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交通部運輸研究所

INSTITUTE OF TRANSPORTATION, MOTC
ANNUAL REPORT 2022



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專業領航 × 追求卓越
Professional Navigation Pursuit-of Excellence

111 交通部運輸研究所 年報

INSTITUTE OF TRANSPORTATION, MOTC
ANNUAL REPORT 2022



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ANNUAL REPORT 2022

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壹

所長的話

01

Message from the Director General

交通部主管全國交通行政及交通事業，負責交通政策、法令規章之釐定和業務執行之督導，肩負推動國家重大交通建設、滿足並提供優質便利民行服務的重任，同時亦期能促進產業發展，乃至帶動經濟成長、促進城鄉均衡與維護環境永續發展。因此，交通部以服務民眾為中心的「人本交通」作為施政願景，以「安全」、「效率」、「品質」及「綠色」等4大面向為主軸，期使施政內容更貼近民眾期許，達成與民同行、連結共好的目標。

本所長期扮演交通部智庫角色，配合國內外情勢與國家整體發展需求，持續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。面對交通部四大施政主軸，全體同仁皆秉持「專業領航、追求卓越」之精神與團隊共識，以「前瞻智庫、落實應用、能量構建」三個面向，規劃「強化運輸規劃與審議支援、提升海空運競爭優勢、優化公共運輸服務及產業轉型、營造潔淨且具韌性的運輸環境、深化運輸安全管理、推動交通科技創新應用與產業發展、精進交通設施維護管理與災防技術」等七項研究主軸，並採「以終為始」的目標及成果導向，落實每項研究成果皆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、交通部氣候變遷運輸部門減緩與調適推動小組、交通部交通費率委員會工作小組、桃園航空城聯外運輸系統工作小組及自行車督導小組之綜合規劃分組與資訊分組等幕僚。

面對交通部揭示的四大施政主軸，過去一年本所陸續完成重大施政規劃並協助推動相關計畫，包括：

The Ministry of Transportation and Communications is in charge of the national transportation administration and transportation operation, and is responsible for the formulation of transportation policies, laws and regulations, and the supervision of business operations. The Ministry of Transportation and Communications is entrusted with the responsibilities of promoting material transportation construction of the country, satisfying and providing excellent and convenient travel services to the general public, and enhancing industrial development at the same time, as well as driving economic growth, activating urban-rural balance in development, and maintaining the sustainability of the environment. Therefore, the Ministry of Transportation and Communications aims to fulfill the administrative vision of "people-oriented transportation" and focus on realizing the four themes of "safety," "efficiency," "quality," and "green life" in order to live up to the expectations of the citizens, give people what they want, and work together to realize the goal of reciprocity.

The Institute of Transportation (MOTC) has been acting as a think tank of the Ministry of Transportation and Communications for years, and has continued to carry out forward-looking and integrated research and development, planning, review, and suggestion on the transportation system in line with domestic and foreign situations and the overall development needs of the country. All colleagues while facing the four administrative themes of the Ministry of Transportation and Communications adhere to the spirit of "professional leadership and pursuit of excellence" and team consensus to plan the seven research subjects including "Enhance the Transportation Planning and Reviewing Support, Improve the Competitive Advantage of Sea and Air Transportation, Optimize Public Transportation Services and Industrial Transformation, Build up a Clean and Resilient Transportation Environment, Deepen Transportation Safety Management, Promote the Innovative Application of Transportation Technology and Industrial Development, Improve the Transportation Facilities Maintenance Management and Disaster Prevention Technology." from the three aspects of "forward-looking think tank, sustentative implementation, and capacity building." Furthermore, adopt the "Beginning with the End in Mind" goal and result orientation to ensure that every research result is supportive of the administration goals of the Ministry of Transportation and Communications. In addition, assist the Ministry of Transportation and Communications continuously by serving as the staff of APEC Transportation Working Group, the Sustainable Transportation Working Group of the National Council for Sustainable Development, Executive Yuan, the Executive Yuan 2050 Net Zero Emissions Pathway Assessment Task Force, the Ministry of Transportation and Communications Climate Change Transport Department Mitigation and Adaptation Promotion Group, the Ministry of Transportation and Communications Transportation Rates Committee Working Group, Taoyuan Aerotropolis Interconnected Transportation System Working Group, and the Comprehensive Planning and Information Unit of the Bicycle Supervision Group.

The Institute of Transportation (MOTC), while facing the four major administrative themes revealed by the Ministry of Transportation and Communications, has successively completed material administrative plans and assisted in promoting the relevant plans in the last year, including:

一、在安全方面：持續精進橋梁維護管理機制，完成「全國橋梁統計網」及「車行橋梁統計系統」建置，同時辦理現地橋梁檢測人員培訓課程，持續提升我國公路橋梁檢測之品質及能量；結合六大區域運輸發展研究中心及道路交通安全相關專家學者之研究能量，建立「道安提升行動小組」機制；協助鐵道局發展安全管理系統（SMS）自主評估準則並規劃建立監理查核工具；研發「輕便型橋梁底部檢測設備」及「地工纖布橋梁基礎保護工法」獲得「2022台灣創新技術博覽會發明競賽」「金牌獎」及「銀牌獎」。

二、在效率方面：推動無人機於交通領域之創新應用與產業發展，輔導成立臺灣無人機大聯盟，並於嘉義縣亞洲無人機AI創新應用研發中心由蔡總統為交通部無人機科技產業小組辦公室揭牌；辦理「無人機在交通領域之創意應用競賽(II)」；辦理「無人機整合示範計畫(II)」，完成偏遠山區緊急災害運補之場域驗證；結合無人機與AI影像辨識技術，應用於橋梁檢測及港區設施智慧化巡查，提升相關設施巡檢效率；因應數位化趨勢，針對公車智慧化營運管理，整合車載設備之駕駛管理系統研發，強化駕駛身分識別與時間（工時）管理，並透過車聯網與區塊鏈紀錄及雲端系統，達成S.M.A.R.T智慧化客運營運管理服務目標；運用5G結合AIoT及數位雙生等創新技術，構建智慧交通數位神經中樞雛型系統，完成高速交通聯網之蒐集、融合與巨量運算整合分析，提升號誌控制與交通管理之效率；建置軌道構件缺失辨識系統與資料庫，並導入系統精準定位功能，提高軌道巡查作業效率及準確度。

三、在品質方面：出版「2022年臺灣公路容量手冊」；繼續推動「區域運輸發展研究中心服務升級2.0計畫」（110-111年），完成「公車進校園服務成效盤點與精進建議」、「北高雄公路公共運輸服務升級計畫」及「110年盤點原住民族地區文化健康站之運輸服務」；於臺南市、高雄市導入通用計程車特約制度，並持續協助臺北市、新北市、桃園

1. **In terms of safety:** Continue to improve the bridge maintenance and management mechanism, complete the establishment of the "National Bridge Statistics Network" and "Bridge Statistics System;" also, arrange training courses for on-site bridge inspection personnel to improve the quality and capacity of Taiwan's public road and bridge inspection continuously; integrate the research energy of the six regional transportation development research centers and the experts and scholars related to road traffic safety, establish the "Road Safety Improvement Action Group" mechanism; assist the Railway Bureau, MOTC in developing the safety management system (SMS) self-evaluation criteria and plan the establishment of supervision and inspection tools; and the researched and developed "Portable Bridge Bottom Inspection Equipment" and "Geotextile Bridge Foundation Protection Method" were awarded the "Gold Medal" and "Silver Medal" in the "2022 Taiwan Innotech Expo - Invention Contest."
2. **In terms of efficiency:** Promote the innovative application and industrial development of unmanned aerial vehicle (UAV) in the transportation field, guide the establishment of the UAS-Taiwan; Ms. Tsai, the President of Taiwan, has inaugurated the UAV Technology Industry Group Office of the Ministry of Transportation and Communications at the Asia UAV AI Innovation Application R&D Center in Chiayi County; handle the "UAV Creative Application Contest in the Transportation Field (II); handle the "UAV Integration Demonstration Project (II)" to complete the field verification of emergency disaster transportation in remote mountainous areas; combine UAV and AI image identification technology for bridge detection and intelligent inspection of port facilities to improve the inspection efficiency of related facilities; in response to the trend of digitalization, for the intelligent operation and management of buses, integrate the research and development of the driving management system of the vehicles and strengthen the driver's identification and time (working hours) management, and achieve the goal of S.M.A.R.T intelligent passenger operation management service through Internet of Vehicles, blockchain records, and cloud systems; utilize 5G together with AIoT, digital twins, and other innovative technologies to build a smart transportation digital nerve center prototype system, complete high-speed transportation networked collection, integration, and massive calculation integration analysis in order to improve the efficiency of signal control and traffic management; build a track component missing identification system and database, and introduce the system's precise positioning function to improve the efficiency and accuracy of railway track inspection operation.
3. **In terms of quality:** Publish the "2022 Taiwan Highway Capacity Handbook; continue to promote the "Implement the Service Upgrade 2.0 Project for the Regional Transportation Research and Development Center" (2021-2022). Complete the "Bus on Campus Service Effectiveness Inventory and Improvement Suggestions," "Implement the Service Upgrade Project for North Kaohsiung Public Transportation," and "2021 Transportation Services Inventory of Cultural and Health Stations in aboriginal Areas;" Introduce the Contract System of Accessible Taxis in Tainan City and Kaohsiung

市、臺中市等四都推動通用計程車特約制度；辦理電動大客車營運數據監控管理平台維運及資料傳輸檢核，並於112.1.1完成平台移轉公路總局維管。

四、在綠色方面：推動「環島自行車道升級暨多元路線整合」，協助辦理「皇冠海岸漫騎趣及環台騎遊活動」；完成2050年運輸部門溫室氣體淨零排放路徑評估與策略規劃，並彙提「臺灣2050淨零轉型『淨零綠生活』關鍵戰略行動計畫（草案）」推動措施暨具體行動、「運輸部門溫室氣體排放管制行動方案（第二期）」、「運輸部門溫室氣體排放管制行動方案執行成果報告（111年9月版）」、「110年維生基礎設施領域成果報告」及「國家氣候變遷調適行動方案（112-116年）」維生基礎設施領域調適行動計畫；協助交通部參加「2022臺灣氣候行動博覽會」獲頒「最佳公部門行動獎」及「最佳永續運輸獎」。

展望未來，配合交通部與本所組織與功能調整，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。

City, and continue to assist Taipei City, New Taipei City, and Taoyuan City, and Taichung City in promoting the Control System of Accessible Taxis; handle the maintenance and transfer of electric bus operational monitoring and management platform and data transmission check, and complete the platform transfer to the Directorate General of Highways MOTC for maintenance and management on January 1, 2023.

- In terms of green environment:** Promote the "Upgrading and Diversifying Island Round Cycling Routes" and assist arranging the "Crown Coast Ride and Cycling Activities around Taiwan"; complete the evaluation and strategic planning of the 2050 Net Zero Greenhouse Gas Emissions Pathway in Transportation Sector, and propose promotion measures and specific actions of the "Taiwan 2050 Net Zero Transformation 'Net Zero Green Life' Key Strategic Action Plan (Draft)", "Greenhouse Gas Emissions Control Action Plan (Phase II) in the Transportation Sector," "Report on the Implementation Results of the Greenhouse Gas Emission Control Action Plan in the Transportation Sector (September 2022 Edition)," "2022 Report on the Achievements in the Life-Sustaining Infrastructure," and "National Climate Change Adaptation Action Plan (2023-2027)" life-sustaining infrastructure adaptation action plan; assist the Ministry of Transportation and Communications to participate in the "2022 Taiwan Climate Action Expo" with the "Best Public Sector Action Award" and "Best Sustainable Transportation Award" received.

In prospect, in line with the organizational and functional adjustments of the Ministry of Transportation and Communications and the Institute of Transportation (MOTC), the Institute will continue to act as the think tank of the Ministry of Transportation and Communications forcefully. The Institute will improve the core missions such as transportation basic research, forward-looking technological innovation application research and development, and transportation policy planning to enhance material policy research and planning and decision-making support capabilities. In addition, the Institute will continue to observe international trends, enhance sea and air transportation planning capabilities, and study transportation safety, public transportation, smart transportation, green transportation, disaster prevention and adaptation, etc., in order to support transportation administration and technological innovation applications, and to promote industrial development for laying a solid foundation to upgrade the transportation services of Taiwan.

交通部運輸研究所 所長

林建國

Institute of Transportation, MOTC
Director General

Chi-Kuo Lin

組織與職掌

Organization and Functions

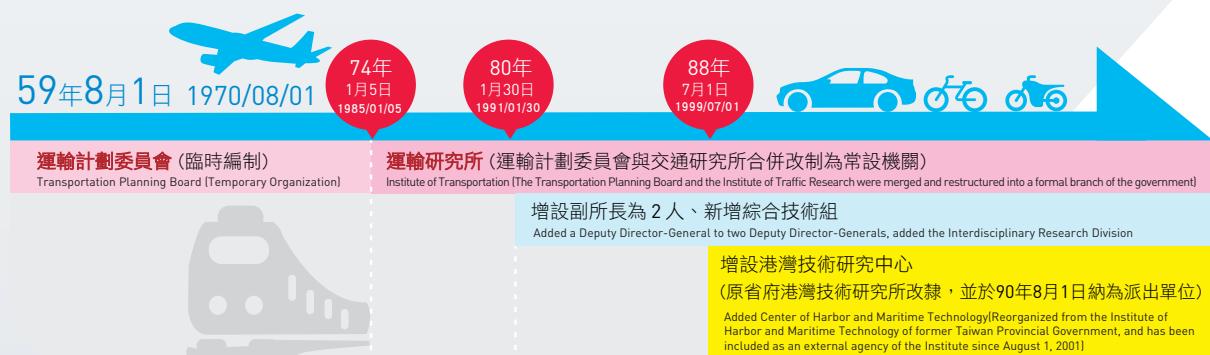
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一

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，更需要妥善擬訂中長期運輸發展計畫，以肆應未來的需求。

由於運輸建設所需要的投資甚為龐大，且在整體經濟發展的考量下，可供運用的資金有限，因此對於投資決策的研提及優先順序的釐定，便須由一個統一的運輸規劃機構來承擔；其次，由於運輸事業係屬公用事業，政府對其費率、加入、退出、能量等等，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。



I

History

Since its relocation to Taiwan, the Central Government of the Republic of China has been actively engaged in infrastructure development. This effort has brought prosperity to Taiwan and transformed Taiwan into an economically dynamic force. 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 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 Ministry of Transportation and Communications established the Transportation Planning Board on August 1, 1970. Over a period of fourteen years since its inception, the Transportation Planning Board had completed a number of planning projects. Notable examples of such projects include: Taiwan Area Integrated Transportation Systems Planning Study; Plan for Integration of Freeway Interchanges and Connecting Highway Systems; Preliminary Plan of Taipei Area Public Transportation Systems; Taipei City Area Railway Improvement Plan; Plan of Taipei Metropolitan Area MRT System; 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。

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 intelligence on Mainland China. Being a formal branch of the government, the Institute of Transportation is funded through a normal budgeting process. Because of the increased demand for its services, the organizational structure of the Institute was expanded, on January 30, 1991, by adding a Deputy Director-General, an Interdisciplinary Research Division, and intermediate-level planners. And since July 1, 1999, due to the adjustment of government functions, the Institute of Harbor and Maritime Technology has become affiliated to the Institute of Transportation and renamed as Center of Harbor and Maritime Technology. It was originally affiliated to the Department of Transportation of the Taiwan Provincial Government. As part of the entire government agency reorganization, the Institute of Transportation's organization adjustment has been approved by the Executive Yuan, and since August 1, 2001 the organization level of the Center of Harbor and Maritime Technology has again been adjusted. According to the new arrangement, the Center is incorporated with the Institute of Transportation and becomes an external agency of the Institute of Transportation.





二

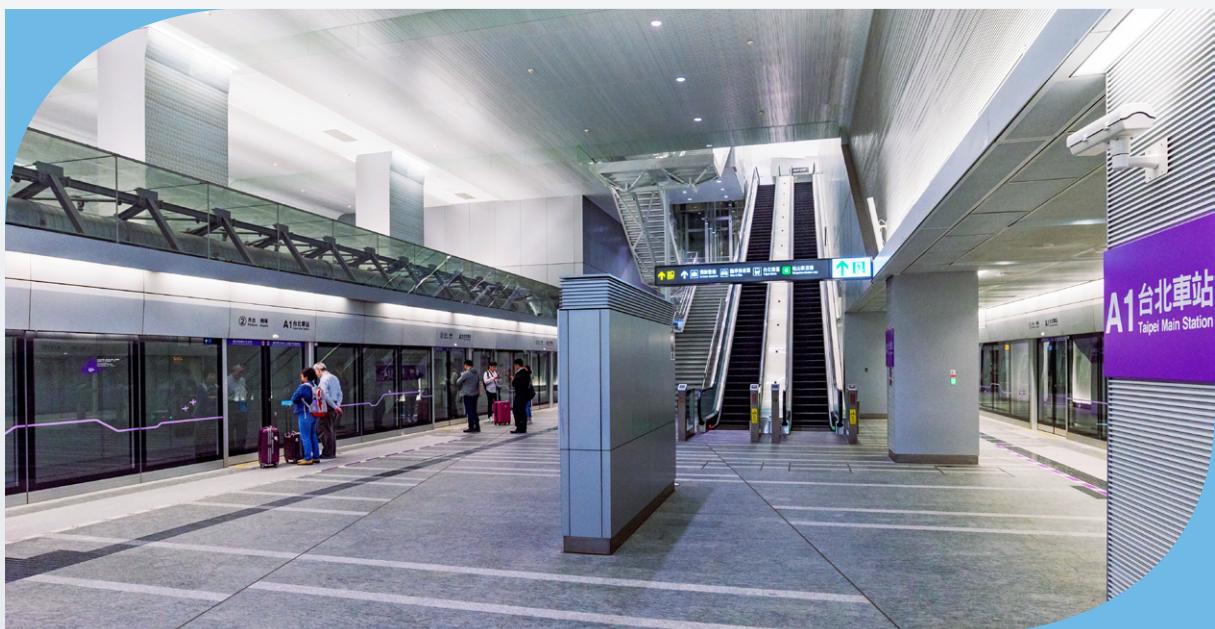
組織及人力

本所設置運輸計畫、運輸工程、運輸安全、運輸經營管理、運輸資訊、綜合技術6個組與港灣技術研究中心等計7個業務單位，及秘書室、人事室、主計室等行政單位。依照本所組織條例，編制員額計177人，111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）。

II

Organization and Human Resources

The Institute of Transportation comprises seven divisions and a Secretariat, a Personnel Office, and an Accounting Office. The seven divisions include Planning, Engineering, Operations and Management, Safety, Information Systems, Interdisciplinary Research and the Harbor and Maritime Technology Center. According to the organization act of the Institute, the total authorized staff is 177 and the budgetary staff is 148 (including 3 contracted research employees and 15 technicians, office workers and drivers).





三 本所職掌

依據本所組織條例第二條規定，本所掌理下列事項：

1. 運輸政策之研究及建議事項。
2. 運輸系統規劃配合及運輸計畫之研擬、評估事項。
3. 運輸發展與政治、經濟、國防及社會關係之研究與配合事項。
4. 運輸工程之設計、研究及發展事項。
5. 運輸經營及管理效率之研究發展事項。
6. 運輸安全之研究及規劃事項。
7. 運輸研究成果之應用及指導事項。
8. 國內外運輸研究之聯繫及合作事項。
9. 運輸資料之蒐集、整理、編譯及提供事項。
10. 港灣技術之研究及建議事項。
11. 其他運輸研究事項。

III Functions

According to Article 2 of the organization act of the Institute, the functions of the Institute are as follows:

1. Studying transportation policies and providing suggestions;
2. Coordinating planning, evaluation and project programming of transportation systems;
3. Studying the interrelationships among transportation development, political functions, socio-economic activities, and national defense;
4. Designing, researching and developing transportation engineering systems;
5. Studying the efficiency of transportation systems operation and management;
6. Studying and planning of transportation safety;
7. Applications of transportation research findings and guidance;
8. Liaison and cooperation of local and foreign transportation research;
9. Collection, compilation, translation and dissemination of transportation information;
10. Studying harbor and Maritime technologies and providing suggestions;
11. Other matters related to transportation research.

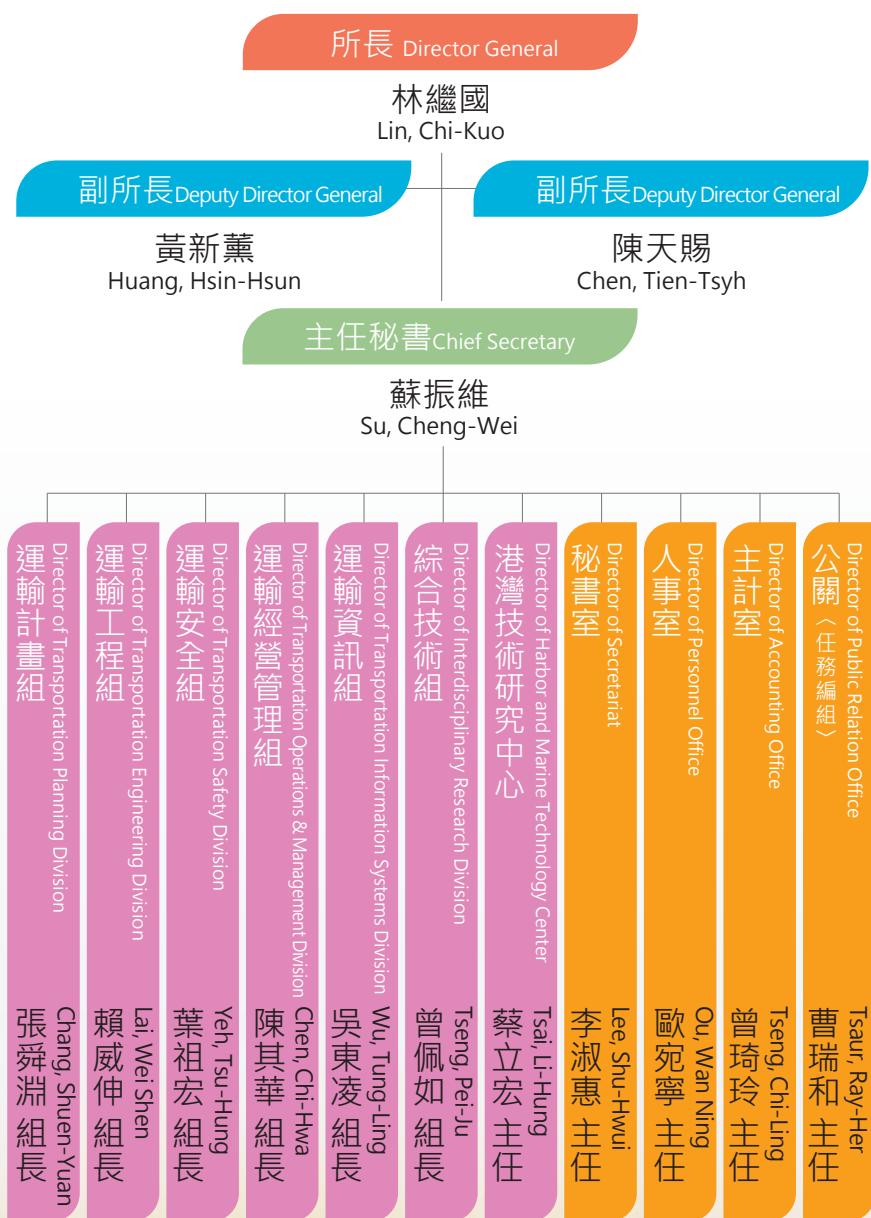
四

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 黃新薰 Huang, Hsin-Hsun



副所長 Deputy Director General 陳天賜 Chen, Tien-Tsyh



主任秘書 Chief Secretary 蘇振維 Su, Cheng-Wei



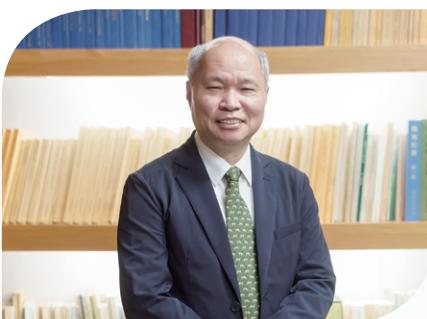
人事室主任 Director of Personnel Office
歐宛寧 Ou, Wan Ning



秘書室主任 Director of Secretariat
李淑惠 Lee, Shu-Hwui



主計室主任 Director of Accounting Office
曾琦玲 Tseng, Chi-Ling



公關室主任 Director of Public Relation Office
曹瑞和 Tsaur, Ray-Her



港灣技術研究中心代理主任
Acting Director of Harbor and Marine Technology Center
蔡立宏 Tsai, Li-Hung



運輸計畫組組長
Director of Transportation Planning 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



運輸工程組組長
Director of Transportation Engineering Division
賴威伸 Lai, Wei Shen



運輸經營管理組組長
Director of Transportation Operations & Management Division
陳其華 Chen, Chi-Hwa



運輸資訊組組長
Director of Transportation Information Systems Division
吳東凌 Wu, Tung-Ling



綜合技術組組長
Director of Interdisciplinary Research Division
曾佩如 Tseng, Pei-Ju



年度研究主軸 與重點

Annual Research Theme and Focus

參
/ 03

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，111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) 辦理中臺區域（苗中彰投雲）整體運輸規劃系列研究，透過地方訪談掌握中部區域各縣市施政重點與施政方向，並就未來年供需預測結果進行運輸功能定位與檢討，研擬中部區域整體運輸發展策略。
- (2) 辦理東臺區域（宜花東）整體運輸規劃系列研究，完成旅次特性調查與分析、未來年社會經濟發展趨勢預測、東臺區域交通量調查、路網構建與編碼。
- (3) 辦理貨運需求調查與模式建立方法之研究，針對我國貨運需求模式提出進出口貨物與城際貨物之分析架構建議，及貨運量產生與吸引、分布、運具分派、客運與貨運模組整合構想等模式方法。

2. 持續精進審議評估／決策支援工具

- (1) 持續維護與更新運輸規劃整合資料庫，完成北臺、南臺區域運輸需求模式成果查詢模組開發，提供交通分區間各項運具人旅次／車旅次、各旅次目的之起迄矩陣查詢。
- (2) 辦理交織路段公路容量及服務水準研究先期規劃，以開展交織路段後續公路容量研究與手冊研訂。
- (3) 再版付梓「2022年臺灣公路容量手冊」，就高速公路基本路段、高速公路隧道、市區地下道號誌化路口、郊區多車道公路及郊區雙車道公路等章節修訂，以適用於國內本土之車流特性。

The research and development roadmap blueprint planned on a rolling basis is continued according to the transportation development policy of the Ministry of Transportation and Communications and is reflective of the domestic demand for transportation. There were seven main schemes and key points of 2022 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 overall transportation developments. Highlights of the research are as follows:

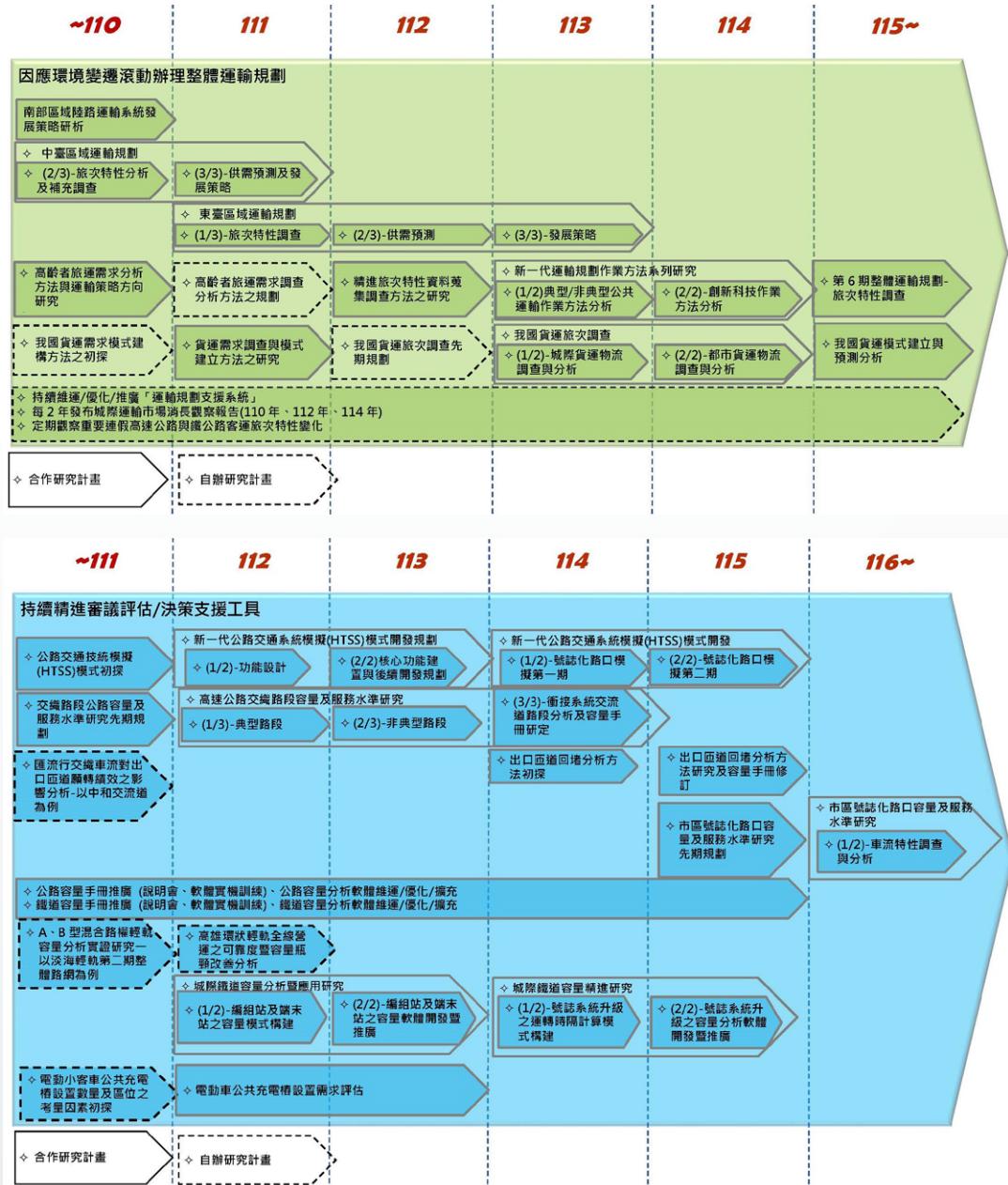
1. Overall Transportation Planning on a Rolling Basis Reflective of Environmental Changes

- (1) A series of research was conducted in the central part of Taiwan (Miaoli, Taichung, Changhua, Nantou, and Yunlin) as part of overall transportation planning. Local interviews took place to keep track of the administration highlights and directions in respective counties and cities throughout the central part of Taiwan and the transportation features were positioned and reflected upon according to the annual supply and demand forecast findings in the future while the overall transportation development strategies were prepared throughout the central part of Taiwan.
- (2) A series of research was conducted in the eastern part of Taiwan (Yilan, Hualien, and Taitung) as part of overall transportation planning. The survey and analysis of the travel count and characteristics, forecast of future socioeconomic development trends, survey of the traffic load, road network construction, and encoding were completed for the eastern part of Taiwan.
- (3) The survey on demand for freight forwarding and research on how to create a model were conducted. Advice on the analytical framework of imports/exports and inter-city cargos specifically for the freight-forwarding demand model in our country and integrated conceptualization on the generation and attraction, distribution, and transportation tool assignment, passenger and cargo modules were provided specifically for the demand model of freight-forwarding in our country.

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

- (1) Maintenance and update of the transportation planning and integration database were continued. The inquiry module for accomplishments on the transportation demand model in northern and southern parts of Taiwan was successfully developed to allow matrix-based inquiries about the headcount of travelers/trip count and purpose of each trip, for example, of respective transportation tools in respective traffic zones.
- (2) Preliminary planning of highway capacity and service level research for the weaving section was done to facilitate research on the subsequent highway capacity for the weaving section and the preparation of a manual.

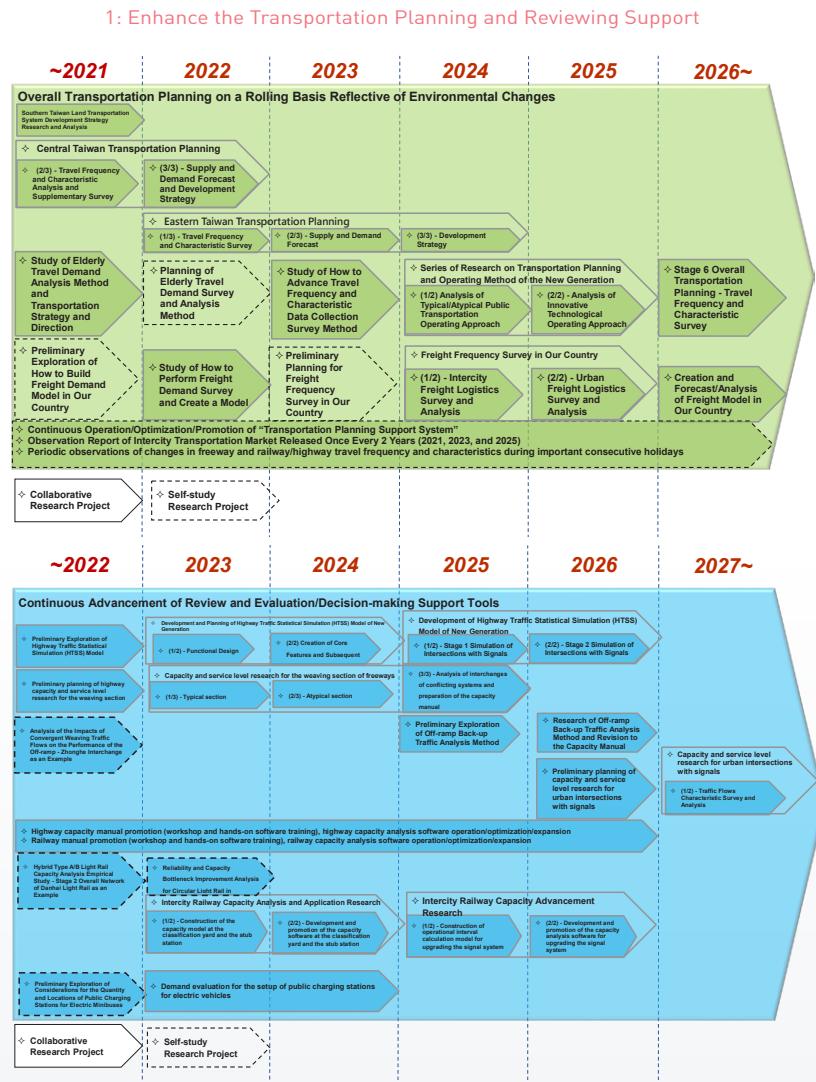
主軸 1：強化運輸規劃與審議支援



(4) 辦理鐵路系統供需診斷模式軟體之維護與擴充及策略分析，導入國際鐵路聯盟（UIC）班表壓縮法，結合本計畫列車排點自動解衝突技術及精進求解能力，據以完成鐵路供需診斷模式軟體之維護及功能之擴充與精進。

(3) The "2022 Taiwan Highway Capacity Manual" was updated and printed, with revisions made to sections on basic freeway sections, freeway tunnels, urban underpass intersections with traffic signals, suburban multi-lane highways, and suburban dual-lane highways, etc. to be applicable to local traffic.

(4) Maintenance and expansion and strategic analysis of the supply and demand diagnostic model of the railway system were done, with the introduction of the International Union of Railways (UIC) schedule compression approach and combining the train scheduling automatic conflict-resolving technology and advancement capabilities under this project to accordingly complete the maintenance of the railway supply and demand diagnostic software and feature expansion and advancement.



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) 辦理「載貨無人機與傳統運送服務環境效益差異之案例分析」，導入無人機進行商業應用時，除了考量成本和法規層面外，應考量其對環境的影響。本研究量化分析無人機運送的潛在環境影響，並比較分析載貨無人機及摩托車配送的能源消耗成本差異，以供我國發展無人機運送服務評估參考應用。

Improve the Competitive Advantage of Sea and Air Transportation

Sea and air transportation is an important model for our country to be linked internationally. Becoming a sea and air transportation pivot is a vision for the development of sea and air transportation in our country. Highlights of the research are as follows:

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

[1] The "Case Analysis of Differences in Environmental Efficacy Between Shipment Drones and Traditional Shipment Service" was conducted. Besides cost and regulatory requirements, their impacts on the environment and the introduction of drones for commercial application shall be considered. For the research, the potential environmental impacts of drones applied for purpose of shipment were quantified in the analysis and differences in the cost of energy consumption between shipment drones and deliveries on

(2) 辦理「亞太地區往返歐洲航空中轉市場路徑分布初探」，桃園機場往返國際間的航空客運量穩定成長，其中洲際航線又以北美航線為主要的往返區域，而東南亞往返北美的航線亦為桃園機場目前最主要的轉機航線之一，相較歐洲地區而言，歐洲航線一直是桃園機場發展的弱點，爰藉由旅客路徑資料及連結度分析，以釐清桃園機場中轉歐洲市場之優劣勢。

(3) 辦理「北美經桃園及鄰近機場往返亞太市場探討」：發展桃園機場為「國際空運樞紐」為我國空運發展願景，鄰近競爭機場（包括香港、仁川、成田、新加坡、浦東、廣州等機場）亦以發展區域樞紐機場為目標，有鑑於北美地區往返亞太地區旅次為前述機場中轉旅客最重要之來源，爰藉由旅客路徑資料分析，探討前述各機場於北美往返亞太市場之中轉概況及市占情形；並探討國籍業者於北美地區可評估增班或新增之潛在航點，做為國籍航空業者北美市場拓展之參考應用。

(4) 辦理「貨櫃碼頭自動化對港口營運影響研析」，近年來港口貨櫃裝卸從追求效率轉向自動化、人工智慧及大數據運用擴展，傳統港口如何搭上科技的潮流，實現智慧化、低污染成為業內高度關注的焦點，已成為碼頭發展的重要趨勢。本研究透過貨櫃碼頭自動化發展型態及全球貨櫃碼頭自動化發展歷程的蒐整，並研析未來發展趨勢，再探討貨櫃碼頭自動化對港口營運的優缺點、自動化與傳統碼頭作業效率差異，及綜整貨櫃碼頭自動化建置評估的重點，再進一步研析我國港口貨櫃碼頭發展自動化之可行性及課題，以做為我國港口後續發展之參考應用。

motorcycles were compared for reference while deliveries through drones are being developed and applied.

(2) "Preliminary Exploration on the Distribution of Layover Market Roadmap for Air Transportation Between the Asia-Pacific Region and Europe" took place. Air traffic throughput has been growing steadily between the Taoyuan International Airport and airports in other countries. As far as inter-continental routes are concerned, North America accounted for a majority. The routes between Southeast Asia and North America have also made the Taoyuan International Airport one of the primary layovers so far compared to Europe. European routes have been a weakness in the development of the Taoyuan Airport. The strengths and weaknesses of the Taoyuan Airport as a layover for the European market were analyzed according to the passenger pathway data and connectivity.

(3) "Exploration of Travels Between North America and Asia-Pacific Markets Throughout Taoyuan and Adjacent Airports" took place. Developing the Taoyuan Airport into an "international air transportation pivot" has been a developmental vision for air transportation in our country. Developing pivotal regional airports has also been a goal for adjacent competitive airports (Hong Kong, Incheon, Narita, Singapore, Pudong, Guangzhou). In light of the fact that travels between North America and the Asia-Pacific Region have been an important source of layover passengers for the above-said airports, by analyzing passenger pathway data, the layover overview and market share of each of the above airports between North America and the Asia-Pacific markets were explored and so was the evaluation of potential flights or stops to be added to North America by national operators; such information can serve as a reference for and applied by national operators while they try to expand their presence on the North American market.

(4) "Research and Analysis of Impacts of Container Pier Automation on Port Operations" was conducted. Over the past few years, port loading and unloading of containers have shifted from the pursuit of efficiency to automation and extensive utilization of artificial intelligence and big data. How traditional ports keep up with technological trends and how to realize intelligence orientation and low pollution levels are catching high levels of attention throughout the industry and have become important pier development trends. For the research, container pier automation patterns and global container pier automation processes were collected and future development trends were analyzed, followed by an exploration of the strengths and weaknesses of container pier automation versus port operations, differences in the operating efficiency between automated and traditional piers, and overview of highlights of container pier automation evaluation and further analysis of the feasibility of port container pier automation and associated topics for reference and application in subsequent developments of ports in our country.

(5) 辦理「創育加速器推動智慧航港與創
新海事生態系統之研究」，瞭解孵化器/ 加速器之沿革及其運作方式，
蒐整全球海事加速器案例及其內涵案
例，進一步瞭解國內外創育加速機構
實務運作模式與定位；另擇定本土既
有加速器進行實地參訪並與專家深度
交流，以探討從政府、產業與風險投
資機構等層面，以及創育加速機構導
入我國推動智慧航港及其施政之課題
與可行性。另提出導入推動航港智慧
發展之三種初步對策，做為航港主管
機關、港口管理機構及國內外創育加
速機構，未來發展創新海事加速器或
推動智慧發展之參考應用。

(6) 辦理「我國港口貨櫃航網變化之研
究」，為維繫港口競爭力，對於區位
相近港口之發展需持續關注，並即時
調整相關獎勵措施以為因應。臺灣港
務公司之行銷獎勵方案中，新闢航線
獎勵部分，主要區分遠洋線、近洋線，
依不同航線別設有不同到靠航次
裝卸量要求，給予獎勵金額。若能透
過量化分析方法，評估我國港口之航
網變化，可做更細緻化之獎勵方案研
訂，進而達成與國內外航運商共同追
求貨量成長之目標。爰透過資料蒐
整，探討以高雄港為主之貨櫃航網變
化，做為後續航線開發或港口合作的
參考應用。

(7) 辦理「我國國際航空貨運疫後變化趨
勢與發展課題初步評析」，由於後
疫情期間及疫後全球貨運發展趨勢不
變，全球供應鏈因疫情衝擊，從長鏈
轉變成短鏈，從全球化走向區域化，
以致國際航空貨運發展策略需配合調
整因應，爰蒐整疫後國際航空貨運趨
勢變化、我國國際機場貨運發展現況
與未來規劃、國籍航空公司對國際貨
運發展布局及我國國際航空貨運重要
課題進行初步分析，俾做為交通部、
民航局、桃園機場公司及國籍航空業者
擬定政策與發展策略之參據。

(5) "Research on the Promotion of Smart Ports and Innovative Maritime Ecology through Incubation Accelerator" was conducted to understand the history of incubators/accelerators and how they work. Maritime accelerators and what they involve were collected around the world to help understand further the practical operation pattern and positioning of domestic and international incubation accelerating organizations. In addition, local existing accelerators were selected for site visits and advanced exchanges with experts in order to explore at the governmental, industrial, and risk investment organization's level the topic of introducing the incubation accelerating organizations in the promotion of smart ports and their administration in our country and the feasibility. In addition, the three preliminary countermeasures for the promotion of smart ports were introduced for reference and application in future developments of innovative maritime accelerators or promotion of smart developments by port regulatory authorities, port administrations, and domestic and international incubation accelerating organizations.

(6) "Research on Changes to Port Container Network in Our Country" was conducted. To keep ports competitive, it is required to closely monitor the developments of adjacent ports and adjust in real-time related incentives accordingly. Among the marketing incentives of port administration companies in Taiwan, for the new lines, there are primarily ocean-going and near-sea ones. Different lines are associated with different loading and unloading capacities and the incentives are provided accordingly. If network changes of the ports in our nation can be quantified for the purpose of analysis, finer incentives can be stipulated to accordingly fulfill the goal of growth in shipment sizes that is shared by domestic and international operators. Container network changes for primarily Kaohsiung Port were explored with the data collected and sorted out for reference and application in subsequent lines developed or port collaboration.

(7) "Preliminary Evaluation and Analysis of Post-pandemic Changes, Trends, and Developments of International Air Freights in Our Country" was conducted. The global freight-forwarding development trends have changed drastically during and after the pandemic. Impacted by the pandemic, the global supply chain has shifted from a long to a short one and from globalization to regionalization. As a result, international air freight development strategies need to be adjusted accordingly. Post-pandemic changes in international air freight trends, current situation of and future plans for the freight-forwarding developments of international airports in our country, national operators' deployment in international freight-forwarding, and important issues on international air freight in our country were hence collected and sorted out for preliminary analysis and to be followed by the Civil Aeronautics Administration under the Ministry of Transportation and Communications, the Taoyuan International Airport Corporation, and national operators while the latter prepare their policies and development strategies.

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。成果方面在海運部分，提供航港局及港務公司在政策評估所需之全球貨櫃航線數據，例如：全球疫情前後主航線部署變化分析、國籍航商之區域航線部署分析等；空運部分，提供交通部航政司、民航局、桃園機場公司在政策評估疫情影響所需分析資料，例如：2019至2021年桃園機場貨運市場分析、疫情期間亞洲主要航空公司貨機機隊應用分析、東南亞國家往返歐美移動路徑之變化。

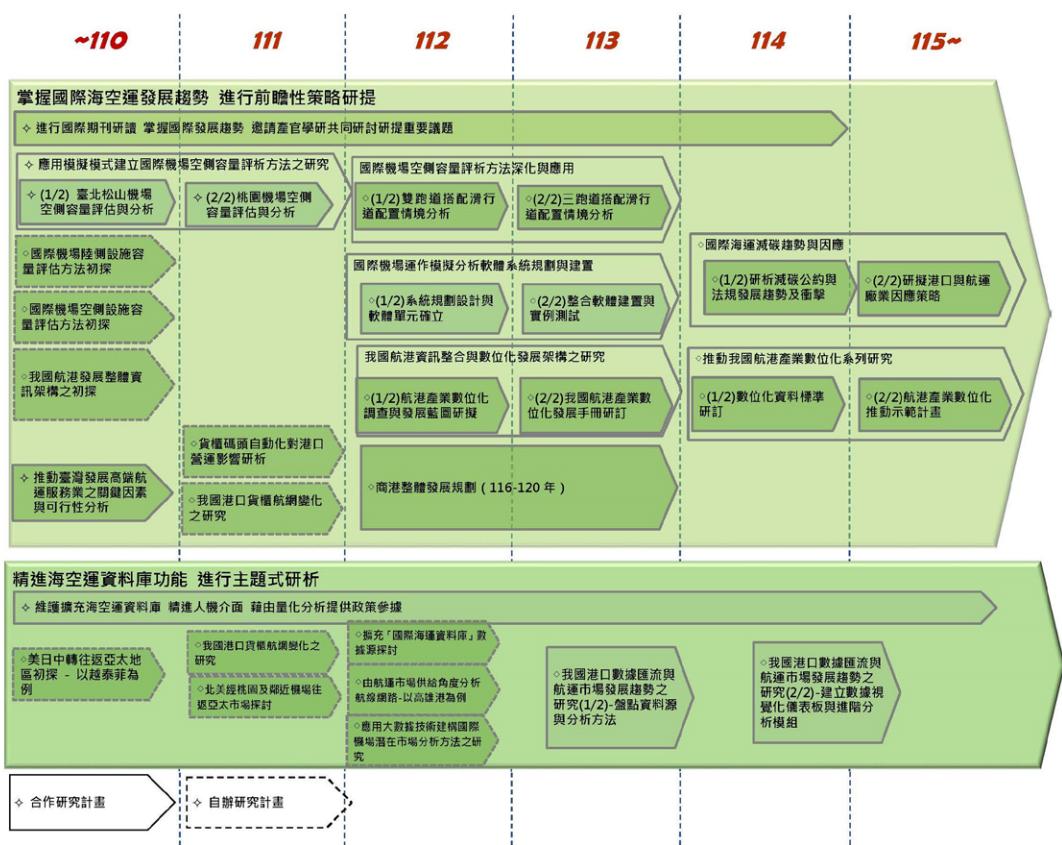
(2) 因應內外在環境激烈變化，定期辦理國際海空運期刊研讀與研討，並掌握國際先進技術及產業發展情勢，進行研究與資料蒐集，提供重要海空運議題之研析，支援交通部及部屬機關（構）進行政策研擬，包括：疫情前後全球主航線部署之變化分析、國籍航商之區域航線部署、桃園機場於美國-越泰菲中轉市場之競爭力、臺港航空貨運概況分析、國際航空客貨運量復甦狀況初探、民用航空運輸業者因應疫情相關作為、永續航空燃料應用趨勢之初探。

2. Advancement of Sea and Air Transportation Database Features for Topic-based Analysis

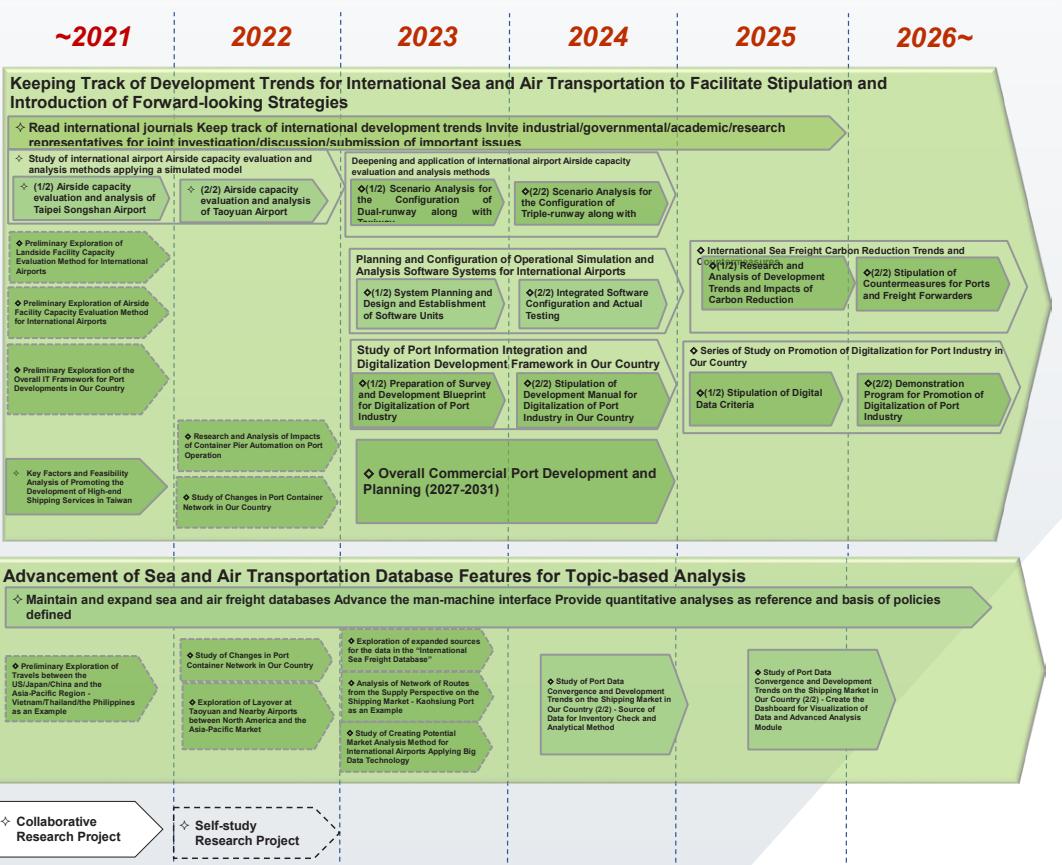
(1) Maintenance and update of the international sea and air transportation database continued. The data were quantified and analyzed to be applied in decision-making. For the accomplishments, as far as sea freight is concerned, the Maritime Port Bureau and Taiwan International Ports Corporation, Ltd. were provided with the global container line data needed for policy evaluation, such as the analysis of changes in the deployment of main lines before and after the pandemic and the analysis of the deployment of regional lines of national operators. In terms of air freight, the Department Of Navigation and Aviation, the Civil Aeronautics Administration, and the Taoyuan International Airport Corporation were provided with the analytical data for the policy evaluation of impacts of the pandemic, such as the freight-forwarding market analysis of the Taoyuan Airport from 2019 to 2021, the analysis of application by major airliner cargo fleet throughout Asia during the pandemic, and the changes in trips between Southeast Asia and Europe/America.

(2) In response to the drastic changes in internal and external settings, periodic international sea and air transportation reading and explorations/discussions were held; the situation in internationally advanced technologies and industrial developments was kept track of; and studies and data collection were embarked on to allow the investigation and analysis of important issues on sea and air transportation and to support the preparation of policies by the MOTC and its subordinate agencies (organizations), including the analysis of changes in the deployment of main lines before and after the pandemic, the analysis of the deployment of regional lines of national operators, the competitive advantages of the Taoyuan Airport on the US-Vietnam/Thailand/the Philippines layover market, the analysis of the overview of air freight-forwarding between Taiwan and Hong Kong, the preliminary exploration of recovery in the passenger throughput of international airlines, related countermeasures adopted by private aviation operators to the pandemic, and the preliminary exploration of trends in the application of sustainable aviation fuels.

主軸 2：提升海空運競爭優勢



2: Improve the Competitive Advantage of Sea and Air Transportation



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. 策劃暨協助公運計畫推動

除繼續協助交通部公路總局推動「公路公共運輸服務升級計畫（110－113年）」（包括參與提案審查會以及就公路總局陳報交通部核定之補助作業要點規範或辦理計畫內容研提意見等），並辦理「106-110年公路公共運輸載客量變化狀況分析」，特別針對疫情期間市區公車以及公路客運供給面與需求面變化進行分析，並比較公車載客量相較其他公共運具是否有較大幅度衰退以及是否有區域性之差異；另蒐集國外資料比較國內外公共運輸載客量受疫情衝擊之差異。因我國於111年始爆發較大規模疫情，爰將上述分析觀察時間拉長至111年第三季。此外，亦蒐集資料瞭解各國公共運輸部門因應疫情衝擊之作為，並就減緩疫情對我國公共運輸之衝擊提出相對應之建議措施，供主管機關參辦。

2. 優化需求反應式公共運輸服務

為瞭解國內需求反應式公共運輸發展狀況，本所辦理「需求反應式公共運輸服務（DRTS）補貼制度之檢討」，透過彙整國外需求反應式公共運輸服務之推動案例及補貼機制相關資料，並與我國現行推動模式與補貼制度進行比較分析。經檢視美國、日本、英國及歐盟等國家需求反應式公共運輸服務發現，其營運型態及服務目的均較多元，且不受限於偏鄉交通不便區域；除既有公共運輸補貼制度外，亦透過設立補助計畫，鼓勵創新運輸模式，以導入偏鄉或郊區，期望補足最後一哩路及達成綠色永續之目標。本研究相關案例及補貼機制之研析，可做為後續我國推動需求反應式公共運輸服務及補貼制度之參據。另112-113年辦理「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」，持續針對需求反應式公共運輸服務（DRTS）之議題進行探討，提出具體建議。

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. Planning and Assistance in the Promotion of Public Transit Projects

Besides continuing to assist the Directorate General of Highways, MOTC in the promotion of the "Highway Public Transportation Service Upgrade Project (2021-2024)" (including involvement in the Proposal Review Committee and stipulation and submission of opinions for the operating guidelines for subsidies or details about the project submitted by the Directorate General of Highways to be approved by the MOTC) and conducting the "Analysis of Changes in Highway Public Transportation Passenger Throughput for 2017 to 2021", intra-city passenger buses and changes in the supply and demand of highway passenger buses during the pandemic were particularly analyzed and the passenger bus throughput versus other public transportation tools were compared against each other for presence of significant recession and regional differences, if any. In addition, international data were collected to compare the differences impacted by the pandemic in terms of the passenger throughput of domestic and international public transportation tools. The pandemic did not break out on a relatively large scale until 2022. Therefore, the duration of analysis and observation as mentioned above was extended to the third season of 2022. In addition, data were also collected to know what action the public transportation department took in response to the pandemic and recommended measures were introduced accordingly to reduce the pandemic's impacts on public transportation in our country.

2. Optimization of Demand Responsive Transit Services (DRTS)

In order to know the demand responsive transit services development status in the country, the IOT conducted the "Review Subsidy of Demand Responsive Transit Service (DRTS)". Promotion cases of DRTS overseas and related data on the subsidization mechanism were compiled, compared, and analyzed against our country's current promotion model and subsidization system. An overview of DRTS in the US, Japan, the UK, and the EU reveals that their operational patterns and service purposes are both more diversified and are not restricted by outlying inaccessible areas. Besides the existing public transportation subsidies, reimbursements are available and the innovative transportation model is encouraged to facilitate introduction to outlying areas or suburban areas; it is the last piece of the puzzle to fulfill the goal of green sustainability. The research and analysis of related cases and the subsidization mechanism in this research can serve as the reference for the DRTS and subsidization system to be promoted in our country in the future. In addition, the "Study of the Operational Cost, Subsidization System, and Fees Collection System for Demand Responsive Transit Services" was conducted from 2023 to 2024 for continuous exploration of the DRTS and to render substantial advice.

3. 導入先進技術推動產業數位治理

- (1) 為提昇汽車客運業者數位治理能力，希冀在數位式行車紀錄器基礎之上，利用車輛內建的車載診斷系統（OBD）整合控制器區域網路（CAN Bus）與先進駕駛輔助系統（ADAS），進一步判定車輛與駕駛的行為，並透過車聯網與區塊鏈紀錄，將行車資料上傳至雲端系統，達成Safety, Mobility, Accessibility, Responsiveness, Trustiness (S.M.A.R.T) 智慧化客運營運管理服務目標。
- (2) 開發整合區塊鏈技術與OBD車載設備的「駕駛工時管理系統」，期望改善公路客運駕駛超時或過勞現象，提升公路客運行車安全。為驗證本系統技術之可行性，並進行實車測試，派遣4輛公車、16位駕駛，行駛4條路線，共計行駛397趟次，累計行駛時數達615.11小時。研究成果除可協助業者進行自主管理，有效掌握駕駛工時狀態外，並可協助公路主管機關提升公路監理效能。

4. 協助推動2030大客車全面電動化政策

- (1) 進行電動大客車營運數據監控管理平台系統維運、資料傳輸與蒐集分析作業，並更新電動大客車導入指南，達到檢核申請業者營運績效之基礎、公共運輸業者購置及營運電動大客車參據之綜效。
- (2) 完成平台移轉至公路總局相關作業，移轉後公路總局可直接掌握補助車輛營運妥善率，另提供車輛特性資料由本所持續研析，藉由平台資料蒐集分析、掌握各項重要關鍵指標，做為交通部滾動檢討電動大客車推動政策與後續計畫應用推動之基礎。

5. 完備通用小客車特約制度之人本服務

持續協助6都推廣通用計程車特約制度，同時檢討通用計程車特約制度、擴充愛接送系統平台功能以及探討跨部會資源整合議題，以積極開展高齡及行動不便者友善的交通服務。

3. Introduction of Advanced Technology for Promotion of Digital Industrial Governance

- (1) For the sake of enhancing the digital governance capability of passenger bus operators, it is hoped that on the basis of a digital camcorder, the on-board diagnostics (OBD) system can be integrated with the local network of the controller (CAN Bus) and the advanced driver-assistance system (ADAS) to further determine the movements of the vehicle and the driver and the driving data can be uploaded to the cloud system through the vehicle-to-everything and block-chain records to fulfill the goal of smart passenger bus operation and management service featuring Safety, Mobility, Accessibility, Responsiveness, and Trustiness (S.M.A.R.T).
- (2) Develop the "Driver Working Hours Management System" that combines the block-chain technology and OBD equipment to improve overtime or overwork of highway passenger bus drivers and ensure the driving safety of passenger buses on highways. To authenticate the feasibility of the system technology and perform a real-vehicle test, 4 passenger buses and 16 drivers were assigned to drive along 4 routes; that is, a total of 397 trips and up to 615.11 driving hours. The results of the research not only helped operators with autonomous management for effective control over the working hours of drivers but also assisted the highway regulatory authority in enhancing the highway supervisory efficacy.

4. Assistance in Promotion of Comprehensive Electrification of Large Passenger Buses by 2030

- (1) The electric large passenger bus operational data monitoring and management platform system maintenance and data transmission and collection for analysis were embarked on. The guide to introduction of electric large passenger buses was updated to render the synergistic effect of examining the operational performance of operators and serving as reference for public transportation operators. At the same time, they purchase and operate large electric passenger buses.
- (2) Related tasks for the transfer of the platform to the Directorate General of Highways were completed. After the transfer, the Directorate General of Highways can keep track of the operational adequacy of subsidized vehicles while at the same time providing vehicle characteristic data to the Institute for continuous investigation and analysis. Platform data were collected and analyzed and respective important key indicators were kept track of as the basis for the rolling reflection upon the policy on the promotion of electric large passenger buses and subsequent project applications and promotions of the MOTC.

5. Implement the Contract System of Passenger car for Humanity-Oriented Transportation Services

Continuous assistance was provided to the six municipalities in the promotion of the universal taxi contract system and the universal taxi contract system was reflected upon, the "Love Pickup Passengers" App features were expanded, and the cross-ministerial resources integration was explored in order to proactively start friendly transportation services for the aged and those with disabilities.

6. 協助小客車租賃業數位轉型

為協助輔導小客車租賃業者進行數位轉型，辦理「小客車租賃服務整合旅遊生態系平台」軟體著作權授權公告，接受小客車租賃業公會或聯合會提出申請應用，藉由新科技與智慧化服務的導入，增加同業/異業結盟之機會，優化營運環境並提升整體產業的競爭力，並提供消費者行動化租車服務以提升民眾更好的運輸服務體驗。

7. 執行區域運輸發展研究中心服務升級專案計畫

續辦理區域運輸發展研究中心服務升級2.0計畫，以「區域性（跨縣市）」、「連結政策」及「跨域整合」為執行重點，推動區域治理與在地深耕，擴大成果推廣應用及對區域發展的長期擘劃引導精進與升級，連結國家重大政策，除開設交通運輸專業人才培訓課程、輔導地方政府解決公共運輸問題及接受地方政府諮詢，以協助交通部相關政策之推動外，並補足地方政府於推動公路公共運輸時欠缺之人力及能力，穩健推動公共運輸發展，同時納入地方道安改善專案的輔導協助。

8. 發展交通行動服務（MaaS）連結民眾行動需求

(1) 輔導通過交通部智慧運輸系統發展建設計畫（110至113年）-營造智慧交通行動服務生活環境類別補助計畫之地方政府（臺中、高雄、花蓮、臺東、澎湖），進行MaaS服務之導入與推廣，以實際具體行動支持各縣市成為友善交通的幸福城市。

(2) 探討臺灣地區MaaS服務與其他產業合作、推動MaaS服務可能帶來之社會效益及建議估算模式等議題，並強化國際合作與行銷推廣，期使MaaS服務得以擴展至更多地區。

9. 強化汽車客運業路線別成本計算制度

續檢討修訂汽車客運業路線別成本計算制度，提出建議修訂方式，並以前期研究成果為基礎，建置成本分析應用軟體，以因應運輸業者數位轉型、決策支援及主管機關數位治理之需求。

6. Assist Car Rental Industry Businesses in Digital Transformation

In order to help car rental businesses with digital transformation, the copyright authorization over the software entitled "Car Rental Service and Travel Ecology Platform" was announced. The car rental association or federation could apply for the service. New technologies and smart services were introduced to increase opportunities for intra-/inter-industry alliances, optimize the operational environment, enhance the industry's competitive advantages, and provide consumers with mobile rental services for a better public transportation service experience.

7. Implementation of Project to Upgrade Services Provided by the Regional Transportation Development and Research Center

The Regional Transportation Development and Research Center Service Upgrade Program 2.0 continued. Action items included "Regionality (Cross-county/city)", "Connectivity Policy", and "Interdisciplinary Integration". Regional governance and localization were promoted. Extended utilization of the results and guided advancement and upgrade of long-term planning in regional developments were maximized. Major national policies were linked. Besides training courses for transportation professionals, the assistance provided to local governments in addressing public transportation issues, and acceptance of inquiries from local governments to help with the promotion of related MOTC policies, the wanted manpower and capabilities of local governments in the promotion of highway public transportation were supplemented to steadily promote the developments of public transportation while at the same time including it in the counseling assistance as part of the local road safety improvement project.

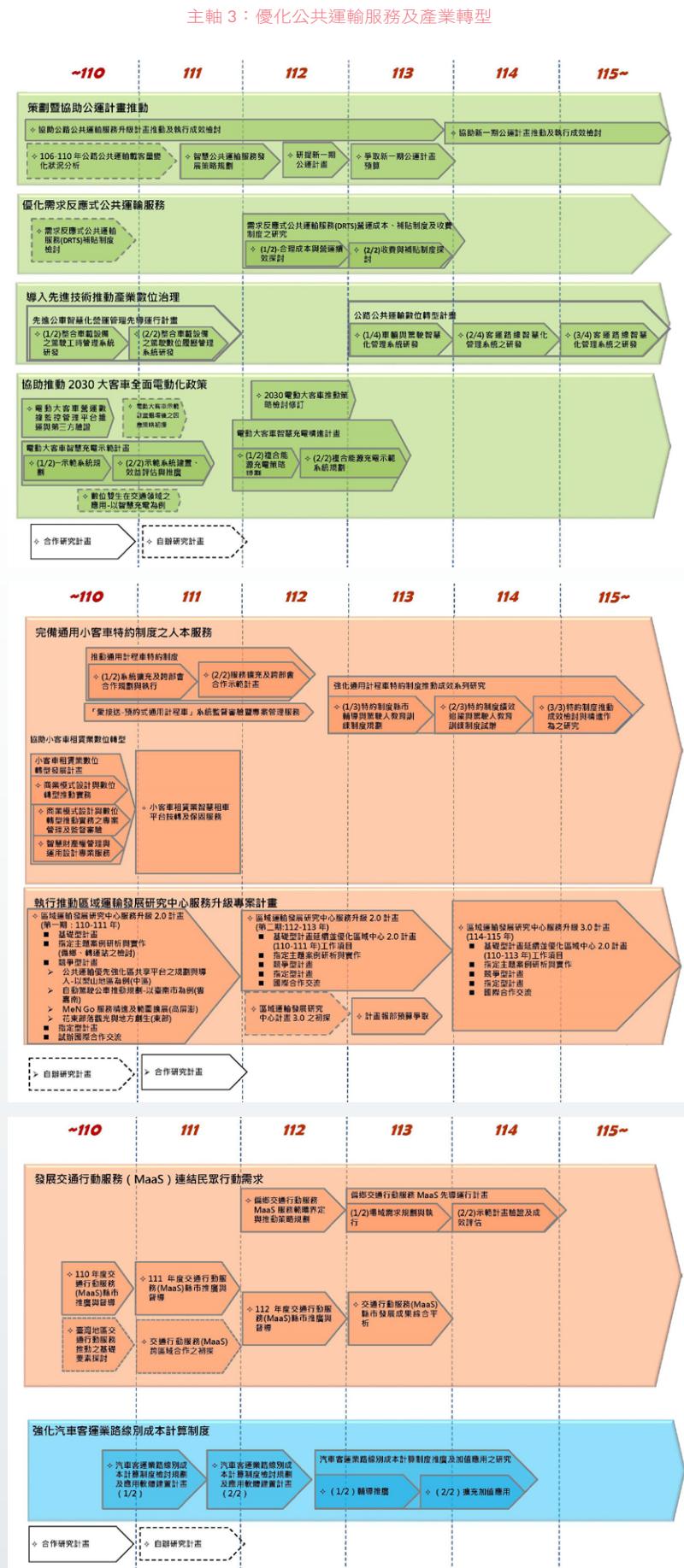
8. Development of Mobility as a Service (MaaS) to Link Mobile Demand of People

(1) Assistance was provided to local governments as part of the MOTC Smart Transport System Development and Construction Plan (2021 to 2024) - Subsidization for Smart Transportation Mobile Service Living Environment (Taichung, Kaohsiung, Hualien, Taitung, Penghu) in the introduction and promotion of the MaaS service in order to support through substantial action respective counties and cities in becoming a transportation-friendly happy city.

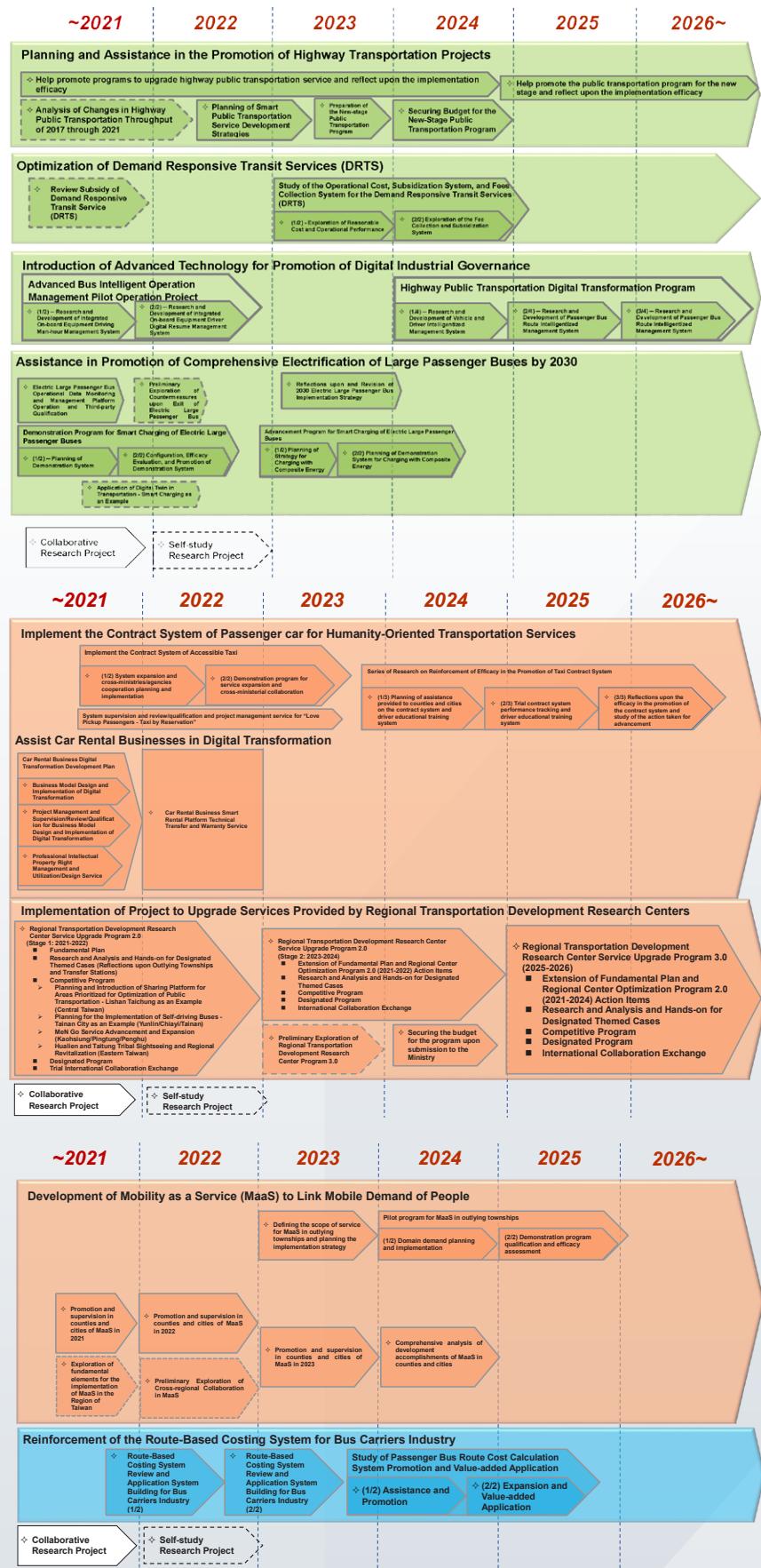
(2) Issues such as social benefits and recommended estimation model that may be brought about with collaboration in the region of Taiwan between the MaaS service and other sectors and in the promotion of the MaaS service, among others, were explored and international collaboration and marketing/promotion were reinforced to hopefully extend the MaaS service to more regions.

9. Reinforcement of the Route-Based Costing System for Bus Carriers Industry

The route-based costing system for bus carriers industry continued to be reflected upon. The recommended revision method was introduced and results of preceding studies were followed in the creation of the cost analysis app to address the demand for the digital transformation of transportation operators, decision-making support, and digital governance of the regulatory authority.



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) 彙提「第二期運輸部門溫室氣體排放管制行動方案」，並於111年9月16日奉行政院核定；編寫110年運輸部門溫室氣體排放管制行動方案執行成果報告，並於112年2月3日奉行政院核定；協助審視共22個地方政府提報之第二期溫室氣體管制執行方案，並就涉及運輸部門部分提供意見。
- (2) 因應國際淨零排放趨勢，以及我國2050年淨零排放政策，配合我國長期淨零碳排放規劃，參酌國際淨零排放路徑規劃方法修訂淨零排放評估模型架構，做為研析適合我國運輸淨零排放路徑、重要淨零排放策略之減碳潛力，以及推估不同減碳路徑減碳效益之評估工具，俾利滾動檢討修正運輸部門長期減碳路徑。
- (3) 協助交通部配合行政院能源及減碳辦公室「淨零排放路徑專案工作組」之路徑藍圖規劃與減碳效益評估業務，提出運輸部門三大策略與兩項輔助策略，並納入國家發展委員會111年3月30日公布之「臺灣2050淨零排放路徑及策略總說明」。另配合行政院淨零排放推動作業，彙整綠運輸淨零排放策略之具體行動。
- (4) 辦理推估共享電動機車對運輸溫室氣體排放之影響。111年透過問卷調查，於臺北市及高雄市各完成1,268份有效樣本（市話1,068份，手機200份），分析具使用共享電動機車經驗、潛在使用者及無意願使用者等不同族群特性、可能運具選擇（移轉）傾向、使用意願與阻礙因素，經推估使用共享電動機車具有減碳效益，並研提相關研究建議，供未來地方政府施政推動時參採應用。

IV

Build up a Clean and Resilient Transportation Environment

Sustainable green transportation continued to be promoted in response to climate change with the creation of a living environment featuring clean transportation as the vision. Highlights of the research are as follows:

1. Promotion of Zero Emission and Efficacy Assessment of Transportation Sector

- (1) The "Stage 2 Transportation Department Greenhouse Gas Emission Control Action Plan" was compiled and submitted to the Executive Yuan on September 16, 2022 for approval. The Implementation Outcome Report of the 2021 Transportation Department Greenhouse Gas Emission Control Action Plan was prepared and submitted to the Executive Yuan on February 3, 2023 for approval. Assistance was provided in reviewing the Stage 2 greenhouse gas control action plans submitted by 22 local governments and in providing feedback on the part involving the transportation department.
- (2) In response to the international net zero emission trend and the national policy on net zero emission by 2050, as part of the long-term net zero carbon emission plan in our country, the net zero emission evaluation model and framework were revised with reference to the international net zero emission pathway planning approach to be the tool for investigating and analyzing the carbon reduction potential suitable for the transportation net zero emission pathway and important net zero emission strategies in our country and for inferring the carbon reduction efficacy of different carbon reduction pathways to facilitate the reflection upon and modification of the long-term carbon reduction pathways of the transportation department on a rolling basis.
- (3) Assistance was provided to the MOTC in going with the pathway roadmap planning and carbon reduction efficacy evaluation of the "Net Zero Emission Pathway Project Working Group" of the Office of Energy and Carbon Reduction under the Executive Yuan. Three major strategies and two auxiliary strategies were introduced for the transportation department and were included in the "Overview of Taiwan Net Zero Emission Pathway and Strategy by 2050" released by the National Development Council on March 30, 2022. In addition, substantial actions of the green transportation net zero emission strategy were compiled in response to the net zero emission promotion of the Executive Yuan.
- (4) Inference on the impacts of shared electric motorcycles on transportation greenhouse gas emissions was made. The 2022 survey had 1,268 valid samples recovered in Taipei and Kaohsiung, respectively (1,068 copies through landlines and 200 copies through mobile phones). The characteristics of different populations, namely, those with experience using shared electric motorcycles, potential users, and unwilling users, inclinations in the selection (transfer) of prospective transportation tools, use willingness and obstructive factors were analyzed and related research advice were investigated and introduced for reference and to be applied by local governments while they implement policies in the future.

2. 整合串聯自行車路線並優化資訊系統

- (1) 辦理全國自行車單一總入口網區域路線自動規劃功能及完整版英文網站，提供民眾完整的一站式服務平台。
- (2) 協助交通部研提「環島自行車道升級暨多元路線整合推動計畫（109~113年）」修正計畫，並規劃自行車路網優化項目與期程，供路權單位施作，強化自行車路網的安全性與友善性。
- (3) 研提國際化及在地化的16條多元自行車路線，供主責單位持續改善及觀光部門辦理行銷推廣，帶動自行車與觀光產業發展。
- (4) 為縫合既有自行車道斷鏈，規劃新增辦理串聯路線，以打造更優質的騎乘路線。
- (5) 協助交通部研提新一期自行車公建計畫「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）」，針對自行車路網進行盤點，並持續依照行政院指示，整合地區既有口碑好、具特色自行車道，以持續縫補路網斷鏈處及既有路線優化。

3. 精進改善交通空污管理策略

- (1) 綜整前期就臺北、新北、臺中、高雄等都會區私人運具通勤族群問卷調查成果，進一步分析不同都會區、性別、年齡、學歷…等族群間之交通空污認知及管理策略意向差異特性。
- (2) 研擬減少交通空污之管理策略，並分析各項策略之可行性，綜整提出短、中、長期之減污交通管理策略建議，及推算預期減污成效，以供後續推動應用。

4. 建立鐵公路系統強化調適能力指引

- (1) 蒐集與分析目前國外運輸系統調適發展趨勢，探討公路系統規劃階段強化調適能力之作為，提出公路系統規劃階段強化調適能力機制與方法之建議，提供公路主管機關應用。

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

- (1) The exclusive cycling portal for automatic planning of regional lines and the complete English website was created to provide the general public with a thorough one-stop service platform.
- (2) Assistance was provided to the MOTC in stipulating and preparing the amendment to the "Promotion Plan for Upgrading bike lanes and Integrating Diversified Lines Around Taiwan (2020-2024)," and the items and timeline for optimizing the cycling network were planned to allow implementation by the road right owner for enhanced safety and friendliness of the cycling network.
- (3) Sixteen diversified bike lanes, international and local, were prepared and introduced to facilitate continuous improvements by the responsible unit and marketing and promotion by the sightseeing department, driving developments of the cycling and sightseeing sectors.
- (4) In order to make up for the broken chain of bike lanes, additional lines were planned. Better-quality riding lines were connected accordingly.
- (5) Assistance was provided to the MOTC in preparing and introducing a new-stage cycling construction project entitled "Stage 2 of the Promotion Plan for Upgrading bike lanes and Integrating Diversified Lines Around Taiwan (2024-2027)". The cycling network was checked and instructions from the Executive Yuan continued to be followed in integrating well-reputed unique bike lanes to continue patching up the broken network and optimizing existing lines.

3. Improve the Traffic Air Pollution Management Strategies

- (1) Preceding survey findings from the commuting population on private transportation tools in metropolitan areas such as Taipei, New Taipei, Taichung, and Kaohsiung were summarized to further analyze differences in awareness of traffic air pollution and the management strategy by the metropolitan area, gender, age, and education, among others.
- (2) The management strategy to reduce traffic air pollution was stipulated and the feasibility of respective strategies was analyzed. Advice on the traffic management strategy to reduce pollution over the short, mid, and long term was compiled. The expected pollution-reducing efficacy was inferred to allow subsequent promotion and application.

4. Guide to Establishment of Railway/Highway Systems to Reinforce Adaptability

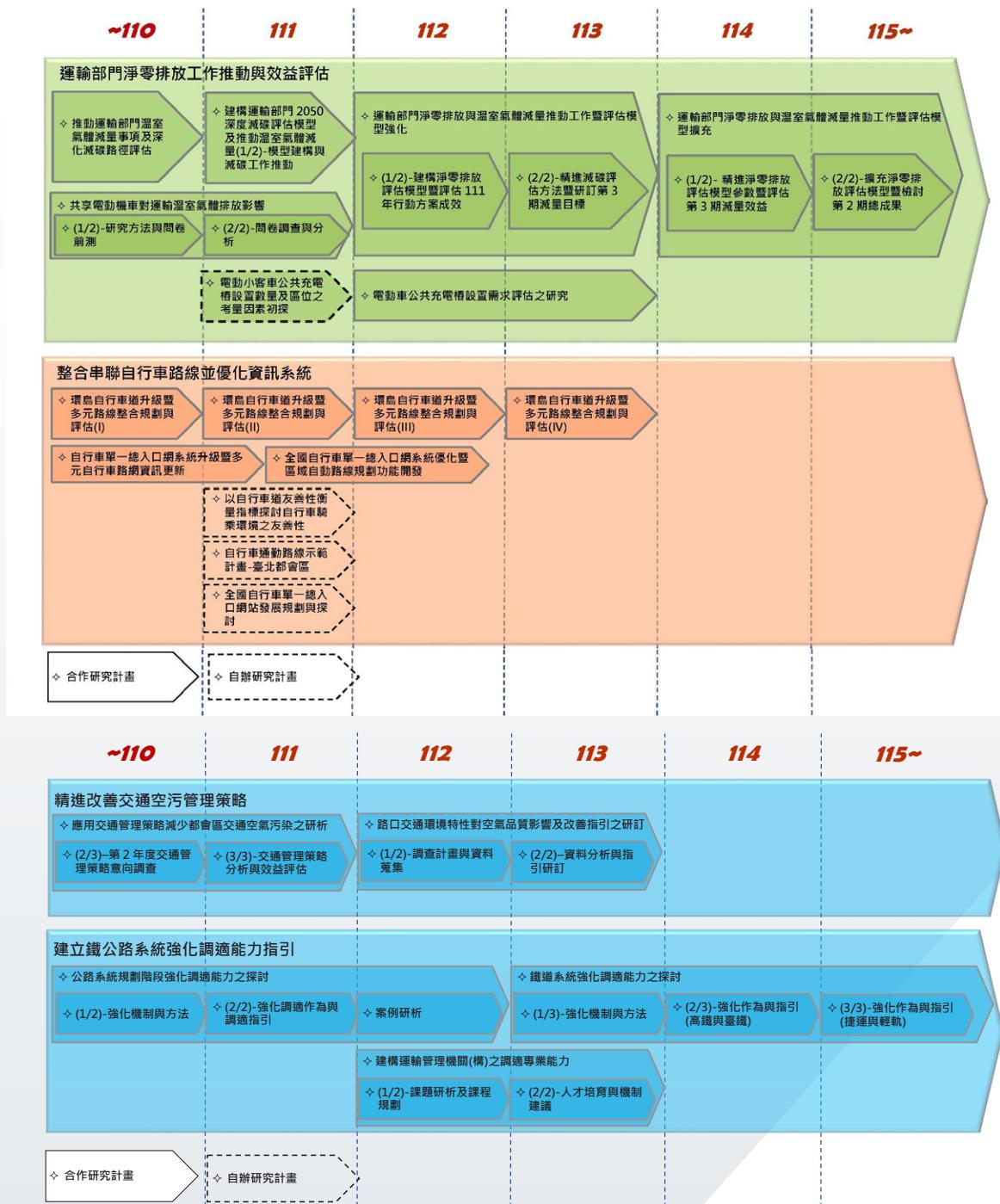
- (1) Current trends in the adaptation and development of international transportation systems were collected and analyzed to explore the action taken to strengthen adaptability

(2) 研提公路系統因應氣候變遷調適指引，提供公路設施權責機關參據，俾提升公路系統因應氣候變遷之調適能力。

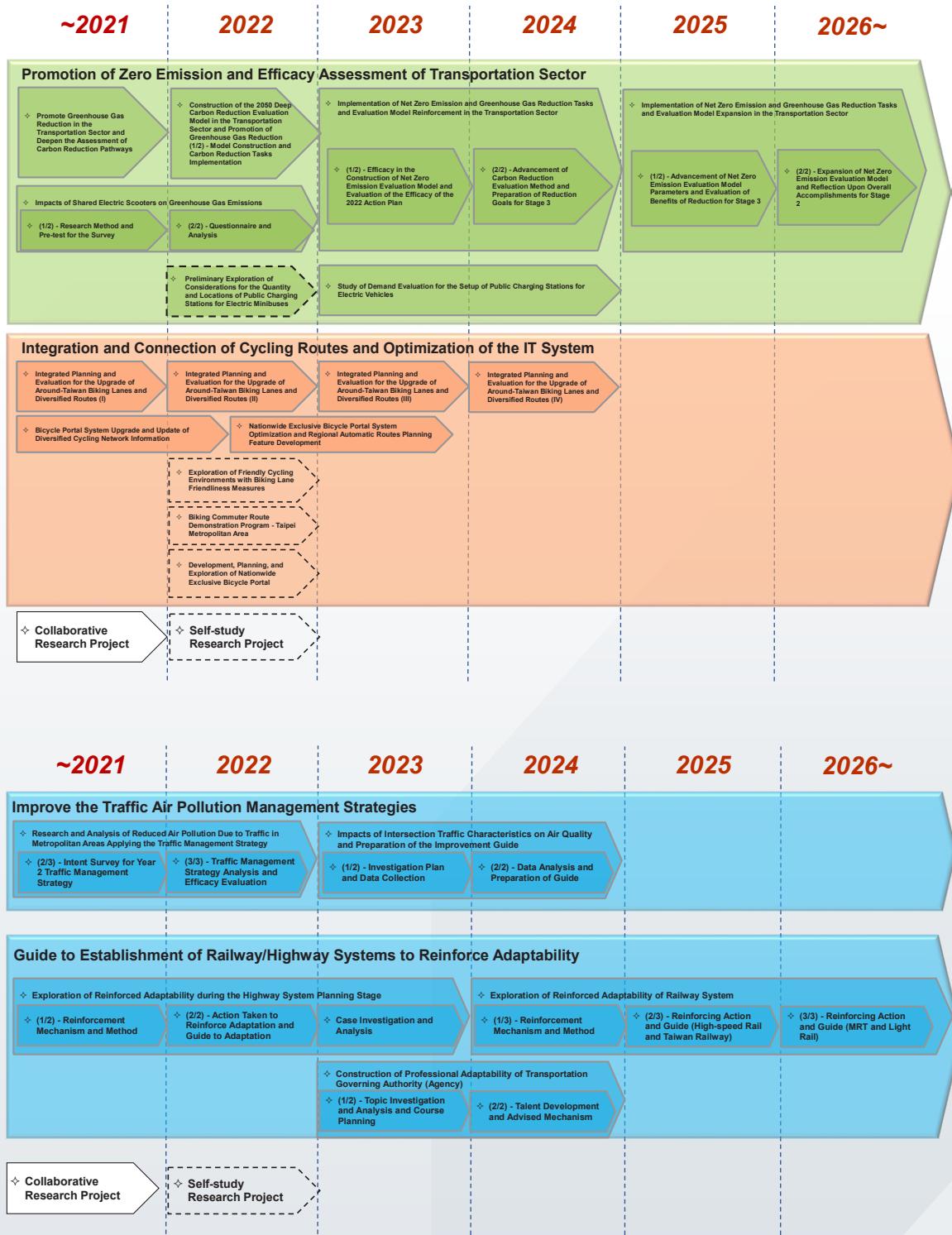
during the highway system planning stage and advice on the mechanism and approach to reinforce adaptability during the highway system planning stage was provided to be applied by the competent authority for highways.

(2) The highway system was prepared and introduced in order to adapt to climate change and to be provided to the authority responsible for highway facilities for reference to facilitate the enhancement of highway systems' adaptability to climate change.

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，研究重點如下：

1. 完備鐵公路運輸安全管理系統（SMS）

鐵路行車規則已要求營運機構建立安全管理制度系統（SMS），為協助營運機構評估所建立之SMS的符合性及有效性，且讓鐵道監理機關能夠查核SMS運作狀況，本研究發展一套適用於我國的機制、準則與工具，並辦理教育訓練加以推廣。

2. 評估車輛安全輔助系統功能

進行大型車輛裝設主動預警輔助系統之試運行使用成效評估，建立成效評估架構、提出四大評估指標，設計使用成效評估方法（確立抽樣方法、受測者定義、實驗設計、實驗程序、資料分析及統計方法），並配合設備研發、裝設期程啟動相關調查及資料蒐集程序。

3. 改造交通安全知能與行為

就新興科技導入國小、國中、高中乃至大專院校交通安全教育進行需求評估規劃，做為後續各級學校發展新興科技交通安全輔助教學工具之基礎，以協助學校交通安全教育的落實推動。

4. 轉型與推廣交通安全工程設計技術

(1) 推廣「事故型態導向之路口交通工程設計範例參考手冊」，與六都合作進行易肇事路段改善，並辦理6場推廣教育訓練，使相關人員熟悉作業流程，進而提升交通工程環境之安全水準。

(2) 分析自行車環島、多元及串聯路線之自行車事故，提供交通部及管理機關分析瞭解自行車事故狀況及特性，據以改善自行車騎乘安全，並做為後續研提改善機制之參據。

V

Deepen Transportation Safety Management

Improve transportation safety and strengthen the spontaneous preventive safety mechanism, with a safe and humanistic transportation environment as the vision. Highlights of the research are as follows:

1. Perfection of Railway/Highway Transportation Safety Management System (SMS)

Under the Railway Operation Rules, operators are already required to define their own safety management system (SMS). To help with the conformity and validity of the SMS evaluated and created by each operator and in order for the railway regulatory authority to inspect the operational status of the SMS, the mechanism, guidelines, and tools suitable for our country were developed as part of the research and educational training is held for promotional purpose.

2. Evaluation of Features of Vehicle Safety Assist System

The trial uses efficacy evaluation was performed on the spontaneous pre-warning assist system installed in large vehicles. The efficacy evaluation framework was defined. Four major evaluation indicators were introduced. The use efficacy evaluation method was designed (with the sampling approach, subject definition, experiment design, experiment procedure, data analysis, and statistical method defined). In addition, there were the equipment R&D and installation timeframe and activation-related investigation and data collection procedures.

3. Knowledge, skills, and action taken for traffic safety transformation

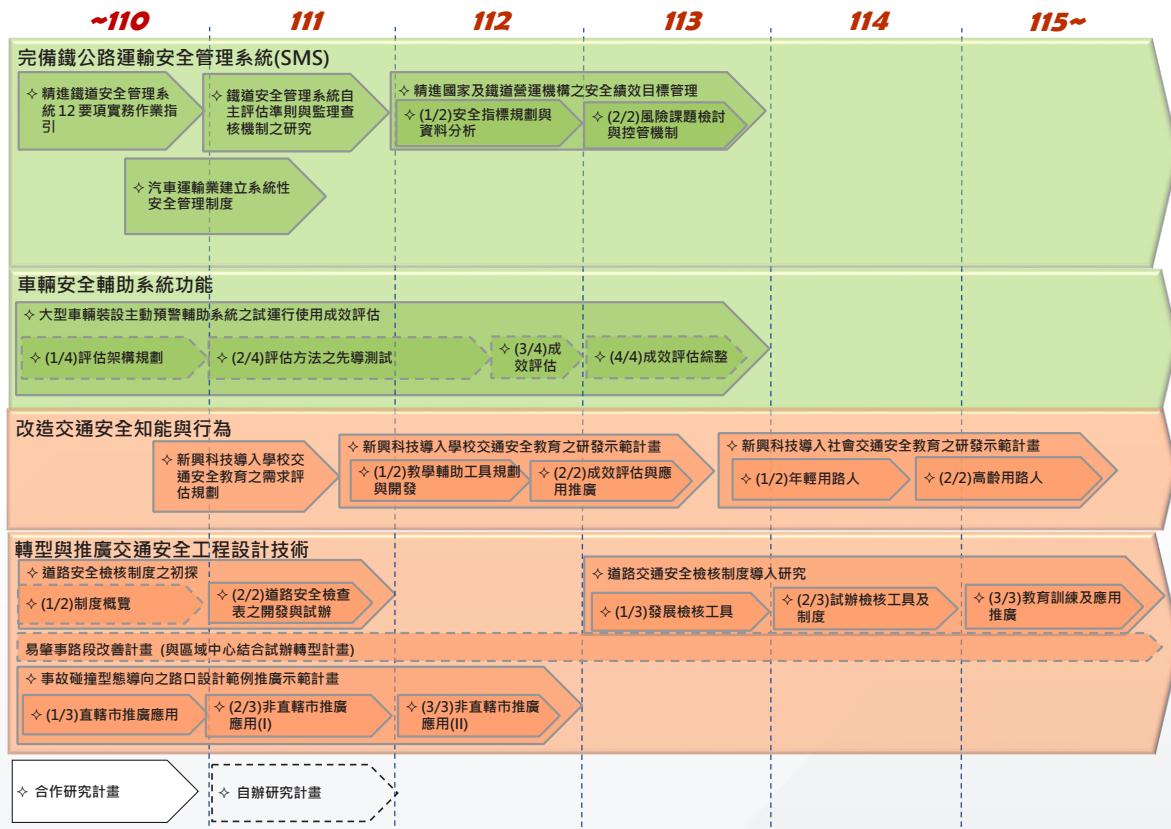
Emerging technologies were introduced as part of traffic safety education at the elementary, junior high, and senior high school levels and at the university/college level for demand evaluation and planning. They would be the basis for subsequent tools to help with education on emerging technology-assisted traffic safety at schools of respective levels and consolidate traffic safety education.

4. Engineering Design and Technologies for Transformation and Promotion of Traffic Safety

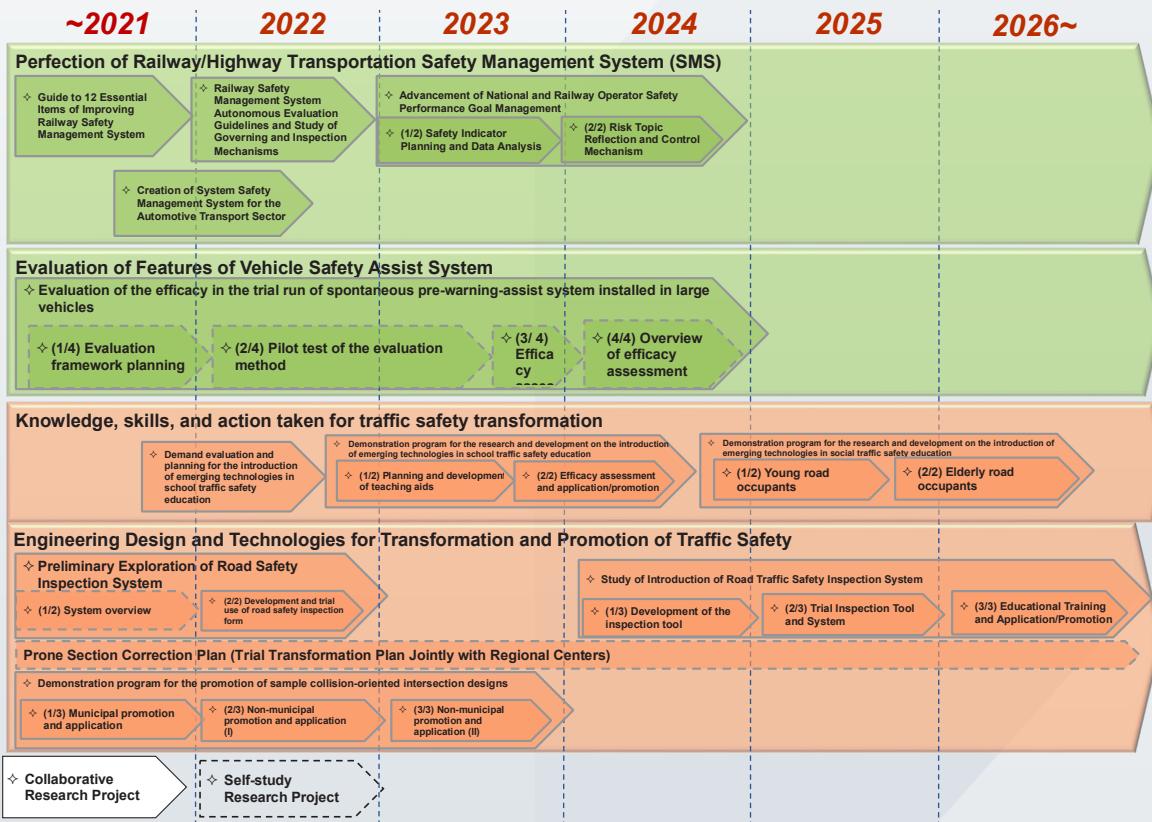
(1) The "Accident-oriented Intersection Traffic Engineering Design Sample Reference Handbook" was promoted and collaborative efforts were made with the six municipalities to improve sections prone to accidents. Meanwhile, 6 rounds of promotional educational training were held to help related staff familiarize themselves with the operating procedure and to accordingly enhance the safety level of the traffic engineering environment.

(2) Bicycle accidents along round-island, diversified, and serial lines were analyzed to help the MOTC and the regulatory authority analyzes bicycle accidents and their characteristics and accordingly improve cycling safety. Such information may serve as a reference for subsequent preparation and submission of a correction mechanism.

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及產業發展

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) 運用5G結合AIoT等創新科技，延續110年度提出之5G智慧交通數位神經中樞功能整體規劃構想，研發交通壅塞機率預測模式庫與公共運輸管理相關知識庫，並結合示範城市試驗場域交通即時資訊的蒐集，透過數位雙生的技術構建5G智慧交通數位神經中樞雛型系統，並完成交通控制通訊協定3.0版檢討修訂初稿，以及緊急救援車輛智慧號控系統驗證實作。
- (2) 應用人工智慧（AI）強化學習（Reinforcement Learning, RL）在都市交通號誌控制，以及未來AI在交通陸運領域之發展趨勢探討。
- (3) 與國道客運業者合作，藉由大客車先進駕駛輔助設備蒐集大量行車影像、駕駛行為及行車安全警示紀錄等資料，並應用影像辨識技術從大量的警示資訊當中找出真正具有安全隱憂的異常事件，以及可能造成行車安全隱憂之潛在高風險路段。
- (4) 結合無人機空拍與AI人工智慧影像辨識等先進技術，分析路口交通衝突情形，並辦理「右轉衝突」及「非號誌化路口停讓衝突」先導測試計畫，以測試及驗證相關分析技術，且應用於易肇事路口分析及改善。

VI

Promote the Innovative Application of Transportation Technology and Industrial Development

Utilize innovative technologies to boost the transportation industry's developments, creating a humanistic and sustainable smart traffic living environment as the vision. Highlights of the research are as follows:

1. Promote the Innovative Application of Transportation Technology

- (1) 5G combined with innovative technologies such as AIoT was applied as the continuum of the overall planning of 5G smart traffic digital central nervous features introduced in 2021. The traffic congestion probability forecast model bank and the public transportation management-related knowledge bank were researched and developed, with a combination of the collection of real-time traffic information at the test location of an exemplary city. The digital dual technology was applied in the construction of the 5G smart traffic digital central nervous prototype and the first draft of the reflections and revisions made to Traffic Control Protocol 3.0 and physical testing to validate the emergency rescue vehicle smart signal control system was completed.
- (2) Artificial intelligence (AI) was applied for reinforcement learning (RL) in urban traffic signal control and the trends in the development of AI in traffic and land transportation in the future were explored.
- (3) We worked with freeway passenger bus operators. Excessive driving images, driving behavior, and driving safety warning records, among other data, were collected through the advanced driving-assist equipment on board large passenger buses and the image recognition technology was applied to locating abnormal events of true safety concerns and potentially high-risk road sections that may cause concerns about driving safety in the excessive warning information.
- (4) Advanced technologies such as drones and AI image recognition were combined to analyze conflicting traffic at intersections and the pilot test programs for "right-turn conflict" and "non-signal intersection yield conflict" were implemented in order to test and qualify related analytical technologies and apply them to the analysis and improvement of intersections prone to accidents.

2. 推動無人機科技產業發展

(1) 推動成立臺灣無人機大聯盟 (UAS-Taiwan)，並於111年6月與日本無人機產業振興協會JUIDA簽訂合作備忘錄；並依據2025年我國無人機在交通領域發展之橋梁巡檢、物流運送兩項里程碑，提出對應之推動策略及路徑圖。

(2) 無人機在交通領域之創意應用競賽 (II)：競賽分為創意組、應用組、研發組，創意組鼓勵學生提出無人機創新設計概念；應用組由政府機關提出導入無人機於公務應用之成功案例；研發組找出應用痛點之解決方式。

(3) 無人機整合示範計畫 (II) - 物流運送之深化應用，驗證主題為-道路（橋梁）中斷以無人機維持郵務運送，選擇桃園復興郵局（介壽國中舊址）至華陵里（達觀山風景區停車場）做為驗證場域，共有4家廠商完成驗證。

2. Promotion of the Development of the Drone Technology Industry

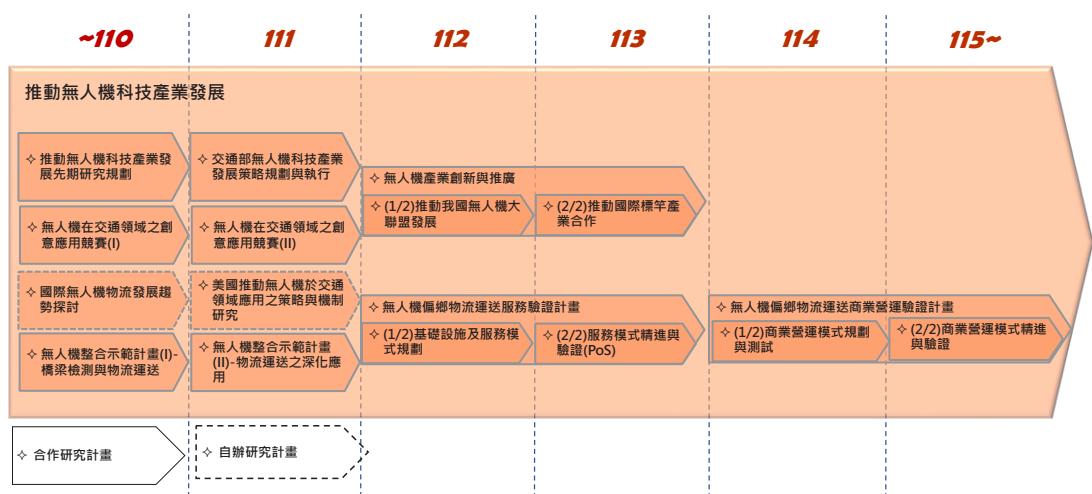
(1) The UAS-Taiwan was promoted and formed and the Memorandum of Understanding (MOU) was entered into in June 2022 with the Japan UAS Industrial Development Association (JUIDA). Meanwhile, corresponding promotion strategies and roadmaps were introduced according to the two milestones reached with drones in bridge inspection and logistics by 2025.

(2) Creative application contest of drones in traffic (II): The contest consisted of the creativity group, the application group, and the R&D group. For the creativity group, students were encouraged to come up with an innovative design concept of drones. For the application group, government agencies introduced successful examples of the application of drones in public affairs. The R&D group, on the other hand, was devoted to finding solutions for application pain points.

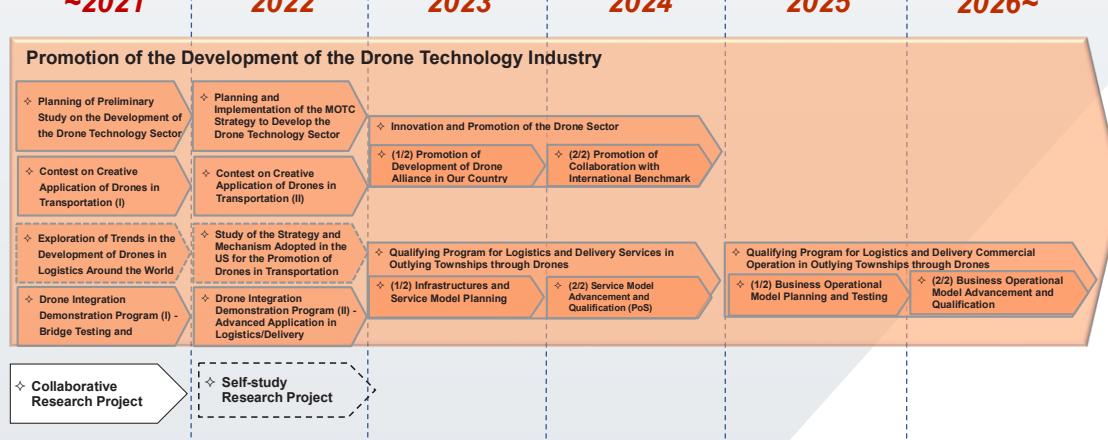
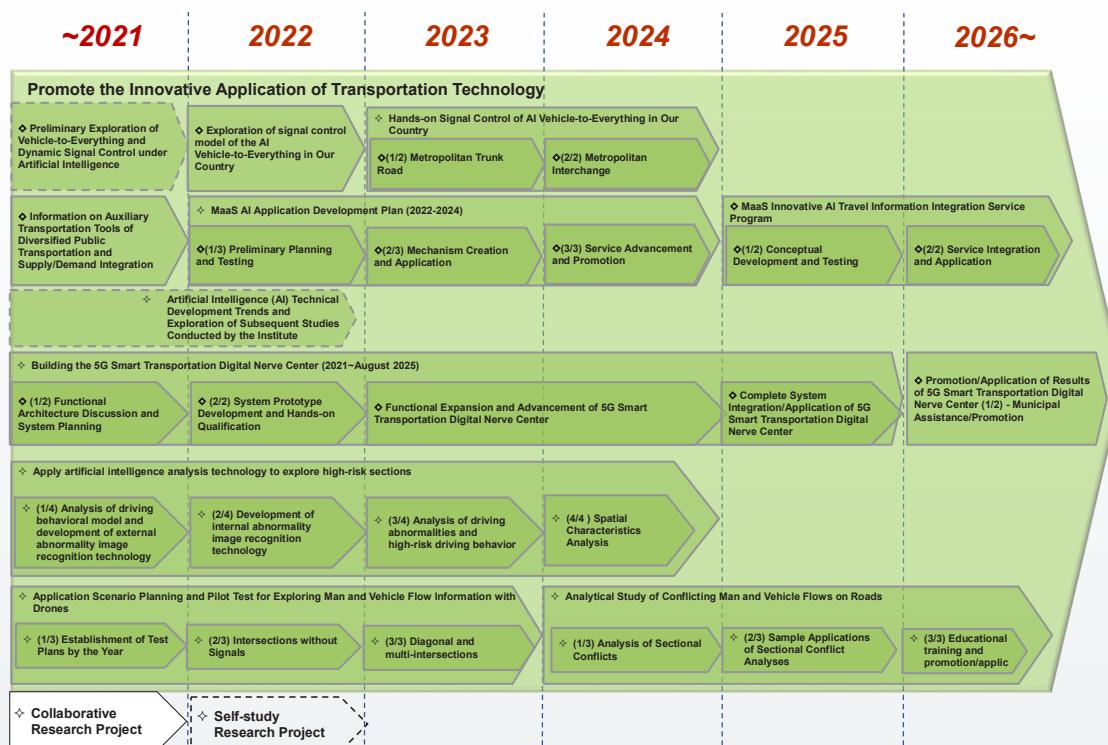
(3) Drone integration exemplary program (II) - advanced application in logistics. The topic qualified was - postal service maintained through drones in cases of broken roads (bridges). The qualified section was from the Post Office in Fuxing Township, Taoyuan (old site of Jieshou Junior High School) to Hualing Neighborhood (the parking lot of the Daguan Shan Scenic Area). A total of 4 manufacturers have qualified accordingly.

主軸6：推動交通科技創新應用及產業發展





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



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) 鐵路災防部分，精進軌道構件缺失辨識系統，提升巡查速度至時速60公里，並將原系統（適用臺中段）之適用範圍擴大至宜蘭段的丘陵區，建置臺鐵局宜蘭段構件缺失資料庫，並導入精準定位系統，提高軌道巡查作業之效率及準確度，提供臺鐵局臺中工務段及宜蘭工務段參考應用。
- (2) 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111年度國道3號大甲溪橋基保護之年度維護工作應用，提升國道3號大甲溪橋橋基抗沖刷能力。研發成果於111年4月1日獲得經濟部智慧財產局發明專利（證書：發明第I759792號），並參加「2022台灣創新技術博覽會發明競賽」獲得「銀牌獎」殊榮。
- (3) 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。

Emerging technologies were combined to reinforce the capabilities of the transportation system to withstand disasters and the managerial efficacy and to accordingly enhance sea and land transport safety and facilitate cross-disciplinary integration, communication, and coordination of transportation technologies. Highlights of the research are as follows:

1. R&D and Advancement of Railway/Highway and Commercial Port Disaster Prevention Technology

- (1) In terms of railway disaster prevention, the rail component deficiency recognition system was advanced and the inspection speed was enhanced to 60 kilometers per hour. Meanwhile, the applicable scope of the existing system (applicable to the Taichung section) was maximized to the hills section in Yilan. The Yilan deficiency database was created at the Taiwan Railways Administration, with introduction of the precision positioning system, to enhance the efficiency and accuracy of rail inspections for reference and application by the Taiwan Railways Administration for the Taichung and Yilan sections.
- (2) As far as highway disaster prevention is concerned, the fabric abutment protection technique was developed for application in the 2022 maintenance of the abutment in Dajia River performed by the Dajia section of the Freeway Bureau in order to boost the ability of the abutment in Dajia River of Freeway 3 to resist scouring. The R&D accomplishments were issued the invention patent by the Intellectual Property Office under the Ministry of Economic Affairs [Certificate No.: Invention I759792] on April 1, 2022, and were honored with the "Silver Medal" during the "2022 Taiwan Innotech Expo Contest".
- (3) For the prevention of disasters in a commercial port, test stations for the VHF Data Exchange System (VDES) were set up, including 1 fixed test signal station and 1 mobile device at the Fangyuan Lighthouse in Changhua (Wanggong Lighthouse), to explore signal reading and information application. In the future, by connecting related signals of land, sea, air, and space satellites, they will help boost marine cruising safety and rescue efficacy and the Maritime Port Bureau enforce smart cruise safety-related programs.

2. 精進橋梁檢測與管理

南方澳大橋斷落事件後，在制度面，為健全全國橋梁之安全維護管理體制，奉交通部指示研擬完成「橋梁維護管理作業要點（草案）」，於109年7月21日由行政院頒布生效，以「健全制度、落實執行」為主軸，透過要點促使各部會、縣市政府、公立學校及公營事業機構於既有法系架構下導入3層次管理機制，據以建立合宜制度並持續強化橋梁維管作業，「車行橋梁管理資訊系統」除調整帳號控管方式及新增統計儀表板外，並於各單位登入系統首頁增加未檢測及未維修橋梁數提醒、每月1日自動將前述提醒資訊以電子郵件通知各單位設定帳號、改善檢測人員頭像與檢測構件照片拍攝問題、以及提升主系統覆核功能，針對檢測時間疑似過短及檢測人員頭像疑似有誤標註示警等精進功能。

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，提供港灣風、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。港灣環境資訊網除持續整併臺灣腐蝕環境分類資訊系統基本功能及資料外，同時精進資料開放服務功能，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，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，加值港灣環境資訊圖臺颱風圖層，結合颱風行進預測軌跡、侵襲機率與港區海氣象即時資訊，亦可提供港埠管理、營運人員及民眾因應惡劣環境參考。本系統提供於港灣全面整體且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. Advancement of Bridge Testing and Management

After the Nanfang'ao Bridge collapse incident, as far as the system is concerned, in order to normalize the safety maintenance and management system for bridges throughout the nation, the "Bridge Maintenance and Management Operating Guidelines (Draft)" were prepared as instructed by the MOTC and were promulgated by the Executive Yuan and took effect on July 21, 2020. With "normalize systems, enforce, and implement" as the theme, respective ministries, departments, county/city governments, public schools, and state-run enterprises were urged under the Guidelines to introduce a managerial mechanism consisting of three levels was introduced following the existing legal framework and a suitable system was created and reinforcement of bridge maintenance and control was continued accordingly. For the "bridge vehicle access management information system", besides adjustment of control by account and addition of the statistical dashboard, a reminder of the number of bridges yet to be tested and repaired has been added to the homepage of the log-in system of respective authorities and the above-said reminder will be sent through email to the account set up for each authority automatically on the first day of each month. Tester profile picture and test elements filming issues were improved. The main system approving features was enhanced. For the suspicious overly short duration of testing and suspicious erroneous tester profile pictures, tagging and warning, among other advanced features, are available.

3. Optimization of Port Environmental Information Application and Facility Management Feature

(1) The port environment information application features were advanced and port environment information system maintenance was done to facilitate the six major features, namely provision of information on port wind, waves, tides, and flows observed, simulated information, corrosion information, general scientific knowledge of the website, public data, and port environment information. For the port environment information network, besides continuing to combine and integrate basic features and data of the corrosive environment categorical information system in Taiwan, the open data service features were advanced at the same time. Bridging service of the platinum level for real-time information is now available at 9 commercial ports such as wind speed, wind direction, wave height, wave direction, flow rate, flow direction, and tidal level, to facilitate inquiries by users about real-time marine meteorology in the port area. Meanwhile, data on the corrosion rate of metal materials such as carbon, copper, aluminum, and zinc are available for reference in structural anti-corrosion design and maintenance/management. In addition, value is added to the typhoon layer of the port environment information map. The typhoon travel path forecast, probability of invasion, and real-time information on marine meteorology in the port area are combined. It can also be provided to the port administration, operational staff, and the general public for their reference while coping with an undesirable environment. The comprehensive, integrated, and instantaneous dynamic and

(2) 辦理臺中港區高精度三維數值地形模型建構，分析各種無人飛行載具並評估飛行能力及可應用範圍，開發人工智慧（AI）影像辨識技術，針對重要設施（如岸邊設施：碰墊、反光板及車擋；港區道路設施：標線及裂縫）於平日與颱風或地震後啟動自動化巡查管理，並建置空間資訊整合分析平臺，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，並藉由辦理教育訓練，推廣研究成果，另蒐集應用新興科技辦理巡查檢測案例，探討應用於國內商港之可行性，提供港務管理單位落實港灣構造物維護管理工作及資訊化之需求。

4. 提升港區海氣象監測技術

(1) 辦理臺北港域應用微波雷達整年度連續觀測波流資料蒐集，並運用鄰近測站波流觀測資料，驗證微波雷達觀測波流結果，掌握微波雷達於臺北港域觀測之特性，輔助並精進臺北港域海氣象觀測作業；此外，進行臺中港海洋陣列雷達雙系統整合，產出平面觀測資訊，提供波浪與海流資訊與查詢服務，並建構陣列海洋雷達3級觀測品管制度，透過訊號增益與辨識等品管等方法，強化雷達觀測品質及技術，釐訂雷達資料開放標準，達成輔助臺中港港埠管理與本所後續相關研究延伸應用之目的。

stationary environmental information provided by the system at ports can be accessed by port affairs-related authorities and the general public to not only support disaster prevention responsive decision-making of the port affairs authority and the vessel operators but also serve as reference and applied by passengers and fishermen in the port area.

(2) The high-precision three-dimensional value topographical model was built at the Taichung Port. Respective unmanned aircraft were analyzed and their flying ability and scope of application were evaluated. The artificial intelligence (AI) image recognition technology was developed. For important facilities (such as on-shore facilities: fender, reflectors, and bumpers; port road facilities: markings and cracks), automatic inspections and management would be activated on a daily basis and after a typhoon or an earthquake and the Spatial Information Integrated Analysis Platform was built to realize the application of innovative technologies for the purpose of enhanced port management efficacy.

(3) Reflective of the practical demand of the Taiwan International Ports Corporation, Ltd. and the Harbor Bureau of Kinmen and Lienchiang Counties, the port structure maintenance and management system continued to be advanced and the maintenance and management system features continued to be expanded on a rolling basis. Meanwhile, research accomplishments were promoted through the educational training held. In addition, inspections and tests performed applying emerging technologies were collected while exploring the feasibility of their application in domestic commercial ports and provided to the port administration for the latter to consolidate port structure maintenance and management and to meet the informatization demand.

4. Enhancement of Port Marine Meteorology Monitoring Technology

(1) The annual continuous wave and flow observation data applying the microwave radar were collected in the Taipei Port area and the adjacent test station wave and flow observation data were utilized to qualify microwave radar-acquired wave and flow results, keep track of the monitoring characteristics of the microwave radar in the Taipei Port area, and help and advance marine meteorology observations in the Taipei Port area. In addition, the marine matrix radar dual-system was integrated at Taichung Port to generate plane observation information, including wave and sea current information, and to provide the inquiry service. Meanwhile, the matrix marine radar Level 3 observation quality control system was built. Radar observation quality and technology were reinforced through signal gain and recognition, among other quality control approaches, in order to reinforce the quality and technology of radar observation.

(2) 持續精進港灣海象模擬，本所海象模擬作業化系統110年度已發展為「臺灣近岸海象預測系統2.0」，每日執行4次，每6小時更新並提供全臺各主要商港未來2日之海氣象預測資訊；本（111）年度系統於風力部分，增加5日風速預測資訊，並精進基隆港風浪及水動力模組，新建基隆港靜穩分析模組、發展花蓮港外廓防坡堤越波模組，藉以提供基隆港內靜穩及花蓮港越波預警等資訊；另針對花蓮縣豐濱鄉台11線人定勝天路段發展波浪溯升/浪襲之影像判釋方法，可由影像判釋水線位置變化及波浪溯升高程，做為後續建立浪襲影像判釋自動化與精進海岸公路浪襲預警系統之依據，可提供公路總局第四區養護工程處於颱風浪襲封路決策應用參採，強化通行安全管理。

The radar data release criteria were defined to help manage Taichung Port and to facilitate extended applications in subsequent relevant studies of the Institute.

(2) Advancement in the simulation of port marine meteorology continued. The Institute's marine meteorology system was developed into "Taiwan Coastal Marine Meteorology Forecast System 2.0" in 2021. It works 4 times a day and the information is updated once every 6 hours and the 2-day marine meteorology forecast data are provided to respective primary commercial ports throughout Taiwan. As far as the wind power of the system this year (2022) is concerned, the 5-day wind speed forecast information was added and the wind wave and hydrodynamic force module of Keelung Port was advanced. The static analysis module was added to the Keelung Port and the wave overtopping module of the outline breakwater was developed for the Hualien Port to accordingly provide information such as the static analysis inside the Keelung Port and the pre-warning about wave overtopping at the Hualien Port. Meanwhile, the wave runup/wave attack image interpretation method was developed for the Rendingshengtian section of Taiwan Route 11 in Fengbin Township, Hualien County. Changes in the water level and the high range of wave runup can be determined through images, which will be the basis for the subsequent wave attack image determination automation and the advanced coastal highway wave attack pre-warning system to be created and can be applied and referred to by the Fourth Maintenance Office, Directorate General of Highways while making a decision about road shutdown to prevent against wave attacks during typhoons for enhanced passage safety management.

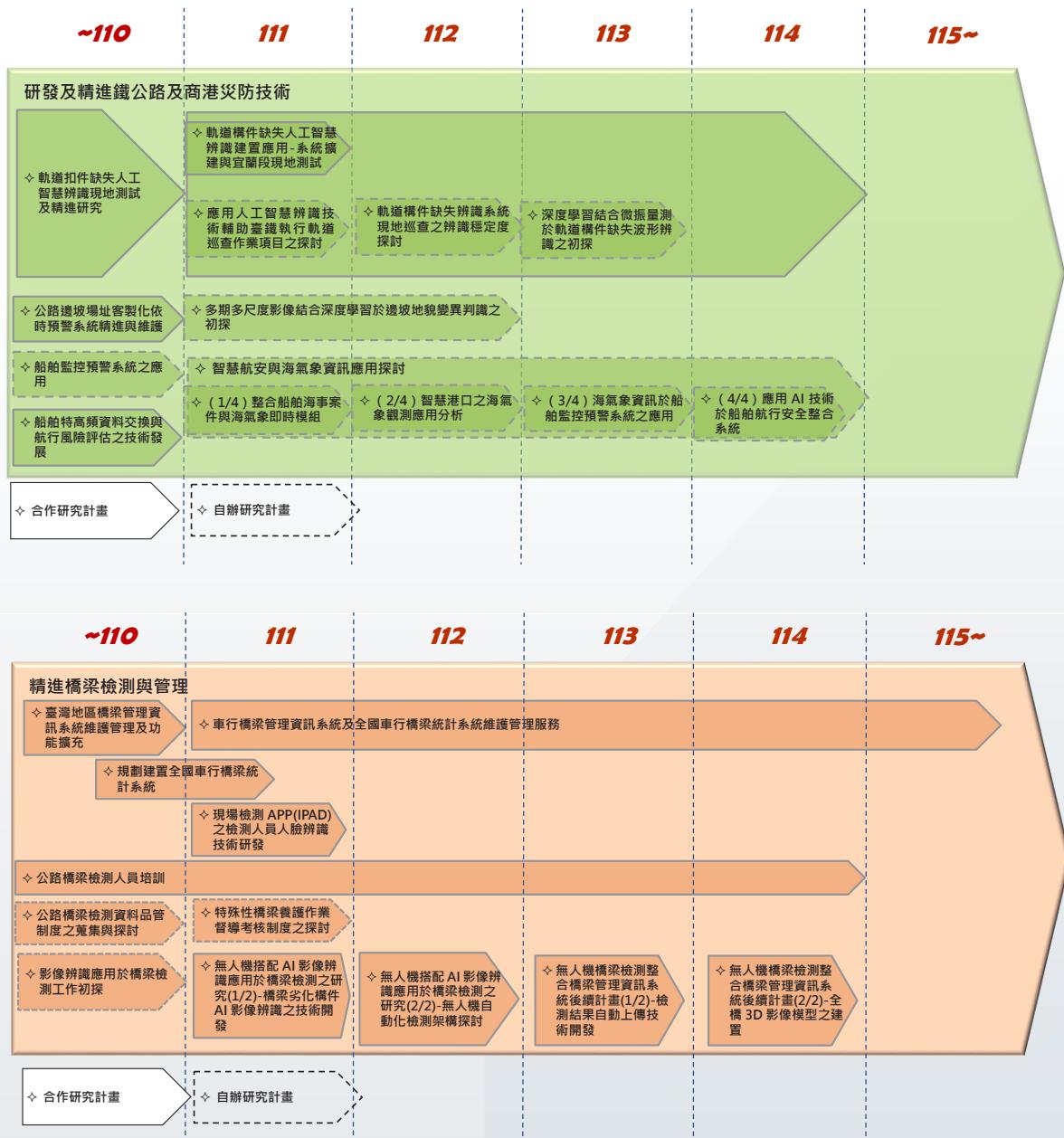
5. 精進金屬材料腐蝕環境研究

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，分析相關金屬腐蝕因子關聯性，及精進擴充「臺灣腐蝕環境分類資訊系統」，並藉由辦理研討會、教育訓練與發行年報，提供高速公路局、公路總局、臺灣鐵路管理局、台灣高鐵股份有限公司、工程顧問公司及民間業者辦理構造物防蝕設計及維護管理之應用參據。

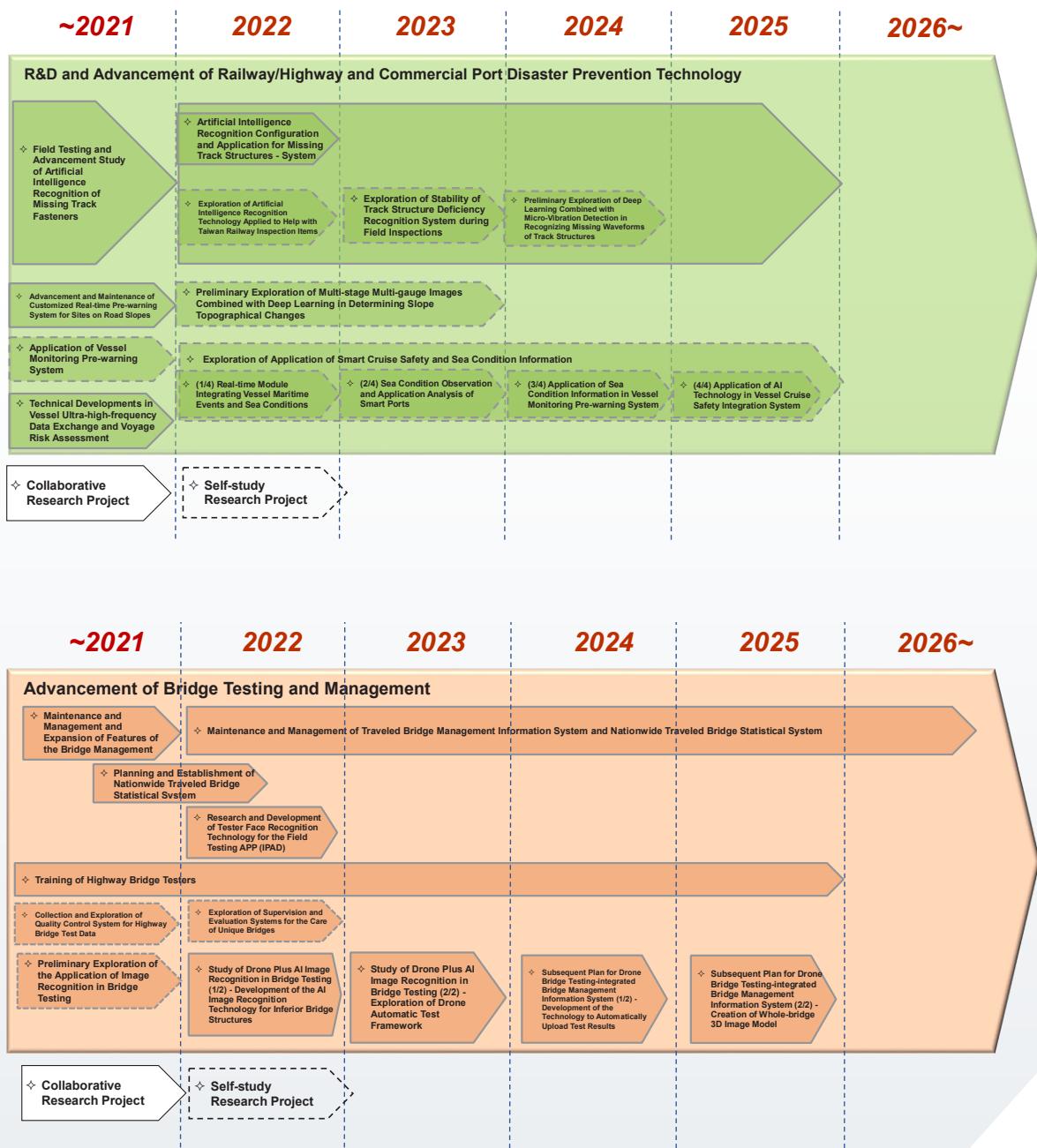
5. Advancement of Metal Material Corrosive Environment Study

The survey of atmospheric corrosion factors and site exposure testing of metal materials in the region of Taiwan continued. The correlation among relevant metal corrosion factors was analyzed and the "Taiwan Corrosive Environment Classification System" was advanced and expanded. Meanwhile, by means of seminars, educational training, and annual reports released, such information is provided to the Freeway Bureau, the Directorate General of Highways, the Taiwan Railways Administration, Taiwan High Speed Rail Corporation, engineering consulting companies, and non-governmental organizations for their application and reference in structure anti-corrosion design, maintenance, and management.

主軸7：精進交通設施維護管理與災防技術



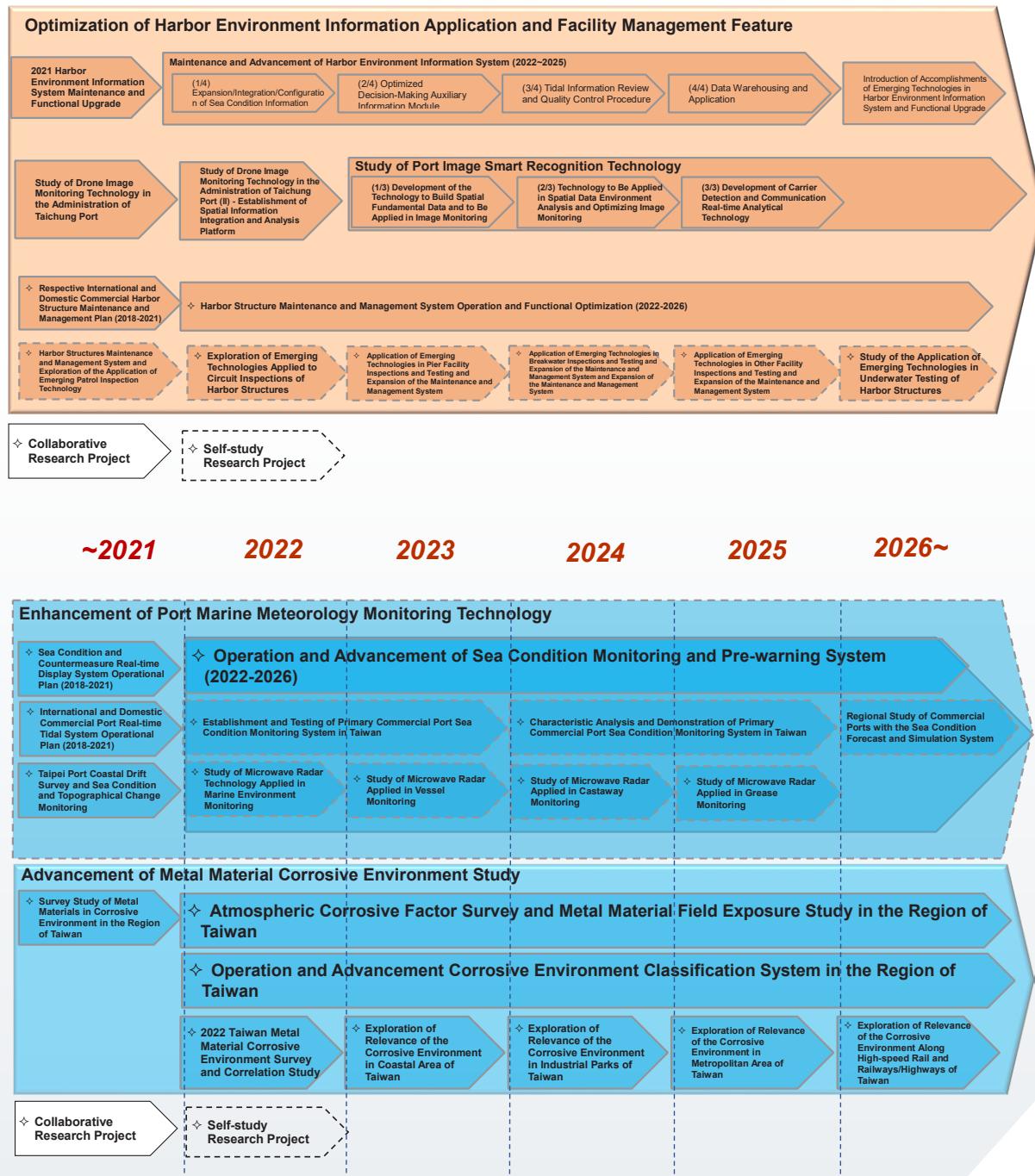
7. Improve the Transportation Facilities Maintenance Management and Disaster Prevention Technology



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



重點研究 成果

Key Research Results



依據前述111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) 中臺區域整體運輸規劃

1. 計畫概述

本計畫為3年期計畫，主要係為掌握中臺區域（包含苗栗縣、臺中市、彰化縣、南投縣、雲林縣）平常日之通勤、通學及商務旅次特性，透過調查蒐集相關旅次特性資料，以建立運輸需求模式，預測未來運輸系統之供需情形，針對中臺區域各運輸系統進行功能定位與檢討，並研提中臺區域陸路運輸服務均衡發展策略。

本計畫研究期程分為兩階段，第一階段執行期程為109年至110年，第二階段執行期程為111年，其中第一階段主要進行旅次特性調查與分析，透過旅次特性調查及屏柵線交通量調查，掌握區域內旅次行為之變化，並完成目標年社經預測；第二階段建立中臺區域運輸需求模式，完成供需預測分析，並檢視中部區域運輸發展趨勢與課題，透過地方訪談掌握中部區域各縣市施政重點與施政方向，並就未來年供需預測結果進行運輸功能定位與檢討，以研擬中部區域整體運輸發展策略。

2. 研究成果

(1) 掌握區域運輸旅次特性（旅次起迄分布、旅次長度、運具使用狀況），可反映不同政策下的各運輸市場變化。

(2) 構建「2021中臺區域運輸需求模式」，完成運輸系統供需預測分析，可了解主要運輸走廊運具競合關係、分析區域間路廊運量、觀察點／屏柵線通過量，滿足地區間連結道路之乘載能力檢討的需求，做為政策實施及工程改善方向的依據。

The Institute of Transportation, MOTC complied with the formulation and implementation of related research programs in 2022 in order to assist in the promotion of transportation policies and provide research results as references for the central and local governments' transportation units during policy implementation, as described below.

I

Enhance the Transportation Planning and Reviewing Support

(I) Overall transportation planning of the central Taiwan region

1. Project Overview

This is a three-year plan designed to understand daily work and school commuting, as well as the characteristics of business trips in central Taiwan (including Miaoli County, Taichung City, Changhua County, Nantou County, and Yunlin County). A transportation demand model has been established to forecast the supply and demand of transportation systems in the future by investigating and collecting data related to trip characteristics. Functional positioning and review are carried out with a particular emphasis on various transportation systems in central Taiwan. Furthermore, plans for the balanced development of land transportation services in central Taiwan have been developed.

This plan is divided into two stages. The first stage's implementation period is from 2020 to 2021; the second stage's implementation period is from 2022 to 2023. The first stage is primarily concerned with the investigation and analysis of trip characteristics. Changes in trip behaviors within a region can be grasped through an investigation of trip characteristics and screen line traffic volume, while socioeconomic predictions for the targeted year can be completed. A transportation demand model for central Taiwan can be completed in the second stage. The policy implementation focuses and directions of the counties and cities in Central Taiwan can be grasped through local interviews. Furthermore, transportation function positioning and review were carried out based on the results of the supply and demand forecast for the coming year in order to formulate strategies for overall transportation development in the central region.

2. Research Results

(1) Comprehend the regional transportation trip characteristics (trip start and end distribution, trip length, and mode use status) to reflect changes in various transportation markets in response to various policies.

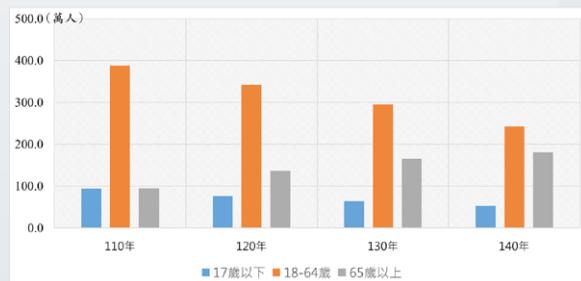
(2) Develop the "2021 Transportation Demand Model for the Central Taiwan Region," Complete the transportation system supply and demand forecast and analysis to gain insight into transportation corridor mode competition. Analyze the interregional corridor traffic volume and observation point/screening line throughput capacity to meet the need to review the carrying capacity of interregional connecting roads, which will serve as a reference for policy implementation and the direction for construction improvement.

- (3) 提出中臺區域整體運輸規劃成果，研提運輸系統供需分析與發展策略，提供交通部暨部屬機關及中部縣市政府辦理相關運輸系統規劃與評估參據。
- (4) 相關產出為國發會、內政部（國土計畫）、交通機關（臺鐵局、鐵道局、公路總局、高公局等）與各地方政府（捷運與都會整體運輸規劃等）辦理鐵公路運輸系統計畫與評估之參據。

3. 成果推廣與效益

- (1) 針對「中臺區域運輸需求模式各模組更新與預測成果之合理性」及「中部區域整體運輸系統發展策略與重大議題分析成果」於111年7月12日及111年11月10日召開2次專家學者座談會。
- (2) 111年12月9日辦理1場次成果說明會進行推廣應用。
- (3) 111年10月21日、10月27日及11月3日，共辦理3場次教育訓練，針對運輸需求模式進行推廣應用。
- (4) 發表「中臺區域整體運輸規劃與旅次特性分析」，都市交通半年刊第37卷第一期。

4. 研究成果精華摘要



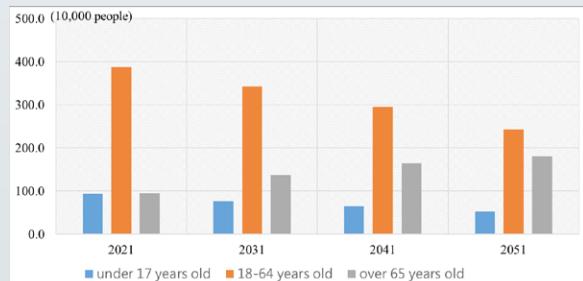
(3) Proposed are the results of the comprehensive transportation planning for the central Taiwan region. The analysis of the transportation system and development strategies was formulated to serve as a reference for the Ministry of Transportation and Communications, its subordinate agencies, and county and city governments in Central Taiwan when conducting related transportation system planning and evaluations.

(4) National Development Council, Ministry of the Interior (national plan), transportation agencies (Taiwan Railway, Railway Bureau, Directorate General of Highways, Freeway Bureau) and local governments (MRT and Urban Overall Transportation Planning, etc.) refer to the relevant outputs when planning and assessing railway and highway transportation systems.

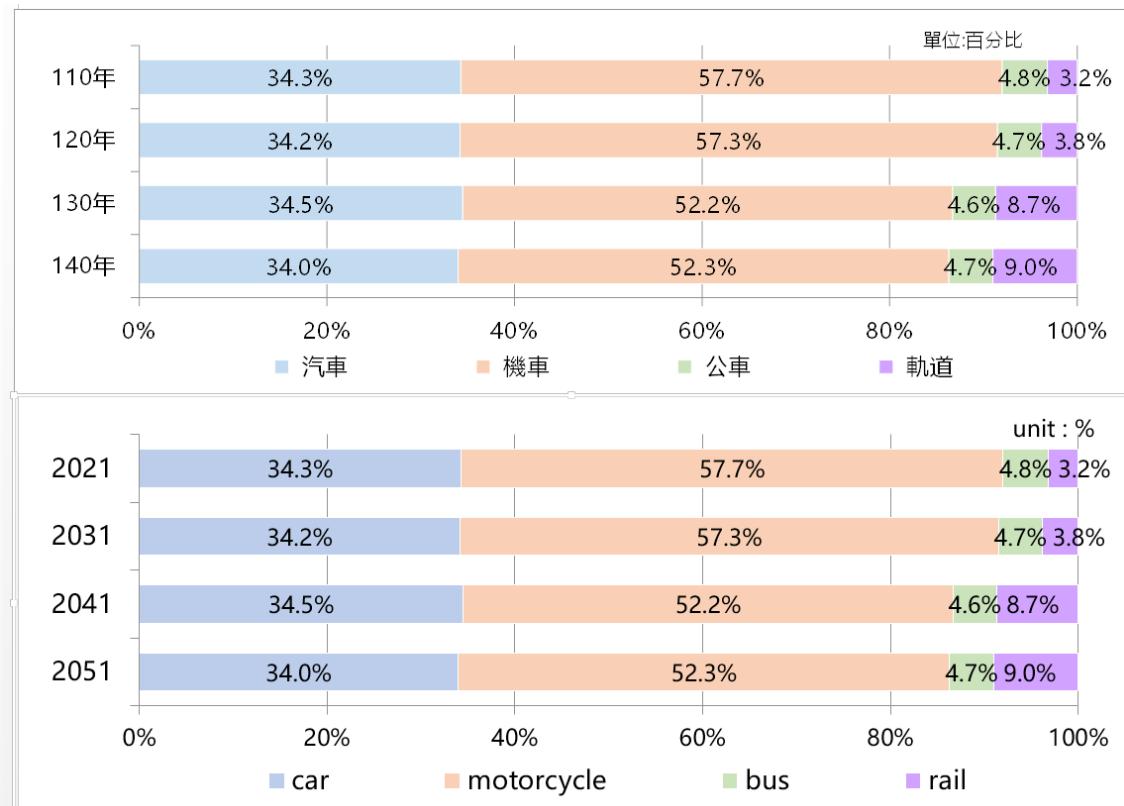
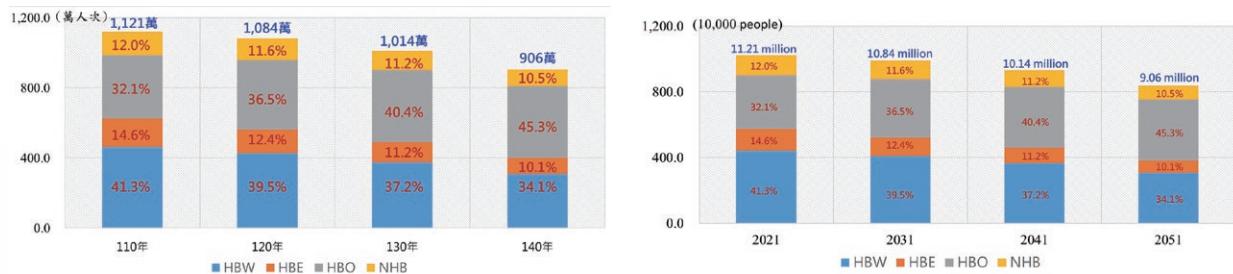
3. Result Promotion and Benefits

- (1) Two seminars with experts and scholars were held on July 12 and November 10, 2022, focusing on the "reasonableness of the updates of the modules in the transportation demand model of central Taiwan region and forecast results" and "strategies for the development of the overall transportation system of central Taiwan region and analysis of major issues."
- (2) On December 9, 2022, one result briefing was held to promote application submissions.
- (3) Three education training sessions were held on October 21, October 27, and November 3, 2022 to promote applications with a focus on the transportation demand model.
- (4) The publication of "The Overall Transportation Planning of the Central Taiwan Region and Analysis of Trip Characteristics," First Issue of Volume 37, Urban Traffic Biannually.

4. Summary of Research Results



中臺區域目標年人口預測與人口結構
The projected population and demographic composition
of the central Taiwan region.



5. 研究成果報告

- 中臺區域整體運輸規劃系列研究（1 / 3）—旅次特性調查及初步分析與（2 / 3）—旅次特性分析及補充調查（112年2月出版）
- 中臺區域整體運輸規劃系列研究（2 / 2）—供需預測及發展策略分析（預計112年10月出版）

5. Research Result Report

- A Series of Studies on the Overall Transportation Planning of Eastern Taiwan (1/3)-Investigation and Preliminary Analysis of Trip Characteristics and (2/3)-Analysis and Supplemental Investigation of Trip Characteristics (Published in February 2023).
- A Series of Studies on the Overall Transportation Planning of Central Taiwan Region (2/2)-Transportation Supply/Demand Forecast and Development Strategy Analysis (Scheduled to be published in October 2023).

(二) 2022年臺灣公路容量手冊

1. 計畫概述

本所於民國79年出版「臺灣地區公路容量手冊」，為臺灣公路容量分析研究起步之初，故大部分採用美國1985年公路容量手冊之分析方法。由於臺灣之車流及交通設施特性與美國差異甚大（如車種組成、車間距、駕駛行為...等），故自民國80年起開始，以有限經費及人力，進行長期性之容量在地化研究工作，陸續於民國90、100年更新出版公路容量手冊，並於今（111）年再版付梓「2022年臺灣公路容量手冊」，以適用於國內之本土化分析。

「2022年臺灣公路容量手冊」主要修訂高速公路基本路段、高速公路隧道、市區地下道號誌化路口、郊區多車道公路及郊區雙車道公路等章節，而配合手冊更新改版之進程，本所開發公路交通系統模擬（HTSS）模式並逐步擴增其功能，以做為非阻斷性車流坡度路段、號誌化路口、幹道、公車設施、機車專用道等複雜車流行為之分析工具。此外為增進容量分析作業的效率，亦根據手冊之分析方法與程序開發臺灣公路容量分析軟體（Taiwan Highway Capacity Software，簡稱THCS）。公路容量手冊及分析軟體相關內容，可於「臺灣公路容量分析專區」網站下載，以利各界應用。

2. 研究成果

- (1) 2022年臺灣公路容量手冊：公路容量手冊內容包含不同公路設施之運轉特性，以及評估容量及服務水準分析之方法，提供公路規劃及設計人員客觀的資料，以決定適當之規劃及設計方案，並協助評估既有設施的服務品質以訂定改善方針。
- (2) 2021公路交通系統模擬（HTSS）模式：HTSS模式為配合本土化公路容量研究所開發，提供分析高速公路、郊區雙／多車道公路、號誌化路口、公車設施、機車專用道、幹道、路網等複雜車流行為之分析工具。

(II) 2022 Taiwan Highway Capacity Manual

1. Project Overview

The Institute of Transportation, MOTC published the Taiwan Highway Capacity Manual in 1990, marking the beginning of Taiwan highway capacity analysis research. Consequently, the analysis method outlined in the U.S. Highway Capacity Manual of 1985 was largely adopted. There are significant differences between Taiwan and the United States in terms of traffic flow and the characteristics of transportation facilities (for instance, vehicle composition, vehicle interval, driving behavior, etc.). Therefore, beginning in 1991, long-term research on local capacity was conducted with limited resources and personnel. The revised Highway Capacity Manual was published in 2001 and 2011. This year, 2022, the "2022 Taiwan Highway Capacity Manual" was reprinted for use in the domestic localized analysis.

In the "2022 Taiwan Highway Capacity Manual," freeway basic segments, freeway tunnels, signalized intersections of urban underpasses, multilane rural highways, two-lane rural highways, and other sections were revised extensively. In tandem with the updated and revised manual, the Institute of Transportation, MOTC developed the Highway Traffic System Simulation (HTSS) model and progressively expanded its capabilities to serve as an analysis tool for uninterrupted flow segments, signalized intersections, arterial roads, bus facilities, motorcycle exclusive lanes, and other complex traffic flow behaviors. In addition, in order to improve the efficiency of capacity analysis operations, the Taiwan Highway Capacity Software (THCS) has been developed based on the manual's analysis methods and procedure. To facilitate applications by all parties, the Highway Capacity Manual and analysis software-related content can be downloaded from the "Taiwan Highway Capacity Analysis Area" website.

2. Research Results

- (1) 2022 Taiwan Highway Capacity Manual: The Highway Capacity Manual contains operational characteristics of various highway facilities, methods for evaluating capacity, and an analysis of service standards. The purpose of providing objective information to highway planning and designing personnel is to determine appropriate planning and design plans and to assist in evaluating the service quality of existing facilities, thereby formulating improvement guidelines.
- (2) 2021 Highway Traffic System Simulation (HTSS) model: The HTSS has been developed in conjunction with local highway content research. It is a tool for analyzing freeway, multilane rural highways, two-lane rural highways, signalized intersections, bus facilities, motorcycle exclusive lanes, arterial roads, and other complex traffic flow behaviors.

(3) 臺灣公路容量分析軟體（THCS）：THCS之操作介面，可使公路規劃及設計人員於短時間內瞭解軟體操作方法、降低容量手冊熟悉門檻，減少原本分析性模式對照手冊內容、公式、圖表，逐條逐項計算之錯誤率，及節省模擬模式輸入檔建置時間，且以電腦運算方式獲得精確數值結果。

(4) 臺灣公路容量分析專區網站（網址：<https://thcs.iot.gov.tw/>）：提供臺灣公路容量手冊、THCS軟體及使用手冊下載，以及相關應用資訊及諮詢管道。

3. 成果推廣與效益

(1) 111年8月18日辦理「2022年臺灣公路容量手冊發表說明會」，就臺灣公路容量研究歷程及展望、新版公路容量手冊內容、分析軟體與實務應用等主題進行說明與分享。

(2) 111年9月20、21日分別於臺北、高雄辦理「臺灣公路容量分析軟體實機教育訓練」。

4. 研究成果精華摘要

(3) Taiwan Highway Capacity Analysis Software (THCS): The THCS operational interface enables highway planning and design personnel to quickly comprehend software operation methods. The familiarization threshold for the capacity manual can be lowered, and the content of the existing analysis model comparison manual, formulas, and charts, as well as the error rates for step-by-step calculations, can be simplified. Input file setup time for simulation models can be shortened, and accurate numerical results can be obtained through computer calculation.

(4) The Taiwan Highway Content Analysis Area Website (<https://thcs.iot.gov.tw/>): It provides downloads of the Taiwan Highway Capacity Manual, THCS software, and user manual. In addition, information regarding relevant applications and inquiry channels is provided.

3. Result Promotion and Benefits

(1) The presentation briefing for the 2022 Taiwan Highway Capacity Manual was held on August 18, 2022. The process and future of Taiwan highway capacity research, the content of the new edition of the Highway Capacity Manual, analysis software, and practical applications were explained and shared.

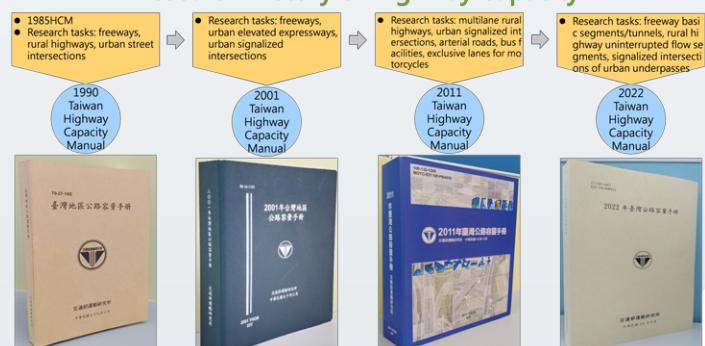
(2) On September 20 and 21, 2022, "Education training on highway capacity analysis software" was held in Taipei and Kaohsiung.

4. Summary of Research Results

公路容量研究歷程



Research History of Highway Capacity



臺灣公路容量手冊出版歷程

Process of Taiwan Highway Capacity Manual Publication



2022年臺灣公路容量手冊內容架構

Architecture of the 2022 Taiwan Highway Capacity Manual Content

5. 研究成果報告

- 2022年臺灣公路容量手冊（111年6月出版）

6. 相關網站

臺灣公路容量分析專區（<https://thcs.riot.gov.tw/>）

5. Research Result Report

- Taiwan Highway Capacity Manual (Published in June 2022)

6. Related Websites

Taiwan Highway Capacity Analysis Area (<https://thcs.riot.gov.tw/>)

(三) 運輸規劃支援系統維運技術服務（111年度）

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、空間環境分析等功能服務。提供規劃人員快速查詢、下載規劃交通建設計畫所需的圖資、數據資料。

未來本所將持續更新整合資料庫，提供予相關單位進行運輸規劃相關研究共享應用，為能與時俱進，將朝導入更多元的巨量資料分析及視覺化技術強化系統功能，並配合運輸規劃作業、城際運輸市場觀察，優化資料庫架構與內容。

2. 研究成果

(1) 本系統以TGOS所提供的豐富多樣之底圖（TGOS MAP、福衛路網圖、量滙路網圖）為圖臺，使用TGOS環境敏感地區圖資等服務，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（運輸規劃社經資料、運輸需求模式資料庫）、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。

(III) Maintenance Service of the Transportation Planning Support System (2022)

1. Project Overview

The Institute of Transportation, MOTC has long conducted comprehensive transportation planning in the Taiwan region, amassing a large quantity of materials necessary for transportation planning operations. Since 2007, "The Research on the Transportation Sector's Long-term Plan Review Decision-making Support System and Integrated Database Establishment" has been conducted in order to effectively preserve data, observe the national transportation market trends, and assist with policy evaluations. Transportation planning integration database; transportation planning support system (web version); transportation plan display and delivery operation system (single user session) are the primary components of the completed transportation planning support system. The database for the integration of transportation planning contains information in four categories: plan data, planning data, planning tools, manuals and review guidelines, indicators, etc. Provide the web version with rapid information search, the PC (single user session) with map compilation, spatial environment analysis, and additional functional services. Provide planning personnel with quick search, map downloads needed to create transportation construction plans, and data.

The Institute of Transportation, MOTC will continue to update integrated databases and distribute them to relevant units conducting research related to transportation planning and sharing applications. In order to keep up with the times, greater emphasis will be placed on big data analysis and the visualization of technical system strengthening functions. In addition, the database architecture and contents are optimized in conjunction with transportation planning information and intercity transportation market operations.

2. Research Results

- Rich and diverse base maps provided by TGOS (TGOS MAP, Fuwei Road Network, Yunhsian Road Network) serve as the foundation for the system that provides access to maps of environmentally sensitive areas in TGOS and other services. In addition, the system digitalizes and generates independent transportation construction plans and major land development plan maps. In conjunction with socioeconomic data, transportation operation data, basic information of the transportation demand model (transportation planning socioeconomic data, transportation demand model database), plan evaluation tools, etc., the public sector's transportation planning units, academic units, and private consultancy firms can quickly search and acquire related maps and data required for transportation planning operations.

(2) 整合交通部高速公路局國道、公路總局省道之交通量，部外主計總處統計之社會經濟資料，及文化部、水利署、農委會、國家公園、營建署等單位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) 應用交通部「臺灣地區交通路網數值資料」與「GIS-T交通網路地理資訊倉儲系統」圖資，結合既有相關開放圖資，產製底圖（包含地形圖、人口密度圖等），行政區界，運輸系統路線（公路、臺高鐵、捷運），運輸場站／設施（臺高鐵、捷運、機場、港口、隧道、橋梁），重要區位（工業區、科學園區、新興計畫區、重要地標、國家公園、觀光景點），計畫區位（刻正辦理之鐵公路交通建設計畫），運輸需求模式路網（包含城際運輸模式等路網）等圖資，存置於系統數據庫之圖形資料，可支援重大交通建設計畫評估。

(4) 應用整合資料庫，協助完成本所自辦研究案「城際運輸消長觀察報告」及「春節連假高速公路與鐵公路客運旅次特性觀察報告」資料蒐集彙整。

(5) 111年新增區域模型模組、更新生活圈運輸模式成果資料、優化各運具起迄旅次分布數據查詢模組功能，進行系統之功能調整與提升。

(2) Directorate-General of Budget, Accounting, and Statistics, Executive Yuan, R.O.C. (Taiwan) tallied the socioeconomic data by integrating the provincial highway traffic volumes of the Freeway Bureau, national highways, and the Directorate General of Highways. In addition, the open data of the Ministry of Culture, the Water Resources Agency, the Council of Agriculture, national parks, and the Construction and Planning Agency enable users to acquire pertinent data quickly and accurately by overlapping base maps and visualizing site searches.

(3) The "numerical data of transportation road network in Taiwan area" and "GIS-T transportation network geographic information storage system" maps were applied. The data and related existing open maps were used to generate base maps (including topographic maps, population density maps, etc.), administrative districts, transportation system routes (highways, HSR, MRT), transportation stations/facilities (Taiwan Railway, MRT, airports, ports, tunnels, bridges), important areas (industrial parks, science parks, new planning zones, important landmarks, national parks, and tourist attractions), and plan areas (ongoing railway and highway construction sites). Major transportation construction plans can be evaluated with the help of map data stored in the system database.

(4) The integrated databases were utilized to complete the collection and compilation of data for the Institute of Transportation, MOTC-led research projects "intercity transportation rise and fall observation report" and "Observation on the Trip Characteristics of Freeway and Railway of Chinese New Year Holidays".

(5) In 2022, regional model modules were added and the data on the results of the living circle transportation model were updated. The distribution of start and end trip data for modes was upgraded to improve the search module and system functions.

3. 成果推廣與效益

(1) 107-110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）予交通部公路總局、內政部營建署及各縣市政府建立永續生活圈運輸評估模型使用。

(2) 111年10月27日辦理「運輸規劃支援系統」之教育訓練」。

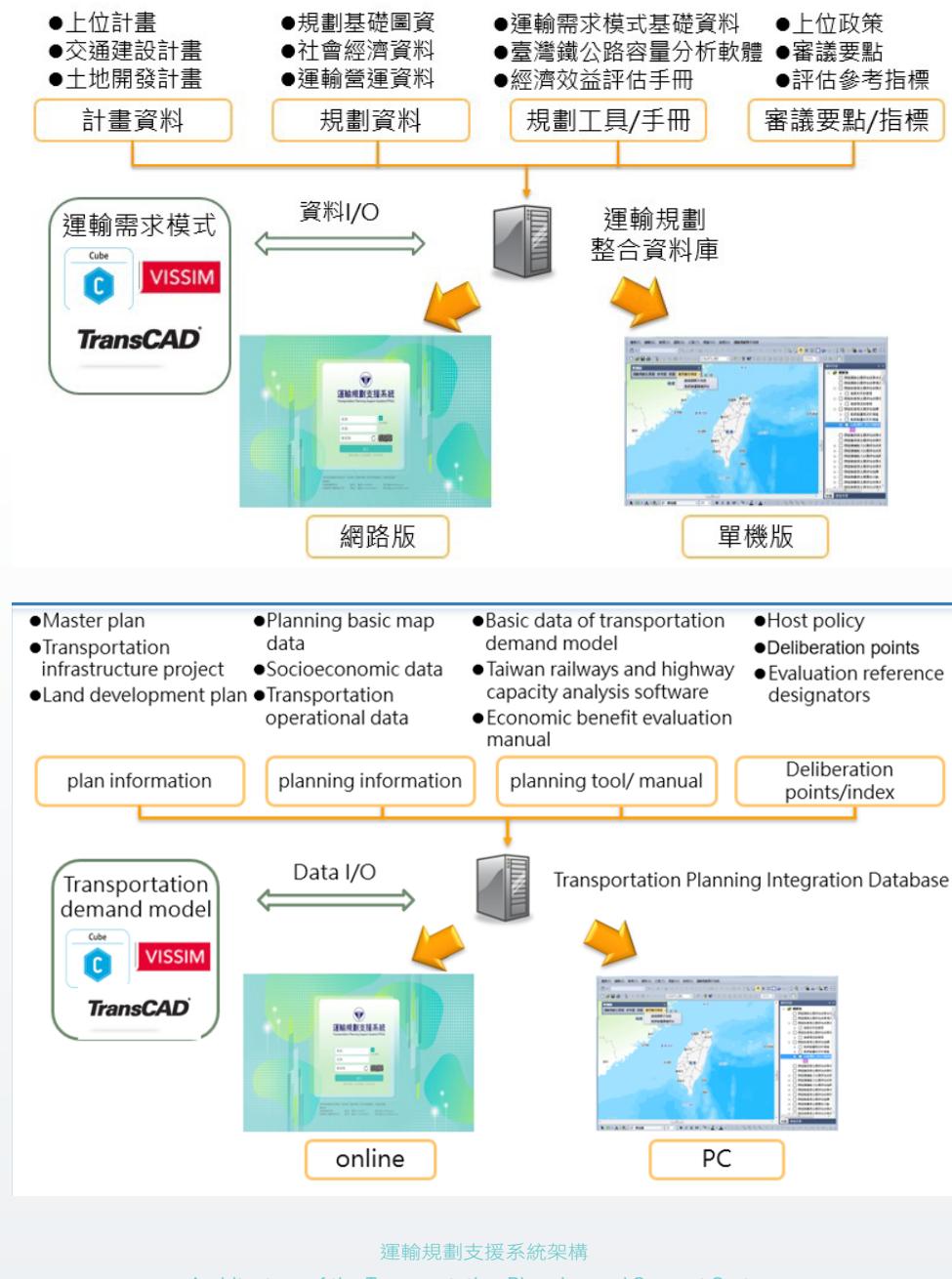
3. Result Promotion and Benefits

(1) The graph databases (transportation systems, transportation stations/transportation construction planning areas, and major land development planning areas) continued to be made available from 2018 to 2021. They were utilized by the Directorate General of Highways, MOTC, the Construction and Planning Agency, Ministry of the Interior, R.O.C., and the county and city governments to construct evaluation models for sustainable living circle transportation.

(2) Education training on the "transportation planning support system" was held on October 27, 2022.

4. 研究成果精華摘要

4. Summary of Research Results



5. 研究成果報告

- 運輸規劃支援系統維運技術服務（110年度）（111年7月出版）

6. 相關網站

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

5. Research Result Report

- Maintenance Service of the Transportation Planning Support System [2021] (Published in July 2022)

6. Related websites

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

(一) 應用模擬模式建立國際機場空側容量評析方法之研究 (2/2) - 桃園機場空側容量評估與分析

1. 計畫概述

機場空側容量分析為民航機場高效率運轉規劃中相當重要之一環，有必要掌握自主研發之核心技術，以支持機場航管、航運及政策擬定單位使用。為此運研所於本計畫第1年期（110年）釐清影響空側容量之核心因素，再於第2年期（111年）完成參數項定義及軟體開發，為我國第一套自主創新研發、以模擬為基礎之機場空側容量評析技術。

本計畫以系統模擬技術為基礎，結合飛航與機場空側運作、等候理論、數學規劃排點與排程等模式，創新研發本土國際機場空側容量評析軟體，並經桃園機場公司真實運轉數據完成驗證。確認技術邏輯確實反映真實狀況與相關規定，具備後續發展人機介面軟體之可行性，可做為政策評估工具，預為模擬機場平日營運或營運期間變動結果，進行不同方案比較及預估機場空側容量，釐清航空器在不同情境之延滯原因。後續可提供民航局、機場公司強化規劃評估與營運調度，使機場空側設施管制作為朝數據化及模式化發展，進而提升我國際門戶機場營運效能，並符合機場長期發展需求。

2. 研究成果

- (1) 完成多跑道機場空側整體容量評析工具建立、雛型軟體開發與模式驗證。
- (2) 完成研提空側容量評估分析所需之參數架構與參數項定義。
- (3) 完成桃園國際機場空側容量在既有條件及分析情境之空側容量評析。
- (4) 研提桃園國際機場提供持續精進方向，有助於提升機場樞紐功能。

Improve the Competitive Advantage of Sea and Air Transportation

- (I) Research on Establishing Airside Capacity Evaluation and Analysis Methods on International Airports Using Simulation Models (2/2)- Taoyuan International Airport Airside Capacity Assessment and Analysis

1. Project Overview

Airside Capacity Evaluation and Analysis is a vital component of high-efficiency airport operation planning. To support the use of air traffic control, shipping, and policy formulation units, it is necessary to understand self-developed core technology. In the first year of the plan (2021), the Institute of Transportation, MOTC clarified the primary factors contributing to airside capacity. In the second year (2022), the parameter definitions and software development were completed. It is Taiwan's first simulation-based airside capacity evaluation and analysis technology developed independently and creatively.

Using system simulation technology as a foundation, this plan combines aviation and airport airside operations, the queueing theory, and mathematics planning arrangement and scheduling models to develop innovative software for domestic and international airport airside capacity evaluation and analysis, thereby completing the validation of operational data for Taoyuan International Airport Corporation. Confirm that the technology logic accurately reflects the actual situation and related provisions, and demonstrate the viability of developing man-machine interface software as policy evaluation tools in the future. It is anticipated that it will be used to simulate daily airport operations or variations in results during the operation period. Various plans are compared and the airport's airside capacity is forecasted in order to determine the cause of aircraft delays in various circumstances. The results are then provided to the Civil Aeronautics Administration and the International Taoyuan International Airport Corporation Ltd. in an effort to improve operational dispatch and planning evaluation. The airport's airside facility control shall move toward digitalized and modularized development, thereby enhancing the operational efficiency of Taiwan's international airport in accordance with the airport's long-term development needs.

2. Research Results

- (1) The establishment of overall multilane airport airside capacity evaluation and analysis tools, the development of prototype software, and the validation of the model have been completed.
- (2) Parameter architecture and parameter definitions necessary for formulating airside capacity evaluation and analysis have been completed.
- (3) The airside evaluation and analysis of Taoyuan International Airport's airside capacity under existing conditions and analysis scenarios have been completed.
- (4) The Taoyuan International Airport has adopted a direction of continuous improvement, which will aid in enhancing the airport's hub functions.

(5) 完成研提後續發展我國國際機場空側模擬分析軟體（含人機介面）之研究架構、工作項目與重要議題。

3. 成果推廣與效益

(1) 111年11月14日召開「國際機場空側容量評析方法建立與後續應用」專家學者座談會，研討議題包括技術推進流程、建立分析方法之挑戰、系統分析成果、參數架構、驗證過程、實務參數項與模式參數項轉化方式、成果應用與後續開發方向。參與人員與單位計有交通部航政司、民航局、民航局飛航服務總臺、桃園機場公司及專家學者，有助於後續精進本技術之實用性，以利我國國際機場營運朝數據化與模式化方向發展。

(2) 後續已規劃於112-113年辦理「國際機場運作模擬分析軟體系統規劃與建置」計畫，強化人機介面之操作親和性，並進行案例測試與教育訓練，俾提供民航局與桃園機場公司落地應用及提高使用便利性。

4. 研究成果精華摘要

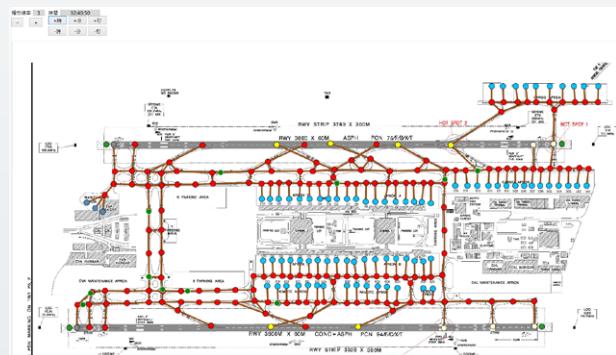
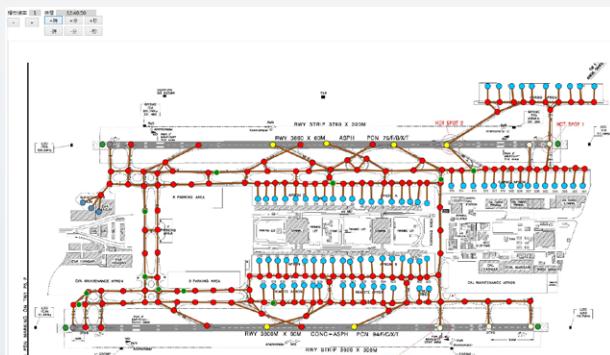
(5) Formulation of the research framework, work items, and significant issues pertaining to airside simulation and analysis software developed for international airports in Taiwan (including the man-machine interface) has been completed.

3. Result Promotion and Benefits

(1) On November 14, 2022, a seminar entitled "Establishment of International Airport Airside Capacity Evaluation and Analysis Methods and Subsequent Applications" was held with the participation of experts and academics. The following topics are discussed: technology promotion processes, difficulties in establishing analysis methods, systematic analysis of results, parameter architecture, verification process, practical parameters, model parameter conversion method, result applications, and future development direction. Participating personnel and units include the Department of Aviation and Navigation, the Civil Aeronautics Administration, the Air Navigation and Weather Services, the Ministry of Transportation and Communications, the Taoyuan International Airport Corporation, as well as experts and academics who contribute to the practicality of this technology's refinement. This will subsequently facilitate the digitalization and modularization of Taiwan's international airport operations.

(2) Between 2023 and 2024, the "Planning and Establishment of the International Airport Operation Simulation and Analysis Software System" plan is scheduled to be implemented. This will increase the operational compatibility of the man-machine interface while conducting case testing and training. The plan will be provided to the Civil Aeronautics Administration and the Taoyuan International Airport Corporation for ground applications, thereby enhancing usability.

4. Summary of Research Results



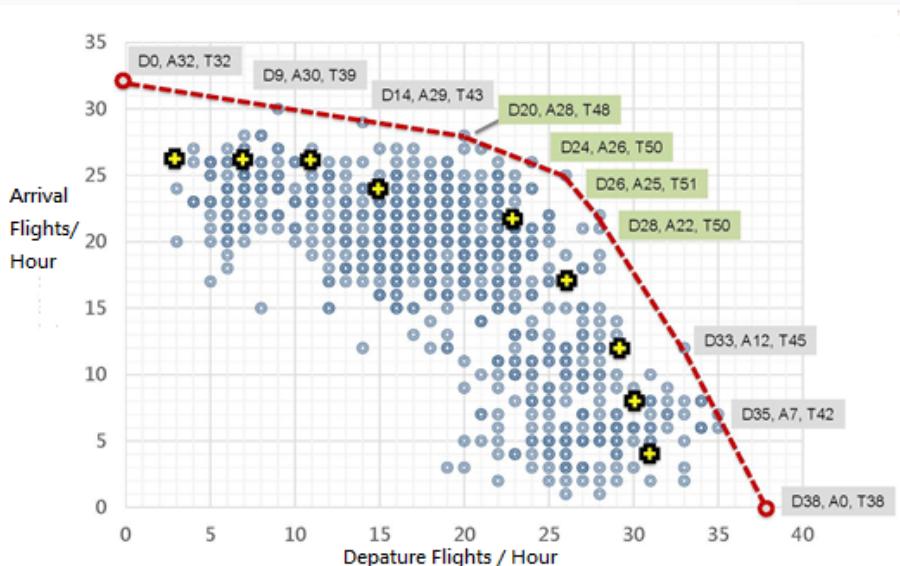
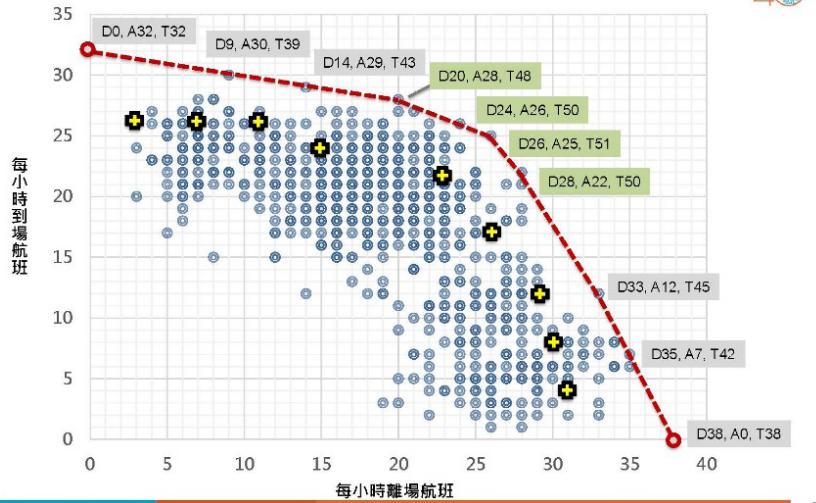
機場空側評析雛型軟體之動畫顯示畫面

The Airport Airside Evaluation and Analysis Prototype Software Animation Display Screen

桃園機場現行雙跑道實際運作包絡線

—數據月份：2019.Jul + Dec 全月，每日10小時

—增加運研所（成大團隊）模擬研究成果（黃十字）



桃園機場雙跑道實際運作包絡線與模擬結果套疊比較圖

The Overlay Comparison Map of Taoyuan International Airport's Dual Runway's Actual Operational Envelope and Simulation Results

5. 研究成果報告

應用模擬模式建立國際機場空側容量評析
方法之研究（2 / 2）-桃園機場空側容量評估與
分析（112年7月出版）

5. Research Result Report

Research on Establishing Airside Capacity Evaluation and Analysis Methods on International Airports Using Simulation Models (2/2)- Taoyuan International Airport Airside Capacity Assessment and Analysis (Published in July 2023)

(二) 國際海運資料庫更新擴充及資料分析服務

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，「國際海運資料庫」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並精進，並於各年度年終依據當年各季資料變化，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2022Q4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1,015處港口之英文名稱、中文名稱、經緯度、所屬國家、所屬貿易區等資料；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) 完成全球疫情前後主航線部署變化、國籍航商之區域航線部署等分析。

(II) Expanding, Updating and Data Analyzing of the International Maritime Database

1. Project Overview

As a result of the rapid transformation of the global economy, the state of maritime freight transport fluctuates significantly. Taiwan, which is surrounded on all four sides by water, is located in the center of East Asia. Despite Taiwan's maritime prosperity over the years, the recent changes have been detrimental. The stagnant position of the Port of Kaohsiung in the global cargo port ranking is cause for grave concern and calls for appropriate government action.

The formulation and evaluation of high-quality policies require high-quality scientific analysis; on the other hand, high-quality data is an essential element of policy formulation. Cargo transport is the focus of Taiwan's maritime transport. Furthermore, maritime cargo transport is a global phenomenon. The "International Maritime Database" collects data on the world's principal maritime cargo transport routes and regional route data. In addition to data statistical analysis and mapping function setting and refinement, as well as quarterly data changes in the current year, issue-based analyses are conducted at the end of each year to gain an understanding of the global shipping market's overview and trends. In addition, in response to current policy or business needs, such as the formulation of a new southbound policy and evaluation of its effectiveness, this system can provide specific and objective quantitative data from the perspective of the cargo transport supply side, which will serve as support.

2. Research Results

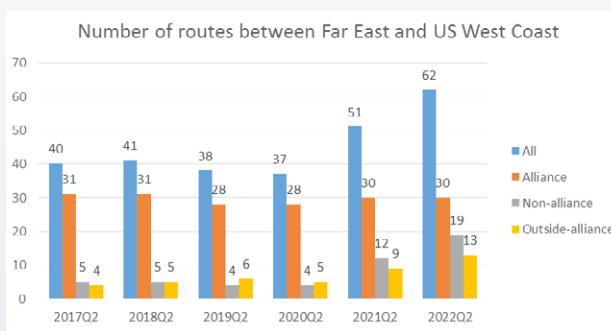
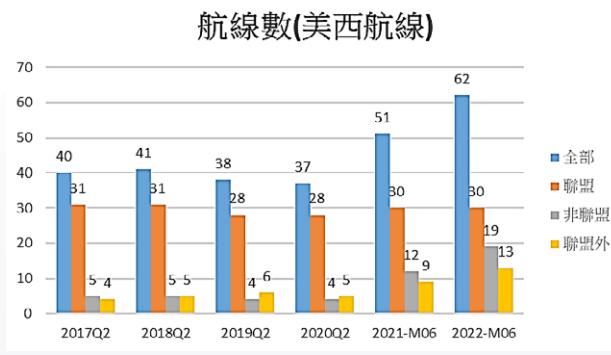
- (1) From the second quarter of 2011 to the fourth quarter of 2023, international periodic cargo route data have been gathered.
- (2) Before 2016, data on 600 routes were collected each quarter, with the Far East as the center; beginning in 2017, the collection of data of all periodic cargo routes around the world was expanded to 1,500-1,550 routes each quarter; and beginning in 2022, data collection was changed to a monthly basis, with approximately 1,800 routes collected each month.
- (3) The English names, English names, latitudes, countries, and trade zones of 1,015 ports were collected. There are 5,200 cargo ships on the routes, or 97% of the total number of cargo ships in the world.
- (4) The information security and defense capabilities are enhanced by enhancing search software (single user session) with data-statistical analysis and reports, as well as the generation of tables and charts.
- (5) The analyses of changes in the main route deployment and regional route deployment of national airlines before and after the COVID-19 pandemic have been completed.

3. 成果推廣與效益

(1) 111年8月30日為臺灣港務公司辦理「國際海運資料庫」單機版查詢軟體教育訓練。

(2) 111年11月16日召開「國際海運資料庫」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。

4. 研究成果精華摘要



2017~2022各年Q2遠東-美西航線航線數變化
Changes in the Second Quarter Number of
Far East-Western American Routes from 2017 to 2022

3. Result Promotion and Benefits

(1) On August 30, 2022, Taiwan International Ports Corporation, Ltd. provided training for the "International Maritime Database" (single user session) search application.

(2) On November 16, 2022, the "International Maritime Database" seminar was held, inviting the industry, government, university, and academic institutions within the shipping industry to present the database's contents, functions, and issue analysis results.

4. Summary of Research Results



陽明海運公司2022Q2區域航線圖
Regional Route Map of Yang Ming Marine Transport
Corporation in the second quarter of 2022

5. 研究成果報告

- 111年度「國際海運資料庫」更新擴充及資料分析服務（112年4月出版）

5. Research Result Report

- Expanding, Updating and Data Analyzing of the International Air Transportation Database of 2022 [Published in April 2023]

(三) 國際空運資料庫更新擴充及資料分析服務

1. 計畫概述

近年全球航空運輸蓬勃發展，航空業重心逐漸移往亞洲地區。亞太國家門戶機場包括桃園、香港、仁川、東京成田、新加坡、上海浦東、廣州等機場，以發展為區域樞紐機場為目標，除積極提升與擴充機場軟硬體設施，亦鼓勵航空公司增加連結航點、增飛班次，也爭取新航空公司加入營運，期吸引更多旅客前往中轉。為利發展樞紐機場，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」建置目的在長期蒐集相關機場之營運 / 設施及旅客起迄等資料，主要包括兩大部分資料，其一為全球200座重要機場之基礎設施、客貨運量、航網等基本資料；其二為包括桃園機場、亞太與北美地區10座重要機場之旅客起迄路徑資料（購自具公信力與代表性之國際航空運輸協會（IATA）），藉由統計分析掌握航空市場發展變化及趨勢，並據以進行重要空運議題分析，協助本所空運相關研究之進行。

2. 研究成果

- (1) 更新我國及全球共200座主要機場之基礎設施、客貨運量、航網等資料，並持續蒐集桃園、香港、仁川、東京成田、上海浦東、新加坡、洛杉磯、紐約甘乃迪等亞太及北美地區重要機場之旅客移動資料，掌握疫情對前述機場旅客運量變化情形，並就旅客移動路徑變化進行分析。
- (2) 完成國際或國內航線資料篩選功能、新增桃園機場貨運資料等。
- (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「2019至2021年桃園機場貨運市場分析」、「疫情期間亞洲主要航空公司貨機機隊應用分析」、

(III) Expanding, Updating, and Data Analysis Services of the International Air Transportation Database

1. Project Overview

In recent years, as the global aviation transport industry has flourished, the aviation industry's focus has gradually shifted to Asian regions. Taoyuan, Hong Kong, Incheon, Tokyo Narita, Singapore, Shanghai Pudong, and Guangzhou, among others, adhere to the objective of developing regional hub airports. Airports are also encouraged to increase the number of waypoints and flights, in addition to actively enhancing and expanding their software and hardware facilities. Additionally, new airlines have been solicited to join operations, and more passengers are anticipated to take transit. To facilitate the development of hub airports, the growth trend of the international air transport market and relevant airport changes should be constantly monitored.

The objective of establishing the "International Air Transportation Database" is to collect information regarding airport operations/facilities and passenger origin/destination routes. The data consists primarily of two sections: 1. The infrastructure of 200 major airports, cargo volume, aviation network, and other basic information; 2. The start and end routes of passengers of 10 major airports, including Taoyuan International Airport, and airports in Asia-Pacific and North America (purchased from the International Air Transport Association (IATA) with credibility and representatives), are used to analyze significant air transport issues and assist the Institute of Transportation in conducting air transport-related studies.

2. Research Results

- (1) The data on the infrastructure, passenger cargo volume, and aviation network of 200 major airports in Taiwan and around the world have been updated. The passenger moving data of major airports in Taoyuan, Hong Kong, Incheon, Tokyo Narita, Shanghai Pudong, Singapore, Los Angeles, John F. Kennedy International Airport, and the Asia-Pacific and North American regions continued to be collected in order to comprehend changes in the passenger volumes of the aforementioned airports as a result of the COVID-19 pandemic and analyze modifications in passengers' moving routes.
- (2) The international or domestic air route data screening functions have been completed, and Taoyuan International Airport's cargo data has been added.
- (3) Databases were analyzed using big data, and airport data was obtained. Issue-based analyses were conducted on policy and industrial issues, including "2019-2021 Taoyuan International Airport Freight Market Analysis", "Analysis of Asia Major Airlines Freight Fleet Application during the Pandemic Period", and "changes in the trips of moving routes between Southeast Asian countries and European countries and the United States."

「東南亞國家往返歐美移動路徑之旅次變化」等，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。

3. 成果推廣與效益

- (1) 111年5月26日於交通部第1828次部務會報報告「疫情對國際航空市場之衝擊」。
- (2) 111年11月21日邀集交通部、民航局、桃園機場公司、航空公司等單位座談，分享本年度研究成果，並蒐集與會單位需求建議，做為空運資料庫未來精進之參考。

4. 研究成果精華摘要

Evaluation and analysis results will be provided to the Department of Aviation and Navigation, the Civil Aeronautics Administration, MOTC, Taoyuan International Airport Corporation, and airline companies as strategic formulation and evaluation references.

3. Result Promotion and Benefits

- (1) The 1828th MTOC Ministerial Affairs Report "The Impact of the Pandemic on International Aviation Markets" was held on May 26, 2022.
- (2) On November 21, 2022, the Ministry of Transportation and Communications, the Civil Aeronautics Administration, the International Taoyuan International Airport Corporation Ltd., airline companies, and other agencies were invited to a seminar where the results of the annual research were presented. The demands and suggestions of the participating units were also collected for future use in the improvement of air transport databases.

4. Summary of Research Results



5. 研究成果報告

- 111年度「國際空運資料庫」更新擴充及資料分析服務（111年12月出版）

5. Research Result Report

- Expanding, Updating and Data Analyzing of the International Air Transportation Database of 2022 (Published in December 2022).

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 (110-111年)

1. 計畫概述

為落實公共運輸發展，鼓勵大學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。

區域中心前期計畫自104年10月起執行迄109年10月底屆滿，在5年之計畫執行過程中，主要工作項目多已完成階段性任務，為賡續前期計畫之辦理成果及執行成效，本所奉交通部核定於110年接續實施「區域運輸發展研究中心服務升級2.0計畫」（110-111年），以「區域性（跨縣市）」、「連結政策」及「跨域整合」為執行重點，推動區域治理與在地深耕，擴大成果推廣應用及對區域發展的長期擘劃引導精進與升級，連結國家重大政策，透過公運計畫預算及道安經費，穩健推動公共運輸發展，同時納入地方道安改善專案的輔導協助。

2. 研究成果

(1) 辦理交通運輸及道路交通安全專業人才培訓課程：111.1-111.12共開設81門實體課程，參與學員達2,319人次。另線上課程部分，共開設12門，觀看人次約達1,600人次。

III

Optimize Public Transportation Services and Industrial Transformation

(I) Implement the Service Upgrade 2.0 Plan for the Regional Transportation Research and Development Center (2021-2022)

1. Project Overview

Since 2015, the Ministry of Transportation and Communications has allocated funds and tasked the Ministry of Transportation with the "Establishing Public Transportation Development" task in order to implement public transportation development, encourage universities and colleges to use rich basic R&D facilities and research resources, assist the Ministry of Transportation and Communications in related policy promotion, and compensate for manpower and capability shortages in promoting road public transportation. Through the Regional Transportation Research and Development Center (henceforth the regional center), local governments' capacities can be strengthened while promoting the collaborative development of academia, industries, and government sectors, resulting in the implementation of sustainable local public transportation development.

Since the implementation of the pre-plan planning of the regional center from October 2015 to the end of October 2020, the phasal tasks of the principal work items have been completed. The Institute of Transportation, with the approval of the Ministry of Transportation and Communications, has continued to implement the "Implement the Service Upgrade 2.0 Plan for the Regional Transportation Research and Development Center (2021-2022)" in 2021, with the implementation focuses of "regional (cross-county and cross-city)," "linking policies," and "cross-domain integration." Regional governance and local cultivation are encouraged, while guiding the improvement and upgrade of long-term regional development planning. Major national policies are linked to budgets for public transportation plans and road safety funds in order to steadily promote the development of public transportation. In addition, local road safety improvement plans incorporate counseling and assistance.

2. Research Results

(1) Conducting training courses for professionals in transportation and road safety: From January to December 2022, a total of 81 physical courses were held, with 2,319 participants. In addition, 12 online courses were conducted with approximately 1,600 participants.

- (2) 協助地方政府進行公共運輸案例研析：111.1-111.12共協助地方政府進行公共運輸案例研析計18案，並賡續就「偏鄉公共運輸營運模式檢討及創新作為」與「轉運站設置成效之檢討與策進作為」兩項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營運及轉運站設置成效檢討，並提出未來營運或設置之改善建議策略。
- (3) 提供地方政諮詢服務及輔導地方政府提案：111.1-111.12已提供92次之諮詢服務，其中49次有地方政府局處長層級人員參與。
- (4) 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。

3. 成果推廣與效益

- (1) 有關「公車進校園服務成效盤點與精進建議」案，完成盤點校園聯外公共運輸，研提未來精進策略，並至交通部道安會第253次委員會議報告，本案盤點建議的51所學校獲採納優先推動改善。
- (2) 有關立法委員提案「北高雄公路公共運輸服務升級計畫」，就北高雄8區公路公共運輸服務課題彙整並釐清需求，提出12項短期改善方案及3項中長期改善方案，代辦部稿函復立法院交通委員會。
- (3) 高屏澎區域中心協助高屏地方政府及客運業者，在MeN Go服務之精進方面，針對111年6月至7月「MeN Go紓困優惠方案」完成短距離之私有運具移轉成效分析，並提出未來定價及月票方案；就MeN Go服務之範圍擴展機會部分，配合未來捷運路線培養運量需求，推動新闢兩條可納入服務範圍之跨高屏快捷公車，以及推動高墾線共營中心路線納入服務範圍之方案共識。

- (2) Assisting local governments in evaluating and analyzing proposals for public transportation: Between January 2022 and December 2022, 18 cases of assisting local governments in implementing public transportation proposals were documented. In addition, planning and implementation for the two issues "Remote Public Transportation and Operational Model Review and Innovative Practices" and "Review and Promotional Practices of Station Establishment Effectiveness" continued. The focus was on discussing the remote public transportation service operations of local governments and evaluating the effectiveness of bus station layouts. In addition, strategies and recommendations for improving future operations or setups were proposed.
- (3) Providing local policy consultation services and counseling for government proposals: From January 2022 to December 2022, consultation services were rendered 92 times, with local government bureau and division directors participating 49 times.
- (4) Cross-domain cooperation and the integration of cross-ministry/agency resources included not only the promotion of highway public transportation, but also regional industrial upgrade counseling, thereby implementing service innovation and system construction.

3. Result Promotion and Benefits

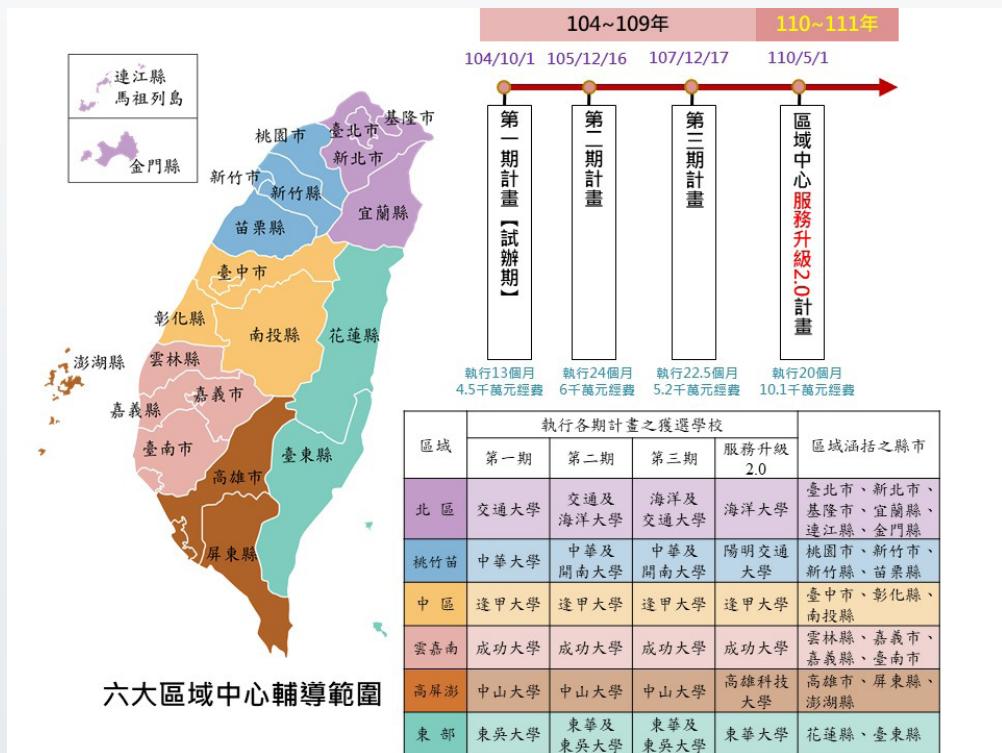
- (1) Concerning the "Inventory of the Effectiveness of Campus Bus Service and Recommendations for Refinement," an inventory of campus-connecting public transportation was conducted, and recommendations for future refinement were made. In the report of the 253rd committee meeting of the MOTC Road Safety Committee, 51 schools were prioritized for improvement based on an inventory of this plan.
- (2) Concerning the legislators' "Plan for the Public Transportation Upgrade of Highways in North Kaohsiung" proposal, highway public transportation service issues in eight Kaohsiung districts were compiled and needs were clarified. Proposed were 12 short-term improvement plans, three medium-term improvement plans, and three long-term improvement plans. On behalf of the ministry, a draft letter was sent to the Legislative Yuan Transportation Committee.
- (3) The Kaohsiung-Pingtung-Penghu Regional Transport Research Center has worked with the local governments of Kaohsiung and Pingtung, as well as bus operators, to improve MeN Go services. Short-distance mode transfer effectiveness analysis was completed with a focus on the "MeN Go Relief Preferential Plan" from June to July 2022. Pricing and monthly pass plans for the future were also proposed. In terms of opportunities for expanding the MeN Go service scope in conjunction with developing the volume of freight demand for future MRT routes, two express bus routes in Kaohsiung and Pingtung were suggested. A consensus was reached to promote the inclusion of the Kaohsiung-Kenting Route Co-Operation Center routes into the service scope.

(4) 中區區域中心輔導臺中市政府推動梨山地區之偏遠地區當地社會團體或個人成立市區汽車客運業，並完成共享平台之規劃與導入，以提供更便利之公共運輸服務，111年5月至10月之總搭乘人數達4,800人次（平均每班次載客數約為2.15人）。

(5) 東部區域中心輔導花東地方政府及地方創生團體合作，為推廣部落觀光與改善公共運輸服務，結合幸福巴士服務研擬跨領域資源之觀光遊程，並於111年試辦期間率國內大學生團、親子團以及馬來西亞籍旅客體驗遊程。

(6) 本所與6大區域中心於111年12月23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，期許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，來滿足民眾交通行動需求並保障通行安全，俾供中央及地方作為改善之參考依據。

4. 研究成果精華摘要



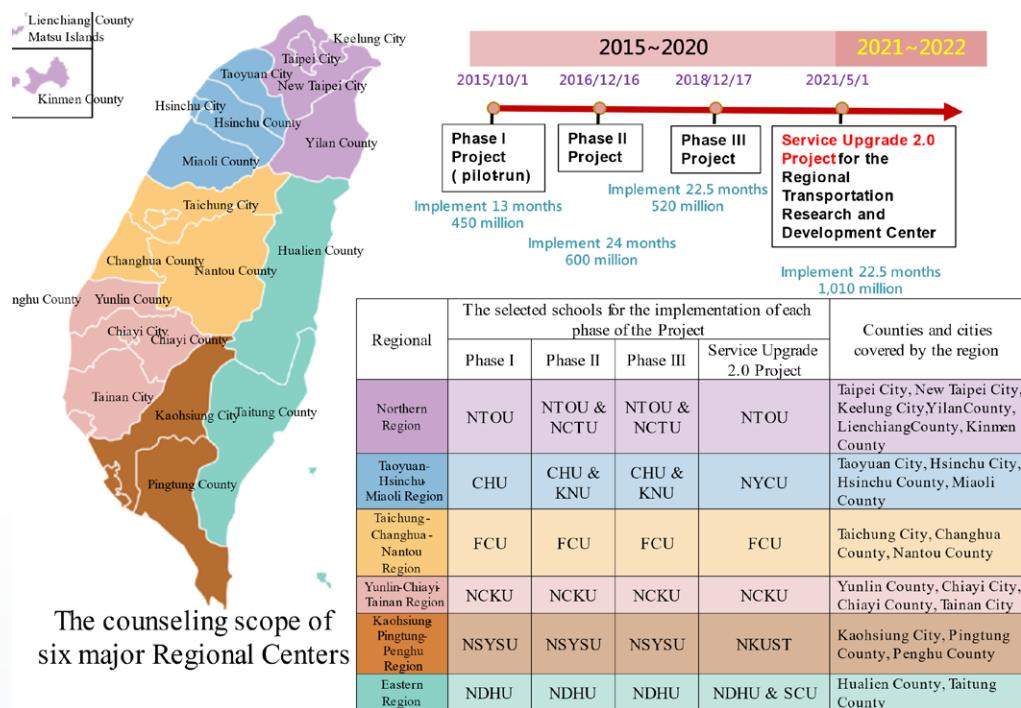
六大區域中心輔導範圍及執行各期區域中心計畫之獲選學校

(4) The Central Regional Center advised the Taichung City Government on how to promote the establishment of city bus companies for local social groups and individuals from remote Lishan towns. In order to improve the convenience of public transportation services, the planning and importation of a shared platform were also completed. From May to October 2022, the total number of passengers reached 4,800, with an average of 2.15 passengers per scheduled bus run.

(5) The Eastern Region Center advised Hualien and Taitung local governments on how to collaborate with local creation groups. Tourism travel with cross-domain resources was developed in order to promote tribal tourism and enhance public transportation services in conjunction with bus services. Domestic university student groups, parent-child groups, and Malaysian passengers were encouraged to travel during the trial period in 2022.

(6) On December 23, 2022, the Institute of Transportation and six regional centers held a "regional center joint results presentation." It is anticipated that through six regional centers, the more intertwined exchanges and interactions of agency unit representatives, scholars, experts, and industrialists, the opinions of industry, government, and academia can be gathered. In turn, this results in the conceptualization of future public transportation service development and road safety improvement directions to meet the public's transportation action needs and ensure passage safety, thereby serving as a reference for central and local governments.

4. Summary of Research Results



The Scope of counseling for Six Regional Centers and Schools Selected to Implement Different Phases of Regional Center Project

(二) 推動通用計程車特約制度 (1/2) - 系統擴充及跨部會合作規劃與執行

1. 計畫概述

依國家發展委員會估計，我國正逐步從「高齡化社會」進入「超高齡社會」，人口老化將使長期照顧、就醫、復健等需求增加，間接造成交通需求亦將增加。本所於109年透過規劃無障礙小客車運輸服務發展環境與推動策略，以因應未來社會需求外，並整合資訊技術以建構無障礙友善環境，來滿足行動不便者日常交通需求，並以「愛接送」為服務品牌，推動預約式通用計程車服務。

本計畫執行期間自110年7月至111年7月，續於臺北市、新北市、桃園市、臺中市等4個直轄市辦理「愛接送-預約式通用計程車服務」外，並將前期計畫成功經驗擴散推廣至臺南市及高雄市，同時滾動檢討通用計程車特約制度、擴充愛接送系統平臺功能以及探討跨部會資源整合議題，以積極開展高齡及行動不便者友善的交通服務，為我國即將進入超高齡社會預為準備。

(II) Implement the Contract System of Accessible Taxis (1/2) – System Expansion and Cross-Ministries/Agencies Cooperation Planning and Implementation

1. Project Overview

The National Development Council estimates that Taiwan is gradually transitioning from an "aging society" to a "super-aged society." The aging of the population will increase the demand for long-term care, medical care, and rehabilitation. This indirectly causes a rise in transportation demand. Through the planning of an accessible light vehicle transportation service development environment and promotion strategies in 2020, the Institute of Transportation responds to future social demand and integrates information and communications technology to create an accessible environment. The transportation needs of individuals with limited mobility can be met. Using "itaxi" as the service brand, promote wheelchair-Accessible Taxi (WAT) services based on reservations.

July 2021 to July 2022 was the implementation period for the plan. In addition to continuing to provide "itaxi-pre-booking wheelchair-Accessible Taxi (WAT) services" in the four special municipalities (Taipei City, New Taipei City, Taoyuan City, and Taichung City), the successful pre-plan planning experience was promoted in Tainan City and Kaohsiung City. Simultaneously, a rolling review of the wheelchair-Accessible Taxi (WAT) contract system was conducted in order to expand the itaxi system platform's capabilities and discuss issues pertaining to cross-ministry/agency resource integration. To prepare Taiwan for its impending transition into a super-aged society, accommodating transportation services for the elderly and those with mobility issues have been aggressively introduced.

2. 研究成果

- (1) 完成「愛接送-預約式通用計程車」系統功能擴充，並開發2款自動排程模組之演算法，以優化民眾、特約業者以及主管機關之使用體驗。
- (2) 完成通用計程車特約制度推廣應用，延續本所109年推動通用計程車特約制度經驗，除於臺北市、新北市、桃園市及臺中市持續提供服務外，並擴大推廣至臺南市、高雄市，完成六都皆有愛接送，辦理6場次有推動通用計程車特約制度相關之說明會及工作坊，以及2場專家學者座談會。
- (3) 完成跨部會合作規劃與執行相關工作，包括：盤點相關部會辦理通用小客車運輸服務或提供民眾使用補助之現況、深入探討有關跨部會合作議題，並訂定跨部會合作策略與願景、定義績效指標，並規劃設計與執行跨部會合作方案，以及研擬下期跨部會合作示範計畫細節，並配合示範計畫需求，完成系統功能增修工作，並完成與新北市復康巴士轉介功能，支援復康巴士需求。
- (4) 完成「交通部公路公共運輸補助通用計程車作業要點修正規定(草案)」、「交通部鼓勵購置通用計程車補助要點(草案)」、「通用計程車特約業者管理要點(草案)」、「通用計程車特約業者營運獎勵金發給作業要點(草案)」、「通用計程車特約業者合約範本(草案)」、「通用計程車特約業者使用者服務須知(草案)」等，提供交通部與地方政府加速完成特約制度法制作業程序，縮短導入通用計程車特約制度時程，精進並加速通用計程車推動成效。

2. Research Results

- (1) The expansion of the "itaxi-prebooking wheelchair-Accessible Taxi (WAT)" system function has been completed. Two algorithms of the automatic scheduling model were developed to optimize the user experience for the general public, contract businesses, and competent authorities.
- (2) Promotion and implementation of the wheelchair-Accessible Taxi (WAT) contract system have been concluded. In addition to continuing to provide services in Taipei City, New Taipei City, Taoyuan City, and Taichung City, itaxi promotion was expanded to Tainan City and Kaohsiung City, making it available in all six special municipalities. Six briefings and workshops on promoting the wheelchair-Accessible Taxi (WAT) contract system were held, in addition to two seminars with experts and scholars.
- (3) Completing tasks related to the planning and implementation of cross-ministry/agency cooperation: creating an inventory of the ministries responsible for general light vehicle transportation services or public use subsidies; holding in-depth discussions on cross-ministry/agency cooperation issues; developing a strategy and vision for cross-ministry/agency cooperation; defining performance indicators; and planning, designing, and implementing cross-ministry/agency cooperation. The subsequent phase of cross-ministry/agency cooperation was outlined in detail. In addition, the system function addition and revision were completed in accordance with the demonstration plan requirements, and New Taipei City's rehabus referral function was completed to support rehabus requirements.
- (4) The "Procedural Guidelines for Amendments to MOTC Road Public Transportation Subsidy for Wheelchair-Accessible Taxi (WAT) [Draft]", "Guideline for MOTC Subsidy for Encouraging Purchase of wheelchair-Accessible Taxi (WAT) [Draft]," "Management Guidelines for Management of wheelchair-Accessible Taxi (WAT) Contract businesses [Draft]," "Procedural Guidelines for Distribution of Operational Incentives for Wheelchair-Accessible Taxi (WAT) Contract Businesses [Draft]," "Example of Contract for Wheelchair-Accessible Taxi (WAT) Contract Businesses [Draft]. In turn, the Ministry of Transportation and Communications and local governments expedited the completion of the operating procedures for the contract system, shortening the timeline for the wheelchair-Accessible Taxi (WAT) contract system and enhancing and accelerating the effectiveness of wheelchair-Accessible Taxi (WAT) promotion.

3. 成果推廣與效益

(1) 110年11月18日~110年11月20日於「臺北國際照顧科技應用展」參展，110年12月20日於高雄辦理測試者說明會，另目前完成臺北市、新北市、臺中市、桃園市、高雄市、臺南市共6都導入，辦理多次特約業者甄選，納入14家通用計程車特約業者385輛車參與計畫。自109年9月2日~111年12月31日，完成319,234趟次服務。目前累計7,719位會員實際搭乘。

(2) 「愛接送」預約整合系統之服務特色包括：(1) 節省民眾時間：各地方政府設置單一預約入口；(2) 資訊公開透明：各特約車隊預先提供服務趟次供乘客預約；(3) 強調公平交易：預估車資先有數，按表收費很安心；(4) 掌握潛在需求：系統平台具候補機制，可提供車隊配置車輛與設定服務趟次之參考；(5) 落實補助稽核：透過系統化標準作業流程，各環節資訊互相自動勾稽，輔以行車軌跡資料及大數據分析，交易紀錄難以造假；(6) 提供API介面：連結業者既有系統，讓車隊業者發揮專業職能；(7) 守護乘客安心搭乘：服務流程新增乘客輪椅固定後照相，配合行車軌跡全紀錄，可保障司機、乘客雙方權利義務關係。

(3) 從上述特色得知系統已針對身心障礙與行動不便者提供單一入口網站預約用車並承諾愛接送服務公平且不加價；透過自動排程串接趟次使專營通用計程車之業者，以不影響業者既有模式納入愛接送服務模式；針對主管機關的部分透過系統化管理與電子稽核，落實營運補助成效、優化服務及產業提升，以建構行動不便者友善運輸環境，解決其日常生活交通需求，擴大生活及社交領域，融入社會。

3. Result Promotion and Benefits

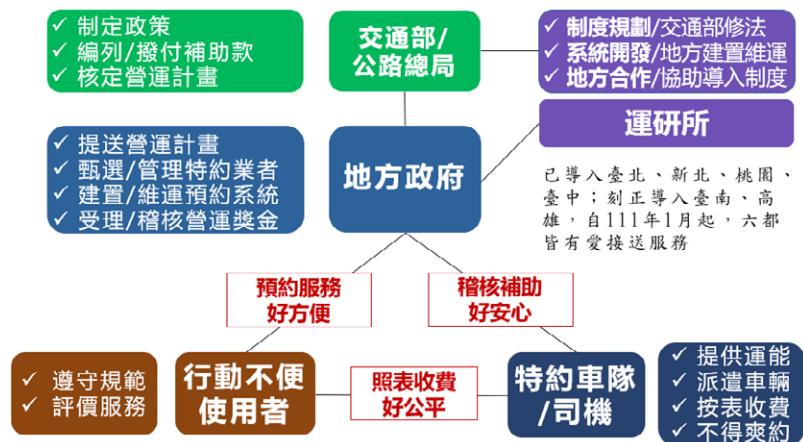
(1) The "Cares Taipei" exhibition was held between November 18 and November 20, 2021. A briefing for the subjects was held in Kaohsiung on December 20, 2021. To conduct selection of multiple contract businesses, importation was completed in six special municipalities, including Taipei City, New Taipei City, Taichung City, Taoyuan City, Kaohsiung City, and Tainan City. The plan was joined by 14 wheelchair-Accessible Taxi (WAT) contract operators and a total of 385 vehicles. From September 2, 2020 to December 31, 2022, 319,234 services were performed in total. There are currently 7,719 members who have taken rides.

(2) The service characteristics of the "iTaxis" pre-booking integration system include: (1) Save time for the public: local governments set up a single pre-booking portal; (2) Openness and transparency of information: passengers can book in advance for all service trips offered by each contract fleet; (3) Emphasize fair trading by estimating the taxifare ahead of time and basing the fare on the meter with confidence; (4) Recognize potential needs: the system platform includes a backup mechanism for the fleet's vehicle configuration and the scheduling of service trips; (5) Carry out a subsidy audit: using systematized standard operating procedures, the information in various sections is automatically audited, which is supplemented by vehicle tract data and big data analysis to ensure that trading records cannot be falsified; (6) Provide an API interface: connect businesses' existing systems so that fleet operators can use their professional expertise; (7) provide passengers with peace of mind for rides: photographs of fixed wheelchairs are added to service processes, which, when combined with complete tract records, protect both drivers and passengers.

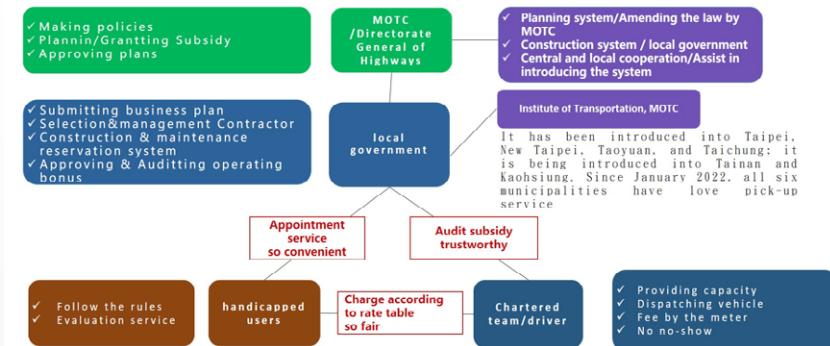
(3) The features listed above show that a single website is available for people with disabilities and mobility issues to pre-book a car. It is also guaranteed that iTaxi pick-up and delivery services are fair at no additional cost; through automatic scheduling linked to the number of trips, so that specialized wheelchair-Accessible Taxi (WAT) businesses are included in the iTaxi service model without affecting businesses' existing models; and by targeting competent authorities, operational subsidy effectiveness is implemented, services are optimized, and the industry is improved. To meet daily transportation needs, expand living and social fields, and blend into society, a friendly transportation environment for those with mobility difficulties is created.

4. 研究成果精華摘要

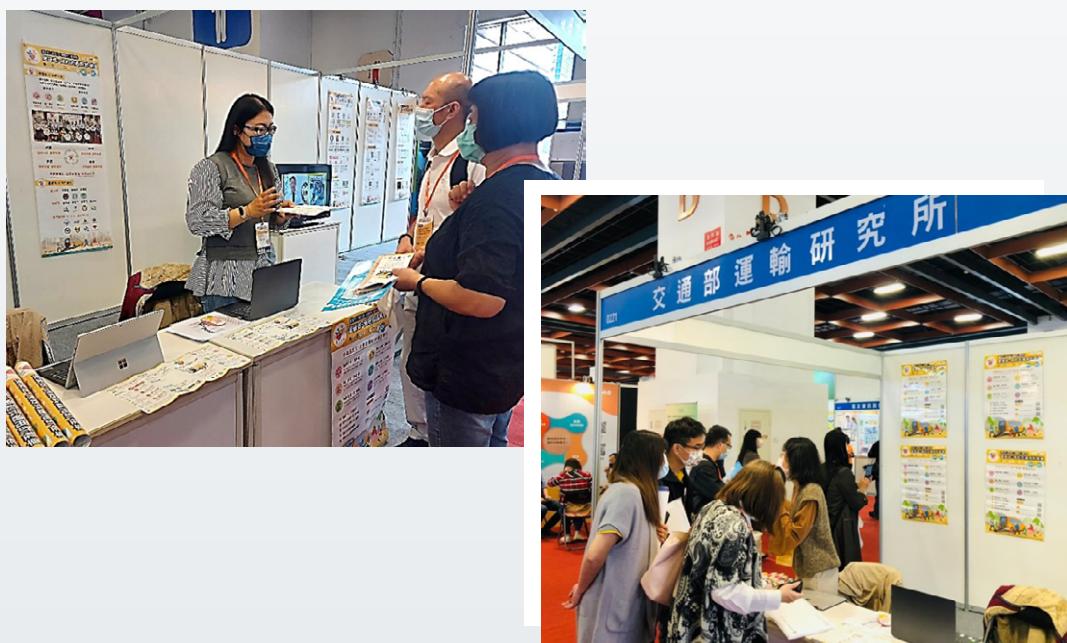
4. Summary of Research Results



Special contract system operation mechanism



特約制度運作機制
Contract System Operational Mechanism



參加110年11月18-20日臺北國際照顧科技應用展
Attend the Cares Taipei from November 18~November 20, 2021.



圓愛接送宣傳影片

愛接送宣傳影片

iTaxi advocacy video

5. 研究成果報告

- 推動通用計程車特約制度（1/2）－系統擴充及跨部會合作規劃與執行（預計112年8月出版）

(三) 先進公車智慧化營運管理先導運行計畫（1/2）－整合車載設備之駕駛工時管理系統研發

1. 計畫概述

因應數位化趨勢，為強化公司駕駛身分識別、駕駛時間（工時）管理、及行駛資訊儲存及輸出格式等後續業務管理，交通部已於107年1月31日以歐盟EC 561/2006規範為基礎，增訂車輛安全檢測基準第16點之1數位式行車紀錄器規定，明訂自110年1月1日起，新型式之大客車及大貨車新車及自112年1月1日起，各型式大客車及大貨車新車應裝設符合規定之數位式行車紀錄器，因此，最遲112年1月1日後，各型式大客車及大貨車新車都將裝設符合規定之數位式行車紀錄器。

5. Research Result Report

- Implement the Contract System of Accessible Taxis (1/2) – System Expansion and Cross-Ministries/Agencies Cooperation Planning and Implementation [Scheduled to be published in August 2023]

(III) Advanced Bus Intelligent Operation Management Pilot Operation Project (1/2) – Research and Development of Integrated On-board Equipment Driving Hours Management System

1. Project Overview

In response to the trend toward digital media, and in order to strengthen company drivers' identity, driving time (work hours) management, driving information storage, output format, and other subsequent business management, the Ministry of Transportation and Communications added one digital GPS regulation to No. 16 of Vehicle Safety Testing Basis on January 31, 2018, in accordance with European Parliament Regulation (EC) No 561/2006. Beginning January 1, 2021, new large passenger cars and large trucks must be equipped with conforming digital GPS, with full compliance required by January 1, 2023. As a result, by January 1, 2023, large passenger cars and large trucks will be equipped with conforming digital GPS.

本計畫執行期間自110年7月至111年4月，本計畫即根據前述數位式行車紀錄器法規革新契機，並延續108年度「車載診斷系統（OBD）在運輸科技管理之應用研究」所得之研究成果，提出「先進公車車載設備功能整合與智慧化營運管理先導運行計畫」，希冀在法規要求的數位式行車紀錄器基礎之上，利用車輛內建的OBD系統讀取車輛即時數據，並分析引擎轉速、車速、水溫和故障代碼等數據以及車輛各個感知器等機械狀態，整合CAN Bus與ADAS系統，進一步判定車輛與駕駛的行為，接著透過車聯網與區塊鏈紀錄，將行車資料上傳至雲端系統，達成S.M.A.R.T智慧化客運營運管理服務目標。

2. 研究成果

- (1) 制定整合車載網路系統（OBD / CAN Bus）與區塊鏈功能之車載設備硬體規格與軟體規格，並研發整合車載網路系統（OBD / CAN Bus）與區塊鏈功能之車載設備模組。
- (2) 完成一套「運用區塊鏈車載網路系統在客運駕駛工時管理系統」，包含車載模組雛型機與雲端後台資料庫暨管理介面。
 - a. 車載模組雛型機包含OBD、GPS、4G無線網路傳輸模組、晶片讀卡機、方向盤握力感知器、攝影機等周邊裝置，可執行駕駛員身分識別、駕駛工時紀錄、及OBD車輛行駛資訊與故障碼儲存，並可將前述資料即時透過行動網路傳輸到區塊鏈系統與雲端後台資料庫。
 - b. 雲端後台資料庫暨管理介面可讓管理者查詢受監控車輛之駕駛工時與車輛狀態，並具備車輛故障預警功能，可針對可能發生超時工作或是可能發生故障的車輛駕駛提出警示。

The plan proposed the "Advanced Bus Intelligent Operation Management Pilot Operation Project" from July 2021 to April 2022, based on the aforementioned digital GPS regulatory reform opportunities and in continuation to the "Applied Research of the On-Board Diagnostics (OBD) in Transportation Technology Management." It is hoped that, in addition to the digital GPS required by the regulations, the vehicles' built-in OBD system will be used to read real-time vehicle data. Engine speed, vehicle speed, water temperature, fault code, and other data, as well as sensors and mechanical statuses, are also analyzed in order to integrate the CAN Bus and ADAS system, determining vehicle and driver behaviors. Vehicle travel data is uploaded to the cloud system via the Internet of Vehicles (IoV) and blockchain records, achieving the goal of S.M.A.R.T smart highway bus operation management services.

2. Research Results

- (1) Specifications for integrated on-board network systems (OBD/CAN Bus) and blockchain-enabled on-board equipment hardware and software have been formulated. In addition, an integrated on-board network system (OBD/CAN Bus) and on-board equipment modules with blockchain capabilities have been developed and integrated.
- (2) The development of a "highway bus driving hour management system utilizing the blockchain on-board network system" has been completed. It includes a prototype on-board module as well as a cloud backend database and management interface.
 - a. OBD, GPS, a 4G wireless network transmission module, a chip card reader, a steering wheel grip sensor, a camera, and other peripheral devices are included in the prototype on-board module. These devices can be used to perform driver identification and driving hours recording, store OBD vehicle driving information and fault codes, and transmit the aforementioned information via the mobile network to the blockchain system and cloud backend database.
 - b. Managers can use the cloud backend database and management interface to query the driving hours and vehicle status of the monitored vehicles. There is also a vehicle failure warning feature. It can send out alerts for potential overtime work or malfunctioning vehicle drivers.

(3) 前述完成之「運用區塊鏈車載網路系統在客運駕駛工時管理系統」，已選定臺中客運及總達客運進行整合車載網路系統（OBD/CAN Bus）與區塊鏈功能之車載設備模組在客運駕駛工時管理之道路實測，共派遣4輛公車、16位駕駛，行駛4條路線，行駛397趟次，累計行駛時數達615.11小時，各項測試結果顯示，本系統可達到預期目標。

3. 成果推廣與效益

- (1) 執行期間與臺中客運及總達客運2家業者進行實測作業。
- (2) 分別於110年12月7日及111年3月7日辦理2場次專家學者座談會，邀請會專家學者、客運業者及相關主管機關對於汽車運輸業應用新科技營運管理進行探討。

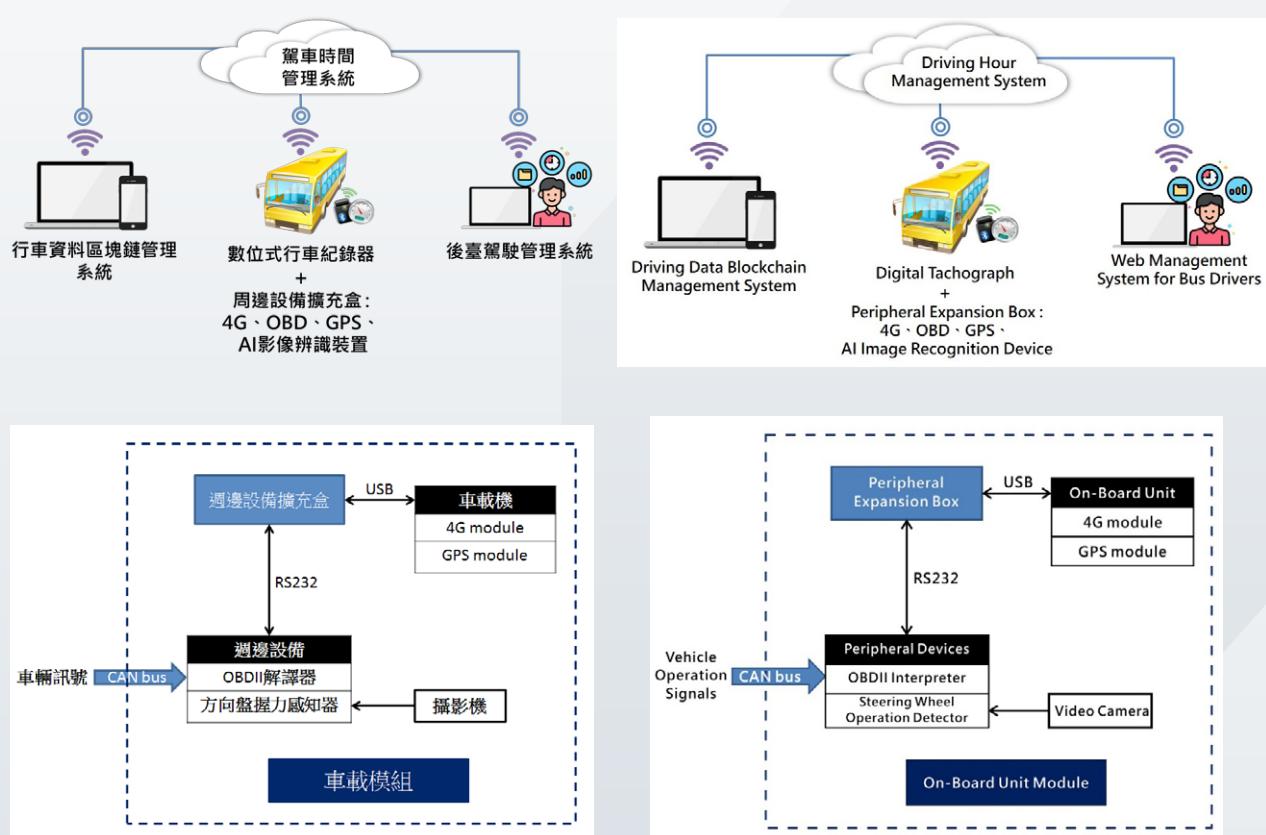
4. 研究成果精華摘要

(3) In the "Utilizing Blockchain On-board Network System in the Highway Bus Driving Hours Management System," Taichung Bus and All Day Bus were chosen to conduct a road test of the OBD/CAN Bus and blockchain functions for highway bus driving hour management. Four buses were dispatched, with a total of sixteen drivers, four driving routes, and 397 driving trips. The total accumulated driving time was 615.11 hours. Multiple test outcomes indicate that the system is capable of achieving the specified objective.

3. Result Promotion and Benefits

- (1) During the period of implementation, two companies, Taichung Bus and All Day Bus, conducted testing operations.
- (2) On December 7, 2021 and March 7, 2022, two seminars with experts and scholars were held. Experts and scholars, highway business owners, and relevant competent authorities were invited to discuss new technological operation and management applied in the automobile transportation industry.

4. Summary of Research Results





舉辦二場專家學者座談會
Two seminars with experts and scholars were held.

5. 研究成果報告

- 先進公車智慧化營運管理先導運行計畫（1/2）－整合車載設備之駕駛工時管理系統研發（112年4月出版）。

(四) 111年電動大客車營運數據監控管理平台 維運與移轉

1. 計畫概述

行政院於103年10月1日修訂第2階段「智慧電動車輛發展策略與行動方案」，並結合經濟部、交通部及環保署推動電動大客車，以落實低碳島政策。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1萬輛市區大客車全面電動化。為落實此政策目標，交通部於107年研擬我國電動大客車推動策略與作法，提出各策略執行工作及部會分工，持續落實電動大客車進展。

交通部已規定自108年起所有電動大客車補助（含示範計畫與一般型計畫），均須提供相關數據供本所與公路總局進行分析，為利累積示範計畫及一般型計畫導入車輛績效與特性掌握，本所於108年建置電動大客車營運數據監控管理平台與建立資料傳輸作業機制，提供後續電動大客車營運績效數據之持續蒐集與分析，掌握營運關鍵指標及關鍵課題，並做為示範計畫與一般型計畫分年檢核資料參據。

5. Research Result Report

- Advanced Bus Intelligent Operation Management Pilot Operation Project (1/2) – Research and Development of Integrated On-board Equipment Driving Hours Management System (Published in April 2023).

(IV) Maintenance, Operation, and Transfer of 2022 Large Passenger Car Operational Data Monitoring and Management Platform

1. Project Overview

On October 1, 2014, the second phase of "Intelligent Electric Vehicle Development Strategies and Action Plans" was revised. The low-carbon island policy was implemented by combining large electric passenger cars promoted by the Ministry of Economic Affairs, the Ministry of Transportation and Communications, and the Environmental Protection Administration. To reduce air pollution, the Executive Yuan announced on December 21, 2017 that 10,000 large passenger vehicles will be fully electrified by 2030. To implement this policy objective, the Ministry of Transportation and Communications formulated large passenger car promotion strategies and practices in 2018, along with proposed strategy implementation jobs and ministerial division of labor, in order to continue implementing the development of large electric passenger cars.

Since 2019, the Ministry of Transportation and Communications has mandated that all subsidized large passenger cars (including demonstration plans and general plans) must include pertinent data so that the Institute of Transportation and the Directorate General of Highways, MOTC can conduct analysis. To facilitate the accumulation of vehicle performance and characteristics imported into demonstration plans and general plans, the Institute of Transportation established an operational monitoring and management platform for large passenger vehicles and collected and analyzed database performance data continuously to monitor operational key indicators and key issues and to serve as references for annual evaluation data in demonstration plans and general plans.

因應交通部已核定109至111年3年期、500輛的電動大客車示範計畫，並於109年頒布「交通部電動大客車示範計畫補助作業要點」及「交通部電動大客車示範計畫車輛業者資格審查作業要點」，本所配合計畫推動時程陸續累積示範計畫導入車輛之營運績效數據，持續辦理電動大客車營運數據資料蒐集作業，進行平台維運與執行計畫進度追蹤，達到輔助電動大客車策略推動之綜效。

2. 研究成果

- (1) 完成系統移轉作業，將系統移交公路總局
- (2) 電動大客車營運數據監控管理平台資料傳輸與蒐集分析作業，提升數據蒐集效率與品質。
- (3) 協助電動大客車示範計畫與一般型計畫營運數據相關檢核，作為業者車輛車體補助及維運補助請領之依據。
- (4) 完成電動大客車營運數據監控管理平台資料傳輸作業規範修正（草案）修訂作業。

3. 成果推廣與效益

- (1) 本平台長期性累積數據可提供交通部、客運業者或學術單位進一步加值研究，回饋推動電動大客車經營規劃及政策目標擬定之參考。
- (2) 本平台可配合示範型與一般型計畫，作為公路總局核發維運補助及妥善率檢核之依據
- (3) 滾動更新電動大客車導入指南，建構電動大客車導入環境與提高使用意願，達到改善空污之目標。
- (4) 應用電動大客車營運數據監控管理平台進行示範計畫營運績效追蹤檢核，可協助管理單位進行業者營運狀況稽核。

In response to the three-year, 500-unit large passenger car demonstration plan approved by the Ministry of Transportation and Communications from 2020 to 2022, the "Operational Guidelines for Subsidies for MOTC Electric Large Passenger Car Demonstration Plan" and the "Operational Guidelines for Review of Vehicle Operator Qualifications in MOTC Electric Large Passenger Car Demonstration Plan" were issued in 2020. In conjunction with the plan promotion schedule, the Institute of Transportation successively accumulated operational performance data of vehicles imported into the demonstration plan. The collection of electric large passenger car operational data for platform maintenance and operation and execute plan progress tracking was continued, achieving the synergistic effects of large passenger car strategy promotions.

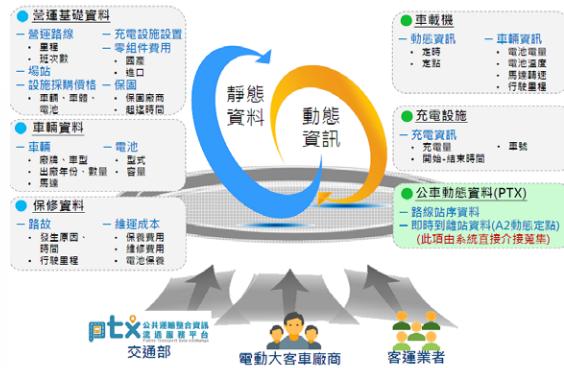
2. Research Results

- (1) Complete the system transfer operation and hand over the system to the General Administration of Highways
- (2) Data transmission and collection analysis operations of the operational monitoring and management platform for large electric passenger cars to improve data collection efficiency and quality.
- (3) Assist in examining the operational data of electric large vehicle car demonstration plans and general plans as a resource for submitting applications for operator vehicle subsidies and maintenance and operation subsidies.
- (4) The "Amendment to [Draft] the Regulations for Operational Monitoring and Management Platform of Electric Large Passenger Cars" has been completed.

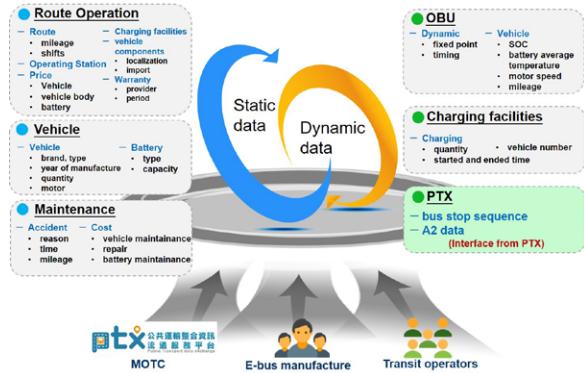
3. Result Promotion and Benefits

- (1) The data collected by the platform over time can be utilized for research by the Ministry of Transportation and Communications, highway bus operators, and academic institutions. It also serves as a resource for promoting the planning and formulation of policy objectives for large electric passenger cars.
- (2) This platform can coordinate with demonstration and general plans to provide the Directorate General of Highways, MOTC, with references for issuing maintenance and operation subsidies and checking availability.
- (3) Conduct a rolling update of the Large Passenger Car Importation Guidelines, create an environment for the importation of large electric passenger cars, and increase intent to use, thereby achieving the goal of reducing air pollution.
- (4) Utilize the operational monitoring and management platform for large passenger cars' operational data to monitor and inspect the operational performance of demonstration plans. Assist management units with auditing the operational status of operators.

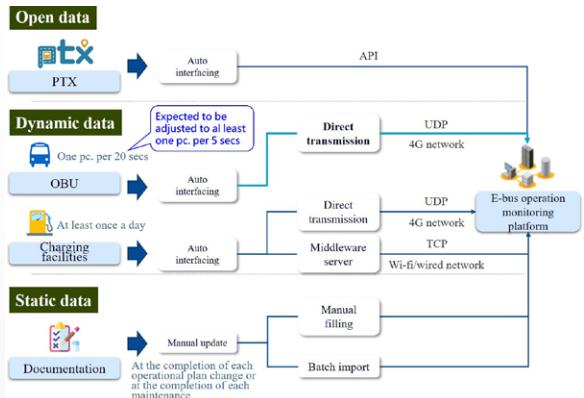
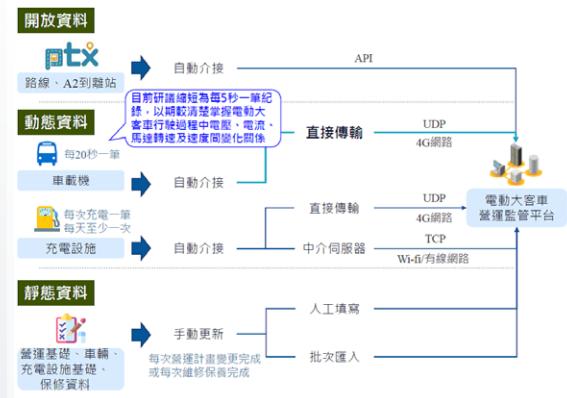
4. 研究成果精華摘要



4. Summary of Research Results



電動大客車營運數據監控管理平台
Operational Monitoring and Management Platform



電動大客車營運數據監控管理平台資料蒐集與串接架構
Data collection and concatenation framework of electric bus operational monitoring and management platform



平台維運圖
Platform Operation Chart

5. 研究成果報告

- 111年電動大客車營運數據監控管理平臺維運與移轉（112年3月出版）

5. Research Result Report

- The Maintenance and Transfer of Electric Bus Operational Monitoring and Management Platform of 2022 (Published in March 2023)

(五) 111年度交通行動服務(MaaS)縣市推廣與督導計畫

1. 計畫概述

近年來由於經濟發展帶動民眾生活水準提升，傳統都市公共運輸服務型態（定線、定班）已無法滿足民眾「行」的需求。因此芬蘭赫爾辛基於2014年提出交通行動服務（Mobility as a Service, MaaS）概念：整合多元運具成為單一運輸移動服務，透過長期套票優惠以及行動裝置，提供符合民眾需求的運輸服務。MaaS整合運輸的創新理念不僅受到全世界交通運輸領域的高度重視，歐美先進國家（如英國、德國、瑞典、比利時、美國）更競相啟動MaaS計畫。

有鑑於MaaS服務日益受到各國重視與推動，交通部2020年版運輸政策白皮書亦宣示MaaS為重要發展策略之一。為能循序擴展國內MaaS服務，使國內各地區民眾均能享受MaaS服務的便捷與永續，交通部智慧運輸系統發展建設計畫（110至113年）接受地方政府針對交通行動服務建設計畫進行補助計畫之申請；為協助地方政府MaaS服務之推動，並傳承過去推動MaaS服務之相關經驗，本計畫協助交通部輔導通過前述補助計畫之地方政府（計有臺中市、高雄市、花蓮縣、臺東縣及澎湖縣政府），進行MaaS服務之推動與導入，並針對其規劃之MaaS服務推動策略，提供相關建議及諮詢，以擴展MaaS服務之廣度與深度，使MaaS服務效益擴展至更多地區，全面提供使用者方便又經濟的行旅服務。

2. 研究成果

(1) 透過異業合作議題，探討在通用MaaS服務範疇中，不同旅次目的使用者適宜之異業整合類型，另針對異業合作議題亦進行更全面之探討，如：結盟業者多元性、MaaS服務曝光度、增加結盟業者合作意願、確保異業合作細節之適法性、服務與顧客偏好權衡、異業合作服務完整度、同性質商品之競合、提升產品易購性等。

(V) MaaS Promotion and Supervision for Counties and Cities in 2022

1. Project Overview

Due to recent economic development leading to rising living standards, traditional forms of urban public transportation services [fixed routes, planned schedules] no longer satisfy people's "travel" needs. In 2014, Helsinki, Finland introduced the concept of Mobility as a Service (MaaS) by integrating various modes into a single transportation mobility service. Using long-term passes with preferential offers and mobile devices, the public was provided with transportation services that met their needs. The innovative concept of MaaS integrated transportation has not only been accorded a high degree of importance by the global transportation industry, but advanced nations in Europe and the United States (including the United Kingdom, Germany, Sweden, Belgium, and the United States) have launched MaaS programs one after the other.

In its 2022 version of the white paper on transportation policy, the Ministry of Transportation and Communications identified MaaS as one of the most important development strategies in light of the increasing importance and global promotion of MaaS services. The intelligent transportation systems development program (2021 to 2024) accepted applications from local governments for the MaaS construction plan subsidy in order to gradually expand domestic MaaS services and allow citizens from all parts of the country to enjoy the convenience and sustainability of MaaS services, for the purpose of assisting local governments in promoting MaaS services and imparting past MaaS service promotion experiences. This plan assisted the Ministry of Transportation and Communications in providing guidance to local governments whose subsidy plans were approved (including the governments of Taichung City, Kaohsiung City, Hualien County, Taitung County, and Penghu County). The MaaS services were advertised and launched. In addition, target the planned MaaS service promotion strategies, provide relevant recommendations and consulting, and extend the breadth and depth of MaaS services, thereby extending MaaS service benefits to more areas and comprehensively offering users convenient and cost-effective travel services.

2. Research Results

- (1) Through cross-industry cooperation-related issues, the types of cross-industry cooperation that accommodate the varying travel purposes of users within the MaaS service scope were examined. In addition, cross-industry cooperation issues were the subject of a comprehensive discussion. For example, the collaboration willingness of alliance operators was increased to ensure the legality of cross-industry cooperation details, the balance between services and customer preference, the comprehensiveness of cross-industry cooperation services, the competition of similar products, the enhancement of product purchase ease, etc.

(2) 輔導高雄市、臺中市、澎湖縣、臺東縣及花蓮縣等5縣市推動MaaS服務，並就各縣市現行MaaS推動策略、服務對象/目標族群、運具整合策略、服務方案、票證載具、定價策略、行銷策略等議題進行討論，相關輔導成果簡述如下：

- 高雄市：除針對現行MeN▶Go服務策略提出建議外，亦協助推動QR月週票、優化APP使用介面及相關友善功能的開發，另亦協助高雄市政府與日本小田急電鐵、全日空ANA簽署合作備忘錄，推動MeN▶Go跨國合作之應用。
- 臺中市：針對臺中MaaS規劃及建置提出相關建議；在考量既有政策衝擊之下，建議初期以觀光旅遊族群為目標族群，並進而研擬適合之運具整合及套票方案，此外考量臺中MaaS採用QR Code為票整載具，因此亦協助臺中市政府交通局及其建置團隊進行公車驗票機改機及捷運驗票閘門加裝QR讀取設備等作業。
- 花蓮縣：針對花蓮縣MaaS規劃及建置提出相關建議；花蓮地區的公共運輸現況與臺東相似、仍有許多成長的空間，因此花蓮MaaS服務初期主要目標客群是以觀光客為主，透過臺鐵、國道客運、公路客運到花蓮的遊客為服務對象，主要先以販售台灣好行303、304、310路線的交通券為主，搭配贈送贈品或優惠券吸引使用者前來購買，未來更進一步會與旅宿業者、觀光業者、餐飲業者等進行異業合作，及後續為提供平台使用者更多元的運具選擇，本計畫提供相關多元運具整合服務策略。

(2) Five counties and cities, including Kaohsiung City, Taichung City, Penghu County, Taitung County, and Hualien County, received assistance in promoting MaaS services. In addition, discussions focused on the counties' and cities' existing MaaS promotion strategies, service targets/target groups, mode integration strategies, service plans, ticket carriers, pricing strategies, and marketing strategies, among other issues. Relevant counseling outcomes are described in brief below:

- Kaohsiung City: In addition to making recommendations based on existing MeN▶Go service strategies, assistance was provided to promote QR monthly and weekly passes, optimize the APP user interface, and develop relevant user-friendly functions. In addition, assistance was provided to the Kaohsiung City Government, which signed a cooperation agreement with Odakyu Dentetsu, Japan, and All Ippon Airways (ANA) to promote MeN▶Go transnational cooperation applications.
- Taichung City: There were pertinent recommendations for the planning and implementation of MaaS in Taichung. Taking into account the impact of the current policy, it is recommended that the initial tourism travel group serve as the target group for the development of suitable mode integration and pass plans. In addition, assistance has been provided to the Transportation Bureau of the Taichung City Government and its setup teams for modifying the bus ticket verification machines and installing QR reading devices at MRT ticket inspection gates, among other operations, in light of the adoption of the MaaS QR code as the ticket carrier.
- Hualien County: Regarding the planning and implementation of MaaS in Hualien County, pertinent recommendations have been made. The current state of public transportation in the Hualien area is comparable to that of Taitung County, with significant room for improvement. Therefore, the initial target audience for MaaS services consisted primarily of tourists. Initially, transportation coupons for the Taipei Trip lines 303, 304, and 310 were sold to Hualien-bound passengers of Taiwan Railway, Freeway buses, and highway buses. In addition to free gifts and discount coupons, users were enticed to make purchases by receiving these incentives. Enhanced cross-industry cooperation with hotel operators, tourism industry operators, and catering industry operators will result in a greater variety of mode options for platform users. Relevant services and strategies for diverse mode integration are provided through this plan.

- 臺東縣：本計畫針對臺東縣MaaS規劃及建置提出相關建議；由於臺東地區人口分散、公共運輸班次密度低，建議臺東MaaS的初期發展係以觀光客做為目標客群，運具整合以計程車、租賃車為主，公路客運、市區客運為輔，並著重加強司機教育訓練以提升觀光服務水準，後續臺東縣MaaS服務將規劃串接鐵路、海運等資訊，並提供跨鄉多元運具整合服務。
- 澎湖縣：菊島智旅平台主要服務對象為觀光旅遊族群，期望讓使用者可透過平台完成相關運輸服務功能資訊掌握；現階段菊島智旅服務平台規劃整合島內相關運輸工具外，後續將透過示範場域之推動整合提供海、空、陸運之整合運輸服務，除讓使用者知悉相關搭乘資訊，更降低運具轉乘過程中之不便，本計畫就平台規劃過程中涉及之使用者需求、業者參與意願等意見蒐集與多元運具整合服務策略給予建議。
- Taitung County: This plan offers recommendations for the planning and implementation of MaaS in Taitung County. Due to the dispersion of Taitung's population and the low density of public transportation, it is suggested that tourists serve as the initial target market for MaaS development in Taitung. In addition to taxis and rental cars, the mode integration also includes highway buses and city buses. In order to improve tourism service standards, emphasis is also placed on enhancing driver education training. Subsequently, the MaaS services of Taitung County will incorporate the planning of linking railway and shipping information. Additionally, cross-township diverse mode integration services will be made available.
- Penghu County: Tourism travel groups are the primary service targets of the Judao smart travel platform, and it is anticipated that users will be able to monitor related transportation services and functions through the platform. Currently, the Judao smart travel platform involves the planning and integration of related Taiwan island transportation modes, as well as the provision of sea, air, and land integrated transportation services via the demonstration field. In addition to familiarizing users with pertinent riding information, the mode transfer process can be made less cumbersome. During the planning process for a platform, this document provides recommendations concerning user requirements, operator participation willingness, opinion collection, and diverse mode integration service strategies.

3. 成果推廣與效益

- (1) 以「交通行動服務（MeN▶Go）計畫-運輸服務數位轉型新契機」榮獲2022亞太經濟合作會議（APEC）能源智慧社區倡議之知識分享平台（ESCI-KSP）智慧運輸（Smart Transport）領域銀牌。
- (2) 計畫研究成果發表於中興工程季刊。
- (3) 111.4.19協助高雄市政府交通局與日本小田急電鐵株式會社簽署合作備忘錄。111.5.25偕同高雄市政府交通局與日本全日空航空公司（ANA）簽署3方（運研所、高雄市政府交通局、ANA）合作備忘錄。另於111.6.24拜會全日空航空公司，共同討論後續跨境合作與交流事宜。

3. Result Promotion and Benefits

- (1) Through the "MeN▶Go Plan-New Opportunities for Transportation Service Digital Transformation," the 2022 APEC ESCI-KSP Smart Transport Smart Transport Field-Silver Medal was received.
- (2) The plan's research results were published in the Sinotech Engineering Quarterly.
- (3) On April 19, 2022, the Transportation Bureau of Kaohsiung City and Odakyu Dentetsu, Japan, were assisted in signing a memorandum of cooperation. The Transportation Bureau of Kaohsiung City Government and ANA, Japan signed a trilateral cooperation memorandum on May 25, 2022 (the Institute of Transportation, the Transportation Bureau of Kaohsiung City Government, and ANA). Furthermore, on June 24, 2022, a visit to ANA was made to jointly discuss future cross-border cooperation and exchange matters.

(4) 本所代表我國於APEC運輸工作小組（Transportation Working Group, TPTWG）複合運輸與智慧型運輸系統專家小組（Intermodal and Intelligent Transportation Systems Experts Group, IIEG）提出並獲同意，於111.12.14辦理APEC「提昇移動力整合新紀元」國際論壇。論壇邀請APEC運輸工作小組主事成員Jason Hill、歐盟MaaS Alliance代表暨立方交通系統策略經理Audrey Denis、越南河內交通大學講師Do Van Manh、日本國土交通省政策局交通政策國際戰略處長佐藤奈美等，就後疫情時代MaaS的挑戰與機會、MaaS的演進與推廣應用、MaaS如何改變民眾對移動的看法等，進行經驗分享。

4. 研究成果精華摘要

(4) The Institute of Transportation submitted a proposal on behalf of Taiwan to the Transportation Working Group (TPTWG) Intermodal and Intelligent Transportation Systems Experts Group, IIEG, which was accepted. The international forum "New Age for Enhancing Mobility Integration" was held by APEC on December 14, 2022. Principal Member Jason Hill of the Transportation Working Group, Representative Audrey Denis of the EU MaaS Alliance, and Manager, Cubic Transportation System Strategy Audrey Denis, lecturer Do Van Manh of University of Transport and Communications, Hanoi, Vietnam, and Ms. Nami Sato, Policy Director, Policy Bureau, International Strategies for Transportation, Ministry of Land, Infrastructure, Transport and Tourism engaged in experience sharing regarding MaaS-related challenges and opportunities in the post-pandemic era, the evolution, promotion, and application of MaaS, and how MaaS altered the public's perception of mobility.

4. Summary of Research Results



111年4月19日協助高雄市政府交通局與日本小田急電鐵株式會社簽署合作備忘錄
With assistance, the Transportation Bureau of Kaohsiung City Government and Odakyu Dentetsu, Japan, signed a memorandum of cooperation on April 19, 2022.



111年5月25日本所、高雄市政府交通局與日本全日空航空公司（ANA）簽署合作備忘錄
Institute of Transportation, the Transportation Bureau of Kaohsiung City Government, and ANA signed the Memorandum of Understanding on May 25, 2022



111年12月14日APEC「提昇移動力整合新紀元」國際論壇
APEC's "New Age for Enhancing Mobility Integration" international forum on December 14, 2022.

5. 研究成果報告

- 111年度交通行動服務（MaaS）縣市推廣與督導計畫（112年4月出版）。

四 營造潔淨且具韌性的運輸環境

(一)建構運輸部門2050深度減碳評估模型及推動溫室氣體減量（1/2）—模型建構與減碳工作推動

1. 計畫概述

為配合國家推動溫室氣體減量政策，交通部依溫室氣體減量及管理法（112年2月15日公布改為「氣候變遷因應法」）暨施行細則規定，以5年為一階段，擬定運輸部門溫室氣體排放管制行動方案，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）依溫管法訂定溫室氣體管制執行方案之依據。

運輸部門為我國溫室氣體排放第四大部門，以公路運輸排放為最大宗，109年占比達96.96%；公路運輸排放又以小客車50.48%最高、其次是大貨車15.81%。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。

5. Research Result Report

- MaaS Promotion and Supervision for Taiwan Counties in 2022 (Published in April 2023).

IV

Build up a Clean and Resilient Transportation Environment

(I) Construct the Transportation Sector 2050 Deep Carbon Reduction Assessment Model and Promote Greenhouse Gas Reduction (1/2)-Model Construction and Carbon Reduction Work Promotion

1. Project Overview

In conjunction with the national greenhouse gas (GHG) reduction policy, the Ministry of Transportation and Communications (MOTC) has developed the Sectoral GHG Emission Control Action Program for Transportation Sector, which is regulated by the Greenhouse Gas Reduction and Management Act (amended as the "Climate Change Response Act" on February 15, 2023) and Enforcement Rules to do in every five-year cycle. It will serve as a reference for Taiwan's transportation sector's GHG reduction promotion, as well as a foundation for municipalities and counties (cities) in developing greenhouse gas control and implementation plans in accordance with the Greenhouse Gas Reduction and Management Act.

In terms of GHG emissions, Taiwan's transportation sector ranks fourth, with road transportation emissions accounting for the majority, reaching 96.96% in the year 2020. Passenger cars account for 50.48% of road transportation emissions, followed by heavy duty trucks, which account for 15.81%. To promote GHG reduction, three strategies, which consist of 14 promotion measures, were proposed for the transportation sector for the second phase (2021-2025): "develop public transportation systems and strengthen transportation demand management," "build the green transportation network, promote the use of low-carbon vehicles, and create a green vehicle oriented traffic environment," and "enhance transportation systems and the energy use efficiency of vehicles." A report on the sectoral implementation of the Action Program is proposed annually with a rolling review of the implementation effectiveness.

另配合行政院政策，以2050年淨零排放目標為願景，就交通部相關業務進行盤點，研提可行之推動措施，納入2050淨零轉型戰略內執行與推動。

2. 研究成果

- (1) 完成並陳報「運輸部門溫室氣體排放管制行動方案執行成果」（111年9月版），於112年2月3日奉行政院核定。
- (2) 彙提「第二期運輸部門溫室氣體排放管制行動方案」，於111年9月16日奉行政院核定。
- (3) 綜整規劃2050淨零轉型關鍵戰略10「淨零綠生活」項下低碳運輸網絡之推動措施及具體行動，並納入行政院111年12月28日記者會之內容。

3. 成果推廣與效益

- (1) 透過交通部、環保署、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CO₂e，低於第1期全期管制目標189.663百萬公噸CO₂e，顯示運輸部門推動溫室氣體減量工作已見成效。
 - ② 依據經濟部能源局111.6.1發布之能源平衡表-運輸部門能源消費統計，推估運輸部門110年溫室氣體排放量約為3,546.5萬公噸（實際統計值需以環保署公布為主），因受到新冠肺炎疫情爆發影響（110年5月19日至110年7月26日全國升為三級警戒），爰排碳量較109年為低（3,727.4萬公噸），並已幾近達成114年目標（不超過3,541萬公噸）。後續隨

Furthermore, aligning with the Executive Yuan's policy and in alignment with the vision of net zero emissions by 2050, the MOTC conducts a thorough review of its relevant undertakings in order to develop practical promotion measures and integrate them into the 2050 net zero transition strategies.

2. Research Results

- (1) The "Implementation Results of the Sectoral GHG Emission Control Action Program for the Transportation Sector" (September 2022 edition) was completed and submitted. It was approved by the Executive Yuan on February 3, 2023.
- (2) "The Second Phase of the Sectoral GHG Emission Control Action Program for the Transportation Sector" has been completed and submitted. It was approved by the Executive Yuan on September 16, 2022.
- (3) Related promotion measures and actions were comprehensively planned and included in the "low-carbon transportation network" aspect of the under the 2050 net zero transition key strategies No.10 "net zero green living", which was announced to the public in the Executive Yuan's press conference on December 28, 2022.

3. Result Promotion and Benefits

- (1) As a result of the relevant measures jointly implemented by the MOTC, the Environmental Protection Administration (EPA), the Ministry of Economic Affairs (MOEA), and other ministries, the GHG emissions in the transportation sector have decreased in comparison to those of the base year (37.998 million tonnes in 2005):
 - ① The GHG emissions in the transportation sector were 36.998 and 37.274 million tonnes in 2019 and 2020 respectively. Furthermore, transportation sector emissions totaled 187.04 million tonnes of CO₂ equivalent (CO₂e) from 2016 to 2020, which was less than the control goal of 189.663 million tonnes CO₂e for the entire first phase. This demonstrates the effectiveness of efforts to reduce GHG emissions in the transportation sector.
 - ② According to the statistics of energy consumption in the transportation sector in the energy balance sheet released by the Bureau of Energy, MOEA on June 1, 2022, the estimated GHG emissions in the transportation sector were around 35.465 million tonnes (the actual statistical value should primarily rely on the published data released by the EPA). Because of the impact of the COVID-19 pandemic (the COVID-19 alert was raised to level 3 in Taiwan from May 19 to July 26, 2021), GHG emissions were lower in 2020 (37.274 million tonnes), nearly reaching the 2025 goal (not exceeding 35.41 million tonnes). With the post-pandemic economic recovery,

著疫後經濟復甦，運輸部門排碳量可能會再增加（如運具電動化成效良好，幾年後應會下降）。

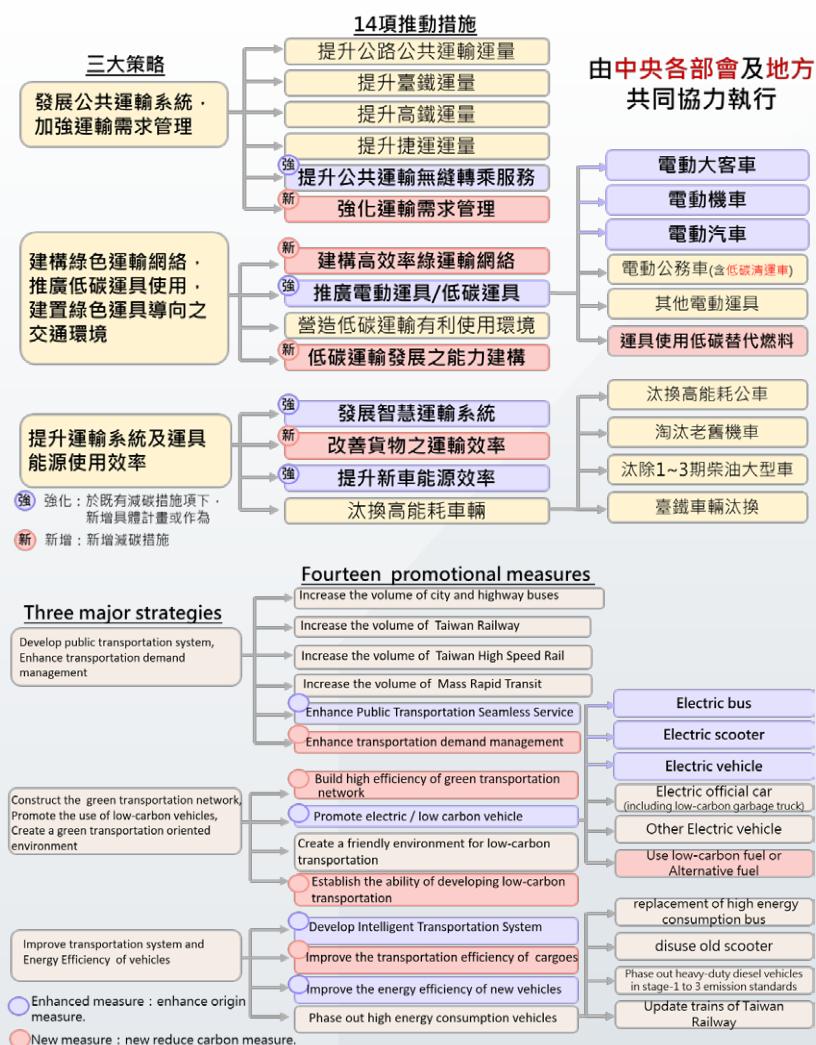
(2) 配合關鍵戰略10「淨零綠生活」主辦單位環保署所辦理之跨部會研商會議、專家諮詢會議、社會溝通會議等5場次，另於18場次相關會議中，進行跨部會、跨政府層級與跨域社會溝通，持續發展綠運輸淨零願景共識。

4. 研究成果精華摘要

the GHG emissions in the transportation sector will possibly increase again (It could have a drop few years later if the electrification of vehicles runs well).

(2) Five meetings including cross-ministry/agency discussion, expert advisory, and social communication were held under the key strategies 10 "net zero green living" conducted by the EPA. Cross-ministries/agencies, cross-government level, and cross-domain social communication were carried out during another 18 related meetings to continuously develop the consensus on the green transportation net zero vision.

4. Summary of Research Results



第二期運輸部門溫室氣體排放管制行動方案
The Second Phase of the Action Plan for the Transportation Sector Greenhouse Gas Emission Control

5. 研究成果報告

5. Research Result Report

- 建構運輸部門2050深度減碳評估模型及推動溫室氣體減量（1/2）-模型建構與減碳工作推動（預計112年8月出版）

- Construct the Transportation Sector 2050 Deep Carbon Reduction Assessment Model and Promote Greenhouse Gas Reduction (1/2)-Model Construction and Carbon Reduction Work Promotion (Scheduled to be published in August 2023)

(二) 共享電動機車對運輸溫室氣體排放影響之研究 (2/2)

1. 計畫概述

「溫室氣體減量及管理法」明定國家長期減量目標為139年溫室氣體排放量降為94年50%以下（112年2月15日公布改為「氣候變遷因應法」，國家長期減量目標修正為139年溫室氣體淨零排放），為達此目標，我國以5年為一期之各階段管制目標，於第1期階段明定109年全國溫室氣體排放量較94年減量2%，114年較94年減量10%，119年較94年減量20%，各階段減量目標漸趨嚴峻。

運輸部門第一期溫室氣體階段管制目標需較94年減量2%，第二期目標則需減量6.79%，亟需尋求並提出具減碳效益之措施。

截至111年12月我國機車登記數總量逾1,439萬輛，其中燃油機車登記數逾1,376萬輛，顯見我國機車登記數量以燃油機車居多。而近年來受惠於資通訊技術快速進步，各式共享運具方興未艾，並強調係取得車輛的使用權而非所有權。故本計畫探討對象聚焦於共享電動機車，並深入瞭解其對用路人的運具選擇行為改變影響，以及對運輸溫室氣體排放可能之正負面影響，以供地方主管機關本權責管理共享運具時，可做為訂修排放管制執行方案之參考。

2. 研究成果

(1) 針對「臺北市」及「高雄市」年滿18歲之民眾執行市話及手機問卷調查（市話1,068份，手機200份，共計1,268份），分析具使用共享電動機車經驗、潛在使用者及無意願使用者等不同族群特性、可能運具選擇（移轉）傾向、使用意願與阻礙因素。

① 具使用經驗者及潛在使用者願意使用因素主要為「機動性高，方便快速」；無意願使用者不願使用因素則為「習慣使用自己的汽機車」、「不方便」。

(II) Research on the Impact of Shared e-scooters on Transportation Greenhouse Gas Emissions (2/2)

1. Project Overview

The "Greenhouse Gas Reduction and Management Act" explicitly states that the national long-term reduction goal is to reduce greenhouse gas emissions to less than 50% of 2005 levels by 2050 (the "Climate Change Response Act" was promulgated on February 15, 2023, with the national long-term reduction goal revised to greenhouse gas net zero emissions by 2050). Taiwan has control objectives for five-year phases in order to achieve this goal. In the first phase, it is stipulated that national greenhouse gas emissions in 2020 will be 2% lower than in 2005; by 2025, they will be 10% lower than in 2005; and by 2030, they will be 20% lower than in 2005. The reduction targets for each phase are becoming increasingly stringent.

The transportation sector's first phase greenhouse gas control goal is a 2% reduction compared to 2005, and the second phase goal is a 6.79% reduction. There is an urgent need to seek out and propose carbon-cutting measures that are effective.

The total number of registered locomotives in Taiwan will exceed 14.39 million units by December 2022. Registered fuel locomotives account for 13.76 million of them, indicating that fuel locomotives account for the vast majority of registered locomotives in Taiwan. Various shared modes are still expanding as a result of the rapid advancement of information and communication technology in recent years. Rather than ownership, the emphasis is on obtaining the right to use vehicles. The topics covered in this plan are centered on shared electric vehicles (EV) and gaining a deeper understanding of their impact on changing road users' mode choices, as well as the positive and negative effects on transportation greenhouse gas emissions. They serve as a reference for local competent authorities when revising emission control and implementation plans in accordance with their authority and responsibility when managing shared modes.

2. Research Results

(1) With a focus on people over the age of 18 from "Taipei City" and "Kaohsiung City," a questionnaire survey was distributed via residence phones and mobile phones (1,068 copies via residence phones and 200 copies via mobile phones, for a total of 1,268 copies). The experiences of using shared electric locomotives, the characteristics of potential users and users with no intention, potential mode choice (transfer) inclinations, the intention of use, and impediments were all investigated.

① The following factors influence the willingness of both experienced and potential users: "highly mobile, convenient, and fast;" The following factors contribute to users' unwillingness: "used to driving one's own car/motorbike" and "inconvenient."

② 具使用經驗者可接受在5分鐘內（約300公尺）取到共享電動機車的民眾，臺北市約7成，高雄市約9成；潛在使用者可接受在3分鐘內（約200公尺）取到共享電動機車的民眾，臺北市約9成，高雄市則約8成。

(2) 經推估使用共享電動機車具有減碳效益，臺北市具使用共享電動機車經驗者，平均每使用1次約可減少111~131公克CO₂e；高雄市具使用共享電動機車經驗者，平均每使用1次約可減少177~185公克CO₂e。

3. 成果推廣與效益

(1) 完成「疫情讓共享電動機車變得更減碳？」，刊登於經濟前瞻雙月刊206期。

(2) 於111年11月邀集專家學者、地方交通局及共享電動機車營運業者等，就民眾可接受取車時間（距離）、是否會因騎乘過共享電動機車而購買／售出／報廢私有機車、政策推廣（如停車供給配套、優惠方案等）、以及共享電動機車之定位（與公共運輸之競合關係）等議題交換意見，可供未來地方政府施政推動時參採應用。

4. 研究成果精華摘要



問卷調查結果
Questionnaire Survey Results

② Among experienced users who can accept access to shared electric locomotives within five minutes (about 300 meters), Taipei City accounts for approximately 70% and Kaohsiung City accounts for approximately 90%; among potential users who can accept access to shared electric locomotives within three minutes (about 200 meters), Taipei City accounts for approximately 90% and Kaohsiung City accounts for approximately 80%.

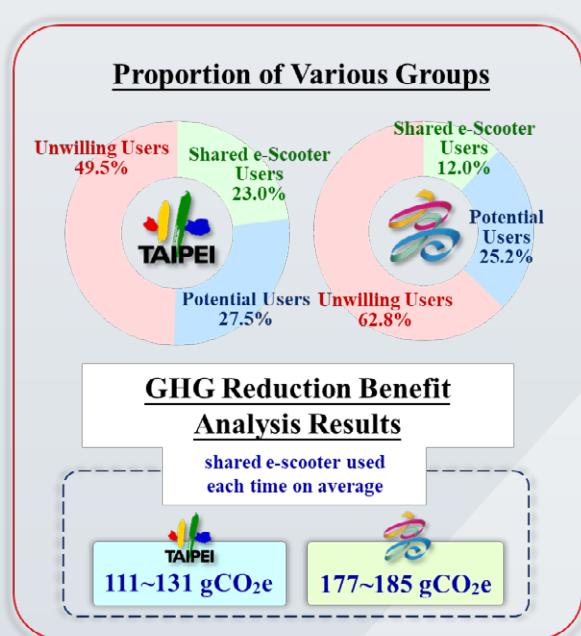
(2) According to estimates, the use of shared electric locomotives reduces carbon emissions. Those from Taipei City with shared electric locomotive use experience can save 111-131grams of CO₂e on average after each use, while those from Kaohsiung City can save 177-185grams of CO₂e on average after each use.

3. Result Promotion and Benefits

(1) "Shared electric locomotives have cut down more carbon during the COVID-19 pandemic?" has been completed.

(2) Experts and scholars, local transportation bureaus, and shared electric locomotive operators were invited to exchange ideas in November 2022 on vehicle access time (distance) accepted by the general public, whether people will buy/sell/declare scrap privately-owned locomotives after riding shared electric local motives, shared electric locomotive positioning (public transportation competition), and other issues. These concepts may be used by local governments in the future during policy administration.

4. Summary of Research Results



5. 研究成果報告

- 共享電動機車對運輸溫室氣體排放影響之研究(2/2)(預計112年8月出版)

(三)全國自行車單一總入口網系統優化暨區域路線自動規劃功能開發

1. 計畫概述

本計畫係依據行政院109年8月20日第3715次會議蘇前院長指示：「為使相關建設更為完善，希望車友能提供各路段之改善意見，請秘書長協助設立自行車車友民意信箱，將意見予以整合」，並由行政院秘書長決議由交通部擔任自行車入口網的主責部會，網站主要設計理念需具備I、C、T三大設計理念：I是資訊入口連結（含部會橫向及縣市政府縱向之連結、C是資訊之通透性（相關部會資訊建置圖層的整合及套疊）、T是資訊的交換互動（含車友登入、留言意見接收及派送等後端平台處理系統），爰交通部責請本所依據上開原則辦理「全國自行車單一總入口網」(<https://taiwanbike.tw/>)之建置工作，已於110年5月正式開台，並已具備車友回饋、路線查詢、相關活動、相關網站連結、Q&A以及騎乘小叮嚀、環島路網自動路線規劃及簡易版英文版網站等功能。

本年度持續精進自動路線規劃功能，除環島路網之外，為利自行車騎士能完整規劃自行車路線，本所至全臺21個縣市政府辦理訪談工作，並篩選地方政府重要之區域路線納入自動路線規劃功能當中，另為鼓勵國外旅客前來臺灣旅遊，本網站亦建置完整英文版網頁，提供外國旅客自行車路線查詢及規劃等服務；另為使有限資源發揮最大成效，本網站後續將與觀光局「臺灣自行車旅遊網」進行整併工作，本所亦研提網站架構供觀光局執行整併作業之參考。

5. Research Result Report

- Research on the Impact of Shared E-scooters on Transportation Greenhouse Gas Emissions (2/2) (Scheduled to be published in August 2023).

(III) Upgrade of the Taiwanbike Website and Automatic Regional Route Planning Function Development

1. Project Overview

This plan is in accordance with the instructions of former premier Su at the 3715th meeting on August 20, 2020: "In order to perfect related constructions, riders are expected to provide their opinions on improving respective road sections. The secretary general has been asked to assist in establishing an email box for cyclists' public opinions and in integrating the ideas." The Secretary General of the Executive Yuan determined that the Ministry of Transportation and Communications will be the dedicated ministry for the cycling portal. Three design concepts must be included in the primary website design concepts: I.C.T. C is information transparency (including the integration and overlay of information layers of related ministries); I is the information portal link (including the horizontal ministry link and the longitudinal county/city government link); T is information exchange and interaction (including cyclist login, message reception, and dispatch backend platform processing systems). The Ministry of Transportation and Communications has designated the Institution of Transportation to carry out the "Taiwanbike Website" (<https://taiwanbike.tw/>) setup work in accordance with the aforementioned principles. The website, which features cyclist feedback, route search, related activities, related website links, Q&A, riding reminders, automatic route planning of the island round network, and websites in both simple and English versions, was officially launched in May 2021.

This year, the automatic route planning feature is being refined further. In addition to the island round road network, the Institute of Transportation interviewed 21 county and city governments across the country to help cyclists plan their routes more thoroughly. Furthermore, the major regional routes chosen by local governments have been included in the automatic route planning feature. The website has also established comprehensive English-language webpages to provide foreign tourists with cycling route search, planning, and other services. In order to make the most of limited resources, the website will be linked to the Tourism Bureau's "Taiwanbike Website." The Institute of Transportation has also provided the website architecture for the Tourism Bureau to use as a reference when implementing integration operations.

2. 研究成果

- (1) 完成自行車單一總入口網系統之建置，提供騎士一站式服務，以利快速取得所需資訊、並可進行環島及區域路網之自動路線規劃服務。
- (2) 整合跨部會、跨縣市資料，可提供民眾完整的全國自行車路網資訊，並可提供各部會、各縣市後續於自行車路網規劃時之參考。
- (3) 自行車單一總入口網系統可將車友意見回饋權責單位，以利公路總局、觀光局、縣市政府等權管單位據以改善，並做為後續經營管理維護時之參據。

3. 成果推廣與效益

- (1) 辦理一場專家學者座談會，討論網站整併之架構規劃。
- (2) 辦理21場次縣市政府訪談，蒐集並整理自行車路線。
- (3) 截至112年2月底，瀏覽人次已突破50萬人次。

4. 研究成果精華摘要

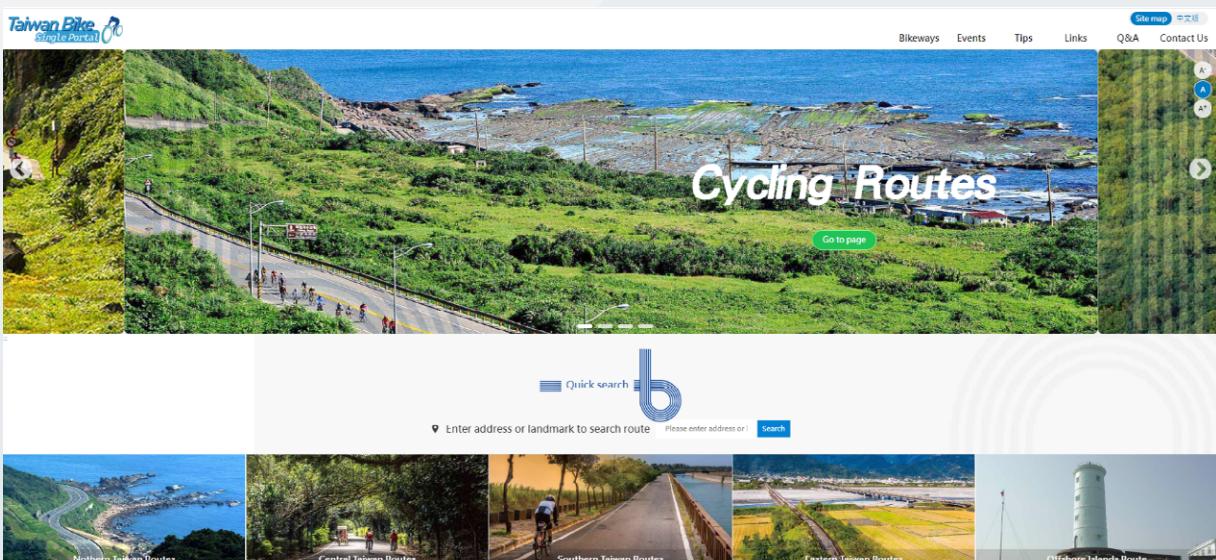
2. Research Results

- (1) The Taiwanbike Website has been completed in order to provide riders with one-stop services, quickly obtain needed information, and participate in island round and regional network automatic route planning services.
- (2) Cross-Ministries/Agencies, as well as cross-county and cross-city data, have been combined to provide the general public with a comprehensive national cycling road network map. The data is also used as a resource by ministries, counties, and cities for future cycling road network planning.
- (3) The Taiwanbike Website can provide cyclists' opinions on dedicated units to serve as a foundation for the Directorate General of Highways, Tourism Bureau, and county and city governments to make improvements, as well as during subsequent operational management and maintenance.

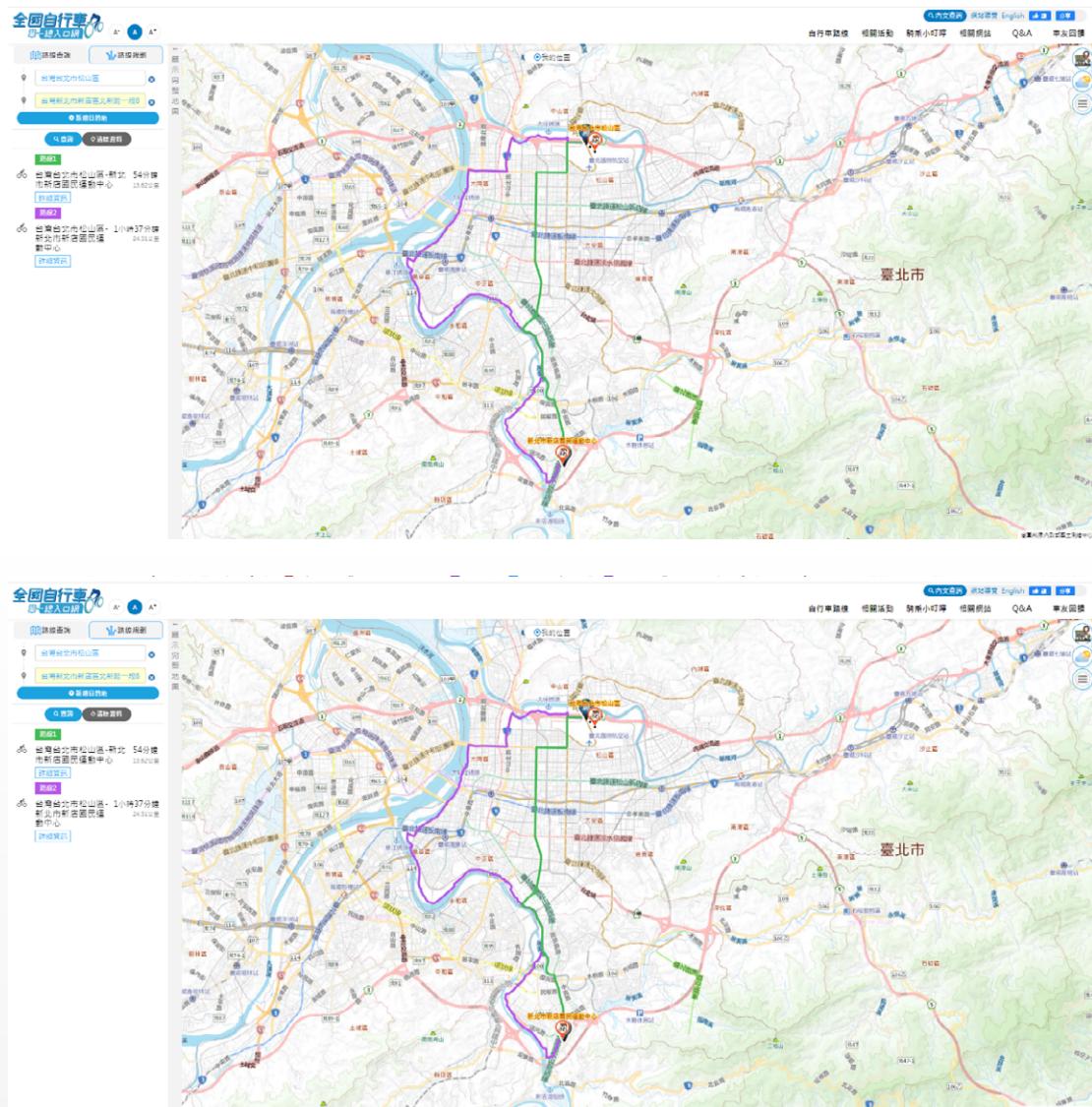
3. Result Promotion and Benefits

- (1) One seminar with experts and scholars was conducted to discuss the architectural planning of website integration.
- (2) 21 interviews with the county and city governments were conducted. The cycling routes were collected and compiled.
- (3) As of the end of February 2023, the website traffic exceeded 500,000 viewers.

4. Summary of Research Results



英文版網站首頁示意圖
Schematic Diagram of Website Homepage (English Version)



自行車自動路線規劃示意圖
Schematic Diagram of Cycling Automatic Route Planning

5. 研究成果報告

- 全國自行車單一總入口網系統優化暨區域路線自動規劃功能開發（預計112年10月出版）

(四) 應用交通管理策略減少都會區交通空氣污染之研析 (3 / 3)

1. 計畫概述

108年10月行政院核定之空氣污染防治行動方案計畫書，其策略十二交通管理新作為中，明確揭示除透過運具之動力形式轉移外，亦要透過相關管制措施，導引汽機車使用者減少使用量。

5. Research Result Report

- Upgrade of the Taiwanbike Website and Automatic Regional Route Planning Function Development (Scheduled to be published in October 2023).

(IV) Research and Analysis on Applying Traffic Management Strategies to Reduce Traffic Air Pollution in Metropolitan Areas (3/3)

1. Project Overview

The Executive Yuan approved the Proposal of Action Plan for Air Pollution Prevention and Control in October 2019. According to Strategy 12, traffic management practices clearly show that, in addition to transferring the power forms of modes, relevant control measures are required to guide car and motorcycle users to reduce usage.

本計畫探討有效影響用路人運具選擇之作為，並考量不同需求之用路人對於各項交通減污措施的行為反應，進而提出交通部門因地制宜之交通管理策略建議，使交通空污減量。

本計畫為3年期計畫，第1、2年度（109、110年）已陸續完成雙北、臺中、高雄等都會區之私人運具通勤族群問卷調查與初步分析，第3年度（111年）則就不同都會區及不同社會條件之族群進一步分析，據以提出短、中、長期之減少交通空污管理策略，並以情境設定方式評估策略推動下之空污改善成效，提供交通及環保單位進行政策推動應用。

2. 研究成果

- (1) 延續前2年問卷調查內容並進一步分析，提出後續短、中、長期減低交通空污之管理策略建議。短期建議包括加密公車班次、提高停車費率、加速老舊車輛汰換低污運具等；中期建議例如減少停車位、強化人行道與自行車道建置、擴大空品維護區劃設範圍等；長期建議則包括推動低碳交通區等；可供後續推動應用，以促使交通空污減量。
- (2) 以情境設定方式估算實施各項管理策略後之減污效益，雙北都會區約可降低0.4%-1.7%之交通源PM2.5排放，臺中都會區則可降低0.3%-1.6%，而高雄都會區則約減少0.6%-3.9%，

3. 成果推廣與效益

- (1) 連結「空氣污染防治行動方案計畫書」及「運輸政策白皮書-綠運輸分冊」之相關交通空污減量管理策略，可提供中央／地方交通主管機關因地制宜提出提升空氣品質之交通管理措施，用以改善地區交通環境空氣品質與民眾健康。

This plan discusses effective practices that influence road users' mode choices and takes into account the behavioral responses of road users with varying needs to various traffic pollution reduction measures. In turn, traffic management strategies and recommendations tailored to local conditions can be developed by the Ministry of Transportation and Communications in order to reduce traffic air pollution.

This plan is for three years. A questionnaire survey on private modes of commuters in Taipei City, New Taipei City, Taichung, Kaohsiung, and other metropolitan areas was completed in the first and second years (2020 and 2021). In the third year (2022), different metropolitan areas and socioeconomic groups were further analyzed in order to propose short-, middle-, and long-term management strategies for reducing traffic air pollution. The effectiveness of air pollution reduction strategies was evaluated in situational settings for transportation and environmental protection units to carry out policy promotion and application.

2. Research Results

- (1) Following on from the contents of the questionnaire survey two years prior and additional analysis, short-, middle-, and long-term management strategies and recommendations for reducing traffic air pollution have been proposed. The short-term recommendations include intensifying bus dispatches, increasing parking fee rates, accelerating the replacement of old vehicles with low-pollution modes, and so on; the long-term recommendations include reducing parking spaces, strengthening the installation of sidewalks and bicycle lanes, broadening the scope of air quality maintenance areas, and so on; the long-term recommendations include promoting low-carbon traffic areas. They are carried out for subsequent promotion and application to facilitate traffic air pollution reduction.
- (2) The benefits of pollution reduction after implementing various management strategies have been estimated using a situational setting. Traffic source PM2.5 emissions can be reduced by 0.4%-1.7% in the Taipei City and New Taipei City metropolitan areas, 0.3%-1.6% in the Taichung metropolitan area, and 0.6%-3.9% in the Kaohsiung metropolitan area.

3. Result Promotion and Benefits

- (1) By connecting the relevant traffic air pollution reduction management strategies in the "Proposal of Action Plan for Air Pollution Prevention and Control" and "Transportation Police White Paper-Green Transport Separate Volume," traffic management measures for improving air quality can be provided to central/local transportation competent authorities to suit local conditions, as well as improve regional traffic environment, air quality, and public health.

(2) 於111年10月召開2場3年期研究結果推廣工作坊，與中央及地方交通與環保單位、專家學者等，分享與交流減少交通空污之管理策略，促使相關單位可將改善交通空污之思維納入規劃考量；經會後調查，有92%之與會者對工作坊主題內容感到滿意。

(2) Two workshops to promote 3-year research results were held in October 2022. Management strategies for reducing traffic air pollution were shared and exchanged with experts and scholars from central and local transportation and environmental protection units. This will prompt the units involved to incorporate traffic air pollution reduction mindset into planning consideration. Following the meeting, it was discovered that 92% of the attendees were satisfied with the workshop themes.

4. 研究成果精華摘要

4. Summary of Research Results

短期：1-2年內可立即執行	中期：涉法律、技術調整等實際執行仍需至少3-4年	長期：民意溝通及可行性評估等，需5年以上推行
<p>公車路線整合與優化公車班次</p> <p>強化公共運輸轉乘接駁運具</p> <p>共享運具結合公共運輸優惠方案</p> <p>擴大都會區停車收費範圍</p> <p>市中心區域提高停車收費費率</p> <p>加強民眾空污認知教育</p> <p>提供電動運具購車補助並強化充電設施</p> <p>研議低碳交通區推動機制</p>	<p>與學校及企業合作減少免費停車位</p> <p>規劃市中心縮減路邊停車格位</p> <p>強化人行道與自行車道路網布設</p> <p>保留一定比例共享或電動運具停車位</p> <p>擴大空品維護區劃設範圍及強化實施強度</p> <p>推動低碳交通區劃設法制作業及示範計畫</p>	<p>促進地方單位積極規劃低碳交通區，並實際設置推動</p> <p>透過稅費方式增加高污染排放車輛成本，加速高污染車輛汰換</p> <p>考量將車輛總量管制納入策略規劃，評估加嚴車輛持有條件之可行性</p>
<p>Short-term : Implementation within 1-2 years</p> <p>Integrate bus routes and optimization of bus schedule</p> <p>Strengthen public transportation transfer models</p> <p>Shared models combine with public transport discounts</p> <p>Expansion of charging parking fee zones in metropolitan</p> <p>Increasing Parking rates in downtown</p> <p>Strengthen public air pollution awareness education</p> <p>Provide subsidies for EV and increase charging facilities</p> <p>Discussion on the promotion mechanism of low carbon emission zone</p>	<p>Mid-term : At least 3-4 years for the laws and technical adjustments</p> <p>Work with schools and businesses to reduce free parking spaces</p> <p>Plan to reduce roadside parking spaces in downtown</p> <p>Enhanced pedestrian and bicycle network</p> <p>Reserve a certain percentage of shared or electric vehicle parking spaces</p> <p>Expand the scope and strengthen the intensity of air quality maintenance zones</p> <p>Promoting low carbon emission zone legislative process and demonstration plans</p>	<p>Long-term : More than 5 years due to public communication and feasibility assessment</p> <p>Prompt local government to planning and implementation of low carbon emission zone</p> <p>Increase the cost of high-polluting vehicles through taxes and fees, and accelerate the replacing</p> <p>Consider incorporating vehicle volume control and assess the feasibility of tightening vehicle ownership conditions</p>

交通空污減量策略之短中長期建議

Recommendations for Traffic Air Pollution Reduction Strategies in the Short, Middle, and Long Term

5. 研究成果報告

5. Research Result Report

- 應用交通管理策略減少都會區交通空氣污染之研析（3 / 3）-交通管理策略分析與效益評估（預計112年8月出版）

- Research and Analysis on Applying Traffic Management Strategies to Reduce Traffic Air Pollution in Metropolitan Areas (3/3) (Scheduled to be published in August 2023)

(五) 公路系統規劃階段強化調適能力之探討 (2 / 2)

1. 計畫概述

運輸子系統中以公路系統與民眾之生活最為息息相關。然而，我國的公路系統規劃機制和相關規範對於氣候變遷調適考量仍有不足，若公路系統規劃階段能融入氣候變遷調適理念，將有效提升未來面臨極端事件之因應能力。欲提升公路系統於氣候變遷環境下的調適能力，需於規劃階段（含新建與改建）即需對公路設施以全生命週期探討工程之規劃與後續的養護管理。因此。本計畫完成「公路系統因應氣候變遷調適指引」，協助公路系統權責主管機關及實務從業人員於規劃階段更全盤性、系統性地納入氣候變遷調適概念，俾利其可進一步檢討相關規範與作業程序，以提升我國公路系統在氣候變遷下的調適能力，建構備具氣候韌性的公路系統。

2. 研究成果

- (1) 完成蒐集分析國外運輸系統調適發展趨勢，包括IPCC AR6第一工作小組報告（2021）、第二工作小組報告（2022）ISO14090氣候變遷指導原則、ISO14091氣候變遷風險評估指引、國際運輸調適推動情形，提供部屬機關（構）參考應用。
- (2) 蒐集國外公路系統規劃階段強化調適能力作為相關文獻，研提國內公路系統規劃階段調適作為之建議與跨運輸系統強化調適介面整合機制建議，完成探討公路系統規劃階段強化調適能力之作為。
- (3) 完成公路系統因應氣候變遷調適指引，可提供公路系統權管機關參考應用，以提升公路系統韌性，緩和因氣候變遷所造成之傷害。

(V) A Study of Enhancing Highway System's Adaptive Capability in the Planning Phase (2/2)

1. Project Overview

The highway system is the transportation subsystem with the most direct impact on people's daily lives. However, in light of climate change and adaptation, Taiwan's highway system planning mechanism and relevant regulations are insufficient. The ability to deal with extreme events in the future can be improved if the concept of climate change and adaptation is incorporated into highway planning. Engineering planning and subsequent care and management regarding the lifecycle of highway facilities should be discussed during the planning phase (including new constructions and reconstructions) in order to increase the highway system's adaptability to the climate change environment. Therefore, the plan has completed the "Highway System in Response to Climate Change and Adaptation Guide," which will help dedicated competent authorities within the highway system and practitioners incorporate climate change and adaptation concepts more comprehensively and systematically during the planning stage. This will facilitate further discussions of relevant norms and operating procedures, thereby improving Taiwan's adaptive capability under climate change and constructing a climatic resilient highway system.

2. Research Results

- (1) IPCC AR6 Working Group I Report (2021), Working Group II Report (2022), ISO14090 Governing Principles for Climate Change, ISO14091 Guidelines for Climate Change Risk Assessment, and International Transportation Adaptation Promotion have all been completed, as the collection and analysis of foreign transportation system adaptation development trends. Subordinate agencies (institutions) use them as references and for applications.
- (2) As relevant references, practices for strengthening adaptive capability during the foreign highway system planning stage have been collected. Adaptation recommendations during the domestic highway system planning stage, as well as mechanisms for integrating cross-transportation system strengthening adaptation interfaces have been formulated. Practices for improving adaptive capability during the planning stage of a highway system have been completed.
- (3) Guidelines for highway system adaptation in response to climate change have been completed, and they can be used as a reference and for application by highway system competent authorities in order to improve highway system resilience and mitigate climate change harm.

3. 成果推廣與效益

- (1) 完成「公路系統規劃階段強化調適能力方法之初探」論文，發表於「中華民國運輸學會2022年年會暨學術論文國際研討會（111年12月1~2日）。
- (2) 完成「氣候變遷調適資訊分享與調適行動計畫研擬」（111年5月26日）與「運輸系統因應氣候變遷調適發展趨勢與公路系統強化調適能力作為」（111年9月15日）2場次氣候變遷調適專業知識教育訓練，輔助運輸設施管理機關（構）配合新一期國家調適行動方案研擬相關調適行動計畫，加強掌握運輸系統氣候變遷調適之精神，進一步將調適知識應用於調適業務之推動；經滿意度調查，教育訓練滿意度分別為100%及93%。
- (3) 辦理「公路規劃強化調適能力指引」（111年10月13日）專家學者座談會，邀請專家學者共同研商調適指引架構及內容，並另提供國內實務案例操作說明，期能協助及引導機關深化調適理解，有助於後續調適工作執行及應用。

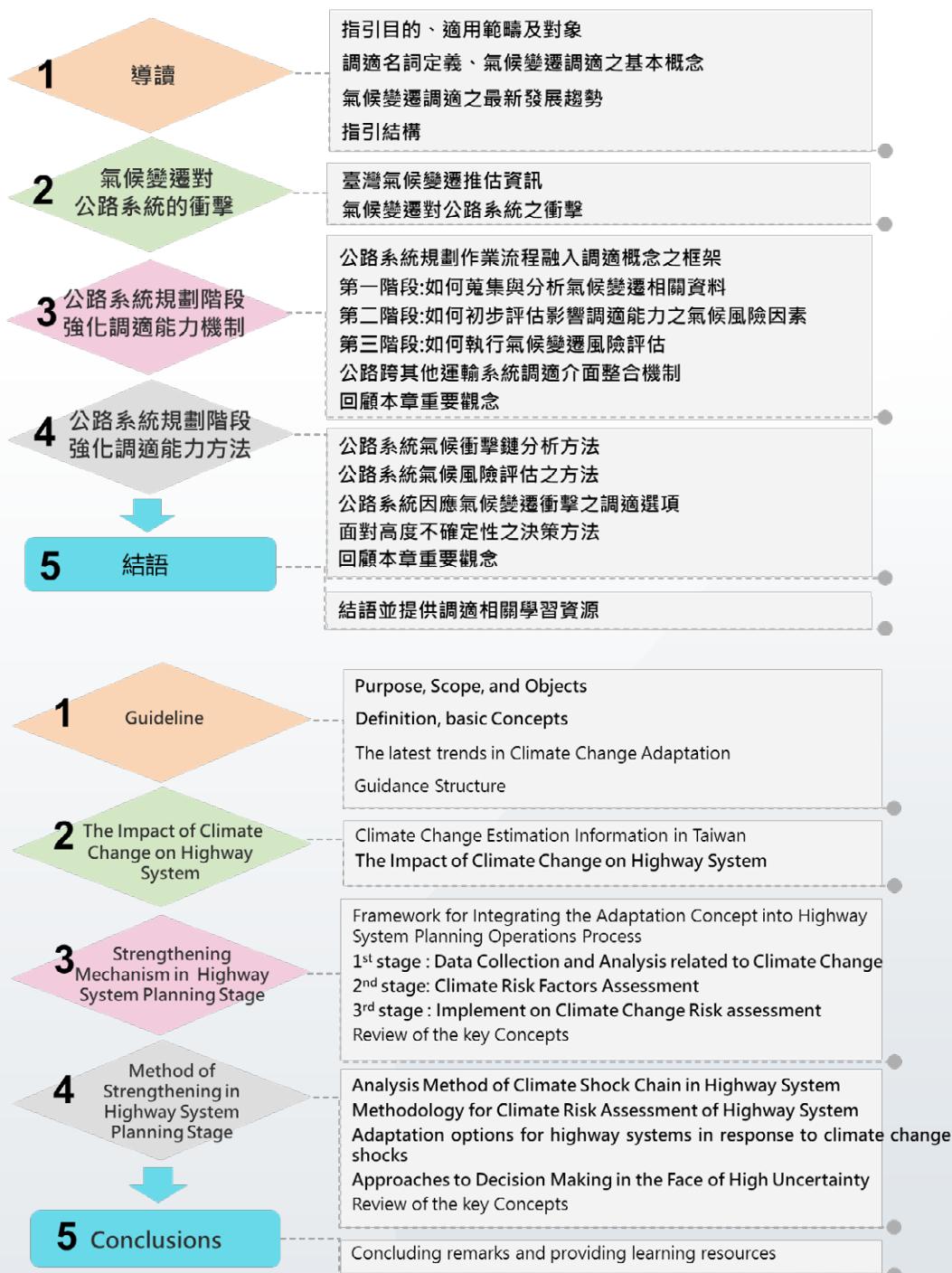
3. Result Promotion and Benefits

- (1) The dissertation paper "A preliminary study on adaptive capability methods during the highway system planning stage" was published in the "Chinese Institute of Transportation 2022 Annual Conference and International Seminar on Dissertation Papers" (December 1 and December 2, 2022).
- (2) Two educational training sessions on climate change adaptation related professional knowledge have been completed: "Sharing of Climate Change Adaptation Information and Formulation of Action Plan for Adaptation" (May 26, 2022) and "Transportation System in Response to the Development Trend of Climate Change Adaptation and Practices for Strengthening Adaptive Capacity of Highway System" (September 15, 2022). In conjunction with the new phase of the National Adaptation Action Plan, the auxiliary transportation facility management agency (institution) develops relevant adaptation action plans and strengthens its grasp of the spirit of the transportation system's adaptation to climate change, further applying adaptation knowledge in adaptive business promotions; according to a satisfaction survey, educational training satisfaction is 100% and 93%, respectively.
- (3) A seminar on "Highway Planning and Adaptive Capability Guide (October 13, 2022)" was held with experts and scholars. Experts and scholars were invited to collaborate on the architecture and content of the adaptation guide. Domestic practical case operations and explanations were also provided in the hopes of assisting and guiding agencies in developing a deeper adaptive understanding, which will aid in the implementation and application of subsequent adaptation work.



4. 研究成果精華摘要

4. Summary of Research Results



公路系統因應氣候變遷調適指引架構

The Architecture of Highway System in Response to Climate Change and Adaptation Guidelines

5. 研究成果報告

5. Research Result Report

- 公路系統規劃階段強化調適能力之探討（2 / 2）（預計112年8月出版）

- A Study of Enhancing Highway System's Adaptive Capability in the Planning Phase (2/2)
(Scheduled to be published in August 2023)

五

深化運輸安全管理

(一) 鐵道安全管理系統自主評估準則與監理查核機制之研究

1. 計畫概述

本計畫回顧國外鐵道、民航等業別之SMS評估機制、準則與工具，彙整出可供營運機構、監理機關施行之自主評估及監理查核機制。另參考文獻及過去數年研究成果，發展出36項評估準則，以及更細部的初步查核工具、自主評估與有效性查核工具。營運機構可使用本計畫所發展的準則與工具評估自身SMS符合性及有效性，並精進其SMS；鐵道局則可透過同樣的準則與工具來查核營運機構SMS是否符合法規、自主評估結果是否屬實，並給予建議。

2. 研究成果

- (1) 汲取國外經驗並考量我國既有機制，發展SMS的評估機制，包含監理查核（初步查核、有效性查核）與營運機構自主評估。
- (2) 在確定評估機制的同時，本計畫亦發展較為具體的評估準則，以供監理機關及營運機構遵循。
- (3) 基於評估準則發展供監理機關與營運機構使用之評估工具，以利監理機關、營運機構安全管理部門應用於實務SMS評估作業。

3. 成果推廣與效益

- (1) 辦理合計四場次教育訓練以向鐵道監理機關、營運機構說明本計畫之評估機制、準則與工具，並培訓種子人員以利未來施行SMS評估機制。
- (2) 可供國內鐵道營運機構了解SMS推動缺口與落實程度之參考，做為研提改善對策之依據。

V

Deepen Transportation Safety Management

(I) Research on the Railway Safety Management System Self-assessment Criteria and Supervision Inspection Mechanism

1. Project Overview

The plan reviews foreign railways and the civil aviation industry's SMS evaluation mechanisms, criteria, and tools to compile a self-assessment and supervisory inspection mechanism for implementation by operational institutions and supervision agencies. In addition, in reference to references and research results over the past few years, 36 assessment criteria, more detailed preliminary inspection tools, self-assessments, and effective inspection tools. Operational institutions can use the criteria and tools to evaluate the conformity and validity of their own SMS, while refining their SMS. The Railway Bureau uses the same criteria and tools to inspect whether or not the operational mechanism's SMS conforms to laws and regulations and whether or not the self-assessment results are true, with suggestions provided.

2. Research Results

- (1) Taking into consideration foreign experiences and Taiwan's existing mechanisms, the SMS evaluation mechanism has been developed, inclusion supervisory inspections (preliminary inspection and validity inspection), as well as operational institution self-assessments.
- (2) While verifying the evaluation mechanisms, the plan has also developed more specific evaluation criteria for compliance by supervisory agencies and operational institutions.
- (3) Based on assessment criteria, evaluation tools for use by supervisory agencies and operational mechanisms have been developed. To facilitate application in practical SMS evaluation operations by supervisory agencies and operational mechanisms' safety management departments.

3. Result Promotion and Benefits

- (1) Four education training sessions have been conducted in order to explain the plan's evaluation mechanisms, criteria, and tools to railway supervisory agencies and operational institutions, as well as train seed personnel to facilitate the future implementation of the SMS evaluation mechanism.
- (2) It shall serve as a reference for domestic railway operational institutions to gain insight into the SMS promotion gap and the degree of implementation, thereby serving as a basis for formulating improvement strategies.

(3) 透過評估準則，可檢視SMS推動缺口，據以強化鐵道監理機關定期檢查之重點。

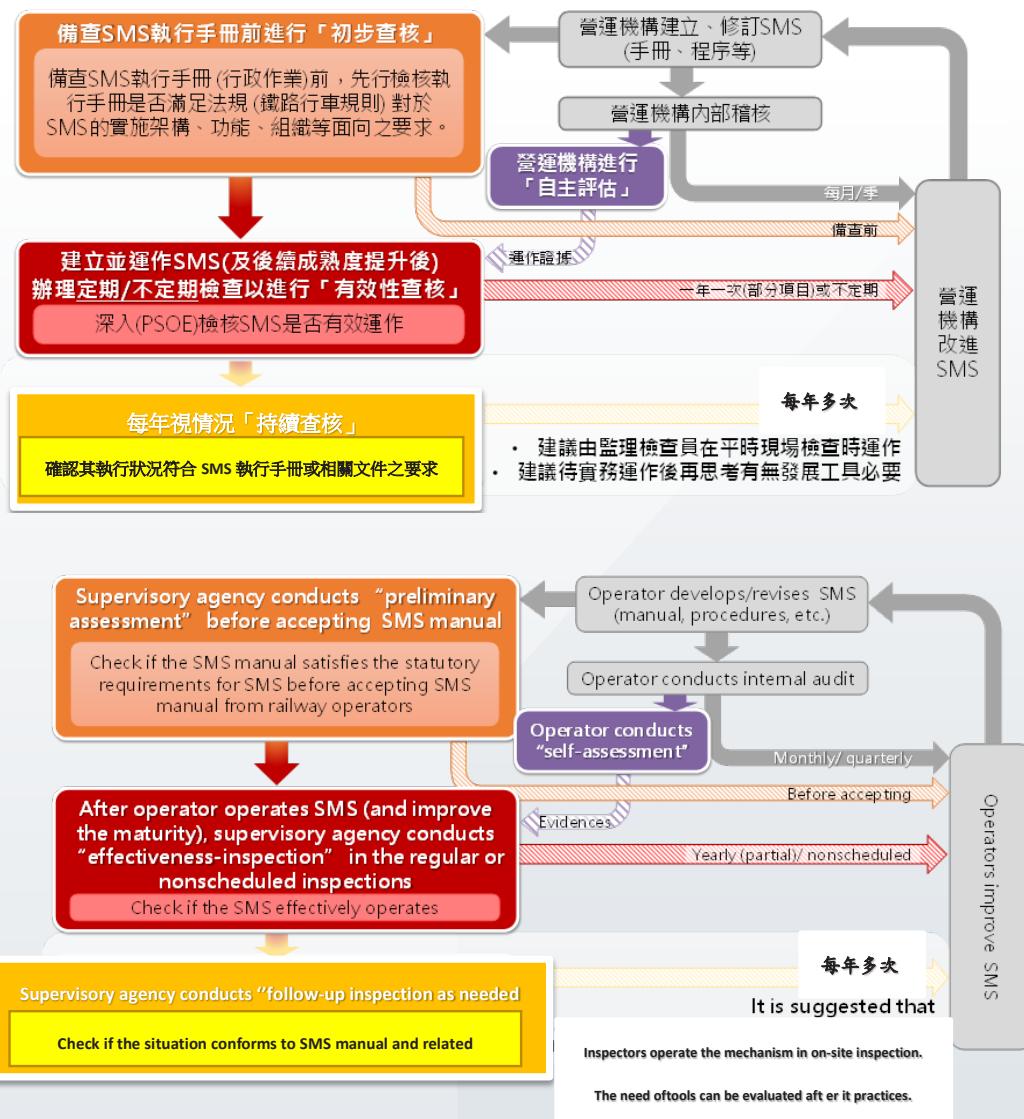
(4) 協助鐵道營運機構提昇安全管理系統作業水準。

4. 研究成果精華摘要

(3) Through evaluation criteria, examine the SMS promotion gap, thereby strengthening the focus of periodic inspections by railway supervisory institutions.

(4) Assists railway operational institutions in enhancing the operational standards of the safety management system.

4. Summary of Research Results



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我國鐵道SMS自主評估與有效性查核工具範例

Railway SMS self-assessment and examples of validity inspection tools in Taiwan

5. 研究成果報告

- 精進鐵道安全管理系統12要項實務作業指引之研析（111年5月出版）。
- 鐵道安全管理系統自主評估準則與監理查核機制之研究（112年5月出版）。

5. Research Result Report

- A Study on Improving 12 Key Elements in Railway Safety Management System – the Development of Practical Operation Guidelines (Published in May 2022)
- Research on Railway Safety Management Security Self-assessment Criteria and Supervisory Inspection Mechanism (Published in May 2023)



(二) 大型車輛裝設主動預警輔助系統之試運行使用成效評估(2/4)-評估方法之先導測試

1. 計畫概述

行政院與交通部為協助國內科技研發業者，整合大型車輛相關主動預警輔助系統、訂定認驗證規範、提供試運行機會、帶動先進駕駛輔助系統（Advanced Driver Assistance System, ADAS）產業發展，以提升行車安全，爰辦理「交通部大型車輛裝設主動預警輔助系統」科研計畫（110-113年）。本計畫為該科研計畫之子計畫，目的為評估主動預警輔助系統裝設於試運行之大型車輛後，於實際道路上應用的使用成效。

本年度為110-113年之第2年期計畫，以110年（第1年期）建立之使用成效評估架構（包含成效評估資料需求、蒐集計畫、指標架構等），111年依據「交通部大型車輛裝設主動預警輔助系統」之成效評估需求，設計使用成效評估方法（確立抽樣方法、受測者定義、實驗設計、實驗程序、資料分析及統計方法），並配合設備研發、裝設期程啟動相關調查及資料蒐集程序，112-113年將進行試運行成效評估及4年計畫成果之綜整。

2. 研究成果

- (1) 完成建立大型車輛裝設主動預警輔助系統之試運行使用成效評估方法。
- (2) 完成建立成效評估資料需求及蒐集計畫。

3. 成果推廣與效益

- (1) 提供交通部科研計畫後續年度（111-113）成效評估架構規劃。
- (2) 提供交通部納入「大型車輛裝設主動預警輔助系統補助要點」附件3受補助人應配合計畫執行事項。

(II) Evaluation of the Trial Operation of Large Vehicles Installed with Active Warning Assist System (2/4): Pilot Run of Evaluation Methods

1. Project Overview

In order to assist technology R&D operators in integrating active the active warning assist system for large vehicles, establishing certification and verification regulations, providing operational opportunities, and promoting the development of the Advanced Driver Assistance System, ADAS industry in order to enhance vehicle travel safety. Therefore, the "Evaluation of the Trial Operation of Large Vehicles Installed with Active Warning Assist System" scientific research plan (2021-2024). The plan is a sub-plan of the scientific research plan. The objective is to evaluate the effectiveness of the actual application on roads after installing the active warning assist system on large vehicles during trial operations.

The current year is the second year of the plan spanning 2021~2024. With the use effectiveness evaluation architecture (including effectiveness evaluation data requirements, plan collection, indicator architecture, etc.) established in 2021 (in the first year), in 2022, the use effectiveness evaluation methods (establishing sampling methods, the definition of subjects, experimental design, experimental procedures, data analysis, and statistical methods) were designed in accordance with the effectiveness evaluation requirements of "the MOTC Active Warning Assist System Installed on Large Vehicles." In addition, in conjunction with equipment R&D, installation schedule, relevant investigations and data collection procedures were launched. From 2023 to 2024, trial operation effectiveness evaluations and 4-year plan results were compiled.

2. Research Results

- (1) Evaluation Methods of the Trial Operation of Large Vehicles Installed with Active Warning Assist System.
- (2) The establishment of effectiveness evaluation data requirements and plan collection has been completed.

3. Result Promotion and Benefits

- (1) Provide planning of the effectiveness evaluation architecture for the MOTC scientific research plan in the subsequent year (2022~2024).
- (2) Provide MOTC subsidy recipients' plan compliance implementation matters included in the "Guidelines for Subsidizing Installation of Active Warning Assist System on Large Vehicles."

4. 研究成果精華摘要

4. Summary of Research Results

成效評估指標



Effectiveness Evaluation Indicators



成效評估方法架構圖

Effectiveness Evaluation Indicator Framework Diagram

5. 研究成果報告

- 「大型車輛裝設主動預警輔助系統之試運行使用成效評估 (1 / 4)：評估架構規劃」(111年8月陳報交通部)

(三) 事故碰撞型態導向之路口設計範例推廣示範計畫 (2 / 3) – 非直轄市推廣應用 (1)

1. 計畫概述

本所已於109年初步完成「事故型態導向之路口交通工程設計範例」，以路口常見的肇事型態為應用對象，彙整各肇事型態的交通工程改善設計範例，可直接應用於路口特定肇事型態的改善。為有效降低國內道路交通事故的發

5. Research Result Report

- Evaluation of the Trial Operation of Large Vehicles Installed with Active Warning Assist System (1/4): Evaluation Framework Planning (Submitted to the Ministry of Transportation and Communications in August 2022)

(III) The Promotion of "Traffic Safety Engineering Design Guidance for Intersection Based on Accident Types (2/3)" – Special Municipality (I)

1. Project Overview

The "examples of accident-type oriented intersection traffic engineering design" were initially completed by the Institute of Transportation in 2020. Examples of traffic engineering improvement design for different accident types have been compiled and directly applied for improving specific accident types at intersections using common accident types at intersections and application targets. To reduce the number of domestic road accidents, the plan has promoted the use of research result

生，本計畫推動該研究成果設計範例的應用，訓練各交通主管機關之交通工程從業人員，熟悉各類型設計範例的應用情境，以及交通診斷學的整套作業流程，從而協助各級道路主管機關提昇易肇事路段改善的技術水準，帶動整體交通工程環境更趨於安全與友善。

2. 研究成果

- (1) 本計畫推動過去累積的易肇事交叉口改善設計範例之應用，以訓練各交通主管機關之交通工程從業人員，使相關人員可熟悉各種設計範例的應用情境，以及肇事診斷學的作業流程，進而提升交通工程環境之安全水準。
- (2) 配合「第40期台灣地區易肇事路段改善計畫」在基隆市、新竹市、嘉義市、新竹縣、苗栗縣、南投縣、彰化縣、嘉義縣所建議之示範改善地點，進行分析與初擬改善方案，並於現場會勘檢討會議中，協助對示範改善地點的改善方案進行討論。
- (3) 各示範地點的改善項目，主要以適當車道配置與導引、縮小面積過大的交叉口、改善車流動線與提供行人適當穿越空間為原則。

3. 成果推廣與效益

- (1) 本計畫於8縣市研議的示範改善地點，納入「第40期臺灣地區易肇事路段改善計畫」並辦理交通工程改善，並將於112年陸續完成改善施工，實質改善當地交通安全。
- (2) 111年6月22～7月1日於基隆市、新竹市、嘉義市、苗栗縣、南投縣、彰化縣辦理6場次之推廣教育訓練座談會，訓練各交通主管機關之交通工程從業人員熟悉各種設計範例的應用情境，以及肇事診斷學的作業流程，進而提升交通工程環境之安全水準。

design examples to train transportation engineering practitioners of transportation competent authorities in the application situations of various design examples, as well as a whole set of operational procedures related to transportation diagnostics. In turn, assistance is provided to the road competent authorities at all levels in order to improve the technical standards of accident-prone road section improvement. In turn, the overall transportation engineering environment can be pushed toward greater safety and usability.

2. Research Results

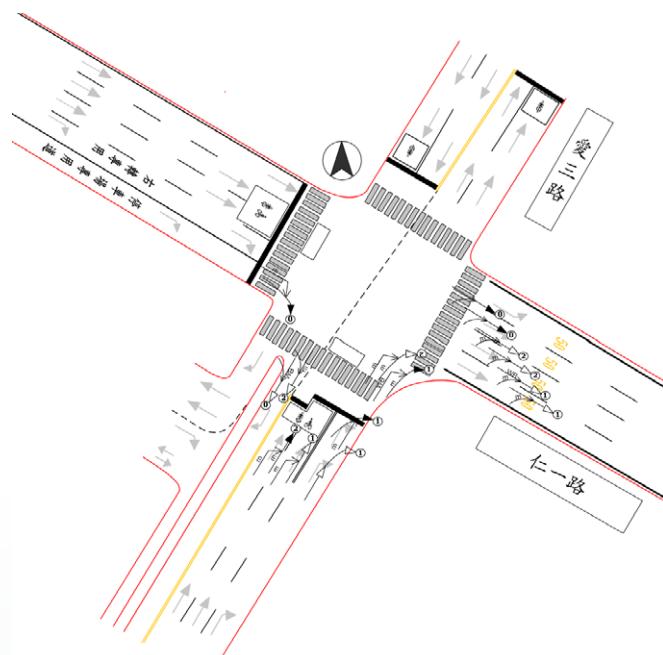
- (1) This plan has promoted the use of past examples of accident-prone intersection improvement design in order to train transportation engineering practitioners from transportation competent authorities. Relevant personnel will be familiarized with the application situations of various design examples, as well as accident diagnostics related operational procedures, thereby improving the transportation engineering environment's safety standards.
- (2) Analysis and preliminary improvement plans were carried out in conjunction with the "Improvement Plan for the 40th Accident-prone Road Sections," including Keelung City, Hsinchu City, Chiayi City, Hsinchu County, Miaoli County, Nantou County, Changhua County, and Chiayi County. Furthermore, the improvement plans for assisting improvement demonstration sites were discussed during site investigation review meetings.
- (3) In general, the improvement items for the demonstration sites include appropriate lane configurations and guides, narrowing overly large intersections, improving flow routes, and providing appropriate pedestrian crossing spaces.

3. Result Promotion and Benefits

- (1) The "40th Improvement Plan for Accident-prone Road Sections in Taiwan" has been incorporated into the plan for the formulated demonstration improvement sites in eight counties and cities. Transportation engineering improvements were made. Improvement construction was completed in stages in 2023 to significantly improve local traffic safety.
- (2) From June 22 to July 1, 2022, six education training seminars were held in Keelung City, Hsinchu City, Chiayi City, Miaoli County, Nantou County, and Changhua County. Transportation engineering practitioners from transportation competent authorities received training to become acquainted with the application situations of various design examples, as well as accident diagnostics related operational procedures, thereby improving the safety standards of the transportation engineering environment.

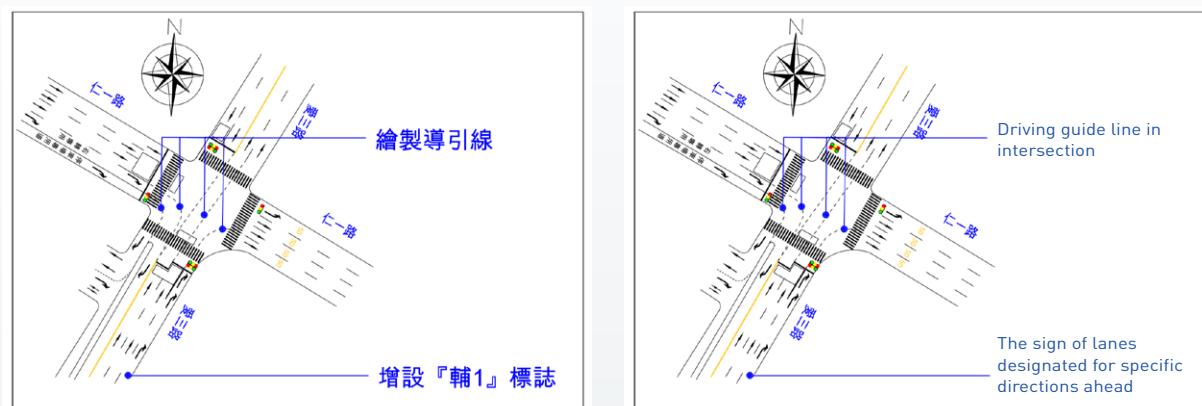
4. 研究成果精華摘要（圖、表資料）

4. Summary of Research Results (Figures and Tables)



基隆市仁愛區仁一路愛三路碰撞構圖

Collision composition of Ren-yi Road and Ai-san Road, Renai District, Keelung City



基隆市仁愛區仁一路愛三路研究改善示意圖

Schematic diagram of research and improvement of Ren-yi Road and Ai-san Road, Renai District, Keelung City.

5. 研究成果報告

- 混合車流情境之機車交通安全工程設計方法研究驗證與推廣（107年6月出版）
- 混合車流情境路口交通工程設計範例（107年3月出版）
- 混合車流路口道路與交通工程設計範例（1/4）（107年11月出版）

5. Research Result Report

- Research Verification and Promotion of Locomotive Traffic Safety Engineering Design Methods with Mixed Flow Situations [Published in June 2018]
- Examples of Intersection Traffic Engineering Design Examples with Mixed Flow Situations [Published in March 2018]
- Examples of Intersection Traffic Engineering Design Examples with Mixed Flow Situations (1/4) [Published in November 2018]

- 混合車流路口道路與交通工程設計範例 (2/4) (108年12月出版)
- 混合車流路口道路與交通工程設計範例 (3/4) -非號誌化路口 (109年10月出版)
- 事故型態導向之路口交通工程設計範例之研究 (110年7月出版)。
- 事故碰撞型態導向之路口設計範例推廣示範計畫 (1/3) -直轄市推廣應用 (111年7月出版)
- 事故碰撞型態導向之路口設計範例推廣示範計畫 (2/3) -非直轄市推廣應用 (I) (112年7月出版)
- Examples of Intersection Traffic Engineering Design Examples with Mixed Flow Situations (2/4) [Published in December 2019]
- Examples of Intersection Traffic Engineering Design Examples with Mixed Flow Situations (3/4) [Published in October 2020]
- Research on Examples of Accident-oriented Intersection Transportation Engineering Design [Published in July 2021]
- The promotion of "Traffic Safety Engineering Design Guidance for Intersection Based on Accident Types (1/3)" -Special Municipality [Published in July 2022]
- The Promotion of "Traffic Safety Engineering Design Guidance for Intersection Based on Accident Types (2/3)" -Special Municipality [Published in July 2023]

(四) 臺灣地區易肇事路段改善計畫

1. 計畫概述

隨著我國經濟發展，道路周邊的土地使用及產業活動等不斷隨著時間變化下，道路建設、交通狀況與交通流量也不斷地遞移。因此，為因應道路環境與交通狀況的改變，並且有效降低可能衍生的更多交通事故狀況，以維護道路安全及有效、持續不斷地改進道路交通設施，臺灣地區易肇事路段改善計畫已列為交通部每年提昇道路安全之重要工作。

本計畫係依據院頒「道路交通秩序與交通安全改進方案」，由交通部列為長期性之任務，並責由本所自民國69年開始辦理第1期計畫，至111年已完成39期，並持續辦理報告研提及執行。

本計畫主要針對各縣市政府轄區內易肇事路段做為改善範圍，自第37期開始，由交通部投入相關補助經費機制引導改善，結合本所107年至109年「事故型態導向之路口交通工程設計範例」系列研究成果，及110年辦理「事故碰撞型態導向之路口設計範例推廣示範計畫 (1/3) -直轄市推廣應用」計畫等，致力提升各道路主管機關的易肇事路段改善技術能力。另自第39期計畫起，為協助各縣市道安會報

(IV) Improvement Plan for Accident-prone Road Sections in Taiwan

1. Project Overview

With Taiwan's economic development, changing peripheral road land use and industrial activities, road construction, traffic conditions, and traffic flows continue to shift. As a result, to maintain road safety and effectiveness, as well as to continue to improve road traffic facilities in response to changes in the road environment and traffic conditions. The Taiwan Ministry of Transportation and Communications identifies the Improvement Plan for Accident-prone Road Sections as a critical task for improving road safety every year.

The "Improvement Plan for Road Traffic Order and Traffic Safety" of the Executive Yuan serves as the foundation for this plan. The Ministry of Transportation and Communications has designated it as a long-term task, with the Institute of Transportation committed to launching the first phase of the plan in 1980. As of 2022, 39 phases had been completed, and report formulation and implementation were still ongoing.

This plan focuses on accident-prone road sections within the jurisdictions of the county and city governments as the improvement scope. Beginning the 37th phase, the Ministry of Transportation and Communications has introduced a pertinent subsidy fund mechanism to guide the improvement. Combining the "Examples of Intersection Traffic Engineering Design Based on Accident Types" series of research results of the Ministry of Transportation from 2018 to 2020, as well as the Promotion of "Traffic Safety Engineering Design Guidance for Intersection Based on Accident Types (1/3)" -Special Municipality" in 2021, the road competent authorities are committed to enhancing accident-prone road section improvement technological capabilities. In addition, beginning with the 39th phase of the plan, counties and cities can log in to the MOTC's road safety information platform to select 20 accident-prone road sections and download relevant data to assist them in reporting on road safety. The Institute of Transportation has been tasked with developing operational examples for county

自行登入交通部道安資訊平台篩選出20處易肇事路段及下載相關資料，改由本所製作操作範例，提供各縣市政府自行參考其道路狀況、交通特性及肇事紀錄等需求列入改善地點，並據以研提改善方案送本所彙整。此外，於第40期計畫起，本所結合事故碰撞型態導向之路口設計範例推廣示範計畫、區域運輸發展研究中心及交通部道安會院頒「道路交通秩序與交通安全改進方案」等，以進一步協助各縣市道安會報提升道安改善能量。

2. 研究成果

- (1) 完成蒐集歷年臺灣地區道路交通事故資料，並分析易肇事路段之肇事次數、死亡人數、受傷人數等資料。
- (2) 完成易肇事路段現地會勘工作，並提出改善方案彙整成報告書報部核定後，送各道路主管機關據以執行。

3. 成果推廣與效益

- (1) 第40期臺灣地區易肇事路段改善計畫已納入各縣市64處改善地點，預計總經費，改善總經費共計約2,668萬8,057元，平均每處改善經費約為新臺幣41萬7,000元。
- (2) 透過「事故型態導向之路口交通工程設計範例」、「事故碰撞型態導向之路口設計範例推廣示範計畫」及「區域運輸發展研究中心服務升級2.0計畫」指定型計畫之推動，有效將本所歷年交通工程技術發展計畫之相關成果推廣至第一線交通工程從業人員，實際協助易肇事路口改善，並可進一步精進其易肇事路段改善技術。整體而言，可達到中央地方協力改善道路交通安全，降低交通事故死傷人數之效益。

and city governments to use as references for road conditions, traffic characteristics, accident records, and other requirements to list improvement locations. A plan for improvement will be proposed and submitted to the Institute of Transportation for compilation. In addition, beginning with the 40th phase of the plan, the Institute of Transportation has combined accident collision type intersection design examples to promote demonstration plans, the North Center for Transportation Research and Development, the "Improvement Plan for Road Traffic Order and Traffic Safety" promulgated by the MOTC road safety committee, etc., to assist the counties and cities in road safety reports on how to increase road safety improvement momentum.

2. Research Results

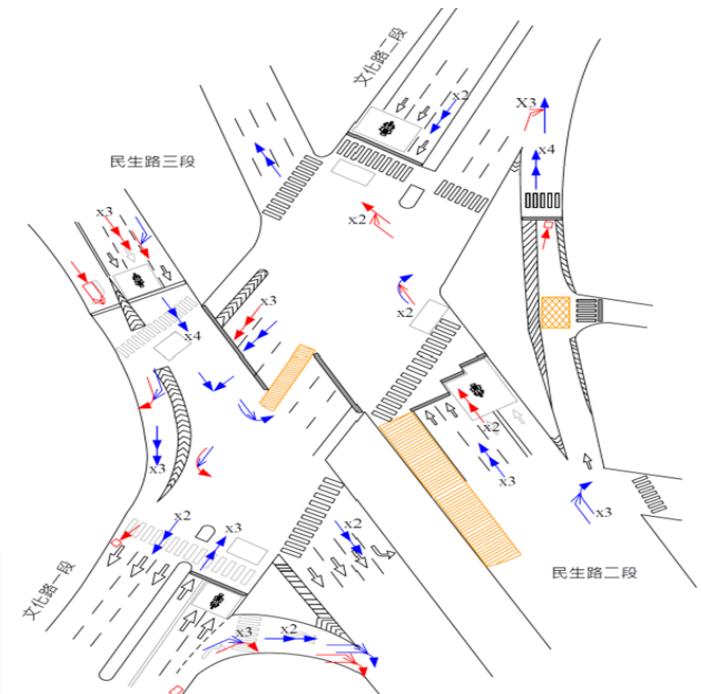
- (1) Over the years, Taiwanese road traffic accident data has been collected and analyzed, including the number of accidents on accident-prone roads, the number of fatalities, and the number of injuries.
- (2) The investigation into accident-prone road sections has been completed. Improvement plans have been submitted to the ministry for approval in the form of reports and have been sent to the respective road competent authorities for implementation.

3. Result Promotion and Benefits

- (1) The 40th Improvement Plan for Accident-prone Road Sections in Taiwan has incorporated 64 improvement locations in respective counties and cities. The tentative total budget for improvement is NT\$26,688,057, with the average improvement funding for each location for a total of NT\$417,000.
- (2) Through the "Examples of Intersection Traffic Engineering Design Based on Accident Types," "The Promotion of "Traffic Safety Engineering Design Guidance for Intersection Based on Accident Types," and "Implement the Service Upgrade 2.0 Project for the Regional Transportation Research and Development Center" designated plan promotions, the Institution of Transportation's traffic engineering technology development plan related results over the years have been promoted to first-line traffic engineering practitioners, thereby substantively assisting in improving accident-prone intersections and further refining the technologies for improving accident-prone road sections. Overall, the benefit of achieving the central and local governments' collaboration to improve road traffic safety and reduce traffic accident casualties can be achieved.

4. 研究成果精華摘要

4. Summary of Research Results



易肇事路段肇因分析技術-事故碰撞構圖
Cause analysis technology for accident-prone road sections-accident and collision composition

5. 研究成果報告

- 第38期臺灣地區易肇事路段改善計畫
(110年7月出版)。
- 第39期臺灣地區易肇事路段改善計畫
(111年7月出版)。
- 第40期臺灣地區易肇事路段改善計畫
(112年7月出版)。

5. Research Result Report

- The 38th Phase of the Improvement Plan for Accident-prone Road Sections in Taiwan (Published in July 2021).
- The 39th Phase of the Improvement Plan for Accident-prone Road Sections in Taiwan (Published in July 2022).
- The 40th Phase of the Improvement Plan for Accident-prone Road Sections in Taiwan (Published in July 2023).



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(2/2)-
系統雛型開發與驗證實作

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、公路總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。本計畫係延續110年度提出之整體規劃構想，運用5G結合AIoT等創新科技，完成高速交通聯網之蒐集、融合與巨量運算整合分析，跨平台掌握人車流、公共運輸、交通號誌等系統即時狀況，此外於面臨5G通訊環境與多元智慧運輸應用需求挑戰之時，一併探討現有都市交通控制系統的通訊協定與控制，以及如何與國際主流車聯網通訊協定標準的無縫接軌，並完成前期（110年）規劃警消與災害防救車輛之智慧號誌控制系統之示範場域概念驗證實作，以確保緊急車輛優先安全通行路口，進而發展城市智慧移動之核心技術與創新應用服務。

2. 研究成果

- (1) 完成智慧交通數位神經中樞系統實作示範場域設備佈建作業，研發重現性與非重現性交通壅塞機率預測模式庫與公共運輸管理相關知識庫，並結合示範城市實證場域交通即時資訊的蒐集分析，再透過數位雙生的技術，構建智慧交通數位神經中樞雛型系統。
- (2) 完成緊急救援車輛智慧號誌控制系統之概念驗證實作（於臺中市水湳經貿園區進行驗證實作）。
- (3) 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版第二階段檢討（包括資訊可變標誌（CMS）、自動車輛辨識（eTag與AVI），以及搭配輕軌優先號誌運行之「號誌控制器訊息」等項目）。

VI

Promote the Innovative Application
of Transportation Technology and
Industrial Development

- (I) Construction of 5G intelligent transportation digital nerve center (2/2) - System prototype development and verification implementation

1. Project Overview

The Institute of Transportation has been tasked to co-formulate the "Plan for Promoting the Efficiency and Safety of Smart Transportation Services" (By Letter of Yuan-Tai-Ke-Hui-Zi No. 1090098342 of the Executive Yuan on September 3, 2020) in accordance with the "Digital Nation Innovative Economic Development Plan," "Taiwan 5G Action Plan," and other major policy implementation focuses. The plan runs from 2021 to August 2025. Construction of 5G intelligent transportation digital nerve center planning and implementation and other plan series. In continuation of the overall planning and idea development in 2021, this plan uses 5G in conjunction with AIoT and other innovative technologies to complete an integrated analysis of the highway transportation network through collection, integration, and massive computing. People and traffic flow, public transportation, traffic signal status, and other real-time statuses were monitored across multiple platforms. In addition, the communication protocol and control of existing transportation control systems, as well as how to connect seamlessly with international mainstream vehicle-to-everything (V2X) protocol standards, were discussed in light of the 5G communication environment and diverse intelligent transportation application requirements and challenges. In addition, during the pre-planning period of 2021, the verification and implementation concepts for intelligent signal control systems for police and fire protection and disaster prevention and rescue vehicles at demonstration sites were planned. This ensures that emergency vehicles have priority for safe passage at intersections, thereby advancing urban smart mobility's core technologies and innovative application services.

2. Research Results

- (1) At the digital nerve center implementation demonstration sites of intelligent transportation, equipment deployment operations have been completed. The development of a library of reproducibility and non-reproducibility traffic congestion probability prediction models and a knowledge base related to public transportation management were developed. In addition, the intelligent transportation digital nerve prototype system has been developed through the collection and analysis of real-time transportation information from the demonstration site, as well as the use of digital twin technology.
- (2) Verification and implementation of the intelligent signal control systems for emergency rescue vehicles have been concluded (verification and implementation of the Shuinan Economic and Trade Park in Taichung City).
- (3) The second phase of the review of the Urban Traffic Control Protocol Version 3.0 in response to 5G V2X and A.I. requirements (including Changeable Message Sign (CMS), automatic vehicle recognition (eTag and AVI), and "signal control messages" that operate with the Light Rail Transit priority signals) has been completed.

3. 成果推廣與效益

(1) 111年11月8日辦理完成「都市交通控制通訊協定3.0版檢討成果」交流座談會，邀集各界說明110-111年都市交通控制通訊協定3.0版的新舊課題檢討成果，以期都市交通控制通訊協定能與時俱進，在向前相容精神下與新資訊科技無縫接軌，以支援未來城市智慧移動之各式創新應用服務。

(2) 111年11月10日舉辦「構建5G智慧交通數位神經中樞(2/2)-系統雛型開發與驗證實作」成果交流座談暨技術研討會，國內6都交通局正副局長及各交通管理與實務應用單位參加，分享及研討執行成果，以推廣本計畫重要研究成果與應用經驗。

(3) 計畫成果已摘錄論文於「中華民國運輸學會2022年會暨學術論文國際研討會」發表相關研究規劃成果共計2篇，以提供各界瞭解及研討與應用。

4. 研究成果精華摘要

3. Result Promotion and Benefits

- (1) The "Urban Traffic Control Protocol Version 3.0 Review Results" Exchange Seminar was held on November 8, 2022. People from all sides were invited to discuss the results of the review of the new and existing issues of Urban Traffic Control Protocol Version 3.0, in the hopes that the protocol can keep up with the times. Under the spirit of forward compatibility, future urban smart mobility can support a variety of innovative application services.
- (2) The "Construction of 5G intelligent transportation digital nerve center [2/2] - System prototype development and verification implementation" Result exchange, Symposium, and Technical Seminar was held on November 10, 2022. Director-general and deputy director-general of the Transportation Bureau in six special municipalities, as well as various transportation management and practical application units in Taiwan, shared and discussed the implementation results at the seminar. The plan's major research results and application experience were then promoted.
- (3) Two articles of relevant research planning results were published in "The 2022 International Conference and Annual Meeting of the Chinese Institute of Transportation" to facilitate comprehension, discussion, and application by people from all sides.

4. Summary of Research Results



5 研究成果報告

- 構建 5G 智慧交通數位神經中樞
(2/2) - 系統雛型開發與驗證實作
(112年6月出版)

5 Research Result Report

- Construction of 5G intelligent transportation digital nerve center [2/2] - System prototype development and verification implementation [Published in June 2023]

(二) 我國人工智慧車聯網之號誌控制模式探討

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、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。本所於104年至108年進行系列智慧交通服務效能與安全的車聯網研究計畫，優先探討我國都市交通號誌控制與車聯網整合，提供即時號誌動態資訊給各式車輛，以提供安全、優先通行、節能的道路交通環境。交通部「淡海新市鎮智慧交通場域試驗研究計畫」以本所車聯網系列研究為基礎，進一步針對號誌控制與電信車聯網（C-V2X）整合的通訊協定需求，參酌SAE標準研擬「號誌控制器與車聯網路側設施間資訊標準」。另本所於109年「應用人工智慧技術進行交通數據蒐集暨號誌控制之研究」計畫發展以仿真學習（Imitation Learning, IL）與以號誌「週期」為基礎的人工智慧強化學習（RL）號誌控制，而國內亦有相關學術研究與桃園市的實作案例。本計畫導入人工智慧強化學習深度確定策略梯度（Deep Deterministic Policy Gradient, DDPG）與近端策略優化（Proximal Policy Optimization, PPO）的「無模式（Model-free）」與車聯網（V2X）等技術在交通號誌控制應用，並藉由實驗場域實際車流資料於模擬環境中進行訓練學習與量化績效分析。

2. 研究成果

(1) 與臺北市政府、臺南市政府、高雄市政府合作分別於「中山北路-德行東路」多路口幹道、「台86-19甲」單一路口、「台88鳳山出口」（過埠路-鳳頂路）等3個實驗場域完成交通調查、模擬模式構建與校估，以及人工智慧強化學習號誌控制模型之學習訓練與模擬測試及績效分析。

(II) A Discussion of the Artificial Intelligence V2X Signal Control Model

1. Plan Overview

In recent years, artificial intelligence has progressed by leaps and bounds, with the rapid development of numerous software and hardware field applications. Future applications of artificial intelligence, image recognition, Information and Communication Technology (ICT), vehicle-to-vehicle (V2X), and 5G technology are especially helpful for alleviating the public's transport pain point as a result of insufficiently intelligent traffic signal control. The Institute of Transportation conducted a study titled "Proposal for the efficiency of intelligent transportation service series and the safety of V2X." Prioritized for discussion are Taiwan's urban transportation signal control and V2X integration, which provide dynamic information of real-time signals to various vehicles to create a safe, priority at intersections, energy-efficient road traffic environment. The Ministry of Transportation and Communications' "Proposal for an Intelligent Transportation Open Test Field in Danhai New Town" is founded on the Ministry of Transportation's V2X research series. In addition to addressing signal control and cellular vehicle-to-everything (C-V2X) integration protocol needs, the SAE standards serve as a reference for the development of the "Standards for Signal Controller and V2X Roadside ICT." In addition, "Research on Applied Artificial Intelligence in Transportation Data Collection and Signal Control" planned to implement Imitation Learning (IL) and signal "cycle"-based artificial intelligence reinforced learning (RL) signal control by 2020. In Taoyuan City, there are also domestic academic research and implementation cases. This plan has imported artificial intelligence to strengthen learning depth and confirm the application of "model-free" and V2X technology in traffic signal control under Deep Deterministic Policy Gradient (DDPG) and Proximal Policy Optimization (PPO) in traffic signal control. In addition, through actual traffic flow data at the experimental fields, training learning and quantitative performance analysis have been carried out in a simulation environment.

2. Research Results

- (1) A traffic survey, simulation model construction, calibration, and estimation were completed in collaboration with Taipei City Government, Tainan City Government, and Kaohsiung City Government for three experimental fields: "Jhongshan N. Road-Dexing E. Road" multi-intersection main line, "Provincial Highway 86-19 Jia" single-intersection, and "Tai 88 Fengshan Exit" (Guopi Road-Fongding Road). Furthermore, artificial intelligence has improved the learning signal control model's learning training, simulation test, and performance analysis.

(2) 根據模擬測試績效顯示，依不同場域特色所設計人工智慧強化學習（DDPG與PPO）應用方案皆能不同程度的改善現況交通績效，顯示DDPG強化學習號誌控制的潛力與可行性。

(3) 採用卷積層網路（CNN）結構萃取車聯網資料資料特徵，進而作為強化學習的資料輸入，而實驗結果顯示，以車聯網資料作為強化學習號誌控制資料來源的潛力。

3. 成果推廣與效益

於111年11月18日與21日邀請各縣市政府、學術界與產業界參與，透過成果分享會來推廣本計畫之研究成果，並於111年11月22日辦理教育訓練。

4. 研究成果精華摘要

(2) According to simulation test results, artificial intelligence strengthened learning (DDPG and PPO) based on different field characteristics can improve existing traffic performance to varying degrees, indicating DDPG's potential and feasibility in strengthening learning signal control.

(3) To extract V2X data characteristics, which serve as strong learning data input, the convolutional neural network (CNN) structure is used. The experimental results show that V2X data has the potential to improve learning signal control data.

3. Result Promotion and Benefits

The county and city governments, academia, and industry were invited to promote the research results in this plan through result sharing on November 18 and 21, 2022. On November 22, 2022, education training was held.

4. Summary of Research Results



5. 研究成果報告

- 我國人工智慧車聯網之號誌控制模式探討（112年5月出版）。

5. Research Result Report

- A Discussion on the Signal Control Model of Taiwan's AI V2X (Published in May 2023).

(三) 應用人工智慧分析技術探勘高風險路段 (2/4)-車內異常事件影像辨識技術開發

1. 計畫概述

近年先進駕駛輔助系統（ADAS）日益普遍，越來越多運輸業者於轄下車輛加裝相關設備，以在危險狀況下警示駕駛人，避免事故發生。為優化ADAS系統於安全分析之應用，本4年期計畫與國道客運業者合作蒐集大量行車影像、駕駛行為及行車安全警示紀錄，應用影像辨識技術分析車外、車內異常事件，從大量的警示當中找出真正具有安全風險的異常事件，並進而從空間層面探討異常事件的好發熱區，以及研提行為導向之高風險路段改善（道路主管機關）及整合至安全管理系統（運輸業者）的可行方案。

本計畫之第1年期（110年）已針對車外異常事件進行影像辨識技術開發，並以國道客運實際營運的車外行車影像與ADAS警示為基礎，從2,531件ADAS警示當中，找出當中僅占23%的行車異常事件；第2年期計畫進一步整合車內行車影像，開發車內異常事件影像辨識技術，觀察駕駛人手部、頭部及軀體動態，藉以分析潛在分心行為，並其對各項ADAS警示、行車異常事件的影響。研究成果可以協助運輸業者了解駕駛人行為特性及事故風險，以利對症下藥。

2. 研究成果

- (4) 與國道客運業者合作，蒐集其在自然狀態下之車內、外行車影像、駕駛行為及ADAS系統產生之警示事件等資料，建立本所4年期計畫之自然駕駛資料集合。
- (5) 開發車內行車異常事件影像辨識技術，探討駕駛人潛在的分心行為，以及潛在分心行為對異常事件之影響。
- (6) 整合車內、外行車影像、駕駛行為、ADAS警示事件及外在道路幾何、環境資料及駕駛人潛在分心行為，探索行車異常事件之好發特性。

(III) Applying Artificial Intelligent Method for Exploring Risk-prone Road Section (2/4) – Driving Behavior Analysis and Image Recognition Technique Development for Aberrant Events

1. Project Overview

Advanced Driver Assistance Systems (ADAS) have become increasingly common in recent years. An increasing number of transportation companies have installed ADAS-related equipment in their vehicles to alert drivers to potentially hazardous situations and assist them in avoiding collisions. This 4-year plan and freeway bus operators have collaborated to collect massive driving images, driver behaviors, and driving safety warning records in order to optimize the application of ADAS system in safety analysis. In addition to analyzing image recognition technology to analyze vehicles, aberrant events inside vehicles, and find aberrant events that actually pose safety risks from a large number of warnings, the hot zone where aberrant events occur from a spatial standpoint was discussed. Plans for behavior-oriented high-risk road section improvement were developed and integrated into safety management systems (transportation operators).

In the plan's first year (2021), image recognition technology for abnormal events was developed. Only 23% of aberrant events were discovered from 2,531 ADAS warnings using actual driving images of freeway buses outside vehicles and ADAS warnings as the basis. In the second year of the plan, images of vehicles inside vehicles were further integrated to develop aberrant event image recognition technology inside cars, observe drivers' hands, heads, and trunk dynamics, thereby analyzing potential distracting behaviors and the impact of various ADAS warnings and aberrant events while driving. Research results can help transportation operators gain insight into the behavioral characteristics of drivers and accidents, allowing them to take appropriate actions and solve problems.

2. Research Results

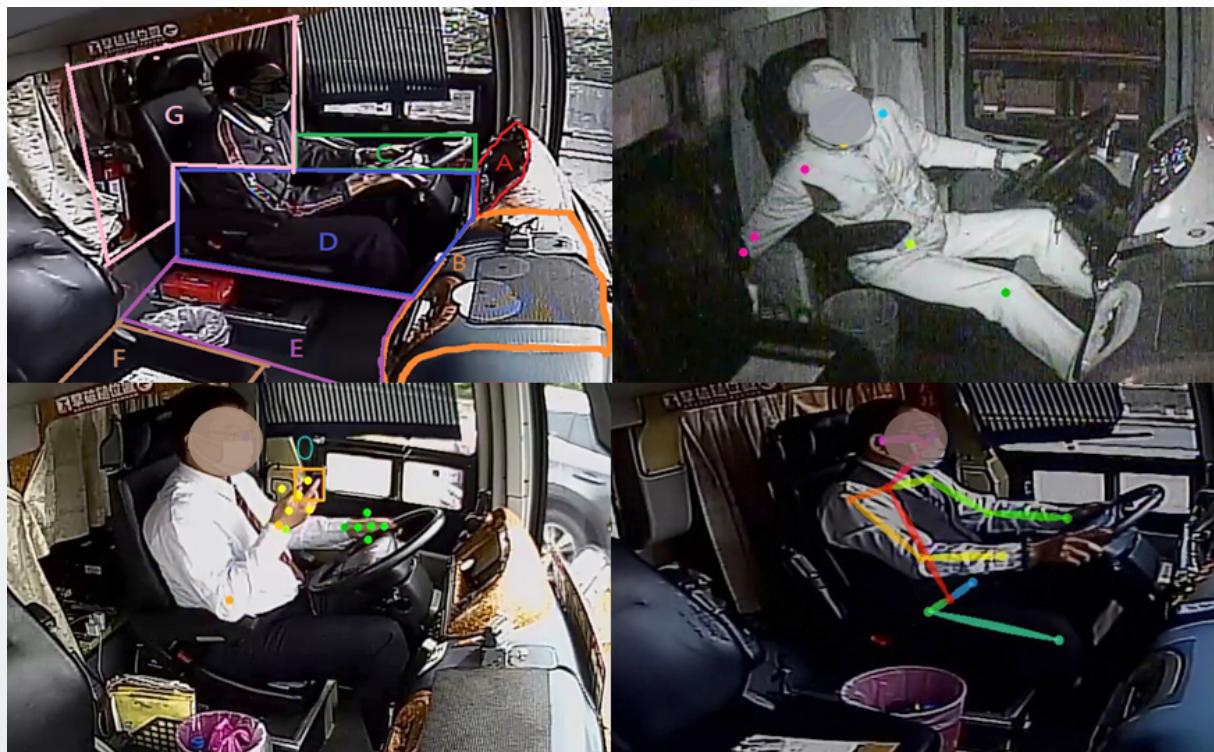
- (4) Collaborate with highway bus operators to collect images inside and outside vehicles, driver behaviors, ADAS warning events, and other data. The Institute of Transportation has established a four-year plan for collecting natural driver data.
- (5) To investigate potential distracting behaviors of drivers and the impact of potential distracting behaviors on aberrant events, image recognition technology for aberrant events while driving in vehicles has been developed.
- (6) Integrate images from inside and outside vehicles, driver behaviors, ADAS warning events, external road geometry, environmental data, and potential distracting behaviors of drivers, and investigate the characteristics of frequent occurrences of aberrant events.

3. 成果推廣與效益

(1) 應用車內、外行車異常事件影像辨識技術之階段性成果，分析各項行車異常事件之好發特性，可提供汽車運輸業者參考，做為教育訓練及其他安全改善策略研擬之基礎。

(2) 112年1月18日參與汽車客運業數位轉型及運輸安全學者專家座談會，邀請主管機關及運輸業者參與，推廣本計畫之研究成果。

4. 研究成果精華摘要



車內異常事件影像辨識技術開發展示

The demonstration of image recognition technology development for abnormal events inside vehicles.

5. 研究成果報告

- 應用人工智慧分析技術探勘高風險路段 (1/4) - 駕駛行為模式研析及車外異常事件影像辨識技術發展 (111年6月出版)
- 應用人工智慧分析技術探勘高風險路段 (2/4) - 車內異常事件影像辨識技術開發 (112年5月出版)。

3. Result Promotion and Benefits

(1) Image recognition technology's phasal results have been applied to detect anomalous events both inside and outside of vehicles. The characteristics of frequent occurrences of aberrant events have been analyzed to serve as a reference for automobile transportation operators and a foundation for developing other safety improvement strategies.

(2) Participated in the digital transformation of the automobile transportation industry and a seminar for transportation safety scholars and experts; invited competent authorities and transportation operators to participate; and promoted the plan research results on January 18, 2023.

4. Summary of Research Results

5. Research Result Report

- Applying Artificial Intelligent Method for Exploring Risk-prone Road Section (1/4)
 - Driving Behavior Analysis and Image Recognition Technique Development for Aberrant Events (Published in June 2022)
- Applying Artificial Intelligent Method for Exploring Risk-prone Road Section (1/4)
 - Driving Behavior Analysis and Image Recognition Technique Development for Aberrant Events (Published in May 2023)

(四) 以無人機探勘人車流動資訊之應用情境 規劃與先導測試 (2/3) -非號誌化路口

1. 計畫概述

以往路口交通安全改善係分析事後之事故資料，本所近年來發展交通衝突分析工具，結合無人機（UAV）空拍攝影及人工智慧（AI）影像辨識技術，將路口行人、車輛流動影像自動轉換成軌跡資料，再透過軟體分析路口易發生交通衝突之地點及型態，以防範事故於未然。本計畫為110-112年3年期計畫之第2年，為應用並驗證此分析工具，除進行兩項先導測試計畫，並選擇4處易肇事路口進行分析，做為地方政府後續改善路口之依據。

2. 研究成果

- (1) 在物件偵測技術方面，縮短空拍影片穩定化處理時間，並就提升行人偵測、修正自行車分類情況、車輛偵測框偏斜問題進行研究。
- (2) 分析軟體優化軌跡／車速繪製功能升級、衝突熱區影像疊合、衝突影片回放功能升級。
- (3) 與公路總局、新北市、臺中市合作挑選13處路口，進行「右轉衝突」及「非號誌化路口停讓衝突」兩項先導測試計畫，除研提風險駕駛行為及判斷邏輯外，並於分析軟體新增相關功能。
- (4) 在基隆市、新竹縣、苗栗縣、彰化縣選擇4處易肇事路口進行分析，並提供分析資料做為地方政府後續改善路口之依據。

3. 成果推廣與效益

- (1) 完成「右轉衝突」及「非號誌化路口停讓衝突」兩項先導測試計畫，將13處路口分析資料提供公路總局、新北市、臺中市參考，以進行後續路口改善。

(IV) Application Scenarios and Pilot Run of Vehicle and Pedestrians Traffic Flow Information Using UAV Aerial Videography (2/3) - Non-signalized Intersections

1. Project Overview

Previously, improving traffic safety meant analyzing accident data after the fact. In recent years, the Institute of Transportation has developed traffic conflict analysis tools that, when combined with UAV aerial photography and artificial intelligence (AI) image recognition technology, automatically convert pedestrians at intersections and vehicle flow images into trajectory data. In order to prevent accidents from occurring, software is used to analyze the venues and patterns of intersections prone to traffic accidents. This is the second year of a three-year plan between 2021 and 2023 to apply and validate analysis tools. In addition to the two pilot test projects, four accident-prone intersections were chosen for analysis and will serve as a reference for local governments to improve intersections in the future.

2. Research Results

- (1) In terms of object detection technology, aerial videos were compressed to reduce processing time and conduct research on pedestrian detection, bicycle classification status, and vehicle detection frame deflection issues.
- (2) Upgrades to the software optimization trajectory/vehicle speed drawing function, conflict hot zone image supposition, and conflict video playback function have all been analyzed.
- (3) 13 roads/intersections have been chosen in collaboration with the Directorate General of Highways, MOTC, New Taipei City, and Taichung City to carry out pilot test projects, namely "right turn conflict" and "non-signalized road/intersection stop and yield conflict." Relevant functions have been added to the analysis software in addition to proposing risk driver behaviors and determining logic.
- (4) Four accident-prone roads/intersections were chosen for analysis by Keelung City, Hsinchu County, Miaoli County, and Changhua County. Local governments have been given analysis data to use as a reference for future road/intersection improvements.

3. Result Promotion and Benefits

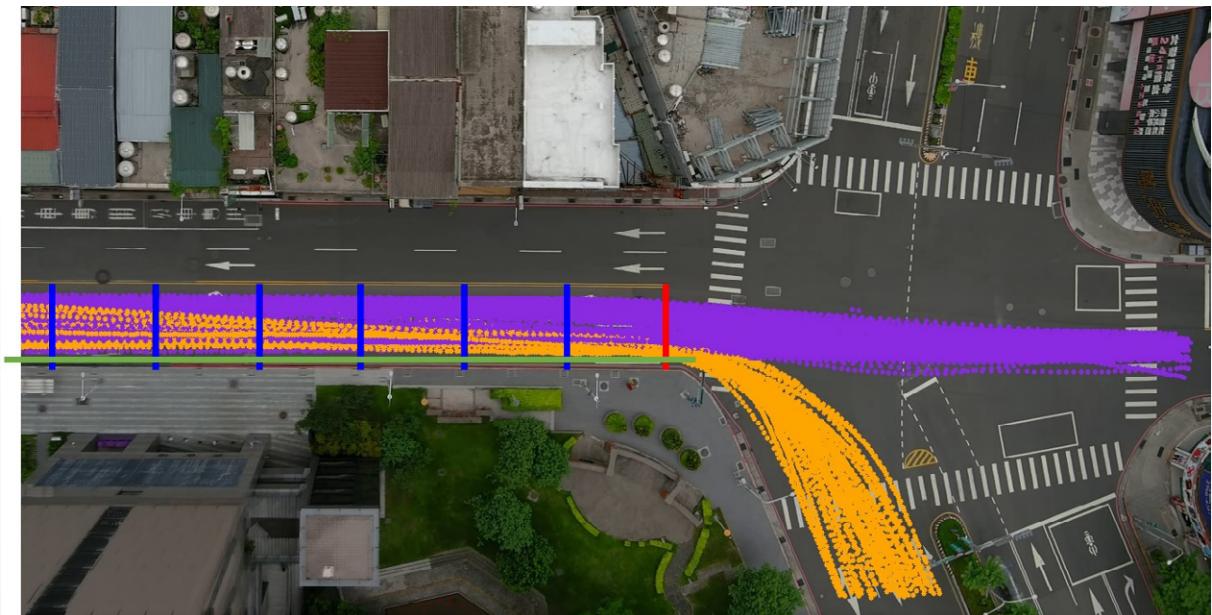
- (1) Two pilot test projects have been completed: "right turn conflict" and "non-signalized road/intersection stop and yield conflict." The analysis data of 13 roads/intersections was provided to the Directorate General of Highways, MOTC, New Taipei City, and Taichung City for reference and subsequent improvement.

- (2) 完成4處易肇事路口交通衝突分析，並提供分析資料做為基隆市、新竹縣、苗栗縣、彰化縣後續改善路口之依據。
- (3) 111年10月27日辦理本案成果發表暨教育訓練講習會，宣導研究成果。

4. 研究成果精華摘要

- (2) A traffic conflict analysis of four accident-prone roads/intersections has been completed. The analysis data has been provided as a reference for future road/intersection improvements in Keelung City, Hsinchu County, and Changhua County.
- (3) On October 27, 2022, the proposal's result presentation and education training seminar were held to advocate for research results.

4. Summary of Research Results



運用右轉車流軌跡分析路口右轉衝突情況

Analysis of the right-turn conflict situation at roads/intersections using right-turn traffic flow trajectory.

5. 研究成果報告

- 道路交通車流及事故風險偵測與分析工具之發展應用（108年11月出版）
- 路口無人機交通攝影及衝突分析技術開發（109年7月出版）
- 路口俯視攝影技術於交通衝突分析之案例應用與比較（110年7月出版）。
- 以無人機探勘人車流動資訊之應用情境規劃與先導測試（1/3）-建立分年測試計畫（111年5月出版）。
- 以無人機探勘人車流動資訊之應用情境規劃與先導測試（2/3）-非號誌化路口（112年5月出版）。

5. Research Result Report

- The Development and Application of Road Traffic Flow and Accident Risk Detection and Analysis Tools (Published in November 2019)
- Road/intersection UAV Traffic Photography and Conflict Analysis Technology Development (Published in July 2020)
- The Case Application and Comparison of Road/intersection Overhead Photography in Traffic Conflict Analysis (Published in July 2021)
- Application Scenarios and Pilot Run of Vehicle and Pedestrians Traffic Flow Information Using UAV Aerial Videography (1/3) - Establishing a Test Plan (Published in May 2022).
- Application Scenarios and Pilot Run of Vehicle and Pedestrians Traffic Flow Information Using UAV Aerial Videography (2/3) – Non-signalized Road/intersection (Published in May 2023).

(五) 推動無人機於交通領域之創新應用與產業發展規劃

1. 計畫概述

交通部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，責成運輸研究所召集成立「交通科技產業會報-無人機科技產業小組」。本所已於交通部「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」。本所依據前述發展策略與路徑圖，109年至110年與中華航空事業發展基金會合作推動相關計畫；110至111年延續前期計畫成果，並申請交通部智慧運輸發展建設計畫經費，推動各項計畫。

2. 研究成果

- (1) 「交通部無人機科技產業發展策略規劃與執行」計畫重點為推動臺灣無人機大聯盟（UAS-Taiwan）之籌組並協助成立初期之發展運作，該聯盟業於111年3月正式成立，並於111年6月與日本無人機產業振興協會JUIDA簽訂合作備忘錄；此外，並依據2025年我國無人機在交通領域發展之橋梁巡檢、物流運送兩項里程碑，提出對應之推動策略及路徑圖，提供國內政府單位、學研單位及產業界之參考依據。
- (2) 無人機在交通領域之創意應用競賽（II）：競賽分為創意組、應用組及研發組，創意組鼓勵學生提出無人機創新設計；應用組由政府機關提出導入無人機於公務應用之成功案例；研發組找出應用痛點之解決方式。本競賽吸引近百隊參賽，並遴選出創意組10隊、應用組9隊、研發組10隊，共29組優秀作品獲獎。

(V) Promote UAE innovative applications in the field of transportation and industrial development planning.

1. Plan Overview

The MOTC has tasked the Institute of Transportation with convening and establishing the "MOTC Technology Industry Bulletin-UAV Technology Industry Group" in order to effectively import UAE for innovative applications in Taiwan's transportation field and promote the development of relevant industries. The Institute of Transportation proposed Taiwan's UAV technology development strategies and roadmap 2.0 version in the "2021 MOTC Industry Policy White Paper" and the "2025 Taiwan UAV transportation field Development milestone." The Institute of Transportation and the China Aviation Development Foundation collaborated to promote related plans from 2020 to 2021 in accordance with the aforementioned development strategies and roadmaps. MOTC intelligent transportation development construction plan funds were used to promote various plans as a continuation of the pre-planning plan results from 2021 to 2022.

2. Research Results

- (1) The "MOTC Strategic Planning and Implementation of the UAV Technology Industry Development" Plan's primary goal is to promote the UAS-Taiwan organization and assist in developmental operations during its early stages. The alliance was formed in March 2022, and a memorandum of cooperation was signed in June 2022 with Japan UAS Industrial Development Association (JUIDA). Furthermore, corresponding promotion strategies and roadmaps were proposed for 2025 to serve as a reference for domestic government units, academic and research units, and industries based on the two milestones of bridge inspection in Taiwan's UAE throughout the development of the transportation field and logistics delivery.
- (2) UAV Creative Application Contest in the Field of Transportation (II): the contest is divided into three categories: creative, application, and R&D. Students were encouraged to propose UAV innovative designs for the creative category; for the application category, the government agency proposed and imported successful cases of UAV applied in public affairs; and for the R&D category, solutions for application pain points were found. This contest attracted nearly 100 teams. There were ten teams chosen for the creativity category, nine for the application category, and ten for the R&D category, for a total of 29 outstanding award-winning entries.

(3) 無人機整合示範計畫 (II) -物流運送之深化應用，透過與民航局及中華郵政緊密合作，共同決定驗證主題為-道路（橋梁）中斷以無人機維持郵務運送，並選擇桃園復興郵局（介壽國中舊址）至華陵里（達觀山風景區停車場）做為驗證場域，飛行距離（來回）達約44公里。本期共吸引21家廠商報名，最後其中4家（25kg以上：4家為田屋科技股份有限公司、經緯航太科技股份有限公司、泰世科技有限公司、樂飛創新國際股份有限公司）完成驗證。

(4) 無人機搭配AI影像辨識應用於橋梁檢測之研究(1/2) -橋梁劣化構件AI影像辨識之技術開發，透過清洗「車行橋梁管理資訊系統」資料庫中橋梁構件劣化影像資料，同時提出AI影像辨識模式，並設計橋梁檢測無人機雛型，研擬無人機在橋下無GPS訊號之解決方案，以建立利用無人機搭配AI影像辨識模式之標準作業程序，協助人工橋梁檢測工作，逐步推動自動化方式檢測橋梁工作。112年預計將AI影像辨識模式結合無人機橋下無GPS飛行技術，進行實橋檢測技術驗證，以瞭解實際檢測成果。

3. 成果推廣與效益

(1) 111年3月23日舉辦「111年3月23日臺灣無人機大聯盟成立大會暨科技產業發展國際論壇」。

(2) 111年8月13日蔡英文總統蒞臨嘉義縣亞洲無人機AI創意研發中心為交通部無人機科技產業小組辦公室揭牌。

(3) 111年12月12日辦理「飛山越嶺交通部無人機推動成果發表會」。

(3) Unmanned Aerial Vehicle (UAV) Integrated Pilot Program (II)- Expanding Logistics Application Collaboration with the Civil Aeronautics Administration, MOTC, and Chunghwa Post Co., Ltd. is required to jointly determine and verify the theme of maintaining postal delivery using UAVs during road (bridge) interruptions. Furthermore, "from Taoyuan Post Office (former site of Taipei Municipal Jieshou Junior High School) to Hualing Village (reaching the parking space of the Lalashan scenic area)" was chosen as the verification field, with a flight distance (roundtrip) of approximately 44 kilometers. During this phase, 21 manufacturers were invited to sign up, with four (over 25kg) completing verification: AVIX Technology Inc., GEOSAT Aerospace & Technology Inc., GAUI Innovative Technology, and A3FUN II CO. LTD.

(4) Application of UAV with AI image recognition for bridge inspection (1/2)-Technology development of AI technology for bridge component defects recognition involves cleaning bridge component defect image data in the "vehicle bridge management information system" database. Simultaneously, the AI image recognition model was proposed, while the bridge detection UAV prototype was designed and solutions for the absence of UAV GPS signals under bridges were formulated. In turn, standard operating procedures for unmanned aerial vehicles (UAVs) coupled with artificial intelligence (AI) image recognition models were established to aid manual bridge detection work, thereby gradually promoting automated bridge detection work. In 2023, the AI image recognition model was combined with UAV bridge flight technology without GPS in order to verify bridge inspection technology and comprehend actual test results.

3. Result Promotion and Benefits

(1) UAS-Taiwan Inaugural Conference and International Forum on Technology Industry Development was held on March 23, 2022.

(2) President Tsai Ing-Wen visited the Asia UAV AI Innovation Application R&D Center on August 13, 2022 to officially inaugurate the MOTC UAV Technology Industry Division Office

(3) The "Flying Over the Mountains-MOTC UAV Promotion Result Presentation" was held on December 12, 2022.

4. 研究成果精華摘要

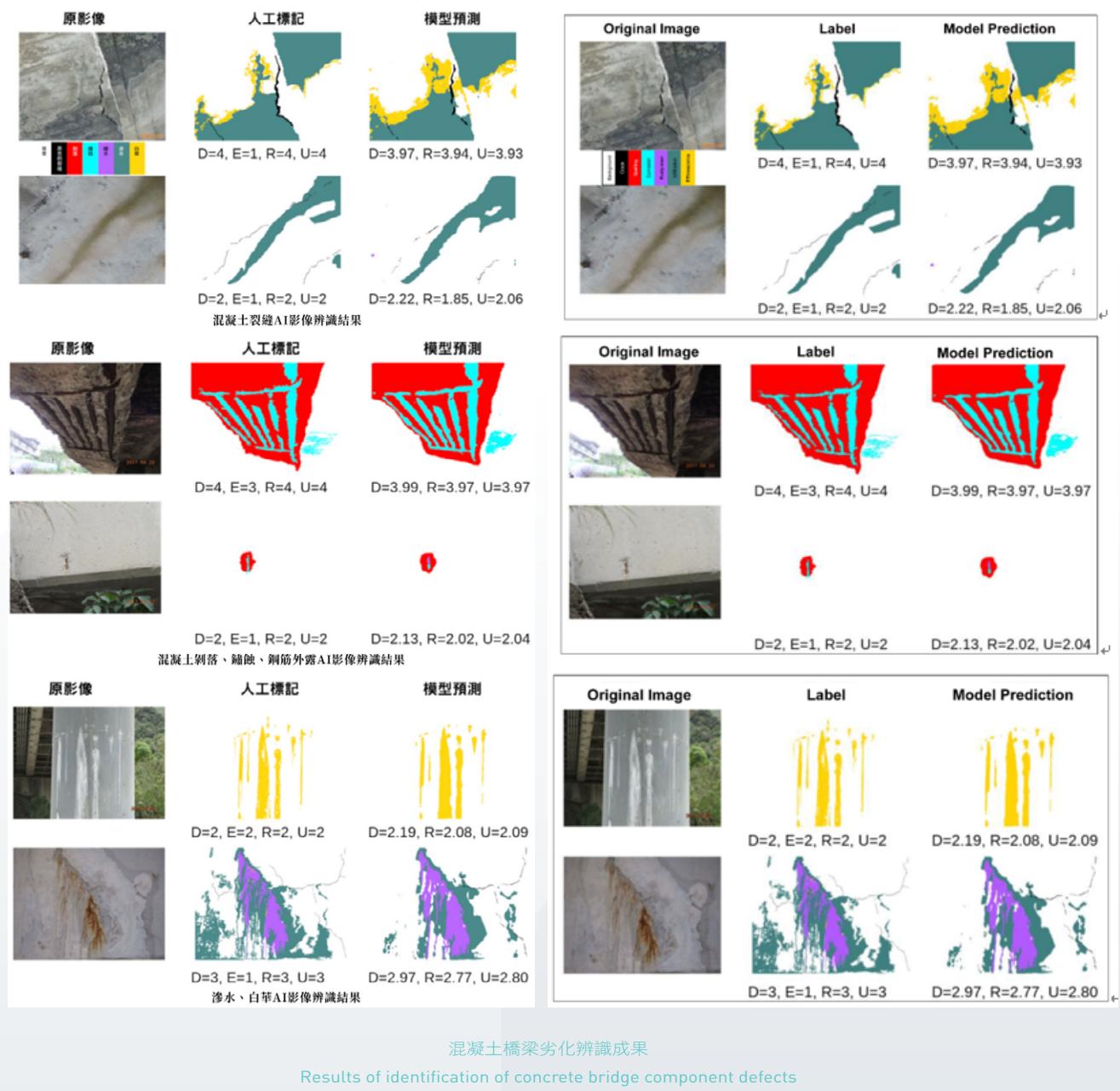
4. Summary of Research Results



111年3月23日臺灣無人機大聯盟成立大會暨科技產業發展國際論壇
UAS-Taiwan Inaugural Conference and International Forum on
Technology Industry Development on March 23, 2022



「無人機整合示範計畫(II) - 物流運送之深化應用」場域驗證活動
Unmanned Aerial Vehicle (UAV) Integrated Pilot Program [II] -
Deepening Application of Logistics Transport Field Verification Activities



5. 研究成果報告

- 交通部無人機科技產業發展策略規劃與執行（112年4月出版）
- 無人機整合示範計畫（II）-物流運送之深化應用（112年4月出版）
- 無人機搭配AI影像辨識應用於橋梁檢測之研究（1/2）-橋梁劣化構件AI影像辨識之技術開發（112年5月出版）

5. Research Result Report

- The Planning and Implementation of MOTC UAV Industry Development Strategies (Published in April 2023)
- Unmanned Aerial Vehicle (UAV) Integrated Pilot Program (II)-Deepening Application of Logistics Transport (Published in April 2023)
- Application of UAV with AI image recognition for bridge inspection [1/2]-Technology development of AI technology for bridge component defects recognition (Published in May 2023)

七

精進交通設施維護管理
與災防技術

(一) 港灣構造物巡查檢測作業精進

1. 計畫概述

港區幅員廣大，碼頭與防波堤又長年處在惡劣的海洋及水下未知的環境，在執行港灣構造物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，本計畫精進港灣構造物之巡查與檢測作業，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111年度擴充及滾動精進港灣構造物維護管理系統，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構造物巡查、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構造物巡查效率之目的。

2. 研究成果

- (1) 完成開發船舶靠離岸巡查與旅客橋巡查等功能模組，並擴充行動應用程式查詢模組與精進相關功能。
- (2) 配合臺灣港務公司、金門縣港務處及連江縣港務處巡查、檢測及維護實務需求，針對港灣構造物巡查檢測技術問題、管理制度與劣化判定標準，完成港灣構造物維護管理手冊修訂並持續滾動檢討。
- (3) 辦理3場次教育訓練，說明港灣構造物維護管理制度，構造物巡查檢測方法及進行系統操作訓練，以利落實港灣構造物維護管理工作。

VII

Improve the Transportation Facilities Maintenance Management and Disaster Prevention Technology

(I) Improved Inspection and Detection of Harbor Structures

1. Project Overview

The port area encompasses a large area, and the pier and breakwater have been exposed to the harsh ocean and unknown underwater environment all year round. When conducting daily inspections and detections of harbor structures, considerable manpower and time are frequently required. In recent years, the rise of automated inspections has made it possible for machines to perform complex tasks and detect and identify structural defects, which can greatly assist facility maintenance management. This plan has improved the inspection and detection operations of harbor structures to increase the inspection work's efficiency. Maintenance management personnel are assisted in implementing maintenance management tasks more efficiently and digitized, thereby enhancing the efficiency of maintenance management.

This plan extends and improves the Harbor Structure Maintenance Management System by rolling increments in 2022. Diverse inspection function modules were also developed and distributed to Taiwan International Ports Corporation Ltd., the Harbor Bureau, Kinmen County, and the Lianjiang County Harbor Office in order to conduct inspection, detection, maintenance, audit, and other operational applications pertaining to harbor structures. In addition, the functions of the inspection mobile application (APP) continue to be enhanced in response to the practical requirements of site inspection, achieving the goal of assisting harbor units in enhancing the efficiency of harbor structure inspections.

2. Research Results

- (1) The functional modules for vessel docking and offshore inspection and passenger bridge inspection have been completed. In addition, search modules for mobile APPs have been expanded and associated functions have been enhanced.
- (2) In conjunction with the practical needs for inspection, detection, and maintenance of Taiwan International Ports Corporation Ltd., Harbor Bureau, Kinmen County, and Lianjiang County Harbor Office, the technical problems, management systems, and defect determination standards related to inspection and detection of harbor structures were targeted in order to finalize the revision of the harbor structure maintenance management handbook and continue rolling reviews.
- (3) To facilitate harbor structure maintenance management work, three educational training sessions were conducted to explain the Harbor Structure Maintenance Management System, structure inspection and detection methods, and system operation training.

3. 成果推廣與效益

(1) 111年10月21日、11月15日及11月16日辦理3場次教育訓練，參與單位包括交通部航港局、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構造物維護管理工作，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。

4. 研究成果精華摘要

3. Result Promotion and Benefits

(1) Three educational training sessions were held on October 21, November 15, and November 16, 2022. The Maritime Port Bureau (MOTC), Taiwan International Ports Corporation Ltd., Lianjiang County Harbor Office, and others were among those who took part. Furthermore, the students' feedback and opinions were compiled to serve as references for future system extension and improvement.

(2) Taiwan International Ports Corporation Ltd., Harbor Bureau, Kinmen County, and Lianjiang County Harbor Office received assistance with harbor structure maintenance and management. This ensures the use of harbor facilities and operational safety, resulting in improved port service quality and competitiveness, as well as the achievement of the goal of sustainable development.

4. Summary of Research Results



線上教育訓練截圖

Screenshot of Online Education Training



系統儀表板統計分析之精進



港灣構造物維護管理系統功能模組



靠離岸行動應用程式巡查模組之開發



旅客橋巡查功能模組擴充

港灣構造物維護管理系統功能擴充

Harbor Structure Maintenance Management System Functional Extension

5. 研究成果報告

- 港灣構造物巡查檢測作業精進 (1/4) - 新興科技應用於巡查檢測作業之探討 (112年3月出版)

5. Research result report

- Improved Inspection and Detection of Harbor Structures (1/4) - Discussion on Application of New-Emerging Technology to Inspection and Detection (Published in March 2023)



(二) 軌道構件缺失辨識系統建置研究

1. 計畫概述

交通部臺灣鐵路管理局（以下簡稱臺鐵局）之軌道構件巡檢作業，目前係採用夜間人工目視方式進行，受限於巡檢車車速及視察角度等問題，無法有效快速進行。因此，本計畫於108~111年與臺鐵局合作，開發軌道構件缺失辨識系統。108年初步建立一套系統，先以攝影機進行軌道扣件影像拍攝，再利用人工智慧（AI）辨識扣件缺失，檢測鐵路軌道扣件是否脫落；109年進行系統精進及驗證，增加人工智慧辨識缺失種類，並提高辨識準確性及定位精度。110年持續精進系統，增加側向拍攝以擴增軌腹裂縫、魚尾鰏缺失辨識。111年以復興號車廂承載模組化之巡檢系統，提升巡查速度至時速60公里，並將原系統之適用範圍擴大至宜蘭段的丘陵區，完成臺鐵局宜蘭段構件缺失資料庫建置，導入系統精準定位功能，提高軌道巡查作業效率及準確度，提供臺鐵局臺中及宜蘭工務段實務應用。

2. 研究成果

- (1) 完成模組化軌道構件缺失巡檢系統建置，可於夜間時速60公里以下，攝取足供AI辨識之清晰影像。
- (2) 完成雲端辨識、儲存資料庫建置，經即時運算，構件辨識結果與座標資訊一併上傳雲端儲存，提供圖像化資訊，方便使用者查詢及應用參考。
- (3) 完成臺鐵宜蘭工務段現地測試，並擴充構件缺失資料庫，建立手機查詢缺失影像及定位搜尋功能，精進臺鐵臺中工務段軌道構件及資料庫。

(II) Research on Railway Track Component Defect Inspection System Establishment

1. Project Overview

The manual visual inspection method is currently used for Taiwan Railways Administration, MOTC (hereinafter Taiwan Railways) railway track component inspection operations, but it cannot be carried out effectively and quickly due to limitations in inspection vehicle speed, inspection angle, and so on. In collaboration with Taiwan Railways, this plan developed the railway track component defect inspection system from 2019 to 2022. For the first time, a system was established in 2019. After capturing images of the fasteners on the track with a camera, artificial intelligence was used to identify fastener defects and detect if fasteners had fallen off the track. System refinement and verification were completed in 2020, and artificial intelligence was used to identify defect types and improve identification and positioning accuracy. The enhancement of the system continued in 2021. Lateral shooting was implemented to expand the inspection of rail cracks and fishplate defects. In 2022, the Fuxin modularization carriage inspection system increased the inspection speed to 60 kilometers per hour. The existing system was expanded to incorporate the hilly area of Yilan. The setup of the Taiwan Railway Yilan Section Railway Track Defect Database has been completed, and the system precision positioning function has been imported to enhance the efficiency and precision of track component inspection operations, thereby accommodating the practical applications of Taiwan Railways Taichung and Yilan work sections.

2. Research Results

- (1) The establishment of the modularized railway track component defect inspection system has been completed. At night, below 60 kilometers per hour, sufficient clear images were captured for AI identification.
- (2) The database setup for cloud identification and storage has been completed. The component identification results and coordinates were uploaded to the cloud following real-time calculation. Graphical information was provided so that users could search and apply it with ease.
- (3) Testing of the Taiwan Railways work section site has been completed. To enhance the Taiwan Railways work section railway track components and database, the railway track defect database was expanded, and mobile phone search of defect images and positioning search functions were implemented.

3. 成果推廣與效益

- (1) 111年6月於港灣季刊發表論文「人工智慧軌道構件巡檢系統精進及驗證」。
- (2) 111年11月10日辦理「AI軌道構件缺失辨識系統」教育訓練。
- (3) 研究成果可協助軌道構件巡檢判釋，提供鐵路養護巡檢單位使用，提升軌道構件之巡查效率，達到精簡人力及節省經費目的，有效改善目視巡查盲點及作業安全。

4. 研究成果精華摘要

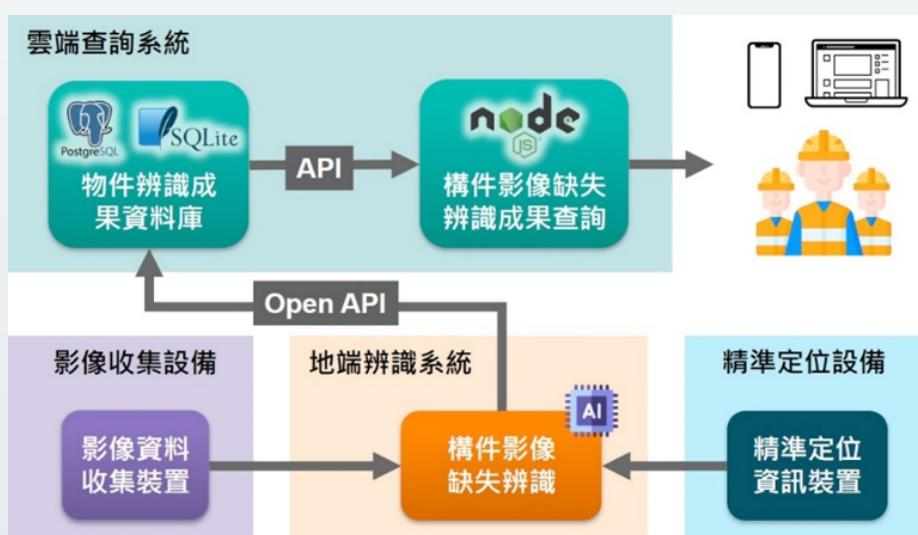
3. Result Promotion and Benefits

- (1) In June 2022, the paper "Improvement and Verification of the "AI Railway Track Component Inspection System" was published in Harbor Quarterly.
- (2) On November 10, 2022, education training on the "AI Railway Track Component Defect Inspection System" was conducted.
- (3) The research results can aid in inspecting and interpreting railway track components, and be provided to railway maintenance and inspection units to improve the inspection efficiency of railway track components, thereby achieving the goals of reducing manpower and saving money. The blind spots of visual inspection and operational safety can also be effectively enhanced.

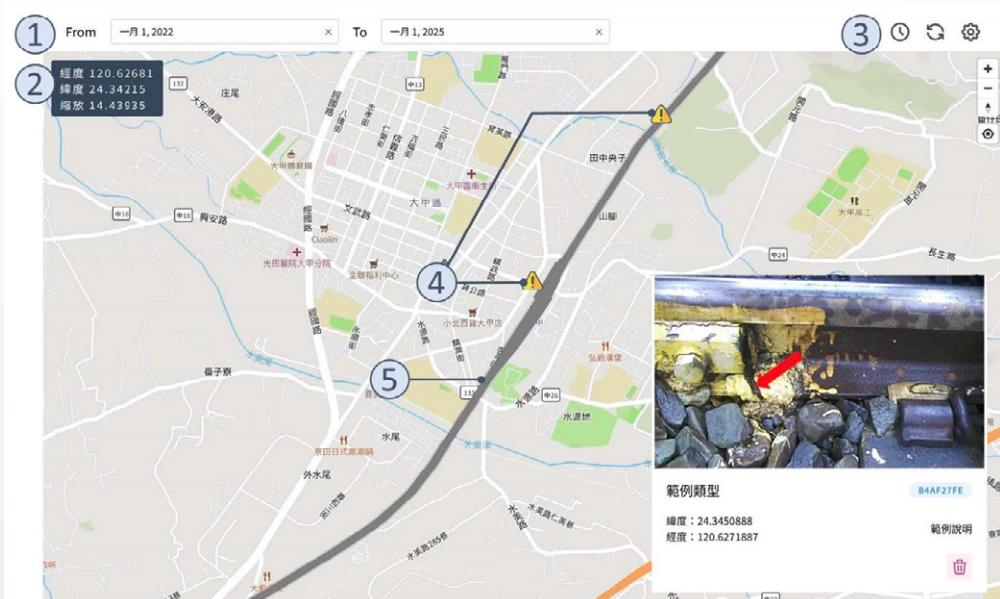
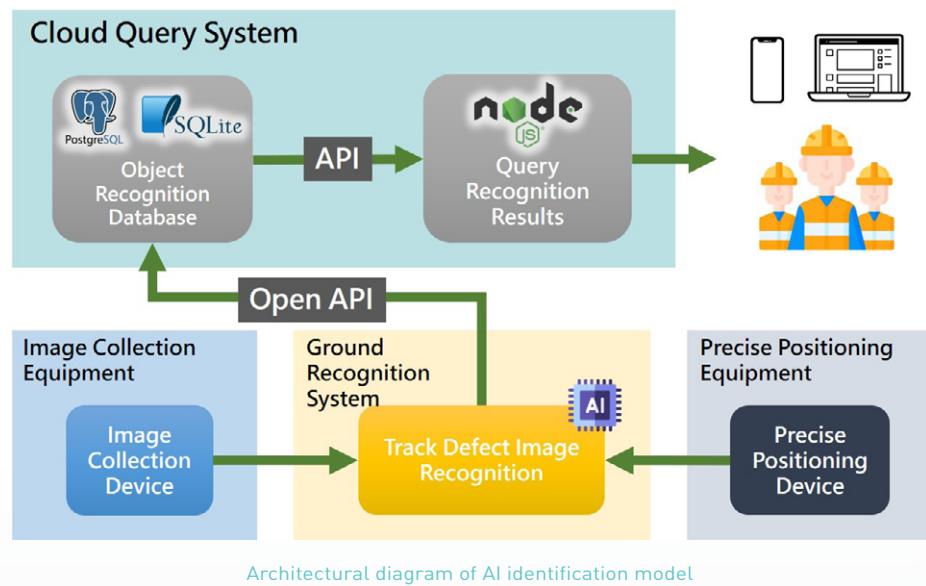
4. Summary of Research Results



復興號車廂外部安裝系統設備架構
Architecture of Fuxing Carriage External Installation System



AI辨識模式架構圖



以地圖顯示損壞構件位置及查詢功能
The demonstration of the locations of damaged components and search functions using maps

5. 研究成果報告

- 軌道扣件巡檢系統建置（1/2）-扣件缺失辨識系統建置研究（109年2月出版）
- 軌道扣件巡檢系統建置（2/2）-扣件缺失辨識系統精進驗證（110年2月出版）
- 軌道扣件缺失人工智慧辨識現地測試及精進研究（111年3月出版）
- 軌道構件缺失人工智慧辨識建置應用-系統擴建與宜蘭段現地測試（112年3月出版）

5. Research result report

- Railway Track Fasteners Inspection System (1/2)-Fastener Defect Inspection System Improvement and Verification (Published in February 2020)
- Railway Track Fasteners Inspection System (2/2)-Fastener Defect Inspection System Improvement and Verification (Published in February 2021)
- Research on Railway Track Fastener AI Identification Site Test and Improvement (Published in March 2022)
- Railway Track Defect Inspection System by Artificial Intelligence- System Expansion and Field Test in Yilan (Published in March 2023)

(三) 港區設施智慧化巡查技術研發

1. 計畫概述

考量我國商港區域幅員廣大，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。因此，基於近年來無人載具技術快速發展，本所辦理「無人機影像監測技術應用於臺中港區管理之研究」計畫，期能結合無人飛行載具影像處理優勢，建立一套能快速涵蓋大範圍港區地表資訊的蒐集技術，並藉由開發影像辨識功能，針對港區重要設施進行巡查與管理，達到應用創新科技，提升智慧化管理效能之目的。

2. 研究成果

完成臺中港區高精度三維數值地形模型建構，分析各種無人飛行載具並評估飛行能力及可應用範圍，開發客製化人工智慧（AI）影像辨識技術，針對港區重要設施（如岸邊設施：碰墊、反光板及車擋；港區道路設施：標線及裂縫）於平日與颱風或地震後，啟動自動化巡查與管理，並建置空間資訊整合分析平臺，提供多期影像搜尋比對技術。

3. 成果推廣與效益

- (1) 111年10月於港灣季刊第123期發表論文「應用人工智慧技術於港灣構造物自動化辨識管理」。
- (2) 111年11月於第44屆海洋工程研討會發表論文「基於實例分割之港區岸邊設施物件多時期影像自動化檢測」。
- (3) 111年11月9日辦理「港區無人機智慧化巡查技術研發成果教育訓練」暨成果說明會，推廣無人機影像監測技術應用於臺中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。

(III) Technological Research and Development of Harbor Facility Intelligent Inspection

1. Project Overview

In light of the fact that Taiwan's commercial port area encompasses a large area with limited manpower, the ability to rapidly grasp the use of various facilities in the harbor and to inspect the use environment and facility safety and stability are crucial policy administration concerns. Due to the rapid development of UAV technology in recent years, the Institute of Transportation conducted the Application Research of the Management of Taichung Port Area based on UAV Image Monitor Technique in hopes of combining the advantage of UAV image processing and establishing a technique for collecting information of harbor surfaces covering a large range, as well as developing an image recognition function to conduct inspection and management of major harbor areas. In turn, the objective of employing innovative technology to improve the efficacy of intelligent management can be achieved.

2. Research Results

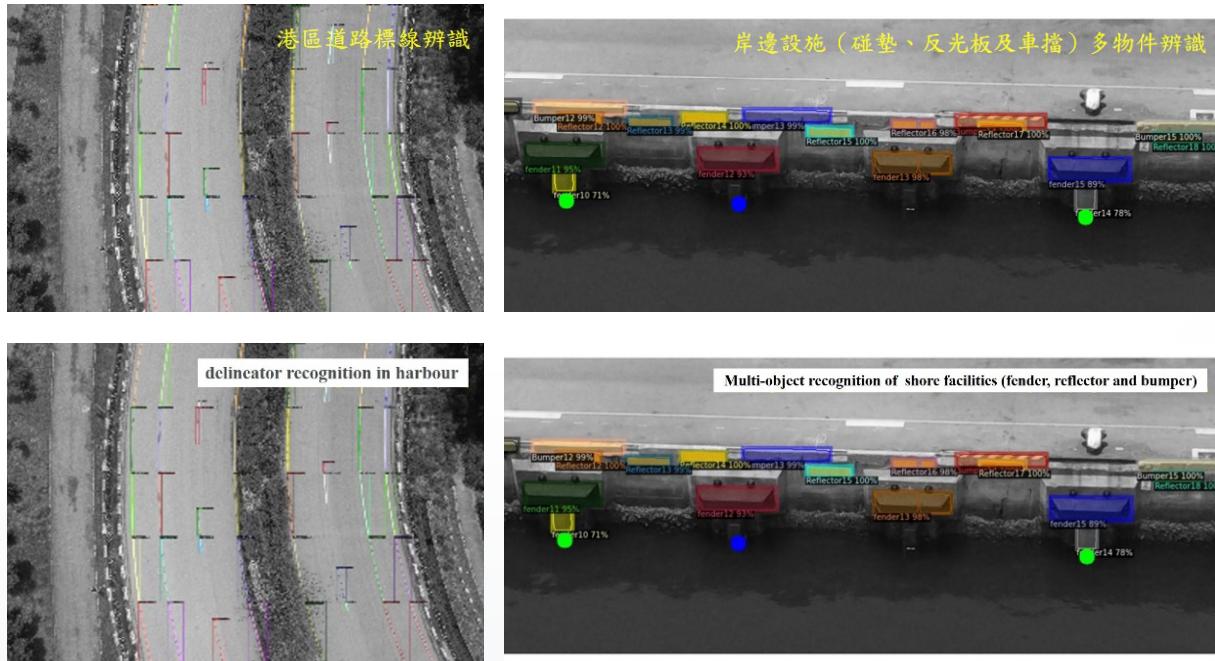
The construction of a high-precision, three-dimensional numerical terrain model for Taichung Port has been completed. Various UAVs have been analyzed, and their flight capabilities and applicability have been evaluated, while AI image recognition techniques have been developed. Automated inspection and management have been implemented for major port area facilities (such as shore facilities, fenders, reflectors, and vehicle bumpers; harbor road facilities: markings and cracks). A spatial information integration analysis platform with multi-phase image search comparison technology has been established.

3. Result Promotion and Benefits

- (1) In October 2022, the paper "Applying AI Technology in Automatic Identification Management of Harbor Structures" was published in the 123rd issue Harbor Quarterly.
- (2) The paper "Automatic instance segmentation for multi-period image detection of port area shore facilities and objects" was presented at the 44th Ocean Engineering Conference in Taiwan in November 2022.
- (3) Application Research of the Management of Taichung Port Area based on UAV Image Monitor Technique "Education Training on the R&D Results of Harbor UAV Intelligent Inspection Technology" and result presentation were conducted on November 9, 2022 to promote "Application Research of the Management of Taichung Port Area based on UAV Image Monitor Technique" related research results.
- (4) The research findings can aid Taiwan International Ports Corporation, Ltd. in gaining an understanding of how to automatically grasp port use situations and changes, ensure the quality of port operational management, and implement intelligent management in the context of the long-term trend toward streamlining.

4. 研究成果精華摘要

4. Summary of Research Results



無人機多物件自動化影像辨識技術開發
The development of UAV multi-object automatic image recognition technology



空間資訊整合分析平臺展示
The demonstration of the spatial information integration and analysis platform

5. 研究成果報告

5. Research Result Report

- 無人機影像監測技術應用於臺中港區管理之研究（II）-空間資訊整合分析平臺建置（112年3月出版）

- Application Research of the Management of Taichung Port Area based on UAV Image Monitor Technique(II)-the Platform for Spatial Information and Analysis [Published in March 2023]

(四) 船舶特高頻資料交換系統之技術發展

1. 計畫概述

近 20 年來，雖然船舶自動識別系統 (Automatic Identification System, AIS) 提供了海域內各船隻的即時資訊，然而，海上事故卻仍常造成人身安全及船舶財產嚴重損失。隨著 AIS 越來越普及且大量部署，其運作所承受的壓力也越來越大，AIS 技術之擴展應用也導致 VHF (Very high frequency) 數據鏈路負載顯著增加。

船舶特高頻資料交換系統 (VHF Data Exchange System, VDES) 可視為 AIS 的擴充版本，旨在解決船舶通訊系統面臨的限制。船舶間有效的通訊和資料交換，對於確保航行安全、提高航運效率與支援海上作業至關重要。然而，傳統的船舶通訊系統存在著一些限制，例如，通訊範圍受限、頻率利用效率低，易受到干擾等問題。

本計畫主要探討發展船舶特高頻資料交換系統的相關技術，以克服上述問題並提升系統性能。透過發展訊號技術分析、系統設計，推動 VDES 的技術發展，提供更安全、高效率和可靠的通訊解決方案，提升航海通訊技術，保障航行安全，並提高航運效率。

2. 研究成果

- (1) 完成彙整國外 VDES 系統發展與應用技術，提供未來評估國內發展 VDES 系統之需求與可行性應用參考。
- (2) 完成 VDES 測試站建置，包含彰化芳苑燈塔（王功燈塔）設置一處固定測試訊號站及另一移動裝置，將探討訊號解讀及資訊應用，未來能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. 成果推廣與效益

- (1) 111 年 5 月 27 日於第 23 屆海洋與水下技術研討會發表論文「離岸風電區船舶交通流量之應用與分析」。
- (2) 111 年 11 月 17 日於第 44 屆海洋工程研討會發表論文「臺灣港埠船舶交通流量之應用與分析」。

(IV) The technological development of VHF Data Exchange System (VDES)

1. Project Overview

Despite the fact that over the last 20 years, vessel automatic identification (AIS) has provided real-time information for vessels at sea, maritime accidents continue to result in a serious loss of life and property. As AIS grows in popularity and widespread adoption, strains on its ability to function are bound to increase. The widespread use of AIS increases the traffic volume on VHF (very high frequency) data links dramatically.

The VHF Data Exchange System (VDES) is an AIS extension version designed to address limitations in vessel communications systems. Effective vessel communication and information exchange are critical for ensuring navigation safety, increasing shipping efficiency, and supporting maritime operations. Traditional vessel communication systems have limitations such as limited communication range, inefficient frequency utilization, interference susceptibility, and so on.

The plan focuses on VHF Data Exchange System (VDES)-related technologies to address the aforementioned issues and improve system performance. The advancement of signal technology analysis and system design, along with the promotion of VDES technology development, can provide safer, more efficient, and more reliable communications solutions, thereby enhancing navigational communication technology, ensuring navigational safety, and enhancing shipping efficiency.

2. Research Results

- (1) The compilation of foreign VDES system development and application technology has served as a resource for evaluating domestic VDES system development requirements and feasible applications.
- (2) The establishment of a fixed signal test station and another mobile device at Changhua's Fangyuan Lighthouse (Wanggong Lighthouse) is complete for the VDES test station. The interpretation and application of data have been studied. It will assist the Maritime Port Bureau, MOTC, in promoting intelligent navigation-related plans in the future.

3. Result Promotion and Benefits

- (1) The paper "The Application and Analysis of Offshore Vessel Traffic Flow in Wind Power Areas" was presented at the 23rd Marine and Underwater Technology Conference on May 27, 2022.
- (2) The paper "The Application and Analysis of Vessel Traffic Flow in Taiwan Ports" was presented at the 44th Ocean Engineering Conference in Taiwan on November 17, 2022.

4. 研究成果精華摘要



VDES機動接收站設備及訊號傳輸應用軟體
VDES Mobile Receiver Station and Signal Transmission Application Software

5. 研究成果報告

- 智慧航安與海氣象資訊應用探討（1/4）-整合船舶海事案件與海氣象即時模組（112年3月出版）

（五）應用雷達技術於商港海象觀測

1. 計畫概述

海象會受到大氣、地形水深及近岸結構物等影響變化萬千，常用海象觀測設備，如浮標及底碇波流儀，僅能呈現單點資訊且維護不易，不同於浮標及底碇波流儀，若採用如微波雷達及高頻雷達等遙測方式進行觀測，除可獲取平面波流場之觀測資料，無須至海上佈放觀測儀器，可於岸基上進行維護工作，降低作業人員之職安風險外，其應用層面也較為廣泛。本所110年引進高頻海洋陣列雷達觀測系統並於臺中港完成建置，111年另在臺北港建置微波雷達測站，將雷達遙測技術應用於商港海象觀測，建構商港平面海象觀測雛型，利用不同雷達設備擷取回波訊號，分別演算得到約3公里近域與約40公里遠域不同解析度之平面波浪及海流觀測資訊，輔助並精進國內現行之海象觀測作業。

4. Summary of Research Results

5. Research result report

- Application of Smart Aviation Safety and sea meteorology Information (1/4) - Integrate real-time modules of maritime ship cases and sea meteorology (Published in March 2023)

(V) Applying Radar Technology to Port Sea State Observation

1. Project Overview

Due to the effects of atmosphere, topography, water depth, alongshore structures, etc., the sea state is variable. Equipment used frequently to observe the sea condition, such as buoys and bottom anchors, can only provide single-point data and is difficult to maintain. In contrast to buoys and bottom anchors, if microwave radars, high-frequency radars, and other remote-sensing methods can be used during observation, in addition to obtaining planar wave field observation information, there is no requirement to deploy observation instruments in the seas so that maintenance can be performed on land. In addition to reducing the occupational safety risk for operators, the application aspects are broader. In 2021, the Institute of Transportation will have installed a high-frequency ocean radar system at Taichung Port. In 2022, a microwave radar test station was installed in Taipei Port, where radar remote sensing technology was used to monitor the port's sea conditions. The prototype for port planar sea state observation was constructed. The echo signals were extracted using various radar devices. Through calculation, the planar wave and sea current observation data with varying resolutions at approximately three kilometers in the near field and forty kilometers in the far field complement and enhance the country's existing state observation operations.

2. 研究成果

完成臺北港整年度微波雷達波流連續觀測資料蒐集，並運用臺北港鄰近之測站波流觀測資料，驗證微波雷達觀測波流之結果，掌握微波雷達在臺北港域觀測之特性；此外，完成臺中港雙雷達系統整合，產出平面觀測資訊，提供波浪與海流資訊與查詢服務，並建構陣列式海洋雷達3級觀測品管制度，釐訂雷達資料開放標準，達成輔助臺中港港埠管理與本所後續相關研究延伸應用之目的。

3. 成果推廣與效益

- (1) 111年11月17日於第44屆海洋工程研討會發表論文「遮蔽效應對低掠角岸基微波雷達監測波浪之影響-以臺北港微波海象監測系統為例」。
- (2) 111年12月16日舉辦「雷達遙測技術應用於商港海象觀測」成果說明會，邀請臺灣港務股份有限公司及其所屬分公司與航港局等單位，並且與國家海洋研究院、交通部中央氣象局、國家實驗研究院台灣海洋科技研究中心與國立成功大學近海水文中心等單位分享技術及交流，促成後續國內雷達觀測技術交流合作與資源整合。

4. 研究成果精華摘要

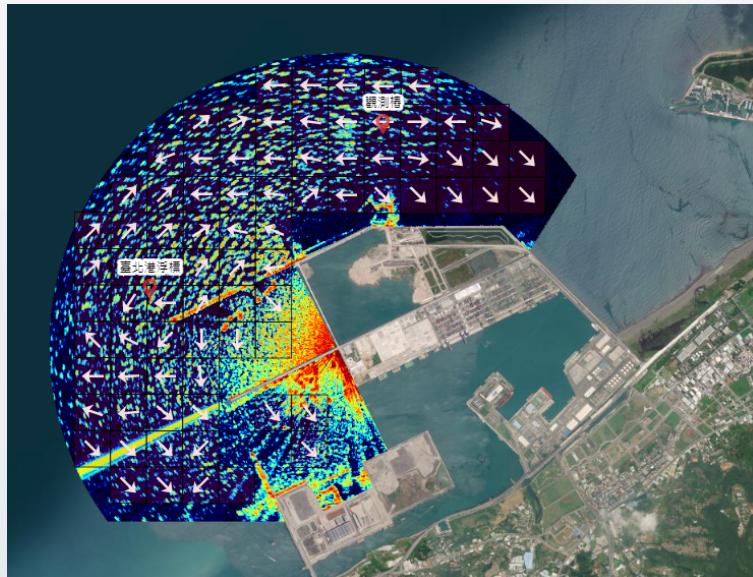
2. Research Results

The annual collection of continuous microwave radar wave-current observation data in Taipei Port has been completed, validating the results of microwave radar wave-current observation using data from test stations in the vicinity of Taipei Port. In Taipei Port, the characteristics of microwave radar observation have been mastered. In addition, the integration of the dual radar system in Taichung Port and the generation of planar observation data to provide wave and current data and search services have been completed. Moreover, a three-tiered quality control system for observational data from the array marine radar has been developed in order to determine the radar information access standards, achieving the goals of Taichung Port management and the Institute of Transportation's subsequent research extensions and applications.

3. Result Promotion and Benefits

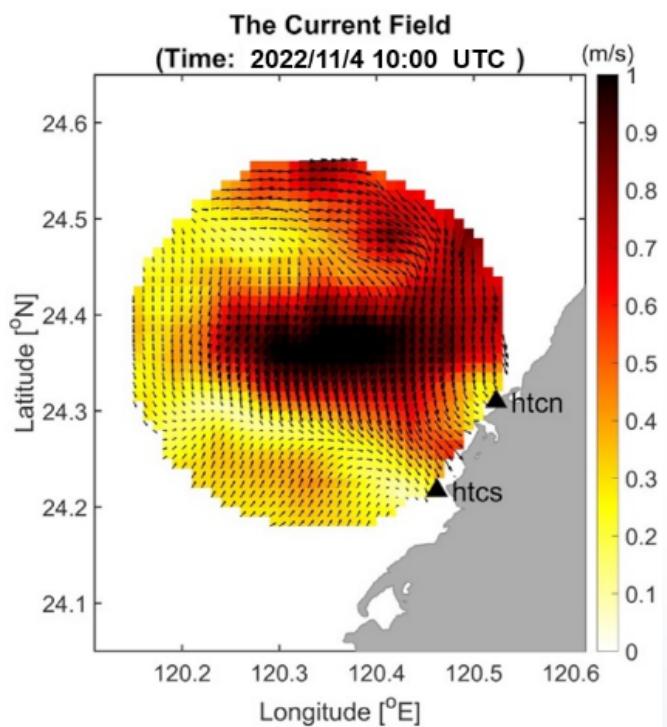
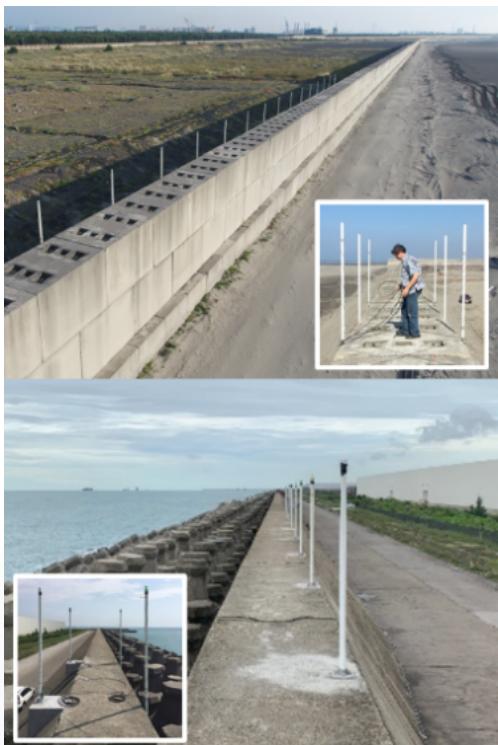
- (1) On November 17, 2022, the paper "The Impact of Masking Effect on Low-sweeping Angle-based Microwave Radar Monitoring of Waves-Using Taipei Port Microwave Sea State Monitoring System as an Example" was presented at the Ocean Engineering Conference in Taiwan.
- (2) The results of "Radar Remote Sensing Technology Applied in Sea State Observation" were presented on December 16, 2022. The Taiwan International Ports Corporation, Ltd., its subsidiary, the Maritime Port Bureau, MOTC, and other organizations were invited. In addition, technology-sharing exchanges were conducted with the Coastal Ocean Monitoring Center, NCKU, the Central Weather Bureau, the Taiwan Ocean Research Institute, National Applied Research Laboratories, and the Coastal Ocean Monitoring Center, NCKU, facilitating future domestic radar observation technology-related exchanges, cooperation, and resource integration.

4. Summary of Research Results



臺北港微波雷達觀測站及平面波浪資訊展示

The demonstration of the Taipei Port microwave radar observation station and planar wave information



臺中港陣列雷達觀測站及平面波浪資訊展示
The demonstration of Taichung Port array radar observation station and planar wave information



111年12月16日成果說明會活動剪影
Event photographs of the result presentation on December 16, 2022

5. 研究成果報告

- 應用微波雷達技術於臺北港域環境監測之研究(1/4)-微波雷達觀測波流特性分析(112年2月出版)

5. Research result report

- Application Research on Environmental Monitoring by Microwave Radar in Costal Sea Area (1/4)-Analysis of Meteo-oceanographic Observation (Published in February 2023)

(六) 應用影像智慧化技術判釋海岸公路及防波堤越波研究

1. 計畫概述

花蓮台11線浪襲路段易受颱風浪襲，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總局應用參採，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年與公路總局第四區養護工程處合作，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/浪襲之影像判釋方法，做為後續建立浪襲影像判釋判釋自動化，與精進本所建置之海岸公路浪襲預警系統之依據。

2. 研究成果

- (1) 於花蓮縣豐濱鄉台11線人定勝天路段設置影像設備，蒐集海岸公路影像，透過影像校正、色彩強化、邊緣偵測，發展波浪溯升/浪襲之影像判釋方法，可由影像判釋水線位置變化及波浪溯升高程。
- (2) 本計畫亦於人定勝天路段海岸設置波浪溯升計，以波浪溯升感測資料分析、驗證影像判釋結果，111年經梅花、軒蘭諾等颱風等案例驗證，本計畫發展之影像判釋方法具有可行性。

3. 成果推廣與效益

- (1) 111年11月17日於第44屆海洋工程研討會發表論文「花蓮海岸公路越波影像判釋之研究」。

(VI) Research on Applying Image Intelligent Technology in Interpreting Coastal Highway and Wave Overtopping on the Breakwater

1. Project Overview

The sections of Provincial Highway No. 11 that are vulnerable to typhoon wave attacks and breaking waves may have a direct impact on the road's foundation and traffic safety. From 2017 to 2021, the Institute of Transportation established a wave attack early warning system on coastal highways in Taitung and Hualien. The Directorate General of Highways, MOTC was provided with improvement strategies for application, reference, and adoption. However, there are no available site observation data on wave overtopping and wave attacks. Consequently, this plan provides wave attack warning information to highway units via camera and image interpretation technology, which will also serve as a reference for the Institute of Transportation in the future as it improves its wave attack early warning system.

In cooperation with the Fourth Maintenance Office, Directorate General Highways, MOTC, imaging devices and wave runup gauges were installed on the Rendingshengtian Road segment of Provincial Highway No. 11 in Fengbin Township, Hualien County, in order to collect images of the coastal highway. Wave runup/wave attack image interpretation techniques were also developed to serve as a reference for establishing wave attack image determination and interpretation automation and for enhancing the Institute of Transportation's coastal highway wave attack early warning system.

2. Research Results

- (1) Imaging devices have been installed on the Rendingshengtian Road segment of Provincial Highway No. 11 in Fengbin Township, Hualien County, to collect images of the coastal highway. Through image correction, color enhancement, and edge detection, techniques for interpreting wave runup/wave attack images were developed. On the basis of the images, changes in waterline positions and wave runup height were interpreted.
- (2) The plan also included the installation of wave runup gauges along the Rendingshengtian Road segment. Using the analysis of runup sensing data, image interpretation results were validated. The image interpretation techniques developed in this plan demonstrated their viability in 2022 through the verification of cases such as Typhoon Muifa, Typhoon Hinnamnor, etc.

3. Result Promotion and Benefits

- (1) On November 17, 2022, the paper "Image Recognition of Wave Overtopping on Hualien Coastal Highway" was presented at the 44th Ocean Engineering Conference in Taiwan.

(2) 研究成果提供本所後續建立浪襲影像判釋自動化與精進本所建置之海岸公路浪襲預警系統之依據，預計可提供公路總局第四區養護工程處於颱風浪襲封路決策應用參採，強化通行安全管理。

4. 研究成果精華摘要



人定勝天路段地形高程套疊影像
Overlay images of Rendingshengtian Road section terrain elevation

(2) The results of the research are provided to the Institute of Transportation as references for establishing wave attack image interpretation automation and enhancing the coastal highway wave attack early warning system developed by the Institute of Transportation. It is anticipated that the results will be provided to the Fourth Maintenance Office, Directorate General Highways, MOTC for application, reference, and adoption during typhoon wave attack road closing decision-making, thereby enhancing passage safety management.

4. Summary of Research Results



人定勝天路段斷面與水線位置、高程影像判釋結果
Cross-section and waterline positions of the Rendingshengtian Road section and elevation image interpretation results.



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 (1/4) - 日間越波影像判釋 (112年3月出版)

5. Research result report

Development of the Image Recognition Technology for Wave Overtopping on the Coastal Highway and Breakwater (1/4)-Daytime Image Recognition [Published in March 2023]

(七) 港灣環境及防災資訊服務應用研究

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，並結合港區海嘯、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、港區海嘯等港區環境資訊。

爰此，本所完成港灣環境資訊網建置，提供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。111年港灣環境資訊網，持續精進資料開放服務功能提升，提供9個商港區之風速、風向、波高、波向、流速、流向及潮位即時資訊之白金標章等級介接服務，方便使用者迅速取得港區海氣象即時資訊，亦開放碳、銅、鋁及鋅等金屬材料腐蝕速率資料，做為辦理構造物防蝕設計與維護管理之參據。此外，也加值港灣環境資訊圖臺颱風圖層，結合颱風行進預測軌跡、侵襲機率與港區海氣象即時資訊，協助港埠管理、營運人員及民眾因應惡劣環境之參考。網站及圖臺採響應式網頁設計，讓使用者在電腦、平板及手機皆可瀏覽，港灣環境資訊網及圖臺功能包括（1）港區及臺灣周圍海域之風力、波浪、潮位及海流即時觀測及未來48小時模擬資訊；（2）颱風位置及其對港區之侵襲機率；（3）提供商港海氣象資訊、金屬年腐蝕速率資料與商港歷年海氣象觀測月統計資料之公開資料；（4）海嘯造成港區最大波高及預計到達時間；（5）港區金屬腐蝕因子及腐蝕速率資訊，上述全面性的港灣資訊可讓船舶業者、臺灣港務股份有限公司、客輪搭乘

(VII) Research on Harbor Environment and Disaster Prevention Information Service Applications

1. Project Overview

Information about the marine meteorological environment in Taiwan's waters is vital to the safety of vessel navigation and maritime operations. In addition, it can be used as a resource for developing early warning systems for disaster prevention in response to short-term alterations in the harbor environment and coping strategies for long-term evolution trends, among other applications. The hydrological characteristics inside and outside the port area frequently produce local effects due to harbor structures, jeopardizing the safety of vessels entering and leaving the port. Consequently, the Institute of Transportation has combined real-time sea meteorology observations and numerical simulation prediction results. The development of real-time and predictive sea meteorology-related environmental data. In addition, information regarding earthquakes and atmospheric corrosion in the port area has been incorporated for search and application by port management units, vessel operators, and pilots in order to promptly, properly, and comprehensively monitor wind force, tide level, waves, current, earthquakes and tsunamis in the port, and other port environment information.

The Institute of Transportation has therefore completed the Harbor Environment Information Website. Provided are real-time observations of wind, wave, tide, and current in 12 water areas at nine commercial ports, as well as simulations for the next 48 hours. It is hoped that four goals, including "data integration," "value-added applications," "open data," and "result promotion," will be attained, allowing for the provision of real-time, accurate, and stable information services. The Harbor Environment Information website continued to enhance its open data service function in 2022. In nine commercial ports, platinum-level interfacing services for real-time wind speed, wind direction, wave height, wave direction, flow speed, flow direction, and tidal level data were provided. This will allow users to quickly obtain real-time information regarding the port's sea meteorology. In addition, corrosion rate information for carbon, copper, aluminum, zinc, and other metals was made available. This serves as a reference for anti-corrosion design and structure maintenance management. In addition, typhoon layers have been added to the Harbor Environment Information Website platform in Taiwan. These layers, in conjunction with typhoon forecast trajectory, probability of typhoon occurrences, and real-time information on sea meteorology in the port area, aid in port management and serve as references for operational personnel and the general public in coping with the adverse environment. The website and map platform utilize responsive web design, enabling users to navigate via desktop computers, tablet computers, and mobile devices. The harbor environment information website and platform functions include: (1) real-time observation of wind, waves, tidal level, and current in the port area and peripheral sea in Taiwan as well as 48-hour simulation information; (2) typhoon locations and the probability of typhoon occurrences in the port area; (3) provide information of sea meteorology at the commercial port; (4) the highest wave height caused by a tsunami in the port area and the expected time of arrival; and (5) the highest wave height

者、港灣構造物設計及維護單位、港區作業、遊玩及釣客等查詢應用，做為船舶業者操航、港務單位管理決策支援、港灣構造物設計等之應用參據，並可提高港區營運管理作業及使用者安全。

2. 研究成果

- (1) 精進資料開放服務功能提升，提供9個商港區之風速、風向、波高、波向、流速、流向及潮位即時資訊之白金標章等級介接服務。
- (2) 加值港灣環境資訊圖臺颱風圖層，結合颱風行進預測軌跡、侵襲機率與港區海氣象即時資訊，可幫助港埠管理、營運人員及民眾因應惡劣環境之參考。

3. 成果推廣與效益

- (1) 111年11月4日舉辦「港灣環境資訊網使用者說明會」，邀請交通部航港局、中央氣象局、臺灣港務股份有限公司、連江縣港務處、金門縣港務處、國家海洋研究院及水域遊憩活動等系統使用單位與會，除介紹港灣環境資訊網及圖臺功能外，另透過問卷調查，彙整各單位需求及建議，以利持續優化系統功能及資訊服務品質。
- (2) 111年10月於港灣季刊第123期發表論文「港灣環境資訊之輔助決策系統」。
- (3) 本所港灣環境資訊網內容包括港灣風、波、潮、流觀測資訊、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。

caused Taiwan International Ports Corporation, Ltd., ferry passengers, harbor structure design and maintenance units, port area operations, tourists, and fishermen have access to the above comprehensive harbor information. This serves as an application foundation for vessel operators' steering, port unit management decision-making support, harbor structure design, etc. The port area's operational management operations and user safety have also been enhanced.

2. Research Results

- (1) The open data service function upgrade has been improved, providing platinum label level interfacing services in nine commercial ports pertaining to real-time information on wind speed, wind direction, wave height, wave direction, flow speed, flow direction, and tidal level.
- (2) The value-added typhoon layers on the Harbor Environment Information Website platform(), in conjunction with typhoon forecast trajectory, typhoon occurrences, and real-time information of sea meteorology, can assist port management, operational personnel, and the general public in coping with the adverse environment.

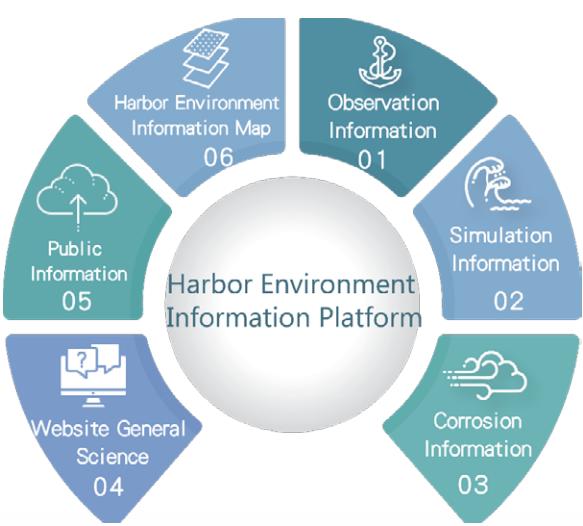
3. Result Promotion and Benefits

- (1) The "Briefing for Harbor Environment Information Website Users" was held on November 4, 2022. Participants included the (Maritime Port Bureau, MOTC)(Maritime Port Bureau, MOTC, Central Weather Bureau, Taiwan International Ports Corporation, Ltd.), Lianjiang County Harbor Office, Harbor Bureau, Kinmen County, the National Academy of Marine Research (the National Academy of Marine Research, water recreation activities, and other system user units. In addition to introducing the Harbor Environment Information Website and platform functions, questionnaires were used to compile the units' recommendations and requirements for further optimizing system functions and information service quality.
- (2) In October 2022, the 123rd issue of the paper "Auxiliary Decision-making System for Harbor Environment Information" was published in Harbor Quarterly.
- (3) Harbor wind, wave, tide, current, and observation information, simulation information, erosion information, website popularization of science, and six search functions make up the Institute of Transportation's Harbor Environment Information Website (). Government agencies and the general public have access to global and real-time information about the sea state.

4. 研究成果精華摘要



港灣環境資訊平臺之六項子系統
Six subsystems of the Harbor Environment Information Platform



港灣環境資訊網
Harbor Environment Information Website

港灣環境資訊圖臺颱風圖層 Harbor Environment Information Website Platform (Typhoon Layers)

5. 研究成果報告

- 港灣環境資訊系統維護與精進(1/4) -
海氣象資訊擴充整合建置(112年3月
出版)

5. Research result report

- Maintenance and Improvement of the Harbor Environmental Information System (1/4)- Expansion and Integration of Marine meteorological Information (Published in March 2023)

(八) 車行橋梁管理資訊系統精進及全國橋梁統計資訊網

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」。

為提升橋梁檢測作業及資料之正確性，避免檢測單位誤傳或為圖利而上傳造假之檢測資料，本所於111年1月25日召開「車行橋梁管理資訊系統功能及作業程序調整說明研商會議」，並於會中向各部會及縣市政府說明系統及作業程序調整之內容，續於111年7月25日函文各部會及縣市政府，說明系統及作業程序已完成調整，所屬委外橋梁檢測單位可進行相關測試。

「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運研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. 改善檢測人員頭像拍攝問題：目前檢測人員僅能使用平板電腦拍攝頭像之照片上傳；為避免檢測人員在非現場以平板電腦拍攝開始前及結束後之頭像照片，因此已修正須在距離橋頭、橋尾或橋中心GPS座標1公里之範圍內，才允許平板電腦操作「開始檢測」及「檢測完成」功能鍵。

(VIII) Improvement of Vehicle Bridge Management Information System and National Bridge Statistics Information Network

1. Project Overview

In conjunction with the "Operational Guidelines for Bridge Maintenance Management" of the Executive Yuan, the Ministry of Transportation and Communications has tasked the Institute of Transportation with establishing the "National Vehicle Bridge Statistical System" (the National Vehicle Bridge Statistical System is divided into two home pages: "National Bridge Statistics Information Network" and "Vehicle Bridge Statistical System) to interface bridge data under the bridge competent authorities of respective levels and consolidate result statistics. In addition, the Institute of Transportation has since 1999 established the "Bridge management information System in Taiwan" for negotiation use by respective bridge competent authorities. The system has since January 1, 2022 been renamed the "Vehicle Bridge Management Information System."

Avoid the detection unit misrepresenting or uploading falsified detection data for personal gain in order to improve bridge detection operations and data correctness. The "Discussion Meeting on Vehicle Bridge Management Information System Functions and Operating Procedure Modification" was held on January 25, 2022 by the Institute of Transportation. The content of system modifications and operating procedures was explained to the ministries and county/city governments during the meeting. On July 25, 2022, a letter explaining the system and operating procedure modifications was sent to the ministries and county/city governments. Outsourced bridge detection units may also conduct related tests.

The "National Bridge Statistics Information Network" has been completed after compiling bridge information for vehicle bridges, railway bridges, and pedestrian overpasses. Furthermore, in accordance with Section 5 of the "Operational Guidelines for Bridge Maintenance Management" promulgated by the Executive Yuan, the national bridge statistical data has been announced, allowing external parties to access bridge information. The interface sources of the statistical information network include the Vehicle Bridge Statistical System created by the Institute of Transportation, the Railway Bridge Statistical System created by the Railway Bureau, MOTC, and the Pedestrian Overpass Statistical System created by the Construction and Planning Agency, Ministry of the Interior.

2. Research Results

- (1) Improvement of the Vehicle Bridge Management Information System
 - a. Improve personnel detection head portrait photo-taking issues: Detection personnel can currently only take a head portrait and upload it to the tablet PC: Corrections must be within one kilometer of the GPS coordinates from the bridge head, bridge tail, or bridge center to avoid detecting personnel's head portrait before and after shooting using a tablet PC. Only then are table PC operations such as "start detection" and "detection complete" function keys allowed.

- b. 改善檢測構件照片拍攝問題：已修正平板電腦現場作業程序及功能，檢測人員須將所有橋梁構件以平板電腦逐一拍攝完成後，方能以自備其他相機輔助拍攝，並將其照片上傳系統，做為補充構件相片之用；同時前述補充構件相片僅能選取一定時間內所拍攝之照片。
- c. 為協助橋梁管理機關覆核橋檢相關資料，已針對整座橋梁檢測時間過短者，標註警示以利檢視，同時如有檢測人員現場照片與資料庫照片不符者，亦利用AI影像辨識技術標註警示。

(2) 全國橋梁統計資訊網

統計資訊網目前有三大功能可供查詢，分別為地圖搜尋、橋梁分類統計、部會及縣市轄管橋梁統計，相關功能摘述說明如下：

- a. 地圖搜尋：結合地理資訊系統功能，民眾可利用橋梁所在縣市（區鄉）或橋名搜尋車行、鐵道或人行天橋等橋梁，並於電子地圖上顯示符合條件之橋梁所在位置。
- b. 橋梁分類統計：提供車行橋梁、鐵道橋梁、人行天橋之使用狀態及橋齡統計資訊，點選統計數字後，即可得到橋梁清單明細資料，包括橋梁管理機關、所在縣市、竣工年月、橋梁總長、結構形式等。
- c. 部會及縣市轄管橋梁統計：提供各部會及縣市政府轄管之車行橋梁、鐵道橋梁及人行天橋之統計資訊，可讓民眾查詢瞭解各部會或縣市政府轄管橋梁之數量。

b. Improved photographing of detection component issues: The tablet PC website's operating procedures and functions have been corrected. Before using a self-prepared camera for supplementary photography, detection personnel should photograph all bridge components with a tablet PC. The images are then saved as supplementary component images in the system. Simultaneously, only photographs of the aforementioned supplemental component taken within a specific time frame can be chosen.

c. Bridges with excessively short detection times are targeted and marked with warnings to aid bridge management authorities in reviewing and approving bridge inspection data. Simultaneously, if there are discrepancies between detection personnel site photographs and database photographs, artificial intelligence image recognition technology will be used to mark warnings.

[2] National Bridge Statistics Information Network

The statistics information network currently has three search functions: map search, bridge classification statistics, ministerial and statistics of bridges under county and city jurisdiction. The following functions are summarized and explained:

- a. Map search: Using the county/city [district/township] of location or bridge name, the general public can search for car companies, railways, pedestrian overpasses, and other bridges by combining geographic information system functions. Electronic maps also show the locations of bridges that meet the conditions.
- b. Bridge classification statistics: provide statistical information on vehicle bridges, railway bridges, pedestrian overpasses, and bridge ages. After selecting a statistical figure, the bridge list detail is displayed, which includes bridge competent authorities, location, year and month of completion, total bridge length, structure type, and so on.
- c. Statistics for bridges under ministerial and county/city jurisdiction: Statistical information about vehicle bridges, railway bridges, and pedestrian bridges under the jurisdiction of ministries and county/city governments is made available to the general public so that they can search for and understand the number of bridges under the jurisdiction of ministries or county/city governments.

3. 成果推廣與效益

(1) 「車行橋梁管理資訊系統」相關精進功能已測試完成，並於112年2月日上線使用。

(2) 「全國橋梁統計資訊網」已於112年2月1日對外開放供民眾查詢。

4. 研究成果精華摘要

返回橋梁清單 編輯定期檢測紀錄

*裝置類型： 主裝置(上傳即新增一筆) 次裝置(依附在最新上傳的檢測資料下)

橋梁名稱：頂埔高架橋(測試)

*檢測日期：2022-12-30 12:06:16 現在時刻

*檢測單位：國立中央大學

檢測主管：姚乃嘉

*檢測員：王大明

檢測員共1人

*檢測員頭像：

王大明 

開始檢測 返回橋梁清單

3. Result Promotion and Benefits

(1) "Vehicle Bridge Management Information System" related improvement functions have been tested and completed, which went online in February 2023.

(2) "The National Bridge Statistics Information Network" search was open to the general public on February 1, 2023.

4. Summary of Research Results

返回橋梁清單 新增定期檢測紀錄

*裝置類型： 主裝置(上傳即新增一筆) 次裝置(依附在最新上傳的檢測資料下)

橋梁名稱：頂埔高架橋(測試)

*檢測日期：2022-12-30 12:06:16 現在時刻

*檢測單位：國立中央大學

檢測主管：姚乃嘉

*檢測員：
目前所在位置與所檢測橋梁座標不符，所以無法繼續執行！
所在地點
24.788822,120.92998
新增/編輯 共1人

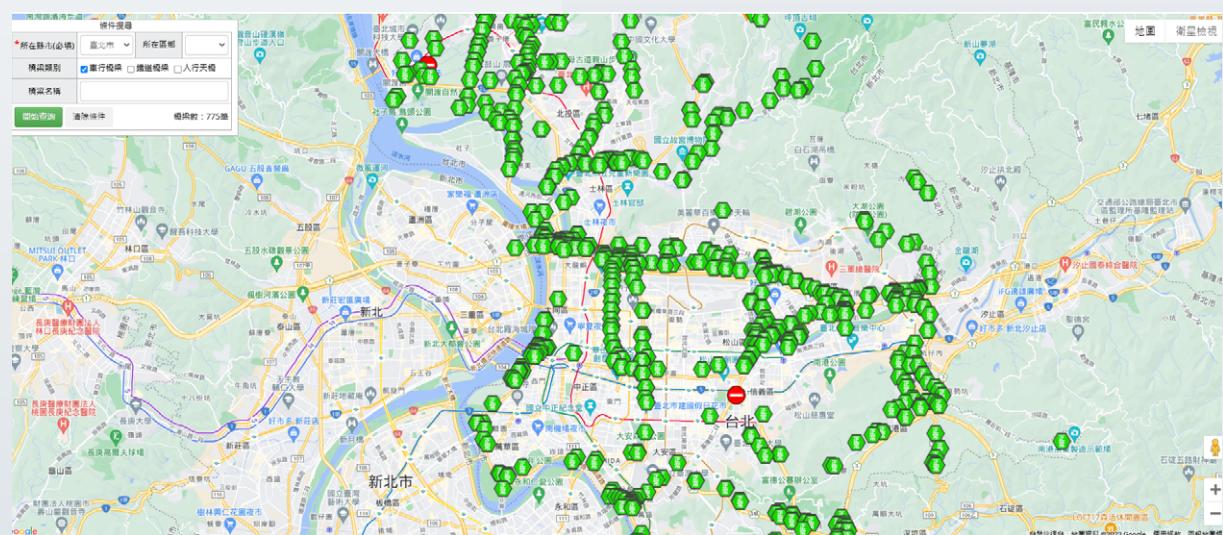
*檢測員頭像：

王大明 

Done 開始檢測

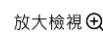
返回橋梁清單 提醒您，按下『開始檢測』便建立該筆檢測資料。

車行橋梁管理資訊系統功能精進
Improvement of Vehicle Bridge Management Information System Functions



橋梁類別	所有橋梁			鋼索型橋梁			放大檢視 
	正常使用	維修中	停用	正常使用	維修中	停用	
車行橋梁	22,800	131	54	161	3	1	
鐵道橋梁	1,380	17	86	4	0	0	
人行天橋	1,598	N/A	50	182	N/A	6	
小計	25,778	148	190	347	3	7	
合計	26,116			357			

*鐵道橋為管理單元

橋梁類別	所有橋梁						鋼索型橋梁						放大檢視 	
	<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	
車行橋梁	74	1,589	3,254	5,839	3,795	2,966	5,468	2	61	67	24	4	3	4
鐵道橋梁	1	211	326	156	339	358	92	0	2	2	0	0	0	0
人行天橋	16	131	136	77	44	58	1,191	6	15	32	10	3	9	113
小計	91	1,931	3,716	6,072	4,178	3,382	6,751	8	78	101	34	7	12	117
合計	26,121						357						*鐵道橋為管理單元	

資料更新日期 車行橋梁：2023-02-01 鐵道橋梁：2023-01-16 人行天橋：2023-02-01

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「全國橋梁統計資訊網」橋梁分類統計功能

"National Bridge Statistics Information Network" Bridge Classification Statistical Functions

5. 研究成果報告

- 規劃建置全國車行橋梁統計系統 (112年5月出版)

5. Research Result Report

- The Planning and Establishment of the National Vehicle Bridge Statistical System (Published in May 2023)





研討與成果 推廣活動

Seminars and
Achievements Promotion Activities

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05

項次	日期	主題	Topic
1	1月21日	軌道期刊研討「Requirements for Big Data Adoption for Railway Asset Management」(文章出處：IEEE Access Vol.8 2020)	Seminar: Railway Journal Papers: 「Requirements for Big Data Adoption for Railway Asset Management」(paper from: IEEE Access Vol.8 2020)
2	3月7日	交通部無人機科技產業小組第5次委員會議	The Board of Transportation Technology Industries –UAV Technology Task Force 5th Consultation Meeting
3	3月7日	先進公車智慧化營運管理先導運行計畫(1/2)－整合車載設備之駕駛工時管理系統研發第2次專家學者座談會	Scholars and Experts Symposium: Project of Advanced Bus Intelligence Operational Management Introduction (1/2)- Driving Hours Management System Development with Automotive Electronics (2nd Session)
4	3月10日	111年3月空運期刊研討會	Seminar: March 2022 Air Transport Journal
5	3月16日	111年3月海運期刊研討會	Seminar: March 2022 Maritime Journal
6	3月17日	「環騎圓夢APP」教育訓練-種子教師及北區小隊長	Training Workshop: 「Taiwan cycling route」 APP for seed teachers and northern area team leaders.
7	3月22日	汽車客運業路線別成本計算制度檢討規劃及應用軟體建置計畫學者專家座談會	Scholars and Experts Symposium: Review and Planning of Route-Base Costing System and Developing Software for the Bus Services Industry
8	3月23日	臺灣無人機大聯盟成立大會暨科技產業發展國際論壇	UAS Taiwan founding ceremony and international forum
9	3月23日	「環騎圓夢APP」教育訓練-中區小隊長	Training Workshop: 「Taiwan cycling route」 APP for central area team leaders
10	4月7日	「環騎圓夢APP」教育訓練-東區小隊長	Training Workshop: 「Taiwan cycling route」 APP for eastern area team leaders
11	4月12日	111年4月海運期刊研討會	Seminar: April 2022 Maritime Journal
12	4月13日	111年4月空運期刊研討會	Seminar: April 2022 Air Transport Journal
13	4月15日	「環騎圓夢APP」教育訓練-南區小隊長	Training Workshop: 「Taiwan cycling route」 APP southern area team leaders.
14	4月15日	「推動通用計程車特約制度(1/2)-系統擴充及跨部會合作策略規劃與執行」第1次專家學者座談會	Expert and Scholar Symposium: The 1st expert and scholar symposium on "Promoting the I-Taxi Contract System (1/2) - System Expansion and Cross-Ministry Cooperation Strategy Planning and Implementation"
15	4月15日	「推動通用計程車特約制度(1/2)-系統擴充及跨部會合作策略規劃與執行」業者座談會	Symposium: "Promoting the I-Taxi Contract System (1/2) - System Expansion and Cross-Ministry Cooperation Strategic Planning and Implementation" industry symposium
16	4月19日	協助高雄市政府交通局與日本小田急電鐵株式會社簽署合作備忘錄	Signing Ceremony: Assisting the Kaohsiung City Government Transportation Bureau in signing a memorandum of understanding with Odakyu Electric Railway Co., Ltd. of Japan.
17	5月4日	「環騎圓夢APP」教育訓練-線上	Training Workshop: 「Taiwan cycling route」 APP- Online
18	5月10日	「推動通用計程車特約制度(1/2)-系統擴充及跨部會合作策略規劃與執行」使用者座談會-北部場	Symposium: "Promoting the I-taxi Contract System (1/2) - System Expansion and Cross-Ministry Cooperation Strategy Planning and Implementation" User Symposium - North Session
19	5月10日	「推動通用計程車特約制度(1/2)-系統擴充及跨部會合作策略規劃與執行」使用者座談會-中南部場	Symposium: "Promoting the I-taxi Contract System (1/2) - System Expansion and Cross-Ministry Cooperation Strategy Planning and Implementation" User Symposium - Central South Session
20	5月10日	111年5月海運期刊研討會	Seminar: May 2022 Maritime Journal
21	5月11日	111年5月空運期刊研討會	Seminar: May 2022 Air Transport Journal

項次	日期	主題	Topic
22	5月13日	「共享電動機車對運輸溫室氣體排放影響」專家諮詢會（第1場）	Meeting: Expert Consultation Meeting on The Impact of Shared e-scooters on Transportation Greenhouse Gas Emissions (1st Session)
23	5月25日	偕同高雄市政府交通局與日本全日空航空公司（ANA）簽署3方（運研所、高雄市政府交通局、ANA）合作備忘錄	Signing ceremony: Signing a trilateral memorandum of understanding among the Institute of Transportation, Kaohsiung City Government Transportation Bureau, and All Nippon Airways (ANA) of Japan.
24	5月25日	「推動通用計程車特約制度(1/2) - 系統擴充及跨部會合作策略規劃與執行」系統更新改版說明會-北部場	Meeting: "Promoting the I-taxi Contract System (1/2) - System Expansion and Cross-Ministry Cooperation Strategy Planning and Implementation" System Update and Revision Explanation Session - North Session
25	5月25日	「推動通用計程車特約制度(1/2) - 系統擴充及跨部會合作策略規劃與執行」系統更新改版說明會-中南部場	Meeting: "Promoting the I-taxi Contract System (1/2) - System Expansion and Cross-Ministry Cooperation Strategy Planning and Implementation" System Update and Revision Explanation Session - Central South Session
26	5月26日	部務會報報告「疫情對國際航空市場影響分析」	Presentation in MOTC: Analysis of Impact of Covid-19 on International Air Transport
27	5月26日	「氣候變遷調適資訊分享與調適行動計畫研擬」教育訓練	Training: Climate Change Adaptive information and Adaptation Action Plan Development
28	5月31日	汽車運輸業建立安全管理制度之挑戰與展望研討會	Seminar: May 2022 Establishing SMS for Motor Carrier Industry: Challenge and Prospect
29	6月13日	「推動通用計程車特約制度(1/2) - 系統擴充及跨部會合作策略規劃與執行」跨部會合作規劃及方案研擬座談會	Symposium: "Promoting the I-Taxi Special System (1/2) - System Expansion and Cross-Ministry Cooperation Strategy Planning and Implementation" Cross-Ministry Cooperation Planning and Program Development Symposium
30	6月14日	111年6月海運期刊研討會	Seminar: June 2022 Maritime Journal
31	6月15日	111年6月空運期刊研討會	Seminar: June 2022 Air Transport Journal
32	6月21日	「推動通用計程車特約制度(1/2) - 系統擴充及跨部會合作策略規劃與執行」第2次專家學者座談會	Expert and Scholar Symposium: The 2nd expert and scholar symposium on "Promoting the I-taxi Contract System (1/2) - System Expansion and Cross-Ministry Cooperation Strategy Planning and Implementation"
33	6月23~7月1日	「事故碰撞型態導向之路口設計範例」教育訓練座談會	Education and Training Symposium: The Guide Manual on Traffic Engineering Safety Design Based on the Accident Types at Intersections
34	6月24日	拜會全日空航空公司，共同討論後續跨境合作與交流事宜	Meeting: Visiting All Nippon Airways (ANA) to discuss follow-up cross-border cooperation and exchange matters together.
35	7月12日	111年7月海運期刊研討會	Seminar: July 2022 Maritime Journal
36	7月13日	111年7月空運期刊研討會	Seminar: July 2022 Air Transport Journal
37	7月15日	「教學與應用合作計畫」試辦期成果座談會	Symposium: Trial Implementation Results of Teaching and Application Collaboration Project
38	7月26日	交通部無人機科技產業小組第6次委員會議	Meeting: Board of Transportation Technology Industries –UAV Technology Task Force 6th Consultation Meeting
39	7月28日	「風速計及能見度儀設備操作」教育訓練	Training workshop: Anemometer and visibility meter equipment operation
40	8月9日	111年8月海運期刊研討會	Seminar: August 2022 Maritime Journal
41	8月10日	111年8月空運期刊研討會	Seminar: August 2022 Air Transport Journal

項次	日期	主題	Topic
42	8月13日	蔡英文總統蒞臨嘉義縣亞洲無人機AI創新應用研發中心為交通部無人機科技產業小組辦公室揭牌	Opening ceremony: President Tsai Ing-wen visited the Asia-Pacific UAV AI Innovative Application Research and Development Center in Chiayi County to unveil the office of the Ministry of Transportation and Communications' UAV Technology Industry Task Force.
43	8月16日	2022年臺灣公路容量手冊發表說明會	Meeting: Briefing Session on 2022 Taiwan Highway Capacity Manual
44	8月30日	「運輸規劃支援系統維運技術服務(111年)」資料需求共識工作坊	Training Workshop: Data Requirements Consensus Workshop: Maintenance Service of the Transportation Planning Support System (2022)
45	9月14日	111年9月空運期刊研討會	Seminar: September 2022 Air Transport Journal
46	9月15日	「運輸系統因應氣候變遷調適發展趨勢與公路系統強化調適能力作為」教育訓練	Training Workshop: Trend of Adaptive Development for Transportation Systems in Response to Climate Change and Enhancing Highway System's Adaptive Capacity in the Planning Phase
47	9月16日	111年9月海運期刊研討會	Seminar: September 2022 Maritime Journal
48	9月20日	111年臺灣公路容量分析軟體教育訓練-臺北場	Training Workshop: Taiwan Highway Capacity Analysis Software (THCS) for Northern Area 2022
49	9月21日	111年臺灣公路容量分析軟體教育訓練-高雄場	Training Workshop: Taiwan Highway Capacity Analysis Software (THCS) for Southern Area 2022
50	9月30日	交通部臉書貼文「感潮河段橋梁底檢測工具精進研究」	MOTC Facebook post: Refined Research on Bridge Girder Bottom Detection Tools in Tidal River Sections
51	10月11日	111年10月海運期刊研討會	Seminar: October 2022 Maritime Journal
52	10月13日	「自行車環島路線、環島替代路線及多元路線指示系統設置原則」教育訓練	Training Workshop: cycling route, alternative route and bike tour sign setting principles
53	10月13日	「公路系統規劃強化調適能力指引」專家學者座談會	Scholars and Experts Symposium: Guidelines of Enhancing Highway System's Adaptive Capacity in the Planning Phase
54	10月14日	111年10月空運期刊研討會	Seminar: October 2022 Air Transport Journal
55	10月14日	「自行車環島路線、環島替代路線及多元路線指示系統設置原則」教育訓練	Training Workshop: cycling route, alternative route and bike tour sign setting principles
56	10月21日	「中臺區域整體運輸規劃系列研究(3/3)－供需預測及發展策略分析」教育訓練	Training Workshop: Transportation Demand Model of Central Taiwan Region
57	10月25日	「共享電動機車對運輸溫室氣體排放影響」專家諮詢會(第2場)	Expert Consultation Meeting: The Impact of Shared e-scooters on Transportation Greenhouse Gas Emissions (2nd Session)
58	10月26日	111年電動大客車營運數據監控管理平台維運與移轉(電動大客車營運數據監控管理平台教育訓練)	Training Workshop: The Maintenance and Transfer of Electric Bus Operational Monitoring and Management Platform of 2022
59	10月26日	「應用交通管理策略減少都會區交通空氣污染之研析」工作坊(第1場)	Training Workshop: Research and Analysis on Applying Traffic Management Strategies to Reduce Traffic Air Pollution in Metropolitan Areas (1st Session)
60	10月27日	「運輸規劃支援系統維運技術服務(111年)」教育訓練	Training Workshop: Maintenance Service of the Transportation Planning Support System (2022)
61	10月27日	「中臺區域整體運輸規劃系列研究(3/3)－供需預測及發展策略分析」教育訓練	Training Workshop: Transportation Demand Model of Central Taiwan Region
62	10月27日	「以無人機空拍及AI影像辨識技術探討路口交通衝突」研究成果說明暨教育訓練	Training Workshop: Education and Training of seeded lecturer: The Guide Manual on Traffic Engineering Safety Design Based on the Accident Types at Intersections

項次	日期	主題	Topic
63	10月28日	「應用交通管理策略減少都會區交通空氣污染之研析」工作坊（第2場）	Training Workshop: Research and Analysis on Applying Traffic Management Strategies to Reduce Traffic Air Pollution in Metropolitan Areas (2nd Session)
64	10月30日-11月4日	交通部無人機科技產業小組臺日交流	Exchange activity: Taiwan and Japan UAV industry exchange activities by the Board of Transportation Technology Industries -UAV Technology Task Force.
65	10月31日	專題演講「Covid-19疫情對公共運輸之影響及因應對策」（陽明交通大學運輸與物流管理學系教學合作計畫）	Keynote Speech: "The Impact of Covid-19 Pandemic on Public Transport and Response Measures" (Teaching Cooperation Program with the Department of Transportation & Logistics Management, NYCU)
66	11月3日	「中臺區域整體運輸規劃系列研究(3/3)－供需預測及發展策略分析」教育訓練	Training Workshop: Transportation Demand Model of Central Taiwan Region
67	11月4日	「港灣環境資訊網」使用者說明會	Meeting: 2022 User Conference of Harbor Environmental Information System
68	11月8日	111年11月海運期刊研討會	Seminar: November 2022 Maritime Journal
69	11月8日	「都市交通控制通訊協定3.0版檢討成果」交流座談會	Symposium: Results of the review of the Urban Traffic Control Communication Protocol 3.0
70	11月9日	「港區無人機智慧化巡查技術研發」成果教育訓練	Training Workshop: Smart Inspection Technique based on UAVs in the port area
71	11月10日	「AI軌道構件缺失辨識系統」教育訓練	Training Workshop: AI Track Component Missing Identification System
72	11月10日	交通部臉書貼文「緊急救援車輛智慧號控系統成功驗證實作」	MOTC Facebook post: "Successful verification and implementation of the smart traffic signal control system for emergency vehicles."
73	11月10日	「構建5G智慧交通數位神經中樞(2/2)-系統雛型開發與驗證實作」成果交流座談暨技術研討會	Results Exchange Seminar and Technical Symposium: Construction of 5G intelligent transportation digital nerve center (2/2) - System prototype development and verification implementation
74	11月11日	111年11月空運期刊研討會	Seminar: November 2022 Air Transport Journal
75	11月11日	「共享電動機車對運輸溫室氣體排放影響」工作坊	Training Workshop: The Impact of Shared e-scooters on Transportation Greenhouse Gas Emissions
76	11月14日	「國際機場空側容量評析方法建立與後續應用」專家學者座談會	Experts and Scholar Symposium: Establishing Airside Capacity Evaluation and Analysis Methods of International Airport and Subsequent Applications
77	11月 11、14、 24、25日	「鐵道安全管理系統自主評估準則與監理查核機制」教育訓練課程	Training Workshop: Railway Safety Management System – the Development of Self-Assessment Criteria and Supervisory Inspection Mechanisms
78	11月15日	「港灣構造物維護管理系統精進」教育訓練	Training Workshop: Improvement of Harbor Structure Maintenance and Management System
79	11月16日	111年度「國際海運資料庫」更新擴充及資料分析服務專家座談會	Experts Symposium: Updating, Expanding and Data Analyzing Services of International Maritime Transport Database of 2022
80	11月16日	專題演講「Covid-19疫情對公共運輸之影響及因應對策」（淡江大學運輸管理學系教學合作計畫）	Keynote speech: The Impact of Covid-19 Pandemic on Public Transport and Response Measures (Teaching Cooperation Program with the Department of Transportation Management, Tamkang University)
81	11月16日	111年度金門港維護管理系統教育訓練	Training Workshop: 2022 Kinmen Harbor Structure Maintenance and Management System Education and Training
82	11月17日	大氣腐蝕及防蝕技術應用研討會（臺北場）	Seminar: Atmospheric Corrosion and Anti-Corrosion Technology Application (Taipei)

項次	日期	主題	Topic
83	11月18日	無人機物流運送深化應用場域驗證啟動儀式	Launch Ceremony: Deepening Application Field Verification of Unmanned Aerial Vehicle (UAV) Logistics Transport
84	11月18日	全球淨零挑戰與行為科學輕推(nudge)機會研討會	Seminar: The Global Net-Zero Challenge and Behavioral Science Nudge Opportunities
85	11月18日	「環騎圓夢APP」教育訓練-種子教師及北區小隊長	Training Workshop: 「Taiwan cycling route」APP for seed teachers and northern area team leaders
86	11月21日	111年度「國際空運資料庫」更新擴充及資料分析服務專家座談會	Experts Symposium: Updating, Expanding and Data Analyzing Services of International Air Transport Database of 2021
87	11月22日	「環騎圓夢APP」教育訓練-中區小隊長	Training Workshop: 「Taiwan cycling route」APP for central area team leaders
88	11月24日	「環騎圓夢APP」教育訓練-東區小隊長	Training Workshop: 「Taiwan cycling route」APP for eastern area team leaders
89	11月25日	「環騎圓夢APP」教育訓練-南區小隊長	Training Workshop: 「Taiwan cycling route」APP southern area team leaders
90	11月25日	「元宇宙趨勢簡介及其對產業與物流之應用」專題演講	Keynote Speech: "Introduction to metaverse and the application to Logistics."
91	11月28日	「鐵路系統供需診斷模式軟體之維護與擴充及策略分析(2/2)」專家學者座談會	Experts and Scholar Symposium: Railway Supply and Demand Diagnosis and Strategy Analysis with Big Data Technology (2/2)
92	12月1日	「感潮河段橋梁底檢測工具研究」成果推廣	Outcome Presentation: Promotion of the results of "Research on Tools for Detecting the Bottom of Bridge Beams in Tidal River Sections "
93	12月7日	「港區海氣象觀測資料品管作業」教育訓練	Training Workshop: Quality control of marine meteorological observation data in the port area
94	12月12日	飛山越嶺-交通部無人機推動成果發表會	Outcome Presentation: Flying Over Mountains and Crossing Ridges - Symposium on Achievements in Promoting Unmanned Aerial Vehicles by the Ministry of Transportation
95	12月13日	道路交通安全科技發展與政策願景研討會	Seminar: December 2022 Roadway Safety Technology and Policy
96	12月13日	大氣腐蝕及防蝕技術應用研討會（高雄場）	Seminar: Atmospheric Corrosion and Anti-Corrosion Technology Application (Kaohsiung)
97	12月14日	辦理APEC「提昇移動力整合新紀元」國際論壇	APEC Conference on "Exploring the new age of mobility integration"
98	12月16日	「雷達遙測技術應用於商港海象觀測」成果說明會	Meeting: The Conference for Meteorological Observation Using Radar Remote Sensing Technology in Commercial Harbor
99	12月16日	「雷達遙測技術應用於商港海象觀測」成果說明會	Meeting: The Conference for Meteorological Observation Using Radar Remote Sensing Technology in Commercial Harbor
100	12月19日	「東臺區域整體運輸規劃系列研究」技術移轉教育訓練及成果推廣會議	Training Workshop: Transportation Demand Model of Eastern Taiwan Region
101	12月22日	「我國運輸部門的淨零解方：COP27觀察心得」成果分享會議	Meeting: "Net-Zero Solutions for Taiwan's Transportation Sector: Observations from COP27" Sharing Session
102	12月26日	「111年度基隆港海象觀測及模擬計畫成果交流會」	Meeting: The Keelung Port Marine Meteorological Observation and Simulation Results Exchange Meeting

大事紀要

Memorabilia

陸
/06



日期 Date

重要記事 Event

01
January

本所與逢甲大學中區區域運輸發展研究中心於梨山地區舉辦競爭型計畫「公共運輸優先強化區共享平台之規劃與導入－以臺中市梨山地區為例」第二場次座談會，因應梨山偏鄉公共運輸將營運上路，優先針對梨山地區公共運輸共享平台之規劃與使用，研擬相關方案，並邀集交通部公路總局、臺中市政府、臺中公車聯營管理委員會、鼎漢顧問公司，以及在地業者、居民、里長與臺中市和平區梨山社區發展協會共同參與討論，透過本次座談會進行多方溝通達成認同及共識。

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The Institute held the second workshop for the competitive project titled "Planning and Introduction of Sharing Platform for Areas Prioritized for Optimization of Public Transportation – Lishan Taichung as an Example" in Lishan jointly with the Transportation Development Research Center in Central Taiwan of Feng Chia University. In response to the imminent commissioning of public transportation for outlying areas in Lishan, related solutions were prepared first for Lishan to facilitate the planning and introduction of the public transportation sharing platform and the MOTC Directorate General of Highways, the Taichung City Government, the Taichung Bus United Management Committee, THI Consultants Inc., and local businesses, residents, neighborhood chiefs, and the Lishan Community Development Association were invited to take part and discuss together. Multilateral communications took place during the workshop and approval and consensus were reached.

15

本所與國立東華大學東部區域運輸發展研究中心舉辦競爭型計畫「『回家觀光（花蓮）』與『訂製觀光（臺東）』：用幸福（巴士）來花蓮和臺東的部落觀光」－花蓮及臺東地區座談會，邀集國家發展委員會、地方創生東區輔導中心、花蓮縣政府、秀林鄉公所、臺東縣政府、達仁鄉公所、社團法人臺東縣南迴健康促進關懷協會等相關單位，就花蓮及臺東地區公共運輸、地方創生與產業發展，以及示範計畫規劃、改善與問題等議題進行交流。

16

The Institute held workshops in Hualien and Taitung for the competitive project titled " 'Come Home for Sightseeing (Hualien)' and 'Customize Sightseeing (Taitung)': Sightsee Tribes in Hualien and Taitung in Happiness (Buses)" with the Transportation Development Research Center in Eastern Taiwan of National Dong Hwa University. The National Development Council, the Regional Revitalization Assistance Center in Eastern Taiwan, the Hualien County Government, the Xiulin Township Office, the Taitung County Government, the Daren Township Office, and the Association for South United Health Care Promotion for Taitung County were invited to exchange on topics such as public transportation in Hualien and Taitung, regional revitalization, and industrial development and the planning, improvement, and issues of demonstration projects, etc.

17

本所協助交通部規劃辦理「推動運具電動化跨部會分工議題研商會議」，由陳彥伯政務次長主持，邀集國發會、經濟部、環保署、財政部等相關單位，討論立法院洪委員申翰關心國內推動運具電動化跨部會分工議題。

The Institute helped the MOTC plan and hold the "Workshop on Cross-disciplinary Division of Labor in Promotion of Electric Transportation Tools". It was chaired by Political Deputy Minister Yen-Po Chen. The National Development Council, the Ministry of Economic Affairs, the Environmental Protection Administration, and the Ministry of Finance, among other related authorities, were invited to discuss the issue of cross-disciplinary division of labor in the promotion of electric transportation tools concerning Legislator Sun-Han Hung.

01
January

本所於高雄辦理兩場次「愛接送-預約式通用計程車」試乘者經驗分享座談會，每位出席參與試營運者就預約系統、服務流程、服務品質等進行經驗分享，提供研究團隊後續系統與服務流程精進之參考。

23

The Institute held two workshops where passengers shared their trial experience with "Love Pickup Passengers – Taxi by Reservation" in Kaohsiung. Each attendee shared their experience with the reservation system, the service procedure, and the service quality, etc., for the reference of the study team while the latter advances the system and the service procedure in the future.

03
March

本所於交通部第1818次部務會報報告「運用無人機及AI影像技術分析道路交通衝突」，王國材部長指示持續研發精進分析技術，將分析地點由路口擴及至路段，並儘速結合區域運輸發展研究中心，將此分析工具推廣至縣市政府及公路總局等相關機關，以提升路口安全改善效果。

3

The Institute gave a presentation on "Analyzing Road Traffic Conflicts Applying Drones and AI Imaging Technology" in the 1818th ministerial meeting of the MOTC. Minister Kwo-Tsai Wang instructed on continuous research and development in order to advance analytical technologies by expanding analytical locations from intersections to road sections and quickly combining regional transportation development research centers so that the analytical tools can be reached out to authorities concerned, such as county/city governments and the Directorate General of Highways for improved safety at intersections.

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本所協助交通部規劃辦理「行政院國家永續發展委員會永續運輸工作分組111年第1次分組會議」，由陳彥伯政務次長主持，邀集永續會委員、國發會及交通部相關單位 / 機關(構)，探討分組主政之臺灣永續發展目標各對應指標執行進度及未達標之對應指標檢討。

The Institute helped the MOTC plan and hold the "First Sectional Meeting of 2022 of the Sustainable Transportation Group under the National Council for Sustainable Development of the Executive Yuan". It was chaired by Political Deputy Minister Yen-Po Chen. Members of the Council, the National Development Council, and related units/agencies under the MOTC were invited to discuss the implementation status of corresponding indicators of sustainable development goals in Taiwan they were responsible for and reflect upon the corresponding indicators yet to fulfill the goals.

日期 Date

重要記事 Event

03
March

本所於臺北南港展覽館辦理「臺灣無人機大聯盟成立大會」，大聯盟引領國內無人機科技產業的發展，建立群聚效應並媒合國內外商機，產官學研能量匯集使無人機產業共好及接軌國際。

The Institute held the "General Assembly for Formation of the Drone Alliance in Taiwan" at the Nangang Exhibition Hall in Taipei. The Alliance spearheads the developments of the drone technology industry in the country to create the cluster effect and brokers domestic and international business opportunities. With the combined momentum of industry/government/academia/research, it contributes to the common good for the drone sector and connection with the world.



17

交通部訂於111年5月28日辦理「2022世界自行車日-騎遊環台活動」，本所奉示以「環騎圓夢APP」記錄軌跡並顯示騎乘熱點圖，共同繪製出臺灣輪廓路線。為期世界自行車日當天活動順利進行，本所遂辦理1場種子教師教育訓練及北區、中區、南區、東區小隊長教育訓練，除宣達種子教師與小隊長須擔任之工作，確保熟悉「環騎圓夢」App操作流程，希望號召更多民眾於活動當天騎乘，提升參與熱度。

23

30

04
April

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The MOTC held the "2022 World Bicycle Day – Touring Around Taiwan" on May 28, 2022. The Institute was instructed to record the trajectory and show the riding hot spots through the "Tour-around-Taiwan for Dream Come True APP"; the joint effort rendered the Taiwan-wide riding outlook. For the events to go smoothly on World Bicycle Day, the Institute held one seed teacher training and the training for group leaders in northern, central, southern, and eastern parts of Taiwan. Besides communicating the tasks expected of the seed teachers and group leaders and ensuring that they are familiar with the "Tour-around-Taiwan for Dream Come True" App operating procedure, they would hopefully call upon more people to join the events on the day and boost participation.

03
March

為致力堆廣智慧交通發展，本所、財團法人中華顧問工程司於今（30）日，透過網路跨海與日本公益社團法人企業情報化協會（JiIT）共同簽署合作備忘錄。簽署儀式由運本所林繼國所長、中華顧問周永暉董事長與公益社團法人企業情報化協會小縣方樹會長代表共同簽署。

To devote to the promotion of developments of smart transportation, the Institute and the China Engineering Consultants, Inc. (CECI) jointly signed the Memorandum of Understanding with the Japan Institute of Information Technology (JiIT) online today (March 30). Director-General of the Institute, Mr. Chi-Kuo Lin, Chairman Yung-Hui Chou of CECI, and Chairman Yoshiki Chiisagata of JiIT jointly signed the memorandum.



30

本所與國立高雄科技大學高屏澎區域運輸發展研究中心舉辦「北高雄公路公共運輸服務升級計畫」座談會，邀集立法委員邱志偉國會辦公室、交通部公路總局、高雄市政府交通局、工務局、捷運工程局、衛生局、交通部公路總局高雄市區監理所、當地公車客運及幸福小黃業者等相關單位代表，就北高雄8區（茄萣區、湖內區、路竹區、永安區、岡山區、彌陀區、梓官區、橋頭區）公路公共運輸服務課題彙整相關單位意見，釐清當地公路公共運輸服務升級需求，俾供交通部研議北高雄地區公路公共運輸服務升級參考。

The Institute held the workshop titled "North Kaohsiung Highway Public Transportation Service Upgrade Program" with the Transportation Development Research Center for Kaohsiung/Pingtung/Penghu of the National Kaohsiung University of Science and Technology. The congress office of Legislator Chih-Wei Chiu, the MOTC Directorate General of Highways, the Transportation Bureau, the Public Works Bureau, the Mass Rapid Transit Bureau, and the Department of Health under the Kaohsiung City Government, Kaohsiung City Motor Vehicles Office, local commuter bus and passenger bus and happy taxi operators, among other related parties, were invited to brainstorm on highway public transportation service issues in the 8 districts of North Kaohsiung (Jiading, Hunei, Luzhu, Yongan, Gangshan, Mituo, Ziguan, and Qiaotou) and clarify the demand for upgrading local highway public transportation service. The gathered feedback shall serve as reference for the MOTC while the latter prepares for an upgrade of the highway public transportation service in North Kaohsiung.



日期 Date

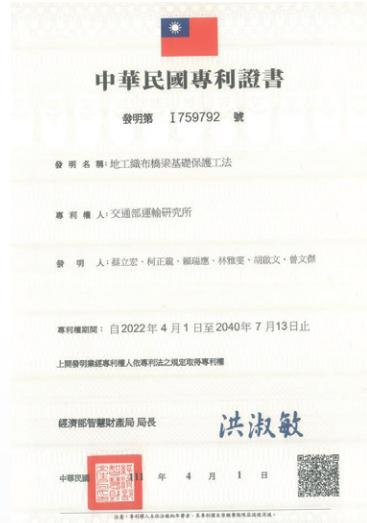
重要記事 Event

04
April

本所取得「地工織布橋梁基礎保護工法」中華民國發明專利，相關保護工法已用於國道3號大甲溪橋墩基礎之保護應用。

The Institute received the ROC invention patent for the "Geofabric Abutment Protection Technique". Related workmanship has been applied to the protection of the Dajia River abutment of Freeway 3.

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12

參與2022年APEC運輸工作小組(TPTWG)政策主題視訊會議(Virtual Thematic Sessions)，掌握國際運輸領域近期重要政策主題發展趨勢：

- (1) 4月12日19:00~21:00航空專家小組(AEG)：「發展航空貨運服務促進供應鏈韌性與經濟復甦」
- (2) 4月14日19:00~21:00複合運輸與智慧型運輸系統專家小組(IIEG)：「改善後疫情時代供應鏈韌性與連結性」
- (3) 4月19日19:00~21:00陸運專家小組(LEG)：「APEC區域內邁向安全、綠色、智慧與包容的城市運輸」
- (4) 4月21日19:00~21:00海運專家小組(MEG)：「APEC區域國際合作促進永續海運」

Attended the APEC Transportation Working Group (TPTWG) Virtual Thematic Sessions of 2022 to keep track of recent trends in the thematic developments of important policies in the field of international transportation:

- (1) Aviation Experts Group (AEG) at 19:00~21:00 on April 12: "Development of Aviation Freight Service to Boost Supply Chain Resilience and Economic Recovery"
- (2) Intermodal and Intelligent Transport System (ITS) Experts Group (IIEG) at 19:00~21:00 on April 14: "Improve Post-Pandemic Supply Chain Resilience and Connectivity"
- (3) Land Expert Group (LEG) at 19:00~21:00 on April 19: "Towards Safe, Green, Smart, and Inclusive Urban transport in the APEC Region"
- (4) Maritime Expert Group (MEG) 19:00~21:00 on April 21: "APEC Regional International Collaboration to Boost Sustainable Sea Freight"

19

21

04
April

本所於第1823次部務會報中報告「捷運路網規劃參考手冊之應用」，部長指示都會區推動捷運建設，需從整體都市發展與路網整合的觀點進行規劃，運研所編訂完成「捷運路網規劃參考手冊」，可提供地方政府規劃捷運路網及中央主管機關審議應用，並請路政司及鐵道局研議依手冊相關內容，修訂審議作業要點。

14

The Institute gave a presentation on the "Application of MRT Network Planning Reference Manual" in the 1823rd ministerial meeting. The Minister instructed that metropolitan MRT constructions need to be planned from a perspective where the overall urban development and road network are integrated. The Institute of Transportation finished compiling the "Application of MRT Network Planning Reference Manual", which can be applied by the local government while the latter plans the MRT network and by the central competent authority during a review. The Department of Railways and Highways and the Railway Burea were also asked to prepare related contents according to the Manual and revise their review operating guidelines.

05
May

本所於1825次部務會報報告「我國發展高端航運服務業潛力之評析」，本所透過國外標竿對象發展經驗，歸納得出的7項成功關鍵因素，以及評估4個我國具發展潛力的業別並據以研擬建議精進之作為，由於導入智慧化或數位化發展高端航運服務業，是全世界航運產業發展趨勢，也是我國發展的利基產業。部長指示航港局及港務公司推動數位航港計畫過程中，可將高端航運服務業（包括海事教育、航運顧問）之發展併予納入考量。

5

The Institute gave a presentation on "Evaluation and Analysis of Potential in Developing High-end Shipping Service Industry in Our Nation" during the 1825th meeting. The Institute summarized 7 key factors of success according to the development experience of international benchmarks and prepared for recommended advancement according to the four sectors of development potential in our country. The introduction of intelligentization and digitalization for the development of the high-end shipping service industry is a trend in the development of the global shipping industry and also where the niche is for the development in our country. The Minister instructed that the Maritime Port Bureau and Taiwan International Ports Corporation, Ltd., while enforcing the digital maritime port project, can take into consideration the development of the high-end shipping service industry (including maritime education and shipping consultation).

18

交通部王國材部長邀集本所及路政司召開會議，聽取運輸部門2050淨零排放路徑與策略規劃、運具電動化辦理情形及汽燃費研究建議。

Minister Kwo-Tsai Wang of the MOTC invited the Institute and the Department of Railways and Highways for a meeting where the transportation department gave a presentation on 2050 net zero emission pathway and strategic planning, the status of realizing electric transportation tools, and fuel cost research and advice.

日期 Date

重要記事 Event

05
May

本所督導六大區域運輸發展研究中心共同辦理「學校周邊公共運輸服務盤點成果座談會」，邀集全國大專院校及高中職學校、公路總局、教育部、地方政府等單位參與線上討論，六大區域中心依據座談會結論並彙整盤點研究成果報告書，做為歸納各區改善之依據。

The Institute supervised the six major regional transportation development research centers over the joint "Workshop on Accomplishment in Inventory Check of Public Transportation Service in Surroundings of Schools". Colleges and universities and high schools, the Directorate General of Highways, the Ministry of Education, and local governments were invited to take part in online discussions. The six major regional research centers compiled a report on the inventory check results according to the conclusions reached in the workshop, which will serve as reference in the respective regions for improvement.

23

26



MeN▶Go交通行動服務成績亮眼，已有眾多國內外城市前來考察取經，當日由本所林繼國所長、高雄市府林欽榮副市長與全日空航空公司（ANA）鈴木謙次部長簽署合作備忘錄，進一步增進臺灣與日本合作推動MaaS交通創新服務，並為後疫情時代雙方觀光旅行開啟新頁。

The MeN▶Go Mobility as a Service (MaaS) performance is impressive. Many domestic and international cities have come for observational visits. On the day, Mr. Chi-Kuo Lin, Director-General of the Institute, Deputy Major Charles Lin of Kaohsiung, and Deputy President Kenji Suzuki of ANA signed the Memorandum of Understanding to further boost the joint effort of Taiwan and Japan in the promotion of MaaS innovative transportation service and to start a new page for both parties in sightseeing in the post-pandemic era.

25



05
May

本所於交通部第1828次部務會報報告「疫情對國際航空市場影響分析」，王國材部長指示，相關分析成果請民航局及桃園機場公司納入參考應用，另請該二單位思考未來可能面臨之挑戰，並為航空市場回溫做好準備，及持續推動各項智慧化工作。

26

The Institute gave a presentation on "Analysis of Impacts of Pandemic on International Aviation Market" during the 1828th meeting of the MOTC. Minister Kwo-Tsai Wang instructed the Civil Aeronautics Administration and the Taoyuan International Airport Corporation to include related analytical results for reference and application. In addition, the two authorities were asked to think about possible challenges in the future and to be prepared for a comeback on the aviation market and to continue enforcing respective intelligentized tasks.

27

中華民國海洋及水下技術協會於本所港灣技術研究中心召開該協會第16屆第2次會員大會暨第23次海洋與水下技術研討會，邀請臺灣港務股份有限公司李賢義董事長及經濟部能源局游振偉局長進行兩場專題演講。研討會總計有70篇論文及海報參與發表，共同交流並提升國內海岸、港灣、海洋能源、水下技術、離岸風電等領域之技術，並推廣本所港灣技術研究中心於海陸災害防治、船舶航安、環境監測與應用、道路、橋梁、軌道與港灣之檢監測技術與維護管理等研究成果。

The ROC Marine and Underwater Technology Association held its second general assembly of the 16th intake and the 23rd marine and underwater technology seminar at the Harbor & Marine Technology Center of the Institute. Chairman Hsien-Yi Lee of Taiwan International Ports Corporation, Ltd. and Director-General Cheng-Wei Yu, Bureau of Energy, MOEA were invited to give two keynote speeches. In the seminar, a total of 70 papers and posters were released. Attendees exchanged with one another to help enhance technologies in domestic fields, such as coastal, bay, marine energy, underwater technology, and offshore wind power and promote the research accomplishments of the Harbor & Marine Technology Center of the Institute in marine and land disaster prevention and control, vessel travel security, environmental monitoring and application, and road, bridge, track, and bay inspection and monitoring technologies and their maintenance and management.



日期 Date

重要記事 Event

05
May

本所辦理「汽車運輸業建立安全管理制度之挑戰與展望研討會」 -交通部陳彥伯政務次長及與會貴賓合影

The Institute held the "Seminar on Challenges and Prospects for the Automotive Transportation Industry in Creating a Secure Management System" – Picture of Political Deputy Minister Yen-Po Chen and attendees



31

本所督導中區及東部區域運輸發展研究中心共同完成「110年盤點原住民族地區文化健康站之運輸服務」研究報告，並代辦部稿於111年5月31日交路（一）字第1118300046號函送原住民族委員會及相關單位參考，本所將持續督導各區域中心與原住民族委員會、地方政府及公路總局合作，以協助精進改善原民鄉之整體公共運輸服務。

The Institute supervised the Central Taiwan and Eastern Taiwan Transportation Development Research Centers over the jointly completed research report titled "2021 Inventory Check of Transportation Service for Cultural Health Stations in Aboriginal Regions" and the script was sent to the Council of Indigenous Peoples and related authorities for their reference through Letter MOTC Highway (I) No. 1118300046 dated May 31, 2022. The Institute will continue to supervise respective regional centers over their collaboration with the Council of Indigenous Peoples, local governments, and the Directorate-General of Highways in order to help advance and improve the overall public transportation service in aboriginal townships.

06
June

本所於第1831次部務會報提報「臺灣公路容量研究之發展與應用」，部長指示高公局及公路總局辦理道路新闢、拓寬改善計畫時，確實依照臺灣公路容量手冊的分析方法進行評估，以確保道路規劃設計成果能符合交通運轉需要，另外各機關（構）辦理重大交通建設計畫時，亦請務必要求受委託的顧問公司運用臺灣公路容量手冊評估相關之交通衝擊，並提出適切之配套改善措施。

16

The Institute gave a presentation on "Development and Application of Highway Capacity Research in Taiwan" during the 1831st meeting. The Minister instructed the Freeway Bureau and the Directorate-General of Highways to precisely follow the analytical method in the Taiwan Highway Capacity Manual while performing evaluations for new road construction and existing road expansion and improvement plans in order to ensure that road planning and design results meet traffic and operational needs. In addition, when respective agencies (institutions) engage themselves in major transportation construction projects, it is important that they ask the authorized consulting company to apply traffic impacts relevant to the evaluations performed according to the Taiwan Highway Capacity Manual and come up with proper improvement package measures.

日期 Date**重要記事 Event****06
June****20**

林繼國所長陪同交通部王國材部長參加自由時報舉辦之「台灣2050綠運輸淨零轉型策略座談」，由部長就交通部針對運具電動化及綠運輸之推動策略進行說明。

Director-General of the Institute, Mr. Chi-Kuo Lin and Minister Kwo-Tsai Wang of the MOTC attended the "Taiwan 2050 Green Transportation Net Zero Transformation Strategy Workshop" held by Liberty Times. The Minister clarified the strategies of the MOTC in the promotion of electric transportation tools and green transportation.

本所依交通部指示，由陳天賜副所長代表接見中華民國台灣通用無障礙服務協會等團體，主要反映對通用計程車服務看法，要求法制化、永續化及補貼撥款等事項。

23

As instructed by the MOTC, the Institute had Deputy Director-General Tien-Tsyh Chen to receive groups such as the Taiwan Universal Barrier-free Service Association. They mainly reflected their opinions about the taxi service in general and demanded legalization, sustainability, and subsidies, among others.

**07
July****4**

本所督導六大區域運輸發展研究中心共同完成「公車進校園服務成效盤點與精進建議」成果報告，依據報告成果，召開精進成果及建議座談會，邀集交通部路政司、道安會、公路總局、教育部及本所相關單位共同參與線上討論，並納入現行機制檢討。

The Institute supervised the six major regional transportation development research centers over the jointly completed outcome report of "Inventory Check of Campus Shuttle Bus Service Efficacy and Advice on Advancement". According to the results, the workshop on advancement and advice was held and the Department of Railways and Highways, the Road Traffic Safety Committee, and the Directorate-General of Highways under the MOTC, the Ministry of Education, and related units of the Institute were invited to take part in online discussions and current mechanisms are included in the discussions.

日期 Date

重要記事 Event

07
July

6

本所召開運輸計劃季刊編輯指導會111年度會議，報告110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。

The Institute held the 2022 meeting of the Transportation Planning Journal Editing Committee, where the 2021 operational status was presented and related matters were discussed to facilitate promotion and adoption for reference in subsequent journal edits.

15

本所召開「教學與應用合作計畫」試辦期成果座談會，邀請合作系方-淡江大學運輸管理學系、陽明交通大學運輸與物流管理學系及成功大學交通管理科學系-分享參與之經驗，做為未來擴散合作模式之參考，會中除討論如何提升學員之學習興趣及互動性外，更針對未來可合作之課程項目進行廣泛討論。

The Institute held a workshop on accomplishments during the trial period of the "Teaching and Application Collaborative Project". Collaborators, the Department of Transportation Management of the Tamkang University, the Department of Transportation and Logistics Management of the National Yang Ming Chiao Tung University, and the Department of Transportation and Communication Management Science of the National Cheng Kung University were invited to share their experience, which will serve as reference when the collaboration model is to be further expanded in the future. During the workshop, besides how to increase students' interest in learning and their interaction, extensive discussions were engaged in regarding courses available for collaboration in the future.

08
August

5

本所依據交通部指示辦理「道路交通標誌標線號誌設置規則」檢討案，先於111年6月27日辦理座談會蒐集意見，接續於7月召開東區、中區、南區、北區共4場檢討會。會後綜整設置規則共29條修正條文草案及各界意見，於111年8月5日函送交通部做為修正法規之參考。

The Institute, as instructed by the MOTC, reflected upon the "Road Traffic Sign, Mark, and Signal Setup Rules". First, a workshop was held on June 27, 2022 to collect opinions. Then, there were 4 rounds of reflections in the eastern, central, southern, and northern parts of Taiwan in July. After the workshops and reflections, a total of 29 provisions to be amended and opinions collected from all parties were drafted of the setup rules and were sent to the MOTC on August 5, 2022 to serve as reference for modifying laws and regulations.

08
August

8

王國材部長聽取本所簡報「『小客車租賃業數位轉型發展計畫』科技計畫研發成果以及辦理「小客車租賃服務整合旅遊生態系平台」軟體著作權授權之規劃，並指示請本所於授權時併同審查營運計畫，及將「獲授權之單位務必遵守汽車運輸業管理規則第103-1條」納入授權要求，俟本所調整授權內容後辦理公告，授權予相關小客車租賃業相關之商業同業公會、聯合會進行授權技轉及推廣應用，以達成協助小客車租賃業者數位轉型之目標。

Minister Kwo-Tsai Wang heeded the R&D accomplishments of the "Minibus Rental Businesses Digital Transformation Development Plan" presented by the Institute and the planning for software copyright authorization for the "Minibus Rental Service and Travel Ecology Platform" and instructed the Institute to also review the operational plan upon authorization and include "required compliance with Article 103-1 of the Automotive Transportation Industry Management Rules by authorized parties" as part of the authorization requirements. It shall be announced once details about the authorization are adjusted by the Institute. Relevant associations and federations of minibus rental businesses are authorized with technical transfers and promotions/applications in order to accomplish the goal of the digital transformation of minibus rental businesses.



日期 Date

重要記事 Event

08
August

蔡英文總統蒞臨嘉義縣亞洲無人機AI創意研發中心為交通部無人機科技產業小組辦公室揭牌，並由本所林所長繼國向蔡總統報告我國無人機在交通運輸應用領域之階段性推動成果。

President TSAI Ing-Wen visited the Asia UAV AI Innovation Application R&D Center in Chiayi County to unveil the Drone Sector Group Office under the MOTC. Director-General Lin of the Institute reported to President Tsai the phased accomplishments in the application of drones in transportation.



13

本所於111年再版付梓「2022年臺灣公路容量手冊」，為介紹新版公路容量手冊以利各界應用，辦理「2022年臺灣公路容量手冊發表說明會」，就臺灣公路容量研究歷程及展望、新版公路容量手冊內容、分析軟體與實務應用等主題進行說明與分享。

18

The Institute reprinted the "2022 Taiwan Highway Capacity Manual" in 2022 and held the "Release Conference on 2022 Taiwan Highway Capacity Manual" in order to introduce the updated manual to respective parties. The history of and prospects for highway capacity research in Taiwan, contents of the updated Highway Capacity Manual, the analytical software, and practical application, among others, were clarified and shared.

09

September

祁文中常務次長主持「區域運輸發展研究中心服務升級2.0計畫」(110-111年)第2次諮詢委員會議，邀集各諮詢委員聽取六大區域中心「區域公共運輸年度發展趨勢與政策方針」重點報告及「計畫亮點行程訪察」規劃，並請本所就各諮詢委員指導意見督導六大區域中心納入參考辦理。

6

Administrative Deputy Minister Wen-Chung Hao chaired the 2nd Advisory Committee meeting of the "Regional Transportation Development and Research Center Service Upgrade Program 2.0" (2021-2022). Members of the Advisory Committee were invited to heed keynote presentations of the six major regional centers on "Regional Public Transportation Annual Development Trends and Policy Directives" and "Program Highlight Itinerary Inspection" and the Institute was invited to supervise the six major regional centers over the inclusion of the feedback from the members in implementation.

14

APEC第52次運輸工作小組會議(TPTWG52)」於111年9月14~16日於泰國曼谷召開，我國循例由本所統籌出席代表團工作，並由本所黃副所長新薰率團與會，成員計有35位(親臨參與22位，視訊參與13位)，其中，政府部門代表人數計22位，民間/法人機構/學界13位。我國代表團分別於相關專家小組報告申辦APEC計畫內容及分享我國施政成果，包括航港局代表於「海運專家小組 (Maritime Experts Group, MEG)」會議報告我國自籌經費計畫「打造APEC地區後COVID-19疫情具韌性及永續性之郵輪產業 (Building a Resilient and Sustainable Cruise Industry Post COVID-19)」、本所代表於「複合運輸與智慧型運輸系統專家小組 (IIEG)」會議報告我國自籌經費計畫「提昇移動力整合新紀元 (Exploring the New Age for Mobility Integration)」，以及逢甲大學代表於「陸運專家小組 (Land Transport Experts Group, LEG)」會議報告「都市機動性發展與實踐：中華台北之經驗 (Urban Mobility Development and Implementation: Experience of Chinese Taipei)」，圓滿達成任務。

16

The 52nd meeting of the APEC Transportation Working Group (TPTWG52) took place in Bangkok, Thailand, on September 14-16, 2022. As always, the Institute was in charge of the delegation. Deputy Director-General Hsin-Hsun Huang of the Institute led the delegation to attend the meeting. There were 35 members in total (22 attended the meeting in person while 13 through video-conferencing). Among them, 22 were representatives from governmental departments and 13 were from private organizations/corporations/academia. Our delegation gave a presentation on the contents of the APEC project applied for in respective experts groups and shared administrative accomplishments in our country, including the representative of the Maritime Port Bureau on "Building a Resilient and Sustainable Cruise Industry Post COVID-19" during the Maritime Experts Group (MEG) meeting, the Institute's representative on "Exploring the New Age for Mobility Integration" during the IIEG meeting, and the representative from Feng Chia University on "Urban Mobility Development and Implementation: Experience of Chinese Taipei" during the Land Transport Experts Group (LEG) meeting. They successfully completed their tasks.

日期 Date

重要記事 Event

09
September

26

10
October

7

9

8

「小客車租賃業數位轉型發展計畫」科技計畫研發成果「小客車租賃服務整合旅遊生態系平台」軟體著作權，於本所網站公告非專屬授權資訊，開放小客車租賃商業同業公會或商業同業公會聯合會提出申請。

For the copyright of the software titled "Minibus Rental Service and Travel Ecology Platform", a research and development accomplishment of the "Minibus Rental Businesses Digital Transformation Development Plan", non-exclusive authorization information was released on the website of the Institute to allow associations and federations of minibus rental businesses to submit their applications.

「2022臺灣氣候行動博覽會」，林繼國所長代表交通部王國材部長參與10月7日「2022臺灣氣候行動高峰壇」，並以「2050淨零排放運輸轉型策略」為題與談交流。另本所協助交通部以運輸淨零轉型路徑為主題策劃參展；在3天展覽期間由本所、交通部路政司及交通部公路總局同仁熱心解說運輸淨零相關策略措施，受到參觀民眾的肯定，經主辦單位設計之票選，交通部展攤獲頒「最佳公部門行動獎」。

As part of the "2022 Taiwan Climate Action Exposition", Director-General Chi-Kuo Lin, on behalf of Minister Kwo-Tsai Wang of the MOTC, attended the "2022 Taiwan Climate Action Summit" on October 7 and moderated the exchange on "2050 Net Zero Emission Strategy for Transport Transformation". In addition, the Institute helped the MOTC plan presence in the exposition following the net zero transport transformation. During the 3-day exposition, colleagues at the Institute and the Department of Railways and the Directorate-General of Highways under the MOTC enthusiastically explained net zero transportation-related strategies and measures, which were well received by the visitors. The MOTC won the "Best Public Sector Action Award" in the election designed by the organizer.

林繼國所長獲邀於臺北市政府主辦之「2022臺北淨零未來論壇」以「2050淨零排放運輸轉型策略」為題進行專題演講，並與國內外專家學者就淨零排放議題分享交流。

Director-General Chi-Kuo Lin was invited to give a keynote speech on "2050 Net Zero Emission Transport Transformation Strategy" during the "2022 Taipei Net Zero Future Forum" held by the Taipei City Government and shared and exchanged opinions on net zero emissions with domestic and international experts and scholars.

日期 Date

重要記事 Event

10
October

本所研發專利「輕便型橋梁底部檢測設備」參加「2022臺灣創新技術博覽會發明競賽」獲得「金牌獎」。

The R&D patent "Compact Bridge Girder Bottom Test Equipment" of the Institute won the "Gold Medal" in the "2022 Taiwan Innotech Expo Invention Contest".



15

本所研發專利「地工織布橋梁基礎保護工法」參加「2022臺灣創新技術博覽會發明競賽」獲得「銀牌獎」。

The R&D patent "Geofabric Abutment Protection Technique" of the Institute won the "Silver Medal" in the "2022 Taiwan Innotech Expo Invention Contest".



本所辦理「111年度馬祖研究計畫成果系統教育訓練」，除介紹馬祖港維護管理制度、巡檢作業外，進行馬祖港維護管理系統、馬祖海情資訊系統及周邊系統精進說明並系統操作，讓應用單位實務應用本所研發成果並意見回饋，以利研究成果及系統功能持續優化。

The Institute held the "2022 Matsu Research Project Outcome System Educational Training". Besides an introduction to the maintenance and management system and the inspections at the Matsu Port, how the maintenance and management system and the sea condition information system and the surrounding system at Matsu can be advanced was clarified and there was the hands-on operation of the systems so that the end users could apply the R&D accomplishments of the Institute in practice and provide feedback to facilitate continuous optimization of research accomplishments and system features.



日期 Date

重要記事 Event

10
October

本所於交通部道路交通安全督導委員會第253次委員會議報告「公車進校園精進計畫」研究案，本所盤點建議51所公共運輸待改善學校並獲主席裁示優先推動改善。

26

The Institute gave a presentation on the research project titled "Campus Shuttle Bus Advancement Plan" during the 253rd meeting of the MOTC Road Traffic Safety Committee. The Institute did an inventory check and gave advice on the 51 schools where public transportation was pending improvement and they were approved by the chairperson to be prioritized for improvement.

本所辦理「以無人機空拍及AI影像辨識技術探討路口交通衝突」研究成果說明暨教育訓練，邀請交通安全從業人員共89人參與，推廣應用分析工具於路口交通安全診斷及改善，以提升路口安全。

27

The Institute held the outcome presentation and educational training on the research titled "Exploring Intersection Traffic Conflicts with Drones and AI Image Recognition Technology". A total of 89 practitioners were invited to take part. The application of analytical tools in the diagnosis and improvement of intersection traffic safety was promoted in order to enhance safety at intersections.

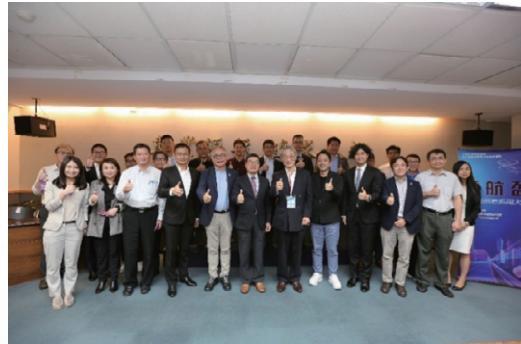
本所召開桃園航空城核心計畫「聯外運輸系統」工作小組第28次會議，就交通部111年10月21日第1848次部務會報結論略以：「桃園航空城自由貿易港區及新貨運站區，物流貨運量龐大，國1甲線與聯外路網及系統交流道銜接務必要為規劃設計，俾使貨運車輛順利進出，避免區域交通壅塞。」預為檢視及研商。

28

The Institute held the 28th meeting of the "outreach transportation system" working group of the Core Taoyuan Airport Project to preview and discuss in advance the conclusions reached in the 1848th meeting of the MOTC on October 21, 2022, which are briefed as "It is important to properly plan and design the bridging of Freeway 1 Route A and Outreach Road Network and the system interchange given the huge logistics and freight load for the Free Trade Zone and New Freight Zone of Taoyuan Airport to facilitate smooth access by freight vehicles and to avoid regional traffic congestion."

日期 Date**重要記事 Event****10
October**

日方無人機產業代表來臺與交通部無人機科技產業小組交流，討論臺日無人機產業合作機會及方向，期盼促成實質合作。

**30****11
November**

Representatives of the drone sector in Japan came to Taiwan to exchange with the Drone Sector Group of the MOTC and they discussed collaborative opportunities and directions in the drone sector between Taiwan and Japan to hopefully contribute to substantial partnerships.

4

本所假國家地震工程研究中心舉辦「港區無人機智慧化巡查技術研發成果」教育訓練，分享適用於臺中港區之無人飛行載具及飛控邏輯技術、影像自動化辨識技術，以及無人飛行載具影像管理與分析平台操作，並說明目前國內外智慧港口發展之現況，藉由透過教育訓練課程和參與單位互相交流，拓展應用領域，提升我國港埠智慧化發展，並協助臺灣港務股份有限公司以自動化方式快速掌握港區之使用狀況。

9

The Institute held the educational training titled "Port Drone Smart Inspection Technology R&D Accomplishments" at the National Center for Research on Earthquake Engineering. Unmanned aircraft and flight control logic technology, image automatic recognition technology, and unmanned aircraft image management and analytical platform operation applicable to Taichung Port were shared and the current status in the development of domestic and international smart ports were explained. Hopefully, through the educational training and exchange with participants, the applied fields may be expanded to boost port intelligentization and to help Taiwan International Ports Corporation, Ltd. quickly keep track of their use at ports automatically.



日期 Date

重要記事 Event

11
November

為響應政府推廣開放資料，本所將環島1號線圖資公開於內政部TGOS平臺，供各界加值應用，111.11.14榮獲內政部評定「111年度TGOS流通服務獎」。

The Institute held the experts and scholars workshop titled "International Airport Airside Capacity Evaluation and Analysis Method Creation and Subsequent Application". Issues explored included technology promotion procedure, challenges encountered in the creation of analytical methods, system analysis results, parameter framework, qualification process, how practical parameters and model parameters are transformed, application of results and subsequent development directions. Attendees and authorities included the Department Of Navigation and Aviation, the Civil Aeronautics Administration, CAA Air Navigation and Weather Services, Taoyuan International Airport Corporation, and experts and scholars. All parties exchanged and discussed with one another, which would help international airports in our country with data and model-based developments.

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本所召開「國際機場空側容量評析方法建立與後續應用」專家學者座談會，研討議題包括技術推進流程、建立分析方法之挑戰、系統分析成果、參數架構、驗證過程、實務參數項與模式參數項轉化方式、成果應用與後續開發方向，參與人員與單位計有交通部航政司、民航局、民航局飛航服務總臺、桃園機場公司及專家學者，藉此與各界交流討論，有助於我國國際機場營運朝數據化與模式化發展。

To answer to the government's promotion of open data, the Institute released Taiwan Cycling Route 1 atlas on the TGOS platform of the Ministry of the Interior to facilitate value-added applications by all parties. It won the "2022 TGOS Circulation Service Award" of the Ministry of the Interior on November 14, 2022.

11
November

王國材部長出席本所辦理之「無人機物流運送深化應用場域驗證啟動儀式」，以道路（橋梁）中斷無人機維持郵務運送為主題，選擇桃園市復興區為驗證場域，共有國內4家無人機業者完成驗證，藉此提升國內無人機物流運送能力，加速無人機物流應用服務實證落地。

Minister Kwo-Tsai Wang attended the "Ceremony to Activate Experience in Advanced Application of Drones in Logistics" held by the Institute. On the topic of postal delivery service maintained through drones in cases of broken roads (bridges), Fuxing District in Taoyuan City was selected as the qualifying area. A total of 4 drone suppliers in the country were successfully qualified. This was meant to enhance the logistics and delivery capabilities of drones in the country and to expedite the practically proven and landing of drones in logistics.



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本所配合交通部觀光局辦理「皇冠海岸漫騎趣及環台騎遊」活動，辦理「環騎圓夢APP」種子教師以及北區、中區、南區、東區之小隊長教育訓練。

The Institute, collaboratively with the MOTC Tourism Bureau, held the "Crown Coast Cycling Fun and Around-Taiwan Cycling" event and the educational training for seed teachers and group leaders for the northern, central, southern, and eastern parts of Taiwan of the "Tour-around-Taiwan for Dream Come True" App.

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本所合作計畫彙整「基於空拍影像之人車軌跡抽取技術」論文，榮獲道路協會111年度論文獎，由本所葉祖宏組長及計畫主持人溫基信副總經理代表領獎。

The Institute's paper titled "Aerial Image-based Man-Vehicle Trajectory Extract Technology" compiled of collaborative projects won the 2022 award of the Road Federation. Section head Tsu-Hurng Yeh of the Institute and the Principal Investigator Vice President Chi-Sin Wen accepted the award.



日期 Date

重要記事 Event

12
December

本所為協助落實感潮河段橋梁梁底檢測工作，邀請內政部營建署、交通部高速公路局、公路總局及縣市政府等橋梁維護管理機關（構），以視訊方式辦理「感潮河段橋梁梁底檢測工具研究成果推廣」，分享橋檢工具研發成果及檢測案例，並展示橋檢工具操作及功能，提供橋梁維護管理機關（構）未來應用參考。

To help consolidate bridge girder bottom testing at tidal reach, the Institute invited authorities (agencies) for the maintenance and management of bridges such as the Construction and Planning Agency under the Ministry of the Interior, the Freeway Bureau and the Directorate-General of Highways under the MOTC, and county and city governments, among others for the "Promotion of Research Accomplishments on Bridge Girder Bottom Testing Tools at Tidal Reach" through video-conferencing; they shared bridge testing tool R&D accomplishments and test cases and demonstrate how to operate bridge testing tools and their features for reference of bridge maintenance and management authorities (agencies) in the future.



1

本所與中華民國運輸學會於該會2022年會暨學術論文國際研討會中共同辦理「重大交通政策未來研究課題專題研討」專題場次，共規劃8個場次，交通部胡湘麟政務次長蒞臨致詞，期盼與會各界專家學者針對重大交通政策未來面臨課題進行研討，以提供做為交通部施政的參考及運輸領域創新研究之方向。

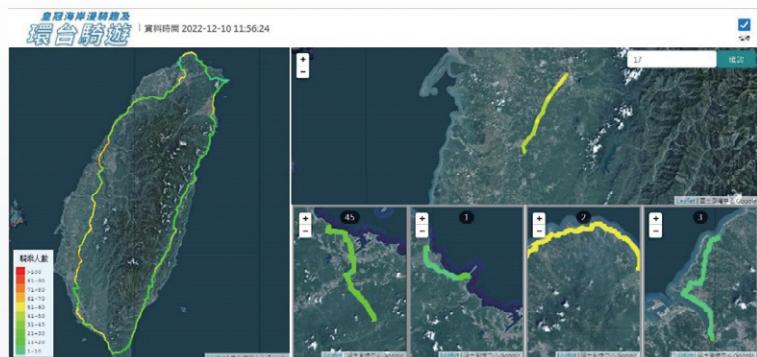
The Institute held jointly with the Chinese Institute of Transportation during the latter's 2022 Congress and International Symposium a keynote session titled "Exploring Future Research Topics on Major Traffic Policies". A total of 8 rounds were planned. Political Deputy Minister Hsiang-Lin Hu of the MOTC spoke for the event and indicated his anticipation that attending experts and scholars could explore and discuss challenges in the future for major traffic policies, which would serve as reference while the MOTC defines policies and guide innovative research in the field of transportation.

12
December

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本所協助觀光局舉辦「皇冠海岸漫騎趣及環台騎遊」活動，本次活動參與總人數為1,919人，參與騎乘人員透過本所開發之「環騎圓夢APP」記錄並經裝置的網路訊號回傳熱點資料至熱點圖分析伺服器，將回傳之騎乘位置即時分析後呈現於全臺騎乘熱點圖，順利串聯成完整的臺灣圖形，達到自行車環台騎遊宣導的目的。

The Institute helped the Tourism Bureau hold the "Crown Coast Cycling Fun and Around-Taiwan Cycling" event. A total of 1,919 people attended the event. The attendees had hot spot data sent back to the hot spot map analysis server through the "Tour-around-Taiwan for Dream Come True" App and the network signals of the device. The riding location sent back was analyzed in real-time and presented in the Taiwan-wide riding hot spot map to successfully connect into a complete Taiwan map and to fulfill the purpose of promoting cycling around Taiwan.



本所辦理「飛山越嶺-交通部無人機推動成果發表會」，頒獎表揚「無人機在交通領域之創意應用競賽(II)」獲獎團隊及「無人機整合示範計畫(II)-物流運送之深化應用」參與測試驗證之優勝廠商團隊，同時展現無人機科技產業小組及本所迄今推動的各項計畫之成果。本次成果發表會，匯集產官學研代表超過120人。

The Institute held the "Over the Mountains and Hills - MOTC Release Conference on Accomplishments in the Promotion of Drones" and presented awards to winning teams during the "Creative Application Contest of Drones in Traffic (II)" and outstanding manufacturers have taken part in testing and qualification for "Drone Integration Demonstration Program (II) - Advanced Application in Logistics and Transport" and also showcased the accomplishments in respective projects promoted by the Drone Technology Sector Group and the Institute so far at the same time. The release conference gathered more than 120 industrial/governmental/academic/research representatives.



日期 Date

重要記事 Event

12
December

本所辦理「道路交通安全科技發展與政策願景研討會-交通部王國材部長及與會貴賓合影

The Institute held the "Road Traffic Safety Technology Development and Policy Vision Seminar" - Picture of Minister Kwo-Tsai Wang of the MOTC and attending VIPs

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本所於臺北福容大飯店舉辦APEC「提昇移動力整合新紀元」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，共邀集APEC區域內包括美、日、越、韓及我國在內等會員體及非APEC區域如歐盟MaaS Alliance等交通行動服務(Mobility as a Service, MaaS)領域相關之政府機關、專家學者、業界代表與會，透過最佳實例與政策成果分享，交流各會員體於後疫情時代，MaaS對區域內跨境移動性和連結性，所可能面臨之挑戰與達成之貢獻。

The Institute held the APEC international forum titled "Exploring the New Age for Mobility Integration" at Fullon Hotel Taipei. The Institute applied on behalf of our country with the TPTWG and the IIEG for the forum and held it after it was approved. In total, members, including the US, Japan, Vietnam, Korea, and Taiwan within the APEC region and those in non-APEC regions such as EU MaaS Alliance and other governmental agencies, experts and scholars, and industrial representatives relevant to MaaS were invited to take part. Best examples and policies were shared. Possible challenges and fulfilled contributions of respective members in the post-pandemic era in terms of MaaS versus intra-regional inter-disciplinary mobility and connectivity.

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12
December

本所為完善商港海域水文調查，發展雷達遙測技術應用，建構商港平面海象觀測雛型，於集思臺中文心會議中心舉辦「雷達遙測技術於商港海象觀測之應用成果說明會」，說明雷達遙測技術所建置之觀測系統，擴展商港海域之波浪、海流海象觀測技術與應用領域。

To perfect marine hydraulics survey of commercial ports, to develop the radar remote survey technology to be applied, and to build a commercial port plane sea condition observation prototype, the Institute held the "Workshop on Accomplishments in Application of Radar Remote Survey Technology in Observing Sea Conditions at Commercial Ports" at the GIS Taichung Wenxin Convention Center where the observation system built applying the radar remote survey technology was clarified in order to expand commercial port marine wave and sea current and sea condition observation technologies and their applicable fields.



16

本所舉辦「東臺區域整體運輸規劃系列研究」之技術移轉教育訓練及成果推廣會議，以實體與線上併行方式辦理，以本年度辦理東臺區域（包含宜蘭縣、花蓮縣及臺東縣）之旅次特性調查分析等工作之實際案例，闡述運輸需求模式旅次特性調查概念、各調查之作業流程、交通分區與路網建構流程及東臺區域旅次特性調查成果等，包含中央與地方政府機關，及7所顧問／學術機構，共22位人員參加。

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The Institute held the technical transfer educational training and results promotion meeting for the "Series of Research on Overall Transportation Planning for Eastern Taiwan"; it was done both physically and online. Actual cases such as travel frequency and characteristic survey and analysis for the eastern part of Taiwan (including Yilan, Hualien, and Taitung) completed this year were adopted to elaborate on the idea about travel frequency and characteristic surveys through the transportation demand model, respective survey operating procedures, traffic zoning and road network construction procedure, and travel frequency and characteristic survey findings for the eastern part of Taiwan, among others. A total of 22 representatives from both central and local governments and 7 consulting/academic institutions attended the meeting.

日期 Date

重要記事 Event

12
December

陳彥伯政務次長出席本所與六大區域運輸發展研究中心共同辦理「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。本發表會係針對110-111年度協助各縣市政府提升公共運輸及輔導道路交通安全改善成果，邀請產官學研各界共同交流研討，藉由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交通安全改善方向，以落實交通部「交通心、幸福行」之施政理念。

23

Political Deputy Minister Yen-Po Chen appeared and spoke at the "Regional Center Joint Accomplishments Release Conference" held jointly by the Institute and the six major regional transportation development research centers and observed important accomplishments on display from the regional centers. For the release conference, representatives from the industry, the government, the academic, and the research circle were invited to exchange and discuss together accomplishments in improved public transportation and road traffic safety of respective county and city governments under assistance in 2021 and 2022. Opinions from all parties were gathered to help underline public transportation service developments and road traffic safety improvements in the future in order to put the belief of the MOTC "Hearty Traffic and Blessed Travel" into practice.



本所於臺灣港務股份有限公司基隆港務分公司舉辦「111年度基隆港海象觀測及模擬計畫成果交流會」分享本所辦理之基隆港海象觀測、港區波潮監測站系統及「海氣象預測模擬系統之維運與精進(1/4) - 精進基隆海域模組」計畫成果。

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The Institute held the "2022 Keelung Port Sea Condition Observation and Simulation Project Accomplishments Exchange" at the Keelung office of Taiwan International Ports Corporation, Ltd., where accomplishments of the Institute in Keelung Port sea condition observation and port tidal monitoring station systems and the project titled "Operation and Advancement of Sea Condition Forecast and Simulation System (1/4) - Advancing the Keelung Marine Module".



附錄： 年度研究計畫

Appendix: Annual Research Project



項次	計畫名稱	Project Title
1	中臺區域整體運輸規劃系列研究（3/3）－供需預測及發展策略分析	A Series of Studies on the Overall Transportation Planning of Central Taiwan Region (3/3) – Transportation Supply/Demand Forecast and Development Strategy Analysis
2	東臺區域整體運輸規劃系列研究（1/3）－旅次特性調查分析	A Series of Studies on the Overall Transportation Planning of Eastern Taiwan (1/3) – Investigation and Analysis of Trip Characteristics
3	臺灣地區整體運輸規劃－貨運需求調查與模式建立方法之研究	Transportation Planning for the Taiwan Region – A Study on Freight Transportation Demand Survey and Model Building Methodology
4	運輸規劃支援系統維運技術服務（111年度）	Maintenance Service of the Transportation Planning Support System (2022)
5	111-112年臺灣公路容量分析軟體（THCS）與專區網站推廣維運服務（111年度）	2022 Taiwan Highway Capacity Analysis Software and Website Promotion and Maintenance Service
6	交織路段公路容量及服務水準研究先期規劃	Research Planning on Highway Capacity and Service Level of Weaving Sections
7	公路交通系統模擬（HTSS）模式初探	Preliminary Study on Highway Traffic Systems Simulation (HTSS) Model
8	環島自行車道升級暨多元路線整合規劃與評估（III）	An Integrated Technical Planning and Evaluation of Upgrading and Diversifying Island Round Cycling Routes (III)
9	全國自行車單一總入口網系統優化暨區域自動路線規劃功能開發	Upgrade of the Taiwanbike Website and Automatic Regional Route Planning Function Development
10	108及111年春節連假高速公路與鐵公路客運旅次特性變化分析	Observations on the Trip Characteristics of Freeway and Railway of 2019 & 2022 Chinese New Year Holidays
11	匯流型交織車流對出口匝道運轉績效之影響分析－以中和交流道為例	Evaluation and Analysis of Traffic Flow Characteristics and Improvement Schemes of Converged Off-ramps take Zhonghe Interchange as an Example
12	A、B型混合路權輕軌容量分析實證研究－以淡海輕軌後續第二期藍海線路網為例	Danhai Light Rail Transit with Mixed Types A and B Rights of Way Railway Capacity Analysis – A Case Study Incorporating Phase 2 Network
13	高齡者旅運需求分析後續推動方向探討	A Plan for the Survey and Analysis of Traveling Demand Relating Senior Citizens
14	電動小客車公共充電樁設置數量及區位之考量因素初探	Factors affecting Public Electric Charging Station Demand and Placement Locations – A Preliminary Exploration
15	以自行車道友善性衡量指標探討自行車騎乘環境之友善性	Using Indicators of Bikeway Friendliness to Explore the Riding Environment
16	臺灣自行車單一入口網站發展規劃與探討	Preliminary Research on "Taiwanbike" Website Development
17	創育加速器推動智慧航港與創新海事生態系統之研究	Research on Innovative Accelerator Promotes Smart Port and Innovative Maritime Ecosystem.
18	無人機整合示範計畫（II）－物流運送之深化應用	Unmanned Aerial Vehicle (UAV) Integrated Pilot Program (II) – Deepening Application of Logistics Transport
19	載貨無人機與傳統運送服務環境效益差異之案例分析	Case Study on the Environmental Benefits of Delivery Drones vs. Traditional Delivery Services
20	亞太地區往返歐洲航空中轉市場路徑分布初探	Preliminary Study on the Air Transit Markets Between Asia-Pacific Region and Europe
21	北美經桃園及鄰近機場往返亞太市場探討	Study on Transfer Traffic Between North America and Asia-Pacific via Taoyuan Airport and its Neighboring Airports

項次	計畫名稱	Project Title
22	貨櫃碼頭自動化對港口營運影響研析	Study on the Influence of Container Terminal Automation on Port Operation
23	111年度「國際海運資料庫」更新擴充及資料分析服務	Expanding, Updating and Data Analyzing of International Maritime Database of 2022
24	111年度「國際空運資料庫」更新擴充及資料分析服務	Expanding, Updating and Data Analyzing of International Air Transportation Database of 2022
25	無人機搭配AI影像辨識應用於橋梁檢測之研究（1/2）－橋梁劣化構件AI影像辨識之技術開發	Application of UAV with AI image recognition for bridge inspection (1/2) – Technology development of AI technology for bridge component defects recognition
26	應用模擬模式建立國際機場空側容量評析方法之研究（2/2）-桃園機場空側容量評估與分析	Research on Establishing Airside Capacity Evaluation and Analysis Methods on International Airports Using Simulation Models (2/2) – Taoyuan International Airport Airside Capacity Assessment and Analysis
27	我國國際航空貨運疫後變化趨勢與發展課題初步評析	Preliminary Analysis of the Trend and Development Issues of International Air Cargo after COVID-19 Outbreak in Taiwan
28	特殊性橋梁養護作業督導考核制度之探討	Research on Supervision and Examination System of Special Bridge Maintenance Operation
29	我國港口貨櫃航網變化之研究	The Study on Container Shipping Network
30	鐵路系統供需診斷模式軟體之維護與擴充及策略分析（2/2）－完成軟體維護與擴充及策略分析	Maintenance and Expansion of the Railway Supply and Demand Diagnosis Model Software and Strategy Analysis (2/2) - Complete Software Maintenance and Expansion and Strategy Analysis
31	以鐵路供需診斷模式軟體進行建設計畫供需影響之初探	A Preliminary Study on the Influences of Supply and Demand in Construction Project Using Railway Supply and Demand Diagnosis Model Software
32	環島自行車道升級暨多元路線整合規劃與評估（II）	An Integrated Technical Planning and Evaluation of Upgrading and Diversifying Island Round Cycling Routes (II)
33	研提112-115年社會發展計畫（跨110-111年度）	Develop the Major Social Development Projects during 2023 to 2026
34	國內駕駛訓練、駕駛執照考驗及駕駛人管理制度之通盤檢討	A Thorough Reflection on Training, Licensing, and Management of Domestic Automobile Drivers
35	網路媒合外送平台外送員之交通安全管理策略研析	Research and Analysis of Road Driving Safety Management Strategies for the Delivery Person of the Internet Crowdsourcing Delivery Platform
36	應用人工智慧分析技術探勘高風險路段（1/4）－駕駛行為模式研析及車外異常事件影像辨識技術開發	Applying Artificial Intelligent Method for Exploring Risk-prone road section (1/4) – Driving Behavior Analysis and Image Recognition Technique Development for Aberrant Events
37	精進鐵道安全管理系統12要項實務作業指引之研析	A Study on Improving 12 Key Elements in Railway Safety Management System- the Development of Practical Operation Guidelines
38	我國海事安全資料蒐集與應用之研究	The Research on Marine Safety Information Collection and Implication Model of Taiwan
39	以無人機探勘人車流動資訊之應用情境規劃與先導測試（1/3）－建立分年測試計畫	Application Scenarios and Pilot Run of Vehicle and Pedestrians Traffic Flow Information Using UAV Aerial Videography (1/3) – Establishing a Test Plan
40	事故碰撞型態導向之路口設計範例推廣示範計畫（1/3）－直轄市推廣應用	The promotion of "Traffic Safety Engineering Design Guidance for Intersection Based on Accident Types (1/3)" – Special Municipality
41	大型車輛裝設主動預警輔助系統之試運行使用成效評估（1/4）：評估架構規劃	Evaluation of the Trial Operation of Large Vehicles Installed with Active Warning Assist System (1/4) : Evaluation Framework Planning

項次	計畫名稱	Project Title
42	高齡友善交通政策之研訂：長期推動策略、行動計畫與觀測指標	Policies toward the friendly transportation for the elderly – Long term strategies, action plans and observatory measures for their effectiveness
43	「區域運輸發展研究中心服務升級2.0計畫」（110-111年）－北區區域	Implement the Service Upgrade 2.0 Project for the Regional Transportation Research and Development Center (2021-2022) – North Region
44	「區域運輸發展研究中心服務升級2.0計畫」（110-111年）－桃竹苗區域	Implement the Service Upgrade 2.0 Project for the Regional Transportation Research and Development Center (2021-2022) – Taoyuan-Hsinchu-Miaoli Region
45	「區域運輸發展研究中心服務升級2.0計畫」（110-111年）－中區區域	Implement the Service Upgrade 2.0 Project for the Regional Transportation Research and Development Center (2021-2022) – Central Region
46	「區域運輸發展研究中心服務升級2.0計畫」（110-111年）－雲嘉南區域	Implement the Service Upgrade 2.0 Project for the Regional Transportation Research and Development Center (2021-2022) – Yunlin, Chiayi, Tainan Region
47	「區域運輸發展研究中心服務升級2.0計畫」（110-111年）－高屏澎區域	Implement the Service Upgrade 2.0 Project for the Regional Transportation Research and Development Center (2021-2022) – Kaohsiung-Pingtung-Penghu Region
48	「區域運輸發展研究中心服務升級2.0計畫」（110-111年）－東部區域	Implement the Service Upgrade 2.0 Project for the Regional Transportation Research and Development Center (2021-2022) – Eastern Region
49	鐵道資產管理相關國際標準及重要資產績效指標之初探	A Study on Railway Asset Management and Asset Performance Evaluation
50	共享運具連結公共運輸之初探	A Preliminary Study on Connecting Shared Modes and Public Transit
51	區塊鏈技術在汽車運輸業經營管理面之應用初探	A Preliminary Study on the Application of Blockchain Technology in the Management of Automobile Transportation Industry
52	國際零碳經濟對汽車貨運業營運影響與因應初探	A Preliminary Study on the Impact and Countermeasures of the Zeronomics on the Truck Freight Industry
53	運輸經營管理組業務決策支援系統規劃（1/2）－需求分析	Planning of Business Decision Support System for Transportation Operations and Management Division (1/2) – Requirements Analysis
54	智慧公共運輸服務發展策略規劃	Planning the Development Strategy of Smart Public Transportation Services
55	交通部無人機科技產業發展策略規劃與執行	Planning and Implementation of the Development Strategy of the Unmanned Aircraft System Technology Industry by MOTC
56	111年電動大客車營運數據監控管理平台維運與移轉維運與移轉	The Maintenance and Transfer of Electric Bus Operational Monitoring and Management Platform of 2022
57	111年度交通行動服務（MaaS）縣市推廣與督導計畫	MaaS Promotion and Supervision for Taiwan Counties in 2022
58	我國人工智慧車聯網之號誌控制模式探討	Study of Artificial Intelligence and Vehicle-to-Everything on Traffic Signal Control Model in Taiwan
59	構建5G智慧交通數位神經中樞（2/2）－系統雛型開發與驗證實作	Construction of 5G intelligent transportation digital nerve center (2/2) – System prototype development and verification implementation
60	無人機在交通領域之創意應用競賽（II）	A Competition for Creative Applications of UAV in the Field of Transportation II
61	推動運輸部門溫室氣體減量事項及深化減碳路徑評估	Promoting Greenhouse Gas Reduction in the Transportation Sector and Assessing Deep Decarbonization Pathways

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62	共享電動機車對運輸溫室氣體排放影響之研究(1/2)	Research on the Impact of Shared e-scooters on Transportation Greenhouse Gas Emissions (1/2)
63	應用交通管理策略減少都會區交通空氣污染之研析(2/3) -第2年度交通管理策略意向調查	Research and Analysis on Applying Traffic Management Strategies to Reduce Traffic Air Pollution in Metropolitan Areas (2/3) - Survey of Intentions for Traffic Management Strategies in the 2nd Year
64	公路系統規劃階段強化調適能力之探討(1/2)	A Study of Enhancing Highway System's Adaptive Capability in the Planning Phase (1/2)
65	運輸部門2050淨零碳排放路徑初析	Analyzing 2050 Net Zero Greenhouse Gas Emissions Pathway in Transportation Sector in Taiwan
66	運具溫室氣體排放及減碳措施效益推估參數精進之探討	Research on Refinement of Parameters for Estimating the Benefits of Greenhouse Gas Emissions and Carbon Reduction Measures from Modes
67	新式運輸服務型態對運輸排碳影響初探	Preliminary Study on the Carbon Emission of Emerging Transportation Type
68	影響軌道系統規劃階段調適能力因素初探	A Preliminary Discussion on the Adaptation Factors Affecting the Railroad Transportation in the Planning Phase
69	交通部永續發展目標自願檢視報告之規劃	The Planning of Voluntary Departmental Review of SDGs in Ministry of Transportation and Communications, Executive Yuan, R.O.C (Taiwan)
70	國內駕駛訓練、駕駛執照考驗及駕駛人管理制度之通盤檢討	A Thorough Reflection on Training, Licensing, and Management of Domestic Automobile Drivers
71	網路媒合外送平台外送員之交通安全管理策略研析	Research and Analysis of Road Driving Safety Management Strategies for the Delivery Person of the Internet Crowdsourcing Delivery Platform
72	應用人工智慧分析技術探勘高風險路段(1/4) - 駕駛行為模式研析及車外異常事件影像辨識技術開發	Applying Artificial Intelligent Method for Exploring Risk-prone Road Section (1/4) - Driving Behavior Analysis and Image Recognition Technique Development for Aberrant Events
73	精進鐵道安全管理系統12要項實務作業指引之研析	A Study on Improving 12 Key Elements in Railway Safety Management System - the Development of Practical Operation Guidelines
74	我國海事安全資料蒐集與應用之研究	The Research on Marine Safety Information Collection and Implication Model of Taiwan
75	以無人機探勘人車流動資訊之應用情境規劃與先導測試(1/3) - 建立分年測試計畫	Application Scenarios and Pilot Run of Vehicle and Pedestrians Traffic Flow Information Using UAV Aerial Videography (1/3) - Establishing a Test Plan
76	事故碰撞型態導向之路口設計範例推廣示範計畫(1/3) - 直轄市推廣應用	The Promotion of "Traffic Safety Engineering Design Guidance for Intersection Based on Accident Types (1/3)" - Special Municipality
77	大型車輛裝設主動預警輔助系統之試運行使用成效評估(1/4)：評估架構規劃	Evaluation of the Trial Operation of Large Vehicles Installed with Active Warning Assist System (1/4) : Evaluation Framework Planning
78	高齡友善交通政策之研訂：長期推動策略、行動計畫與觀測指標	Policies toward the Friendly Transportation for the Elderly - Long Term Strategies, Action Plans and Observatory Measures for their Effectiveness
79	汽車客運業路線別成本計算制度檢討規劃及應用軟體建置計畫(1/2)	Route-Based Costing System Review and Application System Building for Bus Carriers Industry (1/2)
80	先進公車智慧化營運管理先導運行計畫(1/2) - 整合車載設備之駕駛工時管理系統研發	Advanced Bus Intelligent Operation Management Pilot Operation Project (1/2) - Research and Development of Integrated On-board Equipment Driving Hours Management System
81	推動通用計程車特約制度(1/2) - 系統擴充及跨部會合作規劃與執行	Implement the Contract System of Accessible Taxis (1/2) - System Expansion and Cross-Ministries/Agencies Cooperation Planning and Implementation

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82	111年電動大客車營運數據監控管理平台維運與移轉維運與移轉	The Maintenance and Transfer of Electric Bus Operational Monitoring and Management Platform of 2022
83	111年度交通行動服務（MaaS）縣市推廣與督導計畫	MaaS Promotion and Supervision for Taiwan Counties in 2022
84	多元公共運輸之輔助運具供需與資訊整合計畫	Auxiliary Modes of Diverse Public Transportation Supply-Demand and Information Integration Project
85	構建5G智慧交通數位神經中樞（2/2）－系統雛型開發與驗證實作	Construction of 5G Intelligent Transportation Digital Nerve Center (2/2) - System Prototype Development and Verification Implementation
86	推動我國無人機科技產業發展先期研究規劃	Advanced Research and Planning on the Industrial Promotion of Unmanned Aerial Vehicles Technology Development in Taiwan
87	無人機在交通領域之創意應用競賽	A Competition for Creative Applications of UAV in the Field of Transportation
88	推動運輸部門溫室氣體減量事項及深化減碳路徑評估	Promoting Greenhouse Gas Reduction in the Transportation Sector and Assessing Deep Decarbonization Pathways
89	共享電動機車對運輸溫室氣體排放影響之研究（1/2）	Research on the Impact of Shared E-scooters on Transportation Greenhouse Gas Emissions (1/2)
90	應用交通管理策略減少都會區交通空氣污染之研析（2/3）－第2年度交通管理策略意向調查	Research and Analysis on Applying Traffic Management Strategies to Reduce Traffic Air Pollution in Metropolitan Areas (2/3) - Survey of Intentions for Traffic Management Strategies in the 2nd Year
91	公路系統規劃階段強化調適能力之探討（1/2）	A Study of Enhancing Highway System's Adaptive Capability in the Planning Phase (1/2)
92	運輸部門2050淨零碳排放路徑初析	Analyzing 2050 Net Zero Greenhouse Gas Emissions Pathway in Transportation Sector in Taiwan
93	運具溫室氣體排放及減碳措施效益推估參數精進之探討	Research on Refinement of Parameters for Estimating the Benefits of Greenhouse Gas Emissions and Carbon Reduction Measures from Modes
94	新式運輸服務型態對運輸排碳影響初探	Preliminary Study on the Carbon Emission of Emerging Transportation Type
95	影響軌道系統規劃階段調適能力因素初探	A Preliminary Discussion on the Adaptation Factors Affecting the Railroad Transportation in the Planning Phase
96	交通部永續發展目標自願檢視報告之規劃	The Planning of Voluntary Departmental Review of SDGs in Ministry of Transportation and Communications, Executive Yuan, R.O.C (Taiwan)
97	船舶監控預警系統之應用（2/2）	Application of Ship Monitoring and Early Warning System (2/2) - Development of application modules for Traffics Flow and Accident Hot Spot Analysis
98	交通部無人機科技產業發展策略規劃與執行	Planing and Implementation of the Development Strategy of the Unmanned Aircraft System Technology Industry by MOTC
99	111年電動大客車營運數據監控管理平台維運與移轉維運與移轉	The Maintenance and Transfer of Electric Bus Operational Monitoring and Management Platform of 2022
100	111年度交通行動服務（MaaS）縣市推廣與督導計畫	MaaS Promotion and Supervision for Taiwan Counties in 2022
101	我國人工智慧車聯網之號誌控制模式探討	Study of Artificial Intelligence and Vehicle-to-Everything on Traffic Signal Control Model in Taiwan
102	構建5G智慧交通數位神經中樞（2/2）－系統雛型開發與驗證實作	Construction of 5G intelligent transportation digital nerve center (2/2) - System prototype development and verification implementation
103	無人機在交通領域之創意應用競賽（II）	A Competition for Creative Applications of UAV in the Field of Transportation II

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104	研析溫室氣體減量及管理法修法重點及交通主管機關因應建議	Research on the Climate Change Act as well as Related Regulations and the Suggestion of the Transportation Authorities
105	路口交通環境特性對空氣品質影響及改善指引先期規劃	The Pre-planning of Traffic Environment Characteristics at Intersections Impact on Air Quality and Improvement Guidelines
106	鐵道系統強化調適能力探討之先期規劃	A Preliminary Planning for the Discussion on Enhancing Railway System's Adaptive Capacity
107	氣候變遷風險因子於鐵公路風險評估探討之先期規劃	A Preliminary Planning for the Discussion on the Climate Change Risk Factor of Risk Assessment for Highway-Railway System
108	感潮河段橋梁底檢測工具研發(1/4)－功能精進與新興科技導入評估	Research and Development of Bridge Bottom Detection Tools in Tidal River Sections (1/4) – Functional Improvement and Emerging Technology Introduction Evaluation
109	軌道構件缺失人工智慧辨識建置應用-系統擴建與宜蘭段現地測試	Railway Track Defect Inspection System by Artificial Intelligence-System Expansion and Field Test in Yilan
110	無人機影像監測技術應用於臺中港區管理之研究(II)－空間資訊整合分析平台建置	Application Research of the Management of Taichung Port Area based on UAV Image Monitor Technique (II) – the Platform for Spatial Information and Analysis
111	應用影像智慧化技術判釋海岸公路及防波堤越波研究(1/4)－日間越波影像判釋	Development of the Image Recognition Technology for Wave Overtopping on the Coastal Highway and Breakwater (1/4) – Daytime Image Recognition
112	港灣環境資訊系統維護與精進(1/4)－海氣象資訊擴充整合建置	Maintenance and Improvement of the Harbor Environmental Information System (1/4) – Expansion and Integration of Marine meteorological Information
113	海氣象預測模擬系統之維運與精進(1/4)－精進基隆海域模組	Maintenance and Advancing of Sea Meteorology Prediction Simulation System (1/4) – Advancing Keelung Seas Module
114	鼎型塊織布橋基保護工法之現地試驗與成效評估(1/4)－數值水理分析模型建置	Performance Assessment on Geotextile Protection Construction Method (1/4) – On-site Scour Test for Hydraulic Model Building
115	應用人工智慧辨識技術輔助臺鐵執行軌道巡查作業項目之探討	Discussion on the Application of Artificial Intelligence Inspection Technology to Assist Taiwan Railway in Executing Track Inspection Projects
116	多期多尺度影像結合深度學習於邊坡地貌變異判識之初探(1/2)－影像蒐集及辨識演算法架構探討	A Preliminary Study on the Deep Learning Applied to Geomorphological Identification of Slope by Multi-Phase and Multi-Scale Images (1/2) – Probe on Collection of Image and Identification Algorithm
117	111年臺灣地區金屬材料腐蝕環境調查與工業區關聯性研究	Investigation on Metal Materials in the Corrosive Environment of Taiwan in 2022 and Its Association with Industrial Parks
118	港灣構造物巡查檢測作業精進(1/4)－新興科技應用於巡查檢測作業之探討	Improved Inspection and Detection of Harbor Structures (1/4) – Discussion on Application of New-Emerging Technology to Inspection and Detection
119	港區地震液化風險評估模式精進(1/5)－臺中港模式精進	Refinement for Seismic Liquefaction Risk Assessment Model for Port Area (1/5) – Refinement of Taichung Port Model
120	臺灣主要商港風力觀測與特性分析	Analysis of Wind Observations Near the Commercial Harbors in Taiwan
121	臺灣主要商港潮位觀測與特性分析	Analysis of Tide Observations Near the Commercial Harbors in Taiwan
122	臺灣主要商港波浪觀測及特性分析	Analysis of Wave Observations Near the Commercial Harbors in Taiwan
123	臺灣主要商港海流觀測及特性分析	Analysis of Current Observations Near the Commercial Harbors in Taiwan
124	智慧航安與海氣象資訊應用探討(1/4)－整合船舶海事案件與海氣象即時模組	Application of Smart Aviation Safety and Marine Meteorological Information (1/4) – Integrate real-time modules of ship maritime cases and sea weather

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125	消波塊模型試驗之比較研究	Comparison Studies of Laboratory Tests on Eleven Armor Types.
126	馬祖港域能見度探討之研究(2/2) - 能見度預測模式之概念驗證	Study on the Visibility of the Matsu Port Area (2/2) - Proof of Concept for Visibility Prediction Model
127	應用微波雷達技術於臺北港域環境監測之研究(1/4) - 微波雷達觀測波流特性分析	Application Research on Environmental Monitoring by Microwave Radar in Costal Sea Area (1/4) - Analysis of Meteo-oceanographic Observation
128	臺中港遠程外廓堤水工模型動床漂沙試驗	Study on the Long-term Expansion Breakwater of Taichung Port with Hydraulic Model and Movable Bed Transport Test.
129	臺灣港群暨金門港即時潮位系統精進評估	Concentrate on Improving Evaluation of Real-time Tide Level System in Taiwan Port Group and Kinmen Port.
130	岬灣海灘造成近岸港口航道淤塞機制分析與調適對策	Mechanism Analysis and Adjustment Countermeasures of Inshore Harbor Siling Caused by Headland-Bay Beach.
131	商港海氣象風力資料預警機制探討	A Study on Warning Mechanism of Wind Data in Harbors
132	港研中心業務決策支援系統規劃(1/2) - 需求分析	Planning of Administrative Decision-making Supportive System for Harbor & Marine Technology Center (1/2) - Requirements Analysis
133	花蓮港內波浪預測方案初探	Preliminary Discussion on the Wave Forecasting Scheme in Hualien Port.
134	花蓮海域風浪模組模擬成效評估及精進	Evaluation and Improvement of Wind-wave Model Simulation effects in Hualien Sea Area.
135	馬祖南竿福澳港海氣象特性分析	Analysis of Marine Meteorological Characteristics at Fu'ao Wharf in Nangan, Matsu.



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