maintenance Section of the Freeway Bureau for implementation in the foundation protection of the Dajia River Bridge on National Freeway No. 3. The Institute of Transportation, Ministry of Transportation and Communications, assisted in monitoring the effectiveness of the application. Additionally, a two-dimensional numerical hydraulic model was established for the section of the Dajia River from Shigang Dam to the estuary, serving as a reference for evaluating the effectiveness of the protection measures.

(2) A test station for the VHF Data Exchange System (VDES) has been established as part of disaster prevention efforts for commercial ports. This includes the installation of a fixed test signal station at the Fangyuan Lighthouse in Changhua (Wanggong Lighthouse) and a mobile unit. The project explores signal decoding and information applications. In the future, by integrating signals from land, sea, air, and satellite systems, the initiative is expected to enhance maritime navigation safety and improve search and rescue efficiency. It will also support the Maritime and Port Bureau in promoting smart maritime safety programs.

(3) A method for interpreting overtopping images was developed for the breakwater in the Hualien Harbor area. Waves were simulated using wave numerical models, and an overtopping machine learning model was developed as the basis for subsequent overtopping image interpretation warnings and model warning information operations. This will help the Port of Hualien, Taiwan International Port Corporation, Ltd. in safety warning and management applications such as operations on the east breakwater and engineering construction, angler activities, and personnel inspections



2. 精進橋梁檢測與管理

（1）持續辦理車行橋梁管理資訊系統及全國車行橋梁統計系統維護管理與功能精進；「車行橋梁管理資訊系統」除調整強化「箱型梁內部檢測」及「進階查詢」細部功能外，另新增「地震後特別檢測」及「詳細檢測」功能，全國橋梁統計資訊網「運研所專區」之「統計報表輸出」中增加「輸出CSV」功能，上傳「政府資料開放平臺（OPEN DATA）」；另每年2次由系統自動發送Email通知各縣市首長有關該縣市轄管車行橋梁、人行天橋及鐵道橋梁之「U=3及U=4未修橋梁數」，並於「系統設定」模組下，增加「網站滿意度統計」。

（2）在無人機搭配AI影像辨識應用於橋梁檢測方面，113年利用前期AI影像辨識模式開發智慧橋檢系統，結合橋梁檢測3D影像模型作業程序，可在3D模型中呈現橋梁各構件，協助使用者準確定位並瞭解劣化位置與程度，並持續精進優化系統功能。

（3）在公路橋梁檢測人員培訓方面，113年辦理公路橋梁檢測人員之初訓5場次（北部2場次、中部2場次、南部1場次），回訓3場次（北部2場次、中部1場次），並持續精進橋梁檢測人員培訓，藉由專業課程與現地訓練，培養國內橋梁檢測專業人力，以提升國內橋梁安全。

（4）橋梁檢測部分，開發橋梁梁底狹小空間檢測工具雛型機，研訂橋檢工具使用手冊及規劃辦理技術移轉，並至橋梁檢測工程顧問公司，推廣本橋檢工具，另辦理專利申請及技術授權事宜，以利研究成果落實應用，進而提升橋梁檢測品質、效率及安全。

2. Advancement of Bridge Testing and Management

(1) Ongoing maintenance and improvement are being conducted for the Vehicular Bridge Management Information System and the National Vehicular Bridge Statistics System. In the management system, specific functionalities have been enhanced, including the "Box Girder Internal Inspection" and "Advanced Query" features. Additionally, new features such as "Post-Earthquake Special Inspection" and "Detailed Inspection" have been introduced. In the National Bridge Statistics Information Platform, under the "TTS Special Section" of the Institute of Transportation, a new "Export CSV" function has been added to the "Statistical Report Output" feature. This allows data to be uploaded to the Government Open Data Platform (OPEN DATA). Moreover, twice a year, the system automatically sends email notifications to county and city mayors regarding the number of unrehabilitated vehicular, pedestrian, and railway bridges rated U=3 and U=4 under their jurisdiction. A new "Website Satisfaction Statistics" module has also been added under the "System Settings" section.

(2) In 2024, a Smart Bridge Inspection System was developed using AI image recognition models from previous phases, integrating a 3D image modeling workflow for bridge inspection. This system allows users to visualize each bridge component within a 3D model and helps accurately locate and assess the extent and position of deterioration. Efforts continue to optimize and enhance the system's functions.

(3) In 2024, training for highway bridge inspection personnel included 5 introductory training sessions (2 in northern Taiwan, 2 in central Taiwan, and 1 in southern Taiwan) and 3 refresher training sessions (2 in the north and 1 in the center). The program is continually improved through professional courses and on-site training, aiming to cultivate domestic bridge inspection professionals and enhance bridge safety across Taiwan.

(4) In the field of bridge inspection, a prototype inspection tool for the narrow undersides of bridge girders has been developed. A user manual for the tool has been drafted, and plans for technology transfer have been made. The tool has been promoted to bridge inspection engineering consulting firms. Additionally, patent application and technology licensing procedures have been carried out to facilitate the practical application of the research outcomes, thereby enhancing the quality, efficiency, and safety of bridge inspections.

3. 優化港區環境資訊應用與設施管理功能

（1）精進港灣環境資訊應用功能，辦理港灣環境資訊系統維護，包含港灣風、波、潮、流觀測資訊、模擬資訊、腐蝕資訊、網站科普知識、公開資料及港灣環境資訊圖臺等6大功能。除持續提供9個商港區之風速、風向、波高、波向、流速、流向及潮位等即時資訊白金標章等級之介接服務，方便使用者查詢港區海氣象即時資訊外，並開放碳、銅、鋁及鋅等金屬材料腐蝕速率資料，做為辦理結構物防蝕設計與維護管理之參據。此外，亦持續優化港灣環境資訊圖臺之颱風期間即時海氣象資訊展示及查詢功能，提供臺灣港務股份有限公司、船舶業者及港區使用者颱風期間決策支援，提高港區使用安全。本系統提供港灣完整即時之動態與靜態環境資訊，港務相關單位與民眾皆可瀏覽查詢，不僅提供港務單位、船舶業者防災應變決策支援，港區旅客及釣客亦能參考應用。

（2）整合臺北港區現有之CCTV感測資料，且透過112年建構之高精度三維數值地形模型，分析港區環境特性，並開發合適的人工智慧（AI）影像辨識技術，針對重要設施(如岸邊設施、碼頭、堤面及港區變電等設施)發展自動化巡查管理技術，達到應用創新科技，提升港區管理效能之目的。

（3）持續以滾動方式，依臺灣港務公司、金門及連江縣港務處實務需求，精進港灣構造物維護管理制度及擴充維護管理系統功能，滾動修訂港灣設施維護管理手冊，並藉由辦理教育訓練，推廣落實研究成果。

（4）蒐集國內外新興科技應用於防波堤設施巡查檢測案例，探討相關新興科技應用於防波堤設施巡查檢測之可行性，提供港務管理單位落實以智慧化、資訊化管理方式辦理港灣設施維護管理工作。

3. Optimization of Harbor Environment Information Application and Facility Management Feature

(1) We have refined the application functions of harbor environment information, maintaining the harbor environment information system, which includes six major functions: harbor wind, wave, tide, flow observation information, simulation information, corrosion information, popular science knowledge on the website, open data, and harbor environment information map. In addition to continuously providing platinum-standard real-time information interface services for wind speed, wind direction, wave height, wave direction, current speed, current direction, and tide levels for nine commercial port areas, and allowing users to query real-time marine meteorological information, we have also opened data on the corrosion rates of metals such as carbon, copper, aluminum and zinc for reference in structural corrosion-resistant design and maintenance management. Furthermore, the harbor environment information map's real-time marine meteorological information display and query functions during typhoons have been continuously optimized, providing decision support for Taiwan International Ports Corporation, ship operators, and port area users, thus improving port area safety. This system offers comprehensive real-time dynamic and static environmental information for harbors, accessible to both port-related units and the public. It not only supports disaster response decision-making for port authorities and ship operators but also serves as a reference for port area passengers and anglers.

(2) The environmental characteristics of the Taipei Port area are analyzed by integrating existing CCTV sensor data from the Taipei Port area and utilizing the high-precision 3D digital terrain model developed in 2023. Based on this, suitable artificial intelligence (AI) image recognition technologies are being developed to enable automated inspection and management of key facilities, such as waterfront structures, docks, breakwaters, and port substations. The goal is to apply innovative technologies to enhance the efficiency of port area management.

(3) Continuously enhance the maintenance and management system for port structures in accordance with the practical needs of the Taiwan International Ports Corporation and the Harbor Bureau of Kinmen and Lienchiang Counties. This includes rolling updates to the maintenance management manual for port facilities, expanding system functionalities, and promoting the implementation of research outcomes through educational training programs.

(4) Collect domestic and international cases of emerging technologies applied to the inspection and detection of breakwater structures, and assess the feasibility of applying such technologies to breakwater inspections. The goal is to provide port management authorities with intelligent and digital solutions for maintaining and managing port facilities.

4. 提升港區海氣象監測技術

（1）提高波流觀測站觀測密度，將風力資訊由以往每10分鐘1筆，另增加每1分鐘1筆資訊，港口波流資訊由以往每1小時1筆，調整為每半小時1筆，透過監測資料更新頻率提升，提供港區管理或調度人員更為即時海氣象數據，強化港區災防應變能量。

（2）改善臺北港微波雷達的海氣象監測能力，遷移微波雷達測站，提升臺北港附近海域測站之波流觀測數據與觀測品質之準確性，並開發微波雷達視覺化模組，優化數據展示介面；此外，探討臺中港海洋陣列雷達海氣象特性，利用雙雷達系統探討海面波浪變化，並精進波浪觀測與資料品管程序，提高波浪觀測成效，輔助臺中港航運管理使用。

（3）113年除維護「臺灣近岸海象預測系統2.0」外，精進高雄海域小尺度風浪及水動力模組，校修金門海域之風浪模組並新建其水動力模組，整體系統每日提供全臺10個主要商港未來5日風力預測資料，以及未來2日波浪、潮流預測資訊。

5. 精進金屬材料腐蝕環境研究

113年持續進行臺灣地區大氣腐蝕因子調查與金屬材料現地曝露試驗，並彙整調查與試驗成果，發行年報及展示於「臺灣腐蝕環境分類資訊系統」，供產官學研參考應用。另外，針對臺灣地區銅金屬材料與腐蝕劣化因子及氣象因素等因子，建立其腐蝕關聯模式，提供部屬機關（構）未來銅金屬構件防蝕設計及維護的參考應用。

4. Enhancing Marine Meteorological Monitoring Technology in Port Areas

(1) Increase the observation density of wave-current monitoring stations. Previously recorded once every 10 minutes, wind data will now include additional data recorded every minute. Port wave-current data, previously recorded once every hour, will be adjusted to every 30 minutes. By increasing the update frequency of monitoring data, more real-time marine meteorological information can be provided to port management and dispatch personnel, thereby strengthening disaster prevention and emergency response capabilities in the port area.

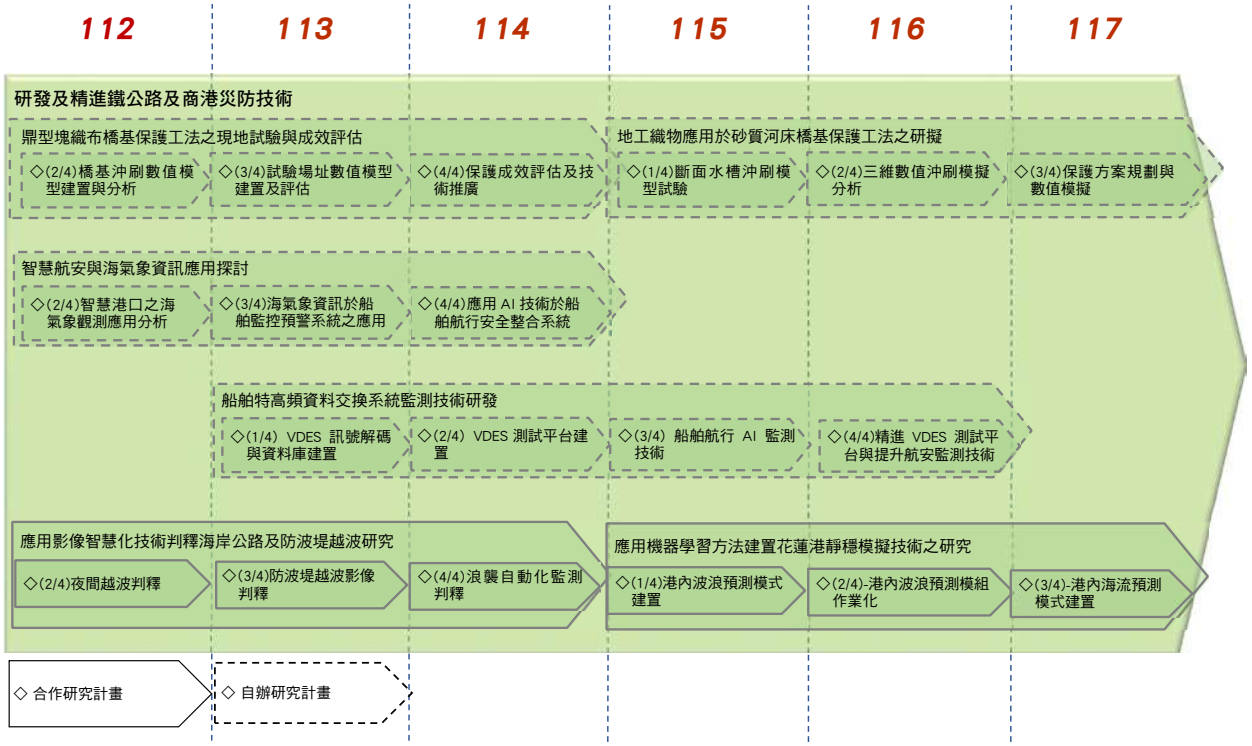
(2) Improve the marine meteorological monitoring capabilities of the microwave radar at Taipei Port by relocating the radar station to enhance the accuracy and quality of wave-current data in the nearby sea area. Additionally, a visual module for the microwave radar will be developed to optimize the data display interface. Furthermore, investigate the marine meteorological characteristics of the ocean radar array at Taichung Port. A dual-radar system will be used to analyze sea surface wave variations, refine wave observation and data quality control procedures, and enhance wave observation effectiveness to support maritime management at Taichung Port.

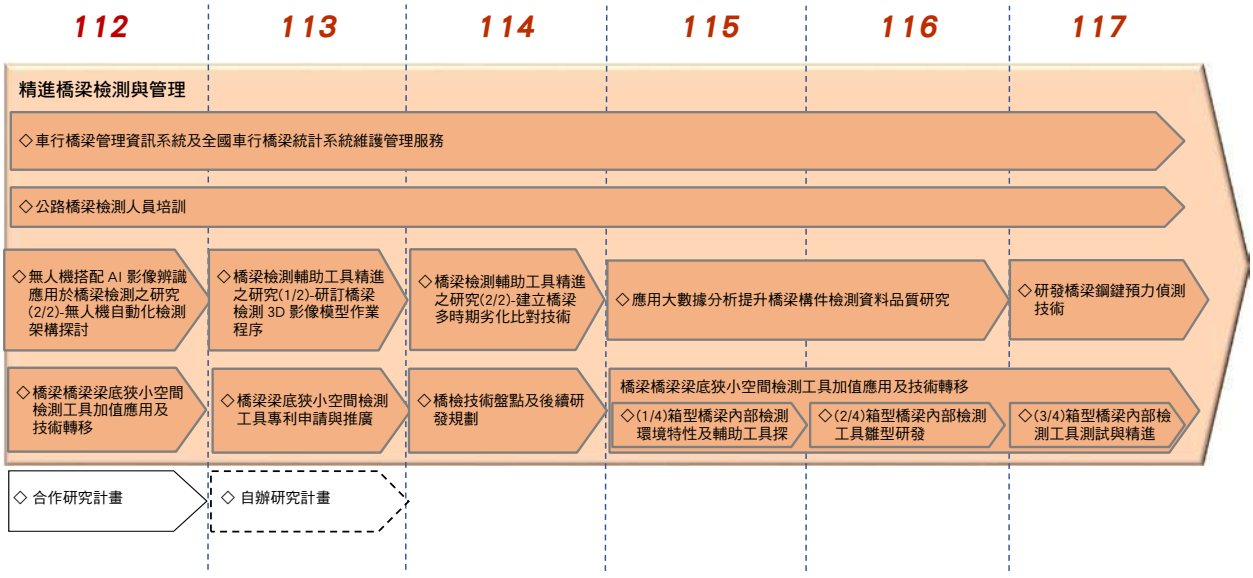
(3) Besides maintaining the " Taiwan Coastal Operational Modeling System 2.0"(TaiCOMS 2.0) in 2024, enhancements were made to the small-scale wind-wave and hydrodynamic modules for the Kaohsiung coastal area. The wind-wave module for the Kinmen waters was calibrated, and a new hydrodynamic module was developed. The overall system provides daily forecasts of wind conditions for the next five days and wave and current predictions for the next two days for ten major commercial ports in Taiwan.

5. Advancement of Research on Corrosive Environments for Metallic Materials

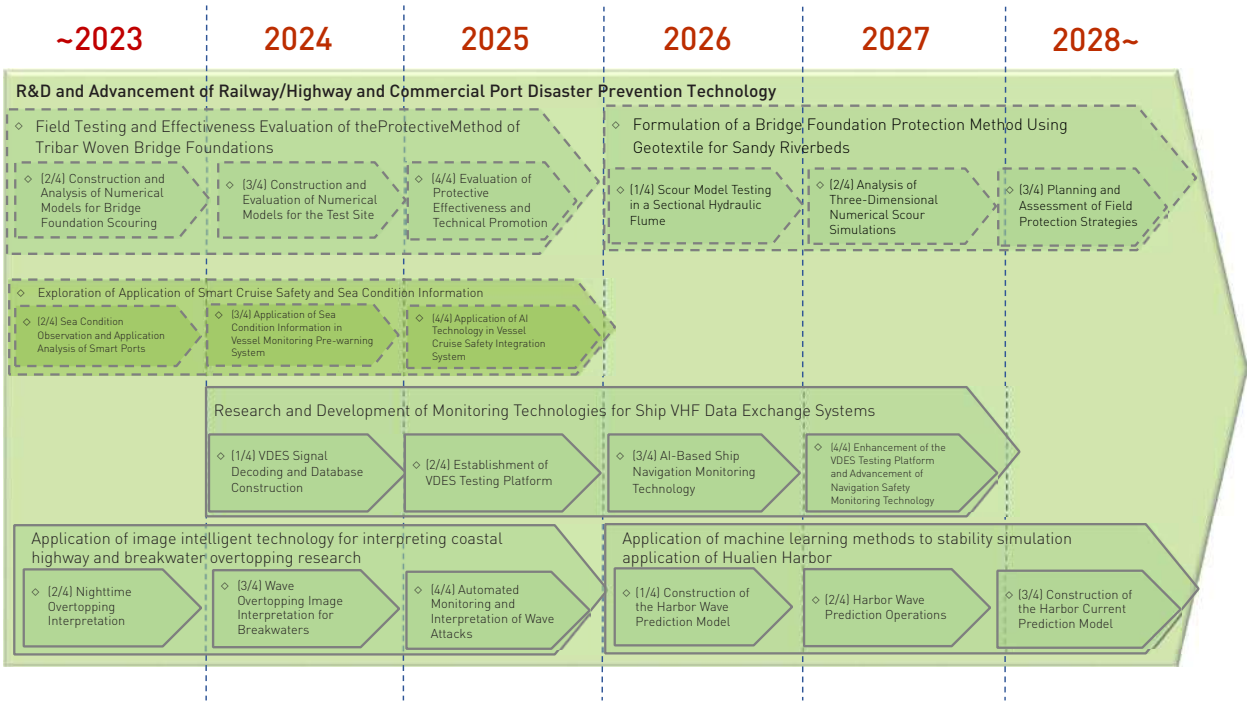
In 2024, the Institute continued to conduct atmospheric corrosion factor surveys and on-site exposure tests on metal materials in Taiwan, and compiled the survey and test results, published an annual report, and displayed them in the "Taiwan Corrosion Environment Classification Information System" for reference and application by industry, government, academia, and research. Additionally, a corrosion correlation model will be established for copper materials in Taiwan based on corrosion-inducing and meteorological factors, providing reference data for government agencies in designing and maintaining corrosion-resistant copper components.

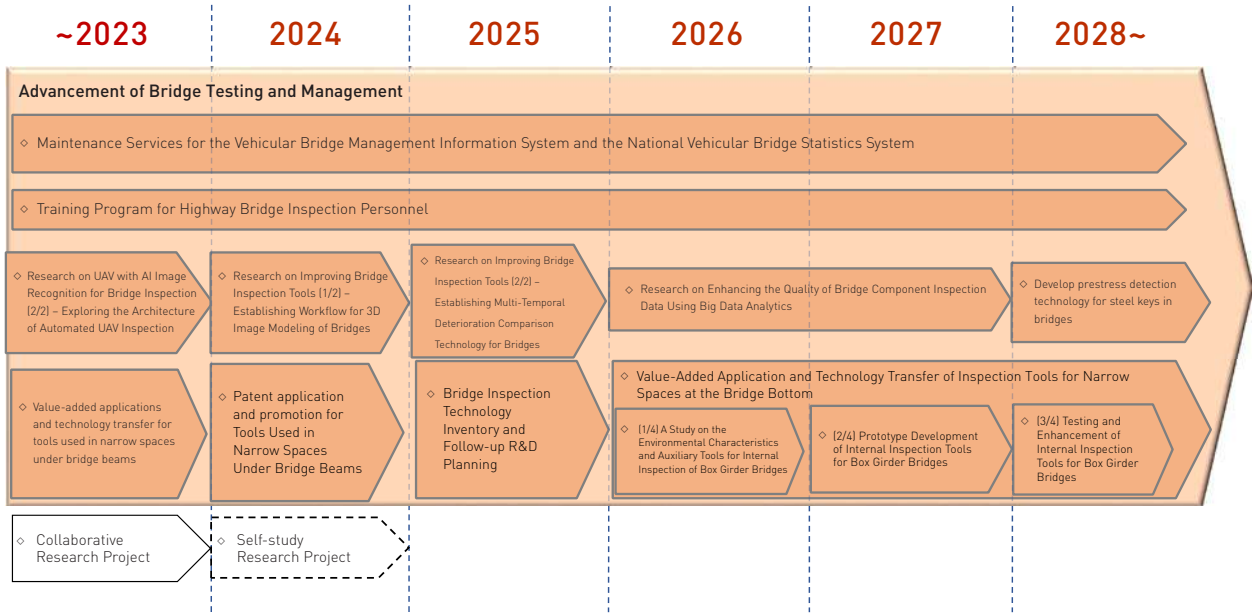
主軸 7：精進交通設施維護管理與災防技術

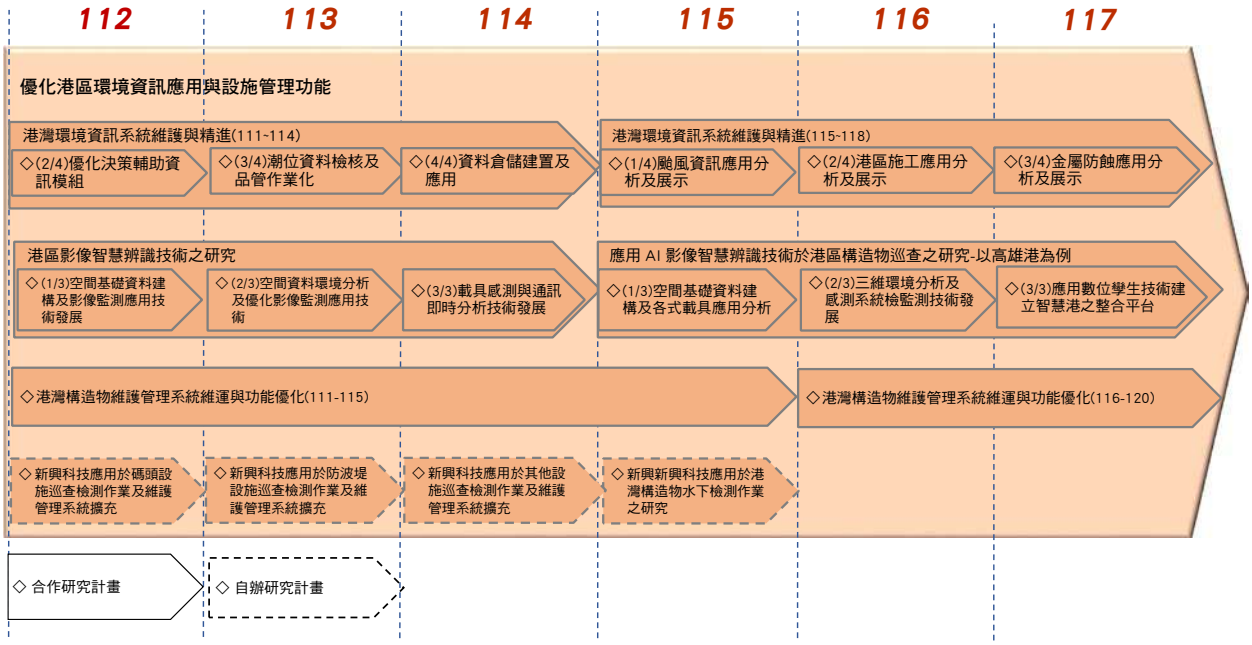




7. Improve the Transportation Facilities Maintenance Management and Disaster Prevention Technology



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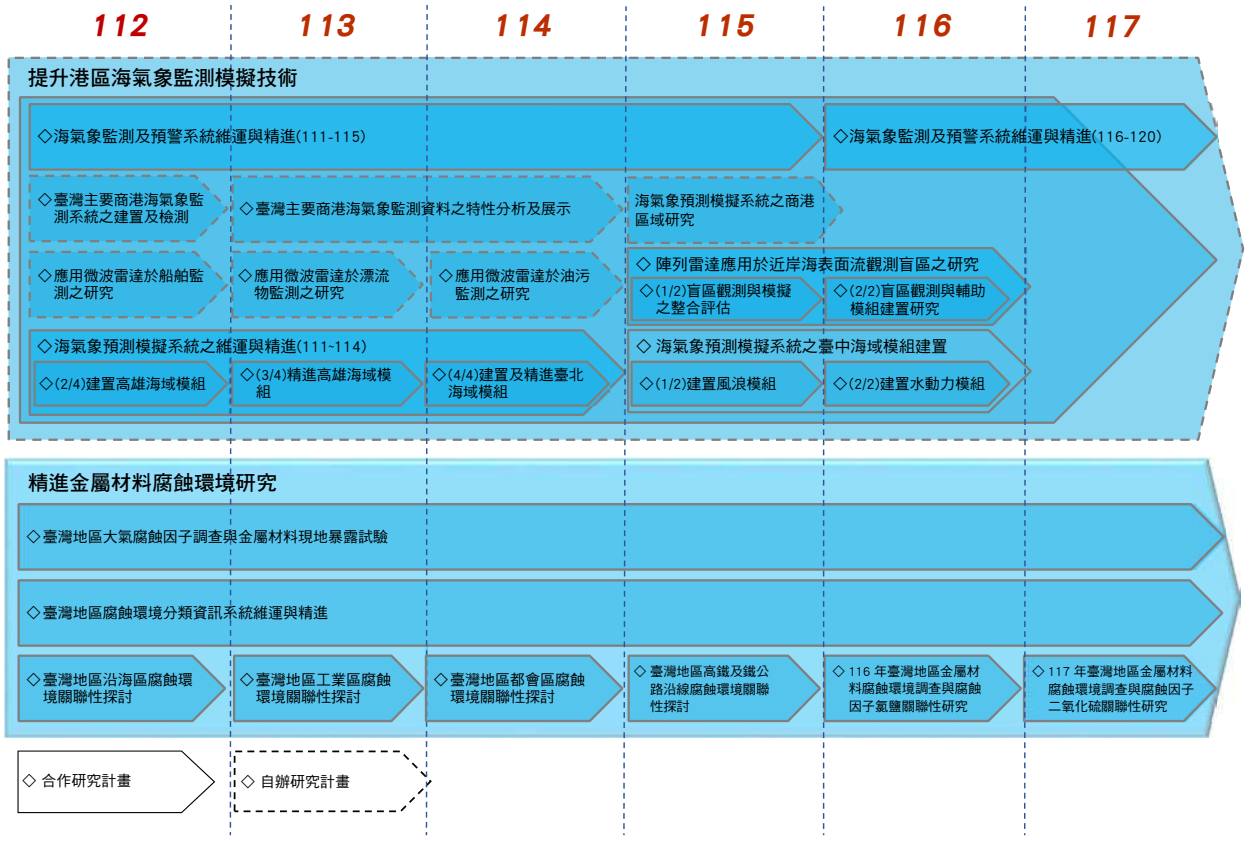
優化港區環境資訊應用與設施管理功能
港灣環境資訊系統維護與精進(111-114)
◇(2/4)優化決策輔助資訊模組
◇(3/4)潮位資料檢核及品管作業化
◇(4/4)資料倉儲建置及應用
港灣環境資訊系統維護與精進(115-118)
◇(1/4)颱風資訊應用分析及展示
◇(2/4)港區施工應用分析及展示
◇(3/4)金屬防蝕應用分析及展示
港區影像智慧辨識技術之研究
◇(1/3)空間基礎資料建構及影像監測應用技術發展
◇(2/3)空間資料環境分析及優化影像監測應用技術
◇(3/3)載具感測與通訊即時分析技術發展
應用 AI 影像智慧辨識技術於港區構造物巡查之研究-以高雄港為例
◇(1/3)空間基礎資料建構及各式載具應用分析
◇(2/3)三維環境分析及感測系統檢監測技術發展
◇(3/3)應用數位孿生技術建立智慧港之整合平台
◇港灣構造物維護管理系統維運與功能優化(111-115)
◇港灣構造物維護管理系統維運與功能優化(116-120)
◇ 新興科技應用於碼頭設施巡查檢測作業及維護管理系統擴充
◇ 新興科技應用於防波堤設施巡查檢測作業及維護管理系統擴充
◇ 新興科技應用於其他設施巡查檢測作業及維護管理系統擴充
◇ 新興新興科技應用於港灣構造物水下檢測作業之研究
◇ 合作研究計畫
◇ 自辦研究計畫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提升港區海氣象監測模擬技術
◇海氣象監測及預警系統維運與精進(111-115)
◇海氣象監測及預警系統維運與精進(116-120)
◇臺灣主要商港海氣象監測系統之建置及檢測
◇臺灣主要商港海氣象監測資料之特性分析及展示
海氣象預測模擬系統之商港區域研究
◇應用微波雷達於船舶監測之研究
◇應用微波雷達於漂流物監測之研究
◇應用微波雷達於油污監測之研究
◇ 陣列雷達應用於近岸海表面流觀測盲區之研究
◇(1/2)盲區觀測與模擬之整合評估
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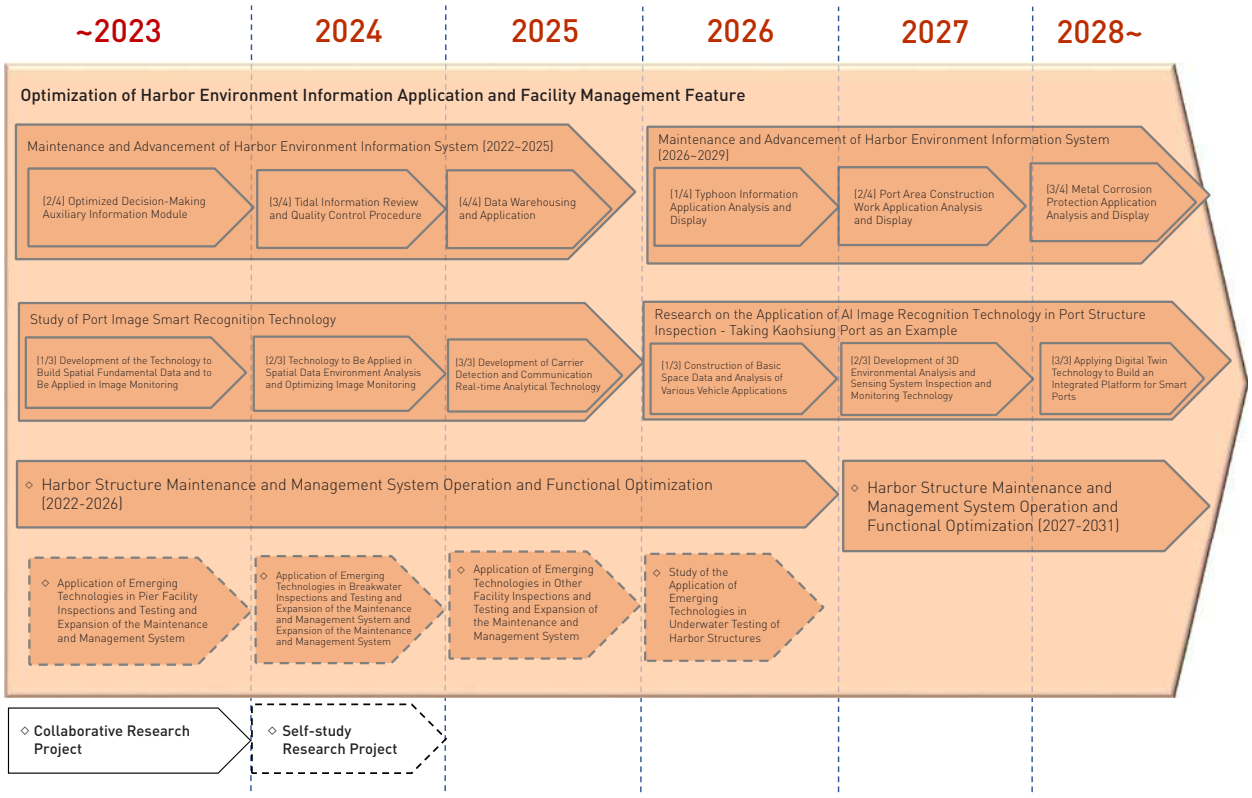
◇海氣象預測模擬系統之維運與精進(111-114)
◇(2/4)建置高雄海域模組
◇(3/4)精進高雄海域模組
◇(4/4)建置及精進臺北海域模組
◇ 海氣象預測模擬系統之臺中海域模組建置
◇(1/2)建置風浪模組
◇(2/2)建置水動力模組
精進金屬材料腐蝕環境研究
◇臺灣地區大氣腐蝕因子調查與金屬材料現地暴露試驗
◇臺灣地區腐蝕環境分類資訊系統維運與精進
◇臺灣地區沿海區腐蝕環境關聯性探討
◇臺灣地區工業區腐蝕環境關聯性探討
◇臺灣地區都會區腐蝕環境關聯性探討
◇ 臺灣地區高鐵及鐵公路沿線腐蝕環境關聯性探討
◇ 116 年臺灣地區金屬材料腐蝕環境調查與腐蝕因子氯鹽關聯性研究
◇ 117 年臺灣地區金屬材料腐蝕環境調查與腐蝕因子二氧化硫關聯性研究
◇ 合作研究計畫
◇ 自辦研究計畫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Optimization of Harbor Environment Information Application and Facility Management Feature
Maintenance and Advancement of Harbor Environment Information System (2022–2025)
(2/4) Optimized Decision-Making Auxiliary Information Module
(3/4) Tidal Information Review and Quality Control Procedure
(4/4) Data Warehousing and Application
Maintenance and Advancement of Harbor Environment Information System (2026–2029)
(1/4) Typhoon Information Application Analysis and Display
(2/4) Port Area Construction Work Application Analysis and Display
(3/4) Metal Corrosion Protection Application Analysis and Display
Study of Port Image Smart Recognition Technology
(1/3) Development of the Technology to Build Spatial Fundamental Data and to Be Applied in Image Monitoring
(2/3) Technology to Be Applied in Spatial Data Environment Analysis and Optimizing Image Monitoring
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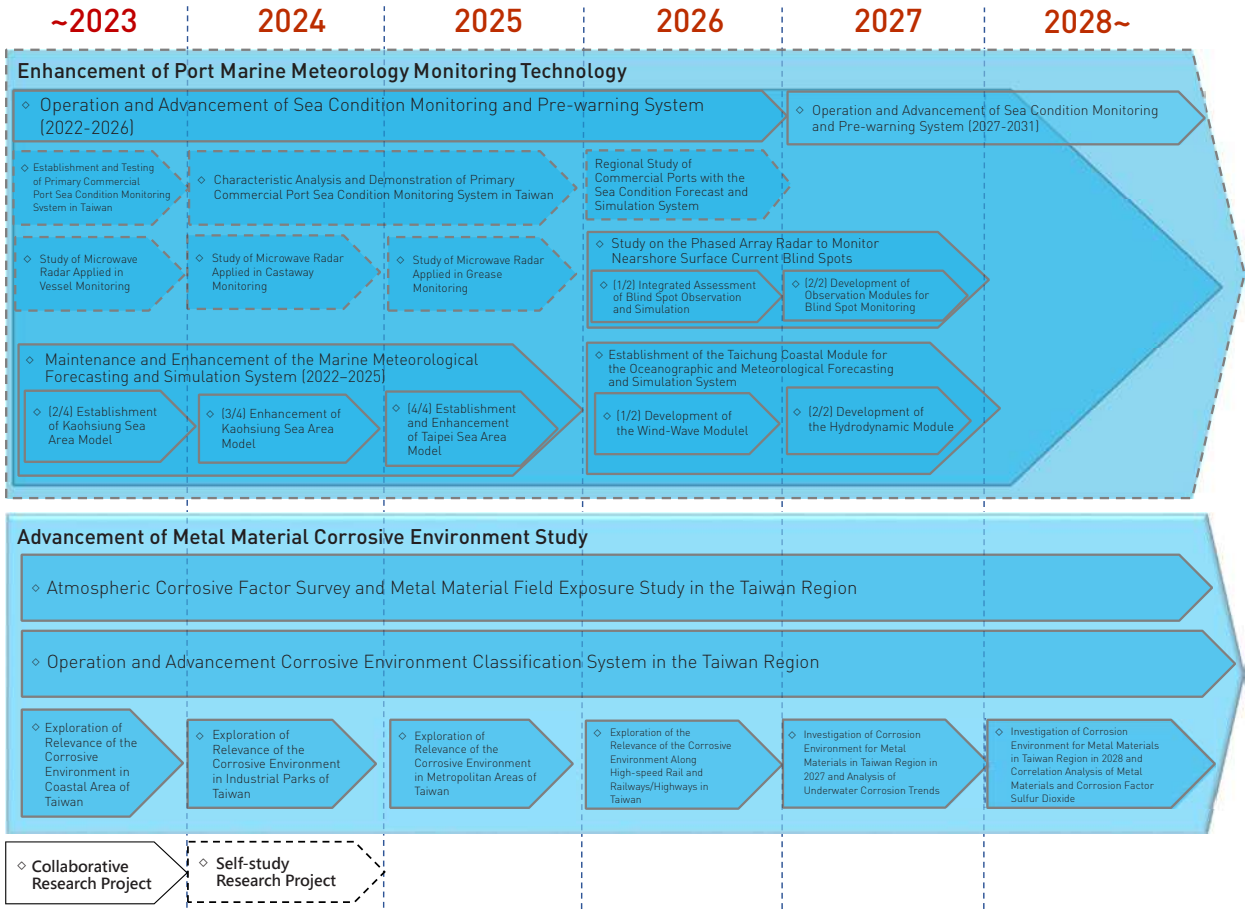
Research on the Application of AI Image Recognition Technology in Port Structure Inspection - Taking Kaohsiung Port as an Example
(1/3) Construction of Basic Space Data and Analysis of Various Vehicle Applications
(2/3) Development of 3D Environmental Analysis and Sensing System Inspection and Monitoring Technology
(3/3) Applying Digital Twin Technology to Build an Integrated Platform for Smart Ports
◇ Harbor Structure Maintenance and Management System Operation and Functional Optimization (2022-2026)
◇ Harbor Structure Maintenance and Management System Operation and Functional Optimization (2027-2031)
◇ Application of Emerging Technologies in Pier Facility Inspections and Testing and Expansion of the Maintenance and Management System
◇ Application of Emerging Technologies in Breakwater Inspections and Testing and Expansion of the Maintenance and Management System and Expansion of the Maintenance and Management System
◇ Application of Emerging Technologies in Other Facility Inspections and Testing and Expansion of the Maintenance and Management System
◇ Study of the Application of Emerging Technologies in Underwater Testing of Harbor Structures
◇ Collaborative Research Project
◇ Self-study Research Project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Enhancement of Port Marine Meteorology Monitoring Technology
◇ Operation and Advancement of Sea Condition Monitoring and Pre-warning System (2022-2026)
◇ Operation and Advancement of Sea Condition Monitoring and Pre-warning System (2027-2031)
◇ Establishment and Testing of Primary Commercial Port Sea Condition Monitoring System in Taiwan
◇ Characteristic Analysis and Demonstration of Primary Commercial Port Sea Condition Monitoring System in Taiwan
Regional Study of Commercial Ports with the Sea Condition Forecast and Simulation System
◇ Study of Microwave Radar Applied in Vessel Monitoring
◇ Study of Microwave Radar Applied in Castaway Monitoring
◇ Study of Microwave Radar Applied in Grease Monitoring
◇ Study on the Phased Array Radar to Monitor Nearshore Surface Current Blind Spots
◇ (1/2) Integrated Assessment of Blind Spot Observation and Simulation
◇ (2/2) Development of Observation Modules for Blind Spot Monitoring
◇ Maintenance and Enhancement of the Marine Meteorological Forecasting and Simulation System (2022–2025)
◇ (2/4) Establishment of Kaohsiung Sea Area Model
◇ (3/4) Enhancement of Kaohsiung Sea Area Model
◇ (4/4) Establishment and Enhancement of Taipei Sea Area Model
◇ Establishment of the Taichung Coastal Module for the Oceanographic and Meteorological Forecasting and Simulation System
◇ (1/2) Development of the Wind-Wave Modulel
◇ (2/2) Development of the Hydrodynamic Module
Advancement of Metal Material Corrosive Environment Study
◇ Atmospheric Corrosive Factor Survey and Metal Material Field Exposure Study in the Taiwan Region
◇ Operation and Advancement Corrosive Environment Classification System in the Taiwan Region
◇ Exploration of Relevance of the Corrosive Environment in Coastal Area of Taiwan
◇ Exploration of Relevance of the Corrosive Environment in Industrial Parks of Taiwan
◇ Exploration of Relevance of the Corrosive Environment in Metropolitan Areas of Taiwan
◇ Exploration of the Relevance of the Corrosive Environment Along High-speed Rail and Railways/Highways in Taiwan
◇ Investigation of Corrosion Environment for Metal Materials in Taiwan Region in 2027 and Analysis of Underwater Corrosion Trends
◇ Investigation of Corrosion Environment for Metal Materials in Taiwan Region in 2028 and Correlation Analysis of Metal Materials and Corrosion Factor Sulfur Dioxide
◇ Collaborative Research Project
◇ Self-study Research Project

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依據前述113年之研究主軸與重點，本所配合研擬及執行相關研究計畫，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 強化運輸規劃與審議支援

(一) 東臺區域整體運輸規劃

1. 計畫概述

本計畫為3年期計畫，主要係為掌握東臺區域（包含宜蘭縣、花蓮縣與臺東縣）平、假日之旅次特性，透過調查蒐集相關旅次特性資料，建立運輸需求模式，預測未來運輸系統之供需情形，針對東

According to the aforementioned 2024 research theme and focus, the institute collaborates with planning and implementing the relevant research projects, 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 Enhance the Transportation Planning and Reviewing Support

(I) Overall transportation planning of Eastern Taiwan

1. Project Overview

This three-year project aims to understand the travel characteristics of Eastern Taiwan, including Yilan County, Hualien County, and Taitung County, on both weekdays and holidays. By collecting relevant travel data through surveys, we established a transportation demand model to forecast the future supply and demand of the transportation system.

04
重點研究成果
Key Research Results

臺區域各運輸系統進行功能定位與檢討，並研提東臺區域陸路運輸系統發展策略。

本計畫第一年期（111年），蒐集東臺區域內重大建設與運輸議題，進行各縣市旅次特性及屏柵線交通量調查，以掌握區域內旅次行為之特性；第二年期（112年）完成東臺區域運輸需求模式之構建、目標年供需預測、課題探討、重大議題之政策敏感度及運輸計畫影響度分析；第三年期（113年）則根據前2年之計畫成果，進行東臺區域之運輸系統發展課題與對策、陸路運輸系統發展策略研析，以及未來展望與發展藍圖等。

The project will assess and define the functions of various transportation systems in the Eastern Taiwan region and propose development strategies for its land transportation systems.

In the first year of the project (2022), we collected data on major construction and transportation issues in the Eastern Taiwan region, conducted surveys on travel characteristics in each county, and screenline traffic volume to understand regional travel behaviors. In the second year (2023), we constructed a transportation demand model for the Eastern Taiwan region, forecasted supply and demand for the target year, analyzed key issues, policy sensitivities, and the impacts of transportation plans. In the third year (2024), based on the results of the first two years, we analyzed transportation system development issues and strategies, proposed land transportation system development strategies and outlined future prospects and development blueprints.

2. 研究成果

（1）完成東部區域運輸系統服務現況分析及未來展望。

（2）分析東部區域運輸系統發展課題與對策。

（3）研訂東部區域陸路運輸發展策略。

3. 成果推廣與效益

（1）以「四大區域整體運輸規劃研究成果分析」投稿中華民國運輸學會2024年會暨學術論文國際研討會，收錄於研討會論文集。

（2）於113年12月17日辦理「北中南東四大區域整體運輸規劃系列研究」成果說明會暨教育訓練。

（3）相關產出做為國發會、內政部（國土計畫）、交通部暨部屬機關（構）（如：臺鐵公司、鐵道局、公路局、高公局等）與各地方政府辦理鐵公路運輸系統計畫與評估之參據。

2. Research Results

(1) Completed the analysis of the current service situation of the transportation system in Eastern Taiwan and the prospects for the future.

(2) Completed the analysis of development issues and solutions for the transportation system in Eastern Taiwan.

(3) Propose strategies for the development of the land transportation system in Eastern Taiwan.

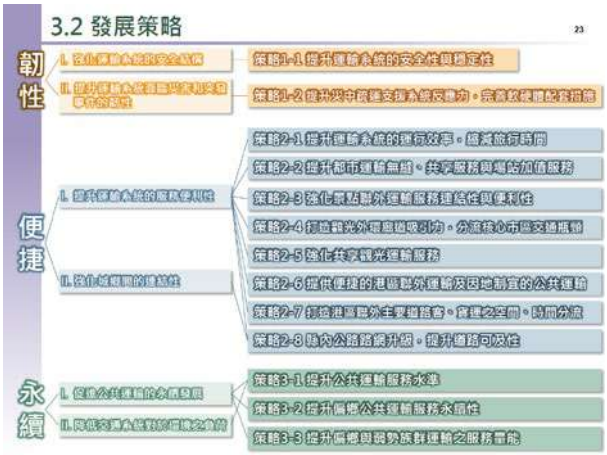
3. Result Promotion and Benefits

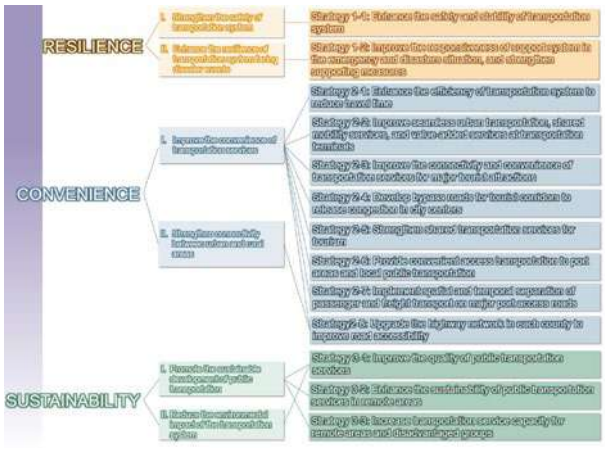
(1) A research paper, "Analysis of Research Findings on Comprehensive Transportation Planning in Four Major Regions," was presented at the 2024 International Conference and Annual Meeting of the Chinese Institute of Transportation.

(2) A symposium and training workshop for the Series of Studies on the Regional Transportation Planning was held on December 17, 2024.

(3) The outcome of this project would be the basis for the planning and evaluation of railway and highway projects conducted by the authorities.

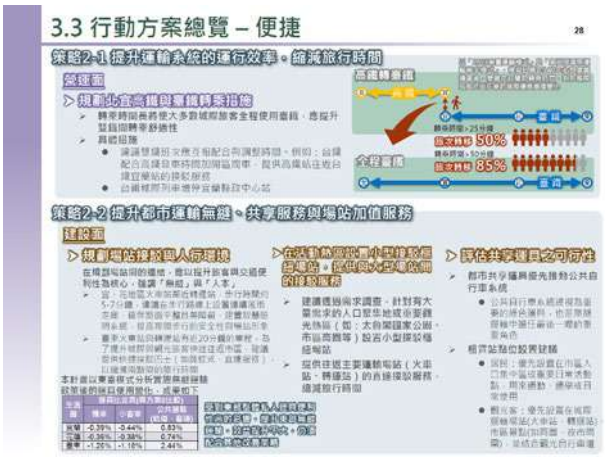
4. 研究成果精華摘整

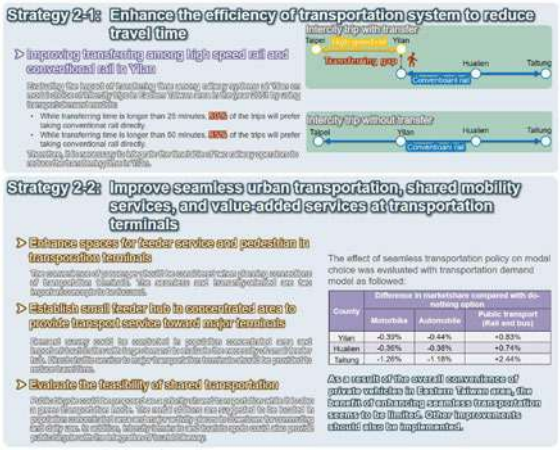




以「韌性、便捷、永續」3大面向研擬東臺區域未來運輸發展策略

Developing future transportation strategies for the Eastern Taiwan region with a focus on resilience, convenience, and sustainability





以運輸需求模式評估城際與都市運輸無縫轉乘之效益

Evaluating the benefits of seamless transfers of intercity and urban transportation through transport demand modeling

5. 研究成果報告

- 東臺區域整體運輸規劃系列研究（3／3）－陸路運輸系統發展策略研析（預計114年8月出版）

5. Research Result Report

- A series of studies on the overall transportation planning of Eastern Taiwan (3/3)-analysis of the development strategy for land transportation system (Scheduled to be published in August 2025).

（二）運輸規劃支援系統維運技術服務（113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，主要包含1.運輸規劃整合資料庫；2.運輸規劃支援系統（網路版）；3.運輸規劃圖展示及出圖作業系統（單機版）。運輸規劃整合資料庫，依運輸規劃作業需求，彙集了計畫資料、規劃資料、規劃工具、手冊及審議要點、指標等四大類資料。提供網路版WEB版－快速資訊查詢，PC單機版－圖資編修、空間環域分析等功能。

2. 研究成果

（1）本系統以TGOS所提供豐富多樣之底圖為圖臺，與本系統自行數化產製交通建設計畫、重大土地開發計畫圖資，結合社會經濟資料、運輸營運資料、運輸需求模式基礎資料、計畫評估工具等，提供公部門運輸規劃單位、學術單位及民間顧問公司快速查詢、取得運輸規劃作業所需相關圖資及數據資料。

（2）整合交通部高速公路局國道、公路局省道之交通量，部外主計總處統計之社會經濟資料，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、正確查詢取得所需相關資料。

（3）113年完成空間資訊圖臺點選查詢功能及強化運輸規劃圖層套疊產製功能；強化數據庫資料查詢統計功能，新增中臺區域運輸需求模式成果查詢功能。

(II) Maintenance service of the transportation planning support system (2024)

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). Based on the needs of transportation planning operations, the integrated transportation planning database aggregates four main types of data: project data, planning data, planning tools, manuals and review points/indicators. It offers web-based quick information query services and PC standalone services for map editing, spatial analysis and more.

2. Research Results

(1) The system uses the diverse base maps provided by 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 basic data and project evaluation tools. It enables public transportation planning units, academic institutions, and private consulting firms to quickly query and obtain relevant maps and data necessary for transportation planning operations.

(2) It integrates traffic volumes from the Freeway Bureau, provincial road data from the Highway Bureau, socio-economic data from the Directorate General of Budget, Accounting and Statistics, and open data from the Ministry of Culture, Water Resources Agency, Ministry of Agriculture, national parks, and the National Land Management Agency Ministry of the Interior. Map overlay and query point visualization provide users quick and accurate access to the required data.

(3) In 2024, the spatial information map point-and-click query function was completed, and the transportation planning layer overlay production function was strengthened; the database data query and statistical function was strengthened, and the Central Taiwan regional transportation demand model results query function was added.

3. 成果推廣與效益

（1）113年10月8日及11月15日辦理「運輸規劃支援系統」之教育訓練」。

（2）107－113年持續提供圖形資料庫（運輸系統、運輸場站／交通建設計畫區位與重大土地開發計畫區位）予交通部公路局、內政部國土管理署及各縣市政府建立永續生活圈運輸評估模型、國土規劃（含都會區域計畫）之機制探討使用。

3. Result Promotion and Benefits

(1) Two training workshops for "Transportation Planning Support System" were held on October 8 and November 15, 2024.

(2) From 2018 to 2024, it continuously provided graphic databases, including transportation systems, transportation stations/transportation construction project locations, and major land development project locations, to the Highway Bureau, the National Land Management Agency Ministry of the Interior, and local governments. These databases were used to establish sustainable living circle transportation evaluation models and explore mechanisms for national land planning, including metropolitan area planning.

4. 研究成果精華摘整

運輸規劃支援系統架構
Structure of the transportation planning support system

5. 研究成果報告

- 運輸規劃支援系統維運技術服務（113年）（預計114年8月出版）

5. Research Result Report

- Maintenance service of the transportation planning support system (2024) (Scheduled to be published in August 2025).

6. 相關網站

運輸規劃支援系統（https://ttdss.iot.gov.tw/ttdss/）

6. Related Websites

Transportation planning support system (https://ttdss.iot.gov.tw/ttdss/)

(三)高速公路交織路段容量及服務水準分析之研究（2／3）－非典型路段

1. 計畫概述

本所於民國79年、90年、110年陸續出版更新「臺灣地區公路容量手冊」，惟其中第七章「高速公路交織區段」仍援引美國運輸研究委員會（Transportation Research Board, TRB）1985年公路容量手冊的分析方法，且該方法將交織路段型態分為三種類型，而第七章僅著重於其中一種。然而TRB 1985年之分析方法因不適用於美國的環境，後續版本亦已更新分析方法。

本所自民國80年起開始進行長期性之容量本土化研究工作，逐步修訂民國79年之公路容量手冊，以適用於國內之分析。由於多年來均尚未蒐集交織路段的資料並進行車流特性分析，因此並未檢討交織路段的容量分析方法的適用性，爰辦理本計畫探討高速公路交織路段之車流特性、容量及服務水準分析方法。

2. 研究成果

（1）完成非典型交織路段之國內外文獻探討。

（2）完成4個地點之非典型交織路段現場調查，並進行資料整理及車流特性之分析。

3. 成果推廣與效益

（1）針對「高速公路路段大車之小客車當量之建議值」及「交織路段容量及服務水準評估之新方法」等議題於113年10月18日召開專家學者座談會。

（2）於2024中華民國運輸年會暨學術論文國際研討會發表「高速公路交織路段車流特性分析之研究」論文，並獲論文獎第一名。

（3）研究成果將做為後續修正「臺灣公路容量手冊」之基礎，以提供交通部及高公局等相關單位參考應用。

(III) Analysis of traffic capacity and level of service of freeway weaving segments – non-typical segments

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.

Since 1991, the institute has conducted long-term localization studies of roadway capacity, gradually revising the 1990 edition of the THCM to better suit domestic applications. However, due to the lack of data collection and traffic flow analysis for weaving segments over the years, the applicability of the current analysis methods for weaving segments has not been reviewed. Therefore, this project was initiated to explore the traffic flow characteristics, capacity, and level of service analysis methods for freeway weaving segments.

2. Research Results

(1) Completed a literature review on non-typical weaving segments from domestic and international sources.

(2) Conducted field surveys at four non-typical weaving sites, followed by data processing and analysis of traffic flow characteristics.

3. Result Promotion and Benefits

(1) An expert and scholar symposium was held on October 18, 2024, to discuss topics such as "Recommended Passenger Car Equivalents (PCE) for Heavy Vehicles on Freeways" and "New Evaluation Methods for Capacity and Level of Service of Weaving Segments."

(2) A research paper,titled "Study on the Traffic Flow Characteristics of Freeway Weaving Segments" was presented at the 2024 International Conference and Annual Meeting of the Chinese Institute of Transportation and won First Prize for Best Paper.

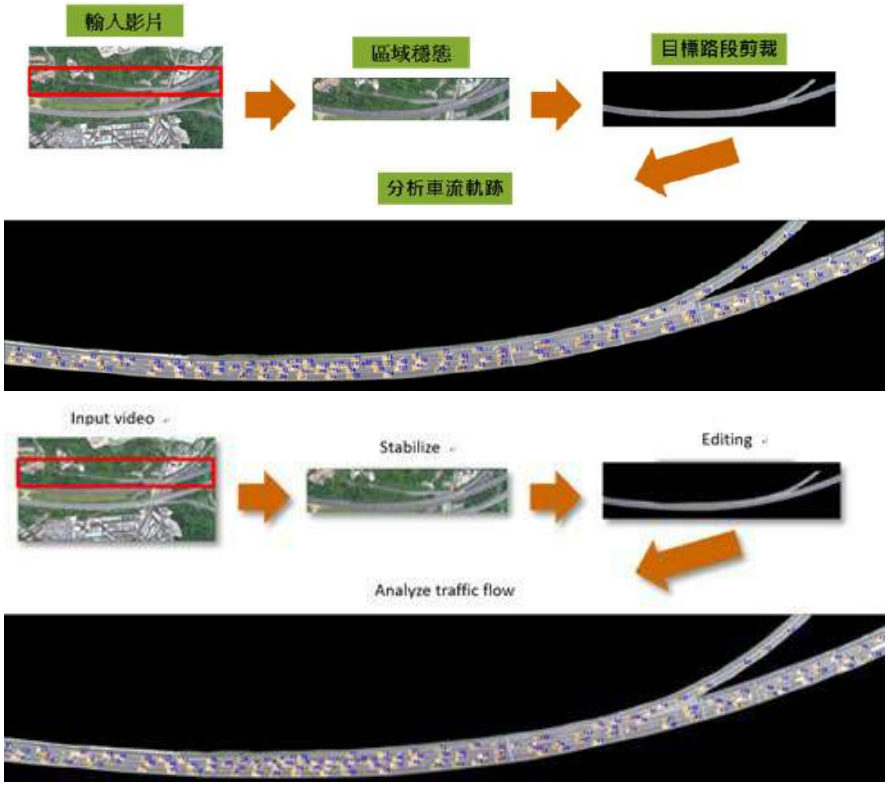
(3) The research findings will serve as the basis for revising the "Taiwan Highway Capacity Manual" and will be made available for reference and application by the MOTC and the Freeway Bureau.

4. 研究成果精華摘整

4. Summary of Research Results

南下霧峰－霧峰系統交織路段拍攝畫面

Southbound weaving segment between Wufeng and Wufeng system interchange – aerial footage



影像辨識分析流程圖

Image recognition analysis flow chart

5. 研究成果報告

- 高速公路交織路段容量及服務水準分析之研究（2／3）－非典型路段（預計114年8月出版）

5. Research Result Report

- Analysis of Traffic Capacity and Level of Service of Freeway Weaving Segments – Non-typical Segments (Scheduled to be published in August 2025).

(四)城際鐵道容量分析暨應用研究(2/2)－編組站及端末站之容量軟體擴充暨案例實作

1. 計畫概述

本計畫為2年期計畫，針對城際鐵道系統之編組站及端末站容量分析進行研究，端末站及編組站主要係列車營運的起迄點，列車抵達車站後必須進行整備後再折返開始下一趟車次，或進出車輛基地等整備工作，相較於一般車站更為複雜。

本計畫112年之第1年期計畫，完成構建可分析編組站及端末站之傳統暨區域鐵道系統容量分析模式，考慮列車於編組站及端末站的折返行為以及相關影響容量之因素進行分析，113年之第2年期計畫完成編組站及端末站之容量分析軟體功能擴充、研析號誌安全時距公式以考量道岔以及列車進出調車場的影響，做為後續114年蒐集環島城際鐵路網之路線容量參數及路線容量初步分析之基礎。本計畫之成果，可做為交通部、鐵道局、臺鐵公司及各地方政府於辦理城際鐵道系統改善計畫評估之參據。

2. 研究成果

（1）擴充開發考量編組站及端末站之容量分析軟體功能。

（2）研析發展城際鐵道系統之號誌安全時距計算公式。

3. 成果推廣與效益

（1）於113年10月29日及113年11月20日辦理2次教育訓練。

（2）於中華民國運輸學會2024年會暨學術論文國際研討會發表「臺鐵三位式號誌系統之號誌安全時距計算公式研析」論文。

（3）相關成果可提供交通部、鐵道局、臺鐵公司及各地方政府辦理臺鐵系統改善計畫評估時，應用新功能進行整體路線容量評估分析，以做為推動相關城際鐵道建設計畫之決策參考應用。

(IV) Research on capacity analysis of intercity railways and its applications (2/2) –case implementation and rail capacity software function extension for the classification yard and terminal station

1. Project Overview

This two-year project focuses on the capacity analysis of classification yards and terminal stations in the intercity railway system. Terminal and classification stations are primarily the starting and ending points for train operations. After a train arrives at these stations, it must undergo preparation before starting the next trip or entering the depot, which is more complex compared to general stations.

In the first year of the project in 2023, we completed the construction of a capacity analysis model for conventional railway systems, which can analyze classification yards and terminal stations. This model considers the turnaround behavior of trains at the classification yard and terminal station and factors affecting capacity. In the second year of the project in 2024, we extended the software functions for capacity analysis at the classification yard and terminal station, also developed formulas for signal close-in time that account for the effects such as turnouts and entry/exit operations at classification yard, serving as the basis for collecting capacity parameters and conducting a preliminary capacity analysis of the intercity railway network in 2025. The results of this project can serve as a basis for the MOTC, the Railway Bureau, the Taiwan Railway Corporation and local governments in evaluating intercity railway system improvement plans.

2. Research Results

(1) Extended the software functions for capacity analysis at the classification yard and terminal station.

(2) Developed signal close-in time formulas for the intercity railway system.

3. Result Promotion and Benefits

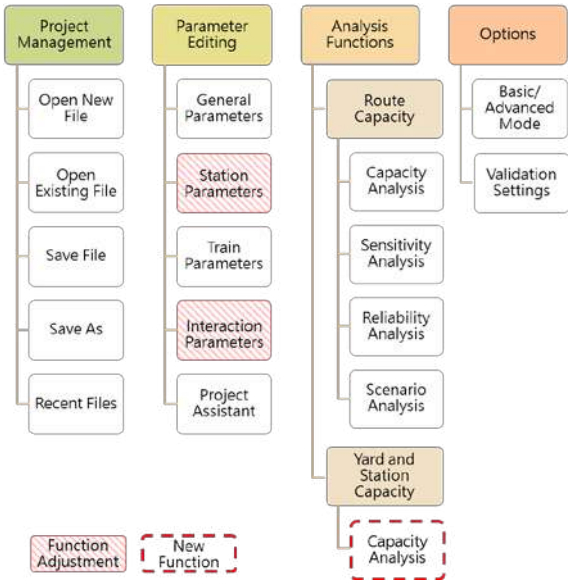
(1) Two training workshops were held on October 29 and November 20, 2024.

(2) A research paper, "A Study on Signal Close-in Time Formulas for the Three-Aspect Signaling System of Taiwan Railway," was presented at the 2024 International Conference and Annual Meeting of the Chinese Institute of Transportation.

(3) The results can assist the MOTC, the Railway Bureau, the Taiwan Railway Corporation and local governments in applying new functions for capacity analysis, providing a basis for evaluating intercity railway system improvement plans.

4. 研究成果精華摘整

4. Summary of Research Results



容量分析軟體功能擴充與調整

Enhancement and adjustment of capacity analysis software functionalities

5. 研究成果報告

- 城際鐵道容量分析暨應用研究（2/2）－編組站及端末站之容量軟體擴充暨案例實作（預計114年8月出版）

5. Research Result Report

- Research on capacity analysis of intercity railways and its applications (2/2) –case implementation and rail capacity software function extension for the classification yard and terminal station (Scheduled to be published in August 2025).

(五)電動車公共充電樁設施設置需求評估之研究

1. 計畫概述

隨著地球溫室效應所造成的氣候暖化及化石能源逐漸耗竭，節能減碳已成為國際發展的趨勢，近年來，各國相繼提出以2050年為目標之淨零排放相關策略與行動。為呼應國際趨勢並提升未來世代人民福祉，我國亦在2022年3月，由國家發展委員會公布「臺灣2050淨零排放路徑及策略總說明」，其中，關鍵戰略七「運具電動化及無碳化」，訂定2040年電動小客車市售比達100%之目標，電動車推動過程中，除車輛本身性能技術條件之外，其他配套措施如價格、維修、充電設施等亦為重要影響因素，其中，提供民眾完善便利的充電服務，解決駕駛人里程焦慮與住家或工作場所無法充電之問題為影響電動車發展的重要因素。

經濟部110年6月及8月召開「電動汽車充電基礎設施推動方案（草案）」會議時，請交通部辦理「區域充電設施設置需求評估方法」，以利台電公司建立電網衝擊評估與配電網擴充需求模型，爰本所於112~113年辦理「電動車公共充電樁設施設置需求評估之研究」，藉由蒐集電動車使用者需求特性及國內外相關文獻，並以臺灣各縣市電動車輛持有數、人口密度、電池容量、充電規格及充電時間等資料為基礎，建立電動車公共充電樁設施需求評估模式以探討不同情境下充電樁總電量需求、分時分布電量需求及電動車公共充電樁需求，並建立「公共充電樁設施需求評估工具」供台電公司推估縣市別及鄉鎮市別公共充電樁總電量需求及分時分布電量需求做為後續電網布設之參據。

2. 研究成果

（1）完成電動車使用者之交通特性及公共充電樁設施使用特性調查。

（2）建立公共充電樁需求評估模式及評估工具，供台電公司推估鄉鎮市別公共充電樁電量需求。

(V) The study of the public charger's demand assessment for electric vehicles

1. Project Overview

As global warming caused by the greenhouse effect intensifies and fossil fuel resources continue to deplete, energy conservation and carbon reduction have become key trends in international development. In recent years, countries around the world have successively proposed net-zero emission strategies and actions, with targets set for the year 2050. In line with international trends and with the aim of improving the well-being of future generations, Taiwan also announced the "Taiwan 2050 Net-Zero Emissions Path and Strategies" in March 2022, released by the National Development Council. Among its key strategies, Strategy 7, " Electric and Carbon-Free Vehicles," sets a goal of achieving 100% market share for electric passenger vehicles by 2040. In promoting electric vehicles (EVs), aside from the vehicles' technical performance and specifications, supporting measures such as pricing, maintenance, and charging infrastructure are also critical influencing factors. Among these, providing the public with accessible and reliable charging services—and addressing issues such as range anxiety and the inability to charge at home or the workplace—are crucial to the success of EV development.

In June and August 2021, during meetings held by the Ministry of Economic Affairs regarding the "Draft Promotion Plan for Electric Vehicle Charging Infrastructure," the Ministry of Transportation and Communications was tasked with developing a "Methodology for Assessing Regional Charging Infrastructure Needs." This would support Taiwan Power Company in creating models to assess grid impacts and distribution network expansion requirements. In response, the institute conducted the "Study on Demand Assessment for Public EV Charging Infrastructure" from 2023 to 2024. Through the collection of EV user behavior data and review of relevant domestic and international literature, and based on variables such as the number of electric vehicles in each city and county, population density, battery capacity, charging standards, and charging duration, the study developed a model to assess the demand for public EV charging infrastructure. The model analyzes total electricity demand, time-based electricity distribution, and the number of required public charging stations under different scenarios. Additionally, a "Public Charging Infrastructure Demand Assessment Tool" was created to help Taipower Company estimate the total and time-distributed electricity demand for public charging infrastructure at city/county and township levels, serving as a reference for smart grid planning and deployment.

2. Research Results

(1) Completed the survey on travel behavior of electric vehicle users and usage characteristics of public charging infrastructure.

(2) Establish a demand-assessment model and evaluation tool for public charging stations, enabling Taipower to estimate the electricity demand for such chargers at the township and municipal levels.

3. 成果推廣與效益

（1）於112年11月14日及113年8月13日召開2次專家學者座談會。

（2）於113年10月17日辦理成果說明會。

（3）於中華民國運輸學會2024年會暨學術論文國際研討會發表「電動車使用與公共充電樁設施需求特性調查」、「電動車公共充電樁設施設置需求評估模式之建立與分析－以臺灣本島縣市為例」論文。

（4）公共充電樁設施需求評估工具可供經濟部及台電公司推估縣市別及鄉鎮市別充電樁總電量需求及分時分布電量需求做為後續電網布設之參據。

4. 研究成果精華摘整

3. Result Promotion and Benefits

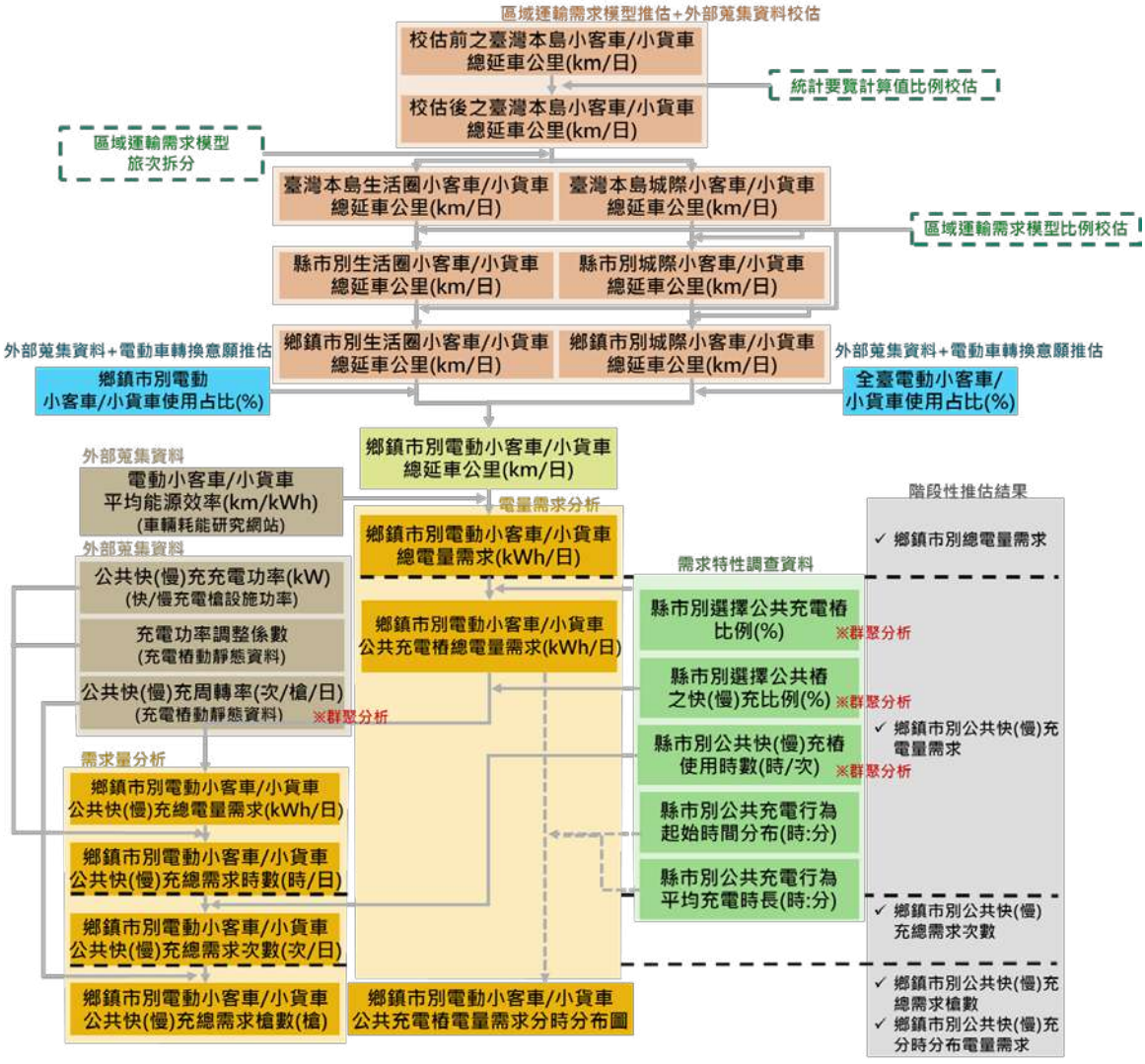
(1) Two expert and scholar symposiums were held on November 14, 2023, and August 13, 2024.

(2) An outcome presentation meeting was held on October 17, 2024.

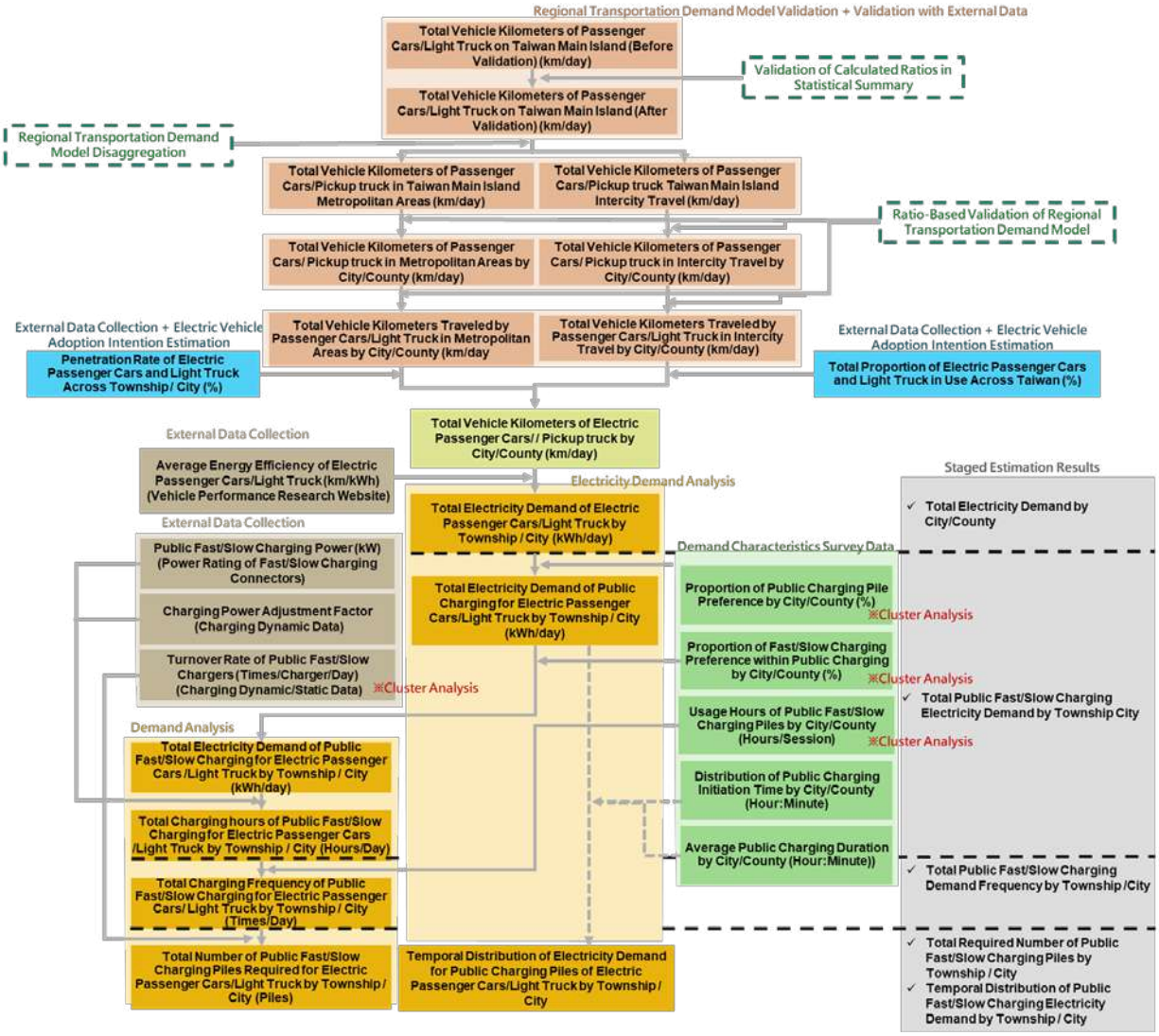
(3) Two research papers, "A Survey on the Usage of Electric Vehicles and the Demand Characteristics of Public Charging Infrastructure" and "Establishment and Analysis of Demand Assessment for Public Charging Infrastructure for Electric Vehicles: A Case Study of Taiwan Main Island Cities" were presented at the 2024 International Conference and Annual Meeting of the Chinese Institute of Transportation.

(4) The public charging infrastructure demand assessment tool can be used by the Ministry of Economic Affairs and Taipower to estimate both the total and time-distributed electricity demand for charging stations at the city/county and township levels, serving as a reference for future power grid deployment.

4. Summary of Research Results



臺灣本島電動車公共充電設施設置需求評估模式架構圖



Modeling framework for assessing public charging infrastructure deployment needs for electric vehicles on Taiwan's main island

5. 研究成果報告

- 電動車公共充電樁設施設置需求評估之研究（預計114年8月出版）

5. Research Result Report

- The study of the public charger's demand assessment for electric vehicles (Scheduled to be published in August 2025).

(六)鐵路供需診斷數位分身軟體平台之建置（2/2）－鐵路數位分身軟體平台雛型架構之研發

1. 計畫概述

本計畫依本所112年所規劃之鐵路數位分身軟體平台雛型架構，完成可設定各種條件，進行鐵路系統旅客運輸供需情形與情境分析之鐵路供需診斷軟體。軟體不僅有臺鐵路軌模型、歷史售票及班表資料等分析所需基礎數據，同時導入大數據分析技術，讓相關單位可以模擬、預測並以具體數據比較各方案間的運轉績效。本計畫並以「桃園都會區鐵路地下化計畫」實測，驗證本計畫開發之軟體可做為鐵路建設計畫經費審議、政策研擬與方案評估之有力輔助工具。

2. 研究成果

（1）結合過去累積研發技術如平台架構及操作界面、自動解衝突、運轉模擬等，開發可於電腦中整合路軌模型、列車模型以及運轉邏輯演算法之鐵路數位分身軟體平台。

（2）以研發之鐵路數位分身軟體平台完成「臺鐵都會區捷運化桃園段地下化建設計畫」分析，提出不同路軌設計情境下之運轉狀況。

3. 成果推廣與效益

（1）113年11月27日召開專家學者座談會，說明「臺鐵都會區捷運化桃園段地下化建設計畫」之情境案例分析預測成果，實例推廣本軟體平台作為鐵路計畫審議之輔助工具。

（2）本軟體平台後續將積極推廣至交通部、鐵道局、臺鐵公司、各地方政府及顧問公司等，提供其辦理鐵路計畫審議時之輔助工具，做為計畫經費審議、政策研擬與方案評估等之決策參考應用。

(VI) Construction of the railway supply-demand diagnostic digital twin software platform (2/2) – development of the prototype architecture of the railway digital twin software platform

1. Project Overview

This project is based on the prototype architecture of the railway digital twin software platform planned by our institute in 2023. It aims to complete a diagnostic software capable of setting various conditions to analyze the supply-demand dynamics and scenarios of railway passenger transportation systems. The software integrates essential data such as Taiwan Railways' track models, historical ticketing and timetable data, and incorporates big data analytics technology. It allows relevant authorities to simulate, forecast, and compare operational performance across different proposals using concrete data. The project also uses the "Taoyuan Metropolitan Area Railway Underground Project" as a case study to validate that the developed software serves as a powerful decision-support tool for railway construction project budgeting, policy development, and proposal evaluation.

2. Research Results

(1) We developed a railway digital twin software platform that integrates track models, train models, and operational logic algorithms by integrating previously accumulated technologies—such as platform architecture, user interfaces, automated conflict resolution, and operational simulation.

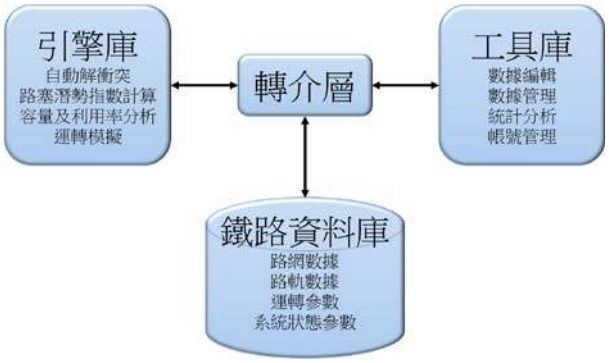
(2) Using the developed digital twin platform, we analyzed the "Taiwan Railways Metropolitan Rapid Transit (MRT) Taoyuan Underground Section Project" and proposed operational scenarios under different track design conditions.

3. Result Promotion and Benefits

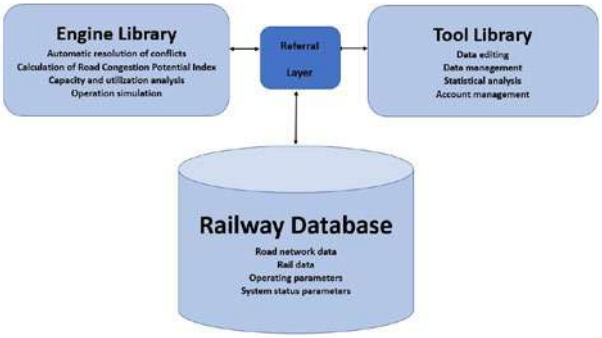
(1) On November 27, 2024, an expert and scholar symposium was held to present scenario-based analysis and forecasting results of the "MRT Taoyuan Underground Section Project", promoting the software platform as an auxiliary tool for railway project reviews.

(2) The platform will be actively promoted to the MOTC, the Railway Bureau, the Taiwan Railway Corporation, local governments, and consulting firms to assist in project budget reviews, policy formulation, and evaluation of proposed plans.

4. 研究成果精華摘整



4. Summary of Research Results



鐵路數位分身平台數據組織架構圖
Data Organization Structure of the Railway Digital Twin Platform

5. 研究成果報告

- 鐵路供需診斷數位分身軟體平台之建置－鐵路數位分身軟體平台雛型架構之研發（預計114年8月出版）

二 提升海空運競爭優勢

(一)國際機場運作模擬分析軟體系統規劃與建置（2/2）－整合軟體建置與實例測試

1. 計畫概述

機場空側模擬分析為民航機場營運規劃相當重要之一環，本計畫前期研究已建立機場空側容量評析方法，並通過桃園機場公司驗證。在前期研究基礎上，本計畫進一步將上述評析方法研發為機場運作模擬分析軟體，並強化人機介面之操作親和性。

本計畫為2年期研究，第1年期（112年）已完成機場運作模擬軟體雛型，包括建立軟體平臺，並完成模擬引擎模組之軟體修正、資料庫模組、操作界面模組之設計與實作等；第2年期（113年）進一步研發成為具人機介面親和性之完整軟體，完成多項實際案例分析，且透過機場相關機關（構）的試用，蒐集使用者回饋意見再進行修正，並於民航局與桃園機場公司各完成1場教育訓練。

5. Research Result Report

- Construction of the railway supply-demand diagnostic digital twin software platform (2/2) – development of the prototype architecture of the railway digital twin software platform (Scheduled to be published in August 2025).

II Improve the Competitive Advantage of Maritime and Air Transport

(I) Development of the Airport Operations Simulation Analysis System (2/2) – Integrate software development and case testing

1. Project Overview

This project aims to establish an airport operations simulation analysis system, focusing on constructing a decision-support platform for aircraft ground movement and passenger processes. By integrating data and knowledge, we apply simulation modeling and operations research methodologies to develop a prototype analysis system. This system will support capacity estimation, bottleneck diagnosis, and strategic evaluation for aircraft ground operations and passenger flow. Furthermore, a Taiwan Taoyuan International Airport case study is conducted to verify system functionality and provide development recommendations for future airport digital twin systems.

This project is a two-year research initiative. In the first year (2023), a prototype of an airport operation simulation software was developed, which included the establishment of a software platform, software modifications to the simulation engine module, and the design and implementation of the database and user interface modules. In the second year (2024), the software was further developed into a complete system with a user-friendly human-machine interface. Several real-world case analyses were conducted, and user feedback was collected through trial use by relevant airport authorities for further refinement. Additionally, one training session was conducted respectively at the Civil Aviation Administration and Taoyuan International Airport Corporation.

2. 研究成果

（1）功能：機場空側場面管理、航班管理、參數管理、專案管理、模擬評估、分析結果檢視、權限管理及個人資訊管理等。

（2）介面操作：使用者可依需求設定機場場面配置、參數數值、機場起降航班數量、起降間隔，以及設定空側運轉情境，包括：起飛、降落、滑行等，以及拖機與地停等實務操作；並可因應不同天候及工程變動情境，進行方案評估與擇選。

（3）技術驗證：本系列研究係以桃園國際機場為場面，並使用該機場多組真實資料進行模擬，模擬結果經專家多次檢視均屬合理，且經桃園機場公司認定符合該機場特性，具備後續長期擴充發展之潛力，已預計114年下半年起導入實務應用。

3. 成果推廣與效益

（1）113年12月9日召開「機場空側模擬分析系統」成果發表會，參與單位計有交通部航政司、民航局（含飛航服務總臺及國際航空站）、桃園機場公司、中華機場協會、顧問公司及大專院校交通相關科系所等。

2. Research Outcomes

(1) Functionality: The system supports airside operations management, flight management, parameter configuration, project management, simulation and evaluation, result analysis, access control, and personal information management.

(2) User Interface: Users can customize airport layout settings, parameter values, flight volumes, and takeoff/landing intervals as needed. The system allows configuration of various airside operational scenarios—including takeoff, landing, taxiing, towing, and parking—and supports evaluations under different weather conditions and construction-related changes to assist in scenario selection and planning.

(3) Technical Validation: The research focused on Taoyuan International Airport, using multiple sets of real operational data for simulation. The results, reviewed multiple times by experts, were deemed reasonable and reflective of the airport's characteristics. Taoyuan International Airport Corporation has confirmed its suitability and potential for long-term development. Practical implementation is scheduled to begin in the second half of 2025.

3. Outcome Promotion and Benefits

(1) An "Airport Airside Simulation and Analysis System" results presentation was held on December 9, 2024. Attendees included representatives from the Department of Aeronautics and Navigation of the Ministry of Transportation and Communications, the Civil Aeronautics Administration (including the Air Navigation and Weather Services and international airports), Taoyuan International Airport Corporation, the Chinese Airport Association, consulting firms, and transportation-related departments from universities.

（2）113年10月在民航局與桃園機場公司各完成1場教育訓練，除上述單位人員參加以外，並邀請飛航服務總臺、臺北國際航空站、高雄航空站、臺中航空站等人員參與，以推廣後續實務應用。

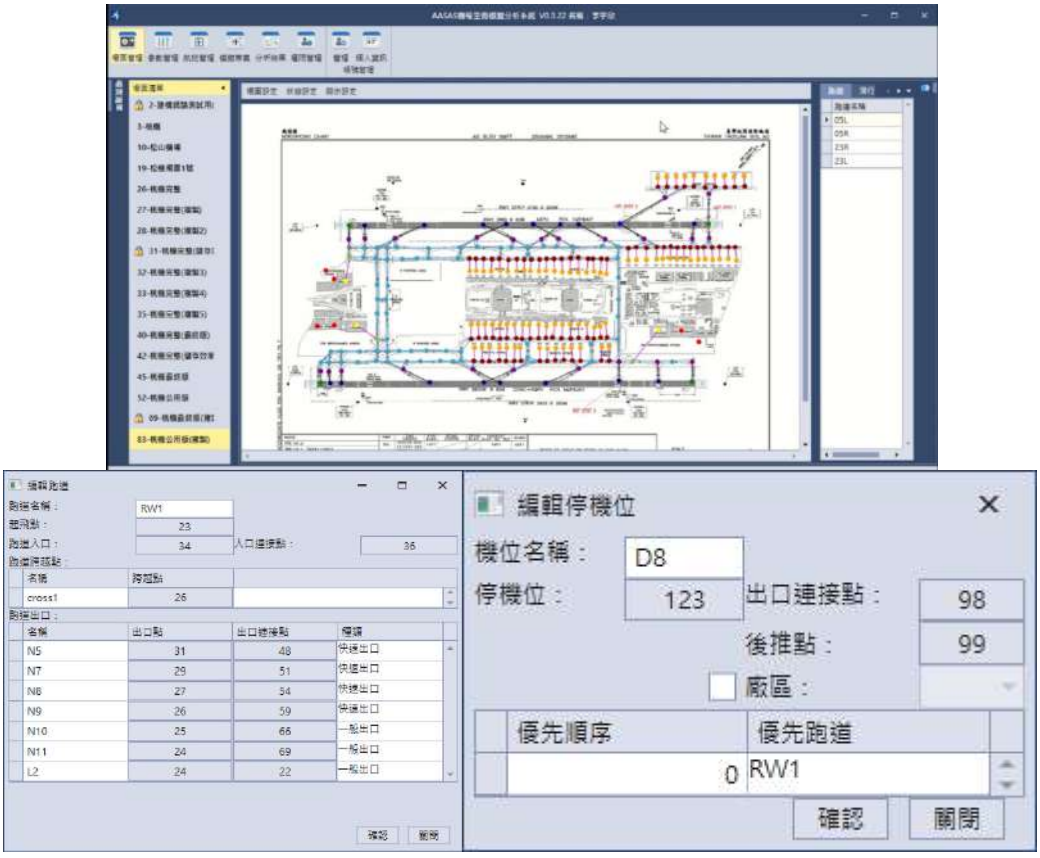
（3）本軟體可做為桃園機場公司、交通部民航局與航空站等單位做為機場營運決策分析輔助工具，提升機場空側營運效能及工程應變決策能力。除可掌握機場空側容量、強化機場空側在日常情境及干擾情境之方案評估、釐清異常狀況及場面施工所導致延滯原因外，並可提升機場營運效能，進而撙節航空公司經營成本及減少旅客等候時間。

(2) In October 2024, one training session was conducted each at the Civil Aeronautics Administration and Taoyuan International Airport Corporation. In addition to staff from the aforementioned organizations, personnel from the Air Navigation and Weather Services, Taipei Songshan Airport, Kaohsiung International Airport, and Taichung International Airport were also invited to participate, promoting future practical application.

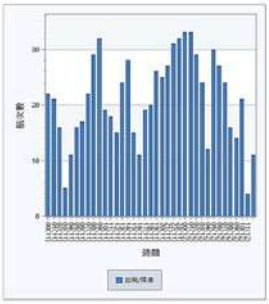
(3) The software serves as a decision-support tool for Taoyuan International Airport Corporation, the Civil Aeronautics Administration, and airport operators. It enhances airside operational efficiency and supports decision-making in response to engineering and operational challenges. The system allows users to assess airport airside capacity, evaluate scenarios under normal and disrupted conditions, identify causes of delays due to abnormal events or airside construction, and ultimately improve airport operations, reduce airline operating costs, and shorten passenger wait times.

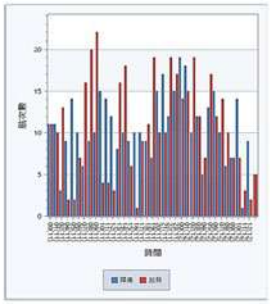
4. 研究成果精華摘整

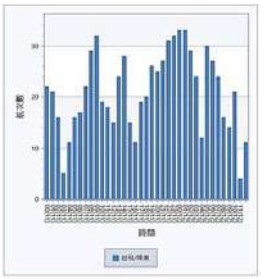
4. Research Highlights

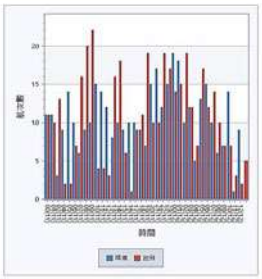


本軟體場面編輯功能圖（含動畫）
User interface of the Airport Airside Simulation and Analysis System

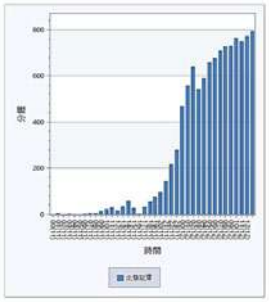

起降合計

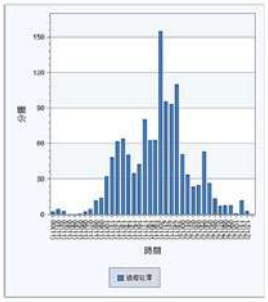

起降分計

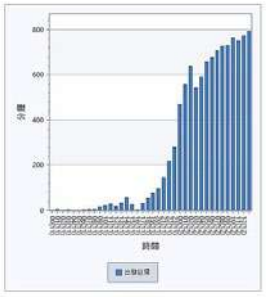

Total aircraft take-offs and landings per period

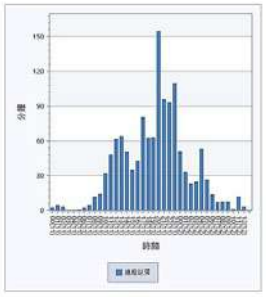

Aircraft take-offs and landings per period

封閉桃園機場南跑道模擬分析結果－05L跑道起降量
Single runway scenario flight group B: takeoffs and landings on runway 05L

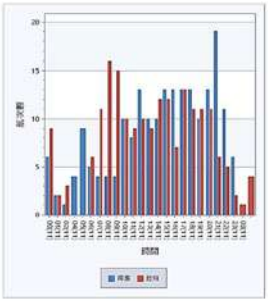

出發延滯

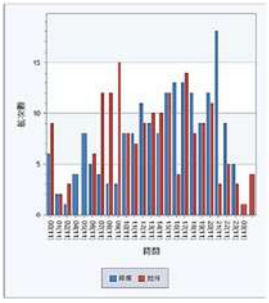

過程延滯

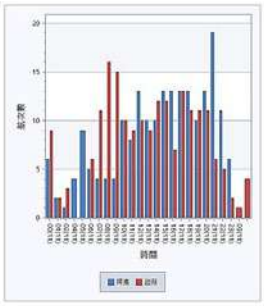

Departure delay

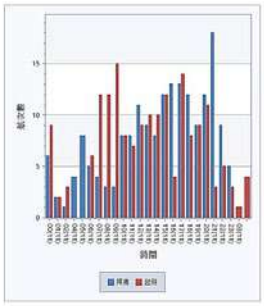

Process delay

封閉桃園機場南跑道模擬分析結果－05L跑道延滯量
Results of simulation analysis of closing the South Runway of Taoyuan International Airport - 05L runway delay


正常情境


關閉部份滑行道


Normal situation


Close some taxiways scenario

關閉桃園機場部份滑行道模擬分析結果－23L跑道起降量比較
Simulation Results of Partial Taxiway Closure at Taoyuan Airport – Comparative Analysis of Takeoff and Landing Volume on Runway 23L

5. 研究成果報告

- 國際機場運作模擬分析軟體系統規劃與建置（2/2）－整合軟體建置與實例測試（預計114年8月出版）

(二)海運國際資料庫維護及議題分析

1. 計畫概述

當前全球經濟版圖變化快速，海上貨物運輸情勢亦隨之劇烈起伏，我國位居東亞中心，四面環海，雖曾經歷多年的海上運輸榮景，但近年來之變化對我國相當不利。近年全球貨櫃港排名，高雄港名次停滯不前，值得政府高度關注並妥善因應。

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，例如新南向政策之研擬與成效評估等，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. 研究成果

（1）蒐集2011 Q2至2024 12月間國際定期貨櫃航線資料。

（2）2016年之前以遠東為中心，每季約蒐集600條航線；2017年起擴大蒐集全球所有貨櫃定期航線，每季約1,500至1,550條航線；2022年起改以月為頻率蒐集，每月約1,800條航線。

（3）收錄全球超過1,000個港口之中英文名稱、經緯度、所屬國家、所在洲別及國際標準碼等資料；航線上使用之船舶約5,200艘，涵蓋全球貨櫃船總數之97%。

（4）精進具資料統計分析及報表、圖表產製功能之單機版查詢軟體，並強化其資安防禦能力。

5. Research Report

- Simulation and Analysis System for International Airport Operations (2/2) – Integrated System Development and Case Testing (Scheduled to be published in August 2025).

(II) Maintenance and Thematic Analysis of the International Maritime Database

1. Project Overview

Amid rapid changes in the global economic landscape, maritime cargo transportation is also experiencing significant fluctuations. Taiwan, located at the heart of East Asia and surrounded by the sea, once enjoyed a thriving maritime transport industry. However, recent developments have posed considerable challenges. Notably, the stagnation in Kaohsiung Port's global container port ranking in recent years warrants close government attention and an effective response.

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. It also serves policy-making needs, such as planning and evaluating Taiwan's New Southbound Policy, by offering concrete and objective supply-side quantitative data.

2. Research Outcomes

(1) Collected international scheduled container route data from Q2 2011 to December 2024.

(2) Before 2016, focused on the Far East with ~600 routes per quarter; from 2017, expanded globally to ~1,500–1,550 routes per quarter; from 2022, switched to monthly updates (~1,800 routes/month).

(3) Compiled data on over 1,000 global ports, including bilingual names, coordinates, countries, continents, and international standard codes; included ~5,200 vessels, representing 97% of global container ships.

(4) Enhanced standalone query software with statistical reporting and chart functions, as well as improved cybersecurity.

（5）完成我國及南向國家對外航線部署分析、主航線部署型態之變化。

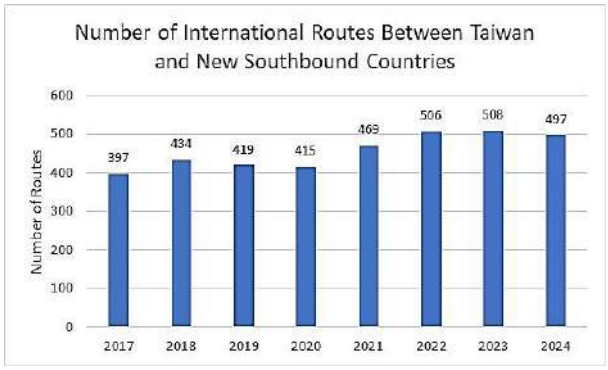
3. 成果推廣與效益

（1）113年11月27召開「113年度海運國際資料庫議題分析成果交流座談會」，邀請海運業產官學界與會，介紹資料庫內容、功能及議題分析成果。

（2）本計畫分析成果投稿「航貿週刊」，投稿題目「全球貿易區主航線部署分析」。

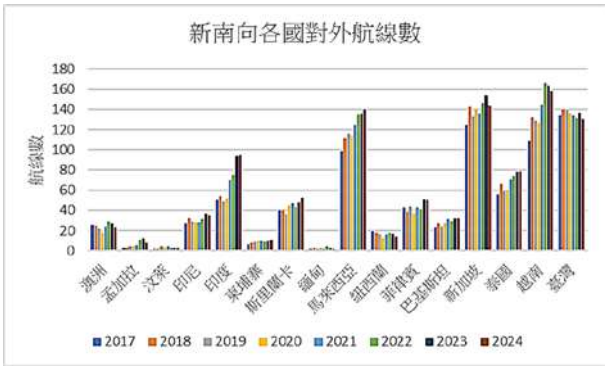
（3）本計畫成果可提供航運管理機關、港務公司及本所研析國際貨櫃航運市場變化之參考應用。

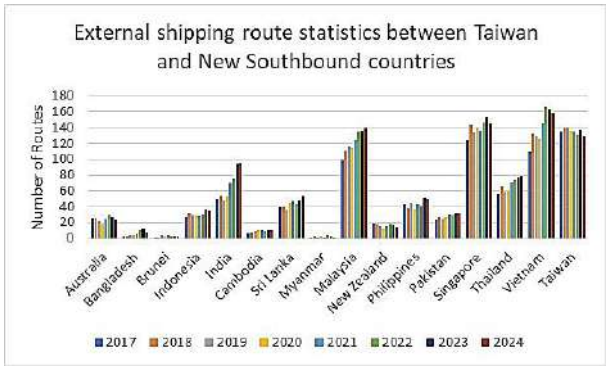
4. 研究成果精華摘整



我國與南向15國2017－2023年第2季對外航線總數

Total Number of International Routes Between Taiwan and the 15 New Southbound Countries, 2017 to Q2 2023





我國與南向15國2017－2023年第2季對外航線數

External shipping route statistics between Taiwan and 15 New Southbound countries from 2017 to Q2 2023.

5. 研究成果報告

- 海運國際資料庫維護及議題分析（預計114年8月出版）

（5）Completed analyses on Taiwan's and New Southbound countries' foreign route deployments and mainline deployment pattern changes.

3. Promotion and Benefits

（1）On November 27, 2024, the "2024 Maritime International Database Analysis Results Exchange Forum" was held, bringing together participants from the maritime industry, government, and academia. The event introduced the database's content, functions, and key analytical findings.

（2）Submitted research titled "Analysis of Mainline Deployments in Global Trade Zones" to Shipping Weekly.

（3）The project outcomes serve as a valuable reference for maritime regulatory agencies, port authorities, and the institute in analyzing trends and changes in the international container shipping market.

4. Highlights of Findings

5. Research Report

- Maintenance and Thematic Analysis of the International Maritime Database (Scheduled to be published in August 2025).

(三)我國航港資訊整合與數位化發展架構之研究(2/2)－研訂航港產業數位化發展指引

1. 計畫概述

近年來數位科技快速發展，數位轉型變成一個熱門話題，加上疫情催化，數位生活與數位經濟躍然成為各國主流發展趨勢，各行各業皆受到數位科技影響，而湧現轉型的需求，在航運業也是如此，海運數位化為航運界及資訊業長期討論的議題，近年大型航商等業者陸續自行開發數位化管理平臺，許多國家港口也建立自己的港口管理系統，以解決其經營管理上的議題，然與其他產業相較之下，航港產業的數位化發展較為緩慢，針對此一趨勢，有必要進行深入研究研擬相關策略。

本計畫目的在擘劃我國航港產業數位化發展方向，為二年期計畫，以貨櫃運輸為研究對象，聚焦於「航港產業數位化調查與發展藍圖研擬」以及「研訂航港產業數位化發展指引」，擘劃我國航港產業數位化發展方向及策略，推動我國航港產業加速數位化進程，提升競爭力與永續發展能力。

2. 研究成果

（1）研提我國航港產業數位化發展藍圖，以前期研究成果為基礎並彙集政府機關與國營企業之意見，依時間區分為短期（1-5年）、中期（5-7年）及長期（7-10年）三階段，共為政府部門及業者規劃32項策略，整體涵蓋系統面、資料面及產業面。

（2）建立國內航港產業數位化評估指標架構，透過文獻解析法及層級分析法確定航港產業數位化的關鍵衡量指標，包括：數位轉型目標、新市場開發、資訊安全、數轉策略及創造價值等，並進行航港產業數位化問卷調查。

（3）整合調查結果，研提《航港產業數位化發展指引》，內容涵蓋數位化價值、評估指標建置、現況分析、發展建議、案例研究與外部資源。

(III) Study on the Integration and Digital Development Framework of Taiwan's Maritime and Port Information Systems (Part 2/2): Formulating Digitalization Guidelines for the Maritime Industry

1. Project Overview

With the rapid advancement of digital technologies and the acceleration of digital transformation due to the pandemic, digital life and economy have become global trends. All industries, including maritime transport, face transformation pressures. Maritime digitalization has long been discussed by the shipping and IT sectors. Major shipping lines have developed digital management platforms, and many ports have established port management systems to address operational challenges. However, compared to other sectors, digitalization in the maritime and port industries lags behind, necessitating strategic research.

This two-year project aims to map out Taiwan's maritime industry digital development strategy, focusing on container transport. It includes an industry-wide digitalization survey, blueprint development, and the formulation of digitalization guidelines, ultimately enhancing competitiveness and sustainable growth.

2. Research Outcomes

(1) Developed a digital development roadmap for Taiwan's maritime and port industry, building on previous research findings and incorporating feedback from government agencies and state-owned enterprises. The roadmap is structured into three phases—short-term (1–5 years), mid-term (5–7 years), and long-term (7–10 years)—and outlines 32 strategic initiatives for both public and private sectors, covering system, data, and industry dimensions.

(2) Established a digitalization assessment framework for the domestic maritime and port industry. Using literature review and analytic hierarchy process (AHP), the study identified key indicators for evaluating digital transformation, including digital goals, market development, information security, transformation strategies, and value creation. A nationwide survey was conducted to gather industry insights.

(3) Compiled a Guideline for Digital Development of the Maritime Industry, including values, indicators, current status, strategic recommendations, case studies, and external resources.

3. 成果推廣與效益

（1）113年11月1日召開「航港數位化發展藍圖與指引」專家學者座談會，邀請財政部關務署、數位發展部數位產業署、交通部航政司、航港局、臺灣港務公司與學研單位，以及船舶運送業、船務代理業、海運承攬、貨櫃集散站等航港業者代表等進行座談。

（2）完成我國航港產業數位化發展藍圖及發展指引，可提供交通部、航港局、臺灣港務公司等，作為我國海運航港數位化發展之推動架構基礎，並協助促進公私部門以產業數位轉型為願景共同協作，推動整體航港產業的數位生態系。

3. Promotion and Benefits

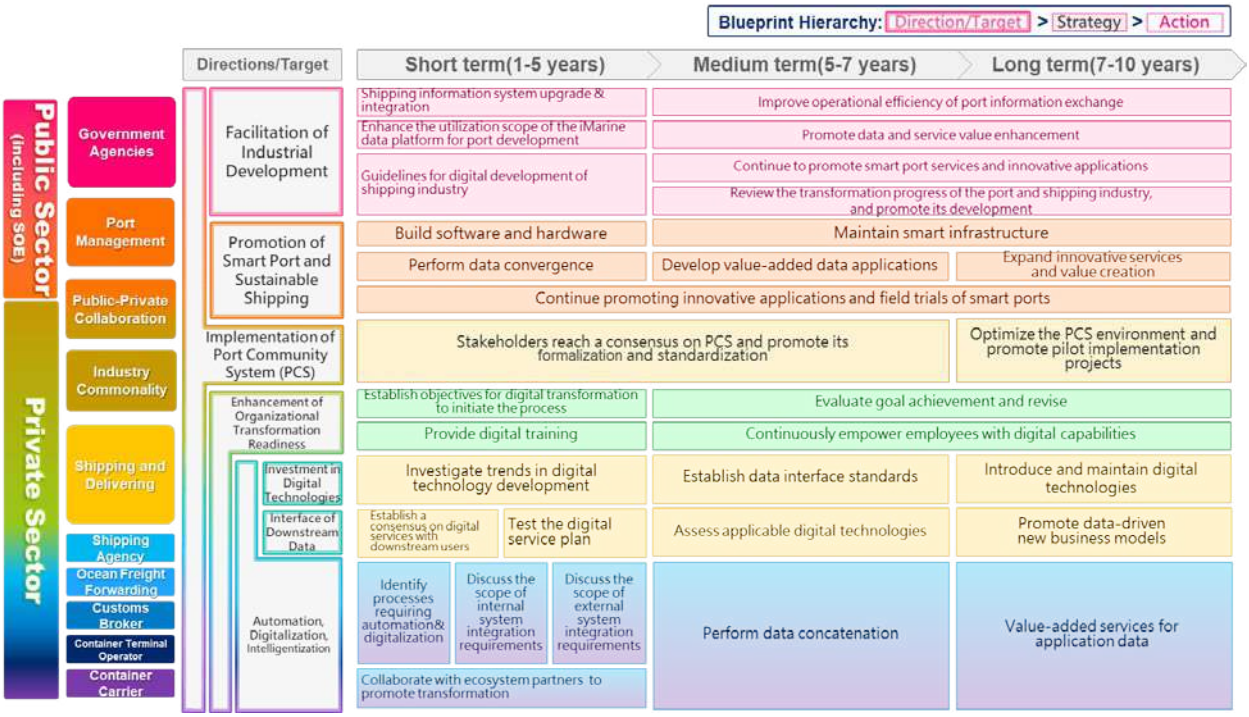
(1) On November 1, 2024, an expert forum on the "Digital Development Roadmap and Guidelines for the Maritime and Port Industry" was held, bringing together representatives from the Ministry of Finance's Customs Administration, the Administration for Digital Industries under the Ministry of Digital Affairs, the Department of Navigation and Aviation and Maritime and Port Bureau under the Ministry of Transportation and Communications, Taiwan International Ports Corporation, academic and research institutions, as well as industry representatives from shipping, ship agency, freight forwarding, and container terminal operations.

(2) The completed roadmap and development guidelines for Taiwan's maritime and port digitalization provide a foundational framework for the Ministry of Transportation and Communications, Maritime and Port Bureau, and Taiwan International Ports Corporation. They aim to promote a collaborative public-private effort toward digital transformation across the industry, fostering the development of a comprehensive digital maritime and port ecosystem.

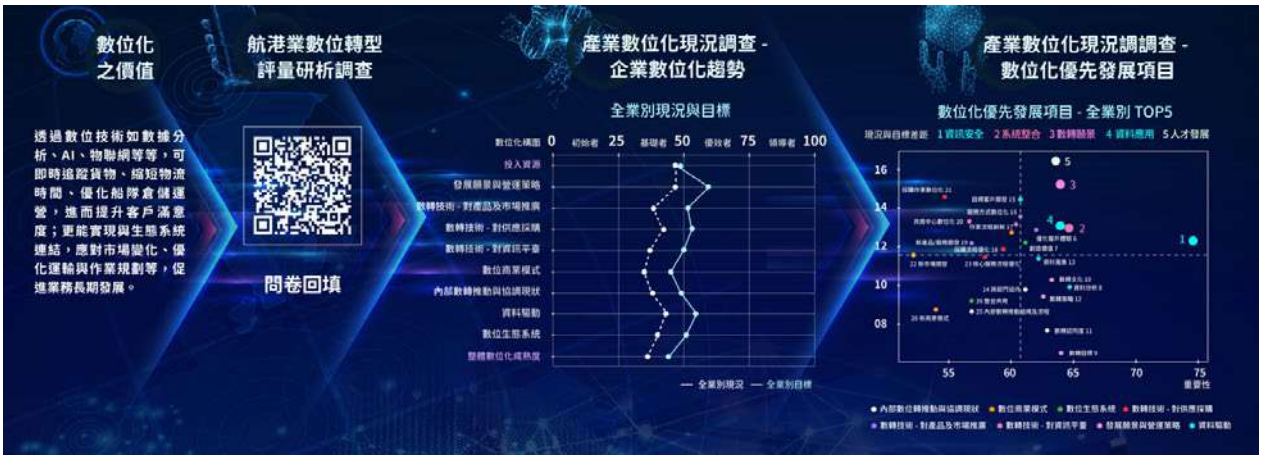
4. 研究成果精華摘整

4. Highlights of Findings

我國航港產業數位轉型發展藍圖



Digital transformation roadmap for Taiwan's maritime and port sector



航港產業數位化發展指引架構

Structural framework of the digital development guideline

5. 研究成果報告

- 我國航港資訊整合與數位化發展架構之研究（2/2）－研訂航港產業數位化發展指引（預計114年8月出版）

5. Research Report

- Study on the Integration and Digital Development Framework of Taiwan's Maritime and Port Information Systems (Part 2/2): Formulating Digitalization Guidelines (Scheduled to be published in August 2025).

(四)評估建立我國港口協調整合決策系統之研究

1. 計畫概述

近年來，各式數位科技工具快速發展，如雲端、工業4.0、大數據、人工智慧、區塊鏈等，數位轉型形成熱門話題，此外，大型航商等業者陸續自行開發數位化管理平台，許多港口也建立港口管理系統，透過數位轉型來解決或精進其經營管理議題。新加坡港、鹿特丹港、安特衛普港等具代表性的國際港口，均已積極推動數化轉型，利用整合的數據及港口管理系統提供足夠且透明的資訊，讓港口參與者間能有效的進行作業規劃，提高操作效率並減少不必要的能源消耗，實現協作決策及規劃。

本計畫目的在評估建立港口協調整合決策系統之可行性，探討港口參與者間，透過協作提高訊息透明度及能見度，提升港口資源使用效率，並協助優化船舶航行速度，以減少燃料消耗及溫室氣體排放。

2. 研究成果

（1）探討我國國際港口在船舶靠離港作業流程中利害關係人之間資訊傳遞效率所面臨之挑戰，透過訪談船舶靠離港作業流程中利害關係人，說明建置協調整合決策系統之構想與可能所遭遇之問題及完成我國船舶進出港資訊傳遞狀態圖。

（2）透過船舶動態系統已公開之資訊，整合各利害關係人所需之即時動態資訊，以測試案例模擬主動推播至各利害關係人之資訊群組，使港埠管理機關快速瞭解各協同作業者之即時狀態，進行作業調整，以提升船舶靠離港作業效率。

(IV) Feasibility Study on Establishing a Coordinated Port Decision-Making System in Taiwan

1. Project Overview

As technologies like cloud computing, Industry 4.0, big data, AI, and blockchain evolve rapidly, digital transformation has become a major trend. Major carriers have launched digital management platforms, and many ports have adopted port management systems. Ports like Singapore, Rotterdam, and Antwerp have embraced digital transformation, using integrated data and systems to offer transparent information, enabling effective planning and operational efficiency while reducing energy use and enabling collaborative decision-making.

This project assesses the feasibility of a coordinated decision-making system for Taiwan's ports. It explores how stakeholders can enhance information visibility and collaboration, optimizing resource use and vessel speeds to cut fuel and emissions.

2. Research Outcomes

(1) Examined the challenges stakeholders face in the efficiency of information exchange during ship arrival and departure operations at Taiwan's international ports. Through interviews with key stakeholders involved in these processes, the study outlined the concept of establishing a coordinated and integrated decision-making system, identified potential issues, and developed a current-state information flow diagram for vessel entry and exit operations.

(2) Leveraged publicly available data from the vessel tracking system to consolidate real-time information needed by various stakeholders. A test case was used to simulate proactive information push to designated stakeholder groups, enabling port authorities to gain timely insights into the status of each collaborating party and make operational adjustments to enhance the efficiency of ship berthing and departure.

（3）研提建立我國港口協調整合決策系統之推動建議，依時間區分為短期（1-2年）、中期（2-4年）及長期（4-6年）三階段，由臺灣港務公司作為主要推動角色，逐步發展我國港口協調整合決策系統，以落實強化智慧應用轉型，健全國際港口樞紐功能。

3. 成果推廣與效益

（1）113年11月20日召開「評估建立我國港口協調整合決策系統」專家學者座談會，邀請交通部航政司、航港局、臺灣港務公司、中華航運學會、中華海運研究學會與學研單位，以及船舶運送業者代表等參加。

（2）本計畫完成建立我國港口協調整合決策系統之推動建議，可提供交通部、航港局、臺灣港務公司等提升船舶靠港作業效率及推動航港數位化發展之參考應用。

4. 研究成果精華摘整

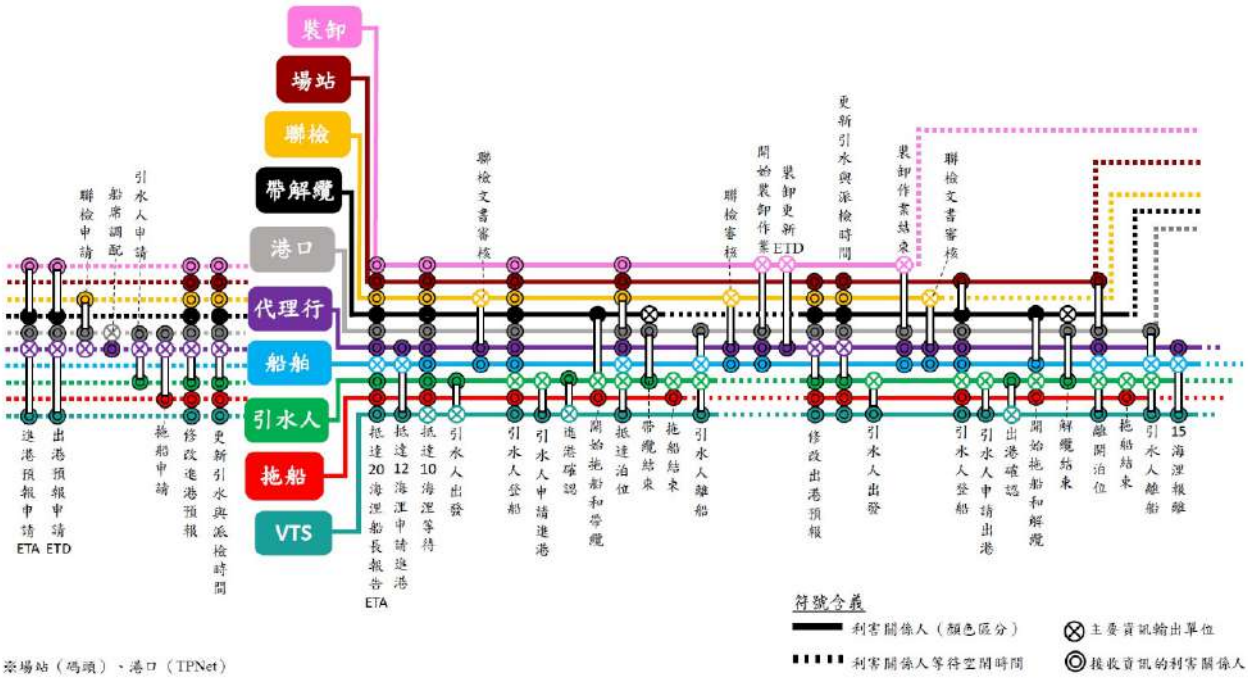
(3) Proposed a phased implementation plan: short-term (1–2 years), mid-term (2–4 years), and long-term (4–6 years), led by Taiwan International Ports Corporation to build a coordinated port decision-making system and enhance port smart capabilities. The aim is to gradually develop a smart decision support system, strengthening Taiwan's transformation toward intelligent operations and reinforcing its role as a regional port hub.

3. Promotion and Benefits

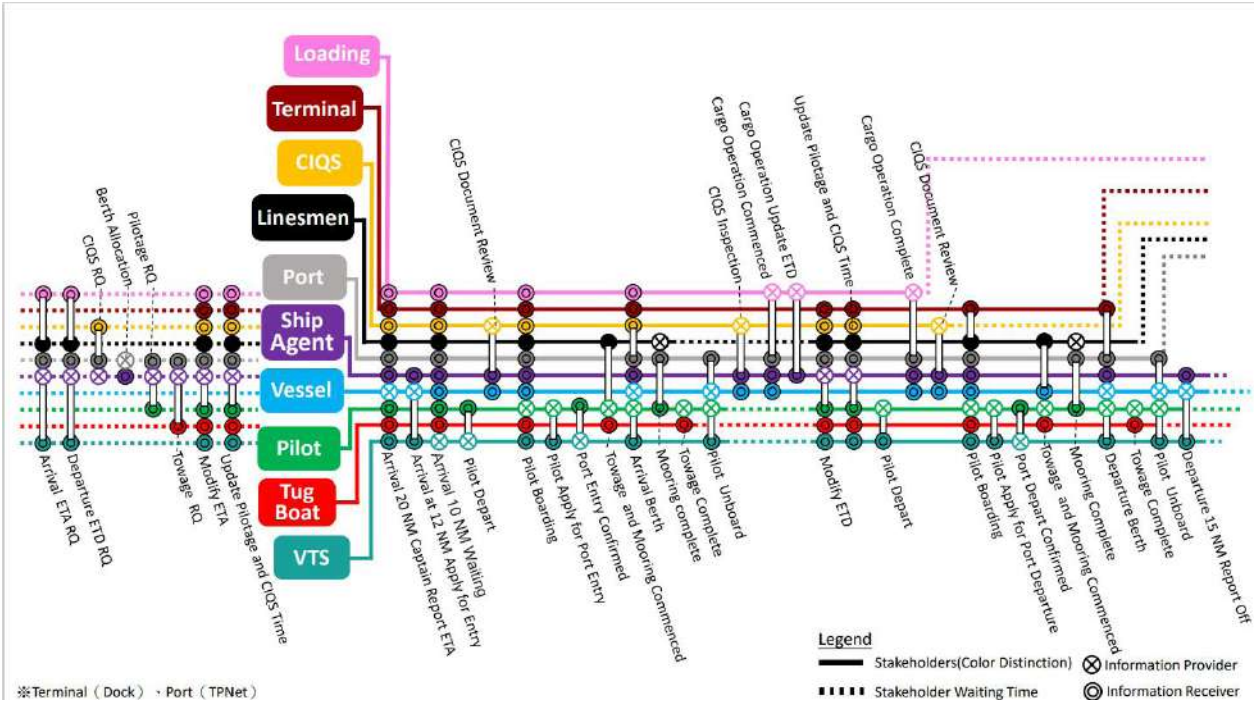
(1) On November 20, 2024, an expert forum on "Assessing the Establishment of a Coordinated and Integrated Decision-Making System for Taiwan's Ports" was held. Participants included representatives from the Department of Navigation and Aviation and the Maritime and Port Bureau under the Ministry of Transportation and Communications, Taiwan International Ports Corporation, the Chinese Maritime Institute, the Chinese Association of Maritime Transport, academic institutions, and shipping industry stakeholders.

(2) The project concluded with a set of recommendations for implementing a coordinated and integrated decision-making system for Taiwan's ports. These recommendations serve as a reference for the Ministry of Transportation and Communications, the Maritime and Port Bureau, and Taiwan International Ports Corporation in enhancing port call efficiency and advancing digital development in the maritime and port sectors.

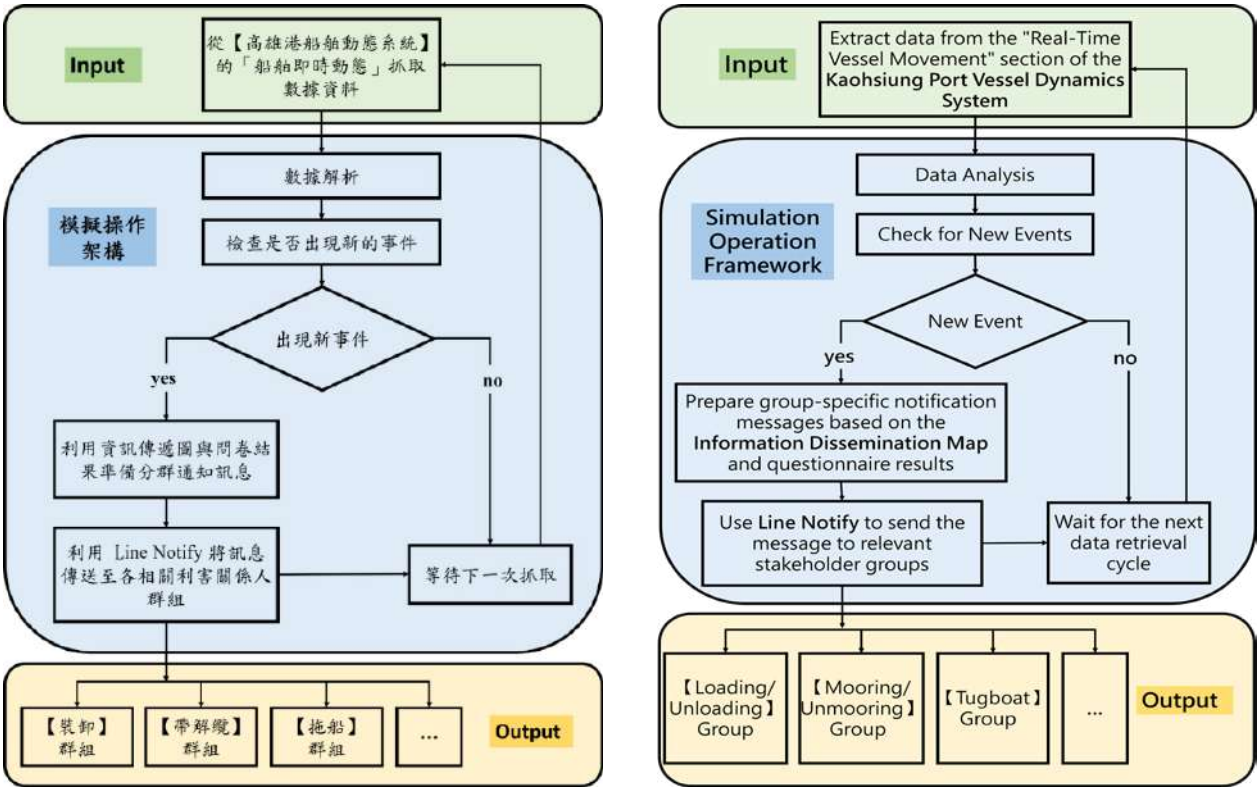
4. Highlights of Findings



船舶進出港資訊傳遞狀態圖



Port entry/exit information flow map



測試案例模擬資訊主動推播流程圖
Simulated information push process diagram

5. 研究成果報告

- 評估建立我國港口協調整合決策系統（預計114年8月出版）

5. Research Report

- Feasibility Study on Establishing a Coordinated Port Decision-Making System in Taiwan (Scheduled to be published in August 2025).

(五)空運國際資料庫維護精進及議題分析

1. 計畫概述

航空運輸在全球經濟發展扮演相當重要的角色，全球運輸重心漸移往亞洲地區，包括桃園、香港、仁川、成田、新加坡樟宜等亞太國家門戶機場，均致力於發展為區域樞紐機場，鼓勵航空公司增加連結航點、增飛班次，也爭取新業者加入。為利發展我國桃園機場為區域樞紐機場，需持續掌握國際空運市場發展趨勢及相關機場變化情形。

「國際空運資料庫」長期蒐集全球重要機場營運相關資料，主要含括兩大部分，其一為全球200餘座機場之客貨運量、航網、營運及基礎設施等基本資料；其二為包括桃園機場、鄰近競爭機場（如：香港、仁川、東京成田等）、亞太地區其他重要機場及北美地區重要門戶機場之旅客起迄路徑資料，藉由資料統計分析進行空運議題探討，以掌握全球航空市場概況及變化趨勢，並可因應業務面或政策面需求，提供旅客需求面具體數據，供政策研擬參據。

2. 研究成果

（1）更新我國及全球共207座主要機場之基礎設施、客貨運量、航網等資料，及蒐集檢索桃園、香港、仁川、東京成田、上海浦東、新加坡、曼谷、馬尼拉、吉隆坡、胡志明市、洛杉磯、舊金山、西雅圖、巴黎（戴高樂）、維也納等亞太、北美及歐洲地區重要機場之旅客移動路徑資料，就旅客移動路徑變化進行分析。

（2）完成使用者自行定義查詢之航空公司功能、新增不同旅客移動型態查詢功能。

（3）透過大數據分析資料庫檢索機場資料，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於疫情前後之變化分析」、「桃園機場在亞歐航線起迄與中轉市場之現況分析」、「低成本與傳統航空公司疫後於我國航線市場競爭分析」，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做為策略研擬評估參據。

(V) Maintenance and Thematic Analysis of the International Air Transport Database

1. Project Overview

Air transport plays a key role in global economic development. With the global transportation hub shifting to Asia, airports like Taoyuan, Hong Kong, Incheon, Narita, and Changi strive to become regional hubs by increasing route connectivity and attracting new carriers. To develop Taoyuan into a hub, it is crucial to track global air transport trends and airport developments.

The International Air Transport Database collects long-term data on global airport operations, including:

(1) Basic information on over 200 global airports (passenger/freight volumes, networks, operations, and infrastructure);

(2) Origin-destination (OD) data for passengers traveling through Taoyuan and other key competing airports in Asia, North America, and Europe. This supports issue-based analyses to understand market changes and inform policy decisions.

2. Research Outcomes

- 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.
- Added user-defined airline query and multiple passenger movement type query functions.
- Conducted big data analysis on key topics such as:
- Pre-/post-pandemic changes in Southeast Asia–North America markets
- Current status of Taoyuan Airport's O&D and transfer role in Asia–Europe routes
- Post-pandemic market competition between LCCs and full-service airlines on Taiwan routes

These findings provide strategic reference for the Department of Navigation and Aviation, Civil Aviation Administration, Taoyuan International Airport Corporation, and airlines.

3. 成果推廣與效益

（1）113年11月26日舉辦「113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、功能及分享本年議題分析成果。

（2）本計畫分析成果投稿「航運季刊」，投稿題目「疫後我國歐洲航線載客市場分析之研究」。

（3）本計畫成果可提供民航管理機關、機場公司及航空公司航網航班規劃安排之參考應用。

3. Promotion and Benefits

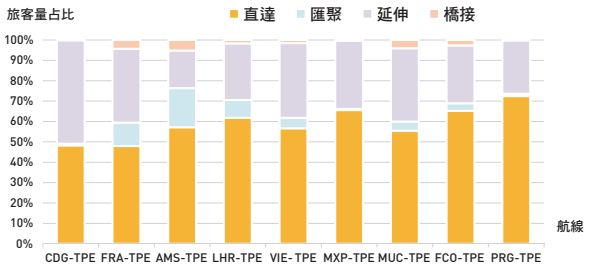
(1) On November 26, 2024, the"2024 Air Transport International Database Analysis Results Exchange Forum" was held, inviting participants from the Ministry of Transportation and Communications, Civil Aviation Administration, Taoyuan International Airport Corporation, airlines, and academic and industry experts in the air transport sector. The event introduced the database's content and features and shared this year's analytical findings.

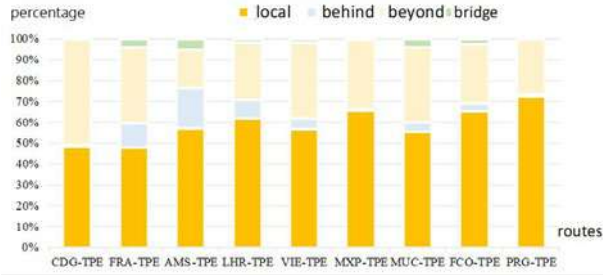
(2) Submitted the article "Post-Pandemic Analysis of Taiwan–Europe Passenger Market" to Maritime Quarterly.

(3) Findings support route and flight planning for aviation regulators, airports, and airlines.

4. 研究成果精華摘整

資料庫使用者自行定義航空公司功能畫面
User-defined airline search interface





2023年桃園－歐洲航線東向載客移動型態分布
2023 eastbound passenger movement distribution on Taoyuan–Europe routes

5. 研究成果報告

- 空運國際資料庫維護及議題分析（預計114年8月出版）

5. Research Report

- Maintenance and Thematic Analysis of the International Air Transport Database (Scheduled to be published in August 2025).

三 優化公共運輸服務及產業轉型

(一)推動區域運輸發展研究中心服務升級2.0計畫（112-113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，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。

區域中心計畫自104年10月起執行，以輔導地方政府推動公共運輸為主，自110年起試辦輔導道安改善工作，迄111年12月止，主要工作項目多已完成階段性任務，為賡續計畫之辦理成果及執行成效，本所奉交通部核定於112年接續實施「區域運輸發展研究中心服務升級2.0計畫」（112-13年），並將輔導道安改善工作正式納入計畫執行，深化中央政府、地方政府、產業界及學界合作，除共同推動並執行公路公共運輸服務升級計畫及道安改善相關計畫外，並連結國家重大政策，包含環島高快速鐵公路網、智慧交通、觀光旅遊及地方創生等，以擴大計畫之實施範圍及成效。

2. 研究成果

（1）辦理交通運輸專業人才培訓課程：113.1-113.12共開設24門實體課程，參與學員達340人次。另線上課程部分，共開設12門，觀看人次約達3,600人次。

（2）協助地方政府進行公共運輸案例研析：113.1-113.12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「偏鄉公共運輸跨部會資源整合之示範推動」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個鄉鎮推動執行示範計畫3個月。

III Optimize Public Transportation Services and Industrial Transformation

(I) Implement the service upgrade plan 2.0 for the regional transportation development research centers (2023–2024)

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.

The regional center program has been implemented since October 2015, with its primary focus on assisting local governments in promoting public transportation. In 2021, the program initiated a pilot phase to support road safety improvement efforts. By December 2022, most major tasks had reached their interim milestones. To continue the program's progress and effectiveness, the Institute was authorized by the MOTC in 2023 to launch the Regional Transportation Development Research Center Service Enhancement Program 2.0 (2023–2024). This upgraded program formally incorporates road safety improvement efforts and aims to deepen cooperation among central and local governments, industry, and academia. In addition to jointly advancing the enhancement of road-based public transportation services and road safety initiatives, the program is also aligned with major national policy objectives–including the development of the national highway and rapid transit network, intelligent transportation systems, tourism, and regional revitalization–thereby expanding the program's scope and overall impact.

2. Research Results

(1) Professional transportation talent training courses: From January to December 2024, a total of 24 courses were offered, with approximately 340 participants. In addition, 12 online courses were offered, with approximately 3,600 views.

(2) Assist Local Governments with Public Transportation Case Studies: From January to December 2024, the Institute supported local governments in conducting a total of 18 public transportation case studies. The six regional centers jointly planned and implemented the initiative titled "Demonstration of Cross-Ministerial Resource Integration for Rural Public Transportation." This initiative focused on exploring the feasibility of integrating cross-ministerial resources to enhance rural public transportation services across various local governments. It also involved the formulation of corresponding strategies and concrete improvement action plans. Additionally, one township was selected for a three-month pilot demonstration project to implement the proposed measures.

（3）提供地方諮詢服務：113.1-113.12共提供110次之諮詢服務，其中83次有地方政府局處長（或三級行政區之鄉、鎮、市、區長）層級人員參與。

（4）輔導地方政府研提前瞻性公共運輸提案：112年共協助研提12案提案計畫書，並於113年輔導地方政府向交通部公路局（或相關補助單位）提案申請補助經費，截至113年底計 5 案獲公路局核定補助。

（5）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。

（6）競爭型計畫部分：配合國家重大政策，112年就區域特色研提5項次亮點計畫之示範計畫，並於113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。其中協助推動地方偏鄉客貨共載服務探討及營運模式建議部分，成果摘要說明如下：

a. 北區區域中心執行競爭型「地方創生最後一哩路」計畫，整合宜蘭縣頭城鎮「五漁村」地區商家需求，結合便利商店實施幸福巴士客貨共載服務，載運民生必需品及商品，包含新鮮漁獲，以增加地方經濟活動。就服務流程、行政區內運送及銜接便利商店物流體系方式、貨物類型、裝卸方式、裝載配置、收費方式、保存方式（配合漁獲）、預約方式等面向研擬建議。

b. 中區區域中心執行競爭型「梨山幸福巴士永續營運服務構想之探討－觀光及跨部會資源之規劃與導入」計畫，結合幸福巴士服務推動公益性質之客貨共載服務，配合865公車接駁民眾及配送生活用品至環山地區，並就物品規格、收費制度研擬建議。

(3) Provide local consultation services: From January to December 2024, 110 consultation services were provided, 83 of which involved participation from department heads of local government (or leaders of townships, towns, cities, or districts at the third administrative level).

(4) Supporting Local Governments in Developing Forward-Looking Public Transportation Proposals: In 2023, the Institute supported the development of 12 proposal plans. In 2024, the Institute further assisted local governments in submitting these proposals to the Highway Bureau, MOTC, or other relevant funding agencies. As of the end of 2024, five proposals had been approved and granted funding by the Highway Bureau and MOTC.

(5) 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.

(6) Competitive Projects: In alignment with major national policies, five regional highlight demonstration projects were proposed in 2023 based on regional characteristics. In 2024, 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. Among these initiatives, the results related to exploring joint passenger and freight transport services in rural areas and proposing operational models are summarized as follows:

a. Northern Regional Center implemented the competitive project titled "Last-Mile Solution for Regional Revitalization", focusing on the "Five Fishing Villages" area in Toucheng Township, Yilan County. This initiative integrated local business needs and partnered with convenience stores to operate the "Happiness Bus," providing joint passenger and freight services. The bus transported daily necessities and goods, including fresh seafood, to stimulate local economic activity. The project proposed recommendations across various dimensions such as the service workflow, methods for intra-district deliveries, integration with existing convenience store logistics, the types of goods transported, loading and unloading procedures, vehicle cargo configurations, fare structures, preservation methods tailored for fresh seafood, and reservation systems.

b. Central Regional Center conducted a competitive project titled "Exploration of Sustainable Operations for the Lishan Happiness Bus – Planning and Integration of Tourism and Inter-Agency Resources." This initiative aimed to provide public-interest-oriented combined passenger and freight services through the Happiness Bus system. Working in coordination with Bus Route 865, the project supported both the transportation of residents and the delivery of essential goods to the remote Huanshan area. Recommendations from this project focused on the specifications for goods to be transported and the design of an appropriate fare system.

（7）指定型計畫部分：指定中區區域中心試辦，為促進與國際之交流合作，與APEC亞太經濟合作，強化與國際組織連結，瞭解國際間於交通領域發展動態，同時藉由國際交流合作，分享我國推動經驗，並尋求技術輸出之機會。

（8）道安改善計畫部分：

a. 配合交通部「道安提升行動小組」，113年完成輔導桃園、新竹市、南投、屏東等5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. 協助地方政府診斷道安問題及研提道路交通事故防制策略，113年共計完成3處易肇事路口之安全改善檢查與改善方案研提，以及15處路口之交通工程改善規劃設計方案。

c. 113年完成辦理1場「易肇事路口安全改善檢查表」推廣與應用座談會，與5場次「人行與車行交通工程改善教育訓練」，參與人次約360人，以提升並輔導縣市提升道安專業能力。

3. 成果推廣與效益

（1）本所與中區區域中心於113年8月26日辦理APEC「偏鄉公共運輸跨域資源整合之推動與挑戰」國際論壇，以虛實整合方式邀集來自APEC區域內日本、澳洲、韓國、越南、美國及我國等經濟體，聚集約100名國內外之產官學研各界代表，共同就偏鄉公共運輸導入新興科技與跨域資源整合以及促進偏鄉公共運輸實現可及性與包容性進行經驗分享與提供建議，深入探討如何運用科技的力量，為偏鄉提供更便捷的公共運輸服務。

（2）本所與6大區域中心於113年9月24日共同辦理「區域中心聯合成果發表會」，透過六大區域中心與各機關單位代表、學者專家及業界更緊密的交流與互動，凝聚產官學研各界意見，構思未來公共運輸服務發展及道路安全改善方向，以滿足民眾交通行動需求、建構安全交通環境，俾供中央及地方作為改善之參考依據。

(7) Designated Project: As part of the designated project, the Central Regional Center was assigned to conduct a pilot program aimed at promoting international exchange and cooperation. This initiative focuses on engagement with APEC (Asia-Pacific Economic Cooperation) to strengthen connections with international organizations, gain insight into global developments in the field of transportation, and share Taiwan's experience in policy implementation. Through such international collaboration, the project also seeks opportunities for the export of domestic technologies.

(8) Road Safety Improvement Project:

a. In alignment with the MOTC's Road Safety Enhancement Task Force, this project provided guidance to five local governments — Taoyuan City, Hsinchu City, Nantou County, and Pingtung County — in 2024. These local governments presented their respective "Road Traffic Accident Prevention Strategies or Enhanced Improvement Results" during the MOTC's Road Traffic Safety Coordination Meeting.

b. As part of the project, local governments were offered assistance in diagnosing road safety issues and developing effective road traffic accident prevention strategies. In 2024, safety inspections and improvement proposals were completed for three high-risk intersections. In addition, the project delivered planning and design solutions for traffic engineering improvements at 15 intersections.

c. Moreover, in 2024, the project included one promotional seminar on the application of the "High-Risk Intersection Safety Improvement Checklist" and five training sessions on pedestrian and vehicular traffic engineering improvements. These sessions attracted approximately 360 participants and aimed to enhance and support the professional capabilities of local governments in road safety management.

3. Result Promotion and Benefits

(1) The Institute, in collaboration with the Central Regional Center, organized the APEC International Forum on "Promotion and Challenges of Cross-Sectoral Resource Integration in Rural Public Transportation" on August 26, 2024. The forum was conducted in a hybrid format and brought together participants from APEC economies, including Japan, Australia, South Korea, Vietnam, the United States, and Taiwan. Approximately 100 representatives from industry, government, academia, and research institutions participated. The forum facilitated experience-sharing and discussions on topics such as the application of emerging technologies in rural public transportation, cross-sectoral resource integration, and the promotion of accessibility and inclusiveness in rural mobility services. The event served as a platform for in-depth dialogue on how technological innovations can enhance the convenience and availability of public transportation in remote areas.

(2) On September 24, 2024, the Institute jointly held the "Regional Center Joint Results Presentation" with the six Regional Centers. The event promoted close interaction and collaboration among the Regional Centers, government agencies, academic experts, and industry stakeholders. By consolidating insights and perspectives from various sectors, the event aimed to envision future directions for public transportation service development and road safety improvement. The outcomes are intended to support central and local governments in planning strategies to meet public mobility needs and create a safer transportation environment.

4. 研究成果精華摘整

計畫類型	工作重點	成果、效益或應用
基礎型計畫	• 教育訓練：開設交通運輸專業人才培訓課程，供地方政府、汽車客運業者等學員參與。(共計24場次實體課程及12門線上課程) • 諮詢服務：提供地方政府(含鄉鎮公所)、汽車客運業者等諮詢建議。(共計110次) • 研提前瞻性公路提案：輔導地方政府向交通部公路局或相關補助單位提案，截至113年底計5案獲公路局核定補助。 • 案例研析與實作：各相關案例輔導地方政府執行推動示範計畫3個月。(共計18案) • 聯合成果發表會：113年9月24日由本所與六大區域中心辦理。 • 協助交通部(本所及公路局)研提公共運輸發展策略或配合交通部政策宣導：協助鈞部施政支援。	• 跨域及整合跨部會資源，除推動公路公共運輸外，並輔導區域內產業升級、落實服務創新及制度建構。 • 做中央預算與資源分配予經費較為缺乏之非六都縣市，促使地方政府計畫成果發揮實質效益。
競爭型計畫	配合國家重大政策，就區域特色提出亮點計畫，並以示範計畫性質進行推廣執行5項次計畫。	檢討示範計畫成果，未來可跨區擴大成果之推廣應用。
指定型計畫	辦理1場國際論壇，於113年8月26-27日辦理APEC「偏鄉公共運輸跨域資源整合之推動與挑戰」國際論壇。	藉由國際合作交流合作，相互觀摩學習，並分享我國推動經驗。
道安改善計畫	賡續執行相關工作項目，配合鈞部「道安提升行動小組」，協助地方政府診斷道安問題及研提道路交通事故防制策略，並輔導縣市提升道安專業能力。	協助鈞部及地方政府推動道安改善計畫、進行縣市事故特性分析，並整合工程、教育、執法等研提改善對策。

4. Summary of Research Results

Project Type	Key Work Focus	Outcomes, Benefits, or Applications
Basic Project	• Educational Training: Organize training courses for transportation professionals, targeting local governments, intercity bus operators, etc.(Total: 24 in-person courses and 12 online courses) • Advisory Services: Provide consultation services to local governments (including township offices), intercity bus operators, etc.(Total: 110 sessions) • Forward-looking Public Transport Proposals: Guide local governments in submitting proposals to the Highway Bureau, MOTC or other relevant subsidy authorities. As of the end of 2024, 5 proposals have been approved for funding by the Highway Bureau, MOTC. • Case Study Analysis and Pilot Implementation: Assist local governments in executing demonstration projects based on relevant case studies for a 3-month period.(Total: 18 cases) • Joint Achievement Conference: Held by the Institute and six regional centers on September 24, 2024. • Support for MOTC Policy and Strategy Development: Assist MOTC (including the Institute and the Highway Bureau, MOTC) in developing public transport strategies or conducting policy advocacy and implementation support.	• Cross-sectoral and Inter-ministerial Resource Integration: In addition to promoting highway-based public transport, support regional industry upgrading, service innovation, and institutional development. • Equitable Resource Allocation: Enable central government budgets and resources to be directed toward non-municipality counties and cities (i.e., those outside the six major municipalities), ensuring that local project outcomes deliver tangible benefits.
Competitive Projects	In alignment with major national policies, propose highlight projects based on regional characteristics. Promote and implement 5 sub-projects with a demonstrative nature.	Review outcomes of the demonstration projects to explore potential for future cross-regional expansion and broader application.
Designated Projects	Organize 1 international forum. The APEC international forum titled "Promotion and Challenges of Cross-sectoral Resource Integration in Rural Public Transport" was held on August 26–27, 2024.	Foster international cooperation and exchange. Promote mutual learning and share Taiwan's experience in public transport development.
Road Safety Improvement Projects	Continue implementing relevant tasks in cooperation with the Road Safety Promotion Taskforce under MOTC. Assist local governments in diagnosing road safety issues and formulating traffic accident prevention strategies. Guide and support counties and cities in enhancing their road safety professional capacity.	Support MOTC and local governments in promoting road safety improvement projects. Analyze traffic accident characteristics by county and city. Propose integrated improvement strategies across engineering, education, and enforcement domains.

北區及中區區域中心協助地方推動偏鄉客貨共載服務探討及營運模式建議之成果示意圖

Illustrative Diagram of Outcomes: Assistance from Northern and Central Regional Centers in Promoting Joint Passenger and Freight Services in Rural Areas

5. 研究成果報告

推動區域運輸發展研究中心服務升級2.0計畫（112-113年）（本計畫屬兩年期計畫，執行至114年初，114年7月出版）

(二)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（1/2）－合理成本與營運績效探討

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112年7月至113年6月，因應DRTS多元營運型態，研提合理成本試算情境，針對受補貼DRTS路線進行績效評定，為避免現行補貼僅考量營運成本而忽略社會效益，透過分析消費者剩餘與外部效益確立補貼必要性，另亦建立公共運輸供給均衡指標，以衡量其服務永續性。

2. 研究成果

（1）完成國內外執行需求反應式公共運輸（DRTS）案例與補貼制度文獻蒐集及分析，並盤點我國需求反應式公共運輸服務（DRTS）營運模式。

（2）完成我國需求反應式公共運輸服務（DRTS）合理營運成本分析，並提出共通性合理成本方案架構。

（3）完成我國需求反應式公共運輸服務（DRTS）績效評估架構及分析，並提出績效精進策略。

（4）完成我國需求反應式公共運輸服務（DRTS）路線補貼必要性架構之評估，透過試算消費者剩餘及外部效益、比較當期補貼金額評析補貼必要性。

5. Research Result Report

Regional Transportation Development Research Center Service Upgrade 2.0 Project (2023–2024) (This is a two-year project, running through early 2025, with final publication expected in July 2025.)

(II) An Investigation of Operation, Subsidy and Fare System of Demand Responsive Transport Service (DRTS) Scheme (1/2) – Operation Cost Analysis and Performance Evaluation

1. Project Overview

Demand Responsive Transport Services (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 systems, subsidy mechanisms, performance evaluation, and sustainability of DRTS, to support the long-term development of rural public transportation services.

Conducted from July 2023 to June 2024, the project responds to DRTS's diverse operational models by proposing scenarios for estimating reasonable costs and establishing performance evaluation methods for subsidized DRTS routes. To avoid subsidy schemes that consider only operating costs while overlooking social benefits, the study incorporates an analysis of consumer surplus and externalities to justify the necessity of subsidies. A public transportation supply balance index is also developed to assess service sustainability.

2. Research Results

(1) Completed the collection and analysis of domestic and international literature on Demand Responsive Transport Services (DRTS) cases and subsidy mechanisms and conducted a comprehensive inventory of DRTS operation models in Taiwan.

(2) Completed the analysis of reasonable operation costs for DRTS in Taiwan and proposed a framework for a standardized and common cost structure.

(3) Developed a performance evaluation framework and analysis for Taiwan's DRTS, along with strategies for performance improvement.

(4) Completed the assessment framework for evaluating the necessity of DRTS route subsidies in Taiwan. The evaluation incorporated trial calculations of consumer surplus and external benefits, and compared them against current subsidy levels to determine subsidy necessity.

（5）完成可衡量各區域公共運輸供給均勻程度之供給指標，推估各區域各利害關係人（政府、民眾）所負擔之比例，以實現公共運輸社會經濟均衡發展，促進其永續及財政平衡。

3. 成果推廣與效益

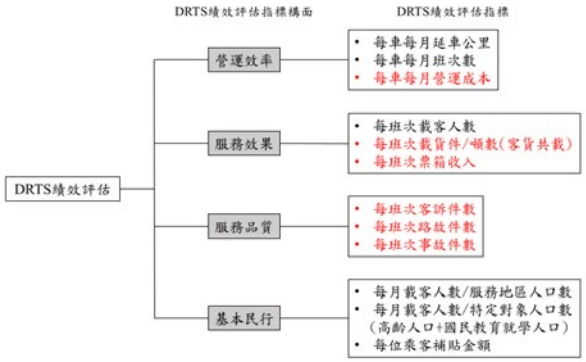
（1）完成需求反應式公共運輸服務（DRTS）共通性成本建議方案及績效指標架構與評估，可提供公路局及縣市政府作為審核或提案之參考應用。

（2）於112年12月27日舉辦專家學者座談會，與幸福巴士業者（臺中市公車聯營管理委員會、苗栗南庄鄉工作站、首都客運）探討計畫研提之成本公式合理性及適用性。

（3）於113年4月1日舉辦專家學者座談會，邀請國外學者分享國外DRTS永續性、成本結構等案例與經驗，並邀請產官學界共同探討計畫成果。

（4）於中華民國運輸學會112年學術論文研討會發表部分研究成果。

4. 研究成果精華摘整



本計畫研提之需求反應式公共運輸服務（DRTS）績效評估構面與指標

Performance Evaluation Dimensions and Indicators for Demand Responsive Transport Services (DRTS) Proposed in This Project

(5) Established supply indicators to measure the balance of public transportation provision across different regions. The project also estimated the share of responsibility borne by various stakeholders (government, the public) in each region to achieve socio-economic balance, promote sustainability, and support financial equilibrium in public transportation.

3. Result Promotion and Benefits

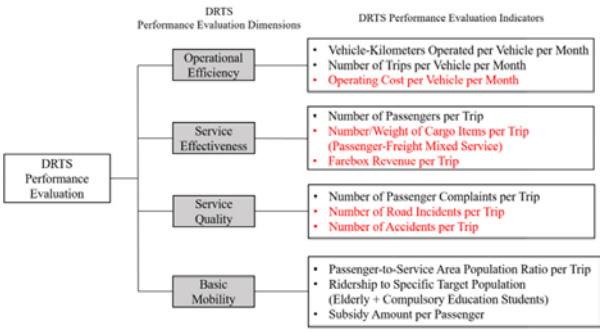
(1) Completed the proposed standardized cost structure and performance indicator framework for Demand Responsive Transport Services (DRTS), which can serve as a reference for the Highway Bureau and local governments in proposal preparation and review processes.

(2) Held an Expert and Scholar Symposium on December 27, 2023, to discuss the reasonableness and applicability of the proposed cost formulas with DRTS operators, including the Taichung Bus United Management Committee, Nanzhuang Township Workstation in Miaoli, and Capital Bus.

(3) Held an Expert and Scholar Symposium on April 1, 2024, inviting international scholars to share overseas DRTS sustainability practices and cost structure cases, and engaging stakeholders from industry, government, and academia to discuss the project findings.

(4) Presented part of the research findings at the 2023 International Conference and Annual Meeting of the Chinese Institute of Transportation.

4. Summary of Research Results



舉辦2場專家學者座談會

Held Two Expert and Scholar Symposia

5. 研究成果報告

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（1/2）－合理成本與營運績效探討（114年4月出版）。

(三)共享運具連結公共運輸之研究（1/2）－營運管理因應策略規劃

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及服務品質，並透過與現有公共運輸系統無縫整合，作為民眾第一哩路及最後一哩路之接駁運具，例如通勤者使用共享自行車或機車轉乘捷運或公車，商務或觀光旅客搭乘臺、高鐵後使用共享汽車或機車抵達目的地，以減少私人車輛使用、緩解城市停車需求、減少碳排放及滿足使用者之交通需求，實為值得探討的課題。

本計畫透過蒐集國內外共享運具管理規範和連結公共運輸的相關文獻及案例，分析共享運具於運輸系統之定位及服務模式，彙整共享運具整合公共運輸服務之相關規範及智慧化營運、創新加值等議題，並訪談營運業者及政府部門，提出因應策略規劃及發展方向之建議。

2. 研究成果

（1）完成蒐集國內外共享運具推動現況及共享運具連結公共運輸文獻案例，分析共享運具於運輸系統之定位及服務模式、研提共享運具與公共運輸智慧整合、創新加值及相關服務規範建議。

（2）辦理6場國內共享運具業者及主管機關之訪談，並召開2場座談會，徵詢相關利害關係人及學者專家意見，完成共享運具營運管理議題分析並研提具體建議方向。

（3）完成共享運具連結公共運輸整合因應發展短中長期策略（包含強化共享運具與公共運輸之時間、空間、服務、資訊無縫轉乘環境、完善共享運具使用環境、訂定共享運具與公共運輸間搭乘優惠措施、訂定共享運具資料開放標準）及不同共享運具連結公共運輸之指引。

5. Research Result Report

An Investigation of Operation, Subsidy and Fare System of Demand Responsive Transport Service (DRTS) Scheme (1/2) –Operation Cost Analysis and Performance Evaluation (Published in April 2025).

(III) A Plan for Connecting Shared Modes and Public Transportation (1/2)-Strategic Planning for Operation Management

1. Project Overview

In response to Taiwan's 2050 net-zero emissions goal and the rapid development of emerging transportation service models, it is worth exploring how to leverage the sharing economy to enhance the 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 solution for the public—for example, commuters using shared bicycles or scooters to transfer to the metro or bus, or business and leisure travelers using shared cars or scooters after arriving via Taiwan Railways or High-Speed Rail. This approach can reduce private vehicle use, ease urban parking demand, lower carbon emissions, and better meet users' transportation needs.

This project gathers domestic and international regulations and case studies related to shared mobility management and its integration with public transportation. It analyzes the role and service models of shared mobility within the transportation system, compiles related regulations, smart operations, and innovative value-added topics, and interviews operators and government agencies. Based on these findings, it proposes strategic planning and development recommendations.

2. Research Results

(1) Collected and analyzed domestic and international cases and literature on the current status of shared mobility promotion and its integration with public transportation. This includes examining the role and service models of shared mobility within the transport system, and proposing recommendations for smart integration, innovative value-added services, and relevant service regulations.

(2) Conducted six interviews with domestic shared mobility operators and competent authorities and organized two stakeholder forums to gather input from stakeholders, scholars, and experts. Based on these engagements, an analysis of shared mobility operational management issues was completed, along with concrete strategic recommendations.

(3) Developed short, medium and long-term strategies for the integration of shared mobility with public transportation. This includes: enhancing seamless transfers in terms of time, space, service, and information; improving the user environment for shared mobility; establishing fare discount mechanisms between shared mobility and public transport; and setting open data standards for shared mobility. Guidelines for integrating various types of shared mobility with public transportation were also formulated.

3. 成果推廣與效益

（1）完成彙析我國推動共享運具營運管理議題及提出建議，並研擬與公共運輸連結之因應措施與發展策略規劃，可提供交通部、公路局、地方政府、相關運輸業者，做為後續推動共享運具連結公共運輸營運管理及發展低碳永續交通運輸環境之指引或相關研究參考應用。

（2）分別於113年8月7日及11月13日辦理2場專家學者座談會，邀請相關利害關係人針對我國共享運具暨連結公共運輸之發展定位、營運管理、服務整合、資訊應用等面向及114年示範場域建置推動計畫書、不同共享運具連結公共運輸之指引等項目凝聚初步共識，據以研提共享運具連結公共運輸整合因應發展策略及推動方向之建議。

3. Result Promotion and Benefits

(1) Completed an analysis of key issues related to the promotion and operational management of shared mobility in Taiwan, and proposed recommendations. Strategies and responsive measures for integrating shared mobility with public transportation were also developed. These results can serve as guidance or reference for the Ministry of Transportation and Communications, the Directorate General of Highways, local governments, and relevant transportation operators in promoting the integration of shared mobility with public transport and advancing a low-carbon, sustainable transportation environment.

(2) Two expert forums were held on August 7 and November 13, 2024, bringing together relevant stakeholders to discuss and build preliminary consensus on various aspects of shared mobility development in Taiwan, including its positioning, operational management, service integration, and information application. The forums also reviewed the 2025 demonstration project implementation plan and the guidelines for integrating different types of shared mobility with public transportation. Based on these discussions, recommendations for strategic direction and integration measures were proposed.

4. 研究成果精華摘整

5. 研究成果報告

「共享運具連結公共運輸計畫（1/2）－營運管理因應策略規劃」（114年7月出版）

(四)汽車貨運業因應淨零轉型策略規劃(1/2)－策略架構建立

1. 計畫概述

近年來依循國家整體淨零政策下，客運及大眾運輸推廣相關法制及政策目標已相對明確且完善，並逐步邁向落實，惟公路貨運部分相較之下較為不足，亟待努力。為充分掌握並順應國際趨勢，協助我國汽車貨運業者加速邁向低碳化，本計畫透過蒐集標竿國家與我國推動現況進行落差分析，初步提出政策工具參考框架與執行建議，並根據經濟、產業與技術發展等外在環境趨勢，制定汽車貨運淨零轉型之短中長期策略，包括運具電動化推動進程、配套與獎勵機制完善以及技術革新升級所帶來的契機等，作為後續行動方案規劃參考，期能協助我國汽車貨運業者順利完成轉型，提升產業競爭力。

2. 研究成果

（1）完成國際貨運淨零趨勢蒐研，包含國際組織推動建議、歐美日韓星等各國主要法制框架及政策目標，以及如何透過綠色經濟、永續金融法制政策達成輔導與協助的作用，將推動策略分析歸納為規範機制的建立、管理及規劃、設備建置與技術發展、財政工具的導入等面向，作為後續推動參考應用。

（2）依據上述框架完成我國現行貨運推動策略盤點與蒐研，掌握執行中及規劃中之政策發展，並依構面對應分析國際趨勢與國內情形之差異，研擬未來可強化方向，按急迫性、可行性、及潛在減量效益預估推動期程，以此作為後續擬定相關政策落地執行之基礎。

5. Research Result Report

Shared Mobility and Public Transportation Integration Plan (1/2) –Operational Management Strategy Planning (Published in July 2025).

(IV) Trucking Carrier strategy planning for net zero transformation (1/2) - Establishment of strategic framework

1. Project Overview

In recent years, under the guidance of the national net-zero policy, the legal frameworks and policy goals for the promotion of passenger and mass transportation have become relatively clear and well-developed and are gradually being implemented. However, in comparison, the progress in the road freight transport sector remains insufficient and requires urgent attention. To keep pace with international trends and assist Taiwan's road freight operators in accelerating the transition toward low carbon, this project conducts a gap analysis by comparing the current efforts in Taiwan with those of leading countries. Based on this analysis, a preliminary reference framework for policy tools and implementation recommendations is proposed. Furthermore, taking into account external factors such as economic conditions, industrial development, and technological advancements, the project formulates short-, medium-, and long-term strategies for achieving net-zero transformation in the road freight sector. These strategies include promoting vehicle electrification, enhancing supporting measures and incentive mechanisms, and leveraging opportunities arising from technological innovation and upgrades.

2. Research Results

(1) Conducted comprehensive research on international net-zero freight transport trends, including recommendations from international organizations, major legal frameworks and policy goals in countries such as the United States, Europe, Japan, South Korea, and Singapore. The study also examined how green economy and sustainable finance-related legal and policy measures contribute to guidance and support mechanisms. Based on the findings, the strategies were categorized into several key dimensions: the establishment of regulatory mechanisms, management and planning, infrastructure and technological development, and the introduction of financial instruments, serving as a reference for future policy implementation.

(2) Based on the above framework, an inventory and analysis of Taiwan's current freight transport strategies were conducted, identifying ongoing and planned policy initiatives. By comparing international trends with Taiwan's domestic context across the defined dimensions, gaps and potential areas for improvement were identified. Future enhancement directions were proposed and prioritized according to urgency, feasibility, and estimated emission reduction benefits. This provides a foundational basis for the formulation and practical implementation of subsequent policies.

3. 成果推廣與效益

（1）完成我國汽車貨運業達成環境永續目標利基路徑整體策略架構，可協助汽車貨運業主管機關未來研擬相關淨零排放政策時參考應用，並作為後續（114）年度計畫辦理之基礎。

（2）分別於113年6月25日及10月30日，辦理2場次座談會，邀請各領域重要利害關係人，對象包含公部門主要執行單位、環境與運輸相關學者與科研機構、貨運三業代表，共計18個與會單位，對於推動策略藍圖架構達成初步共識，將依據基本雛形持續深化執行細節。

（3）於113年6月18日商用車技術發展協會及11月6日智慧電動車及綠能科技協會及車輛測試研究中心舉辦之研討會進行3場次主題發表，對於貨運淨零國際趨勢、轉型障礙與契機、策略規劃等現階段研究成果進行推廣宣傳，共計250人次以上參與。

3. Result Promotion and Benefits

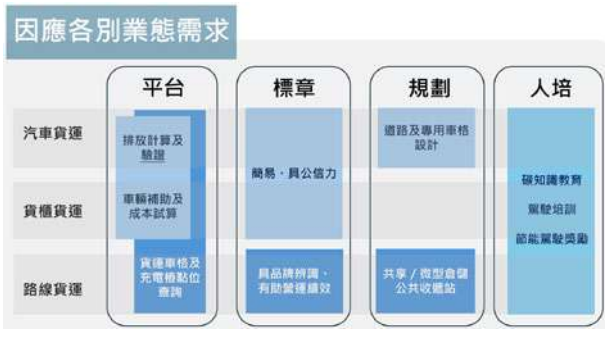
(1) Developed a comprehensive strategic framework outlining the optimal pathways for Taiwan's road freight industry to achieve environmental sustainability goals. This framework is intended to serve as a reference for competent authorities when formulating future net-zero emission policies and will also form the foundation for subsequent projects in the 2025 planning cycle.

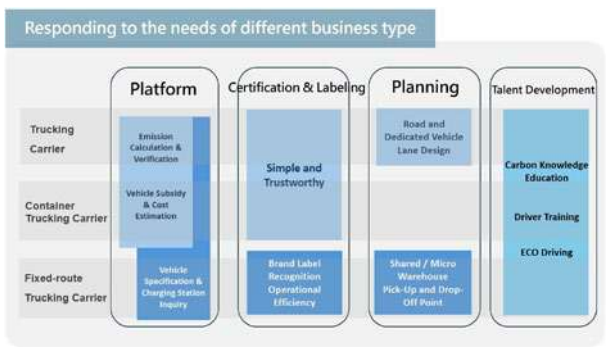
(2) Two stakeholder consultation meetings were held on June 25 and October 30, 2024, bringing together key stakeholders from various sectors. Participants included major implementing agencies from the public sector, scholars and research institutions in the fields of environment and transportation, and representatives from the three major freight industry sectors. A total of 18 organizations participated. The meetings resulted in a preliminary consensus on the strategic roadmap framework, which will continue to be refined and developed in greater detail based on the initial outline.

(3) Three thematic presentations were delivered at seminars organized by the Commercial Vehicle Technology Development Association on June 18, 2024, and by the Smart EV & Green Energy Technology Association and the Vehicle Testing and Research Center on November 6, 2024. These presentations promoted the current research findings on international trends in net-zero freight transport, transformation challenges and opportunities, and strategic planning. The events attracted a total of over 250 participants.

4. 研究成果精華摘整

4. Summary of Research Results





5. 研究成果報告

汽車貨運業因應淨零轉型策略規劃（1/2）－策略架構建立（114年7月出版）

(五)TPASS行政院通勤月票推動成效評估與精進建議

1. 計畫概述

為加強公共運輸疫後振興推動力道，以降低私人運具使用所造成之道路壅塞、環境衝擊及交通事故，民國112年2月23日行政院會通過「行政院促進公共運輸使用方案」，透過「疫後強化經濟與社會韌性及全民共享經濟成果特別條例」於112-114年推動公共運輸通勤月票優惠方案（以下稱為TPASS），截至113年底已有20縣市推出。

雖然推動TPASS之各縣市政府需每年提交成果報告書，惟為更全面評估該政策之推動成效以掌握未來精進方向，交通部王國材前部長於112年7月6日部務會報指示：「請運研所啟動TPASS通勤月票實施效益研究，研究重點包括公共運輸運量轉移變化、減碳效益及價格彈性的分析等，過程中可邀請地方政府參與，共同研議務實可行的推動機制，以瞭解TPASS通勤月票實施後的成效，並作為下一階段補助策略的參考依據。」。由於TPASS推動成效評估除需進行統計數據分析外，尚需於各實施地區進行問卷調查及電子票證資料分析等，爰本所辦理「TPASS行政院通勤月票推動成效評估與精進建議」計畫，期能就TPASS之實施成效進行詳細評估，以利交通部規劃下一階段補助策略並爭取賡續辦理所需經費。

2. 研究成果

（1）有關使用者觀察指標部分：

a. 相關公共運具中，乘客使用TPASS比例最高為捷運，其次為臺鐵、公路客運及市區公車。市區公車則以臺北市、新北市及基隆市使用比例為最高。

5. Research Result Report

Trucking Carrier strategy planning for net zero transformation (1/2) - Establishment of strategic framework (Published in July 2025).

(V) The Effectiveness Evaluation and Improvement Suggestion of TPASS, the Commuter Monthly Pass Promoted by the Executive Yuan

1. Project Overview

In order to strengthen the driving force of public transportation post-pandemic revitalization to mitigate the road congestion, environmental impact, and traffic accidents caused by riding private vehicles, Executive Yuan approved the "Executive Yuan Public Transportation Promotion Plan" on February 23, 2023, providing a preferentially priced Executive Yuan commuter monthly pass (hereinafter referred to as TPASS) in 2023-2025 in accordance with the "Special Act for Enhancing Economic and Social Resilience and Public Sharing of Economic Achievement in the Post-pandemic Era". TPASS had been implemented in 20 counties and cities by the end of 2024.

The county and city governments implementing TPASS must submit annual performance reports, however, a more comprehensive evaluation of this policy's implementation effectiveness is needed to master improvement directions in the future, former Minister of Ministry of Transportation and Communications, Wang, Kwo-Tsai, instructed Institute of Transportation Research during the ministerial meeting on July 6, 2023: "Please initiate a study on the implementation effectiveness of TPASS. The study should focus on key aspects such as changes in public transport ridership, carbon reduction benefits, and price elasticity analysis. Local governments may be invited to participate in the process to collaboratively develop practical and feasible promotion mechanisms, thereby understanding TPASS's implementation effectiveness and providing a reference for subsidy strategies in the next phase."

Given that evaluating TPASS's implementation effectiveness requires not only statistical data analysis but also questionnaire survey and electronic ticket data analysis in each county and city where implementing TPASS, Institute of Transportation Research carried out the "Effectiveness Evaluation and Improvement Suggestion of TPASS, the Commuter Monthly Pass Promoted by Executive Yuan, with a goal of conducting a comprehensive evaluation of TPASS's implementation effectiveness to assist Ministry of Transportation and Communications to plan subsidy strategies and secure the necessary funding for TPASS in the next phase.

2. Research Results

(1) Regarding User Behavior Observation Indicators:

a. Among the relevant public transport modes, the metro system has the highest ratio of TPASS users, followed by Taiwan Railways, intercity buses, and city buses. For city buses, the highest ratio of TPASS users is observed in Taipei, New Taipei, and Keelung.

b. TPASS使用者平均每日使用次數約2次左右，符合對於TPASS作為通勤學使用之預期認知；TPASS使用者的月均轉乘次數較一般乘客高，代表TPASS提升了民眾使用多元運具的誘因。

c. 根據問卷調查結果，TPASS使用者中，有28.93%於TPASS實施前係以使用私人運具為主。

（2）有關核心指標部分：

a. 依據問卷調查結果推估TPASS政策可減少每月327.24萬公升能耗、7,406噸碳排及121件交通事故，具節能減碳及減少交通事故件數之成效，推估全國一年可帶來約160億元效益，益本比約為2.24。

b. TPASS減少了同縣市內不同鄉鎮市區居民之交通支出差異，代表TPASS能照顧到距離商業中心（CBD）較遠的使用者，具促進交通平權成效。

c. 各縣市TPASS使用者每人每日旅次數均上升，上升幅度介於4.3%~17.68%，代表TPASS具促進經濟活動之效，同時也提升公共運具運量，增加公共運輸業者營收。

d. 經調查TPASS使用者整體滿意度達85.4%，受訪者對於TPASS之改善建議，都會區民眾希望月票價格可再降低，或是月票方案可讓民眾自行加價選購；非都會區民眾則有較高比率反映公共運輸班次及路線應增加。

b. The average daily public transportation trip per TPASS user is about two trips, which aligns with the expectation of using TPASS as a commuter pass. In addition, the monthly average transfers in public transportation trips per TPASS user are higher than for general passengers, indicating that TPASS increases the incentive for people to take multiple public transport modes.

c. According to the survey results, 28.93% of TPASS users primarily relied on private vehicles before its implementation.

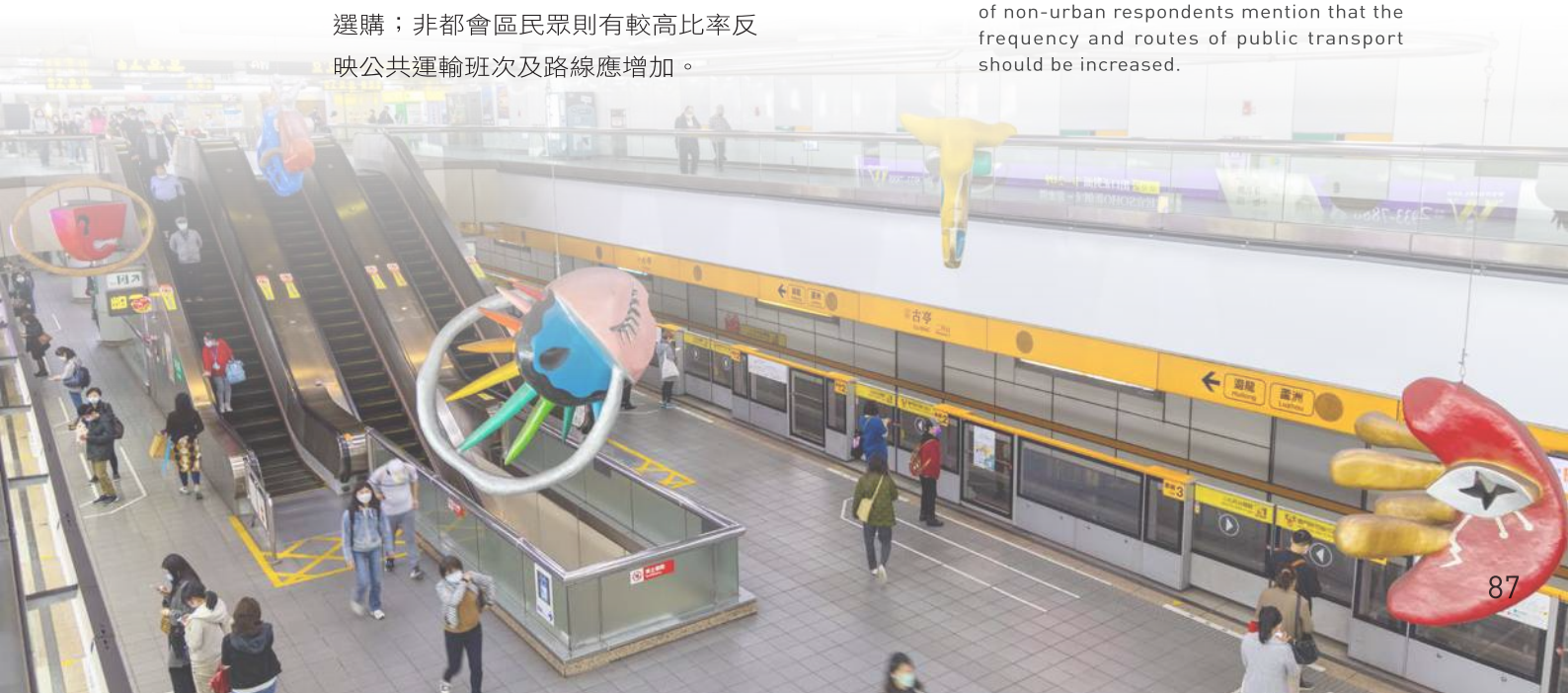
(2) Regarding Core Evaluation Indicators:

a. Based on survey data, it is estimated that the TPASS policy can reduce monthly fuel consumption by approximately 3.2724 million liters, lower carbon emissions by 7,406 tons, and prevent 121 traffic accidents, resulting in the benefit of energy conservation, carbon reduction, and traffic accident reduction, which is estimated about NT$16 billion per year a whole nation. The benefit-cost ratio is about 2.24.

b. TPASS has reduced the differences in commuting expenses by public transportation among residents in different administrative districts within the same county or city. This means that TPASS benefits passengers who live further from the central business district (CBD), thereby promoting equity in transportation.

c. The daily trips per TPASS user in every county and city has risen, with increases ranging from 4.3% to 17.68%. This implies that TPASS not only boosts economic activities but also increases public transport ridership and the revenue of public transport operators.

d. Survey results show that the overall satisfaction rate among TPASS users is 85.4%. About the improvement suggestion, urban respondents wish that the price of TPASS may be lower or TPASS offers mode options for people via additional payment. Meanwhile, a higher proportion of non-urban respondents mention that the frequency and routes of public transport should be increased.



e. TPASS推出1年後（113年6月），適用之公共運具運量平均成長6.83%，其中以臺鐵、國道客運及捷運／輕軌成長最多，分別成長12.7%、8.85%及8.06%，這使得臺鐵及捷運運量於112年底已恢至趨近108年疫情前水準。相較下公共運輸發達之新加坡，其捷運運量於111年初開始穩定復甦，至112年底運量約為疫情前9成5，我國捷運運量則於111年下半年開始穩定復甦，112年下半年推出TPASS，至112年底運量已趨近疫情前水準，可見TPASS對於加速臺灣疫後公共運輸乘客回流是有成效的。

(3) 根據調查民眾未購買TPASS之主要原因為：無使用需求、使用私有運具較為方便、持有敬老愛心點數卡或具法定優待票條件者。後續如要擴增TPASS受益族群，除持續提升公共運輸便利性並加強私人運具使用管制外，應針對潛在使用族群設計不同使用天期及運具組合之定期票方案，並結合資通訊系統提升TPASS使用者加值或續購之便利性。

3. 成果推廣與效益

(1) 研擬TPASS推動成效評估指標，並於113年7月5日召開專家學者座談會，可提供後續交通部公路局、統計處及地方政府定期進行TPASS推動成效評估之參據。

(2) 完成TPASS階段性推動成效評估報告，並於113年10月29日召開專家學者座談會，有助於掌握TPASS行政院通勤月票執行成效及應改善問題，適時調整相關政策作為，以利資源之有效運用並提高推動成效。

(3) 本計畫成果提供交通部公路局研提第二期TPASS行政院通勤月票執行計畫（草案）之參考，俾利交通部向行政院爭取計畫預算，以賡續推動公共運輸發展。

e. One year after the launch of TPASS (June 2024), the ridership of relevant public transport modes increased by an average of 6.83%. Among these, Taiwan Railways, intercity bus, and metro/light rail systems have the largest growths—12.7%, 8.85%, and 8.06%, respectively. As a result, Taiwan Railways and metro/light rail system ridership had nearly recovered to pre-pandemic levels (comparable to those in 2019) by the end of 2023. In contrast, in Singapore, where public transport is highly developed, the metro ridership began a steady recovery from pandemic in early 2022 and reached about 95% of pre-pandemic levels by the end of 2023. In Taiwan, the metro ridership began a steady recovery from pandemic in the latter half of 2022, and reached pre-pandemic levels by the end of 2023 with the launch of TPASS in the latter half of 2023. This shows that TPASS has been effective to accelerate the return of public transport passengers in Taiwan after pandemic.

(3) According to the survey, the main reasons for not purchasing TPASS are: no need for TPASS, riding private vehicles is more convenient, and having the senior citizen love-and-care card or meeting the criteria for purchasing statutory discounted tickets. To further expand the beneficiary groups of the TPASS program, efforts should go beyond improving public transportation convenience and strengthening controls on private vehicle use. It is essential to design periodic pass plans tailored to different potential user groups, offering flexible validity periods and combinations of transport modes. Additionally, integrating information and communication technologies can enhance the convenience of value-added services and pass renewals for TPASS users.

3. Result Promotion and Benefits

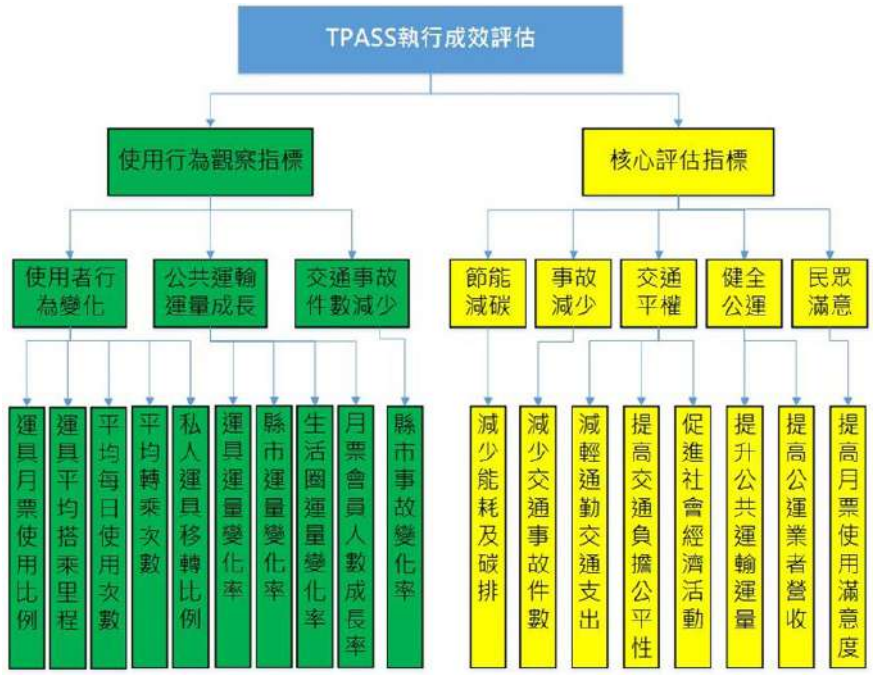
(1) Formulate evaluation indicators for TPASS's implementation effectiveness and hold a symposium with experts and scholars on July 5, 2024, providing a reference for Highway Bureau, Ministry of Transportation and Communications, Department of Statistics, and local governments to conduct regular evaluations of TPASS's implementation effectiveness.

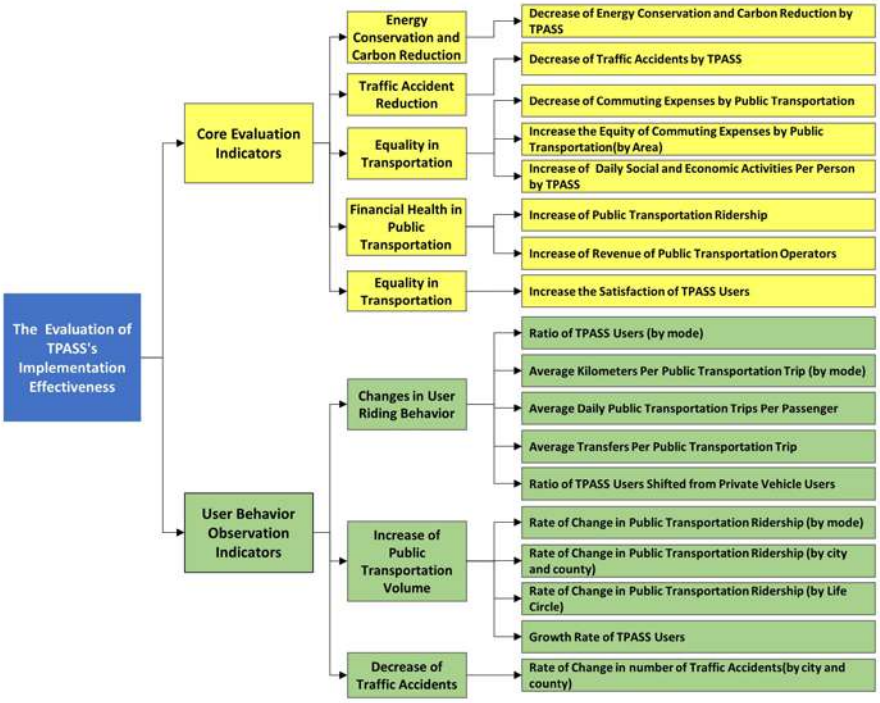
(2) Complete the staged evaluation report on TPASS's implementation effectiveness and hold a symposium with experts and scholars on October 29, 2024, which is helpful to understand the outcome of TPASS and the problems which should be improved in order to adjust relevant policies timely, ensuring the effective utilization of resources and the enhancement of implementation.

(3) The outcome of this project serves as a reference for the Highway Bureau, Ministry of Transportation and Communications to propose the draft of the second TPASS Implementation Plan, which is submitted by the Ministry of Transportation and Communications to secure its budget from the Executive Yuan to keep promoting the development of public transportation.

4. 研究成果精華摘整

4. Summary of Research Results





TPASS推動成效評估指標

Performance Evaluation Indicators for TPASS Implementation

5. 研究成果報告

TPASS行政院通勤月票推動成效評估與精進建議（預計114年8月出版）

(六)交通行動服務（MaaS）跨域合作與應用優化之研究（2/2）－應用精進與提升包容性

1. 計畫概述

為能循序擴展國內MaaS服務，規劃未來MaaS服務的發展與永續機制，本計畫在前期計畫成果基礎下，除探討國外MaaS服務之內涵外，亦依照前期擬定之MaaS服務所蒐集之數據進行應用精進探討，制定我國MaaS數據應用課題與分析建議，並以臺中市MaaS為案例進行分析實作，供其他縣市參考；此外為使MaaS服務範圍更為多元，本計畫就MaaS服務如何與其他區域MaaS服務合作進行探討，制定相關推行方式與應用課題，藉以擬定MaaS服務未來進行跨域合作之參考方針，此外本計畫亦透過臺中市敬老愛心點數為媒介，探討Taichung Go與MeN Go服務合作之操作方式並進行實作，驗證本計畫所規劃之跨域合作方式與課題。考量社會服務包容性，本計畫針對現行倡議之包容性宣言與定義進行蒐集，並探討MaaS服務如何讓MaaS服務使用族群更加多元且包容，並制定我國未來在服務包容性推展願景下，各利害關係單位之執行策略。另外考量現行MaaS服務之永續推廣與經營，本計畫以成立MaaS服務組織作為我國MaaS未來發展建議，並制定了該組織之角色定位與組織內容，作為後續MaaS服務永續提供之關鍵利基。

2. 研究成果

（1）在MaaS跨域合作可能方式方面，以跨縣市合作模式研提合適執行之合作模式，包含特約合作、MaaS會員及通路整合、單一APP平台整合，各合作方式皆已定義其適當執行條件及優缺點，可供後續MaaS服務跨縣市合作參考應用；另外本計畫以臺中及高雄兩地MaaS服務透過敬老愛心點數為媒介進行實作探討，掌握此服務模式之概況，並蒐集推行過程中，遭遇挑戰與困難，後續相關MaaS服務要進行跨域合作或是MaaS服務包容性功能精進時，可參考應用。

5. Research Result Report

The Effectiveness Evaluation and Improvement Suggestion of TPASS, the Commuter Monthly Pass Promoted by the Executive Yuan (Scheduled to be published in August 2025).

(VI) Research on Cross-Domain Collaboration and Application Optimization of Mobility as a Service (MaaS) (2/2) — Enhancing Application and Inclusiveness

1. Project Overview

To support the gradual expansion of domestic MaaS services, this project builds upon the outcomes of earlier initiatives to plan for the development and sustainability of MaaS in Taiwan. In addition to analyzing international MaaS practices, this project uses data collected under previous MaaS initiatives to refine applications and identify data-driven challenges and analysis recommendations for Taiwan's MaaS ecosystem. A case study and practical analysis will be conducted based on MaaS implementation in Taichung City to serve as a reference for other local governments.

To broaden the service scope, the project also explores strategies for interregional collaboration among different MaaS systems, formulating corresponding implementation methods and application topics. These will inform the future framework for cross-domain MaaS cooperation. Furthermore, the project uses Taichung City's senior and charity point system as a tool to explore and test the integration of "Taichung Go" and "MeN Go" services, validating the cross-domain cooperation model and its associated topics as planned.

From the perspective of social inclusiveness, the project collects and examines current international declarations and definitions related to inclusive services. It explores how MaaS can serve a broader and more diverse user base, and outlines strategies for stakeholders under a shared vision of inclusive service development in Taiwan.

To ensure the long-term sustainability of MaaS services, the project proposes the establishment of a dedicated MaaS service organization. It defines the organization's role and structure to serve as a foundational element for the ongoing and sustainable development of MaaS in Taiwan.

2. Research Results

(1) Cross-Domain Collaboration Models:

The project proposes feasible cross-county collaboration models, including designated partnership agreements, integration of MaaS memberships and service channels, and unified app platform integration. Each collaboration model has defined implementation conditions, advantages, and disadvantages, serving as practical references for future cross-county MaaS cooperation.

Additionally, a pilot was conducted using the senior and charity point system in both Taichung and Kaohsiung to evaluate the service model, document its key features, and identify challenges faced during implementation. These insights can support future efforts to enhance cross-domain cooperation and inclusiveness in MaaS services.

（2）依照無障礙設計、通用設計、包容性設計概念整合探討MaaS的服務包容性推動策略，並探討在未來達成MaaS服務包容性過程中，各利害關係單位之職責，並透過案例實作及座談會辦理之方式，凝聚推行共識。

（3）在MaaS使用者數據資料應用部分，探討MaaS服務各利害關係人（中央政府、地方政府、MaaS營運商、運輸業者與MaaS使用者）就使用數據分析上所關注的議題或痛點需求，提出相關數據分析行動方案、資料分析流程與所需資料，並進行數據分析行動方案之試做。另外，針對數據分析試做過程中所遭遇之挑戰與困難，進行彙整並提出配套措施與未來MaaS使用者數據精進方向。

（4）另考量我國在推動MaaS的過程中面臨諸多挑戰，本計畫就法規限制、產業整合問題、使用者習慣、資金投入和人才培育等面向，研提以MaaS發展及營運為目標的第三方法人組織之推動建議，期能加速我國MaaS的發展，邁向永續低碳兼顧智慧的綠色運輸。

3. 成果推廣與效益

（1）於113年 11月8日辦理臺中×高雄牽手行MaaS跨域包容體驗活動。

（2）計畫研究成果包含數據應用課題及包容性主題，於中華民國運輸學會113年學術論文研討會發表及刊登。

（3）於113年11月11日邀請相關專家、運輸業者，辦理「MaaS包容性服務運輸業者意見蒐集」座談會，就為達成MaaS包容性服務，各利害關係人之角色義務及可能作為等，進行探討與意見交流。

(2) Inclusive Service Strategy:

The project integrates the concepts of accessible design, universal design, and inclusive design to develop strategies for promoting inclusive MaaS services. It also outlines the roles and responsibilities of various stakeholders in achieving inclusiveness. Through case studies and stakeholder workshops, the project helped build consensus for inclusive service implementation.

(3) Data Application for MaaS Users:

The project investigates the data needs and concerns of different MaaS stakeholders–central and local governments, MaaS operators, transport providers, and users. It proposes specific data analysis action plans, workflows, and required data sets. Pilot analyses were carried out, and challenges encountered during these pilots were documented. Mitigation measures and future directions for refining the use of MaaS user data were also proposed.

(4) Organizational and Policy Recommendations:

Recognizing the challenges Taiwan faces in promoting MaaS–such as legal restrictions, industry integration, user habits, funding, and talent development–the project recommends establishing a third-party nonprofit MaaS organization. This organization would focus on MaaS development and operations, aiming to accelerate Taiwan's transition toward a sustainable, low-carbon, and intelligent green transportation system.

3. Dissemination and Impact

(1) On November 8, 2024, the "Taichung × Kaohsiung Joint MaaS Cross-Domain Inclusiveness Experience Event" was held.

(2) Research findings on data application and inclusiveness were presented and published at the 2024 Annual Conference of the Chinese Institute of Transportation.

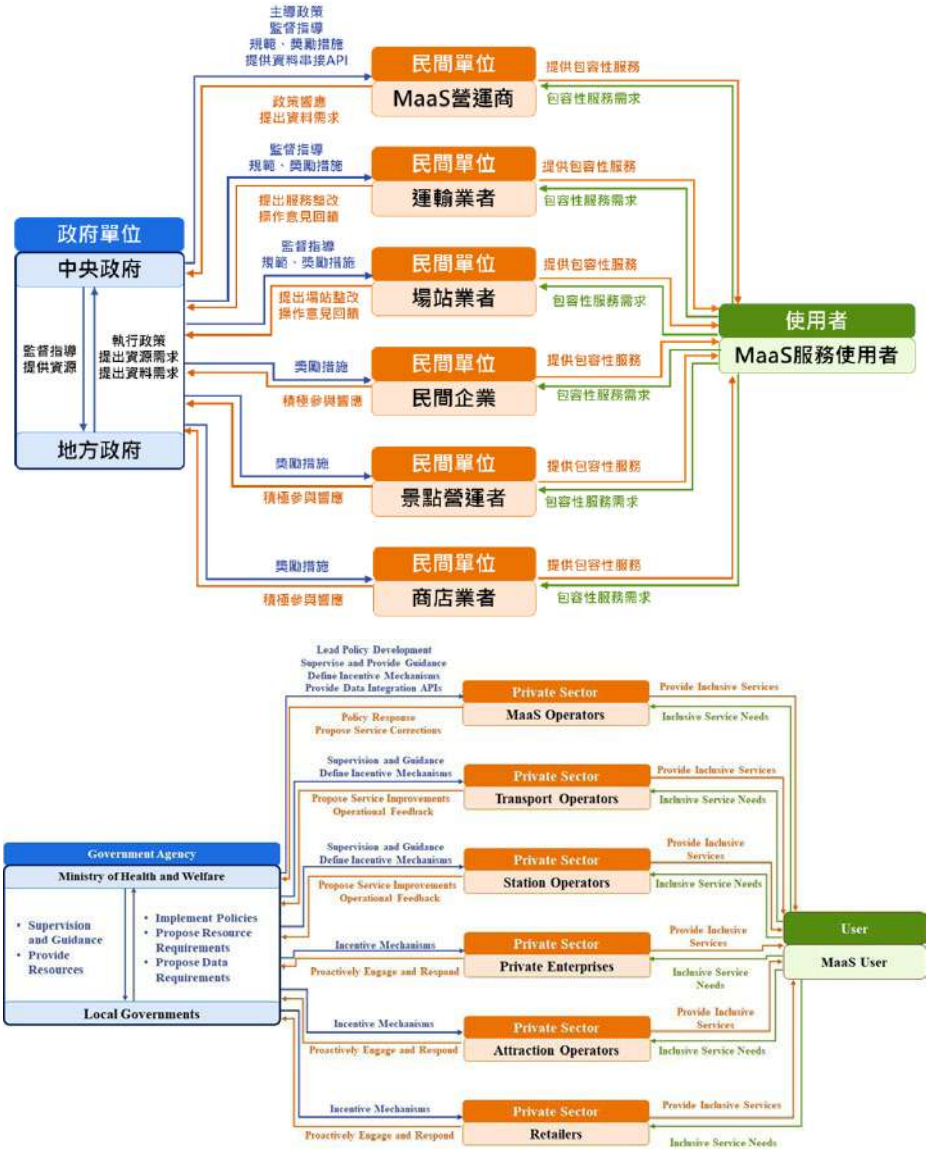
(3) On November 11, 2024, a stakeholder roundtable titled "Collecting Transport Operators' Views on Inclusive MaaS Services" was held. Experts and transport operators discussed roles, responsibilities, and potential contributions of different stakeholders toward advancing inclusive MaaS services.

4. 研究成果精華摘整

4. Summary of Research Results

臺中×高雄牽手行MaaS跨域包容體驗活動

Taichung × Kaohsiung Joint MaaS Inclusive Experience Event



MaaS服務包容性推動之各利害關係人分工合作架構

Collaborative Framework for Promoting Inclusive MaaS Services – Roles of Key Stakeholders

5. 研究成果報告

- 交通行動服務（MaaS）跨域合作與應用優化之研究（2/2）－應用精進與提升包容性（114年4月出版）。

(七)電動大客車數據分析與應用計畫(2/2)－資料視覺化與AI應用

1. 計畫概述

為達成市區公車2030年全面電動化之目標，本所自108年開始建置電動大客車營運數據監控管理平臺，並建立資料傳輸作業機制，持續追蹤與掌握導入之電動大客車輛營運績效與長期行駛特性。

對應公車客運電動化導入進程，客運業者在營運管理思維亦需要隨之轉變，考量電動大客車營運特性，相較於過去柴油大客車的營運調度，需更強化於電動大客車數據化資料蒐集與分析，追蹤與掌握導入之電動大客車輛營運績效、長期行駛特性等關鍵指標，以及對應電池營運特性，及早觀察發現異常狀況、釐清與進行改善。

電動大客車數據平臺自110年起開始蒐集電動大客車營運數據，本計畫以電動大客車數據平臺所累積之數據資料為基礎，依據需求掌握與資料可蒐集程度，規劃分析應用指標與分析主軸；挑選8條路線與11處充電站的資料，進行營運數據分析指標案例探討與應用，將分析成果進行資料視覺化呈現與展示，並探討AI應用，就分析成果研提營運面與政策面之建議，提供相關單位掌握以精進電動大客車之營運與管理。

5. Research Results

- Research on Cross-Sector Collaboration and Application Optimization of Mobility as a Service (MaaS) (2/2) – Enhancing Application and Promoting Inclusivity (Published in April 2025).

(VII) Data Analysis and Applications for Electric Buses (Part 2) – Data Visualization and AI Applications

1. Project Overview

To support the goal of fully electrifying city buses by 2030, we began building a data monitoring and management platform for electric buses in 2019. We also established data transmission processes to continuously track and understand the performance and long-term driving patterns of these buses.

As the transition to electric buses progresses, bus operators need to adapt their management strategies. Unlike traditional diesel buses, electric buses require a more data-driven approach. Operators need to analyze performance indicators such as energy use, driving behavior, and battery performance to identify any issues early and make necessary improvements.

Since 2021, the platform has been collecting electric bus operation data. This project uses the accumulated data to define key performance indicators and analysis topics. We selected data from 8 routes and 11 charging stations to conduct case studies. The results were visualized for easier understanding, and AI was used to enhance analysis. The insights are used to provide recommendations for operations and policy-making to help improve electric bus management.

2. 研究成果

（1）蒐集本所建置、移交公路局維運之電動大客車營運數據監控管理平台數據，蒐集受補助客運業者之車輛、充電及營運資訊，具有跨業者、跨車型之資料全面性，應用累積數據進行應用指標分析。

（2）綜整電動大客車應用指標分析架構，分析指標包括以車輛能耗、電量追蹤、充電車位利用（充電時間）與節能減碳等指標為主，包括車輛用電效率、電量曲線追蹤、回站時低電量追蹤、充電車位時間利用率、燃料成本節省、推動現況掌握、行駛里程統計、節能減碳效益計算等。

（3）運用能耗AI預測模型進行測試場站之路線班次能耗預測，做為班次充電排程之依據，進行排程充電與人工充電之情境比較，顯示透過班次規劃充電排程，可大幅降低總充電量、總充電時間。

3. 成果推廣與效益

（1）本計畫結合「電動大客車智慧充電服務驗證（1/2）－智慧充電管理系統實證計畫」，代表我國參與APEC能源工作小組ESCI競賽，獲得APEC－ESCI智慧運輸金獎。

（2）本計畫另結合「電動大客車智慧充電服務驗證（1/2）－智慧充電管理系統實證計畫」，以「電動公車服務數位創新加值計畫－驅動智慧城市能源管理新思維」為題參與並獲選交通部服務獎與行政院「第7屆政府服務獎」數位創新加值項獎項。

（3）於113年11月4日辦理電動大客車數據分析與應用計畫（2/2）－資料視覺化與AI應用成果說明會，邀請與電動大客車推動相關之中央單位、地方政府、客運業者、公協會出席，以利相關單位掌握電動大客車營運數據應用之分析成果。

2. Key Findings

1. We gathered data from the electric bus monitoring platform–built by our team and now managed by the Directorate General of Highways—covering subsidized operators' vehicle, charging, and operational information. The data spans multiple operators and bus models, allowing for a comprehensive cross-analysis.
2. We developed an analysis framework focusing on key performance metrics, including:
   - Energy efficiency of vehicles
   - Battery usage trends
   - Low battery levels when returning to the depot
   - Charging station time utilization
   - Fuel cost savings
   - Overview of current progress
   - Driving distance statistics
   - Carbon reduction impact calculations
3. We tested an AI model to predict energy usage for different routes and schedules at a selected site. The model helped us simulate and compare two charging approaches: scheduled charging and manual charging. Results showed that using scheduled charging significantly reduced total charging time and electricity consumption.

3. Promotion and Impact

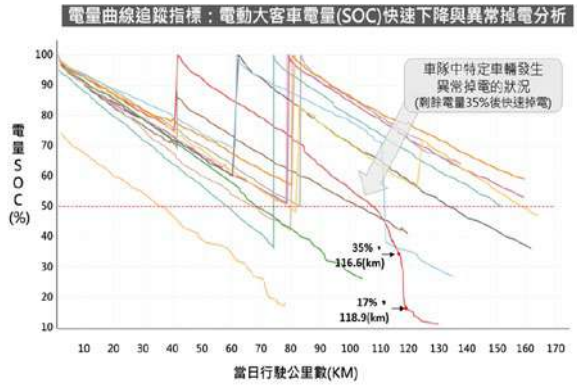
(1) This project was integrated with the "Smart Charging Services for Electric Buses (1/2) – Pilot Smart Charging Management System" and represented Taiwan in the APEC Energy Working Group's ESCI competition, where it won the APEC ESCI Smart Transport Gold Award.

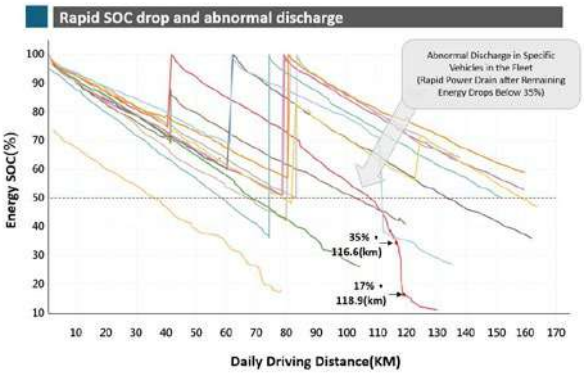
(2) It was also part of the "Digital Innovation Project for Electric Bus Services (1/2)– Driving Smart Energy Management for Cities" and received both the Ministry of Transportation's Service Award and the Executive Yuan's 7th Government Service Award for Digital Innovation.

(3) On November 4, 2024, a results briefing was held for the "Electric Bus Data Analysis and Application Project (2/2) – Data Visualization and AI Applications." The event invited representatives from central government agencies, local governments, bus operators, and industry associations involved in promoting electric buses, providing them with insights into the latest analytical findings on electric bus operational data.

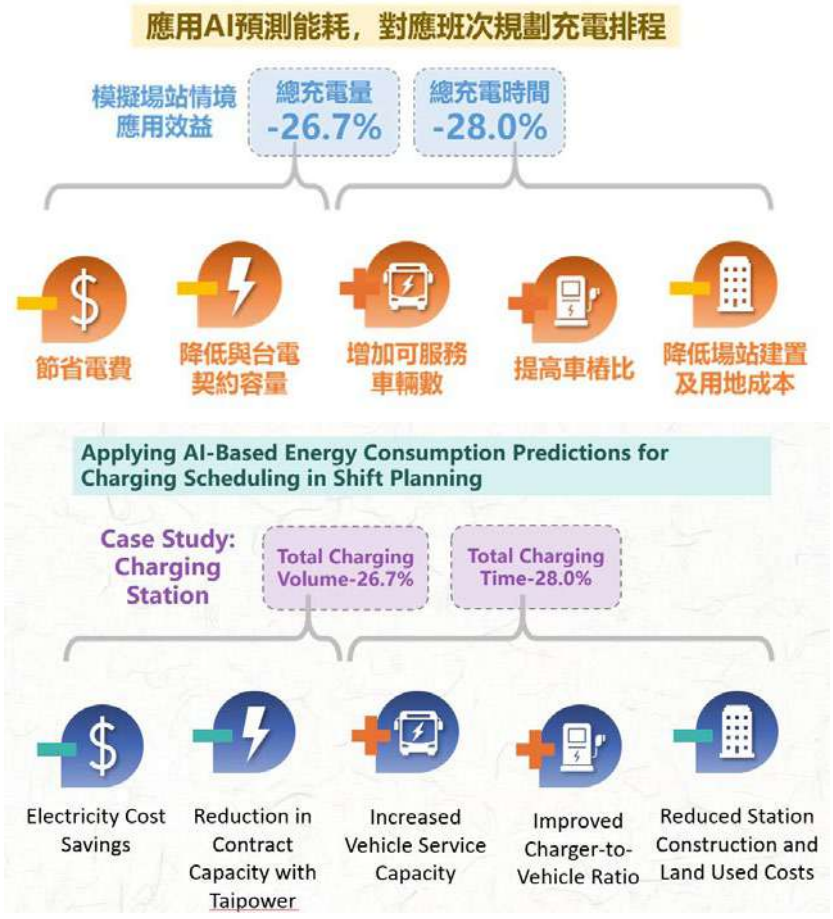
4. 研究成果精華摘整

4. Summary of Research Results





電動大客車電量（SOC）快速下降與異常掉電之視覺化分析案例
Case Study: Visual Analysis of Rapid SOC Drop and Abnormal Power Loss in Electric Buses



電動大客車數據結合AI預測可達成的充電時間與節電之效益
Using AI and Bus Data to Predict Charging Time and Achieve Energy Savings

5. 研究成果報告

- 電動大客車數據分析與應用計畫（2/2）－資料視覺化與AI應用（114年4月出版）

5. Research Results

- Electric Bus Data Analysis and Applications (Part 2): Data Visualization and AI Integration (Published in April 2025)

（八）電動大客車智慧充電服務驗證（2/2）－智慧充電管理系統精進與優化

1. 計畫概述

行政院為改善空氣汙染，已於106年12月21日宣布於2030年前將1萬輛市區公車全面電動化。當車隊逐漸全面改換為電動大客車時，由於停車場充電站安裝位置等條件限制，部分電動大客車將會產生充電供給與需求匹配問題，因此如何建立合理的電動大客車和充電站數量配比，提供最適當的充電站安排與營運管理需要預先詳細分析規劃，爰本所於110-111年開始於示範場域規劃與建置電動大客車智慧充電管理系統。為強化電動大客車智慧充電管理系統功能，並發展客運業者電動大客車充電班表及契約容量最佳充電策略，本計畫利用110-111年所建置電動大客車智慧充電管理系統，開始導入客運業者班表、契約容量與電動大客車營運數據監控管理平台資訊，進行智慧充電管理系統實證，協助業者進行示範，未來可加以推廣至其他電動大客車充電場站，以促進我國電動大客車政策之推動。

2. 研究成果

（1）強化電動大客車智慧充電管理系統功能，提升控制及資訊蒐集效率及系統可靠度。

（2）整合智慧充電管理系統控制策略所需之車機資料，如：車牌號碼、GPS、SOC及電池溫度並完成系統串接，以使業者可於場域端透過看板掌握車輛即將進站資訊、是否需要充電以及最佳之充電量。

（3）完成發展客運業者之電動大客車充電班表及契約容量最佳充電策略，透過110年電動大客車智慧充電示範計畫建置電動大客車智慧充電管理系統之客運業者建構應用程式介面（API），智慧充電管理系統可與示範場域內電動大客車日間動態班表進行資訊整合，針對即將進站之車輛對應查找該車下次離站服務之時間及里程，並透過智慧充電排程判斷充電資格、優先權、充電功率及充電時間等功能。

(VIII) Verification of Smart Charging Services for Electric Buses (2/2) – Enhancement and Optimization of the Smart Charging Management System

1. Project Overview

To improve air pollution, the Executive Yuan announced on December 21, 2017, that it aims to fully electrify 10,000 urban buses by 2030. As the fleet gradually transitions to electric buses, there will be challenges related to matching the supply and demand for charging due to constraints such as the installation locations of parking lot charging stations. Therefore, establishing a reasonable ratio of electric buses to charging stations and providing optimal charging station arrangements and operational management requires detailed analysis and planning in advance. Consequently, we began planning and constructing the smart charging management system for electric buses in demonstration areas from 2021 to 2022.

To enhance the functionality of the smart charging management system for electric buses and develop optimal charging strategies for bus operators' charging schedules and contract capacities, this project utilizes the smart charging management system established in 2021-2022. We began integrating bus operators' schedules, contract capacities, and operational data monitoring management platform information into the smart charging management system for empirical validation, assisting operators in demonstrations, which can later be promoted to other electric bus charging stations to facilitate the implementation of electric bus policies.

2. Research Achievements

(1) Enhanced the functionality of the smart charging management system for electric buses, improving control and information collection efficiency and system reliability.

(2) Integrated the vehicle data required for the smart charging management system control strategy, such as license plate number, GPS, SOC (State of Charge), and battery temperature, completing system connectivity. This allows operators to grasp information about vehicles approaching the station, whether they need charging, and the optimal charging amount through dashboards at the site.

(3) Developed optimal charging strategies for bus operators' electric bus charging schedules and contract capacities. Through the 2021 electric bus smart charging demonstration project, we constructed application programming interfaces (APIs) for the smart charging management system, allowing integration with the dynamic daily schedules of electric buses in the demonstration area. This facilitates tracking the next departure service time and mileage for incoming vehicles and determines charging eligibility, priority, charging power, and charging time through smart charging scheduling.

3. 成果推廣與效益

（1）藉由我國電動大客車車隊之智慧充電管理系統監控資料分析，提供客運業者提升車輛稼動率、維運成本最佳化等經營管理及滾動檢討電動大客車推動政策之依據，提升電動大客車整體營運品質以及安全性。

（2）於113年12月10日舉辦電動大客車智慧充電管理系統服務成果發表會，並說明智慧充電分級補助制度，降低客運業者對電動公車之疑慮並提高執行成效。

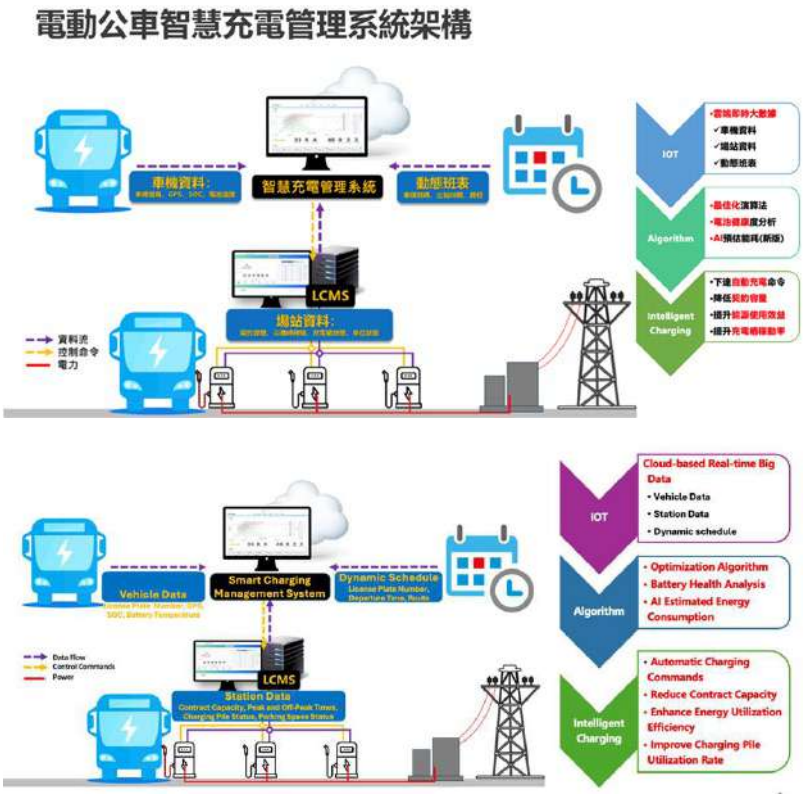
3. Promotion and Benefits of Achievements

(1) By analyzing the monitoring data from the smart charging management system for electric bus fleets, we provide bus operators with insights to improve vehicle utilization rates and optimize maintenance costs, serving as a basis for ongoing reviews of electric bus promotion policies, thereby enhancing overall operational quality and safety.

(2) A service achievement presentation for the smart charging management system for electric buses will be held on December 10, 2024, to explain the tiered subsidy system for smart charging, reducing operators' concerns about electric buses and improving implementation effectiveness.

4. 研究成果精華摘整

4. Summary of Research Achievements



電動公車智慧充電管理系統架構

System Architecture of Smart Charging Management for Electric Buses

電動大客車智慧充電驗證

Smart Charging Verification for Electric Buses

5. 研究成果報告

- 電動大客車智慧充電服務驗證（2/2）－智慧充電管理系統精進與優化（預計114年8月出版）

四 營造潔淨且具韌性的運輸環境

(一)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（2/2）－精進減碳評估方法暨研訂第三期減量目標

1. 計畫概述

為配合國家推動溫室氣體減量政策，交通部依112年2月15日公布之「氣候變遷因應法」暨112年12月29日修正發布之「氣候變遷因應法施行細則」規定，以5年為一階段，訂修運輸部門溫室氣體減量行動方案，做為我國運輸部門推動溫室氣體減量之依循，並做為直轄市、縣（市）政府訂定溫室氣體減量執行方案之依據。

運輸部門111年溫室氣體排放量約3,628.7萬公噸CO_2e，占國家溫室氣體排放總量約12.69%，為我國溫室氣體排放第4大部門，經推估其中以公路運輸排放為最大宗，約占96.32%；公路運輸中又以小客車排放占比最高，占整體公路運輸約48.99%最高、其次為小貨車約17.77%。為推動溫室氣體減量工作，第二期（110-114年）運輸部門採取「發展公共運輸系統，加強運輸需求管理」、「建構綠色運輸網絡，推廣低碳運具使用，建置綠色運具導向之交通環境」及「提升運輸系統及運具能源使用效率」三大策略共14項措施。每年滾動檢討行動方案執行成效及研提執行成果報告。同時，配合環境部第三期溫室氣體階段管制目標研訂作業，透過評估模型推估運輸部門第三期溫室氣體排放基線、能源需求及減碳目標，據以做為訂定運輸部門第三期溫室氣體階段管制目標之參考應用。

5. Research Result Report

- Verification of Smart Charging Services for Electric Buses (2/2) – Enhancement and Optimization of the Smart Charging Management System (Scheduled to be published in August 2025).

IV Build up a Clean and Resilient Transportation Environment

(I) Enhancing Net-Zero Emission in the Transportation Sector and Promoting Carbon Reduction Evaluation Model (2/2) – Enhancing Carbon Reduction Evaluation Methods and Formulating the Phase Three Periodic Regulatory Goals of the Transportation Sector.

1. Project Overview

In alignment with the national GHG reduction policies, the Ministry of Transportation and Communications (MOTC), in accordance with the "Climate Change Response Act" promulgated on February 15, 2023 and the amended "Revisions to the Enforcement Rules of the Climate Change Response Act" released on December 29, 2023, formulated and refined the Sectoral Greenhouse Gas Reduction Action Program of the transportation sector on a 5-year basis as a guideline for promoting GHG reduction measures. This program also serves as the foundation for municipalities and county/city competent authorities to formulate their own GHG reduction implementation programs.

In 2022, the transportation sector was the fourth-largest source of GHG emissions in Taiwan, emitted approximately 36.287 million metric tons of CO_2e, accounting for about 12.69% of GHG emissions nationwide. Road transport accounted for the largest share of GHG emissions of the transportation sector, approximately 96.32%, of which, passenger cars had the highest share, contributing 48.99% of GHG emissions of the transportation sector, followed by light trucks at about 17.77%. To promote GHG reduction of the transportation sector in the phase two (2021–2025), three main strategies were adopted: (1) increasing public transportation use and improving transport demand management, (2) building a green transportation network, promoting the use of low-carbon vehicles and creating a traffic environment that encourages green vehicles and (3) enhancing the energy efficiency of transportation systems and vehicles, with 14 specific measures. The effectiveness of the sectoral action program is reviewed annually and an implementation performance report is compiled.

Additionally, in alignment with the efforts of the MOENV in determining the phase three periodic regulatory goals for GHG emissions, the baseline of GHG emissions of the transportation sector in the phase three was estimated via evaluation models, energy demand and carbon reduction targets were estimated as well. These estimations will serve as the reference for determining the phase three periodic regulatory goals for GHG emissions of the transportation sector.

另依據永續會淨零轉型關鍵戰略管制制度，持續配合交通部及環境部之半年執行情形報告與年執行成果報告撰擬作業。配合淨零轉型關鍵戰略行動計畫之工作項目，研析國際運輸能源與減碳與運具電動化之政策與法規發展趨勢，並研擬綠運輸生活推廣誘因機制之具體推動作法及建構運輸場站與交通場域減碳能力。

2. 研究成果

（1）完成彙提「運輸部門溫室氣體減量行動方案成果報告（113年9月版）」送環境部，並奉行政院於113年12月17日核定。

（2）完成推估運輸部門第三期溫室氣體排放基線、能源需求及減碳目標，做為行政院協商六大部門第三期減碳目標之基礎。

（3）完成公私部門員工綠運輸通勤指引，並提出事業減碳通勤優良單位標章制度與具體推動作法。

3. 成果推廣與效益

（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：

① 108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CO_2e，低於第一期全期管制目標189.663百萬公噸CO_2e，顯示運輸部門推動溫室氣體減量工作已見成效。

Besides, in accordance with the Net-zero Transition Key Strategies Monitoring and Evaluation Scheme administered by the National Council for Sustainable Development, semi-annual implementation reports and annual implementation reports were compiled according to the notices of the MOTC and the MOENV. To facilitate works of the Net-zero Transition Key Strategies Action Plan, global and foreign countries' trends in energy (consumption) and carbon reduction policy of transportation sector as well as vehicle electrification policies and regulations. Furthermore, we studied and drafted detailed operational measures for promoting green transportation lifestyles via incentive scheme. In addition, we promoted measures to enhance carbon reduction capabilities of staffs of transportation terminals and hubs.

2. Research Results

(1) Completed and submitted the "Transportation Sector Greenhouse Gas Reduction Action Program Annual Report (September 2024 Edition)" to the MOENV, which was later approved by the Executive Yuan on December 17, 2024.

(2) Completed the estimation of the baseline of GHG emissions of the transportation sector in phase three as well as energy demand and carbon reduction targets. The results will serve as the discussion basis for the Executive Yuan to negotiate six sectoral periodic regulatory goals in phase three.

(3) Developed a Green Transportation Commuting Guide for Public and Private Sector Employees, along with a proposed certification system and concrete implementation measures to recognize organizations that excel in low-carbon commuting initiatives.

3. Result Promotion and Benefits

(1) Through the implementation of relevant measures by the MOTC, MOENV, Ministry of Economic Affairs and other ministries, GHG emissions of the transportation sector have decreased compared to the base year (37.968 million metric tons, 2005):

① In 2019 and 2020, GHG emissions from the transportation sector were respectively 36.998 and 37.274 million metric tons CO_2e. Furthermore, the total emissions from 2016 to 2020 amounted to 187.040 million metric tons of CO_2e, which is lower than the phase one overall sectoral periodic regulatory target of 189.663 million metric tons. This demonstrates that the efforts to reduce GHG emissions of the transportation sector have yielded positive results.

② 依據經濟部能源署發布之能源平衡表－運輸部門能源消費統計（113年9月2日查詢），推估運輸部門112年溫室氣體排放量約為36.287百萬公噸CO_2e（以聯合國政府間氣候變遷專門委員會（Intergovernmental Panel on Climate Change, IPCC）「第五次評估報告」（The Fifth Assessment Report, AR5溫暖化潛勢值計算；另實際統計值需以環境部公布為主），已達成112年度目標（低於36.791百萬公噸CO_2e），未來運輸部門仍需持續進行溫室氣體減量，以確保可達成第二期階段管制目標。

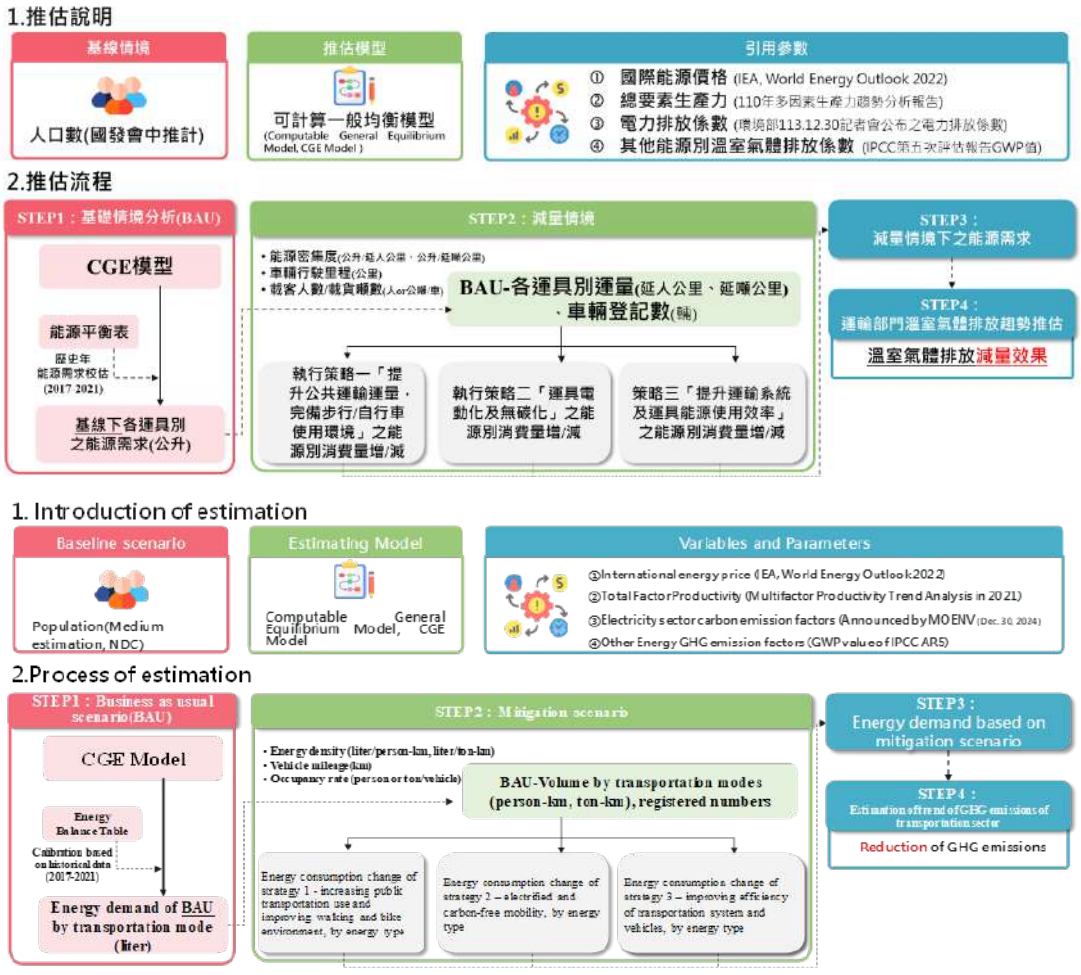
（2）配合行政院淨零轉型關鍵戰略行動計畫推動作業，辦理綠運輸生活型態推廣活動1場次，參與人數達182人。

② The GHG emissions of the transportation sector in 2023 were approximately 36.287 million metric tons of CO_2e, estimated based on the Energy Balance Table – Energy Consumption Statistics of Transportation Sector released by the Ministry of Economic Affairs on September 2, 2024 and Global Warming Potential values from Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). (Note: The final statistics should be subject to the announcements of the MOENV). The target in 2023 has achieved (below 36.791 million metric tons of CO_2e). Moving forward, the transportation sector must continue efforts to reduce GHG emissions to ensure the achievement of the phase two stage control periodic regulatory targets.

(2) In alignment with the Executive Yuan's Net-Zero Transition Key Strategies Action Plan, a green transportation lifestyle promotion event was held, with 182 participants.

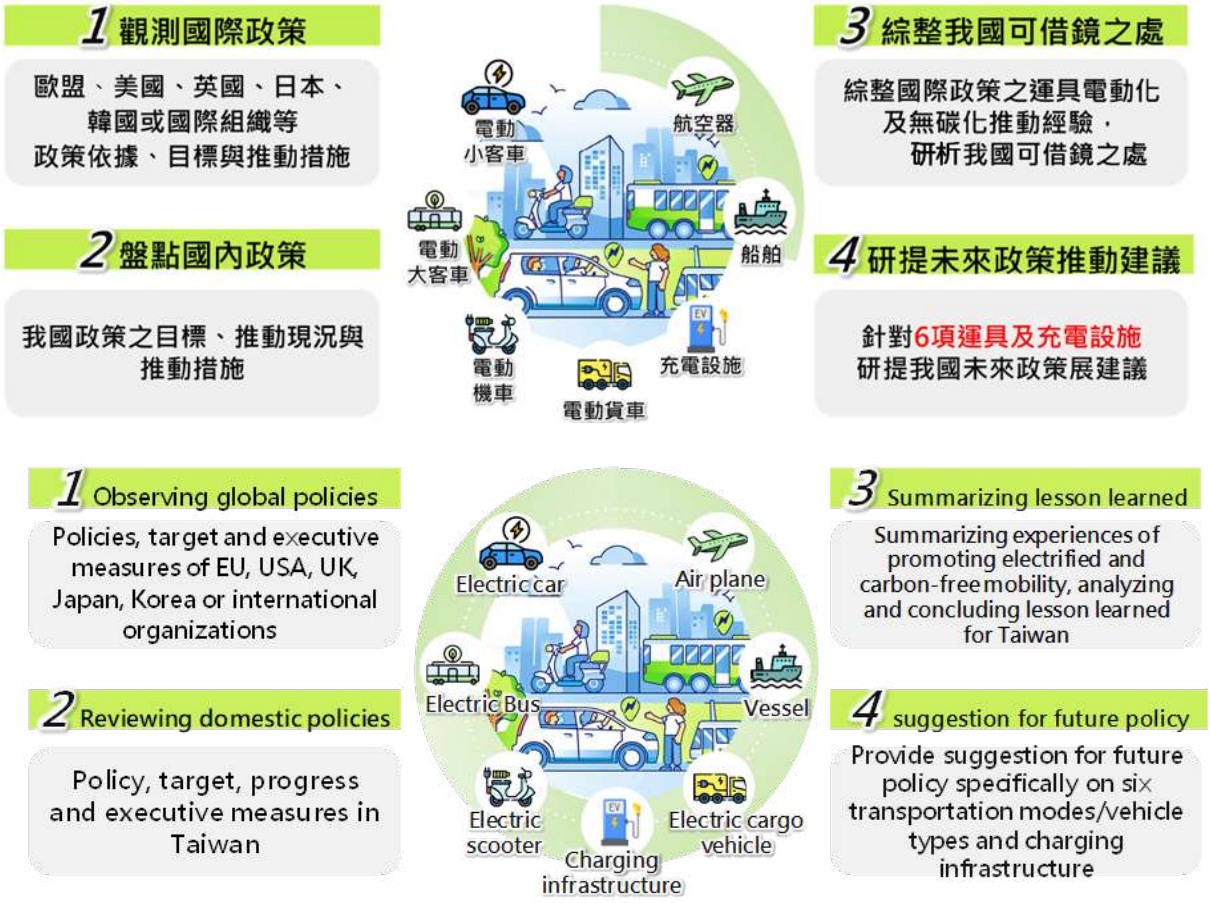
4. 研究成果精華摘整

4. Summary of Research Results



運輸部門溫室氣體排放趨勢推估流程
Estimation Process for Greenhouse Gas Emission Trends in the Transportation Sector

「綠運輸生活型態誘因機制」公私部門座談會（113年9月26日）
"Green Transportation Lifestyle Incentive Mechanism" Public and Private Sector Seminar (September 26, 2024)



運具電動化政策研究架構
Research Framework for Vehicle Electrification Policy

5. 研究成果報告

- 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（2/2）－精進減碳評估方法暨研訂第三期減量目標（預計114年8月出版）

5. Research Result Report

- Enhancing net-zero emission in the transportation sector and promoting carbon reduction evaluation model (2/2) – enhancing carbon reduction evaluation methods and formulating the phase three periodic regulatory goals of the transportation sector (Scheduled to be published in August 2025).

(二)低碳交通區推動機制之研究（2/2）－推動指引

1. 計畫概述

我國於111年3月30日發布「臺灣2050淨零排放路徑及策略總說明」，將低碳交通區納入淨零轉型措施，交通部亦於臺灣2050淨零轉型「運具電動化及無碳化」及「淨零綠生活」關鍵戰略行動計畫將低碳交通區納入具體行動，並請本所於112年至113年期間研究低碳交通區之推動機制，提供交通部公共運輸及監理司應用於補助地方政府推動低碳交通區。

低碳交通區在我國屬地方自治事項，目前已有部分縣市訂定淨零相關自治條列（或草案）並納入低碳交通區，如：臺北市淨零排放管理自治條例已於114年1月22日正式施行，並於第18條揭示市政府得劃定低碳交通區，限制高排碳車輛通行。本計畫以112年研究成果為基礎，徵詢交通部公共運輸及監理司及地方政府意見，提出低碳交通區補助要點（草案）及推動指引，期促進地方政府試辦低碳交通區，減少運輸部門溫室氣體排放。

2. 研究成果

（1）完成研提交通部補助地方政府試辦低碳交通區作業要點（草案）；本計畫參考國內外低碳交通區類似案例，盤點及研析我國地方政府推動低碳交通區相關資源，考量各縣市交通環境差異，建議交通部可分都會型（如：市中心、都市街區）、景區型（如：觀光遊憩區）及園區型（如：產業園區）等3類低碳交通區提供補助，各縣市均可提案申請。

（2）完成研提地方政府低碳交通區推動指引；因應各縣市民情及交通環境差異，且電動運具尚未普及，本計畫建議地方政府因地制宜規劃及推動低碳交通區。地方政府可透過不同區域試辦導入都會型、景區型或園區型低碳交通區，在都市街區可促進低碳運輸使用，在觀光景區可落實低碳觀光旅遊，在產業園區可幫助企業落實ESG，以減少運輸部門溫室氣體排放。

(II) A Study on the Mechanism of Low-Carbon Transportation Zones (2/2)-The Preliminary Guidelines

1. Project Overview

In March 2022, Taiwan officially published "Taiwan's Pathway to Net-Zero Emissions in 2050" including "Low-Carbon Transportation Zones" in its net-zero transition initiatives. The Ministry of Transportation and Communications (MOTC) also incorporated "Low-Carbon Transportation Zones" as a key action in Taiwan's 2050 net-zero transition strategic plans for "Carbon Free Electric Vehicles" and "Green Lifestyle". The Institute of Transportation was tasked with studying the trial implementation and subsidy practices of "Low-carbon transportation zones" by the MOTC from 2023 to 2024. This study aims to support MOTC by offering direction on the discretionary principles for subsidizing local governments to pilot "Low-Carbon Transportation Zones".

"Low-Carbon Transportation Zones" fall under local self-governance in our country. Currently, some counties and cities have established or drafted net-zero related self-governance regulations that include "Low-Carbon Transportation Zones." For example, Taipei City's Net-Zero Emissions Management Self-Governance Ordinance, which came into effect on January 22, 2025, stipulates in Article 18 that the city government may designate "Low-Carbon Transportation Zones" and restrict high-carbon emission vehicles. This study, based on the outcomes of 2023, seeks input from the Department of Public Transportation and Supervision of MOTC and local governments to propose a subsidy draft and provide guidelines for "Low-Carbon Transportation Zones". The aim is to encourage local governments to pilot "Low-Carbon Transportation Zones" and reduce greenhouse gas emissions from the transportation sector.

2. Research Results

(1) Complete the subsidy draft for the MOTC to support local governments in piloting "Low-Carbon Transportation Zones". This study references similar cases of "Low-Carbon Transportation Zones" both domestically and internationally, inventories, and analyzes the resources related to promoting "Low-Carbon Transportation Zones" by local governments. It also considers the differences in transportation environments across counties and cities. It is recommended that the MOTC provide subsidies for three types of "Low-Carbon Transportation Zones": metropolitan (e.g., city centers, urban districts), scenic (e.g., tourist and recreational areas), and park (e.g., industrial parks). All counties and cities can submit proposals.

(2) Complete the guidelines for local governments to pilot "Low-Carbon Transportation Zones". Considering the differences in public sentiment and transportation environments across counties and cities, and the fact that electric vehicles are not yet widespread, this study recommends that local governments pilot "Low-Carbon Transportation Zones" according to local conditions. Local governments can pilot different types of "Low-Carbon Transportation Zones" in various areas: metropolitan (e.g., urban districts) to promote the use of low-carbon transportation, scenic (e.g., tourist areas) to implement low-carbon tourism, and park (e.g., industrial parks) to help enterprises implement ESG practices, thereby reducing greenhouse gas emissions from the transportation sector.

（3）建議地方政府規劃低碳交通區時整合跨部會資源，結合既有資源（如：交通部－公路公共運輸永續及交通平權計畫（114-117年）及智慧運輸系統發展建設計畫（114-117年）、內政部－永續提升人行安全計畫（113-116年）、經濟部－輔導推廣產業園區廠商設置充電樁計畫…等）及既有政策（如：環境部空氣品質維護區、內政部行人友善區）等，加強營造公共運輸環境、智慧運輸環境、人本交通環境及電動運具環境，提升低碳交通區實施綜效。

3. 成果推廣與效益

（1）於113年10月29日、10月30日及11月1日完成北、中、南部研究成果應用交流會，介紹低碳交通區之規劃內容建議，提供地方政府參考應用。

（2）於113年11月15日中華民國環境工程學會第三十六屆（2024）年會暨各專門學術研討會發表研究成果。

（3）於113年10月11日將交通部補助地方政府試辦低碳交通區作業要點（草案）函送交通部參考應用。

4. 研究成果精華摘整

(3) Local governments are encouraged to integrate interdepartmental resources when piloting "Low-Carbon Transportation Zones." This involves combining existing resources, such as the MOTC's "Highway Public Transportation Sustainability and Mobility Equality Plan (2025–2028)" and "Intelligent Transportation System Development Plan (2025-2028)," the Ministry of the Interior's "Sustainable Pedestrian Safety Enhancement Plan (2024-2027)," and the Ministry of Economic Affairs' "Plan to Promote the Installation of Charging Stations in Industrial Parks," alongside existing policies like the Ministry of Environment's Air Quality Maintenance Zones and the Ministry of the Interior's Pedestrian-Friendly Zones. By strengthening environments for public transportation, intelligent transportation, human-oriented transportation, and electric vehicles through this integrated approach, the overall effectiveness of implementing "Low-Carbon Transportation Zones" can be enhanced.

3. Result Promotion and Benefits

(1) Exchange meetings for the northern, central, and southern regions were completed on October 29, October 30, and November 1, 2024, respectively. These meetings presented piloting recommendations for "Low-Carbon Transportation Zones" to local governments.

(2) The study outcomes were presented at the 36th Annual Conference of the Chinese Institute of Environmental Engineering held on November 15, 2024.

(3) On October 11, 2024, the draft for the MOTC's subsidies to local governments for piloting "Low-Carbon Transportation Zones" was forwarded to the MOTC for reference.

4. Summary of Research Results

低碳交通區推動建議
Recommendations for Piloting Low-Carbon Transportation Zones

5. 研究成果報告

低碳交通區推動機制之研究（2/2）－推動指引（預計114年8月出版）

(三)鐵道系統強化調適能力之探討（1/3）－機制與方法

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，賡續辦理鐵道系統強化調適能力之探討，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. 研究成果

（1）蒐整國外鐵道系統氣候變遷調適相關文獻，研析鐵道系統調適發展方向及趨勢，包含鐵道系統強化調適能力文獻、新科技應用調適情形、鐵道系統調適案例，探討氣候變遷影響鐵道系統韌性之主要因素。

（2）研提鐵道系統因應氣候變遷強化調適能力之機制與方法，並以臺北捷運系統為案例，透過Dr.A氣候變遷災害風險調適平台提供之危害、自然脆弱度之圖層資料，與臺北捷運車站出入口之點位套疊，藉以辨識在未來升溫情境下，臺北捷運車站出入口暴露在溢淹下之風險程度。

5. Research Result Report

A Study on the Mechanism of Low-Carbon Transportation Zones (2/2)-The Preliminary Guidelines (Scheduled to be published in August 2025).

(III) A Study of Enhancing the Adaptive Capacity of Railway Systems (1/3) – Mechanism and Method

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. Research Results

(1) Collect international literature related to climate change adaptation in railway systems to study the development directions and trends of adaptation strategies. This includes research on enhancing the adaptive capacity of railway systems, the application of new technologies for adaptation, and case studies of railway system adaptation. The study will also explore the key factors affecting the resilience of railway systems under climate change.

(2) Propose mechanisms and methods to enhance the railway system's climate change adaptation capacity. Taking the Taipei Metro system as a case study, the project will utilize hazard and natural vulnerability data layers provided by the Dr.A Climate Change Risk Adaptation Platform. By overlaying these data with the locations of Taipei Metro station entrances and exits, the project aims to identify the level of flood exposure risk for each station entrance under future warming scenarios.

3. 成果推廣與效益

（1）完成「鐵道系統調適機制與方法之初探」論文，發表於「中華民國運輸學會2024年年會暨學術論文國際研討會（112年12月5~6日）。

（2）完成「鐵道系統強化調適能力之探討（1/3）－機制與方法」1場次（113年9月13日）專家座談會，與各領域專家研討本計畫研議鐵道系統強化調適能力有關機制與方法之可行性，並凝聚後續推動之共識。

（3）完成「鐵道系統強化調適能力之探討（1/3）－機制與方法」1場次（113年10月18日）教育訓練暨成果分享，邀請國內鐵道系統權責機關（構）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）完成鐵道系統因應氣候變遷強化調適能力機制與方法之建議，做為賡續辦理高鐵、臺鐵、捷運、輕軌調適能力作為與指引之基礎。

3. Result Promotion and Benefits

(1) Completed the research paper titled "Preliminary Study on Adaptation Mechanisms and Methods for Railway Systems", which was presented at the 2024 Annual Conference and International Symposium of the Chinese Institute of Transportation (December 5–6, 2023).

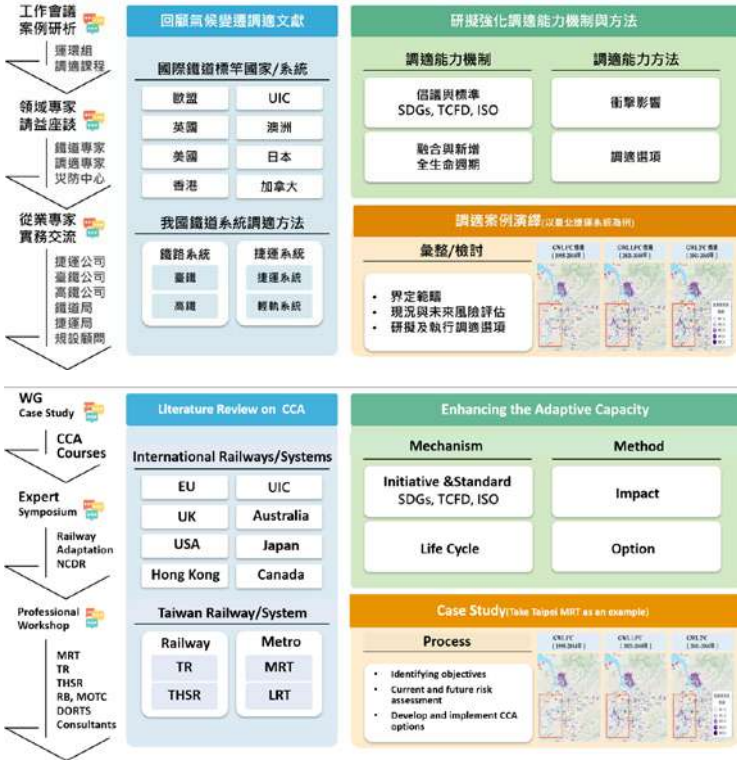
(2) Held one expert Symposium on "A Study of Enhancing the Adaptive Capacity of Railway Systems (1/3) – Mechanism and Method" on September 13, 2024. Experts from various fields discussed the feasibility of the proposed mechanisms and methods for strengthening the adaptation capacity of the railway system, reaching a shared consensus for future implementation.

(3) Conducted one training and result-sharing session on "A Study of Enhancing the Adaptive Capacity of Railway Systems (1/3) – Mechanism and Method" on October 18, 2024. Representatives from the domestic railway system authorities were invited to participate, where they were introduced to international adaptation trends and case studies to support the integration of adaptation knowledge into their respective responsibilities.

(4) Developed recommendations for mechanisms and methods to enhance the adaptation capacity of railway systems in response to climate change, serving as a foundational reference for future adaptation measures and guidelines for high-speed rail, Taiwan Railways, MRT, and LRT.

4. 研究成果精華摘整

4. Summary of Research Results



鐵道系統因應氣候變遷調適機制與方法之框架

Framework of mechanisms and methods for CCA railway systems

5. 研究成果報告

鐵道系統強化調適能力之探討（1/3）－機制與方法（預計114年8月出版）

5. Research Result Report

A Study of Enhancing the Adaptive Capacity of Railway Systems (1/3) – Mechanism and Method (Scheduled to be published in August 2025).

(四)交通部自行車路線整合評估與精進（I）

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，本所於113年配合辦理「交通部自行車路線整合評估與精進（I）」，完成第二條環島路線之初步規劃，並針對114~116年工作項目預為規劃，以提供公路局及觀光署推動之參據。

2. 研究成果

（1）研擬「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」及「臺鐵兩鐵車站導覽圖樣板」。

（2）針對環島1號線進行通盤檢討（含局部改線規劃）。

（3）優先以專用路權型式規劃第2條環島路網，並針對路網整併研提後續推動方向。

3. 成果推廣與效益

（1）於113年6月3日、13日、14日、19日辦理北、中、南、東4場教育訓練。

（2）於中華民國戶外遊憩學會2024第26屆休閒、遊憩、觀光學術研討會暨國際論壇發表「自行車路線推廣行銷策略－以參山國家風景區為例」論文。

（3）本研究成果可提供自行車道權責機關改善相關設施建置之依據；並做為自行車道主管機關審查計畫之參考應用。

(IV) An Integrated Evaluation and Enhancement of Cycling Routes by The Ministry of Transportation and Communications(I)

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)" in 2024, completing the preliminary planning of the second national cycling route loop and pre-planning future tasks for 2025–2027 to support implementation by the Highway Bureau and the Tourism Administration.

2. Research Results

(1) Formulated the "Guidelines for the Installation of Signs and Markings for Round-Island and Diversified Bicycle Routes (including alternative routes)" and developed a "Template Design for Taiwan Railways' Bike-and-Rail Station Guide Maps."

(2) Conducted a comprehensive review of Cycling Route No. 1, including localized route realignment planning.

(3) Prioritized planning the second national cycling loop using dedicated right-of-way infrastructure and proposed future directions for integrated network development.

3. Result Promotion and Benefits

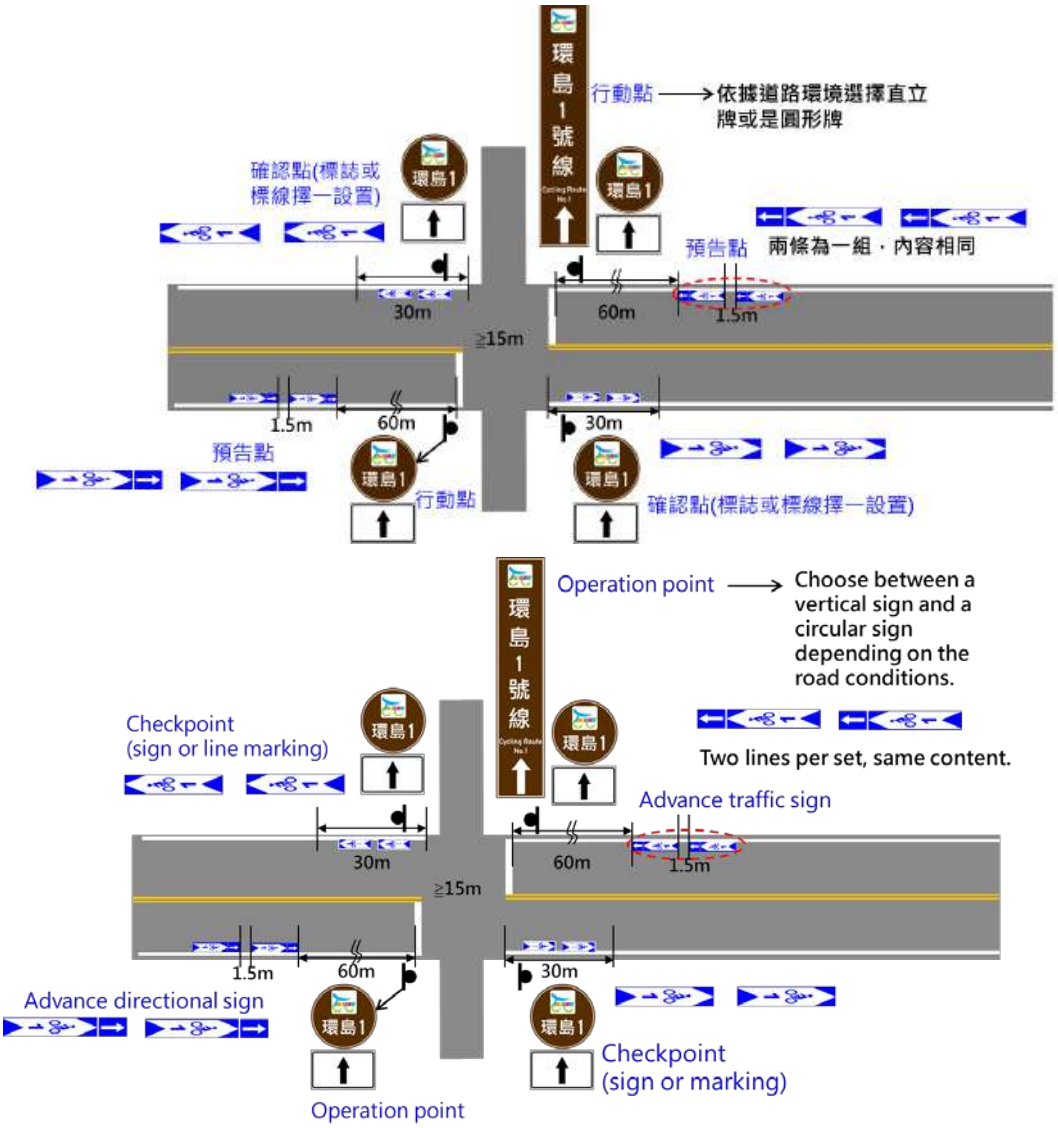
(1) Four training workshops were held in the northern, central, southern, and eastern regions on June 3, 13, 14, and 19, 2024.

(2) The paper titled "Marketing Strategies for Bicycle Route Promotion: A Case Study of the Tri-Mountain National Scenic Area" was presented at the 26th Annual Conference and International Forum on Leisure, Recreation, and Tourism, organized by the Outdoor Recreation Association of the Republic of China in 2024.

(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.

4. 研究成果精華摘整

4. Summary of Research Results



自行車環島路線（含替代路線）及多元路線標誌標線整合布設範例示意圖

Illustrative Example of Integrated Signage and Pavement Marking Layout for Round -Island (Including Alternative) and Diversified Bicycle Routes

5. 研究成果報告

- 「交通部自行車路線整合評估與精進（I）」（預計114年8月出版）

5. Research Result Report

- An Integrated Evaluation and Enhancement of Cycling Routes by the Ministry of Transportation and Communications(I) (Scheduled to be published in August 2025).

（五）「自行車道系統規劃設計參考手冊」修訂

1. 計畫概述

考量本所出版「自行車道系統規劃設計參考手冊（2017修訂版）」迄今已逾7年，近年相關法規（如：「道路交通標誌標線號誌設置規則」、「市區道路及附屬工程設計規範」、「公路路線設計規範」及「交通工程規範」等）亦針對涉及自行車部分進行修訂，爰本所於113年度於「交通部自行車路線整合評估與精進（I）」配合相關條文增修進行更新，並進一步檢視更新手冊中相關範例圖說，提出「自行車道系統規劃設計參考手冊」（初稿），以做為自行車道執行機關進行規劃設計時之依據。

2. 研究成果

完成「自行車道系統規劃設計參考手冊」初稿。

3. 成果推廣與效益

本研究成果可提供自行車道權責機關改善相關設施建置之依據；並做為自行車道主管機關審查計畫之參考應用。

4. 研究成果精華摘整

(V) Revision of "A Study of Integration and Evaluation of the Bicycle Lane Network System"

1. Project Overview

Since the publication of the "A Study of Integration and Evaluation of the Bicycle Lane Network System (2017 Revised Edition)" over seven years ago, several relevant regulations–such as the Regulations for Road Traffic Signs, Markings, and Signals, the Urban Road and Associated Engineering Design Standards, the Highway Route Design Standards, and the Traffic Engineering Standards–have been revised to incorporate bicycle-related provisions. In response, the institute has undertaken updates to align with these regulatory amendments as part of the 2024 project "An Integrated Evaluation and Enhancement of Cycling Routes by The Ministry of Transportation (I)" Additionally, a comprehensive review of illustrative examples in the manual has been conducted, resulting in the preparation of a preliminary draft of the "Study of Integration and Evaluation of the Bicycle Lane Network System", intended to serve as a technical basis for competent authorities in the planning and design of bicycle lanes.

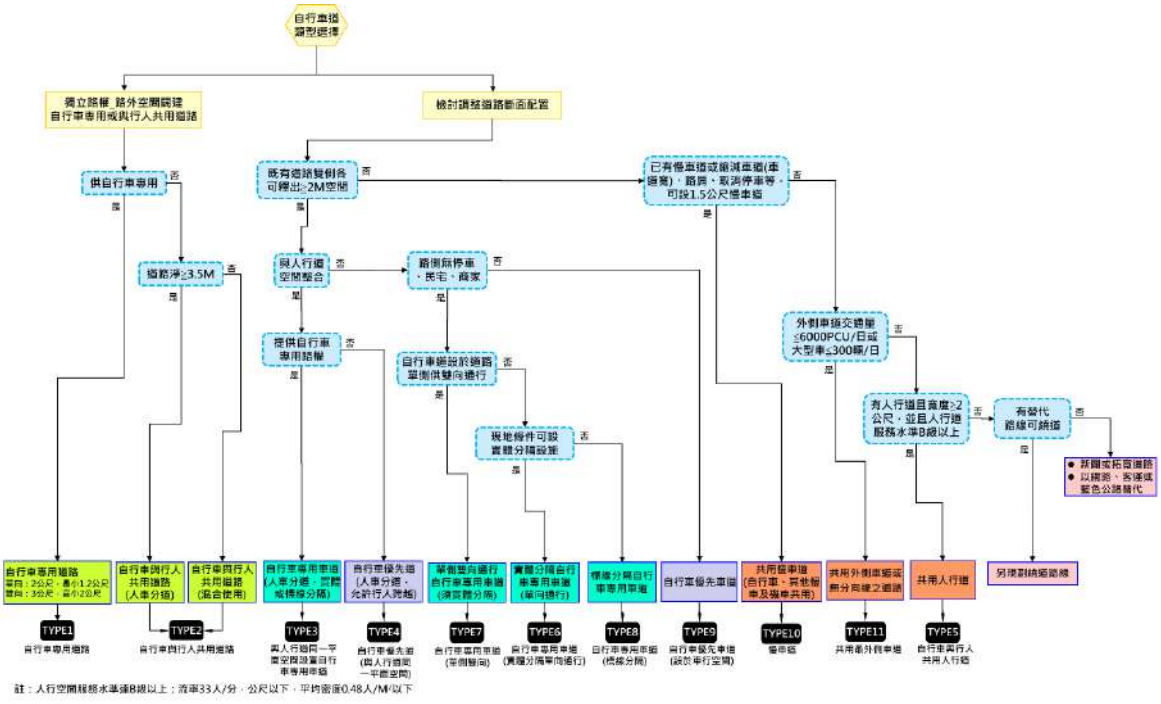
2. Research Results

The preliminary draft of the "A Study of Integration and Evaluation of the Bicycle Lane Network System" has been completed.

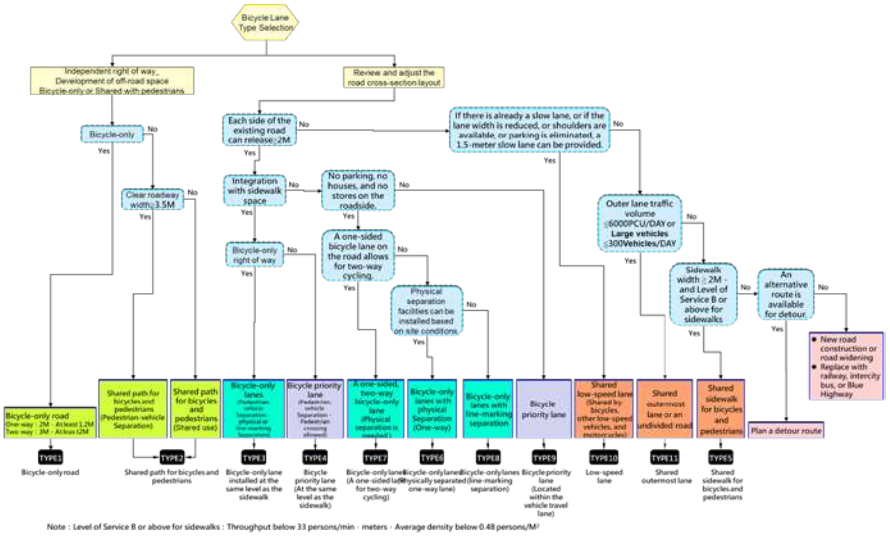
3. Result Promotion and Benefits

The findings of this study can serve as a basis for competent authorities to improve the development of bicycle lane facilities and as a reference for regulatory agencies in reviewing related planning projects.

4. Summary of Research Results



「自行車道系統規劃設計參考手冊」－自行車道設置篩選流程圖



Flowchart for the Selection Process of Bicycle Lane Installation
– A Study of Integration and Evaluation of the Bicycle Lane Network System

5. 研究成果報告

- 「自行車道系統規劃設計參考手冊」（預計114年8月出版）

(六)建構運輸管理機關（構）之調適專業能力（2/2）－人才培育及機制建議

1. 計畫概述

我國「氣候變遷因應法」於112年2月公布施行，第17條「為因應氣候變遷，政府應推動調適能力建構之事項」中包含應強化氣候變遷調適之教育與人才培育。考量運輸系統為國家重要基礎設施，與民眾生活息息相關，本計畫期透過辦理運輸系統調適專業課程，強化各運輸管理機關（構）面對未來極端氣候事件之調適專業知識。

本計畫為2年期計畫，第1年（112年）已透過訪談及問卷調查盤點運輸設施管理機關（構）人員調適專業知能之缺口，據以規劃符合實際需求的調適課程。第2年（113年）滾動檢討及辦理運輸調適教育訓練課程及工作坊，製作運輸系統因應氣候變遷調適知識本及研議運輸管理機關（構）調適專業人才培育機制，期藉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，俾能即早因應，降低設施面對氣候變遷衝擊之風險，維持運輸服務不中斷。

5. Research Result Report

- A Study of Integration and Evaluation of the Bicycle Lane Network System (Scheduled to be published in August 2025).

(VI) Construction of Professional Adaptability of Transportation Governing Authority (Agency) (2/2)–Talent Development and Mechanism Recommendations

1. Project Overview

The "Climate Change Response Act" was promulgated and implemented in February 2023. Article 17 "To respond to climate change, the government should promote the construction of adaptation capabilities," includes strengthening education and talent cultivation for climate change adaptation. Considering that the transportation system is a critical infrastructure for the country and closely related to people's lives, this project aims to enhance the professional knowledge of various transportation management agencies in adapting to future extreme climate events through specialized courses.

This is a two-year project. In the first year (2023), we conducted interviews and surveys to identify gaps in climate change adaptation knowledge among staff at transportation facility management agencies. We designed adaptation training courses tailored to their practical needs based on the findings. In the second year (2024), we continued to review and update our strategies while organizing education and training sessions and workshops on transportation adaptation. We are also developing a knowledge handbook on how transportation systems can respond to climate change and exploring ways to build a long-term training system for adaptation professionals in transportation agencies. The goal is to strengthen the ability of transportation agency staff to adapt their facilities to climate change. We hope they can respond earlier and more effectively by improving their knowledge and skills, reducing the risk of disruptions and helping keep transportation services running smoothly even as climate conditions change.

2. 研究成果

（1）蒐集國內外氣候變遷調適發展趨勢、相關課程／教材、國內法令及相關作業規定，並研析國內外可應用運輸調適相關資訊，以及辦理調適課程規劃專家學者座談會，完成規劃運輸調適課程。

（2）辦理運輸調適教育訓練課程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210人次參加；透過講師講授及分組實務演練，提升運輸管理機關（構）人員調適知能。

（3）製作運輸系統因應氣候變遷調適知識本，提供運輸管理機關（構）人員全面調適知識框架及快速查找調適資訊的工具書，使調適業務人員能依循國家調適框架執行各項程序，以確實推動調適工作。

（4）研提運輸管理機關（構）調適專業人才培育機制，引導機關（構）厚植人員氣候變遷調適能力，自主培訓專業人員。

3. 成果推廣與效益

（1）完成「運輸系統氣候變遷調適專業課程規劃」論文，發表於「中華民國運輸學會2024年年會暨學術論文國際研討會」（113年12月5~6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（113年6月21日、113年8月1日、113年9月30日及113年10月25日），第1場次課程內容包含氣候風險決策參考資訊、氣候變遷情境資訊介紹與應用；第2場次課程內容包含氣候服務的內容與資料解讀、氣候變遷調適指引範例；第3場次課程內容包含氣候變遷風險評估準則及執行程序、調適綜合理念；第4場次課程內容包含運輸系統在氣候變遷調適的環境正義議題、氣候服務在調適應用案例。另於113年8月26日辦理「調適執行實作－運輸系統調適指引實務推演工作坊」及113年11月12日辦理「運輸氣候變遷風險評估－範疇界定操作工作坊」。

（3）透過調適課程培訓，強化運輸從業人員對氣候變遷調適的知能，以降低運輸設施面對氣候變遷衝擊之風險。

2. Research Results

(1) To collect information on domestic and international trends in climate change adaptation, relevant training courses and materials, national laws, and operational guidelines. We also analyzed adaptation information applicable to the transportation sector and held expert roundtable discussions to design suitable transportation adaptation training courses.

(2) Hold four adaptation training sessions and two workshops for transportation agencies. The events combined expert lectures and group-based practical exercises to improve transportation personnel's adaptation knowledge and skills.

(3) To develop a climate change adaptation handbook for transportation systems, offering a comprehensive knowledge framework and a quick-reference guide for transportation agency personnel. This handbook helps adaptation staff follow national adaptation frameworks and procedures, thereby supporting effective implementation of adaptation efforts.

(4) Propose a mechanism for developing professional climate adaptation talent within transportation agencies, aiming to strengthen internal capacity and support agencies in independently training their own adaptation professionals.

3. Result Promotion and Benefits

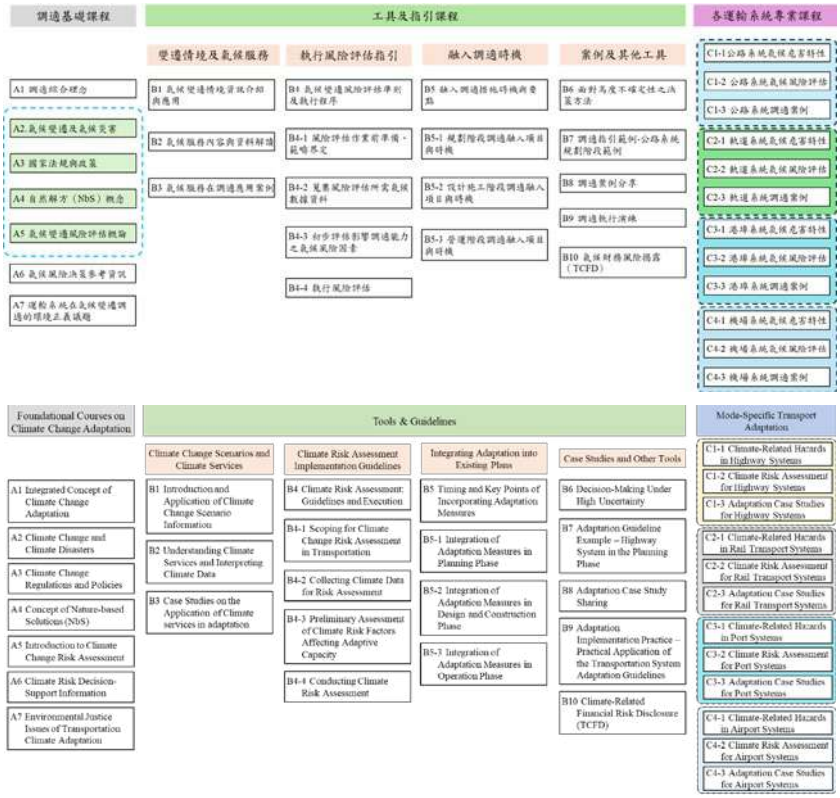
(1) Completed the "Development of training program on climate change adaptation of transportation system" paper presented at the "2024 Taiwan Disaster Management Conference" (December 5-6, 2024).

(2) Conducted four educational training sessions under the "Climate Change Adaptation Training Series" on June 21, August 1, September 30, and October 25, 2024. The first session included topics on climate risk decision-support information and introducing and applying climate change scenario data. The second session focused on the content and interpretation of climate services and examples of climate adaptation guidelines. The third session covered criteria and procedures for climate change risk assessment and integrated concepts of adaptation. The fourth session explored environmental justice issues in transportation adaptation and case studies on the application of climate services in adaptation efforts. In addition, a hands-on workshop titled "Adaptation Implementation Practice – Practical Application of the Transportation System Adaptation Guidelines" was held on August 26, 2024, and another workshop on "Scoping for Climate Change Risk Assessment in Transportation" was conducted on November 12, 2024.

(3) These adaptation training sessions and workshops significantly enhanced the knowledge and skills of transportation professionals in climate change adaptation, helping to reduce the risks faced by transportation facilities under climate change impacts.

4. 研究成果精華摘整

4. Summary of Research Results



運輸調適完整課程規劃

Comprehensive Curriculum Plan for Climate Change Adaptation in Transportation

「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" training

階段	目標	執行項目
短期、中期	提升個人能力	• 指定並培訓**種子師資** • 參加各單位辦理之**調適課程、研討會** • 辦理**在職訓練**（納入教育訓練範疇、委辦計畫增列工作項目） • 提供**進修和培訓獎勵**/獎學金 • 建立**學習歷程紀錄** • **招募人力**
	借重外部資源	• 主動蒐集、建置**調適相關資源** • 建置可傳遞調適知識與經驗管道（**網頁、群組**） • **觀摩**國內其他部會執行經驗 • 與**大學合作**辦理運輸調適課程或訓練 • **出國參訪**
長期	建構組織能力	• 工作安排/工作輪換 • 建置**調適工作模板** • 辦理內部知識與**經驗交流會議** • 結合高等教育體系**培訓專業人才** • 成果展示與宣導

Phase	Objective	Implementation Items
Short-term / Mid-term	Enhance Individual Capability	• Designate and train **seed instructors** (e.g., course materials handled by the Training Institute in 2023 and 2024) • Participate in various **adaptive courses** and **seminars** organized by different agencies • Conduct **on-the-job training** (included in education training scope, added as work items in commissioned projects) • Provide **incentives for advanced study and training** / scholarships • Establish **learning history records** • **Recruit personnel**
	Leverage External Resources	• Proactively collect and establish **relevant adaptive resources** • Develop dissemination channels for adaptive knowledge and experience (**websites, groups**) • **Observe** implementation experiences of other government departments • **Collaborate with universities** to offer adaptive transportation courses or training • **Overseas visits**
Long-term	Build Organizational Capability	• Arrange work distribution / **job rotation** • Develop **adaptive work templates** • Organize **internal experience-sharing meetings** • Collaborate with higher education institutions to **train professional personnel** • **Showcase results and provide guidance**

運輸管理機關（構）調適專業人才培育機制

Professional Talent Development Mechanism for Climate Change Adaptation in Transportation Agencies

5. 研究成果報告

- 建構運輸管理機關（構）之調適專業能力（2/2）－人才培育及機制建議（預計114年8月出版）

(七)路口交通環境特性對空氣品質影響及改善指引之研訂（2/2）－資料分析與指引研訂

1. 計畫概述

近年空氣污染議題深受民眾關注，而車輛所產生之空氣污染，對於駕駛人本身、行人以及環境，皆會產生負面影響。而路口為民眾經常往來的地方，與日常生活息息相關，過往路口交通改善之目的大多為減少壅塞、提升運作效率或安全性等考量，本計畫則以減少交通空污為出發點，研擬減污推動策略及指引，降低國人交通空污暴露風險。

本計畫為2年期計畫，第1年（112年）已研擬交通及空污資料調查計畫，並辦理4處路口之現地調查。第2年（113年）辦理6處路口調查，再透過空污排放擴散模式進行模擬，評估交通特性對路口交通空污之影響，據以規劃路口交通空污改善策略，並進一步研訂改善指引，供相關單位參考應用，以改善路口空氣品質。

2. 研究成果

（1）延續前期研究之成果，檢討修正第1年路口資料調查計畫，並據以完成另外6處路口資料調查；再透過調查資料搭配空污模擬模式，完成不同交通管理策略情境下之空污減量效益分析，整體而言以人行道拓寬與行人專用時相之空污減量成效較佳；惟考量各路口環境特性不同，減污成效可能有所差異。

（2）彙整路口交通空污之分析流程，研擬通案性路口交通空污改善指引，供相關權責機關應用改善指引之內容進行改善規劃，並依當地路口特性評估調整，減少機關操作之困難度。

5. Research Result Report

- Construction of Professional Adaptability of Transportation Governing Authority (Agency) (2/2) – Talent Development and Mechanism Recommendations (Scheduled to be published in August 2025).

(VII) The Impact of Traffic Environmental Characteristics at Intersections on Air Quality and the Development of Improvement Guidelines (2/2)- Data Analysis and Develop Guidelines

1. Project Overview

In recent years, air pollution has become a growing public concern. Vehicle-generated air pollution negatively impacts not only drivers themselves but also pedestrians and the environment. Intersections, being high-traffic areas closely tied to daily life, have traditionally been improved with goals such as reducing congestion, enhancing operational efficiency, or improving safety. However, this project takes a different approach—focusing on reducing traffic-related air pollution. It aims to develop strategies and guidelines to reduce public exposure to transportation-related air pollutants.

This is a two-year project. In the first year (2023), a traffic and air pollution data survey plan was formulated, and on-site investigations were conducted at four selected intersections. In the second year (2024), surveys at six additional intersections are being carried out. The project used an air pollution dispersion modeling approach to assess how traffic characteristics affect air pollution levels at intersections. Based on these findings, targeted improvement strategies will be proposed, along with the development of actionable guidelines for relevant agencies to reference and apply, ultimately aiming to improve air quality at intersections.

2. Research Results

(1) Building upon the results of the previous phase, the intersection survey plan from the first year was reviewed and revised, leading to the completion of surveys at six additional intersections. Using the collected data and applying an air pollution dispersion model, the project analyzed the air pollution reduction benefits under various traffic management scenarios. Overall, strategies such as sidewalk widening and implementation of exclusive pedestrian phases demonstrated better performance in reducing pollution. However, considering the varying environmental characteristics of each intersection, the effectiveness of these strategies may differ.

(2) The project also compiled a standardized analytical process for assessing traffic-related air pollution at intersections and developed a general guideline for intersection air quality improvement. This guideline is intended to assist relevant authorities in planning and implementing improvement measures. It also encourages agencies to adjust the recommendations based on local intersection conditions to reduce operational complexity.

3. 成果推廣與效益

（1）辦理2場次的研究成果分享會議，並邀請交通及環境專家學者擔任與談人，以及交通及環境等中央與地方單位及相關工作者共同參與，分享、交流交通管理策略對於降低路口交通空污濃度之研究及經驗，提供與會者後續相關參考應用。

（2）研究成果彙整為「應用GRAL街谷擴散模式分析交通特性對於路口交通空污之影響」，於環工學會第36屆年會暨研討會發表（113年11月15日至113年11月16日）。

（3）透過指引之操作，可降低路口交通空污濃度，整體而言透過人行道拓寬與行人專用時相等措施，對降低細懸浮微粒及一氧化碳濃度之改善成效較為明顯。

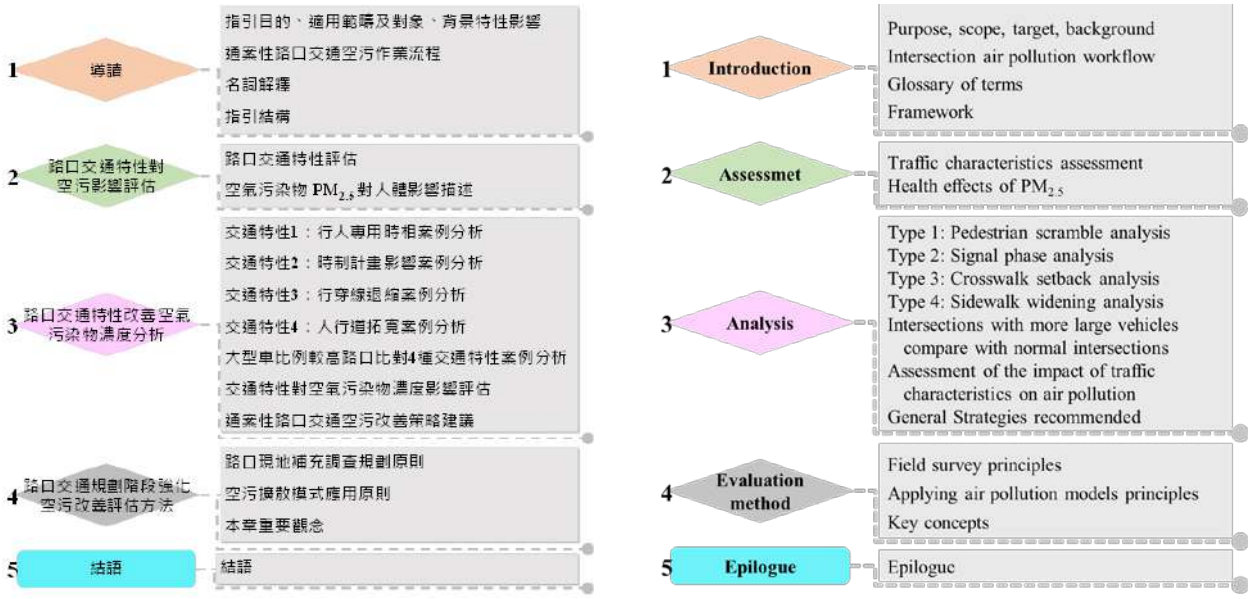
3. Result Promotion and Benefits

(1) Two research result-sharing sessions were held, inviting transportation and environmental experts and scholars as panelists, along with participants from central and local government agencies and related professionals in the fields of transportation and environmental management. These sessions served as a platform for sharing and exchanging research findings and experiences regarding the effectiveness of traffic management strategies in reducing intersection-related air pollution, providing valuable references for future applications.

(2) The research results were compiled into a study titled "Using the GRAL Street Canyon Dispersion Model to Analyze the Impact of Traffic Characteristics on Intersection Air Pollution," which was presented at the 36th Annual Conference and Symposium of the Chinese Institute of Environmental Engineering (CIEnvE) held from November 15 to 16, 2024.

(3) The application of the developed guidelines demonstrates the potential to reduce traffic-related air pollution at intersections. In general, sidewalk widening and exclusive pedestrian phases show more significant improvements in reducing concentrations of fine particulate matter ($PM_{2.5}$) and carbon monoxide (CO).

4. 研究成果精華摘整



路口交通空污改善指引架構

Guideline framework for improving intersection traffic air pollution

交通措施	降低空氣污染物濃度效果							
	一般路口				大型車比例較高路口			
	單一污染源		複雜污染源		單一污染源		複雜污染源	
	$PM_{2.5}$	CO	$PM_{2.5}$	CO	$PM_{2.5}$	CO	$PM_{2.5}$	CO
行人專用時相-全天專用（07-19）	●	○	●	○	△	○	●	●
行人專用時相-尖峰專用（07-09、17-19）	●	○	●	○	●	●	●	●
時制計畫影響－主幹道綠燈加 5 秒	△	△	△	△	△	○	△	●
時制計畫影響－主幹道綠燈減 5 秒	△	●	△	△	●	●	△	●
行穿線退縮 - 距離待轉格 6 公尺	●	●	△	△	△	△	△	●
行穿線退縮 - 距離待轉格 10 公尺	△	●	△	△	△	●	△	●
人行道拓寬 - 拓寬 0.5 公尺	●	●	△	●	●	●	●	●

補充說明：所有情境皆以**行人等候區域**之空氣污染濃度進行比對，● 代表空污減量；○ 代表空污增量；△ 代表空污影響無顯著性差異。

Traffic measures	Air Pollution Reduction Effectiveness							
	Normal intersection				Intersections with more large vehicles			
	Single pollution source		Complex pollution source		Single pollution source		Complex pollution source	
	$PM_{2.5}$	CO	$PM_{2.5}$	CO	$PM_{2.5}$	CO	$PM_{2.5}$	CO
Pedestrian scramble- all day (07-19)	●	○	●	○	△	○	●	●
Pedestrian scramble- peak hour (07-09、17-19)	●	○	●	○	●	●	●	●
Signal phase- main roads add 5 secs. greenlight	△	△	△	△	△	○	△	●
Signal phase- main roads reduce 5 secs. greenlight	△	●	△	△	●	●	△	●
Crosswalk setback- 6m from left turn waiting zone	●	●	△	△	△	△	△	●
Crosswalk setback- 10m from left turn waiting zone	△	●	△	△	△	●	△	●
Sidewalk widening by 0.5m	●	●	△	●	●	●	●	●

Note: All scenarios are compared based on the air pollution concentration in the pedestrian waiting area.
●: Reduction air pollution ○: Increase air pollution △: No significant

不同交通措施對降低空氣污染物濃度之效果
The effectiveness of different traffic measures in reducing air pollutant concentrations

5. 研究成果報告

路口交通環境特性對空氣品質影響及改善指引之研訂（2/2）－資料分析與指引研訂（預計114年8月出版）

五 深化運輸安全管理

(一)研析國家鐵道安全計畫之安全績效與目標管理（2/2）－風險課題檢討與控管機制

1. 計畫概述

依據國家鐵道安全計畫（SSP），透過研訂具體之國家安全績效指標與目標值，引導鐵道營運機構自訂有效的安全領先指標，係鐵道監理推動績效目標管理的重要對策。本計畫113年持續透過國內外風險課題與控管機制之文獻蒐集、國內安全資料實證分析，精進並綜整研提國家鐵道安全績效指標階段性作法、安全監理配套措施及營運機構指標制定指引等建議。

5. Research Result Report

The Impact of Traffic Environmental Characteristics at Intersections on Air Quality and the Development of Improvement Guidelines (2/2)- Data Analysis and Develop Guidelines. (Scheduled to be published in August 2025).

V Deepen Transportation Safety Management

(I) A study on the application of safety performance management by objectives in the railway state safety program (2/2) – review of focal risk areas and risk controls

1. Project Overview

According to the Railway State Safety Program (SSP), developing specific national safety performance indicators and target values is a key strategy to guide railway operators in establishing effective leading safety indicators, thereby supporting performance-based railway supervision. In 2024, this project continues to refine and consolidate phased approaches for national railway safety performance indicators, supporting supervisory measures and providing guidance for railway operators in setting indicators. This is achieved through the literature review on domestic and international focal risk areas and risk controls, and empirical analysis of domestic safety data.

2. 研究成果

（1）完成先進國家鐵道監理機關與營運機構所關注之風險課題與相應控管機制回顧。

（2）持續蒐集鐵道監理機關及營運機構之安全資料，進行第2年期安全資料實證分析，綜整研提國家鐵道安全績效指標階段性作法。

（3）研析國家鐵道風險課題與控管機制，並提出安全資料（如事故事件、事故前兆或領先指標）之認定原則精進、未來風險預警與控管機制等配套措施之建議。

3. 成果推廣與效益

（1）於113年12月9日辦理一場次成果說明會暨教育訓練，向鐵道監理機關、營運機構說明本計畫成果，協助其更具體了解我國鐵道相關層級式安全指標的現況與後續規劃，包含指標層級架構、國家層級之指標、營運機構自訂指標、指標評估機制等，暨說明後續可能的安全監理配套措施，例如事故事件紀錄表單的精進、非行車事故的統計等。

（2）提供鐵道監理機關掌握國家安全績效指標內容與目標值，並做為後續修正國家鐵道安全計畫（SSP）之參考應用。

（3）協助鐵道營運機構提昇安全管理系統作業水準。

2. Research Results

(1) Complete a review of focal risk areas and corresponding risk controls concerned by railway regulatory authorities and operators in advanced countries.

(2) Continuously collect safety data from railway regulatory authorities and operators, conduct the second-year empirical analysis of safety data, and propose phased approaches for national railway safety performance indicators.

(3) Analyze national railway focal risk areas and risk controls and propose recommendations for refining the identification principles of safety data (such as accidents, precursors, or leading indicators) and related measures for future risk warning and control mechanisms.

3. Result Promotion and Benefits

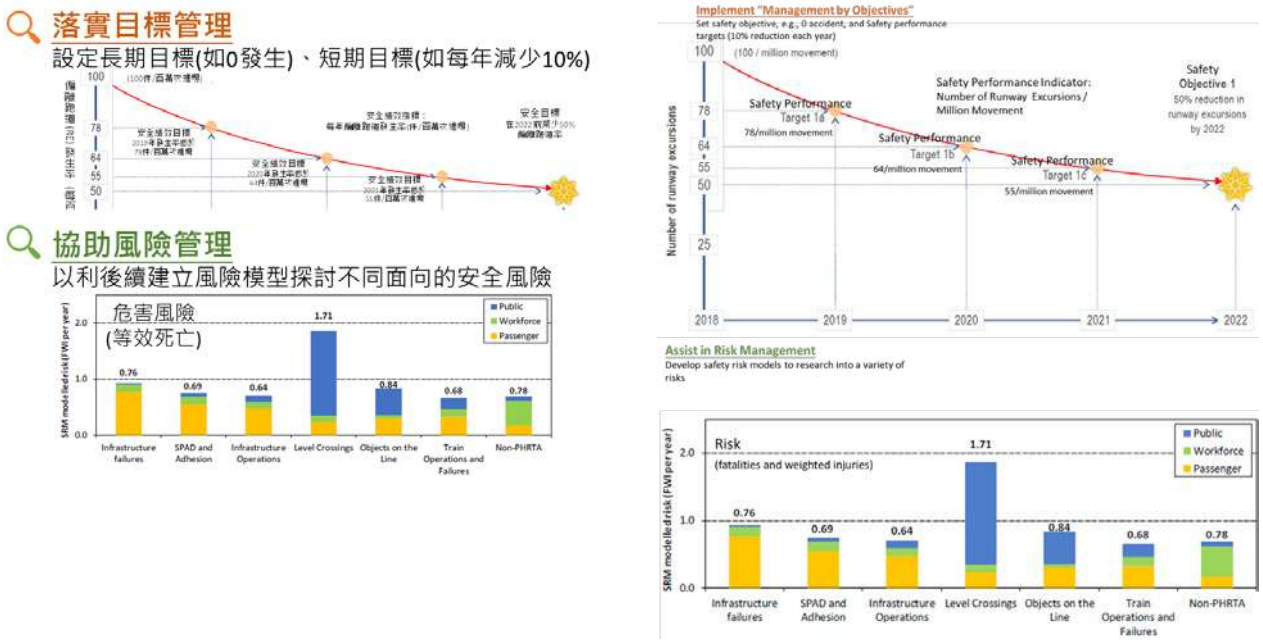
(1) Conduct one outcome presentation and educational training session on December 9, 2024, to explain the outcomes of this project to railway regulatory authorities and operating organizations, assisting them in gaining a more concrete understanding of the current status and future plans for Taiwan's railway-related hierarchical safety indicators. This includes the indicator hierarchy framework, national-level indicators, operating organization-defined indicators, indicator evaluation mechanisms, etc., as well as explaining potential subsequent safety regulatory supporting measures, such as the refinement of accident/incident record forms and the statistics of non-operational accidents.

(2) Provide railway regulatory authorities with a grasp of the content and target values of national safety performance indicators, serving as a reference for future revisions of the National Railway Safety Programme (SSP).

(3) Assist railway operating organizations in enhancing the operational standards of their safety management systems.

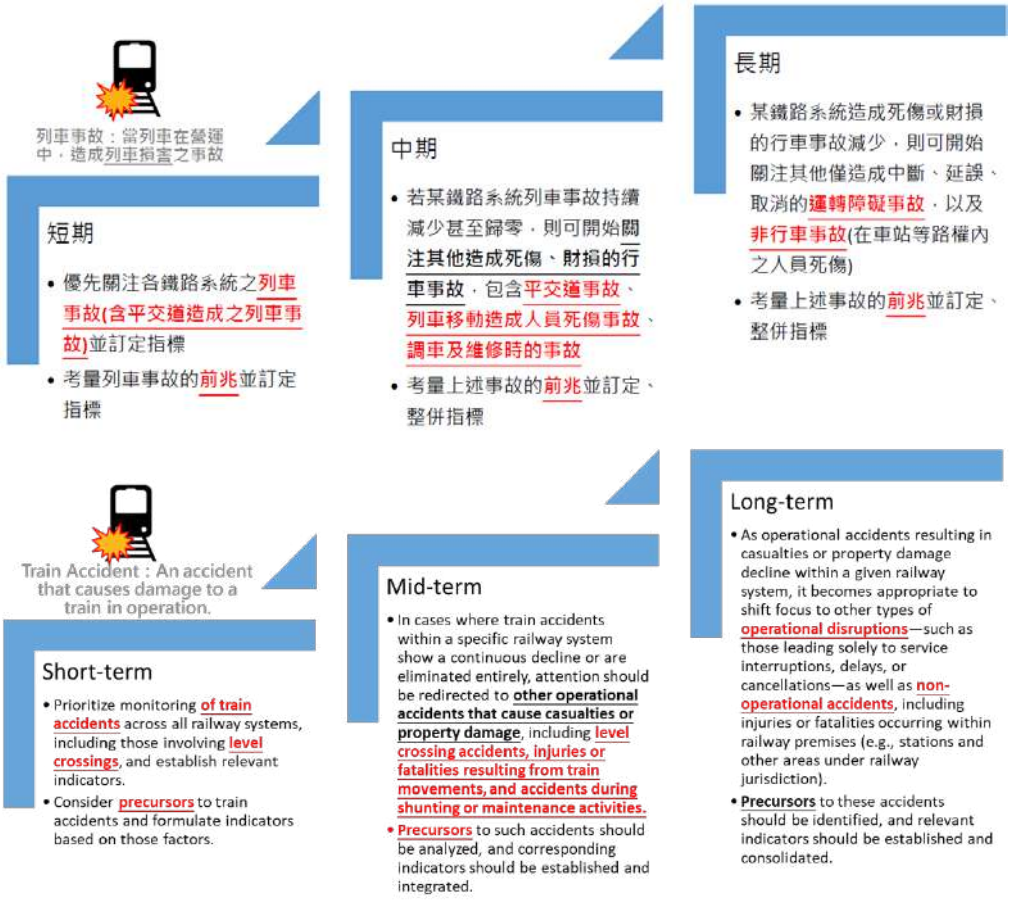
4. 研究成果精華摘整

4. Summary of Research Results



風險課題與SSP指標的期望

Focal Risk Areas and Expectation of SSP Indicators



SSP指標階段性作法建議

Phased Approach for Developing SSP Safety Performance Indicators

5. 研究成果報告

- 研析國家鐵道安全計畫之安全績效與目標管理（2/2）－風險課題檢討與控管機制（期末報告已送委辦機關交通部鐵道局，不另出版報告）。

(二)新興科技導入學校交通安全教育之研發示範計畫（2/2）－成效評估與推廣應用

1. 計畫概述

配合交通部109年研訂之國小、國中、高中各學習階段交通安全基本能力，本計畫以行人、自行車及機車等用路人為主題，結合智慧型行動裝置為學習平台，發展具擬真情境、互動性、遊戲性的交通安全教育學習輔助軟體，並做為108課綱交通安全教育的教學資源，提供國小、國中、高中實施交通安全課程時運用，以輔助學校交通安全教育的落實推動。

2. 研究成果

（1）完成交通安全教學輔助軟體，編撰教學指引及操作手冊提供教師使用。

（2）於國小、國中、高中共19校完成教學示範與成效評估，學生使用平板體驗學習反應熱烈，教師亦能迅速統計學生學習績效，完成教學評估；經入校測試評估可提升學生學習興趣及成績，本計畫所示範的數位教學可做為傳統上課的選項之一。

3. 成果推廣與效益

（1）辦理教學觀摩與成效評估，涵蓋北、中、南、東包括高中、國中及國小共19校次學校，學生使用平板體驗學習，反應熱烈，老師亦能利用資訊記錄系統，統計學生學習績效，迅速完成教學效果的評估。

（2）學習輔助軟體透過交通部及教育部的教材平台提供國小、國中及高中使用，已有國小於資訊教室中設置。另與公路局合作，於交通安全教育園區提供民眾體驗學習，亦有其他監理所站應用本計畫成果製作宣導內容。

5. Research Result Report

- A study on application of safety performance management by objectives in railway state safety program (2/2) – review of focal risk areas and risk controls (Final report submitted to the Railway Bureau, MOTC. No separate publication.)

(II) Demonstration Project on Integrating Emerging Technologies into School Traffic Safety Education (2/2) – Effectiveness Evaluation and Promotion of Applications

1. Project Overview

In line with the Ministry of Transportation and Communications' (MOTC) 2020 established fundamental traffic safety competencies for elementary, junior high, and senior high school learning stages, this project focuses on road users such as pedestrians, cyclists, and motorcyclists. It utilizes smart mobile devices as a learning platform to develop traffic safety education learning auxiliary software featuring realistic scenarios, interactivity, and gamification. This software will serve as a teaching resource for traffic safety education under the 2019 Curriculum Guidelines, providing elementary, junior high, and senior high schools with tools to implement traffic safety courses and facilitate the practical promotion of traffic safety education in schools.

2. Research Results

(1) Complete the traffic safety teaching auxiliary software and compile teaching guidelines and user manuals for teachers' use.

(2) Conduct teaching demonstrations and effectiveness evaluations in a total of 19 schools (elementary, junior high, and senior high). Students showed enthusiastic learning responses when using tablets for the experiential learning, and teachers were also able to quickly compile student learning performance data and complete teaching evaluations. In-school testing and evaluation demonstrated that it can enhance students' learning interest and academic performance. The digital teaching demonstrated in this project can serve as an alternative to traditional classroom instruction.

3. Result Promotion and Benefits

(1) Conducted teaching demonstrations and effective evaluations across 19 school sessions (elementary, junior high, and senior high) in northern, central, southern, and eastern Taiwan. Students showed enthusiastic responses to experiential learning using tablets, and teachers were able to utilize the information recording system to compile student learning performance data and quickly complete evaluations of teaching effectiveness.

(2) The learning auxiliary software is available for use by elementary, junior high, and senior high schools through the teaching material platforms of the Ministry of Transportation and Communications and the Ministry of Education, with some elementary schools already installing it in their computer labs. Furthermore, in collaboration with the Directorate General of Highways, it is offered for public experiential learning at traffic safety education parks, and other Motor Vehicle Supervision Stations have also applied the project's outcomes to create promotional content.

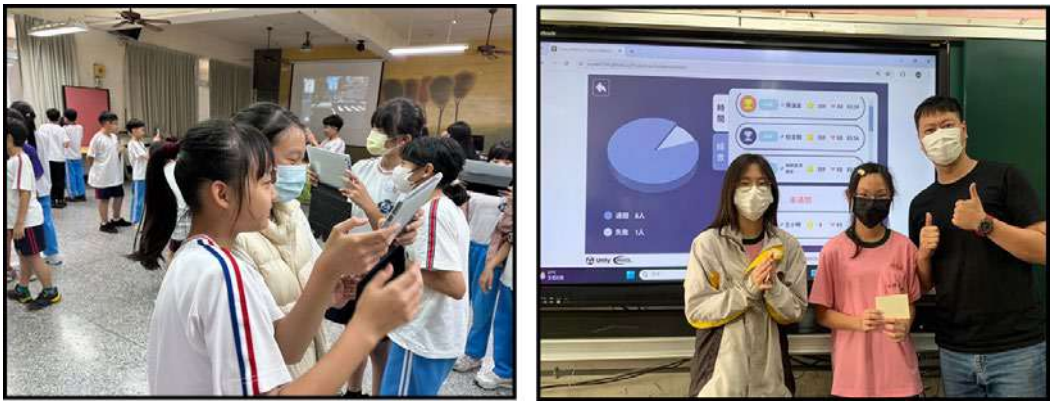
（3）運用新興科技發展交通安全多元教材，可提升學生學習興趣及成效，強化學生用路安全觀念。

(3) Developing diverse traffic safety teaching materials using emerging technologies can enhance students' learning interest and effectiveness and strengthen their road safety awareness.

4. 研究成果精華摘整

4. Summary of Research Results

行人通過路口之情境及學習回饋
Scenarios of pedestrians crossing intersections



於學校進行教學示範與成效評估
Teaching demonstrations in schools

5. 研究成果報告

- 新興科技導入學校交通安全教育之研發示範計畫（2/2）－成效評估與應用（預計114年8月出版）。

5. Research Result Report

- Evaluation and application in introducing emerging technologies into road safety education in schools (Scheduled to be published in August 2025).

(三)道路交通安全檢查制度導入研究（1/2）－建構道路安全檢查工具

(III) Research on the implementation of road safety inspection (1/2) - development of road safety inspection tools

1. 計畫概述

「道路安全檢核Road Safety Audit, RSA」是指在道路建設專案規劃設計建設及通車前後，檢視其設計文件，針對安全議題，由獨立的檢核師所執行的一個正式的安全檢核程序；另就現有道路的檢核，可加以區分並稱為「道路安全檢查Road Safety Inspection, RSI」，針對既有道路進行系統性的現場

1. Project Overview

"Road Safety Audit (RSA)" refers to a formal safety review process conducted by independent auditors on the design documents of road construction projects during the planning, design, construction, and post-opening phases, specifically addressing safety issues. For reviews of existing roads, a distinction can be made and termed "Road Safety Inspection (RSI)," which involves a systematic on-site inspection of existing roads by road safety experts to identify road facilities or sections with road safety deficiencies that could potentially lead to severe accidents. This project aims

檢查作業，由道路安全專家執行辨識出可能導致嚴重事故的安全風險的道路設施或具有道路安全缺陷的部分。本計畫旨在導入道路安全檢查制度，針對道路與交通工程設計與改善策略、國內目前道路安全檢查與檢核制度、國外道路安全檢查與檢核制度進行文獻回顧。基於文獻之探討，完成我國道路安全檢核制度發展架構（含公路基礎設施安全管理規範（草案）及整體發展架構推動藍圖），以及研擬國內道路安全檢查表初稿及手冊初稿。期間辦理專家學者座談會，進行多方的溝通，針對道路安全檢核制度發展架構與道路安全檢查表初稿進行交流與意見討論，並檢討修正相關內容。

2. 研究成果

（1）完成我國道路安全檢核制度發展架構（含公路基礎設施安全管理規範（草案）及整體發展架構推動藍圖）。

（2）完成我國道路安全檢查表及手冊初稿。

（3）完成1處道路安全檢查表現地試檢查。

3. 成果推廣與效益

（1）於113年11月8日辦理「道路交通安全檢查教育訓練」，邀請各級道路主管機關、顧問公司、交通工程技師與民間團體約107人參加。

（2）從我國道路安全檢核制度發展架構出發，勾勒後續推動藍圖。另藉由研提道路安全檢查制度，可提供交通部及道路管理機關參考，並運用於既有道路的道路工程與交通工程的檢查與改善工作，提供用路人順暢、安全的道路交通環境。

（3）道路安全改善將由被動的肇事後檢討改善導向，轉變成具有主動的事前檢查改善導向，促成優先考量交通安全的道路設計，以建構更人本、人性的友善交通環境。

to introduce a Road Safety Inspection system, conducting a literature review on road and traffic engineering design and improvement strategies, the current domestic road safety inspection and audit system, and international road safety inspection and audit systems. Based on the literature review, the project will complete the development framework for Taiwan's Road Safety Audit system (including a draft Highway Infrastructure Safety Management Specification and an overall development framework promotion blueprint), and develop a preliminary draft of a domestic Road Safety Inspection checklist and a preliminary draft of a manual. During the project, expert and scholar seminars will be held for multi-faceted communication, exchanging views and discussing the development framework of the Road Safety Audit system and the preliminary draft of the Road Safety Inspection checklist, as well as reviewing and revising relevant content.

2. Research Results

(1) Completed the development framework for Taiwan's Road Safety Audit system (including a draft Highway Infrastructure Safety Management Specification and an overall development framework promotion blueprint).

(2) Completed the preliminary drafts of Taiwan's Road Safety Inspection checklist and manual.

(3) Completed one on-site trial inspection to demonstrate road safety inspection performance.

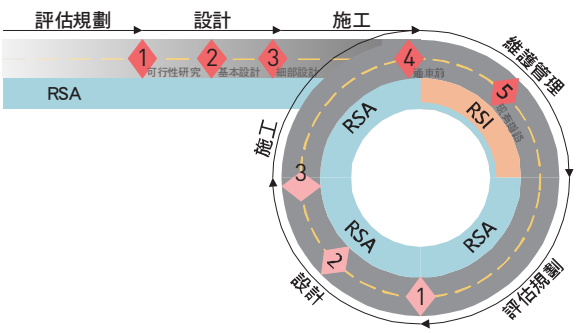
3. Result Promotion and Benefits

(1) Held a "Road Traffic Safety Inspection Educational Training" on November 8, 2024, with approximately 107 participants, including representatives from road management authorities at all levels, consulting companies, traffic engineers, and non-governmental organizations.

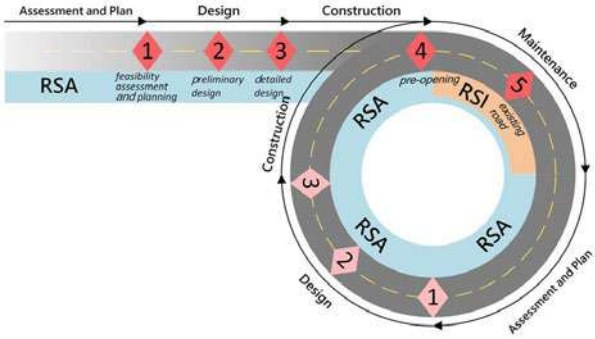
(2) Starting from the development framework of Taiwan's Road Safety Audit system, the subsequent promotion blueprint was outlined. Furthermore, by proposing a Road Safety Inspection system, it can provide a reference for the Ministry of Transportation and Communications and road management authorities, and be applied to the inspection and improvement work of road engineering and traffic engineering on existing roads, providing road users with a smooth and safe road traffic environment.

(3) Road safety improvement will shift from a passive, post-accident review and improvement approach to a proactive, pre-inspection and improvement approach, promoting road design that prioritizes traffic safety to build a more people-oriented and humane-friendly traffic environment.

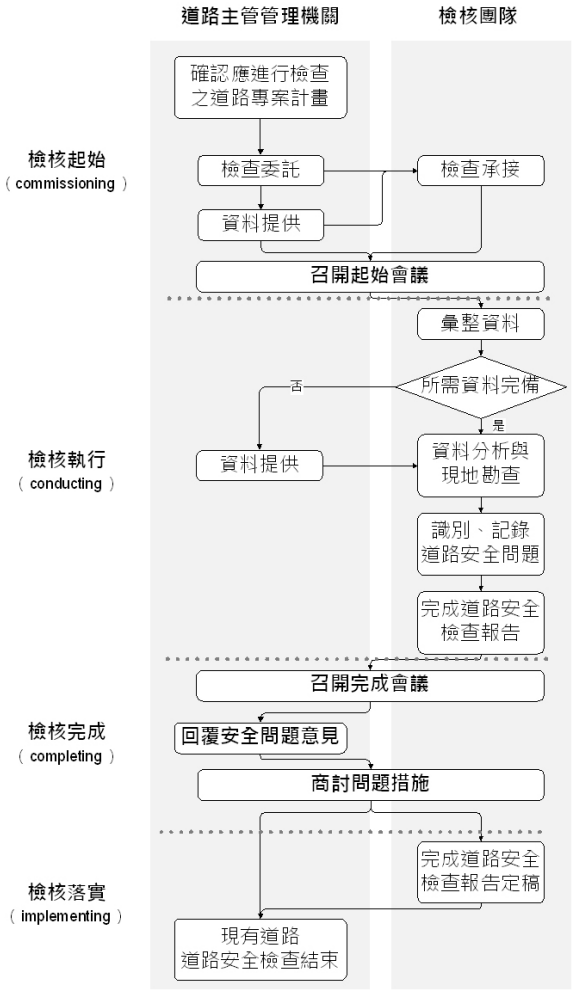
4. 研究成果精華摘整

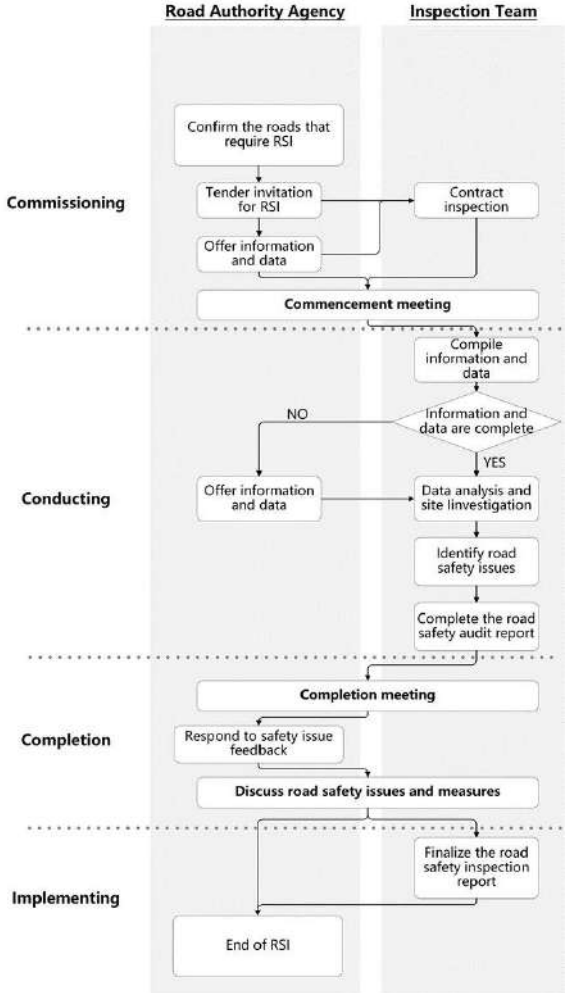


4. Summary of Research Results



道路安全檢核各階段關係圖
RSA relationship diagram for each stage





道路安全檢查流程圖
Road safety inspection flowchart

5. 研究成果報告

- 道路交通安全檢查制度導入研究（1/2）－建構道路交通安全檢查工具（預計114年8月出版）。

5. Research Result Report

- Research on the implementation of road safety inspection (1/2) – development of road safety inspection tools (Scheduled to be published in August 2025).

(四)研擬道路交通標誌標線號誌設置參考指引（1/3）－一般道路情境

1. 計畫概述

「道路交通標誌標線號誌設置規則」（以下簡稱設置規則）係由交通部及內政部合頒，設置規則僅有單一標誌、標線、號誌之圖例，交通部頒之「交通工程規範」亦偏向設置原則，較缺乏相關設施之組合設置案例及詳細運用解說，致使各道路管理機關設置相關設施，常因對於法規不瞭解或認知不一致，而產生現行常見的標誌標線號誌等問題，例如設置錯誤、設置方式不一致、自明性不足等。

本計畫目的在於盤點國內現行之「道路交通標誌標線號誌設置規則」涉及之設置課題，以及研擬通用性之「道路交通標誌標線號誌設置參考指引」，以藉由本參考指引協助道路管理機關規劃及設置標誌標線號誌設施，提供用路人更一致、更自明、更安全的道路交通環境。

另組成標誌標線號誌審議小組，透過執行審議小組機制，不定期召開審議小組會議，對各道路主管機關所提標誌標線號誌設置規則（以下簡稱設置規則）建議事項、待釐清疑義與試辦計畫進行審議，並做成審議決議供交通部參考，同時透過此一辦理程序，參考國外規範或規則的審議機制，研提未來設置規則檢討修正機制。

2. 研究成果

（1）盤點本參考指引涉及之設置課題，依複雜程度區分為一般及複雜道路情境。

（2）研提本參考指引一般道路情境之設置圖例及運用解說，共18種情境。

（3）於計畫期間依交通部指示，本所籌組審議小組，處理設置規則法規檢討及研提建議修正草案供交通部修法參考，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，共召開4次會議完成11項案件審議。

(IV) Develop reference guidance for the installation of road traffic signs and signals (1/3) – general road conditions

1. Project Overview

The "Regulations for Road Traffic Signs, Markings, and Signals" (hereinafter referred to as the Regulations) are jointly promulgated by the Ministry of Transportation and Communications and the Ministry of the Interior. The Regulations only provide illustrations of individual signs, markings, and signals. At the same time, the "Traffic Engineering Specifications" issued by the Ministry of Transportation and Communications tend to focus on installation principles and lack examples of combined installations and detailed application explanations. This often leads to common issues with existing signs, markings, and signals when various road management authorities install related facilities due to a lack of understanding or inconsistent interpretation of the regulations, such as incorrect installations, inconsistent installation methods, and insufficient conspicuity.

This project aims to inventory the current installation issues involved in the domestic "Regulations for Road Traffic Signs, Markings, and Signals" and to develop a universal "Reference Guidelines for the Installation of Road Traffic Signs, Markings, and Signals." These reference guidelines aim to assist road management authorities in planning and installing sign, marking, and signal facilities, providing road users with a more consistent, conspicuous, and safer road traffic environment.

Furthermore, a Sign, Marking, and Signal Review Committee will be formed. Through the implementation of this committee mechanism, review committee meetings will be held irregularly to review suggestions, ambiguities requiring clarification, and pilot projects proposed by various road management authorities regarding the Regulations for Road Traffic Signs, Markings, and Signals (hereinafter referred to as the Regulations). Review decisions will be made for the Ministry of Transportation and Communications' reference. Simultaneously, through this process, and by referencing the review mechanisms of foreign standards or regulations, a mechanism for future review and amendment of the Regulations will be proposed.

2. Research Results

(1) Inventoried the installation issues involved in these reference guidelines, categorizing them into general and complex road scenarios based on their complexity.

(2) Developed installation illustrations and application explanations for general road scenarios in these reference guidelines, totaling 18 scenarios.

(3) During the project period, as instructed by the Ministry of Transportation and Communications, the Institute organized a Review Committee to handle matters such as reviewing the Regulations for Road Traffic Signs, Markings, and Signals and proposing draft amendments for the Ministry's legislative reference, as well as reviewing pilot projects and effectiveness analysis reports for new-style signs, markings, and signals, convening a total of 4 meetings and completing the review of 11 cases.

3. 成果推廣與效益

（1）於113年8月15日辦理「一般道路情境之設置圖例及運用解說暨標誌標線號誌設置規則之使用經驗交流」座談會進行產官學意見交流，與會人數38人。於113年10月31日辦理「道路交通標誌標線號誌設置規則修訂機制交流」座談會進行意見蒐集，參與人數24人。於113年11月21日辦理成果說明會推廣計畫執行成果，計有70人參加，另於114年1月3日交通部道安記者會對外發布研究成果。

（2）研究成果可提供交通部及部屬機關、內政部國土管理署、地方政府、各道路交通管理機關及民間交通工程顧問公司，做為設置道路標誌、標線、號誌之參據。

（3）研究成果可讓交通工程相關從業人員更加瞭解相關設施設置時，相關注意事項及其代表意義，以提供用路人更良好的道路環境。

3. Result Promotion and Benefits

(1) Held a symposium on August 15, 2024 on "Installation Illustrations and Application Explanations for General Road Scenarios and Experience Sharing in Using the Regulations for Road Traffic Signs, Markings, and Signals" to facilitate opinion exchange among industry, government, and academia, with 38 participants. Held a symposium on October 31, 2024, on "Exchange on the Revision Mechanism of the Regulations for Road Traffic Signs, Markings, and Signals" to gather opinions, with 24 participants. Held an outcome presentation on November 21, 2024, to promote the project's achievements, with 70 participants. Furthermore, the research results were publicly announced at the Ministry of Transportation and Communications' road safety press conference on January 3, 2025.

(2) The research findings can serve as a reference for the Ministry of Transportation and Communications and its affiliated agencies, the National Land Management Agency of the Ministry of the Interior, local governments, various road traffic management authorities, and private traffic engineering consulting companies when installing road signs, markings, and signals.

(3) The research findings can enable traffic engineering professionals to better understand the relevant considerations and meanings when installing related facilities, thereby providing users with a better road environment.

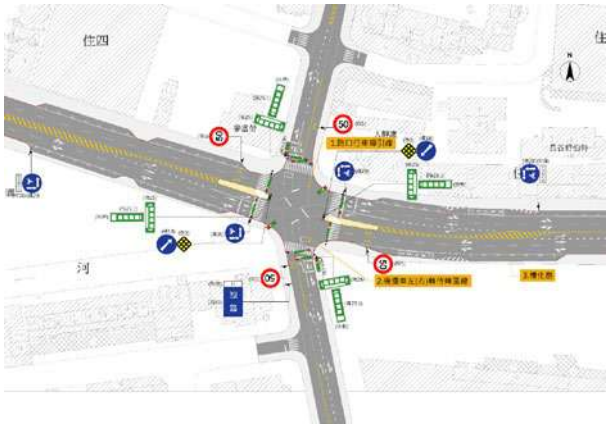
4. 研究成果精華摘整

一般道路情境類型共18種列表如下：

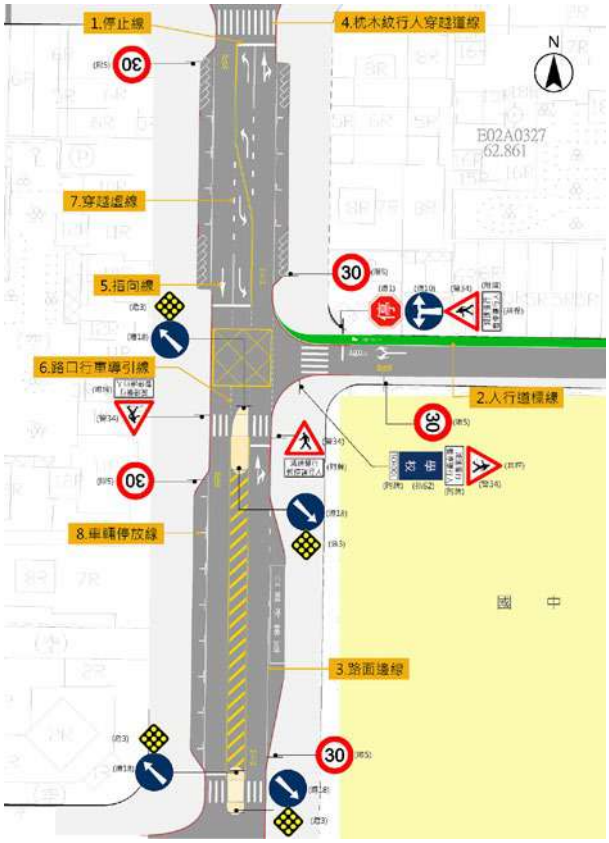
4. Summary of Research Results

The list of 18 general road scenario types is as follows:

無號誌三叉路口 Unsignalized T-intersection	市區正交三叉路口 Urban right-angle T-intersection
	市區斜交三叉路口 Urban skewed T-intersection
	鄉區正交三叉路口 Rural right-angle T-intersection
	鄉區斜交三叉路口 Rural skewed T-intersection
	市區匯入型巷道路口 Urban merging alley intersection
	鄉區匯入型巷道路口 Rural merging alley intersection
號誌化三叉路口 Signalized T-intersection	市區正交三叉路口 Urban right-angle T-intersection
	市區斜交三叉路口 Urban skewed T-intersection
	鄉區正交三叉路口 Rural right-angle T-intersection
	鄉區斜交三叉路口 Rural skewed T-intersection
無號誌四叉路口 Unsignalized 4-way intersection	市區正交四叉路口 Urban right-angle 4-way intersection
	市區斜交四叉路口 Urban skewed 4-way intersection
	鄉區正交四叉路口 Rural right-angle 4-way intersection
	鄉區斜交四叉路口 Rural skewed 4-way intersection
號誌化四叉路口 Signalized 4-way intersection	市區正交四叉路口 Urban right-angle 4-way intersection
	市區斜交四叉路口 Urban skewed 4-way intersection
	鄉區正交四叉路口 Rural right-angle 4-way intersection
	鄉區斜交四叉路口 Rural skewed 4-way intersection



號誌化市區斜交四叉路口之設置圖例
Signalized skewed four-way intersection in urban areas - installation diagram



無號誌市區正交三叉路口交通設施整體設置圖例
Overall installation diagram of traffic facilities at an unsignalized right-angled T-intersection in an urban area

5. 研究成果報告

- 道路交通標誌標線號誌設置參考指引－一般道路情境（114年1月交通部對外發布）。
- 研擬道路交通標誌標線號誌設置參考指引（1/3）－一般道路情境（預計114年8月出版）

5. Research Result Report

- Develop reference guidance for the installation of road traffic signs and signals - general road conditions (Publicly released by the MOTC in January 2025)
- Develop reference guidance for the installation of road traffic signs and signals (1/3)- general road conditions (Scheduled to be published in August 2025).

(五)道安改善專業能力建構

1. 計畫概述

各級道安主管機關每年度從工程、教育、執法、監理、宣導等各面向，投入預算與人力執行各項道安改善工作，然而長期而言，倘道安改善工作無法系統性整合，將導致成功及失敗之經驗難以分享；此外，目前國內對於道安改善之人才培育缺乏完整機制，在無專業人力得以支援道安改善工作的困境下，不利道安工作推動。因此，本計畫針對道安知識平台、道安人員專業培訓制度、道安專業輔導／諮詢團隊機制、事故多重肇因分析初探等4項子題，提出未來精進道安改善相關技術及建立完整培訓制度的初步架構。

2. 研究成果

（1）完成道安知識平台之系統架構及系統軟硬體規劃，初步回顧國內外重要道安改善策略以及盤點相關資料來源，並研提未來永續運作之可行機制。

（2）完成道安從業人員應有之基本知能及其與目前國內現有道安課程之落差盤點，據以提出大專院校交通相關系所專業教育、道安從業人員之課程規劃與示範性教材。

（3）以道安產業生態鏈概念，提出道安專業輔導／諮詢團隊之短、中、長期發展建議，以及整合道安知識平台、道安人員專業培訓相關成果的可行運作機制。

（4）盤點國內外事故分析所需資料，檢視國內現有資料落差，並歸納短、中、長期建議建置之資料欄位，做為未來擴展資料分析能量之參據。

(V) Professional capacity development for road safety enhancement

1. Project Overview

Each year, road safety authorities at all levels invest budgets and manpower in various road safety improvement efforts across engineering, education, enforcement, supervision, and promotion aspects. However, if road safety improvement work cannot be systematically integrated in the long term, it will be difficult to share both successful and unsuccessful experiences. Furthermore, there is currently a lack of a comprehensive mechanism for cultivating road safety improvement personnel in Taiwan. The difficulty in securing professional personnel to support road safety improvement work hinders the advancement of road safety initiatives. Therefore, this project proposes a preliminary framework for future advancements in road safety improvement-related technologies and the establishment of a comprehensive training system, focusing on four sub-topics: a road safety knowledge platform, a professional training system for road safety personnel, a mechanism for a road safety professional guidance/consultation team, and a preliminary exploration of multiple causality analysis of accidents.

2. Research Results

(1) Completed the system architecture and hardware/software planning for the road safety knowledge platform, conducted an initial review of significant domestic and international road safety improvement strategies and an inventory of relevant data sources, and proposed feasible mechanisms for its future sustainable operation.

(2) Completed an inventory of the essential basic knowledge and skills required for road safety practitioners and the gaps compared to existing domestic road safety courses, and based on this, proposed professional education for transportation-related departments in universities and colleges, curriculum planning for road safety practitioners, and demonstrative teaching materials.

(3) Based on the concept of the road safety industry ecosystem, proposed short-term, mid-term, and long-term development recommendations for a road safety professional guidance/consultation team, as well as a feasible operational mechanism for integrating the road safety knowledge platform and the outcomes related to professional training for road safety personnel.

(4) Inventoried the data required for domestic and international accident analysis, reviewed the gaps in existing domestic data, and summarized short-term, mid-term, and long-term recommendations for data fields to be established, serving as a reference for future expansion of data analysis capabilities.

3. 成果推廣與效益

（1）於113年10月17日辦理一場次示範教學與成果交流，邀請國內交通、工務、警政及教育等各道安相關領域從業人員參加，展示本計畫開發之示範課程，以及了解參訓人員對各項道安專業培訓之需求。

（2）相關成果可做為後續相關平台、教材開發之基礎，以利從專業知能、完善工具兩層面，提升國內道安從業人員執行道安改善計畫知能量。

3. Result Promotion and Benefits

(1) Held a demonstration teaching and outcome exchange session on October 17, 2024, inviting domestic practitioners from various road safety-related fields such as transportation, public works, police administration, and education to participate, showcasing the demonstrative courses developed by this project and understanding the training needs of the participants for various road safety professional skills.

(2) The relevant outcomes can serve as a foundation for the subsequent development of related platforms and teaching materials, thereby enhancing the capabilities of domestic road safety practitioners in implementing road safety improvement projects from both the perspectives of professional knowledge and skills and comprehensive tools.

4. 研究成果精華摘整

交通安全概論及相關先修與專業課程架構
Introduction to Traffic Safety and the Structure of Related Prerequisite and Professional Courses

示範教學與成果交流會議
Demonstration teaching and outcome exchange meeting

5. 研究成果報告

- 道安改善專業能力建構（預計114年8月出版）。

5. Research Result Report

- Professional capacity development for road safety enhancement (Scheduled to be published in August 2025).

六 推動交通科技創新應用與產業發展

(一)構建5G智慧交通數位神經中樞－功能擴充與精進

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110年至111年完成之相關研究規劃與階段性推動執行成果，辦理112－113年智慧交通數位神經中樞系統之功能擴充與精進作業，持續擴充示範城市實證場域範圍與所需偵測設備、擴大與提升緊急救援車輛智慧優先號控功能實作範圍及成效、發展人工智慧交通管理／公共運輸之相關決策支援模式庫與知識庫，並結合臺中市試驗場域交通即時資訊的蒐集，運用數位雙生技術完成智慧交通數位中樞系統功能擴充與精進，有助交通管理單位執行最佳交管決策，以提升車流運作效率及交通安全。

2. 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）完成因應5G車聯網與人工智慧需求之都市交通控制通訊協定3.0版檢討作業，並擬訂都市交通控制通訊協定3.5版（草案）。

（3）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%），落實交通安全並提升運輸服務水準。

VI Promote the Innovative Application of Transportation Technology and Industrial Development

(I) Construction of the 5G Intelligent Transportation Digital Nerve Center – Functional Expansion and Enhancement

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), the Directorate General of Highways, 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 current phase builds upon the research and phased implementation achievements from 2021–2022 and carries out the functional expansion and enhancement of the intelligent transportation digital nerve center system for 2023–2024.

Key tasks include the continued expansion of the demonstration city testbed and deployment of necessary detection equipment, the extension and improvement of intelligent priority signal control functions for emergency rescue vehicles, the development of AI-based decision-support model libraries and knowledge bases for traffic and public transportation management, and the integration of real-time traffic data collected from the Taichung pilot site.

By applying digital twin technology, the enhanced system offers comprehensive support for traffic management units to make optimal control decisions, aiming to improve traffic flow efficiency and road safety.

2. Research Outcomes

(1) Integrated key technologies developed in the project to enhance and expand the functions of the Intelligent Transportation Digital Nervous System using a Digital Twins 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) Completed the review of Urban Traffic Control Communication Protocol version 3.0 to address the needs of 5G vehicle-to-everything (V2X) communication and artificial intelligence, and drafted version 3.5 of the protocol.

(3) Optimized the smart priority signal control for emergency response vehicles, improving their success rate in passing through intersections by approximately 40%, thereby enhancing traffic safety and overall transportation service quality.

3. 成果推廣與效益

（1）於113年10月29日舉辦「構建5G智慧交通數位神經中樞－功能擴充與精進」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）計畫成果已摘錄論文於「運輸學刊」、「運輸計劃季刊」、「2024年杜拜第30屆智慧運輸世界大會ITS World Congress 2024」以及「第42屆測量及空間資訊研討會」發表相關研究成果共計4篇，以提供各界瞭解及研討與應用。

4. 研究成果精華摘整

（左圖為路口轉向量即時資訊；右圖為車流異常告警畫面）
智慧交通數位神經中樞系統－數位雙生展示畫面

(Left: Real-time intersection turning movement information; Right: Traffic anomaly alert interface)
Fig. Digital Twin Display Interface of the 5G Intelligent Transportation Digital Nerve Center System

5. 研究成果報告

- 構建5G智慧交通數位神經中樞－功能擴充與精進（114年7月出版）。

(二)運用科技精進連續假期疏運計畫先期規劃研究

1. 計畫概述

依據交通部113年2月15日第1904次部務會報、113年3月15日「運用科技精進連續假期疏運成效構想」研商會議、以及113年4月30日「運用科技精進連續假期疏運成效計畫構想」研商會議結論，為探討如何運用科技提升連續假期之疏運成效，於交通部交通科技及資訊司與公共運輸及監理司之督導

3. Result Dissemination and Benefits

(1) On October 29, 2024, a results-sharing forum titled "Construction of the 5G Intelligent Transportation Digital Nerve Center—Functional Expansion and Enhancement" 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) Four research papers derived from this project have been published or presented, including in the Transportation Planning Journal, the Journal of the Chinese Institute of Transportation, the 30th ITS World Congress in Dubai 2024, and the 42nd Conference on Surveying and Geomatics. These publications and presentations facilitate knowledge sharing, academic discussion, and practical application among relevant sectors.

4. Highlights of Research Achievements

5. Research Report

Construction of the 5G Intelligent Transportation Digital Nerve Center – Functional Expansion and Enhancement (Published in July 2025).

(II) Preliminary Planning Study on Enhancing Holiday Traffic Dispersal with Technology

1. Project Overview

In response to the conclusions of the 1904th Ministry Meeting of the Ministry of Transportation and Communications (MOTC) on February 15, 2024, the consultation meeting on March 15, 2024 regarding "Concepts for Enhancing Holiday Traffic Dispersal with Technology," and the subsequent planning meeting on April 30, 2024, this project was launched under the guidance of the Department of Science and Technology Advisors and the Department of Railways and Public Transport of the MOTC. The project duration is from September 2024 to March 2025.

下，本計畫（113年9月至114年3月）以中部地區區域路網為示範路網範圍（含國道、快速公路及市區道路），整合範圍內各級道路之路側設施／設備運輸及氣象資訊／資料，研析國道及市區道路連動之車流現象，盤點既有設備狀況及分析資料品質；應用人工智慧與物聯網（AIoT）科技，研析示範路網疏運管理所需之模式庫／知識庫；另亦蒐集示範路網範圍各交通管理機關過去連續假期疏運相關執行經驗，舉辦跨單位共識營／座談會確認規劃內容符合需求及凝聚跨單位合作共識，研提精進疏運執行之分年推動策略方案及各相關單位之分工，期能提升整體車流運作效率，縮短用路人旅行時間。

2. 研究成果

（1）完成示範路網範圍現有設施／設備與資料盤點分析，提出後續設施／設備增建或其他可提升資料品質之精進建議方案。

（2）蒐整示範路網範圍疏運管理過去執行成果與經驗，歸納既有疏運執行之痛點與挑戰，據以研提所需發展之知識庫／模式庫及其功能模組架構，並建置視覺化雛型平台，以強化科技輔助決策的效能。

（3）邀集產官學各界先進，舉辦跨單位共識營／座談會凝聚跨單位合作共識，研提精進疏運執行之分年推動策略方案及各相關單位之分工，俾利後續相關單位之參考與應用。

3. 成果推廣與效益

（1）於114年2月21日舉辦「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，展示本計畫多項關鍵研究成果，邀請產、官、學各界先進共同與會討論及交流，整合各界專業意見，並凝聚跨單位合作共識。

（2）將本計畫關鍵研究成果－檢索生成式AI應用之儀控率決策模式彙整投稿至ITS World Congress 2025，投稿題目為「AI – Driven Retrieval – Generation Predictive Ramp Metering System （AI – RGPRMS）: A Case Study on Taiwan's Freeway System」。

The project focuses on the central region's regional road network—covering national freeways, expressways, and urban roads—as the demonstration area. It integrates roadside infrastructure, transportation, and meteorological data across all road levels within the scope. The project analyzes the interaction between freeway and urban traffic flow patterns, conducts an inventory of existing roadside equipment and evaluates data quality.

By applying Artificial Intelligence and Internet of Things (AIoT) technologies, the study investigates the development of the required model libraries and knowledge bases for traffic dispersal management within the demonstration network. Additionally, the project compiles past experiences of traffic dispersal efforts during long holidays from various transportation management agencies within the area. Through the organization of inter-agency consensus workshops and forums, the project aims to validate the planning content against practical needs, foster collaboration among agencies, and develop a phased implementation strategy and task allocation framework. Ultimately, the goal is to improve overall traffic operation efficiency and reduce travel time for road users.

2. Research Outcomes

(1) Completed an inventory and analysis of existing infrastructure, equipment, and data within the demonstration road network area, and proposed recommendations for future infrastructure enhancement or measures to improve data quality.

(2) Compiled and reviewed previous traffic dispersal practices and experiences in the demonstration area, identified key challenges and pain points, and proposed the functional architecture for the necessary model libraries and knowledge bases. A prototype visualization platform was also developed to enhance the effectiveness of technology-assisted decision-making.

(3) Engaged experts from government, industry, and academia conduct inter-agency consensus-building workshops and forums, facilitating cross-agency collaboration. To support future reference and application, a phased strategy for improving traffic dispersal execution and a division of responsibilities among relevant agencies were proposed.

3. Result Dissemination and Benefits

(1) On February 21, 2025, a results-sharing forum for the Preliminary Planning Study on Enhancing Holiday Traffic Dispersal with Technology was held. The event showcased several key project research outcomes and invited experts from industry, government, and academia to engage in discussions and exchanges. The forum consolidated professional insights and fostered consensus for future cross-agency collaboration.

(2) A key research outcome of the project—AI-driven retrieval-generation predictive ramp metering system—was compiled into a technical paper and submitted to the 31st ITS World Congress in Atlanta 2025. The submission title is: "AI-Driven Retrieval-Generation Predictive Ramp Metering System (AI-RGPRMS): A Case Study on Taiwan's Freeway System."

4. 研究成果精華摘整

視覺化雛型平台功能展示

Fig. Demonstration of Functional Features of the Prototype Visualization Platform

5. 研究成果報告

- 運用科技精進連續假期疏運計畫先期規劃研究（本計畫執行至114年3月，預計114年9月出版）

4. Highlights of Research Achievements

5. Research Report

- Preliminary Planning Study on Enhancing Holiday Traffic Dispersal with Technology (This project is scheduled to conclude in March 2025, with the final report scheduled to be published in September 2025.)

(三)我國人工智慧車聯網之號誌控制（2/2）－匝道儀控與平面道路號誌協控實作

1. 計畫概述

近年來人工智慧在軟硬體技術的突飛猛進與各領域應用的迅速發展，可預期未來運用人工智慧（AI）、影像辨識、資通訊（ICT）、車聯網（V2X）與5G等技術，特別有助於紓緩因交通號誌控制不夠智慧，導致民眾行的痛點。本計畫延續111年「我國人工智慧車聯網之號誌控制模式探討」之研究計畫，以及112年第一期計畫所完成與縣市政府合作之現場實驗測試，以及實作測試過程中持續精進AI強化學習（RL）號誌控制模式之成果，除持續精進112年在都會區AI RL模型與進行實測外，特別著重高速公路交流道區域之人工智慧號誌協控、優先構建交流道區域號誌協控車流模擬環境、以及進行分散式AI號誌協控模型（多代理人機制）初步發展設計，以期逐步構建我國在人工智慧號誌控制實力，期能支援我國都市智慧號誌控制在人工智慧導入後之車流運作效率提升。

(III) Study of Artificial Intelligence Traffic Signal Control (2/2) – Implementation of Integrated Ramp Metering and Surface Road Signal Coordination

1. Project Overview

In recent years, the rapid advancements in artificial intelligence (AI) across software and hardware technologies, along with its swift adoption in various fields, indicate that future applications of AI–combined with image recognition, information and communication technology (ICT), vehicle-to-everything (V2X), and 5G–will be especially helpful in addressing the pain points caused by insufficiently intelligent traffic signal control. This project builds upon the 2022 research project titled "Study on AI-Based Traffic Signal Control Models in Taiwan's Connected Vehicle Infrastructure", as well as the field experiments and collaborative implementation with city and county governments completed in the first phase of the 2023 project. Throughout these efforts, the AI reinforcement learning (RL) traffic signal control models have been continuously improved. In addition to further enhancing the AI RL models for metropolitan areas and conducting real-world tests, this phase places special emphasis on the intelligent signal coordination at highway interchange areas. Key focuses include: (1) Prioritizing the development of a traffic simulation environment for coordinated signal control at interchanges; (2) Initiating the design and development of a distributed AI traffic signal control model using a multi-agent mechanism. The ultimate goal is to gradually build national capabilities in AI-based traffic signal control, aiming to improve traffic flow efficiency in urban smart signal systems with the integration of AI technologies.

2. 研究成果

（1）與臺北市政府、臺南市政府合作分別於臺北市「中山北路－德行東路」多路口幹道、臺南市「台86－19甲」單一路口等2個實驗場域完成多目標強化學習都會區號誌控制模型精進與訓練、強化學習號誌控制核心運作模組開發、實測與量化績效評估。

（2）完成交流道區域之高速公路與市區道路號誌協控文獻回顧與實驗場域評估，遴選國道1號桃園市中壢交流道之匝道儀控與鄰近平面道路路口，完成號誌協控模擬模式建構、AI RL號誌控制模型發展與訓練，以及與高速公路局、縣市政府合作進行實測與量化績效分析。

（3）實測績效顯示：（1）桃園市中壢交流道周邊道路8個路口的整體路口停等延滯平均降低15%，均優於現況定時號誌控制；（2）臺南市「台86－19甲」路口的整體路口延滯多優於現況動態號誌控制約2.5%；（3）臺北市「中山北路－德行東路」周邊3個路口，平日離峰與假日昏峰時段的路口平均停等延滯相較現況定時號誌控制平均改善15%。

3. 成果推廣與效益

（1）113年11月29日辦理「我國人工智慧車聯網之號誌控制（2/2）－匝道儀控與平面道路號誌協控實作成果分享會」邀請各縣市政府、學術界與產業界參與。

（2）於113年12月26日辦理教育訓練。透過中華民國運輸學會2024年學術論文國際研討會，進行參展與「應用多任務深度學習模型整合多時段於都會區號誌控制策略」論文發表與各界分享計畫成果。

（3）本研究所發展的人工智慧強化學習在都會區號誌控制與交流道號誌協控的模型設計與訓練演算法，可提供高速公路局、公路局、各縣市政府做為後續導入之參考應用。

2. Research Results

(1) In collaboration with the Taipei City Government and Tainan City Government, the project successfully refined and trained a multi-objective reinforcement learning (RL) traffic signal control model for urban areas. The work was carried out at two experimental sites: a multi-intersection arterial corridor at "Zhongshan North Road–Dexing East Road" in Taipei, and a single intersection at "Tai 86–Route 19A" in Tainan. This included the development of a core RL-based signal control module, field testing, and quantitative performance evaluation.

(2) A literature review and site evaluation were conducted regarding coordinated traffic signal control between freeway interchanges and urban roads. The interchange area of National Freeway No. 1 at the Zhongli Interchange in Taoyuan City—specifically the ramp metering system and nearby at-grade intersections—was selected as the test site. A coordinated signal control simulation model was built, followed by the development and training of an AI RL-based signal control model. Field testing and performance analysis were conducted in collaboration with the Freeway Bureau and local governments.

(3) Field test results showed: (1) For the eight intersections surrounding the Zhongli Interchange in Taoyuan City, the average intersection delay decreased by 15%, outperforming existing fixed-time signal control. (2) At the "Tai 86–Route 19A" intersection in Tainan City, the average intersection delay was approximately 2.5% lower than that under the current dynamic signal control system. (3) At the three intersections near "Zhongshan North Road–Dexing East Road" in Taipei City, the average intersection delay during off-peak weekdays and peak holiday periods improved by about 15% compared to the current fixed-time signal control.

3. Results Promotion and Benefits

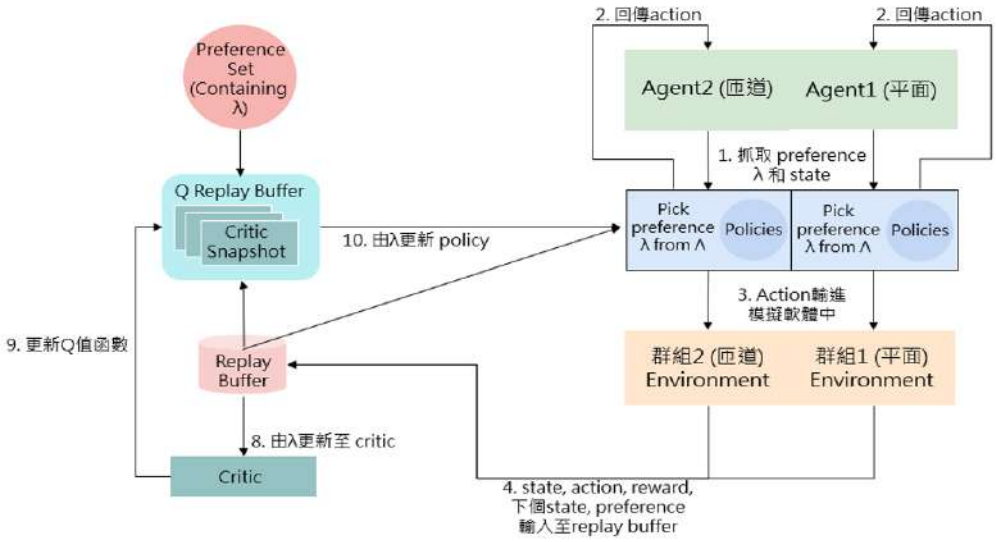
(1) On November 29, 2024, the "AI-Based V2X Signal Control in Taiwan (2/2) – Implementation Results of Ramp Metering and Surface Road Signal Coordination" sharing session was held, with participation from local governments, academia, and industry representatives.

(2) On December 26, 2024, a training session was conducted. In addition, the project outcomes were showcased and presented through a paper titled "Applying Multi-Task Deep Learning Models to Integrate Multi-Time Period Signal Control Strategies in Urban Areas" at the 2024 International Academic Conference organized by the Chinese Institute of Transportation.

(3) The reinforcement learning models and training algorithms developed in this study for urban signal control and ramp coordination provide a reference for future adoption by the Freeway Bureau, Highway Bureau, and local governments.

4. 研究成果精華摘整

4. Summary of Key Research Findings



號誌協控強化學習模型訓練架構

Reinforcement Learning Model Training Framework for Coordinated Traffic Signal Control

桃園市中壢交流道實驗場域協控實測監控畫面

Coordinated Control Field Test Monitoring Footage – Zhongli Interchange, Taoyuan City

5. 研究成果報告

- 我國人工智慧車聯網之號誌控制（2/2）－匝道儀控與平面道路號誌協控實作（114年7月出版）。

2. Research Outcome Report

- Study of Artificial Intelligence Traffic Signal Control (2/2) – Implementation of Integrated Ramp Metering and Surface Road Signal Coordination. (Published in July 2025).

(四)應用人工智慧分析技術探勘高風險路段（4/4）－空間特性分析

1. 計畫概述

近年由於先進駕駛輔助系統發展日趨成熟且應用漸趨普遍，ADAS已被國內汽車運輸業者廣為使用，藉以偵測行車過程中本車與其他用路人、環境的行為互動，並對可能造成事故之潛在風險提出即時警示。然而就長期預防角度，往往受限於準確率不佳、無法區分駕駛人當下行為是否得當等因素，導致資料難以發揮管理功效。

本計畫自110年起，與國道客運業者合作，蒐集其ADAS警示、駕駛行為、行車影像、道路環境等資料，導入影像辨識技術，從大量ADAS警示當中找出真正會影響道路交通安全的行車異常事件，從空間角度出發探討好發情境與相關空間特性，並陸續發展各項管理工具。113年著重空間特性分析，針對前3年度研究成果，綜整探討在不同空間特性下，國道客運駕駛人可能產生的行車異常事件，做為業者定期檢視及行前提示的參考，另將各項影像辨識技術、安全風險分析、影像辨識輕量化及空間特性分析等成果，整合開發以影像辨識為核心之風險分析與安全管理平台，降低業者在人力、成本及技術門檻，深具移轉業者實際應用之潛能。

2. 研究成果

（1）透過國道客運行車異常事件空間特性分析，發現車流量大、服務區、平假日、方向等因素，可能造成行車異常事件發生的頻率，以此為基礎，本計畫進一步建立風險分數系統以量化各趟次之空間、路段風險，可做為業者於出車前行車安全教育與提醒之用。

（2）本計畫整合4年期成果，完成影像辨識為核心之風險分析與安全管理平台之開發，同時增加輕量化技術，降低影像辨識所需時間，相關成果可大幅降低業者應用先進技術進行安全管理的技術、成本及人力門檻。

(IV) Applying Artificial Intelligence Techniques to Identifying Accident-prone Road Sections (4/4) – Spatial Characteristics Analysis

1. Project Overview

In recent years, with the increasing maturity and widespread application of Advanced Driver Assistance Systems (ADAS), ADAS has been widely adopted by domestic motor transport operators to detect the behavioral interactions between their vehicles and other road users, as well as the environment, during driving. It also provides real-time warnings for potential risks that could lead to accidents. However, from a long-term prevention perspective, its management efficacy is often limited due to issues such as poor accuracy and the inability to distinguish whether the driver's current behavior is appropriate, making it difficult for the data to be effectively utilized for management purposes.

Since 2021, this project has collaborated with intercity bus operators to collect data on ADAS warnings, driving behavior, driving footage, and road environment. By introducing video recognition technology, the project identifies genuine abnormal driving events that truly impact road traffic safety from a large volume of ADAS warnings. From a spatial perspective, it explores common scenarios and related spatial characteristics and has successfully developed various management tools. In 2024, the focus is on spatial characteristic analysis. Building upon the research findings of the previous three years, it comprehensively explores the abnormal driving events that intercity bus drivers may exhibit under different spatial characteristics, serving as a reference for operators' regular reviews and pre-trip reminders. Furthermore, the project integrates various achievements in video recognition technology, safety risk analysis, lightweighting, and spatial characteristic analysis to develop a video recognition-centric risk analysis and safety management platform. This aims to lower the barriers for operators in terms of manpower, cost, and technology, demonstrating significant potential for practical application by operators.

2. Research Results

(1) Through the spatial characteristic analysis of abnormal driving events of intercity buses, factors such as high traffic volume, service areas, weekdays/holidays, and direction were found to potentially influence the frequency of abnormal driving events. Based on this, this project further established a risk scoring system to quantify each trip's spatial and segment risks, which operators can use for pre-departure driver safety education and reminders.

(2) This project integrated the results of four years to complete the development of a video recognition-centric risk analysis and safety management platform. Simultaneously, lightweighting technology was added to reduce the time required for video recognition. The relevant outcomes can significantly lower the technical, cost, and manpower barriers for operators to apply advanced technologies for safety management.

3. 成果推廣與效益

（1）於113年7月11日、8月27日辦理2場次座談會，分別針對運輸業者、安全管理平台業者說明計畫成果，蒐集未來精進方向及實務運作之經驗，並呈現風險分析與安全管理平台實際運作方式。

（2）本期計畫從概念驗證角度，已成功發展行車異常事件影像辨識技術，並就未來進一步朝向服務驗證階段預做準備，完成相關管理工具與平台之開發，有助於後續擴大應用範圍。

（3）結合運輸業者安全管理系統或其他管理機制，本計畫開發之行車異常事件影像辨識技術與相關工具、平台，將可有效提升其自主安全管理能量，保障駕駛人、乘客及所有用路人安全。

3. Result Promotion and Benefits

(1) Held two symposiums on July 11 and August 27, 2024, respectively, explaining the project results to transportation operators and safety management platform providers, collecting insights on future improvement directions and practical operational experiences, and showcasing the actual operation of the risk analysis and safety management platform.

(2) From a proof-of-concept perspective, this phase of the project has successfully developed video recognition technology for abnormal driving events and made preliminary preparations for further advancement towards the service validation stage. It has also completed the development of relevant management tools and the platform, which will help expand the scope of application in the future.

(3) By integrating with transportation operators' safety management systems or other management mechanisms, the abnormal driving event video recognition technology and related tools and platform developed by this project will effectively enhance their autonomous safety management capabilities, ensuring the safety of drivers, passengers, and all road users.

4. 研究成果精華摘整

4. Summary of Research Results

以影像辨識為核心之風險分析與安全管理平台登入畫面示意
Login screen illustration for a video recognition-based risk analysis and safety management platform

使用者上傳影像進行影像辨識畫面示意
User Upload Interface for Image Recognition

5. 研究成果報告

- 應用人工智慧分析技術探勘高風險路段（4/4）－空間特性分析（預計114年8月出版）。

(五)無人機空拍應用於路段交通衝突分析（1/2）－車道交通衝突

1. 計畫概述

近年來許多創新技術，改變了傳統交通資料偵測與分析技術，例如以遙控無人機（以下簡稱「無人機」）空拍道路交通人車流動，並透過AI深度學習技術持續偵測與追蹤瞬息萬變的個別人車位置，以建立人車流動的動態軌跡資料，提供了車種、位置、時間、速度等重要交通特性資訊。若有系統地導入這些新形式的資料於交通衝突分析及應用，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. 研究成果

（1）完成擬定2年期先導測試計畫優先順序，113年已探討路段的車道交通衝突議題，除發展更完整的道路交通衝突分析工具，並與臺北市、新北市合作「汽機車混流衝突」、「左轉車道配置與行車動線」兩項先導測試計畫共9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，及新北市及公路局轄管共2處易肇事地點分析。

5. Research Result Report

- Applying Artificial Intelligence Techniques to Identifying Accident-prone Road Sections (4/4) - Spatial Characteristics Analysis (Scheduled to be published in August 2025).

(IV) Applying drone aerial photography for road traffic conflict analysis (1/2) – lane traffic conflict

1. Project Overview

In recent years, numerous innovative technologies have transformed traditional traffic data detection and analysis techniques. For instance, the use of Unmanned Aerial Vehicles (hereinafter referred to as "drones") for aerial photography of road traffic and pedestrian flow, coupled with AI deep learning technology, enables continuous detection and tracking of the rapidly changing positions of individual vehicles and pedestrians. This establishes dynamic trajectory data of people and vehicle movement, providing crucial traffic characteristic information such as vehicle type, location, time, and speed. If these new forms of data are systematically incorporated into traffic conflict analysis and applications, they can assist road management authorities in identifying traffic conflict hotspots early and implementing improvements to prevent accidents proactively.

Building upon the traffic conflict analysis methods and software developed in the previous research project, this project expands the analysis scope from intersections to road segments. By utilizing precise vehicle trajectory files and analysis software, it quantifies the degree of traffic conflict in lanes and along roadsides to diagnose road segment traffic safety issues and subsequently propose improvement measures. Furthermore, the project collaborates with county and city governments to conduct traffic conflict analysis, aiming to optimize the application capabilities of the analysis software.

2. Research Results

(1) Completed the prioritization of a two-year pilot testing plan. In 2024, the project explored lane-level traffic conflict issues on road segments. In addition to developing a more comprehensive road traffic conflict analysis tool, it collaborated with Taipei City and New Taipei City on two pilot testing plans across nine road segments: "Mixed Traffic Flow Conflict between Cars and Motorcycles" and "Left-Turn Lane Configuration and Traffic Flow."

(2) Continuously optimized AI video recognition tracking technology, the functionality of the traffic conflict analysis software, and analyzed two accident-prone locations under the jurisdiction of New Taipei City and the Directorate General of Highways.

3. 成果推廣與效益

（1）透過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113年10月30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。

（2）完成車道交通衝突先導測試計畫及2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。

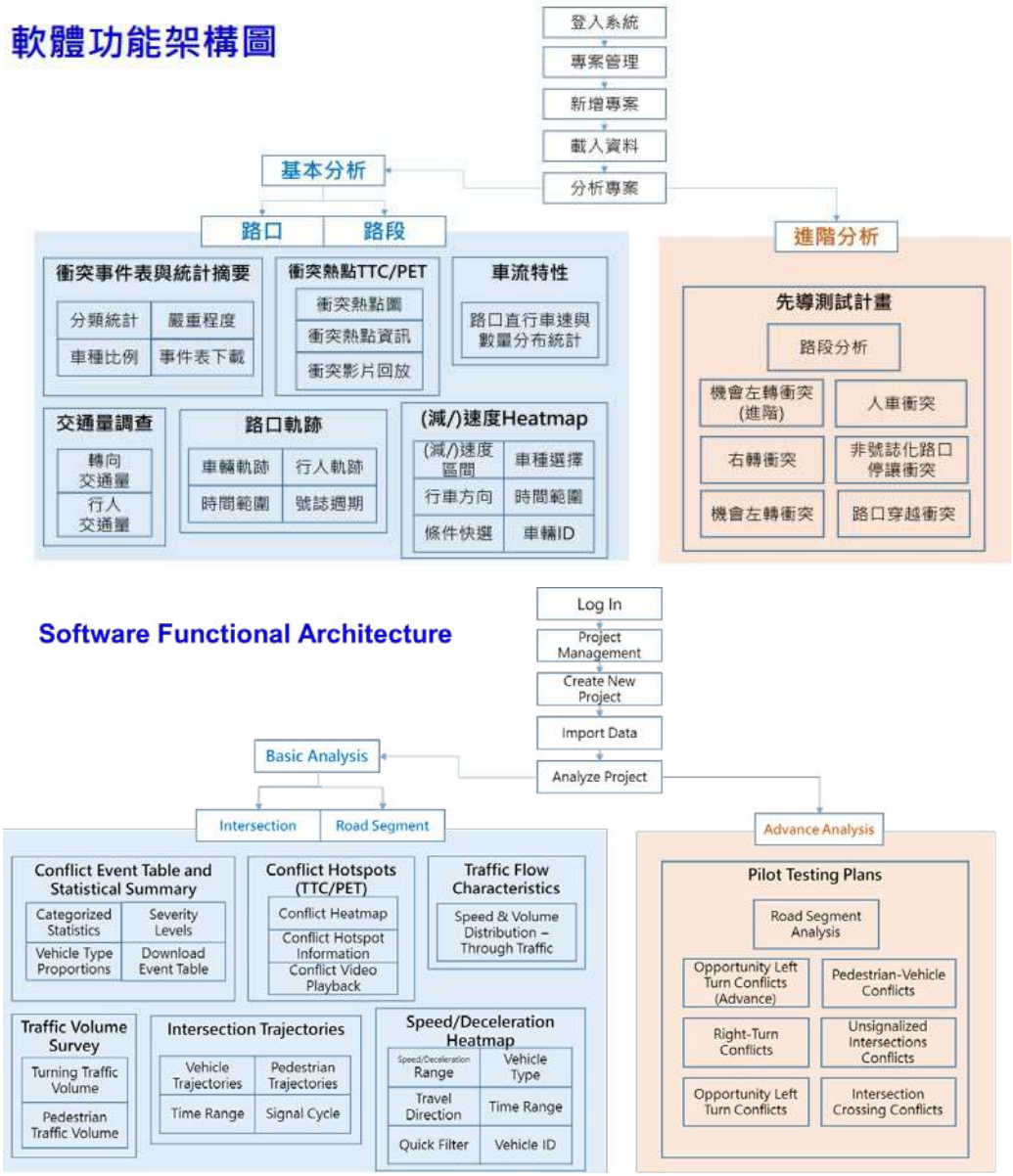
3. Result Promotion and Benefits

(1) Promoted the application of traffic conflict analysis through collaborative pilot testing plans and analyses of accident-prone locations with the Directorate General of Highways and county/city governments, as well as by holding a results presentation and educational training session on October 30, 2024, inviting central and local road and traffic management authorities, consulting companies, regional transportation development research centers, and public/academic associations.

(2) Completed the lane-level traffic conflict pilot testing plan and the analysis of two accident-prone locations, providing the analysis results to the collaborating agencies as a reference for improving road traffic safety.

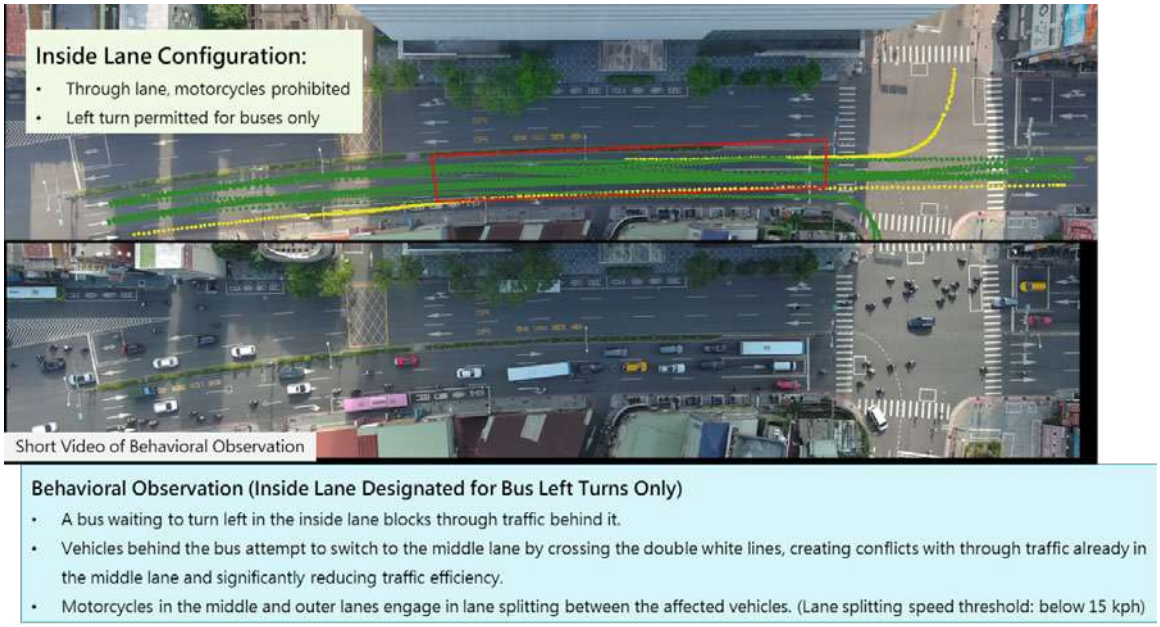
4. 研究成果精華摘整

4. Summary of Research Results



分析軟體功能架構圖

Functional architecture diagram of the analysis software



觀察及分析路段之公車與其他車輛之行為
Observe and analyze the behavior of buses and other vehicles on road segments

5. 研究成果報告

- 無人機空拍應用於路段交通衝突分析（1/2）－車道交通衝突（預計114年8月出版）。

5. Research Result Report

- Applying drone aerial photography for road traffic conflict analysis (1/2) – lane traffic conflict (Scheduled to be published in August 2025).

（六）無人機偏鄉物流運送服務驗證計畫（2/2）－服務模式實作與系統驗證

1. 計畫概述

為有效導入無人機於我國交通運輸領域的創新應用以及促進相關產業的發展，本所奉交通部指示，於「2021交通科技產業政策白皮書」中提出我國無人機科技產業發展策略及路徑圖（Roadmap）2.0版，並提出「2025我國無人機在交通領域發展之里程碑」，針對橋梁巡檢以及偏鄉物流兩項重點領域積極推動研發與應用。在物流運送方面，本所113年於花蓮縣及澎湖縣，擇定適當場域，以偏鄉及離島地區「災害緊急運補」、「日常物資配送」為情境，實作無人機偏鄉物流運送服務模式，並完成服務驗證（PoS），同時提供國內產業界做為自主開發無人機之技術驗證平台。

2. 研究成果

（1）113年因應0403地震災情，以無人機災害緊急物資運補及偏鄉日常物資運送為情境，擇定花蓮太魯閣地區大禮部落及中橫公路，以及澎湖縣馬公市及西嶼鄉為驗證場域，與中華郵政合作，並導入國內2家業者4型無人機，於前述場域進行長時間飛行測試，完成服務驗證（PoS）。

（2）0403地震在花蓮太魯閣地區造成嚴重的災情，因此，本所及合作團隊訪談太魯閣當地大同大禮部落居民，以及公路局太魯閣工務段、太魯閣國家公園管理處，了解當地需求，規劃作業服務模式，並實際於大禮部落及中橫公路進行無人機緊急物資運補服務驗證。

（3）本年度導入兼具多旋翼機及定翼機優點之垂直起降固定翼型無人機（Vertical Take – off and Landing），以及可酬載50公斤之大型物流無人機，未來可依據應用情境擇定適合之機型。並導入國內自主開發空拍機，先行勘查災害情形，再由物流無人機進行運補，驗證緊急物資運補作業程序，提升災害救援與運補作業之效率。

(V) Drone Rural Logistics Delivery Service Verification Project (2/2) – Service Model Implementation and System Verification

1. Project Overview

To effectively promote innovative applications of UAVs in the transportation sector and foster related industrial development, the Institute, under the guidance of the Ministry of Transportation and Communications (MOTC), formulated the "Taiwan UAV Technology Industry Development Strategy and Roadmap 2.0" in the 2021 Transportation Technology Industry Policy White Paper, and proposed the "2025 Milestones for UAV Development in the Transportation Sector." This project focused on key application domains such as bridge inspection and rural logistics services.

In 2024, the Institute selected suitable sites in Hualien County and Penghu County to implement rural logistics delivery service models using UAVs, targeting scenarios including "emergency supply in disaster response" and "routine material delivery" for rural and outlying island areas. The project completed Proof of Service (PoS) verification while also establishing a technical verification platform to support the domestic UAV industry in independent R&D and system validation.

2. Research Results

(1) In response to the April 3 (0403) earthquake in 2024, UAVs were deployed for emergency supply and routine material delivery in rural areas. Verification sites included Dali Village in Taroko, sections of the Central Cross-Island Highway, and Magong City and Xiyu Township in Penghu County. In collaboration with Chunghwa Post and two domestic UAV suppliers, four types of UAVs were deployed for long-duration flight testing, completing service model PoS verification.

(2) Given the extensive damage caused by the earthquake in the Taroko area, the Institute conducted field interviews with residents of Datong and Dali tribes, the Taroko Engineering Office of the Highway Bureau, and the Taroko National Park Headquarters to understand local needs and co-develop a service operation model. Emergency supply service verification was successfully conducted along the Central Cross-Island Highway and Dali Village.

(3) This year, advanced UAV platforms, including Vertical Take-Off and Landing (VTOL) fixed-wing UAVs, which integrate the characteristics of multi-rotor and fixed-wing aircraft, and heavy-lift logistics UAVs capable of carrying payloads up to 50 kg, were introduced. The UAVs were selected based on mission requirements. Additionally, domestically developed aerial survey UAVs were deployed to assess disaster conditions prior to delivery operations. This sequence enhanced the overall efficiency and feasibility of emergency UAV logistics services.

3. 成果推廣與效益

（1）114年1月21日於花蓮縣太魯閣大禮部落及中橫公路辦理無人機物流運送服務驗證飛行展示，邀請在地居民、原住民族委員會、衛生福利部、交通部公路局、太魯閣國家公園管理處共同見證本年度驗證成果，並舉辦交流座談會，共同探討無人機偏鄉物流之應用潛力與方向。

（2）本計畫完成無人機偏鄉物流運送服務驗證，研究成果可供國內公民營單位推動無人機偏鄉物流運送服務落地應用。以及主管機關調適相關法規之參據，並協助國內業者累積物流運送實作經驗。

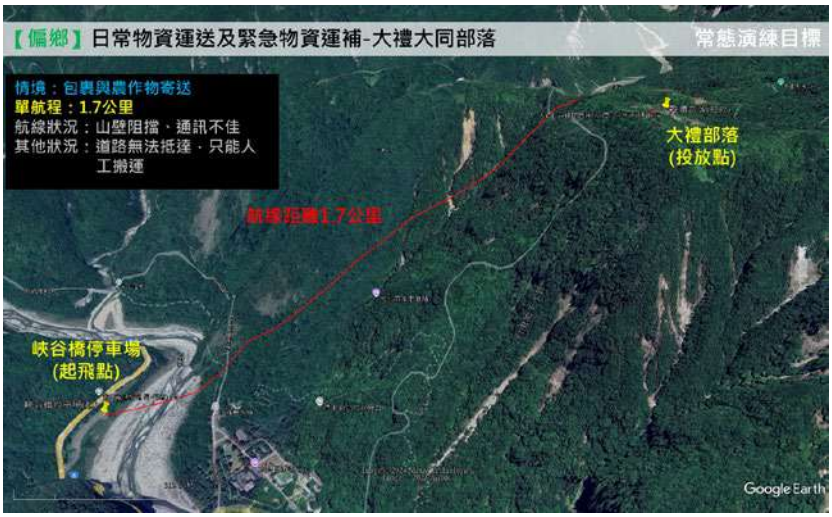
3. Result Promotion and Benefits

(1) On January 21, 2025, a verification flight demonstration was conducted in Dali Village, Taroko, and along the Central Cross-Island Highway. Local residents and representatives from the Council of Indigenous Peoples, the Ministry of Health and Welfare, the MOTC's Highway Bureau, and the Taroko National Park Headquarters attended the event to witness the results. A forum was held concurrently to discuss future applications and developmental directions of UAV logistics in rural areas.

(2) The project successfully completed PoS for UAV-based rural logistics services. The results provide a practical reference for both public and private sectors in promoting the adoption of UAV logistics delivery. Furthermore, the project supports regulatory refinement and facilitates experience accumulation among domestic operators.

4. 研究成果精華摘整

4. Summary of Research Results



花蓮太魯閣大禮部落航線示意圖
Hualien Taroko Dali Village Flight Route Map

大同大禮部落無人機物流運送服務驗證測試
Datong and Dali Village Drone Logistics Delivery Service Verification Test

5. 研究成果報告

- 無人機偏鄉物流服務驗證計畫（2/2）－服務模式實作與系統驗證（預計114年8月出版）

（七）無人機產業創新與推廣計畫（2/2）－深化無人機科技於交通領域之應用與國際交流

1. 計畫概述

本所依據「2021交通科技產業政策白皮書」中提出我國無人機科技產業發展策略及路徑圖（Roadmap）2.0版，持續推動創新應用與人才培育。在創新應用方面，邀請國際城市空中交通產業專家來台交流我國發展策略，並持續拓展無人機之交通應用場域，試辦導入無人機於港區橋式起重機檢驗。在人才培育方面，持續辦理領航盃－無人機於交通領域創意應用競賽，並結合工作坊、專題演講等活動，使國內大專院校學生了解國際間無人機產業最新發展趨勢，鼓勵基層人才投入無人機領域。

2. 研究成果

（1）113年3月20日辦理「2024城市空中交通國際論壇」，邀請來自日本SkyDrive、德國Volocopter及美國AECOM公司之代表，共同探討城市空中交通之國際發展趨勢，並見證我國業者新樂飛無人機股份有限公司與日本SkyDrive公司簽署合作備忘錄；經彙整國際推動經驗及策略，提出我國發展城市空中交通發展策略及路徑圖。

5. Research Result Report

- Proof-of-Service for UAS Delivery in Rural Areas (2/2) – Service Model Implementation and System Verification (Scheduled to be published in August 2025).

(VI) Drone Rural Logistics Delivery Service Verification Project (2/2) – Service Model Implementation and System Verification

1. Project Overview

In accordance with the "2021 Transportation Technology Industry Policy White Paper," which outlined the development strategy and roadmap (version 2.0) for Taiwan's UAV technology industry, the Institute continues to promote innovative applications and talent cultivation. Regarding innovative applications, international experts in urban air mobility (UAM) were invited to Taiwan to exchange views on national development strategies. The application of UAVs in transportation continues to expand, including a pilot program introducing UAVs for quay crane inspection at ports. In terms of talent cultivation, the "Navigator Cup—Creative Application Competition of UAVs in Transportation" is held regularly, alongside workshops and keynote speeches, enabling university students to understand the latest international trends in the UAV industry and encouraging young talent to enter the field.

2. Research Results

(1) On March 20, 2024, the "2024 Urban Air Mobility International Forum" was held. Representatives from SkyDrive (Japan), Volocopter (Germany), and AECOM (USA) were invited to discuss international development trends in UAM. A memorandum of understanding (MOU) was signed between Taiwan's startup XLEEF and Japan's SkyDrive. Insights from international strategies were consolidated to propose Taiwan's strategy and roadmap for UAM development.

（2）推動無人機於交通領域之創新應用，於基隆港試辦無人機結合人工智慧影像辨識應用於橋式起重機檢測工作。本期計畫以無人機蒐集橋式起重機之構件影像，應用影像辨識技術進行分析檢測，初步驗證無人機結合應用影像辨識技術應用於橋式起重機檢測之可行性。

（3）辦理「領航盃－無人機於交通領域創意應用競賽」，舉辦先進空中交通與無人機相關工作坊與專題演講，並辦理創意應用競賽，共計36隊參賽，評選出8隊優勝隊伍。使國內大專院校學生掌握國際無人機產業最新發展趨勢，並鼓勵人才投入無人機領域。

3. 成果推廣與效益

（1）113年3月20日辦理「領航未來－2024城市空中交通國際論壇」，邀集國內外先進空中交通領導廠商及專家學者，分享國際趨勢並交流我國之發展策略。

（2）113年8月9日至10日辦理「領航盃－無人機於交通領域創意應用競賽」。

（3）113年12月27日辦理「無人機於交通領域之應用發展專家學者諮詢會議」，邀集國內無人機產官學研單位專家學者，共同研議無人機於交通領域應用及先進空中交通等議題之未來發展方向。

(2) A pilot project applying UAVs in quay crane inspection at Keelung Port was carried out. UAVs collected images of crane components, which were analyzed using AI-based image recognition technology. The project preliminarily validated the feasibility of using UAVs combined with image recognition for quay crane inspection.

(3) The "Navigator Cup—Creative Application Competition of UAVs in Transportation" featured workshops and keynote speeches on advanced aerial mobility and UAVs. A total of 36 teams participated, and 8 winning teams were selected. The event helped students gain insight into international UAV trends and encouraged participation in the UAV sector.

3. Result Promotion and Benefits

(1) The "Leading the Future—2024 Urban Air Mobility International Forum" was held on March 20, 2024. It brought together leading domestic and international UAM companies and scholars to share trends and exchange Taiwan's development strategies.

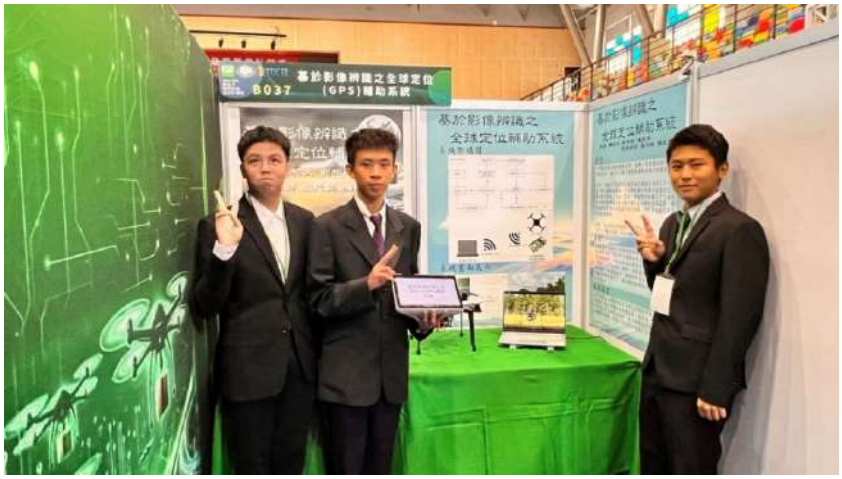
(2) The "Navigator Cup—Creative Application Competition of UAVs in Transportation" was held from August 9 to 10, 2024.

(3) On December 27, 2024, an expert consultation meeting on the application and development of UAVs in the transportation field was held. Experts from industry, government, academia, and research institutions discussed future directions for UAV applications and advanced air mobility.

4. 研究成果精華摘整

4. Summary of Research Results

無人機辨識橋式起重機構件
UAV-based Component Recognition for Quay Cranes



領航盃－無人機於交通領域創意應用競賽
Navigator Cup – Creative Application Competition of UAVs in Transportation

113年3月20日辦理「領航未來－2024城市空中交通國際論壇」
"Leading the Future – 2024 Urban Air Mobility International Forum" was held on March 20, 2024."

七 精進交通設施維護管理與災防技術

(一)鼎型塊織布橋基保護工法之現地試驗與成效評估（3/4）－試驗場址數值模型建置及評估

1. 計畫概述

近年在颱洪作用下，跨河橋梁河道深槽區橋墩基礎常有裸露之情況發生，橋梁管理機關採用鼎型塊排置工法來保護橋墩基礎，雖頗有成效，然於河水長期沖刷下，鼎型塊仍有流失破壞的狀況發生，導致橋梁管理機關於每年汛期過後，仍需針對流失的鼎型塊及裸露之橋基進行整理維護，以確保橋墩基礎的安全。爰此，本計畫針對本所過去研擬之地工織布結合鼎型塊保護工法（以下簡稱本工法），選擇以大甲溪下游國道3號大甲溪橋為研究對象，規劃進行室內水工模型及現地沖刷試驗，持續觀測試驗橋址鼎型塊的穩定性，藉以評估保護成效，並另以CCHE2D建置大甲溪流域石岡壩至河口段之二維水理模型，做為後續年度於現地保護工三維局部沖刷數值模擬時所需之水理資料，以模擬分析及評估現地保護工之成效。

113年凱米颱風帶來豐沛之降雨量，使石岡壩放流量達本計畫自110年起觀測以來最大流量（5年重現期洪水量），颱洪後觀測結果，在試驗組（有鋪設織布）之損壞比約4%，對照組（未鋪設織布）之損壞比約38%，益本比（BCR）約達3.36。以目前110~113年4年期現地試驗觀測結果，顯示本工法可提升保護工之耐洪性，可達延長保護橋基壽命，減少維修頻率及維護經費。

2. 研究成果

（1）完成113年度現場試驗場址觀測及保護成效數據分析。

VII Enhancement of Maintenance Management and Disaster Prevention Technologies for Transportation Infrastructure

(I) Performance Assessment of Geotextile Protection Construction Method (3/4) – Construction of Numerical Models for Test Sites and Effectiveness Evaluation

1. Project Overview

In recent years, under the influence of typhoons and floods, the foundations of bridge piers located in the main channels of rivers have frequently become exposed. To address this issue, bridge management authorities have commonly employed the placement of tripod-shaped concrete blocks for foundation protection. While this method has shown a certain degree of effectiveness, the blocks are still susceptible to displacement and damage under prolonged scouring by river flows. As a result, post-flood maintenance is required annually to restore displaced blocks and address newly exposed foundations to ensure pier stability.

In response, this project focuses on a protection method previously developed by our institute—a Geotextile Protection Construction Method (hereafter referred to as "this method"). The Dajia River Bridge on National Freeway No. 3, located in the lower reaches of the Dajia River, was selected as the study site. The project involves planning and conducting indoor hydraulic model tests and field-scale scour experiments. Concurrently, continuous monitoring of the stability of tripod-shaped concrete blocks at the test site is carried out to evaluate the effectiveness of the protection method.

In parallel, a two-dimensional hydraulic model of the Dajia River from the Shigang Dam to the river mouth was developed using CCHE2D. This model provides essential hydraulic data to support future three-dimensional local scour simulations for field protection works and serves as a basis for performance evaluation.

During Typhoon Gaemi in 2024, heavy rainfall resulted in the highest recorded discharge from the Shigang Dam since observations began under this project in 2021, reaching a Flood Discharge of a 5-year Return Period. Post-flood observations revealed that the damage ratio for the experimental group (with geotextile) was approximately 4%, whereas the control group (without geotextile) exhibited a damage ratio of about 38%. The estimated Benefit-Cost Ratio (BCR) reached approximately 3.36.

Based on four years (2021–2024) of field experimental observations, this method has demonstrated improved flood resilience of the protection works. It has the potential to extend the service life of bridge foundations, reduce maintenance frequency, and lower upkeep costs.

2. Research Results

(1) Completion of on-site observations and analysis of protection effectiveness data at the test site for the year 2024.

（2）完成大甲溪流域石岡壩至河口段之二維水理模型建置，可提供後續三維數值局部沖刷模擬分析時之邊界條件，再以不同重現期流量模擬分析，評估本工法之保護成效，配合現場試驗觀測結果，提供多元分析驗證之成果。

3. 成果推廣與效益

（1）113年8月29日參與「第42屆測量及空間資訊研討會」論文口頭發表及成果推廣。

（2）研發成果獲得中華民國道路協會113年「論文獎」之獎項。

（3）研究成果可提供相關橋梁管理機關（如高公局、公路局、臺鐵公司、各縣市政府等）未來鋪設橋墩基礎保護工法之參考應用。

(2) Establishment of a two-dimensional hydraulic model for the Dajia River basin, covering the reach from Shigang Dam to the river mouth. This model can provide boundary conditions for subsequent three-dimensional numerical simulations of local scour. Simulations with flow rates corresponding to different return periods were also conducted to assess the protective performance of the proposed method. Combined with field observation results, the findings offer a comprehensive and multi-faceted validation of the method's effectiveness.

3. Result Promotion and Benefits

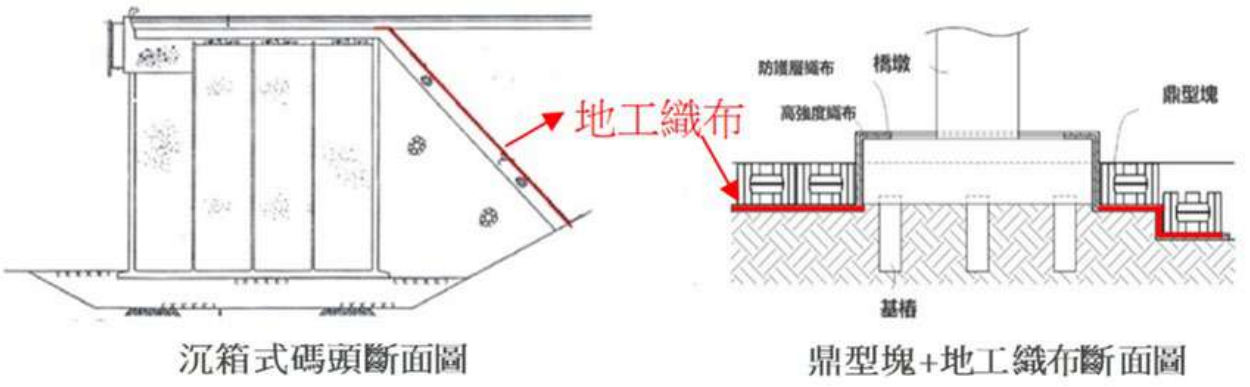
(1) Participated in the 42nd Annual Conference on Surveying and Geospatial Information on August 29, 2024, delivering an oral presentation and promoting the project outcomes.

(2) The research achievement was awarded the 2024 "Paper Award" by the China Road Federation (CRF).

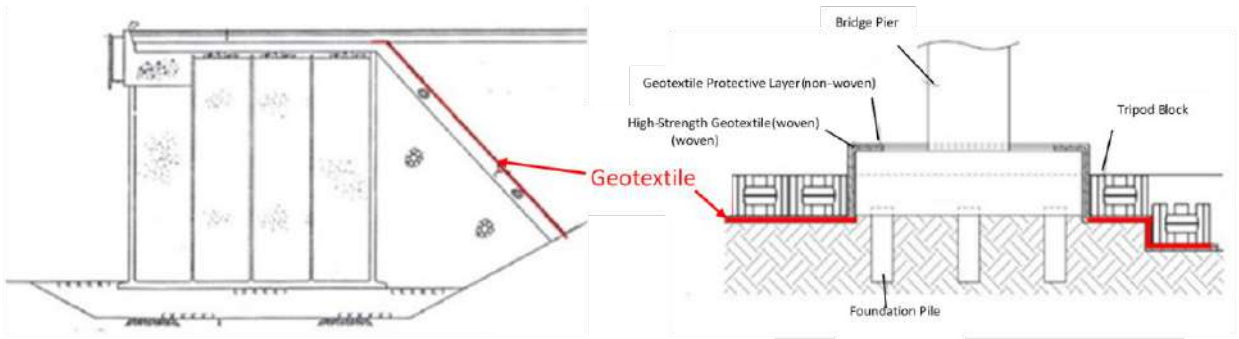
(3) The study results can serve as a valuable reference for relevant bridge management agencies – such as the Freeway Bureau, Directorate General of Highways, Taiwan Railways Corporation, and local governments – for future applications of bridge pier foundation protection methods.

4. 研究成果精華摘整

4. Summary of Research Results



沉箱式碼頭斷面圖　　鼎型塊+地工織布斷面圖



Cross-Section of Caisson-Type Wharf　　Cross-Section of Geotextile Protection Construction Method

本工法構想來源及鋪設斷面示意圖
Concept Origin of This Construction Method and Cross-Section Layout Diagram

橋墩編號	放置鼎型塊面積(m^2)	損壞面積(m^2)	損壞比(%)	維修費用(萬元)	有無鋪設地工織布
試驗組	3,930	152	3.87	152	有
對照組	2,530	965	38.14	965	無

**註: 1.鼎型塊維護單價(A)係以 1 萬/m2 估算，故試驗組維護費用為損壞面積*(A)=152*1=152 萬元，對照組維護費用為損壞面積*(A)=965*1=965 萬元。

2.試驗組總工程經費為 700 萬元(109 年 P24L)+111 年 1,480 萬元(111 年 P22L~P23L)=2,180 萬元，相較傳統保護工法，所增加之織布鋪設費用為 60 萬元(109 年 P24L)+183(111 年 P22L~P23L)萬元=242 萬元。

Test Group Category	Area Covered by Tripod Blocks(m^2)	Damaged Area (m^2)	Damage Ratio (%)	Maintenance Cost (10,000 NTD)	Geotextile Installation (Yes/No)
Test Group	3,930	152	3.87	152	Y
Control Group	2,530	965	38.14	965	N

Notes:
1. The unit price for Tripod Block Protection (A) is estimated at NTD 10,000/m^2.
   Therefore, the maintenance cost for the Test group is:
   Damaged Area × A = 152 × 1 = NTD 1.52 million,
   and for the Control group:
   965 × 1 = NTD 9.65 million.
2. The total construction cost for the test group is NTD 21.8 million, including:
   - NTD 7.0 million (Year 2020, P24L)
   - NTD 14.8 million (Year 2022, P22L~P23L)
   Compared to traditional protection methods, the additional cost for geotextile installation is:
   - NTD 0.6 million (Year 2020, P24L)
   - NTD 1.83 million (Year 2022, P22L~P23L)
   → Total: NTD 2.42 million

113年凱米颱風事件後保護成效評估
Evaluation of Protection Effectiveness After Typhoon Gaemi in 2024

5. 研究成果報告

- 鼎型塊織布橋基保護工法之現地試驗與成效評估（3/4）－試驗場址數值模型建置及評估（114年3月出版）

5. Research Result Report

- Performance Assessment on Geotextile Protection Construction Method (3/4)-Construction of Numerical Models for Test Sites and Effectiveness Evaluation (Published in March 2025).

(二)車行橋梁管理資訊系統及全國橋梁統計資訊網精進

1. 計畫概述

配合行政院「橋梁維護管理作業要點」規定，交通部責成本所建置「全國車行橋梁統計系統」（「全國車行橋梁統計系統」分為「全國橋梁統計資訊網」及「車行橋梁統計系統」雙首頁）介接各級橋梁主管機關所轄橋梁資料，合併編製成果統計。另由本所88年起建置之「臺灣地區橋梁管理資訊系統」提供各橋梁主管機關協商使用，該系統並自111年1月1日起更名為「車行橋梁管理資訊系統」。

(II) Enhancement of the Vehicular Bridge Management Information System and the National Bridge Statistics Information Network

1. Project Overview

In accordance with the Executive Yuan's "Bridge Maintenance and Management Guidelines," the Ministry of Transportation and Communications (MOTC) commissioned the Institute to establish the "National Vehicular Bridge Statistics System," which includes a dual-homepage structure: the "National Bridge Statistics Information Network" and the "Vehicular Bridge Statistics System." This system integrates data from various bridge authorities and compiles statistical results. Additionally, since 1999, the Institute has developed the "Bridge Management Information System for Taiwan," which was renamed the "Vehicular Bridge Management Information System" starting January 1, 2022, and is shared with bridge management agencies for coordination.

「全國橋梁統計資訊網」經彙整車行橋、鐵道橋及人行天橋相關橋梁資訊建置完成，並依院頒「橋梁維護管理作業要點」第5點資料開放精神，公布全國橋梁統計資料，讓外界有獲得橋梁資訊之管道。統計資訊網的介接來源包括本所建置車行橋梁統計系統、交通部鐵道局建置鐵道橋梁統計系統及內政部營建署建置人行天橋統計系統。

2. 研究成果

（1）車行橋梁管理資訊系統精進

a. 完成「箱型梁內部檢測」模組功能，於相關構件資料表增加「需箱內檢測」欄位及調整「進階查詢」細部功能。

b. 於檢測資料模組新增「詳細檢測」功能，並於特別檢測下新增「地震後特別檢測」功能。

（2）全國橋梁統計資訊網

a. 配合「政府資料開放平臺（OPEN DATA）」於「統計報表輸出」中增加「輸出CSV」功能，上傳「政府資料開放平臺（OPEN DATA）」並順利取得金標章。

b. 每年2次由系統自動發送Email通知各縣市首長有關該縣市轄管車行橋梁、人行天橋及鐵道橋梁之「U=3及U=4未修橋梁數」。

c. 於「系統設定」模組下，增加「網站滿意度統計」。

3. 成果推廣與效益

（1）113年度「車行橋梁管理資訊系統」使用人次達54,448人次，「全國橋梁統計資訊網」使用人次達7,551人次。

（2）「車行橋梁管理資訊系統」113年度發送水情警戒通知計1,330筆，地震後通知計6,415筆。

The "National Bridge Statistics Information Network" consolidates information on vehicular, railway, and pedestrian overpasses. In accordance with Article 5 of the aforementioned guidelines and following the government's open data initiative, the system publishes national bridge statistics to provide public access to bridge information. Data sources include the vehicular bridge statistics system developed by the Institute, the railway bridge statistics system by the Railway Bureau, and the pedestrian overpass statistics system by the Construction and Planning Agency, Ministry of the Interior.

2. Research Results

(1) Enhancement of the Vehicular Bridge Management Information System

a. Completed the "Box Girder Internal Inspection" module, added a "Requires Internal Inspection" field in the component data table and refined the advanced search function.

b. The inspection data module now has a "Detailed Inspection" function, and a "Post-Earthquake Special Inspection" function was added under special inspections.

(2) National Bridge Statistics Information Network

a. In line with the "Government Open Data Platform," added a "CSV Export" function in the statistical report output module, uploaded data to the platform, and successfully received the Gold Certification.

b. The system automatically sends biannual email notifications to mayors regarding the number of unrepaired bridges rated U=3 or U=4 (vehicular, pedestrian, and railway bridges).

c. Added a "Website Satisfaction Survey" module under system settings.

3. Promotion and Benefits

a. In 2024, the Vehicular Bridge Management Information System recorded 54,448 user visits, while the National Bridge Statistics Information Network recorded 7,551 visits.

b. The Vehicular Bridge Management Information System issued 1,330 hydrological warnings and 6,415 earthquake notifications in 2024.

4. 研究成果精華摘整

4. Key Research Highlights

車行橋梁管理資訊系統功能精進

Function enhancements for the Vehicular Bridge Management Information System

「全國橋梁統計資訊網」地圖搜尋（GIS）功能

GIS-based map search functionality in the National Bridge Statistics Information Network

使用狀態統計

放大檢視

橋梁類別	所有橋梁		鋼索型橋梁	
	使用中	停用	使用中	停用
車行橋梁	22,969	33	180	1
鐵道橋梁	1,482	77	5	0
人行天橋	1,845	49	125	8
小計	26,296	159	310	9
合計	26,455		319	

橋齡統計

放大檢視

橋梁類別	所有橋梁							鋼索型橋梁						
	<2年	2~10年	11~20年	21~30年	31~40年	>40年	不詳	<2年	2~10年	11~20年	21~30年	31~40年	>40年	不詳
車行橋梁	44	1,308	2,857	5,740	4,122	3,532	5,399	1	47	86	34	4	5	4
鐵道橋梁	11	241	276	239	315	390	87	0	3	2	0	0	0	0
人行天橋	14	186	285	166	75	77	1,091	1	15	43	12	12	7	43
小計	69	1,735	3,418	6,145	4,512	3,999	6,577	2	65	131	46	16	12	47
合計	26,455							319						

「全國橋梁統計資訊網」橋梁分類統計功能

Bridge classification and statistical functions in the National Bridge Statistics Information Network

(三)113年度公路橋梁檢測人員培訓

1. 計畫概述

我國公路橋梁約2.4萬座，主要由高速公路局、公路局及各縣市政府負責管理，依據公路法相關規定，橋梁養護首重檢測，各橋梁管理機關除應適時針對所轄橋梁實施橋梁檢測作業外，並應針對損壞部分採取適當維修對策，以維行車安全。

公路橋梁檢測作業依據「公路養護規範」及「公路橋梁檢測及補強規範」規定係以目視檢測為主，依據「交通部公路橋梁檢測人員資格與培訓要點」，公路橋梁目視檢測人員之培訓及發證由公路主管機關或其指定機關辦理（本所為指定機關）；培訓分成初訓及回訓兩類，初訓內容應包含公路養護規範、公路橋梁檢測及補強規範、相關公路法規、橋梁管理資訊系統操作、現地實橋檢測訓練等5類別；回訓內容由培訓機關依橋梁檢測之新技術、新法規或相關發展趨勢排定；全程參加初訓或回訓課程，並通過測驗且取得培訓機關具名核發之初訓結業證書或回訓證明者，始具辦理公路橋梁定期目視檢測作業資格。

為持續提升我國公路橋梁檢測之品質及能量，爰辦理本項計畫，以協助各公路橋梁管理機關培訓橋梁檢測人員。113年度培訓課程持續精進強化，新增梁底狹小空間檢測工具應用及無人機搭配AI影像辨識應用於橋梁檢測課程，俾使學員瞭解新科技與AI之應用以提升橋梁檢測品質。

2. 研究成果

（1）完成公路橋梁檢測人員之初訓5場次（北部2場次、中部2場次、南部1場次），參訓人數共計212人、及完成測驗與發證事宜。

（2）完成公路橋梁檢測人員之回訓3場次（北部2場次、中部1場次），參訓人數共計157人、及完成發證事宜。

(III) 2024 Training for Highway Bridge Inspectors

1. Project Overview

Taiwan has approximately 24,000 highway bridges primarily managed by the Freeway Bureau, the Directorate General of Highways, and local governments. According to highway laws and regulations, inspection is essential for bridge maintenance. In addition to regular inspections, management agencies are required to repair damaged sections to ensure traffic safety.

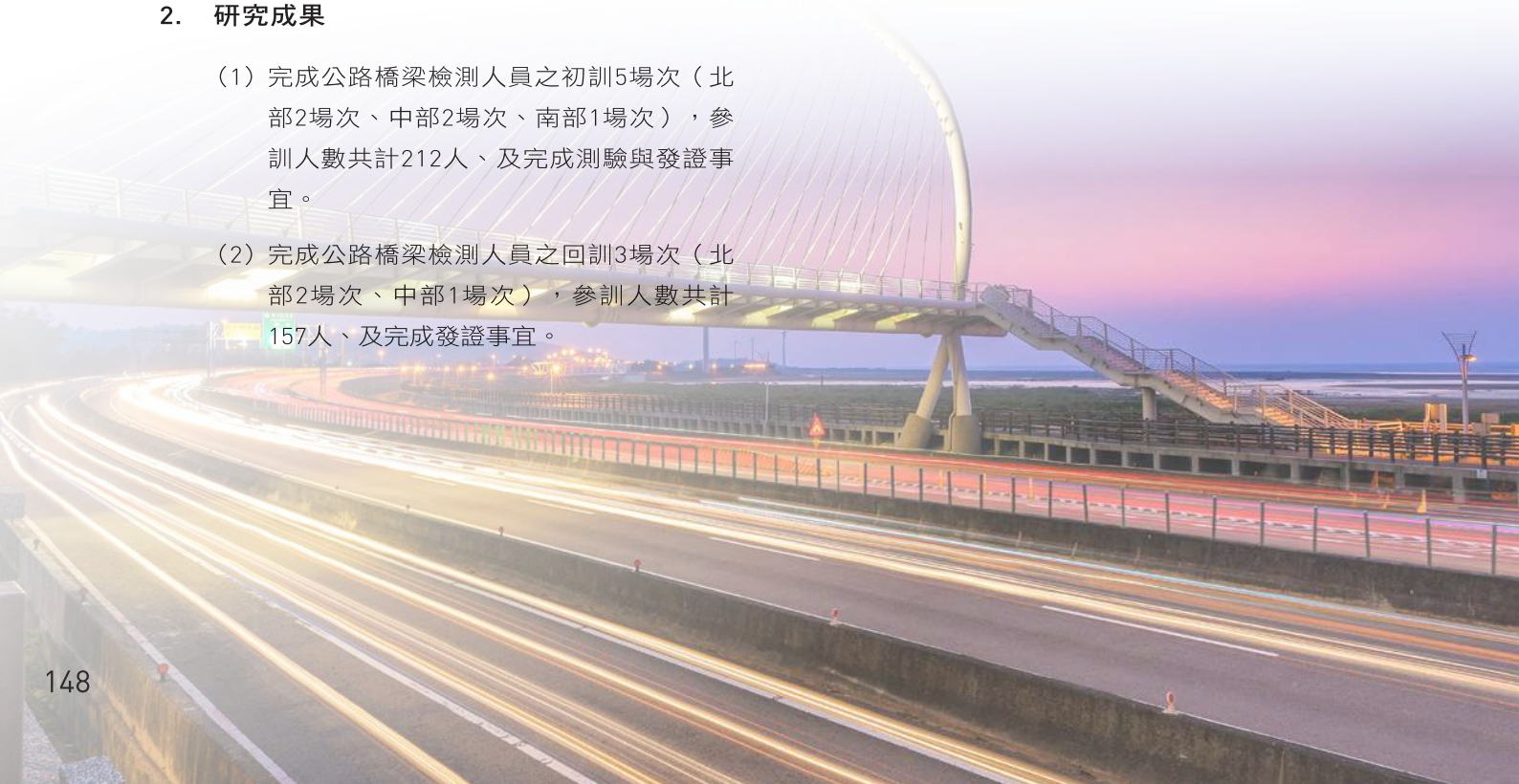
Bridge inspections are mainly visual and follow the "Highway Maintenance Specifications" and "Highway Bridge Inspection and Strengthening Specifications." Under the "MOTC Guidelines for Qualifications and Training of Highway Bridge Inspectors," training and certification for visual inspectors are conducted by the designated agency (the Institute). Training is categorized into initial and refresher courses. Initial training covers five areas: maintenance specifications, inspection and strengthening regulations, relevant laws, system operations, and field inspection. Refresher content is designed based on new techniques, regulations, and development trends. Participants must complete the course and pass an exam to be certified.

The 2024 program included new content to enhance inspection capabilities, such as the use of confined-space inspection tools and drone applications with AI image recognition to improve inspection quality.

2. Research Results

a. Conducted five initial training sessions (2 in northern Taiwan, 2 in central, 1 in southern), with a total of 212 participants certified.

b. Conducted three refresher courses (2 in the north, 1 in the center), with a total of 157 participants certified.



3. 研究成果精華摘整

3. Key Research Highlights

113年公路橋梁檢測人員培訓北部場次剪影
\Highlights from the 2024 Northern Taiwan Session of the Highway Bridge Inspection Personnel Training Program

113年公路橋梁檢測人員培訓中部場次剪影
Highlights from the 2024 Central Taiwan Session of the Highway Bridge Inspection Personnel Training Program

113年公路橋梁檢測人員培訓南部場次剪影
Highlights from the 2024 Southern Taiwan Session of the Highway Bridge Inspection Personnel Training Program

(四)橋梁檢測輔助工具精進之研究（1/2）－研訂橋梁檢測3D影像模型作業程序

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，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；特別檢測係於重大事故或災害發生後，為了解損傷程度及防止災害擴大而實施之不定期目視檢測；詳細檢測則是於定期檢測或特別檢測後，認為有必要時，以儀器或相關設備進行局部破壞或非破壞檢測等之檢測。整體而言，橋梁檢測以目視為主，儀器為輔，故一般進行橋梁檢測作業時，多係以徒步及攀爬方式儘可能接近橋梁結構物後，再以目視判定橋梁狀況。

(IV) Research on the Enhancement of Bridge Inspection Tools (1/2): Development of 3D Imaging Workflow for Bridge Inspection

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. Special inspections are unscheduled visual checks conducted after major incidents or disasters to assess the extent of damage and prevent further escalation. In-depth inspections are carried out when regular or special inspections indicate a need for further evaluation. These involve localized destructive or non-destructive testing using specialized equipment or tools. Overall, bridge inspections rely primarily on visual assessment, supported by instruments when necessary. Therefore, most inspection activities involve inspectors approaching the bridge structure on foot or by climbing to perform close-up visual evaluations.

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。

本計畫利用前期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，可在3D模型中呈現橋梁各構件，協助使用者準確定位並瞭解劣化位置與程度，有效支援橋梁維護管理作業。114年將持續與交通部高公局合作，選定國道3號－南168高架橋與頭前溪河川橋做為橋檢案例，並規劃透過教育訓練及技術移轉將相關成果推廣應用。

2. 研究成果

（1）完成開發完成智慧橋檢系統，同時研訂橋梁檢測3D影像模型作業程序。

（2）完成建立無人機（UAV）影像品質偵測模組，可自動評估無人機拍攝的影像是否符合系統辨識標準。

（3）完成橋梁構件幾何變形偵測演算法，可自動偵測橋墩柱傾斜、沉陷等異常問題。

3. 成果推廣與效益

（1）於113年11月13日召開「橋梁檢測輔助工具精進發展」座談會，邀請各縣市政府橋管機關（線上與實體）共31位參與討論。

（2）113年4月24日於ISRS國際遙測研討會發表論文「Application of Vector – based Occlusion Detection Method for the Generation of Bridge Surface Orthoimage」。

（3）113年6月11日於ISPRS Technical Commission II國際航遙測研討會發表論文「Assisting Visual Inspection of Bridge Components: Geometric Analysis of Cracks Using Semantic Segmentation and RGBD Camera」。

（4）計畫成果可提供相關橋梁管理機關（如高公局、公路局、各縣市政府等）未來輔助檢測工具之參考應用。

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.

This project built upon previous AI-based recognition models and developed a 3D imaging workflow for bridge inspection. The 3D model helps accurately locate and assess deterioration in bridge components, supporting better maintenance decisions. In 2025, the project will collaborate with the Freeway Bureau to implement the model on National Highway 3's Nan 168 Viaduct and the Touqian River Bridge, with plans for training and technology transfer.

2. Research Results

(1) Completed the development of the AI-powered smart bridge inspection system and established the 3D imaging workflow for bridge inspections.

(2) Developed a UAV image quality assessment module to automatically evaluate whether UAV-captured images meet recognition standards.

(3) Created a geometric deformation detection algorithm to automatically detect anomalies such as pier tilting and settlement.

3. Promotion and Benefits

(1) Held a seminar on November 13, 2024, with 31 participants (online and onsite) from municipal bridge authorities to discuss advancements.

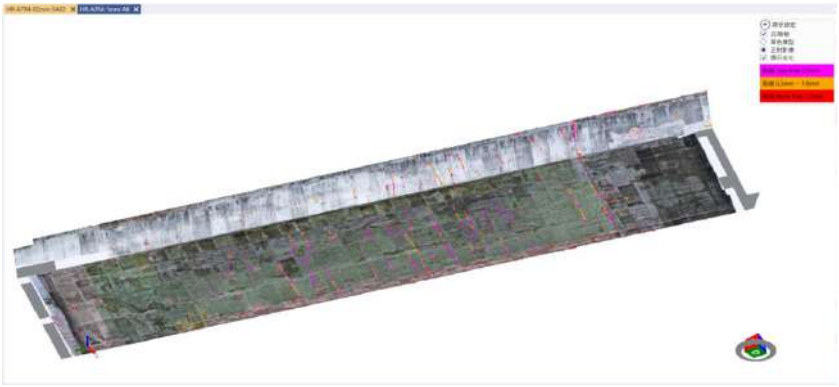
(2) Presented a paper titled "Application of Vector-based Occlusion Detection Method for the Generation of Bridge Surface Orthoimage" at the ISRS international remote sensing symposium on April 24, 2024.

(3) Presented "Assisting Visual Inspection of Bridge Components: Geometric Analysis of Cracks Using Semantic Segmentation and RGBD Camera" at the ISPRS Technical Commission II conference on June 11, 2024.

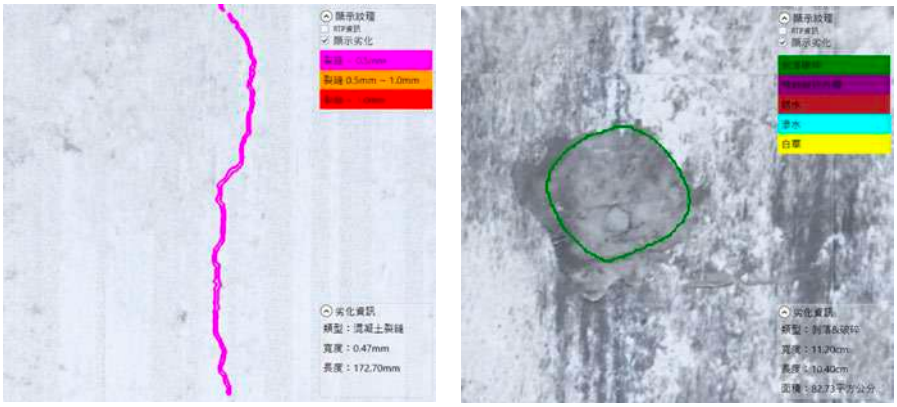
(4) The project outcomes serve as a reference for relevant bridge authorities (e.g., Freeway Bureau, Directorate General of Highways, local governments) in adopting enhanced inspection tools.

4. 研究成果精華摘整

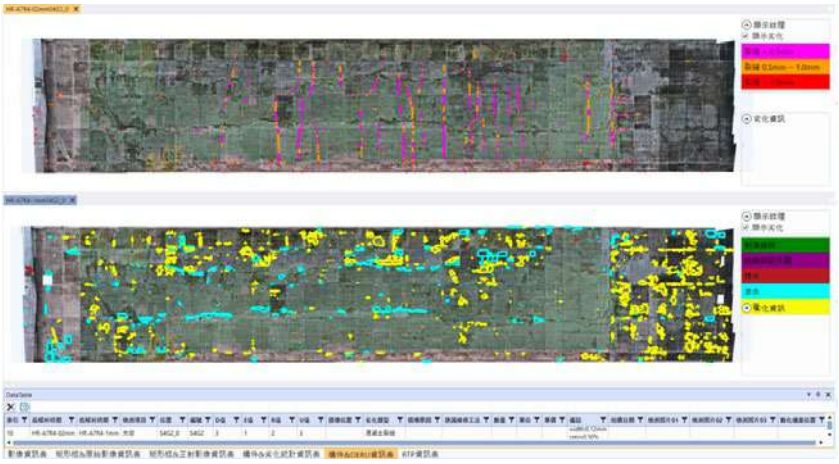
4. Key Research Highlights



系統以3D模型呈現劣化分布狀況
3D model visualization of deterioration distribution



系統可查詢劣化狀況寬度或長度
Query capabilities for crack width or length



套疊AI劣化偵測成果並自動產生檢測結果（DERU）
Integration of AI-detected damage and automatic generation of inspection results (DERU)

5. 研究成果報告

橋梁檢測輔助工具精進之研究（1/2）－研訂橋梁檢測3D影像模型作業程序（預計114年8月出版）

5. Final Report

"Research on the Enhancement of Bridge Inspection Tools (1/2): Development of 3D Imaging Workflow for Bridge Inspection" (Scheduled to be published in August 2025).

(五)公路橋梁梁底狹小空間檢測工具專利申請與推廣

1. 計畫概述

橋梁多為鋼構及鋼筋混凝土組成之構造物，會隨氣候及環境因素交替而逐漸老舊劣化，需定期巡檢並適時維護，依據「車行橋梁管理資訊系統」統計資料，113年正常使用中之車行橋梁為23,124座，橋梁維護管理工作有賴於各級橋梁管理單位，橋梁檢測工作是否確實，檢測品質好壞，攸關民眾行的安全，因此，橋梁檢測工作執行相當關鍵。針對小型或橋下淨高不足之橋梁，檢測人員無法使用橋檢車及UAV等常見之橋檢工具進行檢測，需冒著危險涉水、穿著潛水裝或乘坐船艇，進入橋梁梁底的底部空間進行勘查檢測，增加橋檢人員的工作風險。

爰此，本計畫研發橋檢工具，利用多節可伸縮之臂桿，將鏡頭探入狹暗橋梁底部空間，橋檢人員僅需於橋面上操作橋檢工具，即可透過即時回傳影像，檢查並記錄橋梁梁底狀況，克服梁底淨高不足橋梁檢測之問題。為符合橋檢作業需求，本橋檢工具檢測桿前端裝設三軸穩定器，配備鏡頭轉向模組，可拍攝橋梁底部側向構件（包含帽梁、支承、墩柱等），透過轉動鏡頭、增加光源及提高照相解析度，取得梁間構件之清晰影像。113年評估本橋檢工具申請專利之可行性，並提出專利申請及辦理推廣活動，提供橋梁維護管理單位實務應用。

2. 研究成果

（1）完成專利申請評估作業，並於113年底進行專利申請作業。

（2）執行各項推廣工作，進行訪談交流並蒐集回饋意見，獲得本橋檢工具之專業建議，可提供未來本橋檢工具精進之參考依據。

（3）透過橋檢人員訪談交流，獲悉橋梁檢測之實務問題及設備需求，可提供未來相關檢測輔助工具研發方向之參採。

(V) Patent Application and Promotion of Narrow Underside Inspection Tools for Highway Bridge Girders

1. Project Overview

Bridges are primarily composed of steel structures and reinforced concrete, which deteriorate over time due to alternating climatic and environmental factors. Therefore, regular inspections and timely maintenance are essential. According to the statistics from the "Highway Bridge Management Information System," as of 2024, there are 23,124 vehicular bridges in active use. The maintenance and management of these bridges rely on various levels of bridge management authorities. The accuracy and quality of bridge inspections are directly linked to public safety, making bridge inspection a critical task. Inspectors cannot use common tools such as bridge inspection vehicles or UAVs for small-scale bridges or those with limited clearance beneath them. Instead, they often need to wade through water, wear diving gear, or board small boats to access the underside of bridge girders, significantly increasing the risk to inspection personnel.

To address this issue, this project aims to develop a bridge inspection tool equipped with a multi-section telescopic arm, allowing a camera to be inserted into the narrow, dark space beneath bridge girders. This tool allows inspectors to operate from the bridge deck and view real-time video feeds to inspect and record conditions under the girders. This innovation effectively overcomes the inspection challenges posed by low-clearance bridge girders. To meet operational needs, the inspection tool features a three-axis stabilizer at the end of the inspection arm. It is equipped with a directional camera module capable of capturing lateral components under the bridge—such as cap beams, bearings, and piers. The tool can capture clear images of structural components between girders by adjusting the camera angle, enhancing lighting, and increasing image resolution. In 2024, the feasibility of patenting this bridge inspection tool was assessed. Subsequently, a patent application was filed, and promotional activities were conducted to facilitate practical application by bridge maintenance and management agencies.

2. Research Results

(1) Completed the evaluation process for patent application and proceeded with the patent filing by the end of 2024.

(2) Carried out various promotional activities, including interviews and exchanges to gather feedback. These efforts provided professional insights and suggestions regarding the bridge inspection tool, serving as a valuable reference for future improvements.

(3) Through interviews and exchanges with bridge inspection personnel, practical issues and equipment needs in bridge inspection were identified. These findings offer guidance for the future development of related inspection support tools.

3. 成果推廣與效益

（1）113年辦理各項推廣活動，包含提報交通部部務會報並發布新聞稿、拜訪多間橋梁檢測實務業界廠商、參與橋檢人員回訓課程擔任講師、參加橋梁安全維護管理研討會等，交流分享橋檢工具之研發成果並展示橋檢工具操作及功能，提供中央（內政部國土管理署、交通部高速公路局、公路局等）、地方（縣市政府）橋梁維護管理機關，以及實際執行橋梁檢測之顧問公司或廠商之參考應用。

（2）依據「科學技術基本法」及「交通部科學技術研究發展成果歸屬及運用辦法」，規劃辦理「橋梁梁底狹小空間檢測工具」研究成果後續非專屬授權作業，未來開放本計畫成果供外界申請，進行研發成果技術授權。

3. Result Promotion and Benefits

(1) In 2024, various promotional activities were conducted, including reporting to the Ministry of Transportation's departmental meetings and issuing press releases, visiting multiple bridge inspection industry vendors, serving as lecturers in bridge inspector refresher courses, and participating in bridge safety maintenance management seminars. These activities facilitated the exchange and sharing of research and development achievements of bridge inspection tools, demonstrated the operation and functions of the inspection tools, and provided reference applications for central authorities (such as the Ministry of the Interior's Department of Land Management, the Ministry of Transportation's Freeway Bureau and Highway Bureau), local governments (county and city governments), and consulting companies or vendors engaged in actual bridge inspection.

(2) According to the "Fundamental Act on Science and Technology" and the "Regulations on Ownership and Utilization of Research and Development Results of the Ministry of Transportation," the subsequent non-exclusive licensing operations for the "Bridge Underside Narrow Space Inspection Tool" research results are planned. In the future, the results of this project will be open for external applications and technical licensing of the research outcomes.

4. 研究成果精華摘整

4. Summary of Research Results

橋梁檢測工具整體架構及梁底拍攝影像
Bridge Inspection Tool Overall Architecture and Underside Beam Imaging

研發成果推廣及操作展示
Research Achievements Promotion and Operational Demonstration

5. 研究成果報告

- 公路橋梁梁底狹小空間檢測工具專利申請與推廣（114年3月出版）

(六)應用影像智慧化技術判釋海岸公路及防波堤越波研究(3/4)－防波堤越波影像判釋

1. 計畫概述

花蓮縣台11線浪襲路段易受颱風浪襲，碎波波浪更可能直接淘刷路基，影響公路通行安全。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，提供公路單位浪襲示警資訊，並可做為本所未來精進浪襲預警系統之參據。

本計畫於111-112年與交通部公路局東區養護工程分局合作，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. 研究成果

（1）113年於花蓮港區設置影像設備，蒐集港區波浪影像，透過影像校正、色彩空間轉換與分群、邊緣偵測，建立越波判釋門檻值，發展港區防波堤越波影像判釋方法，目前判釋正確率約為80%，可供後續作業化應用提供越波示警資訊。

（2）應用SCHISM結合FUNWAVE兩波浪數值模式，進行花蓮港區越波模擬，發展越波機器學習模型，後續可搭配外海波浪預報資訊，提供越波預警資訊。

5. Research Result Report

- Patent Application and Promotion of Detection Tools for Narrow Spaces at The Bridge Bottom (Published in March 2025)

(VI) Intelligent Image Recognition Analyses for Wave Overtopping on Coastal Highways and Seawalls (3/4) – Interpretation of Breakwater Overtopping Images

1. Project Overview

The wave-attack section of Provincial Highway 11 in Hualien County is vulnerable to typhoon waves, and the breaking waves are likely to directly wash away the roadbed, affecting highway traffic safety. From 2017 to 2021, the institute gradually established a wave attack early warning system for the coastal highways of Taitung and Hualien. It developed improvement measures to provide a reference to the Highway Bureau. However, there is still no on-site observation information for wave attacks. Therefore, this project uses cameras and image interpretation technology to provide highway units with wave warning information, which can also serve as a reference for our future improvement of the wave warning system.

In 2022-2023, this project cooperated with the Eastern Region Branch Office, MOTC to set up cameras and install run-up gauges on the Rendingshengtian section of Provincial Highway 11 in Fengbin Township, Hualien County, collect coastal highway images, develop image interpretation technology for wave run-up and wave attack, and use wave numerical models to simulate wave run-up and develop a wave run-up machine learning model as a basis for improving the Hualien Coastal Highway Wave Strike Warning System established by the institute. In 2024, we 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 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. Research Results

(1) In 2024, cameras were installed in the Hualien Harbor to collect wave images. Through image correction, color space transformation and clustering, and edge detection, a threshold value for overtopping interpretation was established, and a method for interpreting overtopping images of port breakwaters was developed. The current interpretation accuracy rate is about 80%, which can provide overtopping warning information for subsequent operational applications.

(2) The SCHISM and FUNWAVE wave numerical models are used to simulate waves overtopping in the Hualien Harbor area, and a developed wave overtopping machine learning model. This can be combined with offshore wave forecast information to provide overtopping wave warning information.

3. 成果推廣與效益

（1）113年8月29日於第42屆測量及空間資訊研討會發表論文「應用影像判釋技術分析花東海岸公路波浪溯升之研究」。

（2）研究成果提供精進本所建置之海岸公路浪襲預警系統之依據，可提供公路局東區養護工程分局於颱風浪襲封路決策參採應用，強化通行安全管理。

（3）研究成果提供本所114年完成越波影像判釋及機器學習作業化之依據，將可提供花蓮港務分公司於東堤作業及工程施工、釣客活動等進行安全、及人員巡查等設施管理之安全示警等應用。

3. Result Promotion and Benefits

(1) The August 29, 2024, 42nd Conference on Surveying and Geomatics featured a paper titled "Study on the Analysis of Wave Rise on the Hualien-Taitung Coast Highway Using Image Interpretation Technology."

(2) The research outcomes provide a basis for improving the coastal highway wave warning system established by the institute. The Eastern Region Branch Office, MOTC, can use them for reference in decision-making on road closures during typhoons, thereby strengthening traffic safety management.

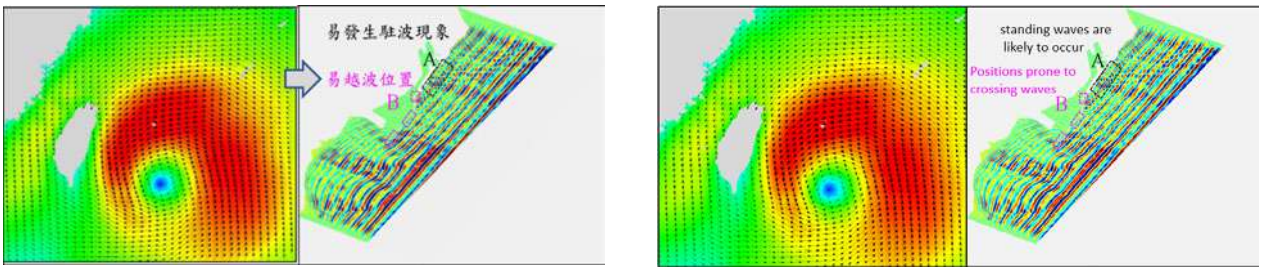
(3) The research outcomes provide a basis for the Institute to complete the interpretation of overtopping images and the operationalization of machine learning in 2025. They will be able to provide Port of Hualien, Taiwan International Port Corporation, Ltd. with applications such as safety warnings for east breakwater operations, engineering construction, angler activities, and facility management such as personnel inspections.

4. 研究成果精華摘整

4. Summary of Research Results

影像判釋港區防波堤越波

Image interpretation of overtopping at port breakwaters



波浪數值模式進行越波模擬，建立機器學習模型

Wave overtopping simulation and establishment of machine learning model

5. 研究成果報告

應用影像智慧化技術判釋海岸公路及防波堤越波研究（3/4）－防波堤越波影像判釋（114年3月出版）

(七)港灣構造物巡查檢測作業精進（3/4）－新興科技應用於防坡堤設施巡查檢測作業

1. 計畫概述

港區幅員廣大，港灣設施又長年處在惡劣的海洋及水下未知的環境，在執行港灣設施之日常巡查與檢測時，常需投入大量的人力及時間來進行巡查與檢測工作。近年來自動化巡檢的興盛，讓機器從事繁複的任務及判識設施的劣化狀況，可提供設施維護管理的重要輔助。為提升巡檢工作的效率，本計畫精進港灣設施之巡查與檢測作業，以更有效率且資訊化方式，協助維護管理人員落實維護管理工作與提升維護管理效率。

本計畫於113年持續擴充及滾動精進港灣設施維護管理系統，並開發各項巡查功能模組，提供臺灣港務公司、金門縣港務處及連江縣港務處辦理港灣設施巡查、檢測、維修、稽核與督導等作業應用，另因應現地巡查之實務需求，持續精進巡查行動應用程式（APP）功能，達成協助各港務單位提升港灣設施巡查效率之目的。

2. 研究成果

（1）完成維護管理系統劣化紀錄審核流程改善、系統儀表板增設航港局基礎設施巡查資料之統計、建置高風險設施（旅運中心、裝卸設備）巡查模組及行動應用程式特別巡查功能模組。

（2）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，完成港灣設施維護管理手冊修訂並持續滾動檢討。

（3）辦理教育訓練，針對第一線相關人員講解港灣設施維護管理制度，港灣設施巡查檢測方法及進行系統操作訓練，以利落實港灣設施維護管理工作。

5. Research Result Report

- Application of intelligent image technology to interpret wave overtopping on coastal roads and breakwaters (3/4) – Interpretation of Breakwater Overtopping Images (Published in March 2025).

(VII) Improved Inspection and Detection of Harbor Structures (3/4) – New-Emerging Technologies are applied to Inspection and Detection Operations of Breakwater Facilities

1. Project Overview

The port area is vast, and port facilities have long been subjected to harsh marine and underwater environments. Performing routine inspections and checks of port facilities often requires significant manpower and time. In recent years, the rise of automated inspections has enabled machines to undertake complex tasks and assess facility deterioration, providing critical support for facility maintenance management. To improve inspection efficiency, this project enhances the inspection and testing operations of port structures more efficiently and information-based, assisting maintenance personnel in implementing maintenance tasks and improving efficiency.

In 2024, this project continued to expand and iteratively enhance the Maintenance Management System for Harbor Facilities, and developed various inspection function modules. These modules support operational applications such as inspection, testing, maintenance, auditing, and supervision of harbor facilities by the Taiwan International Ports Corporation, Kinmen County Harbor Bureau, and Lienchiang County Harbor Bureau. In response to practical needs during on-site inspections, the functionality of the mobile inspection application (APP) is also continuously improved, aiming to assist port authorities in enhancing the efficiency of harbor facility inspections.

2. Research Results

(1) Completed the improvement of the review process for deterioration records in the maintenance management system, added statistical dashboards for infrastructure inspection data from the Maritime and Port Bureau, and developed inspection modules for high-risk facilities (passenger terminals, loading and unloading equipment) as well as a special inspection function module in the mobile application.

(2) In response to technical issues in harbor facility inspection and testing, management systems, and deterioration assessment standards, the Maintenance Management Manual for Harbor Facilities was revised and is subject to ongoing reviews and updates.

(3) Conducted training sessions to educate frontline personnel on the harbor facility maintenance management system, inspection and testing methods, and system operation, in order to effectively implement harbor facility maintenance and management tasks.

3. 成果推廣與效益

（1）於113年11月19日、10月22日及10月25日辦理3場次教育訓練，參與單位包括臺灣港務公司、金門縣與連江縣港務處等，並彙整學員回饋意見，納為後續制度改善及系統擴充精進之參據。

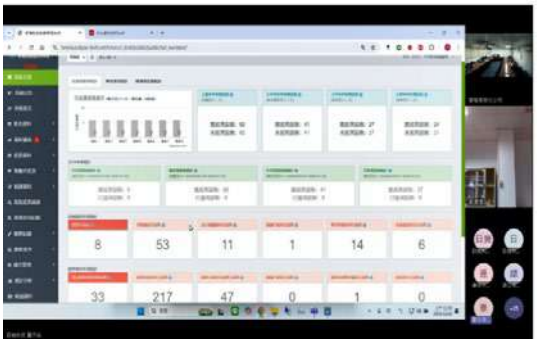
（2）協助臺灣港務公司、金門縣港務處與連江縣港務處落實港灣設施維護管理工作，確保港灣設施使用功能及營運安全，提升港埠服務品質與競爭力，達到永續經營之目標。

3. Result Promotion and Benefits

(1) Three training sessions were held on November 19, October 22, and October 25, 2024. Participating organizations included the Taiwan International Ports Corporation, Kinmen County Harbor Bureau, and Lienchiang County Harbor Bureau. Feedback from participants was collected and consolidated to serve as a reference for future improvements to the system and management framework.

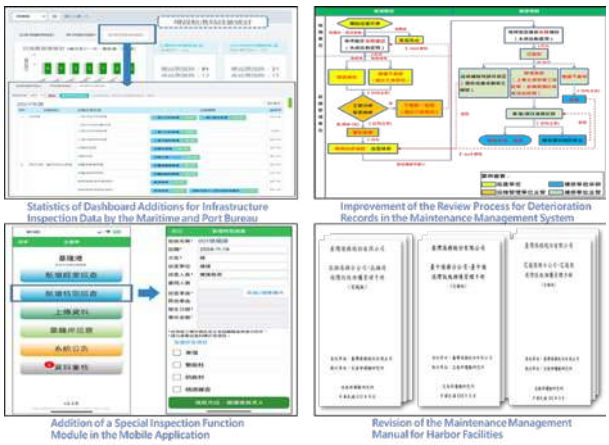
(2) Assisted the Taiwan International Ports Corporation, Kinmen County Harbor Bureau, and Lienchiang County Harbor Bureau in implementing harbor facility maintenance and management tasks to ensure the functionality and operational safety of harbor facilities, enhance the quality and competitiveness of port services, and achieve the goal of sustainable operation.

4. 研究成果精華摘整



教育訓練

Education and training



港灣設施維護管理系統功能擴充

Expansion of functionality for harbor facility maintenance management systems

5. 研究成果報告

- 港灣構造物巡查檢測作業精進（3/4）－新興科技應用於防坡堤設施巡查檢測作業（114年3月出版）

5. Research Results Report

- Improved Inspection and Detection of Harbor Structures (3/4) – New-Emerging Technologies are applied to Inspection and Detection Operations of Breakwater Facilities (Published in March 2025)

（八）港區影像智慧辨識技術之研究（2/3）－空間資料環境分析及優化影像檢監測應用技術

1. 計畫概述

考量我國商港區域幅員廣大，且人力有限，如何快速掌握港區各項設施使用狀況，並巡查港區使用環境及設施安全及穩定性，實為重要施政課題。無人飛行載具在近年快速發展，具有高度的移動性及遠距遙控功能，能取代人力快速且輕易到達過去不容易接近之區域，因此，本所接續110-111年計畫之成果架構，辦理112年「港區影像智慧辨識技術之研究（1/3）－空間基礎資料建構及影像檢監測應用技術發展」計畫及113年「港區影像智慧辨識技術之研究（2/3）－空間資料環境分析及優化影像檢監測應用技術」計畫，建立港區多來源感測資料之整合及智慧化演算技術，發揮資料最大化運用價值，另透過多維度空間資訊的整合，可瞭解港區建物能耗、太陽能設置潛能等環境特性，對港務公司未來巡查可節省大量人力及時間。

2. 研究成果

（1）發展港區現有CCTV與無人移動載具感測資料之整合技術，以擴展港區環境資料蒐集之時空維度與範圍。

（2）優化合適的人工智慧（AI）影像辨識技術，針對重要設施（如岸邊設施、碼頭、堤面及港區變電等設施）發展自動化巡查管理技術。

（3）透過112年建置之高細緻三維環境模型，分析港區環境特性現況（如建築物能耗及屋頂太陽光電潛能），做為港區管理及後續發展依據。

3. 成果推廣與效益

（1）「港區影像智慧辨識技術之研究」113年8月28日榮獲中華空間資訊學會頒發「第一屆空間資訊永續應用獎」特優獎。

（2）113年11月於第46屆海洋工程研討會發表論文「基於深度學習與霍夫直線之港區岸邊設施法線錯位自動檢測與管理方法」。

(VIII) Research on Intelligent Image Recognition Technology in Port Areas (2/3) – Spatial Data Environment Analysis and Optimization of Image Inspection and Monitoring Applications

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. Unmanned Aerial Vehicles (UAVs), which have rapidly developed in recent years, offer high mobility and remote-control capabilities. They can replace manual labor to reach previously inaccessible areas quickly and easily.

Therefore, based on the framework of the 2021–2022 project outcomes, the 2023 project "Research on Intelligent Image Recognition Technology in Port Areas (1/3) – Development of Spatial Base Data and Image Monitoring Application Technology" and the 2024 project "Research on Intelligent Image Recognition Technology in Port Areas (2/3) – Spatial Data Environment Analysis and Optimization of Image Inspection and Monitoring Applications" have been carried out. These aim to establish integrated multi-source sensing data and intelligent algorithm technologies to maximize the value of the data. Furthermore, integrating multi-dimensional spatial information makes it possible to understand environmental characteristics such as building energy consumption and solar power potential, significantly reducing manpower and time needed for future port inspections.

2. Research Outcomes

(1) Developed integration technology for existing port CCTV and mobile unmanned sensor data to expand the spatial and temporal scope of port environmental data collection.

(2) Optimized suitable AI-based image recognition technology to develop automated inspection and management of key facilities (e.g., coastal structures, wharfs, revetments, and port substation facilities).

(3) Used high-resolution 3D environmental models built in 2023 to analyze current environmental characteristics of the port area (e.g., building energy use and rooftop solar potential) as a basis for port management and future development.

3. Promotion of Outcomes and Benefits

(1) On August 28, 2024, the project won the "First Sustainable Spatial Information Application Excellence Award" from the Chinese Society for Geographic Information Systems.

(2) In November 2024, a research paper titled "Automatic Detection and Management of Normal Vector Misalignment in Coastal Structures of Ports Based on Deep Learning and Hough Line Transform" was presented at the 46th Marine Engineering Conference.

（3）113年11月26日辦理「港區無人機智慧化巡查技術研發成果」教育訓練，推廣無人機影像監測技術應用於臺北港區管理之研究成果。

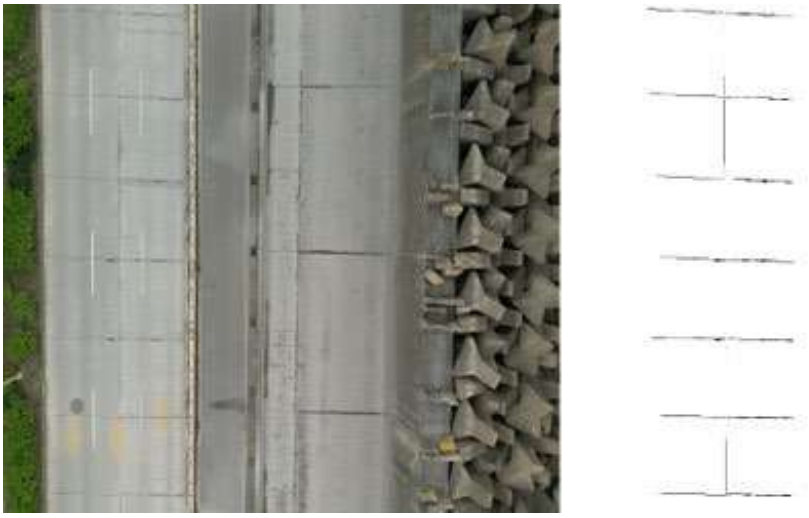
（4）研究成果可協助臺灣港務股份有限公司瞭解如何以自動化方式掌握港區之使用狀況與異動，並在人力持續簡化的長期趨勢之下，確保港區營運管理品質，並落實智慧化管理。

(3) On November 26, 2024, an educational training event was held to promote the R&D results of "Intelligent UAV Patrol Technology in Port Areas," showcasing applications of UAV image monitoring in the management of Taipei Port.

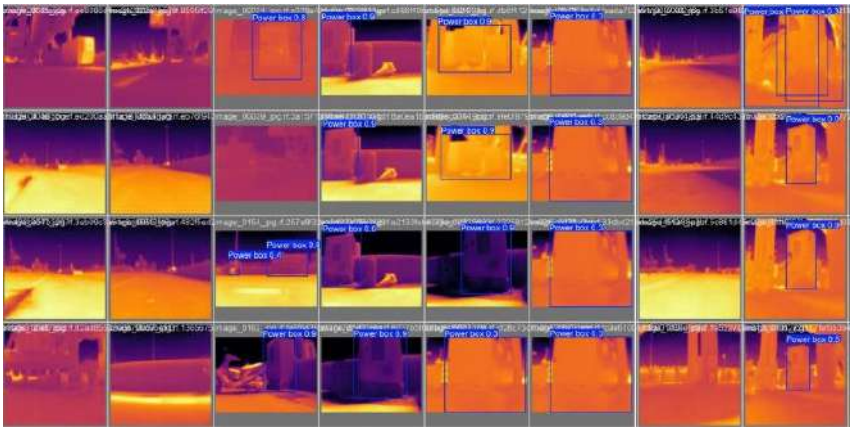
(4) These research outcomes assist the Taiwan International Ports Corporation in adopting automated methods to monitor port usage and detect changes. This ensures operational and management quality amid long-term manpower reduction trends, promoting intelligent management practices.

4. 研究成果精華摘整

4. Summary of Key Research Findings



開發港區碼頭及堤面物件AI影像辨識圖
AI Image Recognition for Wharf and Revetment Structures in Ports



開發港區變電設施偵測模組之影像辨識圖
Image Recognition Module for Port Substation Detection

5. 研究成果報告

- 港區影像智慧辨識技術之研究（2/3）－空間資料環境分析及優化影像檢監測應用技術（114年3月出版）

5. Research Results Report

- Research on Intelligent Image Recognition Technology in Port Areas (2/3) – Spatial Data Environment Analysis and Optimization of Image Inspection and Monitoring Applications (Published in March 2025)

(九)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

1. 計畫概述

臺灣位於亞熱帶和熱帶氣候區，海氣象條件複雜，颱風、季風、潮汐和海流等對船舶航行與海事安全影響顯著，颱風是臺灣常見的自然災害，帶來強風大浪，嚴重威脅船隻安全；季風的風向風速變化也影響船舶航行，漲落潮和海流則會影響船隻速度和航向，進而影響海上安全。船隻在海上航行常遭遇海氣象事件，可能導致擱淺、碰撞、傾覆等海難。因此，提供即時、適當的航行警告、海象與氣象資訊，有助於預防事故並提升安全，為提高臺灣海運競爭力，健全管理制度、提升避險訊號接收效率及搜救能力至關重要。

本計畫利用航港局之即時動態AIS（Automatic Identification System）資料，與本所運輸技術研究中心海氣象觀測資料庫，並引入中央氣象署氣象雲圖、雷達整合回波圖、颱風消息，結合臺灣海域船舶自動辨識系統，完成建置之船舶監控預警測試系統，可提供最近港口之海氣象觀測及預報值，並將相關成果提供航港局、臺灣港務股份有限公司做為海上交通管理及港區營運管理應用之參據。

2. 研究成果

（1）完成利用船舶自動識別系統、海氣象觀測、模擬資料庫及中央氣象署提供氣象雲圖、雷達整合回波圖和颱風消息等公開資訊，開發整合即時展示模組，藉由查詢船舶資訊（MMSI、船名等），取得與船舶距離最小的觀測站海氣象資訊（風速、波浪、潮位、海流）之觀測值，及本所臺灣近岸海象預報系統（TaiCOMs）之預報值。

（2）完成船舶航安通訊技術發展、船舶VDES、AIS資料、臺灣周圍海域與主要港埠航道交通流量蒐集與分析。

(IX) Exploration of Smart Navigation Safety and Marine Meteorological Information Applications – Application of Marine Meteorological Information in Ship Monitoring and Early Warning Systems

1. Project Overview

Taiwan is in a subtropical and tropical climate zone, where complex marine meteorological conditions significantly affect ship navigation and maritime safety. Typhoons, monsoons, tides, and ocean currents play major roles. Typhoons, one of the most common natural disasters in Taiwan, bring strong winds and high waves, posing severe threats to vessel safety. Variations in wind direction and speed caused by monsoons impact navigation, while tidal changes and ocean currents influence a ship's speed and course, thereby affecting overall maritime safety.

Ships frequently encounter marine meteorological events during navigation, which may lead to maritime accidents such as grounding, collisions, or capsizing. Therefore, providing timely and appropriate navigation warnings, as well as ocean and weather information, is crucial for accident prevention and safety enhancement. Strengthening management systems, enhancing the efficiency of hazard signal reception, and improving search and rescue capabilities are essential to improving Taiwan's maritime competitiveness.

This project utilizes real-time dynamic AIS (Automatic Identification System) data provided by the Maritime and Port Bureau and marine meteorological observation data from the Transportation Technology Research Center. It also incorporates meteorological cloud imagery, integrated radar echo maps, and typhoon bulletins from the Central Weather Administration. By integrating these data sources with the ship automatic identification system for the waters surrounding Taiwan, a ship monitoring and early warning test system has been developed.

The system provides real-time and forecasted marine meteorological information for nearby ports. The relevant results are made available to the Maritime and Port Bureau and Taiwan International Ports Corporation as references for maritime traffic management and port operations.

2. Research Outcomes

(1) Developed an integrated real-time display module by utilizing the Automatic Identification System (AIS), marine meteorological observation and simulation databases, and publicly available information from the Central Weather Administration, including meteorological cloud imagery, integrated radar echo maps, and typhoon bulletins. Through querying ship information (such as MMSI and vessel name), the system retrieves observed marine meteorological data (wind speed, wave height, tide level, and ocean current) from the nearest observation station to the vessel, as well as forecast data from the Taiwan Coastal Ocean Modeling System (TaiCOMs) developed by the center.

(2) Completed the development of ship navigation safety communication technologies, as well as the collection and analysis of VDES and AIS data, including maritime traffic flow in the waters surrounding Taiwan and major port channels.

3. 成果推廣與效益

（1）113年11月於第46屆海洋工程研討會發表論文「海氣象資訊於船舶監控預警系統之應用」。

（2）於颱風影響期間，能快速整合颱風路徑及影響範圍，針對受影響船舶，提供航港局、港務公司及海洋委員會海巡署即時警示與安全建議，並協助其調整航線以避開風險，提高海上活動的效率，同時也保障船舶及其他海上人員的安全。

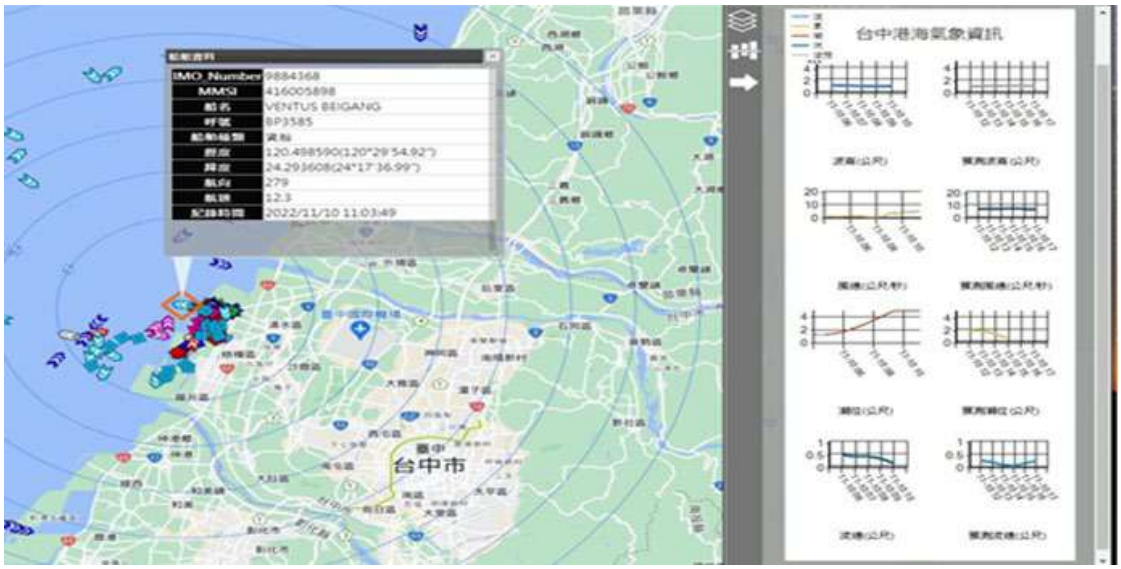
3. Promotion of Outcomes and Benefits

(1) In November 2024, the paper "Application of Marine Meteorological Information in Ship Monitoring and Early Warning Systems" was presented at the 46th Ocean Engineering Conference.

(2) During typhoons, the system can rapidly integrate typhoon paths and affected areas to provide real-time alerts and safety recommendations for impacted vessels. These alerts are delivered to the Maritime and Port Bureau, Taiwan International Ports Corporation, and the Coast Guard Administration of the Ocean Affairs Council. The system also assists in adjusting ship routes to avoid risks, thereby improving the efficiency of maritime operations while ensuring the safety of vessels and personnel at sea.

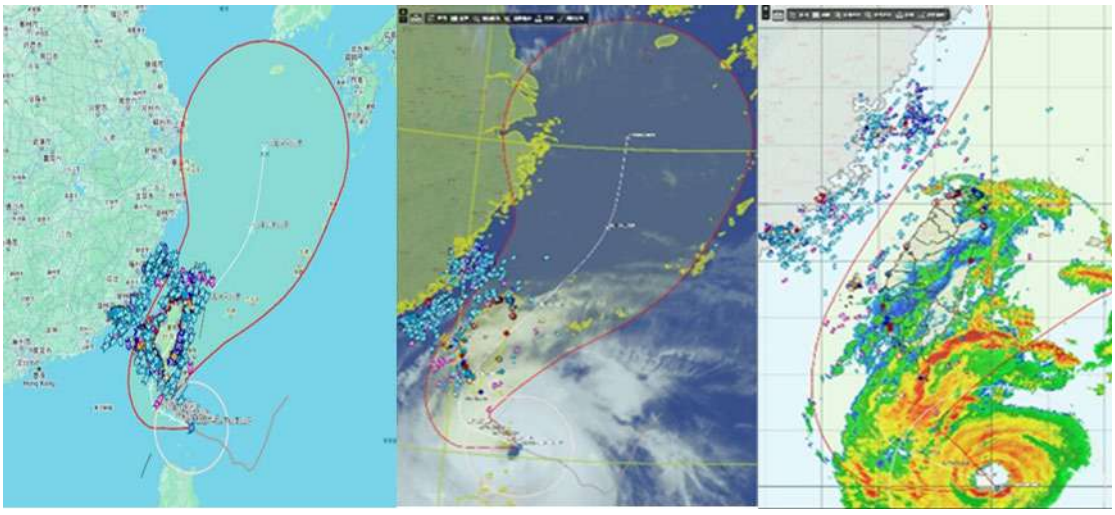
4. 研究成果精華摘整

4. Summary of Key Research Findings



臺中港海氣象觀測資訊

Taichung Port Marine Meteorological Observation Information



船舶動態系統（AIS）整合颱風消息圖

Typhoon Information Map Integrated with the Ship Dynamic System (AIS)

5. 研究成果報告

- 船舶特高頻資料交換系統與海氣象資訊之發展應用（港灣季刊114年3月出版）

(十)臺中港海洋陣列雷達訊號應用分析（2/3）－波浪觀測分析

1. 計畫概述

隨著全球航運業的快速發展與智慧港口技術之進步，臺灣港灣發展已逐步邁入智慧環境監測應用，過去商港海氣象受大氣、地形水深及近岸結構物等因素影響變化，常見浮標與底碇式波流儀雖能提供商港觀測數據，但僅限於空間單點資訊，且維護不易，相較之下，採用雷達遙測技術進行觀測，不僅能獲取大範圍的平面波流場數據，並免除海上佈放儀器之需求，且多數維護作業可於岸上陸地完成，減輕人員職業安全風險，因此，岸基雷達成為許多國家沿海地區監測海表面海流變化之重要遙測設施，在商港海象觀測應用中具有重要價值。

本所於臺中港建置高頻海洋陣列雷達觀測系統，運用雷達遙測技術進行商港海象調查。其中，111至112年間資料品管程序，係依據美國綜合海洋觀測系統（IOOS / QARTOD）高頻雷達表面流品管手冊，所進行的一套科學化標準品管過程。然而，由於該品管程序僅適用於海流產品，尚未針對波浪觀測產品制定統一性作法，因此，本所於113年度發展符合本土雷達資料特性之波浪品管程序，以提升雷達波浪觀測產品的可靠性。該系統可提取來自不同方向的海面背向散射雷達訊號，並演算40公里範圍內的海表面流與波浪等平面觀測數據。此技術不僅能提高港口安全性、提升航運效率，亦能為海域環境監測提供關鍵數據，輔助與優化國內海象觀測作業現況。

5. Research Results Reports

- Development and Application of Ship VHF Data Exchange Systems and Marine Meteorological Information (Published in Harbor Quarterly, March 2025)

(X) Taichung Port High-Frequency Radar Signal Application Analysis (2/3) –Wave observation and analysis

1. Project Overview

With the rapid development of global shipping and advancements in smart port technologies, Taiwan's port development has gradually progressed toward intelligent environmental monitoring applications. Traditionally, marine meteorological conditions in commercial ports are influenced by atmospheric conditions, topography, water depth, and nearshore structures. While buoys and bottom-mounted wave-current instruments have commonly been used to provide observational data, they are limited to single-point measurements and are challenging to maintain. In contrast, radar remote sensing technology offers significant advantages and enables the acquisition of wide-area, two-dimensional wave and current field data without the need to deploy instruments at sea. Most maintenance operations can also be performed onshore, reducing occupational safety risks for personnel. As a result, shore-based radar systems have become essential remote sensing infrastructure in many coastal regions worldwide for monitoring sea surface currents, and they play a valuable role in marine environmental observation within commercial port areas.

The Institute has established a high-frequency (HF) ocean radar array observation system at Taichung Port, utilizing radar remote sensing technology to conduct marine environmental surveys in commercial port areas. From 2022 to 2023, the data quality control procedures were based on the U.S. Integrated Ocean Observing System (IOOS)/QARTOD HF Radar Surface Current Quality Assurance/Quality Control Manual, implementing a standardized scientific quality control process for surface current data. However, since this protocol is limited to current observations and does not provide unified guidelines for wave data products, the Institute developed a wave data quality control procedure in 2024 tailored to the characteristics of Taiwan's local radar data, aiming to enhance the reliability of radar-derived wave observations. The system can extract backscattered radar signals from multiple directions and compute two-dimensional surface current and wave data within a 40-kilometer range. This technology not only improves port safety and navigational efficiency but also provides critical environmental data to support and optimize the current marine meteorological observation efforts in Taiwan.

2. 研究成果

（1）依據美國綜合海洋觀測系統（IOOS/QARTOD）即時高頻雷達表面海流品管手冊以及遵循科學界公認的數據標準，發展符合本土雷達資料特性之波浪品管程序，並釐訂雷達波浪0級與1級品管，對於波浪數據提取與品管限制有顯著效果，能確保雷達波浪觀測數據可用性與準確性，輔助臺中港航運管理單位之應用。

a. 第0級品管用以管制雷達前端訊號基準。

b. 第1級品管用以判斷雷達訊號強度偏差管理。

（2）本計畫成功發展雷達波浪頻譜，並成功觀測到颱風期間高頻波浪與低頻波浪於波浪頻譜中呈現雙峰結構之現象，有助於釐清港灣海域的波浪變化機制。未來將持續優化雷達監測技術與數據品質，深化跨領域合作，推動本土化應用技術開發，以支援商港運營、海岸管理、救生救難及海事污染應變等需求，確保港區航安。

3. 成果推廣與效益

於113年10月30日舉辦「海象雷達遙測工作坊」之應用技術交流及成果推廣說明會，邀請交通部中央氣象署、國家海洋研究院、海軍大氣海洋局、國家實驗研究院台灣海洋科技研究中心、國立中央大學與中國醫藥大學等相關業務機關（構）技術交流及應用分享，促進港灣災害應變、海難搜救及海洋污染防治等領域技術合作，以及透過海洋雷達氣象海嘯事件監測案例，做為港口災害預警機制，與建立安全通報機制並強化海岸防護應用。

2. Research Outcomes

(1) Based on the U.S. Integrated Ocean Observing System (IOOS)/QARTOD guidelines for real-time quality control of high-frequency radar surface currents and following internationally recognized scientific data standards, a wave data quality control procedure has been developed to align with the characteristics of Taiwan's radar observations. This effort includes the establishment of Level 0 and Level 1 quality control classifications for radar-derived wave data. The procedure significantly improves the effectiveness of wave data extraction and quality assurance, ensuring the usability and accuracy of wave observations from the radar system. This, in turn, supports operational applications by maritime management authorities at Taichung Port.

a. Level 0 quality control is used to regulate the baseline of the radar front-end signal.

b. Level 1 quality control is used to identify and manage deviations in radar signal strength.

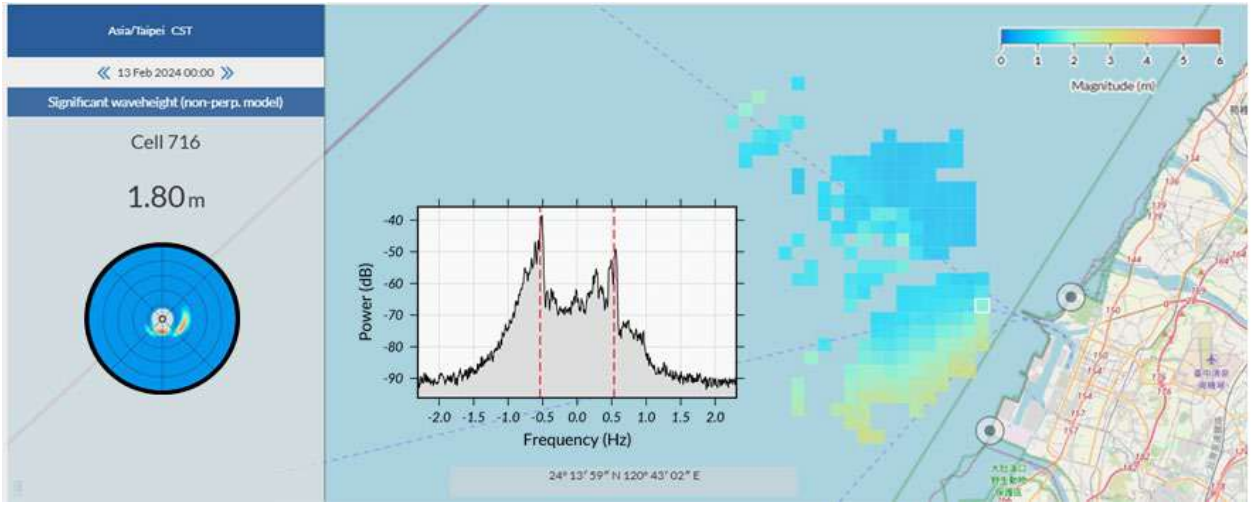
(2) This project successfully developed radar-based wave spectra and captured the dual-peak structure phenomenon in the wave spectrum during typhoon events, where both high-frequency and low-frequency waves were observed. This finding contributes to a better understanding of wave dynamics in port and harbor areas. Moving forward, efforts will focus on further optimizing radar monitoring technology and data quality, deepening interdisciplinary collaboration, and promoting the development of localized application technologies. These advancements aim to support commercial port operations, coastal management, search and rescue missions, and marine pollution response, ultimately ensuring navigational safety within port areas.

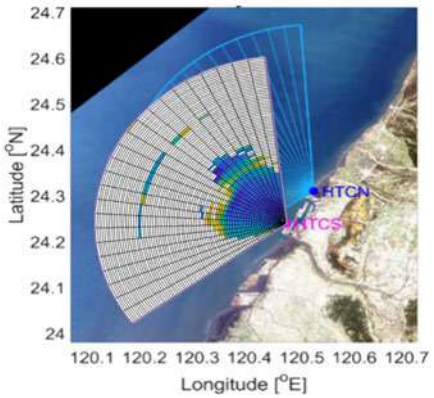
3. Promotion of Outcomes and Benefits

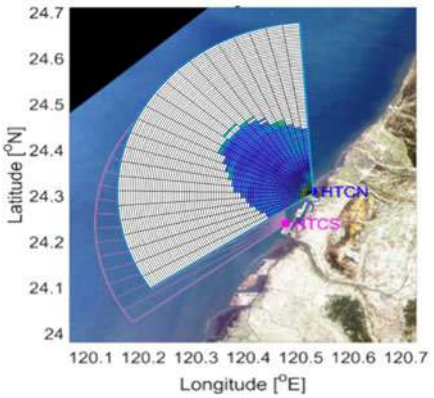
On Oct. 30, 2024, an application-oriented technical exchange and results dissemination session was held as part of the "Taiwan's Marine Radar Remote Sensing Workshop." Relevant agencies and institutions were invited to participate, including the Central Weather Administration of the Ministry of Transportation and Communications, the National Academy of Marine Research, the Naval Meteorological and Oceanographic Office, the Taiwan Ocean Research Institute of the National Applied Research Laboratories, National Central University, and China Medical University. The event facilitated technical exchange and the sharing of practical applications, aiming to promote interagency cooperation in areas such as port disaster response, maritime search and rescue, and marine pollution prevention. In addition, case studies on meteorological and tsunami event monitoring using ocean radar were presented as references for establishing port disaster early warning systems, enhancing safety alert mechanisms, and strengthening coastal protection applications.

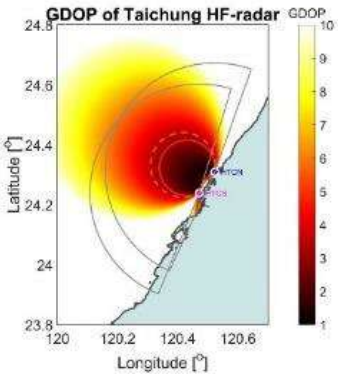
4. 研究成果精華摘整

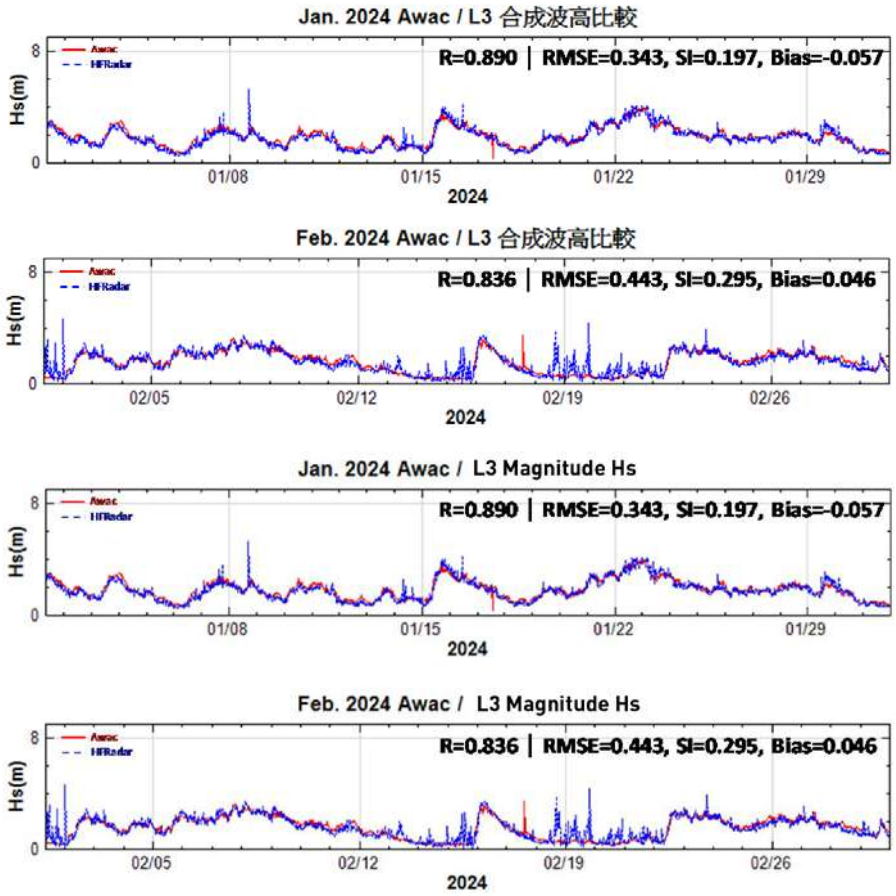
4. Summary of Key Research Findings











臺中港陣列雷達觀測站應用及平面波浪資訊展示

Application of the Taichung Port Phased Array Radar Station and Visualization of Two-Dimensional Wave Information

113年10月30日海象雷達遙測工作坊活動剪影

Highlights from the Taiwan Marine Radar Remote Sensing Workshop on Oct. 30, 2024

5. 研究成果報告

- 臺中港海洋陣列雷達訊號應用分析（2/3）－波浪觀測分析（114年3月出版）

(十一)港灣環境資訊系統維護與精進（3/4）－海氣象資訊分析及展示

1. 計畫概述

臺灣四周海域海氣象環境資料，係船舶航行及海域作業活動安全的關鍵，亦能提供擬定港灣環境短期劇烈變化的防災預警，以及長期演變趨勢之因應對策等應用參考。港區內外水理特性，常因港灣結構物影響產生局部性效應，進而影響船舶進出港口操航安全。因此，本所整合港灣即時海氣象觀測與數值模擬預測結果，發展即時性與預測性之港區海氣象環境資訊，並結合港區地震及港區大氣腐蝕資訊，提供港埠管理單位、船舶業者、引水人等查詢應用，使其迅速、確實、完整的掌握風力、潮位、波浪、海流、港區地震等港區環境資訊。

5. Research Results Report

- Taichung Port High-Frequency Radar Signal Application Analysis (2/3) –Wave observation and analysis (Published in March 2025)

(VI) Maintenance and Function Upgrades of the Harbor Environmental Information System (3/4) – Marine Weather Data Analysis and Display.

1. Project Overview

The maritime meteorological and environmental data around Taiwan's waters are crucial for the safety of vessel navigation and maritime operations. They can also provide disaster prevention warnings for short-term dramatic changes in port environments and serve as references for long-term trend coping strategies. The hydrological characteristics inside and outside port areas often experience localized effects due to port structures, which can impact the safe navigation of vessels entering and leaving ports. Therefore, the institute integrates real-time maritime meteorological observations and numerical simulation predictions to develop real-time and predictive port maritime environmental information. We also combine port tsunami, port earthquake, and port atmospheric corrosion information to provide querying applications for port management units, ship operators, pilots, and others. This enables them to quickly, accurately, and comprehensively grasp information on wind, tide, waves, currents, port earthquakes, port tsunamis, and other port environmental information.

爰此，本所完成港灣環境資訊網建置，提供全國9商港、12海域之風、波、潮、流即時觀測及未來48小時模擬資訊，以期達到「資料整合」、「應用加值」、「資料開放」與「成果推廣」四大目標，進而提供即時、正確、穩定之資訊服務。港灣環境資訊網除綜整本所歷年港灣環境相關研究成果外，亦整合本所、中央氣象署、以及水利署等機構的海氣象即時觀測數據，提供臺灣商港區最全面、即時的環境資訊，包括商港之海氣象觀測及模擬、地震、港區金屬材料腐蝕資訊、網站科普、公開資料及港灣環境資訊圖臺，113年於港灣環境資訊圖臺優化颱風資訊儀表板介面，新增颱風期間各商港海氣象風力、波浪與海流資訊最大值資訊展示，介接呈現民生示警公開資料平臺之中央氣象署的颱風行進軌跡路徑，亦優化觀測資訊、模擬資訊、腐蝕資訊、網站科普知識、公開資料及港灣環境資訊圖臺等6大功能，支援颱風期間各商港區環境資訊即時與模擬資訊查詢應用，及重新取得網站無障礙標章認證，並提供臺灣港務股份有限公司、船舶業者及港區使用者決策輔助參考，提高港區使用安全。

2. 研究成果

（1）精進GIS颱風資訊儀表板專區，於颱風侵臺期間，展示港區海氣象觀測及模擬歷線圖資訊，及套疊臺灣近岸海象預測系統（TaiCOMS）所產出之海氣象模擬平面分佈圖、氣泡資訊與襲港機率，進而提供颱風路徑上各中心點對各商港海氣象資訊變化影響，並呈現發布警報之颱風期間各商港海氣象風力、波浪與海流資訊最大值資訊，可幫助港埠管理、營運人員及使用者因應惡劣環境之參考。

（2）優化臺灣腐蝕環境分類資訊查詢功能，提供臺灣各港口和沿海地區腐蝕環境詳細分析數據，以利瞭解港區環境之腐蝕趨勢或變化，及精進提升資料開放服務功能，提供鋁、銅、鋅與碳鋼4項金屬年腐蝕速率資料之白金標章等級介接服務，作為港區結構物金屬防蝕設計參考，提昇港區結構物安全。

To achieve this, the institute has completed the construction of a port environmental information network, providing real-time observations and future 48-hour simulation information on wind, waves, tides, and currents for 9 commercial ports and 12 sea areas across the nation. This aims to achieve four major goals: "Data integration," "Value-added applications," "Data openness," and "Results promotion," thereby providing real-time, accurate, and stable information services. The port environmental information network not only consolidates the institute's research results related to port environments over the years but also integrates real-time maritime meteorological observation data from the Central Weather Administration and the Water Resources Agency. This provides the most comprehensive and real-time environmental information for Taiwan's commercial port areas, including maritime meteorological observations and simulations, tsunamis, earthquakes, port metal corrosion information, website popularization, public data, and port environmental information graphics platform. In 2024, the typhoon information dashboard on the Harbor Environmental Information Platform was enhanced to display maximum wind, wave, and current data during typhoons for each commercial port. The system was also integrated with the Central Weather Administration's typhoon track data from the Public Warning Information Platform. In addition, six major functions were optimized: observational data, simulation data, corrosion information, website popularization, public data, and the overall platform interface. These improvements support real-time and simulated environmental data access during typhoons, aid decision-making for Taiwan International Ports Corporation, shipping operators, and port users, enhance port safety, and ensure renewed compliance with web accessibility certification.

2. Research Results

(1) The construction of the GIS typhoon information dashboard section displays maritime meteorological observation and simulation history line chart information during typhoon invasion periods, overlaid with the "Taiwan Coastal Operational Modeling System 2.0"(TaiCOMS 2.0) generated maritime meteorological simulation plane distribution maps, bubble information, and port invasion probability. This provides information on how each center point along the typhoon path affects changes in maritime meteorological information for each commercial port, aiding port management, operational personnel, and users in responding to adverse environmental conditions.

(2) The Taiwan Corrosion Environment Classification Information query function has been optimized to provide detailed analysis data on corrosion environments for various ports and coastal areas in Taiwan. This facilitates the understanding of corrosion trends or changes in port environments. Additionally, the data openness service function has been enhanced, offering platinum-level interface services for annual corrosion rate data of four metals—aluminum, copper, zinc, and carbon steel. This serves as a reference for the metal corrosion prevention design of port structures, enhancing the safety of port infrastructure.

3. 成果推廣與效益

（1）113年11月於第46屆海工研討會發表論文摘要「港灣環境資訊系統－資料分析工具開發」。

（2）本所港灣環境資訊網內容包括港灣風、波、潮、流與能見度觀測資訊、模擬資訊、腐蝕資訊、網站科普、公開資料及港灣環境資訊圖臺6大查詢功能，提供整體性、即時性海象資訊供政府單位及一般民眾參考應用。

4. 研究成果精華摘整

3. Result Promotion and Benefits

(1) In November 2024, a paper abstract, "Development of Data Analysis Tools for the Harbor Environmental Information System," was presented at the 46th Ocean Engineering Symposium.

(2) The content of the institute's port environmental information network includes six major query functions: port wind, wave, tide, and current observation information, simulation information, corrosion information, website popularization, public data, and port environmental information graphics platform. This provides comprehensive and real-time maritime information as a reference for government agencies and the general public.

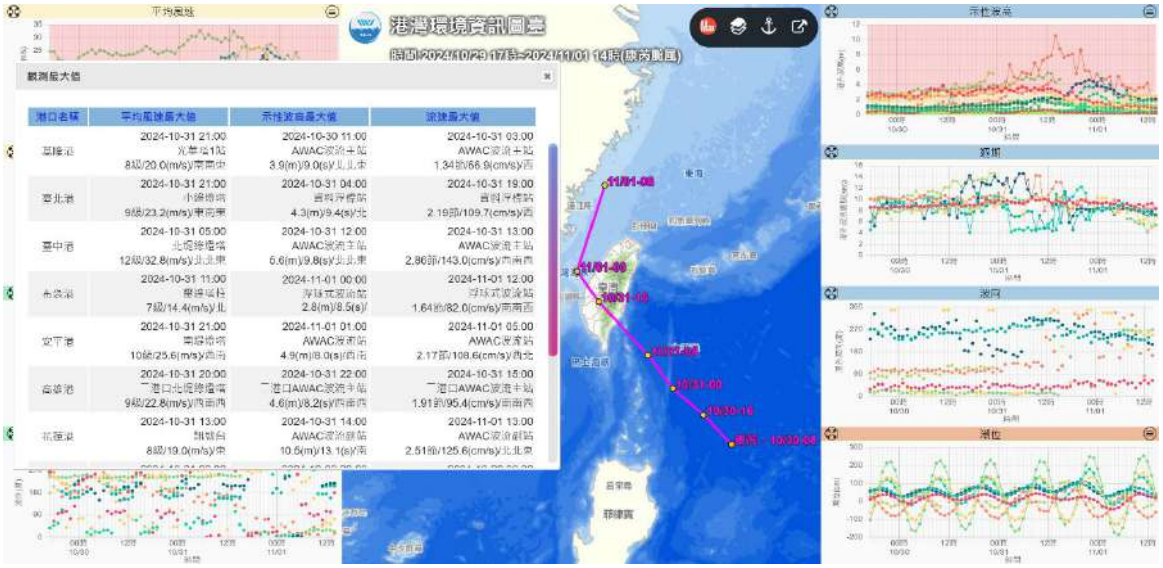
4. Summary of Research Results

港灣環境資訊平臺之六項子系統

The six subsystems of the harbor environmental information platform

港灣環境資訊網

Harbor Environmental Information Website



港灣環境資訊圖臺颱風資訊儀表板專區

Typhoon Information Dashboard Section of the Harbor Environmental Information Platform

5. 研究成果報告

- 港灣環境資訊系統維護與精進（3／4）－海氣象資訊分析及展示（114年3月出版）

5. Research Results Report

- Maintenance and Function Upgrades of the Harbor Environmental Information System (3/4) – Marine Weather Data Analysis and Display. (Published in March 2025).

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項次	日期	主題	Topic
1	1月15日	「畸形波、短波峰於船舶航行與港口工程之應用」專題演講	Experts Symposium: General introduction to freak wave, Short crest wave etc. and application to ship navigation, Harbour engineering.
2	1月18~19日	APEC「提昇移動力整合新紀元」第二場次國際論壇	2nd APEC Conference on Exploring the New Age for Mobility Integration
3	3月5日	113年3月海運期刊研討會	Seminar: March 2024 Maritime Journal
4	3月13日	113年3月空運期刊研討會	Seminar: March 2024 Air Transport Journal
5	3月19日~ 3月22日	「2050淨零城市展」－交通部展攤	Exhibition: 2050 Net Zero City Expo
6	3月20日	「2024城市空中交通國際論壇」	Leading the Future: 2024 Urban Air Mobility International Forum

05
研討與成果推廣活動
Seminars and Achievements Promotion Activities

項次	日期	主題	Topic
7	4月1日	「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（1/2）－合理成本與營運績效探討」第2次專家學者座談會	Expert and Scholar Symposium: The 2nd Expert and Scholar Symposium on "An Investigation of Operation, Subsidy and Fare System of Demand Responsive Transport Service (DRTS) Scheme (1/2) – Operation Cost Analysis and Performance Evaluation"
8	4月9日	113年4月海運期刊研討會	Seminar: April 2024 Maritime Journal
9	4月25日	113年4月運輸及港灣期刊研討會	Seminar: April 2024 Transportation and Harbor Journal
10	5月20日	113年5月空運期刊研討會	Seminar: May 2024 Air Transport Journal
11	5月30日	113年5月運輸及港灣期刊研討會	Seminar: May 2024 Transportation and Harbor Journal
12	5月30日	113年5月運輸能源及環境期刊研討	Seminar: May 2024 Transportation Energy and Environment Journal

項次	日期	主題	Topic
13	5月31日	113年5月運輸經營及管理期刊研討	Seminar: May 2024 Transportation operations and Management Journal
14	6月3日	「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」說明暨討論會議（北部場）	Training Workshop: Cycling route (including alternative route) and Bike tour sign, markings' setting principles(North)
15	6月3日	運輸場站節能減碳推動教育訓練	Training Workshop: Energy Conservation and Carbon Reduction Promotion of Transportation Stations and Terminals
16	6月13日	「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」說明暨討論會議（中部場）	Training Workshop: Cycling route (including alternative route) and Bike tour sign, markings' setting principles(Central)
17	6月14日	「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」說明暨討論會議（南部場）	Training Workshop: Cycling route (including alternative route) and Bike tour sign, markings' setting principles(South)
18	6月19日	「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」說明暨討論會議（東部場）	Training Workshop: Cycling route (including alternative route) and Bike tour sign, markings' setting principles(East)
19	6月19日	113年6月海運期刊研討會	Seminar: June 2024 Maritime Journal
20	6月20日	運輸調適課程規劃專家學者座談會	Expert and Scholar Symposium: Transportation Adaptation Course Planning
21	6月21日	「因應氣候變遷調適系列課程」教育訓練（第1場）	Training Workshop: Climate Change Adaptation Series Courses (1st Session)
22	6月25日	「汽車貨運業因應淨零轉型策略規劃（1/2）－策略架構建立」第1次專家學者座談會	Expert and Scholar Symposium: The 1st Expert and Scholar Symposium on "Strategic Planning for the Net-Zero Transition in the Automobile Cargo Transportation Industries (1/2) – Strategy Framework Development"
23	6月26日	113年6月運輸及港灣期刊研討會	Seminar: June 2024 Transportation and Harbor Journal
24	6月27日	「ISO 55001國際標準導入鐵道資產管理實務之研究（2/3）－績效模型建構」第1次專家學者座談會	Expert and Scholar Symposium: The 1st Expert and Scholar Symposium on "A study on Implementation of Asset Management through ISO 55001 in Railway Industry (2/3) – Performance Measurement Model"
25	7月2日	113年7月運輸科技及資訊期刊研討	Seminar: July 2024 Transportation Technology and Information Journal
26	7月5日	「TPASS行政院通勤月票推動成效評估與精進建議」第1次專家學者座談會	Expert and Scholar Symposium: The 1st Expert and Scholar Symposium on "The Effectiveness Evaluation and Improvement Suggestion of TPASS, the Commuter Monthly Pass Promoted by Executive Yuan"
27	7月9日	大氣腐蝕及防蝕技術應用研習會	Seminar: Atmospheric Corrosion and Anti-Corrosion Technology Application
28	7月11日	國道客運業者基於異常事件之駕駛安全管理系統座談會	Symposium: Aberrant Event Based Driver Safety Management System

項次	日期	主題	Topic
29	7月17日	113年7月空運期刊研討會	Seminar: July 2024 Air Transport Journal
30	7月22日	「臺灣地區整體運輸規劃－貨運需求模式架構分析」專家學者座談會	Expert and Scholar Symposium: The Expert and Scholar Symposium on "The Overall Transportation Planning in Taiwan–Analyzing the Framework of Freight Transport Demand Model"
31	7月30日	「事業減碳通勤優良單位標章制度」專家諮詢會議	Expert Consultation Meeting: Eco-Commuting Business Site Certification System
32	7月31日	113年7月運輸經營及管理期刊研討	Seminar: July 2024 Transportation operations and Management Journal
33	8月1日	「因應氣候變遷調適系列課程」教育訓練（第2場）	Training Workshop: Climate Change Adaptation Series Courses (2nd Session)
34	8月2日	113年7月運輸及港灣期刊研討會	Seminar: July 2024 Transportation and Harbor Journal
35	8月7日	「共享運具連結公共運輸計畫（1/2）－營運管理因應策略規劃」第1次專家學者座談會	Expert and Scholar Symposium: The 1nd Expert and Scholar Symposium on "A Plan for Connecting Shared Modes and Public Transportation(1/2) – Strategic Planning for Operation Management"
36	8月8日~8月10日	「2024亞太永續行動博覽會」	2024 SDGs Asia Exhibition
37	8月13日	「電動車公共充電樁設施設置需求評估之研究」第2次專家學者座談會	Expert and Scholar Symposium: The 2nd Expert and Scholar Symposium on "The Study of the Public Charger's Demand Assessment for Electric Vehicles "
38	8月13日	「離岸風機水下基礎結構物之在地化塗裝耐蝕性暨防蝕系統實證與模擬」專題演講	Keynote speech: Demonstration and simulation of localized coating corrosion resistance and anti-corrosion system of offshore wind turbine underwater infrastructure
39	8月21日	113年8月海運期刊研討會	Seminar: August 2024 Maritime Journal
40	8月23日	113年8月運輸能源及環境期刊研討	Seminar: August 2024 Transportation Energy and Environment Journal
41	8月26-27日	APEC「偏鄉公共運輸跨域資源整合之推動與挑戰」國際論壇	APEC International Conference on "Promoting and Addressing Challenges of Cross-Sector Resource Integration in Rural Public Transportation"
42	8月26日	調適執行實作－運輸系統調適指引實務推演工作坊	Adaptation Implementation Practice – Practical Exercise Workshop on Transportation System Adaptation Guidelines
43	9月5日	113年8月運輸及港灣期刊研討會	Seminar: August 2024 Transportation and Harbor Journal
44	9月13日	「鐵道系統強化調適能力之探討（1/3）－機制與方法」專家座談會	Expert Symposium: A Study of Enhancing the Adaptive Capacity of Railway Systems (1/3) – Mechanism and Method.
45	9月18日	「鐵道系統強化調適能力之探討（1/3）－機制與方法」教育訓練暨成果分享	Training Workshop: A Study of Enhancing the Adaptive Capacity of Railway Systems (1/3) – Mechanism and Method.
46	9月18日	113年9月空運期刊研討會	Seminar: September 2024 Air Transport Journal

項次	日期	主題	Topic
47	9月26日	「綠運輸生活型態誘因機制」公私部門座談會	Government and Industry Symposium: Incentive Mechanism of Green Transportation Life Style
48	9月30日	「因應氣候變遷調適系列課程」教育訓練（第3場）	Training Workshop: Climate Change Adaptation Series Courses (3rd Session)
49	10月1日	113年臺灣公路容量分析軟體教育訓練－臺北場	Training Workshop: 2024 Taiwan Highway Capacity Analysis Software (Taipei)
50	10月4日	113年9月運輸及港灣期刊研討會	Seminar: September 2024 Transportation and Harbor Journal
51	10月7日	113年9月運輸經營及管理期刊研討	Seminar: September 2024 Transportation operations and Management Journal
52	10月8日	113年10月海運期刊研討會	Seminar: October 2024 Maritime Journal
53	10月9日	旅宿業節能減碳推動教育訓練	Training Workshop: Energy Conservation and Carbon Reduction Promotion Training for Hotel and Lodging Industry
54	10月17日	「電動車公共充電樁設施設置需求評估之研究」成果說明會	Outcome Presentation: The Study of the Public Charger's Demand Assessment for Electric Vehicles
55	10月19日	「路口交通環境特性對空氣品質影響及改善指引之研訂－路口空污改善模擬分析與指引規劃」專家諮詢會	Expert Consultation Meeting: Simulation Analysis and Guideline Planning for Intersection Air Pollution Improvement
56	10月22日	「113年度金門港維護管理系統精進與維護」教育訓練（第1場）	Training Workshop: 2024 Kinmen Harbor Structure Maintenance and Management System Education and Training (1st Session)
57	10月24–25日	113年度馬祖研究計畫成果交流暨系統教育訓練	Workshop on Results Exchange and System Training of the 2024 Matsu Research Project
58	10月25日	「因應氣候變遷調適系列課程」教育訓練（第4場）	Training Workshop: Climate Change Adaptation Series Courses (4th Session)
59	10月29日	「TPASS行政院通勤月票推動成效評估與精進建議」第2次專家學者座談會	Expert and Scholar Symposium: The 2st Expert and Scholar Symposium on "The Effectiveness Evaluation and Improvement Suggestion of TPASS, the Commuter Monthly Pass Promoted by Executive Yuan"
60	10月29日	「傳統暨區域鐵路系統場站容量分析」成果發表會暨教育訓練	Symposium and Training Workshop: Yard and Station Capacity Analysis of Conventional Railway Systems
61	10月29日	「構建5G智慧交通數位神經中樞－功能擴充與精進」成果交流座談會	Achievements Exchange Symposium: Construction of 5G intelligent transportation digital nerve center – Function Expansion and Refinement
62	10月29日	「路口交通環境特性對空氣品質影響及改善指引之研訂－通案性路口交通空污之改善策略探討」專家諮詢會	Expert Consultation Meeting: Exploring General Strategies for Improving Traffic – Related Air Pollution at Intersections
63	10月29日	低碳交通區推動機制之研究－北部交流會	Exchange Meeting: A Study on the Mechanism of Low – Carbon Transportation Zones (The Northern Taiwan Session)
64	10月30日	「以無人機空拍及AI影像辨識技術探討路段交通衝突」研究成果說明暨教育訓練	Outcome Presentation and Training Workshop: Using drone aerial photography and AI image recognition technology to study traffic conflicts on roads

項次	日期	主題	Topic
65	10月30日	「汽車貨運業因應淨零轉型策略規劃（1/2）－策略架構建立」第2次專家學者座談會	Expert and Scholar Symposium: The 2nd Expert and Scholar Symposium on "Strategic Planning for the Net – Zero Transition in the Automobile Cargo Transportation Industries (1/2) – Strategy Framework Development"
66	10月30日	低碳交通區推動機制之研究－中部交流會	Exchange Meeting: A Study on the Mechanism of Low – Carbon Transportation Zones (The Central Taiwan Session)
67	10月30日	「海象雷達遙測工作坊」之應用技術交流及成果推廣說明會	Conference and Workshop: Conference on the Application Technology Exchange and Promotion of the "Ocean Radar Remote Sensing Workshop"
68	10月31日	運輸場站與旅宿業節能推動策略專家諮詢會議	Expert Consultation Meeting: Conservation and Carbon Reduction Promotion Strategy of Transportation Stations and Terminals as well as Hotel and Lodging Industry
69	11月1日	低碳交通區推動機制之研究－南部交流會	Exchange Meeting: A Study on the Mechanism of Low – Carbon Transportation Zones (The Southern Taiwan Session)
70	11月1日	航港數位化發展藍圖與指引專家學者座談會	Experts and Scholar Symposium: Digital Development Blueprint and Guidelines of Maritime and Port Industry
71	11月4日	電動大客車數據分析與應用計畫（2/2）－資料視覺化與AI應用成果說明會	Outcome Presentation: Electric Bus Data Analysis and Application Project (2/2) – Data Visualization and AI Application Results
72	11月5日	「ISO 55001國際標準導入鐵道資產管理實務之研究（2/3）－績效模型建構」第2次專家學者座談會	Expert and Scholar Symposium: The 2nd Expert and Scholar Symposium on "A study on Implementation of Asset Management through ISO 55001 in Railway Industry (2/3) – Performance Measurement Model"
73	11月8日	「臺中×高雄牽手行MaaS跨域包容體驗」活動	Taichung × Kaohsiung Hand-in-Hand MaaS Cross – Regional Inclusive Experience Event
74	11月8日	道路交通安全檢查教育訓練	Training Workshop: Road Traffic Safety Inspection
75	11月11日	「路口交通環境特性對空氣品質影響及改善指引之研訂－路口交通空污改善指引」成果分享會議（第1場）	Outcome Presentation: The Impact of Traffic Environmental Characteristics at Intersections on Air Quality and the Development of Improvement Guidelines – Improvement Guidelines for Traffic-Related Air Pollution at Intersections (1st Session)
76	11月11日	MaaS包容性服務運輸業者意見蒐集座談會	Transport Operators Symposium: Inclusive MaaS Services
77	11月12日	運輸氣候變遷風險評估－範疇界定操作工作坊	Workshop: Transportation Climate Change Risk Assessment – Scope Definition
78	11月13日	「橋梁檢測輔助工具精進發展」座談會	Experts and Scholar Symposium: The Advancement of Bridge Inspection Assistance Tools
79	11月13日	「共享運具連結公共運輸計畫（1/2）－營運管理因應策略規劃」第2次專家學者座談會	Expert and Scholar Symposium: The 2nd Expert and Scholar Symposium on "A Plan for Connecting Shared Modes and Public Transportation (1/2) – Strategic Planning for Operation Management"
80	11月14日	「113年度金門港維護管理系統精進與維護」教育訓練（第2場）	Training Workshop:2024 Kinmen Harbor Structure Maintenance and Management System Education and Training (2nd Session)

項次	日期	主題	Topic
81	11月15日	本所、台灣軌道工程學會及財團法人中華顧問工程司合作辦理「2024鐵道科技技術與人才養成論壇」	Our institute, in collaboration with the Taiwan Railway Engineering Society and CECI Engineering Consultants, Inc., Taiwan, hosted the 2024 Railway Technology and Talent Development Forum.
82	11月18日	「路口交通環境特性對空氣品質影響及改善指引之研訂－路口交通空污改善指引」成果分享會議（第2場）	Outcome Presentation: The Impact of Traffic Environmental Characteristics at Intersections on Air Quality and the Development of Improvement Guidelines – Improvement Guidelines for Traffic-Related Air Pollution at Intersections (2nd Session)
83	11月18日~25日	綠運輸生活型態推廣活動	Promotion of Green Transportation Life Style
84	11月19日	113年11月空運期刊研討會	Seminar: November 2024 Air Transport Journal
85	11月19日	「113年港灣構造物維護管理系統」教育訓練	Training Workshop: 2024 Harbor Structure Maintenance and Management System Education and Training
86	11月20日	「評估建立我國港口協調整合決策系統」座談會	Experts and Scholar Symposium: Evaluation on the Development of Port Collaborative Decision Making System in Taiwan
87	11月20日	「傳統暨區域鐵路系統場站容量分析」第2次教育訓練	Training Workshop: Yard and Station Capacity Analysis of Conventional Railway Systems (2nd Session)
88	11月21日	研擬道路交通標誌標線號誌設置參考指引－一般道路情境成果說明會	Outcome Presentation: Develop reference guidance for the installation of road traffic signs markings and signals (1/3) – general road conditions
89	11月25日	本所「運輸經營及管理組業務回顧與展望」諮詢會議	Consultation Meeting: The Review and Prospects of Transportation Operations and Management Division, Institute of Transportation, MOTC
90	11月26日	港區無人機智慧化巡查技術研發成果教育訓練	Training Workshop: The research and development achievements of intelligent drone patrol technology for commercial ports.
91	11月26日	113年度空運國際資料庫議題分析成果交流座談會	Experts Symposium: Sharing & Discussion on Thematic Analysis Outcomes of International Air Transport Database of 2024
92	11月27日	113年臺灣公路容量分析軟體教育訓練－高雄場	Training Workshop: 2024 Taiwan Highway Capacity Analysis Software (Kaohsiung)
93	11月27日	113年度海運國際資料庫議題分析成果交流座談會	Experts Symposium: Sharing & Discussion on Thematic Analysis Outcomes of International Maritime Database of 2024
94	11月27日	「鐵路供需診斷數位分身平台之建置（2/2）－鐵路數位分身軟體平台雛型架構之研發」座談會	Experts Symposium: Construction of Railway Supply and Demand Diagnosis Digital Twin Software Platform (2/2) – A Research on Railway Digital Twin Software Platform Framework
95	11月28日	本所「運輸安全組業務回顧與展望」諮詢會議	Consultation Meeting: The Review and Prospects of Transportation Safety Division, Institute of Transportation, MOTC
96	11月29日	本所「運輸工程及海空運組業務回顧與展望」諮詢會議	Consultation Meeting: The Review and Prospects of Transportation Engineering, Maritime and Air Transport Division, Institute of Transportation, MOTC

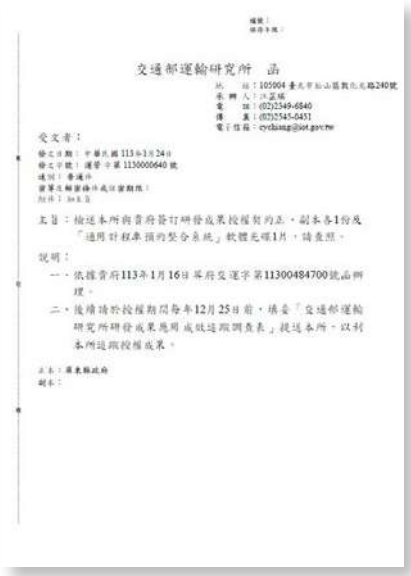
項次	日期	主題	Topic
97	11月29日	113年11月運輸經營及管理期刊研討	Seminar: November 2024 Transportation operations and Management Journal
98	12月2日	本所「運輸技術研究中心業務回顧與展望」諮詢會議	Consultation Meeting: The Review and Prospects of The Transportation Technology Research Center, Institute of Transportation, MOTC
99	12月2日	本所「運輸能源及環境組業務回顧與展望」諮詢會議	Consultation Meeting: The Review and Prospects of Transportation Energy and Environment Division, Institute of Transportation, MOTC
100	12月3日	「ISO 55001國際標準導入鐵道資產管理實務之研究」教育訓練與成果推廣會	Training and Promoting Workshop: A study on Implementation of Asset Management through ISO 55001 in Railway Industry–Performance Measurement Model
101	12月3日	本所「運輸計畫及陸運組業務回顧與展望」諮詢會議	Consultation Meeting: The Review and Prospects of Transportation Planning and Land Transport Division, Institute of Transportation, MOTC
102	12月4日	本所「運輸科技及資訊組業務回顧與展望」諮詢會議	Consultation Meeting: The Review and Prospects of Transportation Technology and Information Division, Institute of Transportation, MOTC
103	12月4日	「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」第1次專家學者座談會	Expert and Scholar Symposium: The 1st Expert and Scholar Symposium on "An Investigation of Operation, Subsidy and Fare System of Demand Responsive Transport Service (DRTS) Scheme (2/2) – Fare and Subsidy System"
104	12月9日	「機場空側模擬分析系統」成果發表會	Outcome Presentation: Airport Airside Simulation and Analysis System
105	12月9日	「研析國家鐵道安全計畫之安全績效與目標管理（2/2）－風險課題檢討與控管機制」成果說明會暨教育訓練	Outcome Presentation and Training Workshop: A Study on Application of Safety Performance Management by Objectives in Railway State Safety Program (2/2) – Review of Focal Risk Areas and Risk Controls
106	12月10日	「電動大客車智慧充電管理系統服務」成果發表會	Outcome Presentation: Electric Bus Smart Charging Management Service
107	12月10日	「商港海氣象觀測資料應用暨成果發表會」	Outcome Presentation: Marine Meteorological Observation Data in Port Areas.
108	12月10日	「113年商港海氣象資訊系統維護及優化」案教育訓練	Training Worshop: 2024 Maintenance and Improvement for The Marine Weather Information System of Taiwan International Ports
109	12月17日	「北中南東四大區域整體運輸規劃系列研究」成果說明會暨教育訓練	Symposium and Training Workshop: The Series of Studies on the Regional Transportation Planning
110	12月27日	「無人機於交通領域之應用發展專家學者諮詢會議」	Expert and Scholar Consultation Meeting: The Development and Application of UAS in the Transportation Sector

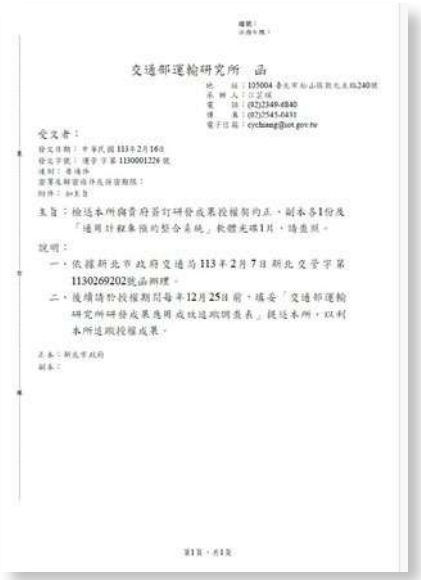
陸 06 IOT

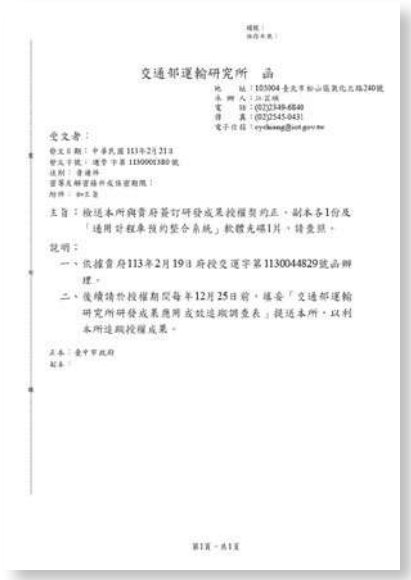
日期Date	重要記事Event
1月4日	交通部王國材前部長聽取本所報告「研擬道路交通標誌標線號誌設置參考指引」案，除指示調整分年工作項目外，並請本所辦理研討會聽取各界對於研提參考指引之意見，做為後續推動之參考。 Former Minister of Transportation and Communications Wang Kuo-tsai listened to the Institute's report on the "Development of Reference Guidelines for the Installation of Road Traffic Signs, Markings, and Signals" project. In addition to directing adjustments to the annual work items, he requested the Institute hold a workshop to gather opinions from various sectors regarding the proposed reference guidelines, which would serve as a reference for future promotion.

06
大事紀要
Memorabilia

日期Date	重要記事Event
1月8日	交通部鐵道局楊正君局長於113年1月8日來訪本所，針對國內面臨之軌道運輸課題，提出以「需求」、「容量」、「減碳」、「安全」等4項主軸，與本所研商未來合作議題，後續雙方將透過專案研究計畫、工作會議等方式，進一步交流合作，提供國內更優質軌道運輸服務。 On January 8, 2024, Director-General Yang Cheng-Chun of the Railway Bureau visited the institute to discuss key issues of domestic rail transportation and proposed four main points—demand, capacity, carbon reduction, and safety, as the basis for future collaboration. The Railway Bureau and the institute will continue to engage in further cooperation through research projects and meetings, aiming to enhance the quality of rail transportation in Taiwan.

日期Date	重要記事Event
1月18-19日	本所於高雄漢來飯店舉辦APEC「提昇移動力整合新紀元」第二場次國際論壇，本論壇係由本所代表我國於APEC運輸工作小組（TPTWG）複合運輸與智慧型運輸系統專家小組(IIEG)提出申請並獲同意辦理，邀集來自APEC區域內：澳、印、日、韓、菲、泰、美、越等會員體以及女性參與運輸任務小組（WiT）、歐盟ERTICO-ITS、身心障礙研究與能力發展中心（DRD）、共享運輸中心、中華智慧運輸協會（ITS Taiwan）、悠遊卡公司等國內外交通行動服務（Mobility as a Service, MaaS）領域相關之政府機關、專家學者、產業代表與會共同探討APEC會員體在MaaS領域推動跨域合作及提供包容性服務所可能面臨之挑戰與願景。 The Institute of Transportation, MOTC (IoT), hosted the APEC Conference on Exploring the New Age for Mobility Integration (second international forum) at the Grand Hi-Lai Hotel in Kaohsiung. The IoT proposed the forum, which represents Taiwan in the Intermodal and Intelligent Transportation Systems Experts Group (IIEG) of the APEC Transportation Working Group (TPTWG). Forum participants included Australia, Indonesia, Japan, South Korea, the Philippines, Thailand, the United States, and Vietnam. In addition, the Women in Transport Taskforce (WIT), ERTICO-ITS, The Center for Disabilities Research and Capacity Development (DRD), Shared Mobility Center, ITS Taiwan, EasyCard Corporation, and other domestic and foreign Mobility as a Service (MAAS) related governmental agencies, experts, scholars, and industrial representatives attended the conference to discuss challenges and visions for promoting cross-domain cooperation in MaaS and providing inclusive services. 
1月24日	屏東縣政府與本所完成「通用計程車預約整合系統」研發成果授權簽約。 The Pingtung County Government and the Institute of Transportation signed a licensing agreement for the research outcome of the “General Taxi Reservation Integration System.”  交通部運輸研究所 函 受文者： 發文日期：中華民國113年1月24日 發文字號：運管字第1130000640號 速別：普通件 附件：如主旨 主旨：檢送本所與貴府簽訂研發成果授權契約乙式，副本各1份及「通用計程車預約整合系統」軟體光碟1片，請查照。 說明： 一、依據貴府113年1月16日府交運字第11300484700號函辦理。 二、後續請於授權期間每年12月25日前，填妥「交通部運輸研究所研發成果應用成效追蹤調查表」提送本所，以利本所追蹤授權成果。 正本：屏東縣政府 副本：

日期Date	重要記事Event
1月29日	本所與中華民國交通工程技師公會共同辦理「提升道路交通標誌標線號誌改善作為研討會」，交通部陳彥伯政務次長蒞臨致詞，並邀請中央與地方道路主管機關、顧問公司、相關公（協）會及民間團體等約150人共同參與。 The Institute and the Taiwan Institute of Traffic Engineers jointly organized the "Workshop on Enhancing Road Traffic Sign, Marking, and Signal Improvement Measures." Deputy Minister of Transportation and Communications Chen Yen-Po graced the event with his opening remarks, and approximately 150 participants from central and local road authorities, consulting companies, relevant public (associations), and private organizations joined the workshop. 
2月16日	新北市政府與本所完成「通用計程車預約整合系統」研發成果授權簽約。 The New Taipei City Government and the Institute of Transportation signed a licensing agreement for the research outcome of the "General Taxi Reservation Integration System."  交通部運輸研究所 函 受文者： 主旨：檢送本所與貴府簽訂研發成果授權契約正、副本各1份及「通用計程車預約整合系統」軟體光碟1片，請查照。 說明： 一、依據新北市政府交通局113年2月7日新北交管字第1130269202號函辦理。 二、後續請於授權期間每年12月25日前，填妥「交通部運輸研究所研發成果應用成效追蹤調查表」提送本所，以利本所追蹤授權成果。

日期Date	重要記事Event
2月21日	臺中市政府與本所完成「通用計程車預約整合系統」研發成果授權簽約。 The Taichung City Government and the Institute of Transportation signed a licensing agreement for the research outcome of the "General Taxi Reservation Integration System."  交通部運輸研究所 函 受文者： 主旨：檢送本所與貴府簽訂研發成果授權契約正、副本各1份及「通用計程車預約整合系統」軟體光碟1片，請查照。 說明： 一、依據貴府113年2月19日府授交運字第1130044829號函辦理。 二、後續請於授權期間每年12月25日前，填妥「交通部運輸研究所研發成果應用成效追蹤調查表」提送本所，以利本所追蹤授權成果。
3月19日	交通部結合民間業者在國家發展委員會與台北市電腦公會共同主辦之第2屆「2050淨零城市展」，共同策展設立「交通部主題館」，本次展出由本所及交通部綜合規劃司籌辦，以「電能駕馭Green Tomorrow」為參展主題，展出電動大客車推動成果、充電樁建置情形、充電資訊服務等三大主軸。總統府林佳龍秘書長及行政院鄭文燦副院長親臨交通部展攤合影留念，林繼國所長接待。另交通部王國材部長、陳彥伯政務次長、黃荷婷主任秘書蒞臨參觀，本所王穆衡副所長、蘇振維副所長、陳其華主任秘書接待。 The Ministry of Transportation and Communications (MOTC), in collaboration with private-sector partners, co-curated the "MOTC Pavilion" at the 2nd "2050 Net-Zero City Exhibition," jointly organized by the National Development Council and the Taipei Computer Association. This year's exhibition, planned by the Institute of Transportation and the Department of Planning and Coordination of the MOTC, centered on the theme "Electric Power Drives a Green Tomorrow," showcasing three major focus areas: the progress in promoting electric buses, the development of charging infrastructure, and charging information services. Secretary-General to the President Lin Chia-Lung and Executive Yuan Vice Premier Cheng Wen-Tsan visited the MOTC pavilion and posed for commemorative photos, received by Director-General Lin Chi-Kuo. In addition, MOTC Minister Wang Kwo-Tsai, Deputy Minister Chen Yen-Po, and Secretary-General Huang He-Ting also visited the pavilion and were received by Deputy Director-General Wang Mu-Han, Deputy Director-General Su Cheng-Wei, and Secretary-General Chen Chi-Hwa of the Institute. 

日期Date	重要記事Event
3月14日	本所於部務會報提報「橋梁梁底狹小空間檢測工具研發與應用」，將本所研發之橋梁梁底檢測工具推廣予部屬機關（構）。 Our institute presented the project "Development and Application of Inspection Tools for Narrow Spaces beneath Bridge Girders" at the Ministry Affairs Meeting with the aim of promoting the inspection tools developed by our institute for use by affiliated agencies in relevant engineering inspection operations.
3月20日	於2024智慧城市展辦理「領航未來－2024城市空中交通國際論壇」，邀集國際標竿城市空中交通（Urban Air Mobility）業者及國內外產官學研單位，共同探討未來UAM創新服務發展趨勢以及我國推動策略。 At the 2024 Smart City Summit & Expo, the "Leading the Future – 2024 Urban Air Mobility (UAM) International Forum" was held, bringing together leading UAM operators from benchmark international cities, as well as domestic and international representatives from industry, government, academia, and research institutions. The forum aimed to explore future trends in innovative UAM services and discuss strategic approaches for advancing Urban Air Mobility in Taiwan. 

日期Date	重要記事Event

4月4日
9日
11日
16日

參與APEC運輸工作小組（TPTWG）2024年政策主題視訊會議（Virtual Thematic Sessions），協助交通部業管單位與會交流，掌握國際運輸領域近期重要政策主題發展趨勢：

（1） 4月4日：海運專家小組（MEG）：「支持整合新興、智慧與永續海運科技與服務（Supporting the Identification and Integration of New, Emerging, Smart, and Sustainable Maritime Technologies and Services）」

（2） 4月9日：空運專家小組（AEG）：「無人航空系統：航向未來的途徑（Unmanned Aerial Systems（UAS）: Flightpath to the Future）」

（3） 4月11日：複合運輸與智慧型運輸系統專家小組（IIEG）：「新興運輸科技改善可及性與包容性（Improving Accessibility and Inclusivity in the Use of New and Emerging Transport Technologies）」

（4） 4月16日：陸運專家小組（LEG）：「道路安全之數位解方：APEC區域內邁向智慧、韌性與低／零排放運輸（Digital Solutions for Road Safety: Towards Smart, Resilient, and Low/Zero Emissions Transport in the APEC Region）」

The Institute of Transportation, MOTC (IoT) participated in APEC TPTWG 2024 Virtual Thematic Meetings and assisted MOTC in engaging with relevant working groups and gaining insights into recent development trends and key policy developments in the international transportation fields:

(1) April 4 — Maritime Experts Group (MEG): "Supporting the Identification and Integration of New, Emerging, Smart, and Sustainable Maritime Technologies and Services."

(2) April 9 — Aviation Experts Group (AEG): "Unmanned Aerial Systems (UAS): Flightpath to the Future."

(3) April 11 — Intermodal and Intelligent Transportation Systems Experts Group (IIEG): "Improving Accessibility and Inclusivity in the Use of New and Emerging Transport Technologies."

(4) April 16 — Land Experts Group (LEG): "Digital Solutions for Road Safety: Towards Smart, Resilient, and Low/Zero Emissions Transport in the APEC Region."

(IIEG VTS, upper right speaker is Mr. Jason Chen, Associate researcher of IOT)

（IEG政策主題會議，右上為本所陳翔捷副研究員講者）

4月12日

奉交通部交下，就公路局陳報「國道客運18項營運成本暨每延人公里基本運價」檢討案，召開交通部交通費率審議會審議，決議同意公路局所報國道客運路線高速公路路段每延人公里基本運價調整。

At the instruction of the Ministry of Transportation and Communications (MOTC), a review proposal titled "18 Operating Cost Categories and Basic Fare per Passenger-Kilometer for Freeway Bus Services" was submitted by the Highway Bureau. The MOTC convened the Transportation Fare Review Committee, which resolved to approve the Highway Bureau's proposed adjustment to the basic fare per passenger-kilometer for freeway segments of Freeway bus routes.

日期Date	重要記事Event

4月22日

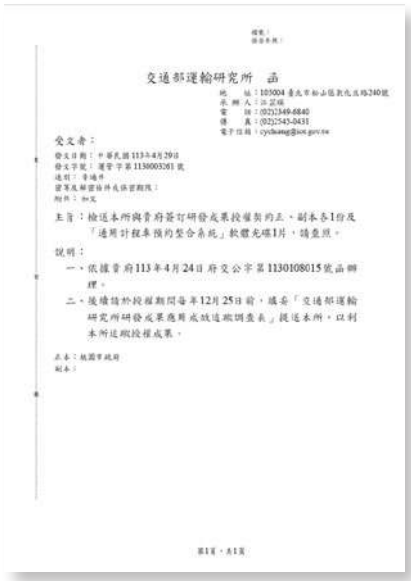
交通部林國顯常務次長主持「區域運輸發展研究中心服務升級2.0計畫」（112-113年）第2次諮議委員會議，聽取六大區域中心「區域公共運輸發展趨勢觀察與課題分析」、「行政院TPASS通勤月票發展趨勢觀察」、「區域內城際及都市公共運輸課題及短中長期改善策略」及「縣市道安問題研析及輔導道安專業能力建構」重點報告後，由各諮議委員提供指導意見。

Deputy Minister Lin Kuo-Shian of the Ministry of Transportation and Communications presided over the second advisory committee meeting for the "Service Upgrade Plan 2.0 for Regional Transportation Development Centers" (2023–2024). During the meeting, the six regional centers presented key reports on the following topics: "Observations on Trends and Issues in Regional Public Transportation Development," "Trends in the Development of the Executive Yuan's TPASS Commuter Monthly Pass Program," "Challenges and Short-, Medium-, and Long-term Strategies for Intercity and Urban Public Transportation within Regions," and "Analysis of Local Road Traffic Safety Issues and Capacity Building for Traffic Safety Expertise." Following the presentations, advisory committee members provided guidance and professional recommendations.

4月29日

桃園市政府與本所完成「通用計程車預約整合系統」研發成果授權簽約。

The Taoyuan City Government and the Institute of Transportation signed a licensing agreement for the research outcome of the "General Taxi Reservation Integration System."


交通部運輸研究所 函

日期Date	重要記事Event
5月2日	本所王穆衡副所長主持113年5月2日「我國電動輔具道路使用之安全管理方式」座談會，本座談會邀請專家學者、民間團體、中央單位、地方政府、輔具廠商及公共運輸業者等單位與會，並就「電動輔具定位」、「使用者行為」、「規格檢驗」及「公共運輸接駁」等四大主題進行討論。會後本所綜整方向性建議，陳報交通部參考。 Deputy Director Wang Mu-Han of the Institute chaired the "Safety management of electric Mobility Aiding Facilities on roads" symposium on May 2, 2024. This symposium invited experts, scholars, non-governmental organizations, central government agencies, local governments, assistive device manufacturers, and public transportation operators to participate and discuss four major themes: "Positioning of Electric Assistive Devices," "User Behavior," "Specification Inspection," and "Public Transportation Connection." Following the symposium, the Institute summarized directional recommendations and submitted them to the Ministry of Transportation and Communications for reference.
5月14日	臺北市政府與本所完成「通用計程車預約整合系統」研發成果授權簽約。 The Taipei City Government and the Institute of Transportation signed a licensing agreement for the research outcome of the "General Taxi Reservation Integration System."  交通部運輸研究所　函
5月14日	出席行政院災害防救韌性科技方案112年度成果交流會並簡報「港灣及海岸環境災防應用研究」成果。 Attended the 2023 Executive Yuan Disaster Prevention and Resilience Technology Program Results Exchange Meeting and presented the Research on Disaster Prevention Applications for Port and Coastal Environments results.

日期Date	重要記事Event
5月15日	臺南市政府與本所完成「通用計程車預約整合系統」研發成果授權簽約。 The Tainan City Government and the Institute of Transportation signed a licensing agreement for the research outcome of the "General Taxi Reservation Integration System."  交通部運輸研究所 函 地址：105004 臺北市松山區敦化北路240號 電話：(02)2349-6840 傳真：(02)2545-8431 電子信箱：cychuang@iot.gov.tw 受文者： 發文日期：中華民國113年5月15日 發文字號：運管字第1130003810號 速別：普通件 密等及解密條件或保密期限： 附件：如文 主旨：檢送本所與貴局簽訂研發成果授權契約正、副本各1份及「通用計程車預約整合系統」軟體光碟1片，請查照。 說明： 一、依據貴局113年5月13日南市交公運字第1130640138號函辦理。 二、後續請於授權期間每年12月25日前，填妥「交通部運輸研究所研發成果應用成效追踪調查表」提送本所，以利本所追踪授權成果。 正本：臺南市政府交通局 副本：
5月22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32次會議，除賡續追蹤列管計畫辦理進度及決議事項外，並共同研商「新台15線與新台4線通車後多叉路口建議解決方案」、「台31線北延路廊與國1甲銜接規劃案」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 32nd meeting of the Working Group on the 'External Transportation System' under the Core Project of the Taoyuan Aerotropolis. In addition to continuing to track the progress of listed projects and follow up on resolutions, the meeting also included joint discussions on topics such as the 'Proposed Solutions for Multi-Intersection Issues Following the Opening of New Provincial Highway 15 and New Provincial Highway 4,' and the 'Planning Proposal for the Northward Extension Corridor of Provincial Highway 31 and Its Connection to Freeway 1A.' These efforts aim to ensure the smooth implementation of various projects and to help the external transportation system of the Aerotropolis achieve its intended benefits.

日期Date	重要記事Event
6月1日	本所響應觀光署舉辦「2024世界自行車日－全臺環騎響應活動」，並於臺中及蘇澳兩路段響應騎乘。 The institute responded to the Tourism Administration's "2024 World Bicycle Day – National Cycling Response Event" and participated in cycling events at two sections in Taichung and Su'ao. 
6月14日	衛生福利部與本所完成「通用計程車預約整合系統」研發成果授權簽約。 The Ministry of Health and Welfare and the Institute of Transportation signed a licensing agreement for the research outcome of the "General Taxi Reservation Integration System."  交通部運輸研究所 函

日期Date	重要記事Event
6月3日 6月13日 6月14日 6月19日	本所於北、中、南、東舉辦4場次之「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」說明暨討論會議，針對自行車環島路線（含替代路線）及多元路線之標誌標線設置原則、布設實例研析及常見錯誤範例等進行說明，另以工作坊形式選取實例進行分組討論，並於南部及東部場次配合現地騎乘以檢視該實例之路線，參與人數每場次約40-80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 sessions of the "Guidelines for the Installation of Signs and Markings for Round-Island and Diversified Bicycle Routes (including alternative routes)" briefing and discussion meetings in the northern, central, southern, and eastern regions. The meetings explained the guidelines of signs and markings for round-island routes (including alternative routes) and diversified routes, case studies of implementations, and common errors. Additionally, workshops were held to select examples for group discussions. Participants also engaged in on-site cycling for the southern and eastern sessions to review the routes. Each session had approximately 40-80 participants, allowing the planning and implementation units of each bicycle route to become familiar with the principles and regulations for signage and markings, ensuring consistency in the identification and setup standards of bicycle route systems. 
6月11日 12日 13日 14日	本所林繼國所長率員出席113年6月21日行政院院會會前研商會，向李孟諺前部長報告路口人行空間改善原則。 Director Lin Chi-Kuo led a delegation from the Institute to attend the pre-Executive Yuan meeting on June 21, 2024, where they reported to former Minister Lee Meng-yen on the principles for improving pedestrian spaces at intersections.
6月18日	本所出版「2023年臺灣大氣腐蝕劣化因子調查研究資料年報」，提供公路局、高速公路局、臺灣港務股份有限公司及交通相關單位辦理公共工程金屬構件防蝕規劃、設計及維護管理之參考依據。 Our institute has published the 2023 Annual Report on Atmospheric Corrosion and Deterioration Factors in Taiwan, providing a valuable reference for the Directorate General of Highways, Freeway Bureau, Taiwan International Ports Corporation, and other transportation-related agencies in planning, designing, and managing the corrosion protection of metal components in public infrastructure projects.

日期Date	重要記事Event
	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「氣候風險決策參考資訊」、「氣候變遷情境資訊介紹與應用」。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）、捷運公司及運輸相關顧問公司等約50餘人參加。
6月21日	Conducted the first session of the "Climate Change Adaptation Training Series," covering topics on "Climate Risk Decision-Support Information" and "Introduction and Application of Climate Change Scenario Data." This training strengthened the professional adaptation knowledge and skills of personnel from transportation management agencies. Approximately 50 participants attended, including representatives from the Ministry of Transportation and its affiliated agencies, metro companies, and transportation consulting firms.
	本所林繼國所長率員陪同參加行政院院會後記者會，會中李孟諺前部長簡報「中央地方攜手維護行人安全」，並播放本所協助製作「路口人行空間改善原則」動畫。
	Director Lin Chi-Kuo led a delegation from the Institute to accompany the press conference following the Executive Yuan meeting. During the press conference, former Minister Lee Meng-yen gave a briefing on "Central and Local Governments Working Together to Protect Pedestrian Safety" and played an animation produced with the Institute's assistance on the "Principles for Improving Pedestrian Spaces at Intersections."
6月21日	
	交通部李孟諺前部長邀集路安司、本所、高公局、公路局、鐵道局召開「沙崙綠能科學城聯外交通問題」研商會議，由本所就本案背景、道路交通分析、相關交通計畫、後續推動建議及臺南市政府提案構想回應等進行簡報說明。
7月3日	Former Minister of the MOTC Li Meng-Yen invited the Department of Railways, Highways, and Road Safety, the institute, the Freeway Bureau, the Highway Bureau, and the Railway Bureau to hold a meeting on the "External Transportation Issues of the Shalun Green Energy Science City". The institute provided a briefing on the project background, road traffic analysis, relevant transportation plans, recommendations for future implementation, and responses to proposals from the Tainan City Government.
	本所林繼國所長率員參加行政院第3911次院會，代表交通部報告「公路公共運輸永續及交通平權計畫(114-117年)」辦理內容，並於會後參加行政院記者會，向媒體說明該計畫內容。
7月4日	The Director General of Institute of Transportation, Lin, Chi-Kuo, led staffs to attend the 3911th Executive Yuan meeting to report the content of "Highway Public Transportation Sustainability and Traffic Equality Plan (2015-2018)" on behalf of Ministry of Transportation and Communications as well as explain the content of the plan to the media in the Executive Yuan press conference after the meeting.
	本所於交通部第1923次部務會報提報「環島自行車道升級暨多元路線整合推動計畫（含自行車道標誌線）辦理情形」，李孟諺前部長請相關單位推動辦理，以自行車道升級，在地化、國際化為推動主軸，落實打造臺灣成為自行車騎乘大國目標。
7月11日	The institute reported the " National Cycling Route Upgrade and Diversified Route Integration Project (including bicycle lane signs and markings)" at the 1923rd MOTC's meeting. Former Minister Lee Meng-Yen requested that relevant agencies to push forward the project, with a focus on upgrading bicycle lanes, localization, and internationalization, aiming to make Taiwan a leading country for cycling.

日期Date	重要記事Event
	本所奉交通部交辦召開「道路交通標誌標線號誌設置檢討修正審議小組」第1~4次會議」，由王穆衡副所長擔任召集人，討論「高雄市前鎮區文橫三路與廣西路口劃設標線型圓環試辦計畫」、「綠底行人穿越線是否加大綠底寬度範圍」、「臺北市彩色標記行人穿越道線擴大試辦計畫」，「臺北市機車與大型重機格位共用試辦計畫2.0試辦計畫」、「新北市共享運具專用格標線試辦計畫」、「澎湖縣成型標塊試辦計畫成效檢討報告」，「停止線與行人穿越道間距離」、「設置規則第226條設置號誌之必要條件中，第6款肇事紀錄疑義」、「路面邊線意義及位置不明」，「設置規則第231條第4款號誌之燈號變換規定」、「設置規則第190條第6項身心障礙者專用停車位規定」。
7月31日 8月7日 9月6日 10月18日	The Institute, as commissioned by the Ministry of Transportation and Communications, convened the 1st to 4th meetings of the "Review and Amendment Deliberation Committee for the Regulations for Road Traffic Signs, Markings, and Signals." Deputy Director Wang Mu-Han served as the convener, and the discussions covered the "Pilot Project for Markings-Based Roundabout at the Wunheng 3rd Road and Guangxi Road Intersection in Cianjhen District, Kaohsiung City," "Whether to Increase the Green Background Width of Green Pedestrian Crossings," "Taipei City's Expanded Pilot Project for Color-Marked Pedestrian Crossings," "Taipei City's Pilot Project 2.0 for Shared Motorcycle and Large Heavy Motorcycle Parking Spaces," "New Taipei City's Pilot Project for Exclusive Parking Space Markings for Shared Vehicles," "Review Report on the Effectiveness of Penghu County's Preformed Pavement Blocks Pilot Project," "Distance between Stop Lines and Pedestrian Crossings," "Ambiguity Regarding Accident Records in Article 226, Paragraph 6 of the Regulations Concerning the Necessary Conditions for Setting Up Signals," "Unclear Meaning and Location of Road Edge Lines," "Regulations for Signal Light Changes in Article 231, Paragraph 4 of the Regulations," and "Regulations for Parking Spaces for Persons with Disabilities in Article 190, Paragraph 6 of the Regulations."
	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「氣候服務的內容與資料解讀」、「氣候變遷調適指引範例」。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）、捷運公司及運輸相關顧問公司等約30餘人參加。
	Conducted the second session of the "Climate Change Adaptation Training Series," covering topics on "Content and Interpretation of Climate Services" and "Examples of Climate Change Adaptation Guidelines." This training enhanced the professional adaptation knowledge and skills of personnel from transportation management agencies. Approximately 30 participants attended, including representatives from the Ministry of Transportation and its affiliated agencies, metro companies, and transportation consulting firms.
8月1日	
	交通部李孟諺前部長召集路安司、本所、高公局、公路局、鐵道局召開「高鐵臺中站聯外道路增設匝道引道評估會議」，並由本所就7月2日（二）上午陳彥伯政務次長召集研商「高鐵娛樂購物城BOT聯外道路案」之辦理情形進行簡報說明。
8月7日	Former Minister of the MOTC Li Meng-Yen invited the Department of Railways, Highways, and Road Safety, the institute, the Freeway Bureau, the Highway Bureau, and the Railway Bureau to hold an "Evaluation Meeting on Adding Ramp Access Roads to Taichung High Speed Rail Station." The institute provided a briefing on handling the "High Speed Rail Entertainment Shopping City BOT Access Road Project" convened by Deputy Minister Chen, Yen-Po, on the morning of July 2 (Tuesday).

日期Date	重要記事Event
	本所協助交通部以「淨零綠活永續綠途」為主題，策劃參與台灣永續能源研究基金會主辦之「2024亞太永續博覽會」，統籌相關單位展出永續運輸推動成果，並於交通部例行記者會向媒體說明本次參展規劃及內容。另為爭取2024亞太永續博覽會之綠色設計獎，實踐永續行動的概念，本所在規劃攤位時即以3R原則理念進行施工，並參考110年永續會展指南之參展單位建議作法執行，展館榮獲最高殊榮之白金獎。 The institute assisted the MOTC in planning and participating in the "2024 Asia-Pacific Sustainable Action Expo" hosted by the Taiwan Institute for Sustainable Energy with the theme of "Net-Zero Green Living, Sustainable Progress", coordinating relevant units to exhibit the results of promoting sustainable transportation, and explained the exhibition plan and content to the media at the MOTC's regular press conference. To win the 2024 Green Design Award of the "2024 Asia Pacific Sustainable Action Expo and practice the concept of sustainable action, our booth was constructed based on the 3R principle when planning the booth, and the 2021 Sustainable Exhibition Guidelines were referred to. The exhibition hall won the highest honor, the Platinum Award.
8月8日 9日10日	
	本所參加2024年第六屆APEC能源工作小組能源智慧社區倡議（ESCI）競賽(2024 6th APEC Energy Smart Communities Initiative（ESCI），以「智慧、永續的電動公車解決方案：塑造智慧城市能源管理的未來」為題提案，榮獲智慧交通類別金牌獎，APEC主辦單位邀請本所派員出席8月13日於秘魯利馬舉行的2024APEC-ESCI頒獎典禮，本所由林繼國所長率員前往受獎，並與13個APEC經濟體分享我國計畫願景與成功經驗。 Our organization participated in the 2024 6th APEC Energy Smart Communities Initiative (ESCI) competition with the proposal titled "Smart and Sustainable Electric Bus Solutions: Shaping the Future of Energy Management in Smart Cities." We were awarded the Gold Medal in the Smart Transportation category. The APEC organizing committee invited our representatives to attend the award ceremony on August 13 in Lima, Peru. Our director, Lin Chi-Kuo, led the team to receive the award and shared our country's project vision and successful experiences with representatives from 13 APEC economies.
8月13日	

日期Date	重要記事Event
	本所辦理「調適執行實作－運輸系統調適指引實務推演工作坊」。透過實務操作演練，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30餘人參加。
8月26日	Held the "Adaptation Implementation Practice – Practical Exercise on Transportation System Adaptation Guidelines" workshop. Through hands-on exercises, this workshop enhanced the professional adaptation knowledge and skills of personnel from transportation management agencies. Approximately 30 participants attended, including representatives from the Ministry of Transportation and its affiliated agencies, metro companies, and transportation consulting firms.
	本所「港區影像智慧辨識技術之研究」計畫所提專案「UAV影像測繪與空間資訊技術於港區基礎設施之智慧檢測與永續營運應用」參加中華空間資訊學會「第一屆空間資訊永續應用獎」榮獲特優獎，於8月28日「第42屆測量及空間資訊研討會」接受頒獎。
	The institute's project titled "UAV Image Mapping and Spatial Information Technology for Intelligent Inspection and Sustainable Operation of Port Infrastructure," part of the "Research on Intelligent Image Recognition Technology in Port Areas" initiative, was awarded the Top Excellence Award in the 1st Sustainable Application of Spatial Information Award by the Chinese Society for Geographic Information Systems. The award ceremony took place on August 28 during the 42nd Surveying and Spatial Information Conference.
8月26日	

日期Date	重要記事Event
8月26-27日	本所與逢甲大學中區區域運輸發展研究中心辦理APEC「偏鄉公共運輸跨域資源整合之推動與挑戰」國際論壇。邀集日本、澳洲、韓國、越南、美國及我國等APEC經濟體的產官學研代表，共同就偏鄉公共運輸導入新興科技、跨域資源整合、實現可及性與包容性進行經驗分享與提供建議，期為偏鄉提供更便捷的公共運輸服務，縮小城鄉差距，落實交通的平權。 The APEC International Conference on "Promoting and Addressing Challenges of Cross-sector Resource Integration in Rural Public Transportation" was hosted by the IOT and the Central Regional Transportation Development Research Center. APEC member states including Japan, Australia, South Korea, Vietnam, the United States, and Chinese Taipei from the industry-government-university-research domain were invited to participate in the conference. They shared their experiences and recommendations for incorporating emerging technologies into rural public transportation, integrating cross-sector resources, and promoting the feasibility and inclusiveness of rural public transportation, all with the goal of improving the quality of rural public transportation services.   

日期Date	重要記事Event
9月6日	本所奉交通部指示協助交通部辦理法規檢討及各道路主管機關申請新式標誌、標線、號誌試辦計畫及成效分析報告之審議，本月辦理第3次會議，由王穆衡副所長主持，討論「停止線與行人穿越道間距離」、「設置規則第226條設置號誌之必要條件中，第6款肇事紀錄疑義」、「路面邊線意義及位置不明確」等3項議題。 As instructed by the Ministry of Transportation and Communications, the Institute assisted the Ministry in reviewing regulations and deliberating on new-style sign, marking, and signal pilot project applications and effectiveness analysis reports submitted by various road authorities. The third meeting was held this month, chaired by Deputy Director Wang Mu-Han, to discuss three issues: "Distance between Stop Lines and Pedestrian Crossings," "Ambiguity Regarding Accident Records in Article 226, Paragraph 6 of the Regulations Concerning the Necessary Conditions for Setting Up Signals," and "Unclear Meaning and Location of Road Edge Lines."
9月24日	林國顯常務次長出席本所與六大區域中心共同辦理「區域中心聯合成果發表會」致詞並參觀區域中心重要執行成果展示區。本發表會係針對「推動偏鄉公共運輸資源整合」、「公車路網整併與營運模式規劃」、「輔導縣市改善道安專業能力建構」以及各區域之「區域趨勢觀察及公共運輸生活圈發展藍圖」四項重要課題進行成果報告，與產官學研各界共同研討未來公共運輸發展及道路交通安全改善方向。 Deputy Minister Lin Kuo-Shian attended and delivered remarks at the "Joint Achievement Presentation of Regional Transportation Development Centers," co-hosted by the Institute and the six regional centers. He also toured the exhibition area showcasing key accomplishments of the regional centers. The presentation focused on four major topics: promoting integrated public transportation resources in remote areas, restructuring bus route networks and operational model planning, enhancing local governments' professional capacity in traffic safety, and each region's observations on transportation development trends and blueprint for public transportation living circles. Experts and stakeholders from industry, government, academia, and research institutions participated in discussions on the future direction of public transportation development and road traffic safety improvements.  

日期Date	重要記事Event
	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「氣候變遷風險評估準則及執行程序」、「調適綜合理念」。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）、高鐵公司、捷運公司及運輸相關顧問公司等約30餘人參加。
9月30日	Conducted the third session of the "Climate Change Adaptation Training Series," covering topics on "Climate Change Risk Assessment Criteria and Implementation Procedures" and "Integrated Concepts of Adaptation." This training strengthened the professional adaptation knowledge and skills of personnel from transportation management agencies. Approximately 30 participants attended, including representatives from the Ministry of Transportation and its affiliated agencies, Taiwan High-Speed Rail Corporation, metro companies, and transportation consulting firms.
	「APEC第54次運輸工作小組會議（TPTWG54）」於2024年9月30日至10月2日期間於新加坡APEC秘書處與Copthorne King's飯店，採實體會議形式舉行，我國代表團共21位成員，分別於相關專家小組報告我國於TPTWG提案計畫辦理情形及分享我國施政成果，四個簡報分別為： 「海事單一窗口（Maritime Single Window in Chinese Taipei）」、「中華臺北的創新電動巴士解方－透過智慧充電系統提升效率（Chinese Taipei's innovative E-Bus Solution: Enhancing Efficiency Through Automated Smart Charging）」、「偏鄉公共運輸跨域資源整合之推動與挑戰」自籌計畫辦理成果（Promoting and Addressing Challenges of Cross-Sector Resource Integration in Rural Public Transportation）」、「航空交通管理韌性-飛航管理系統（ATM）4級備份（Resilience in Air Traffic Management – ATMS' 4 Level Backup）」，我國與會人員於會中與各會員體充分交流，圓滿達成任務。 APEC TPTWG 54th meeting was held in person from September 30 to October 2, 2024, at the APEC secretariat and Copthorne King's Hotel in Singapore. The Chinese Taipei delegation, consisting of 21 members, participated in various expert group sessions to present updates on Chinese Taipei's TPTWG project proposals and share recent policy achievements. Four presentations were delivered: 1. "Maritime Single Window in Chinese Taipei". 2. "Chinese Taipei's innovative E-Bus Solution: Enhancing Efficiency Through Automated Smart Charging" (the implementation results of a self-funded project). 3. "Promoting and Addressing Challenges of Cross-Sector Resource Integration in Rural Public Transportation." 4. "Resilience in Air Traffic Management - ATMS' 4 Level Backup."
9月30日~10月2日	Delegates from Chinese Taipei actively engaged with representatives from other member economies throughout the meeting, successfully completing their mission.

（TPTWG54與會代表團大合照）
(Group Photo of the Delegation at TPTWG54)

日期Date	重要記事Event
10月1日 11月27日	本所於臺北市、高雄市各辦理1場「臺灣公路容量分析軟體（THCS）」教育訓練，包括公路局、縣市政府交通局處、工程顧問公司、交通技師事務所等共50餘位人員參加。藉由電腦實際操作與實際範例演練，增進使用者實務面之應用，並交流回饋使用經驗，供軟體後續精進參考。 The institute held the "2024 Taiwan Highway Capacity Analysis Software Training Workshop" in Taipei and Kaohsiung City, with more than 50 personnel from the Highway Bureau, county and city government transportation bureaus, engineering consulting companies, and traffic technician offices participating. Through actual computer operation and example exercises, users' practical application is enhanced, and feedback on usage experience is exchanged for reference for subsequent software improvements. 
10月8日	交通部伍勝園政務次長邀集會計處、產業司、路安司、綜規司、郵政公司及本所召開「郵政物流園區（機場捷運A7站）建置計畫」執行情形檢討會議，本所由陳其華主任秘書率員出席，並就「郵政物流園區聯外交通規劃」進行簡報說明。 Deputy Minister of the MOTC Wu, Sheng-Yuan invited the Department of Accounting, the Department of Industrial Development and International Affairs for Transportation, the Department of Railways, Highways, and Road Safety, the Department of Planning and Coordination, the Post Company, and the institute to hold a review meeting on the implementation of the "Postal Logistics Park (Airport MRT A7 Station) Construction Plan". The institute was attended by Chief Secretary Chen, Chi-Hwa and the staff, and provided a briefing on the "Postal Logistics Park External Transportation Planning".
10月11日	交通部陳世凱部長邀集路安司、高公局、公路局、鐵道局及本所召開「台中高鐵特定區增設交流道事宜會前會」，本所由林繼國所長率員出席，並就「臺中高鐵特定區增設交流道評估」進行簡報說明。 Minister of the MOTC Chen, Shih-Kai invited the Department of Railways, Highways, and Road Safety, the Freeway Bureau, the Highway Bureau, the Railway Bureau, and the institute to hold a "Pre-conference on the Establishment of Interchanges in the Taichung High Speed Rail Special Zone". The institute was attended by Director Lin, Chi-Kuo and the staff, and provided a briefing on the "Evaluation of the Establishment of Interchanges in the Taichung High Speed Rail Special Zone".

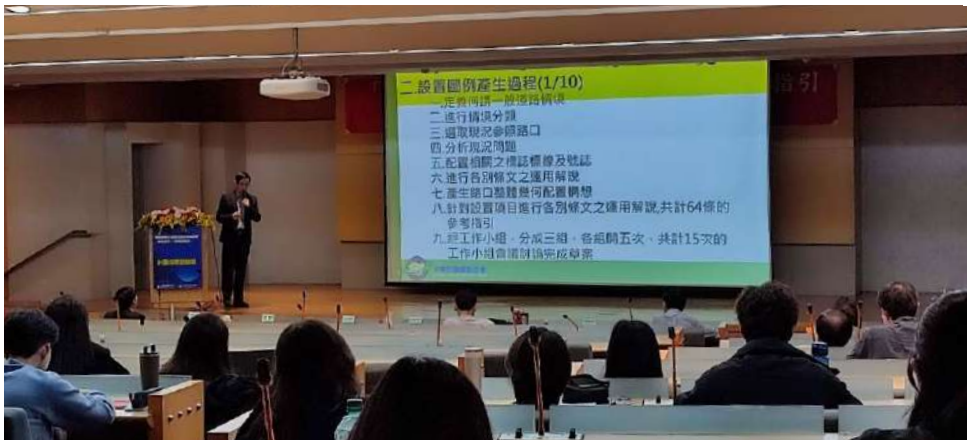
日期Date	重要記事Event
	本所辦理「道安改善專業能力建構」合作研究計畫示範性課程及成果發表，共計70人參加，包含中央機關（交通部路政及道安司、內政部國土管理署）、縣市政府道安會報成員（包含交通、工務、教育、宣導、警政等局處）、區域運輸發展研究中心、交通工程技師公會及顧問公司等，來自產、官、學、研的道安從業人員，共同參與課程並分享對後續課程的建議與期許。 The Institute held a demonstration course and results presentation for the "Professional Capacity Development for Road Safety Enhancement" collaborative research project, with a total of 70 participants. These included personnel from central government agencies (the Department of Road Administration and Traffic Safety of the Ministry of Transportation and Communications, the National Land Management Agency of the Ministry of the Interior), members of county/city road safety councils (including representatives from transportation, public works, education, promotion, and police departments), regional transportation development research centers, the Taiwan Institute of Traffic Engineers, and consulting companies – road safety practitioners from industry, government, academia, and research institutions who participated in the course and shared their suggestions and expectations for future courses.
10月17日	
	本所辦理「電動車公共充電樁設施設置需求評估之研究」成果說明會，簡介公共充電設施需求評估模式架構，並介紹「公共充電樁設施需求評估工具」使用方式，以實例操作讓使用者瞭解需求評估工具操作之方法，邀請經濟部能源署、路政及道安司、公共運輸及監理司、交通部公路局、縣市政府、台灣電力公司等共計約30位人員參加，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 held a presentation on the research findings of "The Study of the Public Charger's Demand Assessment for Electric Vehicles". The presentation included an overview of the modeling framework for assessing public charging infrastructure needs and a demonstration of the "Public Charging Station Demand Assessment Tool". The demonstration utilized practical examples to familiarize users with the tool's operation. Approximately 30 representatives from organizations such as the Ministry of Economic Affairs (Energy Administration), the Department of Railways, Highways and Road Safety, the Department of Public Transportation and Supervision, the Highway Bureau, country and city governments, and Taiwan Power Company participated. Feedback and insights gathered through the exchange of ideas will serve as the basis for future research and the enhancement and optimization of the analysis software."
10月17日	

日期Date	重要記事Event
10月19日	林繼國所長受邀參加「2024第四屆臺灣氣候行動博覽會－中台灣綠色交通論壇」，以「交通部推動運輸淨零排放之策略與作為」為題進行演講，向聽眾闡述交通部推動運具電動化及綠色運輸網絡之規劃策略、作為與成果。 Our Director-General Lin Chi-Kuo was invited to speak at the "2024 4th Taiwan Climate Action Expo – Central Taiwan Green Transportation Forum." Delivering a presentation titled "Strategies and Actions of the Ministry of Transportation and Communications in Promoting Net-Zero Emissions in Transportation," he elaborated on the MOTC's planning strategies, implementation measures, and achievements in promoting vehicle electrification and developing a green transportation network.
10月21日	本所召開運輸計劃季刊編輯指導會113年度會議，報告112年稿務運作辦理情形及相關討論事項，俾利後續季刊編務作業推動參採。 Our institute convened the 2024 Editorial Advisory Meeting for the Transportation Planning Quarterly, reporting on the editorial operations and manuscript management of 2023, and discussing related matters to support and inform the continued advancement of the journal's editorial work.
10月24～25日	本所假連江縣港務處舉辦「113年度馬祖研究計畫成果交流暨系統教育訓練」，分享本所馬祖海氣象監測成果並展示維運精進馬祖海情資訊系統及港灣構造物維護管理資訊系統功能，參與者包含連江縣政府及連江縣港務處18位實際應用成果之職員。 The institute organized the "2024 Matsu Research Project Results Sharing and System Education Training," which was held at the Lienchiang County Port Affairs Office. During the event, the institute presented the results of its marine meteorological monitoring in the Matsu area. It demonstrated the enhanced functionalities of the Matsu Marine Information System and the Port Structure Maintenance Management Information System. A total of 18 personnel from the Lienchiang County Government and the Lienchiang County Port Affairs Office, who are directly involved in the practical application of these systems, participated in the event.
10月25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「運輸系統在氣候變遷調適的環境正義議題」、「氣候服務在調適應用案例」。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）、捷運公司及運輸相關顧問公司等約20餘人參加。 Conducted the fourth session of the "Climate Change Adaptation Training Series," covering topics on "Environmental Justice Issues in Transportation System Adaptation" and "Case Studies on the Application of Climate Services in Adaptation." This training enhanced the professional adaptation knowledge and skills of personnel from transportation management agencies. Approximately 20 participants attended, including representatives from the Ministry of Transportation and its affiliated agencies, metro companies, and transportation consulting firms
10月29日	本所與交通部鐵道局共同辦理「傳統暨區域鐵路系統場站容量分析」成果發表會暨教育訓練，介紹「城際鐵道容量分析暨應用研究」主要成果與應用效益、場站容量分析模式等，推廣鐵道容量分析軟體開發成果。本次參與者包括鐵道局、各縣市政府、大學相關科系，以及各大顧問公司等約20餘人，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 held a symposium and training workshop of the "Yard and Station Capacity Analysis of Conventional Railway Systems," introduced the outcomes and practical applications, the capacity analysis model of the "Intercity Railway Capacity Analysis and Application Research," to promote the outcomes of railway capacity analysis software development. Approximately 20 participants attended the symposium and training workshop, including representatives from the Railway Bureau, local governments, university students, and major consulting firms. The feedback during the session will serve as a basis for future research and further optimization of the analysis software. 

日期Date	重要記事Event
10月30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，出席者包括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，現場及線上合計123人參與。訓練內容包括無人機於長路段空拍及交通分析應用、深度學習辨識空拍影像、交通風險行為分析等，並配合實際道路案例說明軟體基本功能及操作。 The Institute held a results presentation and educational training for the "Applying Drone Aerial Photography for Road Traffic Conflict Analysis" collaborative research project. Attendees included representatives from central and local road and traffic management authorities, consulting companies, regional transportation development research centers, and public/academic associations, with a total of 123 participants both in person and online. The training content covered drone aerial photography and traffic analysis applications on long road segments, deep learning for identifying aerial images, traffic risk behavior analysis, and explanations of the software's basic functions and operation using real road case studies. 
10月30日	本所舉辦「海象雷達遙測工作坊」之應用技術交流及成果推廣說明會，邀請海洋委員會、國家海洋研究院、交通部航港局、中央氣象署、臺灣港務股份有限公司等相關業務機關（構）約25位人員參加，分享應用微波與陣列雷達油汙擴散數值預報及漂流目標辨識等技術於港灣災害應變、海難搜救、海洋污染防治，以及介紹利用海嘯事件之監測做為港口災害預警、建立安全通報及海岸防護機制，精進商港海域海象調查與發展雷達遙測技術應用。 The Institute of Transportation (I.O.T.) hosted the "Taiwan's Marine Radar Remote Sensing Workshop," a technical exchange and results dissemination event. Approximately 25 participants from relevant government agencies and institutions—including the Ocean Affairs Council, National Academy of Marine Research, Maritime and Port Bureau of the Ministry of Transportation and Communications, Central Weather Administration, and Taiwan International Ports Corporation—were invited to attend. The workshop featured presentations on the application of microwave and phased array radar technologies in numerical oil spill dispersion forecasting and drifting target identification, supporting port disaster response, maritime search and rescue, and marine pollution prevention. Additionally, tsunami monitoring was introduced as an early warning tool for port disasters, along with strategies for establishing port safety alert systems and coastal protection mechanisms. The event aimed to advance marine meteorological surveys in commercial port areas and promote the development and application of radar remote sensing technologies.

日期Date	重要記事Event
	本所辦理「道路交通安全檢查教育訓練」，邀請各級道路主管機關、顧問公司、交通工程技師與民間團體參與，約107人參加。訓練內容就本所在「道路交通安全檢查表」、「道路交通安全檢查手冊」等研究成果進行講授，讓與會人員了解如何運用，並安排「道路交通安全檢核制度」、「道路交通安全檢查制度」的介紹，從我國道路安全檢核制度發展架構出發，勾勒後續推動藍圖。 The Institute held "Road Traffic Safety Inspection Educational Training," inviting participants from road authorities at all levels, consulting companies, traffic engineers, and private organizations, with approximately 107 attendees. The training content focused on the Institute's research findings in the "Road Traffic Safety Inspection Checklist" and "Road Traffic Safety Inspection Handbook," enabling participants to understand how to apply them. It also included introductions to the "Road Safety Audit System" and the "Road Traffic Safety Inspection System," starting from the development framework of Taiwan's road safety audit system to outline the future promotion blueprint.
11月8日	
11月12日	本所辦理「運輸氣候變遷風險評估-範疇界定操作工作坊」。透過實務操作演練，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)及運輸相關顧問公司等約30餘人參加。 Held the "Climate Change Risk Assessment Scoping Workshop for Transportation." Through hands-on exercises, this workshop enhanced the professional adaptation knowledge and skills of personnel from transportation management agencies. Approximately 30 participants attended, including representatives from the Ministry of Transportation and its affiliated agencies, as well as transportation consulting firms.
11月15日	本所、台灣軌道工程學會及財團法人中華顧問工程司合作辦理「2024鐵道科技技術與人才養成論壇」，包括鐵道局、臺鐵公司、全國捷運公司、顧問公司及學校等約80餘人參加。藉由臺、日雙方專家學者交流，共同為軌道永續、觀光及人才培訓等議題提出未來之建議。 In partnership with the Taiwan Railways Engineering Society and CECI Engineering Consultants, Inc., the institute co-organized the "2024 Railway Technology, Innovation, and Talent Development Forum." The event brought together over 80 participants, including representatives from the Railway Bureau, Taiwan Railways Corporation, metro companies nationwide, consulting firms, and academic institutions. Through exchanges between experts and scholars from both Taiwan and Japan, the forum aimed to present future recommendations on key issues such as railway sustainability, tourism development, and talent cultivation.

日期Date	重要記事Event
	本所舉辦「運輸規劃支援系統」教育訓練，包括高公局、內政部國土管理署城鄉發展分署、各縣市政府、區域運輸發展研究中心等共19餘位人員參加。針對運輸規劃支援系統架構、功能與本年度強化空間資訊圖臺之成果進行介紹，藉由教育訓練課程，推廣建置成果，促進公部門運輸規劃資源之共享及應用，並經由意見交流回饋，做為後續系統發展精進優化參據。
11月15日	The institute held a training workshop on the "Transportation Planning Support System", with 19 participants, including representatives from the Highway Bureau, the Urban and Rural Development Branch of the National Land Management Agency, the Ministry of the Interior, county and city governments, and the Regional Transportation Development Research Center. The transport planning support system architecture, functions and the results of this year's enhanced spatial information map platform were introduced. Through educational training courses, the construction results were promoted, the sharing and application of public transport planning resources were promoted, and feedback from exchanges of opinions was used as a reference for subsequent system development and optimization.
	本所與逢甲大學假集思交通部國際會議中心202室舉辦「運用科技精進連續假期疏運策略共識營」，由黃新薰司長及林繼國所長開場致詞，邀集資通訊科技業者及交通領域多位先進共同與談，並透過設計思考工作坊引導各級道路管理機關與會人員共同探討疏運執行之痛點。
11月16日	The Institute, in collaboration with Feng Chia University, held the "Consensus Workshop on Leveraging Technology to Improve Holiday Traffic Management" at Room 202 of the GIS MOTC Convention Center. The event opened with remarks by Director General Huang Hsin-Hsun and Institute Director Lin Chi-Kuo. It brought together experts from the ICT industry and transportation sector for in-depth discussions. A design thinking workshop was also conducted to guide participants from various road authorities in identifying key challenges in holiday traffic management. 
	本所112年度自辦計畫「鼎型塊織布橋基保護工法之現地試驗與成效評估（2/4）－橋基沖刷數值模型建置與分析」之研究成果，發表論文「鼎型塊織布橋基保護工法三維數值水槽模型建置」榮獲113年度中華民國道路協會「論文獎」
11月19日	The research results of our 2023 in-house project, Performance Assessment on Geotextile Protection Construction Method (2/4) - Establishment and Analysis of Numerical Model for Bridge Foundation Scour, were presented in the paper Establishment of a 3D Numerical Flume Model for the Ding-Shaped Block Woven Fabric Scour Protection Method, which was awarded the 2024 "Best Paper Award" by the Chinese Association for Roads. 

日期Date	重要記事Event
11月20日	本所與交通部鐵道局共同辦理「傳統暨區域鐵路系統場站容量分析」第2次教育訓練，進行容量分析軟體之介紹及案例演練等。本次訓練參與者包括鐵道局、臺鐵公司、各縣市政府、大學相關科系，以及各大顧問公司等約20餘人參加，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。 In collaboration with the Railway Bureau, the institute held a training workshop of the "Yard and Station Capacity Analysis of Conventional Railway Systems (2nd Session)," introducing the capacity analysis software and case studies. Approximately 20 participants attended the training workshop, including representatives from the Railway Bureau, the Taiwan Railway Corporation, local governments, university students, and major consulting firms. The feedback during the session will serve as a basis for future research and further optimization of the analysis software. 
11月21日	本所辦理「研擬道路交通標誌標線號誌設置參考指引－一般道路情境」計畫成果說明會，受邀之各級道路主管機關、顧問公司、交通工程技師與民間團體均熱烈參與，約70人參加。 The Institute held a results presentation for the " Develop Reference Guidance for the Installation of Road Traffic Signs, Markings, and Signals—General Road Conditions " project. Approximately 70 participants enthusiastically participated, including representatives from road authorities at all levels, consulting companies, traffic engineers, and private organizations. 

日期Date	重要記事Event
	本所林繼國所長主持「運輸經營及管理組業務回顧與展望」諮詢會議，由廖謹志組長報告組織執掌以及業務主軸、過去重要成果與應用，並就重要社會經濟發展趨勢，以及運輸經營與管理面臨之發展課題盤點分析，最後提出至2030年之研究業務發展規劃，藉由諮詢會議匯集產官學研各界的專業意見與建言，提供本所納為策訂符合未來施政需要的研究業務發展規劃之重要參據。 Director Lin, Chi-Kuo of the Institute of Transportation chairing the advisory meeting "Review and Outlook of Transportation Operations and Management Division." During the meeting, Division Chief Liao, Chin-Chih presented the division's mandates and key operational focus, highlighted major achievements and applications to date, and conducted a comprehensive analysis of significant socio-economic development trends as well as emerging challenges in transportation operations and management. The meeting concluded with the proposal of a research and development plan extending through 2030. By gathering insights and recommendations from experts across the public, private, academic, and research sectors, the advisory meeting served as a critical reference for formulating future research directions aligned with upcoming policy needs.
11月25日	
	本所假臺大醫院國際會議中心舉辦「港區無人機智慧化巡查技術研發成果」教育訓練，分享適用於港區之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），以及無人載具影像管理與分析平台操作，並說明目前國內外AI新興科技發展之現況，參與單位有交通部航港局、臺灣港務股份有限公司、國家地震研究中心與臺大土木合設AI研究中心、臺灣無人機應用發展協會、中華空間資訊學會及臺灣無人機大聯盟代表，超過30位人員參加。 An educational training session on the " Research and Development Results of Intelligent UAV Inspection Technology for Port Areas " was held at the NTU Hospital International Convention Center. The session shared technologies related to unmanned vehicles and control logic suitable for port environments, automated image detection technology (with Taipei Port as a case study), as well as the operation of an image management and analysis platform for unmanned vehicles. The current development trends of emerging AI technologies domestically and internationally were also presented. Participating organizations included the Maritime and Port Bureau of the Ministry of Transportation and Communications, Taiwan International Ports Corporation, National Center for Research on Earthquake Engineering, the AI Research Center jointly established by NTU's Department of Civil Engineering, the Taiwan Association for the Development of UAV Applications, the Chinese Society of Photogrammetry and Remote Sensing, and representatives from the Taiwan Drone Alliance. Over 30 participants attended the event.
11月26日	

日期Date	重要記事Event
11月28日	本所林繼國所長主持「運輸安全組業務回顧與展望」諮詢會議，由葉祖宏組長報告組織執掌以及業務主軸、過去重要成果與應用，並就重要社會經濟發展趨勢，以及運輸安全面臨之發展課題盤點分析，最後提出至2030年之研究業務發展規劃，藉由諮詢會議匯集產官學研各界的專業意見與建言，提供本所納為策訂符合未來施政需要的研究業務發展規劃之重要參據。 Director Lin Chi-Kuo chaired a consultation meeting on the "Review and Outlook of the Transportation Safety Division's Business." Division Chief Yeh Tsu-hung reported on the division's organizational responsibilities, core business areas, past significant achievements and applications. The meeting also included an analysis of important socio-economic development trends and challenges facing transportation safety, culminating in a proposed research business development plan up to 2030. The consultation meeting gathered professional opinions and suggestions from industry, government, academia, and research sectors, providing essential references for the Institute to formulate a research business development plan that meets future policy needs. 
11月29日	本所林繼國所長率員參加陳世凱部長召集路安司、綜規司、高公局、公路局，聽取本所「研擬道路交通標誌標線號誌設置參考指引：一般道路情境」執行成果簡報，部長除指示本所儘速完成參考指引，後續並應上傳道安總動員平台，蒐集各界意見並滾動檢討修正。 Director Lin Chi-Kuo led a delegation from the Institute to attend a meeting convened by Minister Chen Shih-Kai with the Department of Road Safety, the Department of Comprehensive Planning, the Freeway Bureau, and the Directorate General of Highways to hear a briefing on the implementation results of the Institute's "Development of Reference Guidelines for the Installation of Road Traffic Signs, Markings, and Signals: General Road Scenarios." The Minister instructed the Institute to complete the reference guidelines as soon as possible and subsequently upload them to the Safe Transportation Total Mobilization Platform to collect opinions from various sectors and conduct rolling reviews and revisions.
11月29日	本所蘇振維副所長主持「運輸工程及海空運組業務回顧與展望」諮詢會議，由賴威伸組長報告組織執掌以及業務主軸、過去重要成果與應用，並就重要社會經濟發展趨勢，以及運輸工程及海、空運面臨之發展課題盤點分析，最後提出至2030年之研究業務發展規劃，藉由諮詢會議匯集產官學研各界的專業意見與建言，提供本所納為策訂符合未來施政需要的研究業務發展規劃之重要參據。 Deputy Director Su Cheng-Wei of the Institute presided over the "Transportation Engineering and Maritime and Air Transport Group Business Review and Outlook" consultation meeting. Group Leader Lai Weishen reported on the organization's management and business priorities, important past achievements and applications, and reviewed and analyzed important social and economic development trends and topics facing transportation engineering and maritime and air transport. Finally, a research business development plan was proposed until 2030. Through the consultation meeting, professional opinions and suggestions from industry, government, academia and research were gathered to provide the Institute with important references for formulating research business development plans that meet future policy needs. 

日期Date	重要記事Event
11月30日	陳世凱部長邀集路安司、觀光署、鐵道局、臺鐵公司、公路局及本所共同參加「L'Étape環法自行車挑戰賽－紐崔萊 • 日月潭站」活動，本所由林繼國所長率隊參加。 Minister of the MOTC Chen Shih-Kai invited the Directorate General of Highways, Tourism Administration, Railway Bureau, Taiwan Railways Corporation, Freeway Bureau, and the Institute to jointly participate in the "L'Étape du Tour de France – Nutrilite Sun Moon Lake Stage.", with Director Lin leading the team from our institute. 
12月2日	本所林繼國所長主持「運輸能源及環境組業務回顧與展望」諮詢會議，由朱珮芸組長報告組織執掌以及業務主軸、過去重要成果與應用，並就重要社會經濟發展趨勢，以及運輸能源及環境面臨之發展課題盤點分析，提出至2030年之研究業務發展規劃，藉由諮詢會議匯集產官學研各界的專業意見與建言，提供本所納為策訂符合未來施政需要的研究業務發展規劃之重要參據。 The consultation meeting on "The Review and Prospects of Transportation Energy and Environment Division" was held and chaired by Director-General Lin Chi-Kuo. During the meeting, Division Director Chu Pei-Yun presented the division's organizational responsibilities, main business focus, key achievements, and applications. She also analyzed important socioeconomic development trends and the challenges faced by transportation energy and environmental sectors, and proposed a research roadmap development plan for research affairs by 2030. The consultation meeting gathered professional opinions and recommendations from industry, governments, academia, and research sectors, providing valuable references for formulating development plans for research affairs projects that align with future policy needs. 

日期Date	重要記事Event
12月2日	本所林繼國所長主持「運輸技術研究中心業務回顧與展望」諮詢會議，由蔡立宏主任報告組織執掌以及業務主軸、過去重要成果與應用，並就強化運輸設施技術發展趨勢，以及防災調適技術面臨之研發課題盤點分析，提出至2030年之研究業務發展規劃，藉由諮詢會議匯集產官學研各界的專業意見與建言，提供本所納為策訂符合未來施政需要的研究業務發展規劃之重要參據。 Director Lin Chi-Kuo of the institute convened the consultation meeting on " The Review and Prospects of transportation technology research center," where Director Tsai, Li-Hung presented the center 's responsibilities, core operations, major achievements and applications. Conduct a comprehensive analysis of the development trends in transportation infrastructure technology, as well as an inventory and assessment of the R&D challenges faced in disaster prevention and adaptation technologies. The presentation also analyzed key socio-economic development trends and identified challenges faced in Technology and Information. Finally, a research and development roadmap through 2030 was proposed. The consultation meeting gathered professional insights and recommendations from experts across industry, government, academia, and research sectors, providing valuable references for the institute in formulating research and development plans that align with future policy needs. 
12月3日	本所林繼國所長主持「運輸計畫及陸運組業務回顧與展望」諮詢會議，由張舜淵組長報告組織執掌以及業務主軸、過去重要成果與應用，並就重要社會經濟發展趨勢，以及運輸計畫及陸運業務面臨之發展課題盤點分析，最後提出至2030年之研究業務發展規劃，藉由諮詢會議匯集產官學研各界的專業意見與建言，提供本所納為策訂符合未來施政需要的研究業務發展規劃之重要參據。 Director Lin Chi-Kuo of the institute convened the consultation meeting on "The Review and Prospects of Transportation Planning and Land Transport Division," where Director Chang Shuen-Yuan presented the division's responsibilities, core operations, major achievements and applications. The presentation also analyzed key socio-economic development trends and identified development challenges faced in transportation planning and land transport. Finally, a research and development roadmap through 2030 was proposed. The consultation meeting served to gather professional insights and recommendations from experts across industry, government, academia, and research sectors, providing valuable references for the institute in formulating research and development plans that align with future policy needs. 

日期Date	重要記事Event
12月4日	本所林繼國所長主持「運輸科技及資訊組業務回顧與展望」諮詢會議，由吳東凌組長報告報告運輸科技及資訊組執掌以及業務主軸、過去重要成果與應用，並就重要社會經濟發展趨勢，以及運輸科技及資訊面臨之發展課題盤點分析，最後提出至2030年之研究業務發展規劃，期盼藉由諮詢會議匯集產官學研各界的專業意見與建言，提供本所納為策訂符合未來施政需要的研究業務發展規劃之重要參據。 Director Lin Chi-Kuo of the institute convened the consultation meeting on " The Review and Prospects of Transportation Technology and Information Division," where Director Wu Tung-Ling presented the division's responsibilities, core operations, major achievements and applications. The presentation also analyzed key socio-economic development trends and identified development challenges faced in Technology and Information. Finally, a research and development roadmap through 2030 was proposed. The consultation meeting served to gather professional insights and recommendations from experts across industry, government, academia, and research sectors, providing valuable references for the institute in formulating research and development plans that align with future policy needs. 
12月5日	交通部函請本所協助中華民國運輸學會共同規劃辦理「中華民國運輸學會2024年會暨學術論文國際研討會」之「重大交通政策未來研究課題專題研討」專題場次，以提升各界對於交通部重要施政議題之交流互動，同時激盪未來研究之課題。 The Ministry of Transportation and Communications, R.O.C., has officially commissioned our institute, in collaboration with the Chinese Institute of Transportation, to co-organize a dedicated session entitled "Special Symposium on Future Research Topics of Major Transportation Policies", to be held as part of the 2024 International Conference and Annual Meeting of the Chinese Institute of Transportation. This session is intended to strengthen cross-sectoral dialogue and engagement on the Ministry's key policy initiatives, while concurrently stimulating discussion on prospective research directions. 

日期Date	重要記事Event

本所與臺灣港務股份有限公司共同舉辦「商港海氣象觀測資料應用暨成果發表會」，除臺灣港務公司（含各分公司）外，亦邀請航港局、中央氣象署、國家海洋研究院、高雄市政府海洋局共計26人共同參與，透過商港海氣象智慧監測系統建置及觀測資料應用成果之交流與分享，增進各港實務應用與決策支援加值服務，促進我國港埠智慧化發展。

Co-hosted the "Commercial Port Marine Meteorological Observation Data Application and Results Presentation Conference" with Taiwan International Ports Corporation (TIPC). In addition to participants from TIPC and its branch offices, representatives from the Maritime and Port Bureau, Central Weather Administration, National Academy of Marine Research, and Kaohsiung City Government Marine Bureau were invited, totaling 26 participants. Through the exchange and sharing of achievements in the development of smart marine meteorological monitoring systems and the application of observational data, the event aimed to enhance practical applications and value-added decision-support services at various ports, thereby promoting the smart development of Taiwan's port infrastructure.

12月10日

本所以「電動公車服務數位創新加值計畫-驅動智慧城市能源管理新思維」為題參與交通部服務獎與行政院「第7屆政府服務獎」數位創新加值項評選。政府服務獎獎項計有142個機關（構）參獎，經書面評審、實地訪視及評審會議嚴謹討論，最終評選出26個機關（構）得獎。本所與另外8個中央與地方機關獲得行政院「第7屆政府服務獎」數位創新加值項獎項

Our organization participated in the Ministry of Transportation Service Award and the 7th Government Service Award from the Executive Yuan with the project titled "Digital Innovation and Value-Added Plan for Electric Bus Services - Driving New Thinking in Energy Management for Smart Cities." A total of 142 agencies participated in the Government Service Award. After a rigorous process of written evaluations, on-site visits, and thorough discussions during review meetings, 26 agencies were ultimately selected as winners. Our organization, along with 8 other central and local agencies, received the 7th Government Service Award for Digital Innovation and Value-Added Projects.

12月12日

日期Date	重要記事Event
12月13日	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－「電動化轉型・綠運輸同行」行動論壇，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」及「淨零綠生活（「低碳運輸網絡」部分）」行動計畫之現階段推動成果及專題報告計畫亮點成果外，並就「運具轉型電動化所需保養、維修、檢驗能力構建」、「運輸業者淨零轉型之碳排管理與減碳能力建構」兩議題進行交流。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190餘位參加，共同就運具電動化及無碳化推動成果、前瞻未來與展望進行探討與交流。 The consultation meeting on the transportation sector's net-zero transformation, titled "Electrification Transformation: Green Transportation Together," was organized by the Institute of Transportation in collaboration with the Public Transportation Supervision Division of the Ministry of Transportation and Communications. The forum was chaired by Deputy Minister Chen Yen-Po. Each responsible agency provided updates on the current progress of the "Vehicle Electrification and Decarbonization" and "Net-Zero Green Living" (specifically the "Low-Carbon Transportation Network") action plans, highlighting key achievements of promotion and research. In addition, a discussion was held on two key topics: "Building Maintenance, Repair, and Inspection Capabilities for Electric Vehicles" and "Carbon Management and Carbon Reduction Capability Development for Transportation Operators' Net-Zero Transition." The forum was attended by approximately 190 participants from government departments (both central and local), academia, research institutions, public and private associations, civic organizations, and the public. The participants discussed the achievements, prospects, and outlook for vehicle electrification and decarbonization.  

日期Date	重要記事Event
12月17日	辦理「北中南東四大區域整體運輸規劃系列研究」成果說明會暨教育訓練，共計30人參加，參與者包含交通部暨所屬機關（構）、地方政府交通主管機關，及相關顧問公司。藉由本次成果說明會與教育訓練，提升政府機關與顧問機構對於整體運輸規劃與運輸需求模式應用之知能，培養交通運輸規劃人才。 A symposium and training workshop for the series of studies on regional transportation planning were held with 30 participants, including the MOTC and external divisions, transportation authorities of local governments, and consulting agencies. The symposium and training workshop enhanced the knowledge and ability of government authorities and consulting agencies in transportation planning and the application of the transportation demand model. 
12月25日	本所林繼國所長應邀至台中市小客車租賃商業同業公會辦理之「交通部運輸研究所小客車租賃服務整合旅遊生態系平台開台典禮暨第五屆第三次會員代表大會」致詞。 Director-General Lin Chi-Kuo was invited to deliver remarks at the "Inauguration Ceremony of the Tourism Ecosystem Platform for Integrating Car Rental Services" and the "5th General Assembly, 3rd Session" organized by the Taichung City Car Rental Business Association. 

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項次	計畫名稱	Project Title
1	東臺區域整體運輸規劃系列研究（3/3）－陸路運輸系統發展策略研析	A Series of Studies on the Overall Transportation Planning of Eastern Taiwan (3/3) – Analysis of the Development Strategy for Land Transportation System
2	城際鐵道容量分析暨應用研究（2/2）－編組站及端末站之容量軟體擴充暨案例實作	Research on Capacity Analysis of Intercity Railways and Its Applications (2/2) – Case Implementation and Rail Capacity Software Function Extension for the Classification Yard and Terminal Station
3	電動車公共充電樁設施設置需求評估之研究	The Study of the Public Charger's Demand Assessment for Electric Vehicles
4	臺灣地區整體運輸規劃－貨運需求模式架構分析	The Overall Transportation Planning in Taiwan – Analyzing the Framework of Freight Transport Demand Model
5	高速公路交織路段容量及服務水準分析之研究（2/3）－非典型路段	Analysis of Traffic Capacity and Level of Service of Freeway Weaving Segments (1/3) – Non-typical Section
6	運輸規劃支援系統維運技術服務（113年度）	Maintenance Service of the Transportation Planning Support System (2024)

07
年度研究計畫
Annual Research Project

項次	計畫名稱	Project Title
7	113-114年臺灣公路容量分析軟體（THCS）與專區網站推廣維運服務（113年度）	2024 Taiwan Highway Capacity Analysis Software and Website Promotion and Maintenance Service
8	新一代公路交通系統模擬（HTSS）模式開發規劃（2/2）－核心功能建置與後續開發規劃	Development Planning for the New Generation Highway Traffic System Simulation (HTSS) Model (2/2) – Core Function Construction and Subsequent Development Planning
9	交通部自行車路線整合評估與精進（I）	An Integrated Evaluation and Enhancement of Cycling Routes by the Ministry of Transportation and Communications (I)
10	旅次特性資料蒐集輔助方法之探討	A Study on The Auxiliary Methods for Collecting Travel Characteristic Data
11	本所辦理交通部主管政府公共建設計畫先期作業之檢討與精進	The Review and Improvement of Our Institute Handles the Preliminary Work of the Ministry of Transportation and Communications' Public Construction Projects
12	自行車道之容量及服務水準分析方法初探	Preliminary Study on Traffic Capacity and Level of Service Analysis Method of Bicycle Lanes

項次	計畫名稱	Project Title
13	以自行車交通量探討自行車相關計畫之辦理成效	Exploring the Effectiveness of Bicycle-Related Projects Based on Bicycle Traffic Volume
14	國內自行車道規劃設計參考手冊精進初探	Preliminary Exploration of Enhancing the Framework of the Domestic Bicycle Lane Planning and Design Reference Manual
15	113年度運輸計畫及陸運組期刊研討計畫	Journal Review Project of the Transportation Planning and Land Transport Division (2024)
16	郵政物流園區聯外交通課題與因應建議	Chunghwa Post Logistics Park External Transportation Issues and Response Suggestions
17	臺鐵兩鐵車站導覽圖樣版研議	A Study on the Template Design for Taiwan Railways' Bike-and-Rail Station Guide Maps Station Guide Maps
18	三貂嶺生態友善隧道前後路段之替代路線研議	A Study on Alternative Routes for the Sections Before and After the Sandiaoling Eco-Friendly Tunnel
19	臺南市沙崙智慧綠能科學城及臺南科學園區聯外交通改善建議	Suggestions for Improving External Transportation of Shalun Smart Green Energy Science City and Tainan Science Park
20	海運國際資料庫維護及議題分析	Maintaining and Data Analyzing of International Maritime Database of 2024
21	空運國際資料庫維護進及議題分析	Maintaining and Data Analyzing of International Air Transportation Database of 2024
22	國際機場運作模擬分析軟體系統規劃與建置（2/2）－整合軟體建置與實例測試	International Airport Operation Simulation Analysis Software System Planning and Construction (2/2) – Integration Software Building and Actual Cases Testing
23	我國航港資訊整合與數位化發展架構之研究（2/2）－研訂航港產業數位化發展指引	Research on Maritime and Port Information Integration and Digital Development Framework in Taiwan(2/2) – Developing Guidelines for Digitalization of the Shipping Industry
24	鐵路供需診斷數位分身軟體平台之建置（2/2）－鐵路數位分身軟體平台雛型架構之研發	Construction of Railway Supply and Demand Diagnosis Digital Twin Software Platform (2/2) – Research and Development of Prototype Architecture of Railway Digital Twin Software Platform
25	橋梁檢測輔助工具精進之研究（1/2）－研訂橋梁檢測3D影像模型作業程序	Research on the Enhancement of Bridge Inspection Assistance Tools (1/2) – Establishing Operational Procedures for 3D Image Modeling in Bridge Inspection
26	商港碼頭作業勞動力進用改善策略之研究	Study on the Strategies to Improve the Employment of Labor in Commercial Port Terminals
27	2024年海運貨櫃定期航線觀察	Tracking the Trends and Patterns of Container Liner Routes in 2024
28	國際推動機場智慧化趨勢及我國發展課題探討	Exploration of International Trends in Promoting Airport Smart Transformation and Development Issues in Taiwan
29	全球海運綠色航運走廊發展之研析	Research and Analysis on the Development of Global Maritime Green Shipping Corridors
30	亞太傳統航空公司北美客運市場營運探討	A Study on North America Passenger Market for Asia-Pacific Full-Service Airlines

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31	車行橋梁管理資訊系統斜張橋與脊背橋檢測值與屬性關聯性探討	Exploration the Correlation between Detection Value and Attribution of Cable-Stayed Bridge and Extradosed Bridge of Taiwan Bridge Management System
32	營運中鐵路工程臨軌作業及施工程序管制措施研析探討	Study and Analysis of On-Track Operations and Construction Procedure Control Measures for Ongoing Railway Engineering Projects
33	我國發展海事單一窗口重要課題之研究	Research on Key Issues in the Development of Maritime Single Window in Taiwan
34	我國推動永續航空燃料（SAF）發展課題與策略之探討	Exploration of Issues and Strategies for Promoting Sustainable Aviation Fuel Development in Taiwan
35	113年運輸工程及海空運組海運期刊研討計畫	Maritime Journal Review Project of the Transportation Engineering, Maritime and Air Transport Division (2024)
36	113年運輸工程及海空運組空運期刊研討計畫	Air Transport Journal Review Project of the Transportation Engineering, Maritime and Air Transport Division (2024)
37	研析國家鐵道安全計畫之安全績效與目標管理（2/2）－風險課題檢討與控管機制	A Study on Application of Safety Performance Management by Objectives in Railway State Safety Program (2/2): Review of Focal Risk Areas and Risk Controls
38	應用人工智慧分析技術探勘高風險路段（4/4）－空間特性分析	Applying Artificial Intelligence Techniques to Identifying Accident-prone Road Sections (4/4): Sptial Characteristics Analysis
39	無人機空拍應用於路段交通衝突分析（1/2）－車道交通衝突	Applying Drone Aerial Photography for Road Traffic Conflict Analysis (1/2) – Lane Traffic Conflict
40	道路交通安全檢查制度導入研究（1/2）－建構道路安全檢查工具	Research on the Implementation of Road Safety Inspection (1/2) – Development of Road Safety Inspection Tools
41	新興科技導入學校交通安全教育之研發示範計畫（2/2）－成效評估與應用推廣	Evaluation and Application in Introducing Emerging Technologies into Road Safety Education in Schools
42	研擬道路交通標誌標線號誌設置參考指引（1/3）－一般道路情境	Develop Reference Guidance for the Installation of Road Traffic Signs Markings, and Signals (1/3) – General Road Conditions
43	道安改善專業能力建構	Professional Capacity Development for Road Safety Enhancement
44	113運輸安全組期刊研討計畫	Journal Review Project of the Transport Safety Division (2024)
45	共享運具連結公共運輸之研究（1/2）－營運管理因應策略規劃	A Plan for Connecting Shared Modes and Public Transportation (1/2) – Strategic Planning for Operation Management
46	ISO 55001國際標準導入鐵道資產管理實務之研究（2/3）－績效模型建構	A study on Implementation of Asset Management through ISO 55001 in Railway Industry (2/3) – Performance Measurement Model
47	汽車貨運業因應淨零轉型策略規劃（1/2）－策略架構建立	Strategic Planning for the Net-Zero Transition in the Automobile Cargo Transportation Industries (1/2) – Strategy Framework Development
48	TPASS行政院通勤月票推動成效評估與精進建議	The Effectiveness Evaluation and Improvement Suggestion of TPASS, the Commuter Monthly Pass Promoted by Executive Yuan

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49	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（1/2）－合理成本與營運績效探討	An Investigation of Operation, Subsidy and Fare System of Demand Responsive Transport Service (DRTS) Scheme (1/2) – Operation Cost Analysis and Performance Evaluation
50	偏鄉交通行動服務MaaS服務範疇界定與推動策略規劃	Defining the Scope and Strategic Planning of MaaS Services for Rural Areas
51	汽車客運業統一會計科目之檢討與建議	Review and Recommendations for Uniform Account Items for the Bus Carrier Industry
52	本所航運經營管理研究發展架構研析	Analysis of the Framework of IOT's Shipping Operations Management Research and Development
53	縣市公共自行車租賃車輛調度課題研析	Analysis of Issues in Public Bicycle Rental Vehicle Dispatching for Cities and Counties
54	113年度運輸經營及管理組期刊研討計畫	Journal Review Project of the Transportation Operations and Management Division (2024)
55	電動大客車智慧充電服務驗證（2/2）－智慧充電管理系統精進與優化	Verification Project of Intelligent Charging Services for Electric Buses (2/2) – Improvement and Optimization of Intelligent Charging Management System
56	電動大客車數據分析與應用計畫（2/2）－資料視覺化與AI應用	Electric Bus Data Analysis and Application Project (2/2) – Data Visualization and AI Application
57	構建5G智慧交通數位神經中樞－功能擴充與精進	Construction of 5G Intelligent Transportation Digital Nerve Center – Function Expansion and Refinement
58	運用科技精進連續假期疏運計畫先期規劃研究	A Preliminary Study on Applying Technologies to Refine Transportation Management Program in Long Holidays
59	我國人工智慧車聯網之號誌控制（2/2）－匝道儀控與平面道路號誌協控實作	Study of Artificial Intelligence Traffic Signal Control (2/2) – Implementation of Integrated Ramp Metering and Surface Road Signal Coordination.
60	交通行動服務（MaaS）跨域合作與應用優化之研究（2/2）－應用精進與提升包容性	A Study on the Application Improvement and Cross-Domain Collaboration of Mobility as a Service (MaaS) (2/2) – Application Refinement and Inclusivity Enhancement
61	無人機偏鄉物流服務運送驗證計畫（2/2）－服務模式實作與系統驗證	Proof-of-Service for UAS Delivery in Rural Areas (2/2) – Service Model Implementation and System Verification
62	113年度運輸科技及資訊組期刊研討計畫	Journal Review Project of the Transportation Technology and Information Division (2024)
63	運用交通行動服務（MaaS）理念探討TPASS月票之後續擴充應用	Applying the Concept of Mobility as a Service (MaaS) to Explore the Subsequent Expansion of the TPASS Monthly Pass
64	電動大客車公共充電站智慧充電管理機制研究	A Study on Intelligent Charging Management Mechanisms of Public Charging Stations for Electric Buses
65	生成式AI應用在交通運輸領域之探討	Exploration of Generative AI Applications in the Areas of Transportation
66	本所零信任資安防護探討（1/2）－技術與成本分析	A Study on Zero Trust Cybersecurity Protection at the Institute of Transportation, MOTC (1/2): Technical and Cost Analysis

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67	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（2/2）－精進減碳評估方法暨研訂第3期減量目標	Enhancing Net-Zero Emission in the Transportation Sector and Promoting Carbon Reduction Evaluation Model (2/2) – Enhancing Carbon Reduction Evaluation Methods and Formulating the Phase Three Periodic Regulatory Goals of the Transportation Sector.
68	低碳交通區推動機制之研究（2/2）－推動指引	A Study on the Mechanism of Low-Carbon Transportation Zones(2/2) – The Preliminary Guidelines.
69	鐵道系統強化調適能力之探討（1/3）－機制與方法	A Study of Enhancing the Adaptive Capacity of Railway Systems (1/3) – Mechanism and Method.
70	建構運輸管理機關（構）之調適專業能力（2/2）－人才培育及機制建議	Construction of Professional Adaptability of Transportation Governing Authority (Agency) (2/2) – Talent Development and Mechanism Recommendations.
71	路口交通環境特性對空氣品質影響及改善指引之研訂（2/2）－資料分析與指引研訂	The Impact of Traffic Environmental Characteristics at Intersections on Air Quality and the Development of Improvement Guidelines (2/2) – Data Analysis and Develop Guidelines.
72	淨零低碳交通政策公正轉型之利害關係人辨識準則與影響評估方法研議	Criteria of Identifying and Method of Impact Assessing of Stakeholders – A Just Transition Preliminary Study of Net Zero and Low Carbon Transportation Policy.
73	本所員工通勤碳盤查作業之研析（含碳盤查專業課程訓練）	A Study on Staff Commuting-Related Carbon Inventory for our Institute (Including Professional Training on Carbon Inventory Methodologies)
74	應用輕推理論促進運輸部門減碳方法之探討	Exploring the Application of Nudge Theory to Promote Carbon Reduction in the Transportation Sector.
75	運輸氣候風險評估應用國家氣候情境圖資之課題研析	Analysis of Issues in Applying National Climate Scenario Data to Transportation Climate Risk Assessment.
76	行政機關（構）申設為溫室氣體查驗機構作業之探討－以本所為例	A Study on Commuting-Related Greenhouse Gas Accounting for Institute Staff: Including Professional Training on Carbon Inventory Methodologies
77	113年運輸能源及環境組期刊研討計畫	Journal Review Project of the Transportation Energy and Environment Division (2024)
78	港區影像智慧辨識技術之研究（2/3）－空間資料環境分析及優化影像檢監測應用技術	Research on Port Area Image Intelligent Recognition Technology (2/3) – Environmental Analysis of Spatial Data and Optimisation of Imaging Surveillance Applications.
79	應用影像智慧化技術判釋海岸公路及防波堤越波研究（3/4）－防波堤越波影像判釋	Intelligent Image Recognition Analyses for Wave Overtopping on Coastal Highways and Seawalls (3/4) – Interpretation of Breakwater Overtopping Images
80	港灣環境資訊系統維護與精進（3/4）－海氣象資料分析及展示	Maintenance and Improvement of The Harbor Environmental Information System (3/4) – Marine Meteorological Data Analysis and Display
81	海氣象預測模擬系統之維運與精進（3/4）－精進高雄海域模組	Maintenance and Advancing of Sea Meteorology Prediction Simulation System (3/4) – Advancing Kaohsiung Seas Module
82	鼎型塊織布橋基保護工法之現地試驗與成效評估（3/4）－試驗場址數值模型建置及評估	Performance Assessment on Geotextile Protection Construction Method (3/4) – Construction of Numerical Models for Test Sites and Effectiveness Evaluation

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83	公路橋梁梁底狹小空間檢測工具專利申請與推廣	Patent Application and Promotion of Detection Tools for Narrow Spaces at The Bridge Bottom
84	人工智慧辨識透地雷達訊號圖像之前處理初探	A Preliminary Study on Pre-Processing of Ground-Penetrating Radar Signal Image Recognition Using Artificial Intelligence.
85	UAV結合深度學習輔助公路局邊坡災防應用探討	Exploring the Application of UAV Combined with Deep Learning for Slope Disaster Prevention in Highway Bureau Operations.
86	113年臺灣地區金屬材料腐蝕環境調查與鋅金屬關聯性研究	Investigation of Corrosive Environments for Metal Materials in Taiwan Region in 2024 and Correlation Analysis of Zinc Metal and Corrosion Factors.
87	港灣構造物巡查檢測作業精進（3/4）－新興科技應用於防波堤設施巡查檢測作業	Improved Inspection and Detection of Harbor Structures (3/4) – New-Emerging Technologies Applied to Inspection and Detection Operations of Breakwater Facilities.
88	港區地震液化風險評估模式精進（3/5）－高雄港模式精進	Refinement for Seismic Liquefaction Risk Assessment Model for Port Area (3/5) – Refinement of Kaohsiung Port Model
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